Occurrence of communicable diseases and their risk factors among the female inhabitants of lower socioeconomic groups in Dhaka city

A dissertation submitted to the University of Dhaka in fulfillment of the requirement for the degree of Doctor of Philosophy in Zoology (Parasitology)

BY

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DEDICATED

TO

MY RESPECTED PARENTS

&

MY BELOVED HUSBAND

DECLARATION

It is my greatest honour and privilege to declare that this dissertation submitted to the University of Dhaka for fulfillment of the degree of Doctor of Philosophy is based on my own investigation, carried out under the supervision and guidance of Professor Dr. Hamida Khanum and Professor Dr. Sharmin Musa, Department of Zoology, University of Dhaka.

I left no stone unturned to make the dissertation unique, informative and comprehensive one with the sincere co-operation and valuable guidance of my supervisors. In this regard, I would like to confirm that the research works reported in this dissertation are original and had never been submitted for any other degree.

Sincerely,

Mt. Tahmina Karim

CERTIFICATE

This is to certify that the dissertation entitled “Occurrence of communicable diseases and their risk factors among the female inhabitants of lower socioeconomic groups in Dhaka city” submitted by Mt. Tahmina Karim, for the degree of Doctor of Philosophy in Zoology (Parasitology) of the University of Dhaka, Bangladesh, embodies the record of original investigations carried out by her under our supervision.

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CONTENTS

Occurrence of communicable diseases and their risk factors among the female inhabitants of lower socioeconomic groups in Dhaka city

Abstract

Identification of the type of most common communicable diseases and prevalence of each disease was observed among the female inhabitants of lower socioeconomic groups in Dhaka city. A total of 900 female inhabitants were examined during Sep 2013 to Aug 2015, prevalence of gastrointestinal parasitic infestation was 66.22% and 26 parasite species were identified. Prevalence of nematoda was the highest (57.55%), then cestode (38.67%), protozoa (19.22%) and lowest was found in trematode (4.11%). *Entamoeba histolytica* (10.44%) indicates severe faecal contamination among protozoan parasites, while in cestodes *Hymenolopis nana* (22.78%), in trematodes *Fasciolopsis buski* (2.11%) and in nematodes *Ascaris lumbricoides* (38%) were highly prevalent. In twelve study areas, the highest prevalence was found in Kamrangichar (87.5%). The peak prevalence (82.5%) of infection was observed in rainy season. Double and triple parasitic infection was higher than that of single infection. Children of age group 1-15 years (75.65%) were mostly affected by intestinal parasite. The overall prevalence of anaemia was 42.22%. Anaemia was significantly higher (49.6%) in 16-30 years of adult group and severe anaemic cases also found within the same age group. Comparatively higher percentage was found in anaemic and parasite positive cases (70.53%) than non anaemic parasite positive cases (63.08%) that prove that parasitic infestation is one of the main reasons for anaemia.

The prevalence of Urinary tract infection was 31.44% and the highest prevalence of urinary tract infection was observed among adult age group (46.8%). Therefore, female from adult age group were vulnerable to many diseases. Comparatively higher UTIs cases were found in rainy seasons (40.31%). The percentage of *E. coli* was found highest (65.72%) for causing UTIs. Among 900 female inhabitants, 41.33% were infected with different types of skin diseases; within these, bacteria (45.16%), fungal (26.07%), viral (19.35%) and arthropod (9.41%) infections were found. Among them, the highest 54.28% were infected by scabies and 38.09% were affected by boil disease. The highest prevalence of skin diseases was observed among the adult age group.

The prevalence of vector-borne diseases was 49.33%, among them four types of diseases were recorded which are malaria (2%), filaria (7.33%), dengue (34.67%) and leishmaniasis (5.33%). Dengue (64.25%) and malaria (4.66%) infection was found highest among the children while filaria (12.18%) and leishmaniasis (8.12%) found in middle age group. Four types of waterborne diseases were found such as cholera/ diarrhoea (28%), typhoid (17.11%), polio (5.11%) and hepatitis A/ Jaundice (9.67%); and overall prevalence was 59.87%. Regarding the airborne diseases, 58.44% were found to be infected, among them four types recorded, such as influenza (25.11%), mumps (10.22%), pneumonia (17.44%) and tuberculosis (5.67%). The major proportion of the waterborne infections (71.50%) and airborne infections (69.43%) were found in children group. The main source of disease transmission may be associated with socioeconomic condition, sanitation and personal hygiene, so these sources were considered to be risk factors. Risk factors and socioeconomic aspects of the female inhabitants in relation to parasitic, skin, vector-borne, waterborne and airborne diseases were also calculated.

ABBREVIATIONS

AD	*Ancylostoma duodenale*
AFB	Acid-fast bacilli
AL	*Ascaris lumbricoides*
ALAT	Alanine aminotransferase
ASAT	Aspartate aminotransferase
BC	*Balantidium coli*
BHI	Brain Heart infusion
BI	Breteau Index
BIRDEM	Bangladesh Institute of Research and Rehabilitation for Diabetes
BMI	Body Mass Index
BSI	Bloodstream infection
CAMP	Christie, Atkins and Munch- Peterson
CDC	Centre for disease control
CHOP	Childrens out patient clinic
CLSI	Clinical and Laboratory Standards Institute
CM	*Chilomastix mesnili*
CS	*Clonorchis sinensis*
DALYs	Disability-adjusted life years
DC	*Dipylidium caninum*
DDT	Dichloro diphenyl trichloroethane
DEN	Dengue
DF	Dengue Fever
DGHS	Directorate General of Health Services
DHF	Dengue Hemorrhagic Fever
DL	*Diphyllobothrium latum*

DMA	Dhaka Metropolitan Area
DMCH	Dhaka Medical college Hospital
DSS	Dengue Shock Syndrome
EC	*Entamoeba coli*
EDS	Ehlers- Danlos Syndromes
EG	*Echinococcus granulosus*
EH	*Entamoeba histolytica*
Eh	*Enteromonas hominis*
EHEC	Enterohemorrhagic *Escherichia coli*
EN	*Endolimax nana*
EPG	Eggs per gram
ESR	Elevated erythrocyte sedimentation
et al.	et alli/ And others
ETEC	Enterotoxigenic *E. coli*
EV	*Enterobius vermicularis*
FB	*Fasciolopsis buski*
FH	*Fasciola hepatica*
GI	Gastro Intestinal
GI	*Giardia intestinalis*
GIDEON	Global Infectious Diseases and Epidemiology Online Network
HAV	Hepatitis A Virus
HCWs	Health-care workers
HD	*Hymenolepis diminuta*
HEV	Hepatitis E Virus
HIV	Human immunodeficiency virus
HIES	Household Income and Expenditure Survey

HN	*Hymenolepis nana*
HPV	Human papillomavirus
IB	*Iodamoeba butschlii*
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
ICU	Intensive care unit
IDA	Iron Deficiency Anaemia
IEDCR	Institute of epidemiology, disease control and research
IH	*Isospora hominis*
ILI	Influenza-like illness
IPD	Inpatient department
IPGM&R	Institute of Postgraduate Medicine and Research
KAP	Knowledge, attitude and practice
KIA	Kliger's Iron Agar
LDH	Lactate dehydrogenase
LF	Lymphatic Filariasis
LSD	Least significant difference
LST	Leishmanin skin tests
MAC	MacConkey agar plate
MDA	Mass Drug Administration
MEP	Malaria Eradication Program
Mf	Microfilaria
MIU	Motility Indole Urease
MMR	Measles, mumps, and rubella
M&PDC	Malaria & Parasitic Disease Control Unit
MR	Microfilaria rate
NIPs	National immunization programs

NaTHNaC	National Travel Health Network and Centre
OPD	Outpatient department
OPV	Oral Polio Vaccine
PAHO	Pan American Health Organization
PDVI	Pediatric Dengue Vaccine Initiative
PHCs	Primary health centres
PPS	Post-Polio Syndrome
PTB	Pulmonary Tuberculosis
PW	*Paragonimus westermani*
RDT	Rapid diagnosis test
SARI	Severe acute respiratory illness
SD	Standard deviation
SEAR	Southeast Asia Region
SPSS	Statistical Package for the Social Sciences
SS	*Strongyloides stercoralis*
STD	Sexual transmitted disease
STH	Soil transmitted helminth
TH	*Trichomonas hominis*
TS	*Taenia saginata*
TSI	Triple Sugar Iron
TT	*Trichuris trichiura*
UK	United kingdom
UTI	Urinary tract infection
VD	Venereal Diseases
VL	Visceral Leishmaniasis
WHO	World Health Organization

INTRODUCTION

The communicable diseases are illness that usually transmits through contact of organisms. Human, animals, and foods are all carriers of organisms that can transfer an infectious illness from one host to another. A simple touch or exchange of fluids can spread a disease from one individual to another (Smith 2012). Communicable diseases, sometimes called infectious diseases, are caused by organisms such as bacteria, viruses, fungi and parasites. It may spread directly from one infected person to another or from an animal to a human or from some inanimate object to an individual. Some communicable diseases can spread in more than one way, consuming contaminated foods or beverages, contact with contaminated body fluids, airborne (inhalation), water or being bitten by an infected animal, insect or tick (http://langladecountyhealth.org/communicable-disease/). Communicable diseases are several contagious diseases like water borne disease (cholera, typhoid fever etc.); vector borne disease (malaria, dengue, yellow fever etc.); diseases associated with overcrowding (tuberculosis infection, diarrhoeal diseases etc.); vaccine preventable disease (polio, tetanus etc.) airborne disease (pneumonia, influenza etc.) etc. (http://www.mindomo.com/mindmap/communicable-and-noncommunicable-diseases/).

Intestinal Parasitic Infestation:

Intestinal parasitic diseases are a major public health problem in Southeast Asia particularly among poor children living in urban squats and rural communities (Bundy *et al*. 1992, Chan 1997). The parasites affect physical growth, and psychomotor development in the infected children (Oberhelman *et al.* 1998). Higher prevalence in children is attributed to many factors, particularly environmental and personal hygiene (Tomono *et al.* 2003). A number of studies were conducted throughout Bangladesh during the past half century regarding the infestation of intestinal nematodes. Among important studies, Kuntz (1960), Muttalib *et al*. (1976), Ahmed (1986), Rousham (1994), Khanum *et al*. (1997, 1999, 2000), etc. Until recent times, the percentage of the infection rates of intestinal parasites were not decreased (Khanum *et al.* 1997, 1999).

Intestinal protozoan and helminth parasites are widely prevalent causing considerable medical and public health problems in developing countries, especially in tropical region (WHO 1981). In some parts of Bangladesh, the prevalence rate is 80% (Khan *et al*. 1986).

Geohelminths and enteric protozoa are readily passed from person to person via the oro-faecal route, either directly, through contact with contaminated hands, or indirectly, via contamination of food, water, or the environment. Sanitation reduces the dispersal of faeces in the environment and thus reduces the transmission of oro-faecal infections (Feachem *et al.* 1983). Reviews of the impact of sanitation on diarrhoeal diseases estimate that sanitation interventions can reduce diarrhoeal morbidity in young children from 22% to 36% (Fewtrell *et al.* 2005). UNICEF & WHO (2004) estimated that 2.6 billion people worldwide lack of access to adequate sanitation.

Intestinal parasitic infections are the most prevalent in the world, with an estimation of 3.5 billion people infected and 450 million ill (WHO 2001). While mortality from enteric helminths and protozoa is relatively low, morbidity and the indirect effects of apparently asymptomatic infections have a substantial impact on health and quality of life. The World Bank (1993) estimates the global burden of disease from geohelminth infections (*A. lumbricoides*, *T. trichiura* and hookworm) to be 2.4 million DALYs. In Latin America, the Pan American Health Organization (PAHO) (1997) estimates that helminth infections affect between 20% and 30% of the general population, with prevalence as high as 60–80% in endemic areas. In Bangladesh, among the helminthes and protozoan parasites, *A. lumbricoides*, *A. duodenale*, *T. trichiura*, *E. vermicularis* and *E. histolytica*, *G. lamblia* are common (Kuntz 1960, Islam *et al*. 1975, Saha and Chowdhury 1981, Das 1990, Rowsan 1993, Banu *et al*. 2003, D'Silva *et al*. 2003, Uddin *et al*. 2005, Khanum *et al*. 2008).

Parasitic diseases continue to cause significant morbidity and mortality throughout the world irrespective of the patient's immune status. It is estimated that in developing regions of the world, there are approximately 340 parasite species capable of infecting humans (Garcia 2001). Diarrhoeal diseases are extremely common in the developed and developing worlds, affecting millions of individuals each year (Guerrant *et al*. 1990). In Bangladesh, one third of the total child death burden is due to diarrhoea (Victora *et al.* 1993). Every year, a rural child suffers on average from 4.6 episodes of diarrhoea, from which about 230,000 children die (Mitra 1994). The intestinal parasitic infections persist and flourish wherever poverty, improper hygiene, lack of access to clean drinking water, low standards of community and individual sanitation and poor health education, insufficient health care and overcrowding are entrenched (Khanum *et al.* 2010).

Intestinal protozoan infections are even more prevalent; *Entamoeba histolytica* is one of the deadly species and is associated with pathological abnormalities in liver and large bowel in human body (Khanum *et al*. 2010), and is estimated to cause severe disease in 48 million people, killing 70 thousand each year (WHO 2002). *G. intestinalis* is the most common protozoan infection of the intestinal tract. Many countries, especially developing countries, show a high infection rate of giardiasis (Sprong *et al.* 2009). In Thailand, studies on the prevalence of human giardiasis have increased significantly (Waikagul *et al*. 2002, Sirivichayakul *et al.* 2003). 200 million people are infected with giardiasis throughout the world (Mineno and Avery 2003). In Malaysia the prevalence of amoebiasis varied from 11-14%. Prevalence of *G. lamblia* varied between 2-5% in developed countries and 20-30% in developing countries. Rivers and small streams could be possible source of infection, since ova and cyst could get into water with faeces. Poor socio-economic condition, lack of education and failure to use protective materials contributed to high prevalence of intestinal protozoan infection (Norhyati *et al*. 2003).

Trichuriasis is a potentially serious disease that can cause colitis (inflammation of the colon), chronic iron deficiency anaemia and chronic dysentery (Bundy and Cooper 1989). *Hymenolepis nana* is the most common parasitic cestode prevalent globally (Pillai and Kain 2003). Multiple infections with several different parasites like *Ancylostoma*, *Ascaris*, *Giardia* and amoebae are common and their harmful effects are often aggravated by coexistent malnutrition or micronutrient deficiencies (WHO 2002). Strongyloidiasis caused by *S. stercoralis*, like most filth borne diseases, is most prevalent under condition of low sanitation standards. Peoples typically become infected with these parasites by contacting their juvenile in contaminated soil and water (Schmidt and Roberts 1989).

The World Health Organization (WHO) 2005 estimates that, 2.2 million people die annually from diarrhoeal diseases and that 10% of the population of the developing world are severely infected with intestinal worms related to improper waste and excreta management (Murray and Lopez 1996). Human excreta transmitted diseases predominantly affect children and the poor people. Most of the deaths occur in children due to diarrhoea in developing countries (WHO 1999). Parasites lead to malabsorption and chronic blood loss in children, with long-term effects on their physical (height-weight) and cognitive development (Balci *et al.* 2009, Pezzani *et al.* 2009).

There were around 1000 million cases of ascariasis due to *Ascaris lumbricoides*, and 500 million cases of *Trichuris trichiura* infection worldwide (WHO 1990 and Bundy *et al*. 1992). On the other hand, WHO (1990) estimated that worldwide, there were 1447 million and 1048 million cases of *A. lumbricoides* and *T. trichiura* infections, respectively (Khanum *et al*. 2013). WHO (1994) estimates suggested that approximately 1.4 billion, 1.2 billion and 1 billion persons are currently infected with various species of intestinal helminths such as *Ascaris lumbricoides*, hookworm (*Ancylostoma duodenale/ Necator americanus*) *and Trichuris trichiura* respectively. In developing countries like Bangladesh intestinal worms are really threats to child and adolescents health. Although the intestinal helminthiasis is extremely wide spread in Bangladesh, they do not always cause immediate fatalist, acute illness or disabilities, so their presence has long been ignore and neglected to the people's mind (Khanum *et al.* 2008 and 2010).

Asolu *et al.* (1992), in a study in Southern Nigeria at the same time, Ashford and Atkinson (1992) in Papua New Guinea noted similar findings that the prevalence of infection with intestinal parasites was usually higher in children than in adults, since age related behavioural and environmental factors clearly contributed to exposure. Prevalence and species diversity increased with age up to 5-15 years and decreased in adulthood. Nishiura *et al.* (2002) found similar pictures in Northern area of Pakistan.

Center for Disease Control and Prevention (CDC 2000) in a study on food borne disease outbreaks in the United States noted that food handlers who are infected themselves or have had contact with the faeces of infected children have been implicated in some food borne outbreaks. An outbreak on 1996 was traced to contaminated ice cream and poor hygiene was cited as a contributing factors. Curtis *et al.* (2000) noted that safe stool disposal was far more effective as a safe guard against disease than any amount of hand washing. They also pointed out that, in Malawi, Nepal, Burkina Faso and India, children rarely used latrine before they were six or eight because of the risk that they might fall into pit.

Bartlett (2005) in his study found that in poor urban communities around the world, thousands of children still die every day from preventable diseases, related to poor provision of water and sanitation. Many more live with repeated diarrhoea and worm infestation. Those live in poor urban settlement; face some of the most difficult environmental conditions. High concentration of people and wastes in urban areas create more opportunities for exposure to pathogens. Children have a drive to play and explore, thus they are in close contact with excreta, the primary source of intestinal parasite. Inadequate toilets or hand washing facilities may allow parasites or disease to spread quickly from child to child and from there to the community.

Anaemia:

Anaemia is one of the major public health problems in many developing countries (WHO 1972, WHO 1975, WHO 1989). According to WHO, about 700 million individuals around the world were suffering from anaemia of which a major proportion was from South Asia (WHO 1989). Many studies have revealed higher prevalence of anaemia in females than in males (WHO 1989, WHO 1992, Pan and Habicht 1991, Isah 1985). According to new data from the Nutritional Surveillance Project (2002)**,** anaemia is a severe public health problem in pre-school children and pregnant women in rural Bangladesh. A national anaemia survey completed in November 2001 during routine nutritional surveillance has shown that about one third of school-age children, adolescents and non-pregnant mothers had low haemoglobin concentrations. The data indicate that 23 million children in rural Bangladesh and 9 million women of reproductive age are anaemic (Helen Keller International 2002).

Intestinal helminth infection affects millions of women of reproductive age in developing countries (Gillespie and Johnston 1998). Intestinal helminthes may cause anaemia through reduced food intake, mal-absorption and endogenous nutrient loss. The main anaemia causing intestinal helminthes are hookworms (*A. duodenale*, *N. americanus*), *T. trichiura* and schistosomes. Hookworms cause chronic intestinal blood loss by attaching to the mucosa of the upper small intestine and ingesting tissue and blood; and also causing ongoing blood loss in the stool (Banwell and Schad 1978). Much of the burden of hookworm is due to extra-corporeal iron loss (Stoltzfus *et al.* 1997). Iron-deficiency anaemia resulting from chronic intestinal blood loss due to hookworm infection often causes long-term morbidity (Albonico *et al.* 1998, Steketee 2003). In 1990, it was estimated that some 44 million pregnant women were infected with hookworm (Bundy *et al.* 1995).

Anaemia is a major consequence of infection with GI (gastro intestinal) nematodes, in particular the hookworms, but heavy *T. trichiura* infections have also been found to cause iron-deficiency anaemia (Gilgen *et al.* 2001). The majority of cases of hookworm-induced anaemia occur in people who live rurally in developing countries and rely on agricultural labour for the main family income. Anaemia reduces the physical ability to carry out the work associated with this way of life, leading to poor nutrition and increased hookworm infection, thus setting up a vicious circle (Crompton 1986). According to the Bangladesh National Nutrition Survey of 1981-82, about 74% of the adult women, 80% of the pregnant women, 73% of the under-five children, and 40% of the adult men were suffering from anaemia (INFS 1983).

The severity of iron-deficiency anaemia is greater in pregnant women infected with hookworms, compared with non-pregnant infected women, due to the natural increased iron requirement during pregnancy. Increasing severity of anaemia can lead to the death of the woman and increased risks to the unborn foetus, such as premature delivery. Thus, hookworms are a major contributing factor to the worldwide incidence of anaemia (Bundy *et al.* 1995; Dreyfuss *et al.* 2000). Prevalence of anaemia among pregnant women in developing countries average 56% with a range of 35% to 100% among various regions of the world (WHO 1992). South Asian regional anaemia prevalence has been estimated to be 75% among pregnant women, the highest in the world (WHO 1998).

Baidoo *et al*. (2010) assessed the prevalence and severity of anaemia and iron deficiency and their association with helminths, in the Ashanti region of Ghana. 108 pregnant women were followed until 5-10 weeks postpartum period and 54.9% were found to be anaemic. The highest prevalence of anaemia and low iron stores (57.4 and 32.4%, respectively) were found in the second trimester. 17.6% had evidence of helminths infection, with hookworm being the commonest (13.9%). There was a significant association between hookworm infection and low iron stores. The study concluded that hookworm infection is a strong predictor of iron status.

Urinary tract infections:

Urinary tract infection (UTI) is the second most common infection in the community. UTI refers to the presence of multiplying micro-organism in the urinary tract including urinary bladder, prostate, kidney, ureters and urethra (Hackett 2005, Simon 2006). The syndrome ranges from asymptomatic bacteriuria to perinephric abscess with sepsis (Johnson 1991). The most significant danger from lower urinary tract infections is that they can affect the kidney (causing pyelonephritis) and develop bladder infections (cystitis) subsequently (Nahar *et al*. 2010). Forty percent of adult women will experience symptoms of cystitis during their lifetime and there is 25% risk that a second symptomatic episode will occur within 6-12 months (Foxman 1990). Acute UTI occurs each year in many women in Bangladesh and caring of those women costs invariably are very high and 20-30% suffers from repeated infections. In their life time, approximately 60% of all women experience at least one UTI (Foxman *et al*. 2000, Patton *et al*. 1991).

Smith and Bullen (1965) reported that bacteriuria; *E. coli* was the predominant organism during pregnancy (Nahar *et al.* 2010, Khanum *et al.* 2006). Almost 10% of the pregnant women suffer from urinary tract infection (Bear 1976). Sexual activities of women are considered important risk factors and recurrences (Kelsey *et al.* 1979). The vast majority of infections occur in young sexually active women (Gupta *et al.* 1999, Schneider and Riley 1996). It is referred to as "honeymooner's" UTI due to its association with intercourse. There are also several case reports of infections in young girls (Abrahamsson *et al.* 1993). Early marriages in slum areas promote UTI. In post-menopausal women UTI comprise urinary incontinence ((Raz *et al*. 2000). Dysuria is a common complaint in young women but only 50% to 60% of all dysuria women have bacterial urinary tract infections (Leibavi *et al.* 1989).

Infection of the urinary tract is an extremely common clinical problem (Lambaie and Davison 1978). Even today urinary tract infection (UTI) is one of the most important causes of morbidity and mortality in the developing countries like Bangladesh. Higher numbers of *E. coli* isolated from the urine of urinary tract infected patients were found to possess hemolytic and hem-agglutinating properties (Muhammad *et al.* 1990). *Staphylococcus saprophyticus* is second only to *E. coli* as the most frequent causative organism of uncomplicated UTI in women. The more severe complications include acute pyelonephritis, septicemia, nephrolithiasis and endocarditis (Hedman and Ringertz 1991, Glimaker *et al.* 1988, Singh and Raad 1990).

Urinary tract infection (UTI) is one of the most common infectious diseases diagnosed that accounts for a large proportion of antimicrobial drug consumption (Neto *et al*. 2003) which is diagnosed in outpatient as well as hospitalized patients. Worldwide, about 150 million people are diagnosed with UTI each year, costing the global economy in excess of 6 billion US dollars (Akram *et al*. 2007). UTI is rare in males unless microorganisms are introduced artificially with catheters. In women, the urethra is much shorter and very close to the anus, which is a constant source of faecal bacteria (Zilevica 2005). Women are also particularly at risk of developing UTIs because of certain behavioral factors which include delay in maturation, sexual activity and the use of diaphragms and spermicides (Hotchandani and Aggarwal 2012).

Skin Diseases:

The skin is the largest organ of the human body covering the entire surface of the body. It is subject to a wide range of medical conditions and infections ranging from simple manifestations to complicated ones like skin cancer. Skin and venereal diseases cause a large part of illness. About 30% of people in Bangladesh suffer from it in their life time. Recurrence, excessive use of chemicals and cosmetics, environmental pollution, delayed marriage etc is the major leading factors for the initiation and transmission of the diseases (Rahman *et al.* 1997). However, fungal and bacterial infections are very common in the healthy people. Several types of bacterial and fungal infections are found which causes negligible mortality but most of the diseases have chronic course and sufferings. It increases when people are herded together and facilities for washing the body and clothing are reduced. Tropical region with 20-37^{0}c and humidity stimulates the development of fungal infection though the disease may occur in any climate (Grigoriu *et al.* 1987). Several different pathogens can cause infections, the most common being *Staphylococcus* bacteria, also called staph. A yeast-like fungus called "*Candida albicans*" is responsible for many of the fungal infections causing skin problems in people with diabetes (Fungal infections of the skin and skin structures@ htm.com, April, 2008).

Both ecto and endo parasitic diseases are common in Bangladesh. Common ectoparasites include ticks, lice, mites (Nooruddin and Dey 1989, Nooruddin and Mondol 1996) that affect both man and animals. Ectoparasitic diseases have been reported in travelers returning from both developed and developing countries. The ectoparasitic diseases afflict the skin and its appendages and orifices, especially the scalp, facial, and pubic hairs; external ears; nares; orbits and eyelids; and genitourinary and rectal orifices. Like endoparasites, ectoparasites may be either obligatory parasites, which need to feed on human hosts to complete their life cycles, or facultative parasites, which prefer to feed on nonhuman hosts and infest humans only as accidental or dead-end hosts (Diaz 2006).

Skin diseases are usually caused by infection with viral or bacterial organisms (http://www.medindia.net/patients/patientinfo/skindisease.htm). Various types of skin disease are eczema, acne, pigmentation and psoriasis, rosacea, warts, scabies, tinea, pediculosis, pyoderma, boil, etc (http://www.midwestderm.com/index/html). Skin diseases and their complications are a significant burden on the health system of many nations. The report on the global burden of disease indicated that skin diseases were associated with mortality rates of 20,000 in Sub-Saharan Africa in 2001 (WHO 2005). Distribution of skin diseases differ from country to country and even city to city (Doe *et al.* 2001, Adebola 2004, Hartshorne 2003). Some factors like genetic, environment, race, age, occupation, nutrition and habits can influence the pattern of skin diseases (Parthasaradhi and Gufai 2004).

Bangladesh is known to have a high prevalence of skin diseases. As reported by the Directorate General Health Services (DGHS) (Anowar *et al.* 2001), figures range from 5.3% (1990) to as high as 12.9% (1995) amongst patients at the district level or below hospitals. The same report mentions skin diseases as one of top ten leading cause of morbidity amongst the Bangladeshis. In an earlier publication from the same source, it was reported that skin disease caused morbidity to the tune of 10.1% and 9.3% in 1988 and 1989 respectively (Bangladesh Health Services Report 1989). In a study done by Islam (1992), the figure is quoted to be as high as 30- 40%. In many studies it has been shown that 30-40% of our population is suffering from skin diseases. Of which about 80% are scabies and pyogenic infections. Children are the worst sufferers from these diseases (Khanum and Alam 2010).

The factors generally thought to explain the high prevalence and incidence of common skin infections in developing countries are poverty related and include: a low level of hygiene, including difficulties accessing water; climatic factors; insanitary and overcrowding living conditions (WHO 2005). In 2006 the Ministry of Health reported 48,221 people had visited health facilities with skin problems (skin ulcers, scabies etc.) and more than 50% of these were aged under 15 years**.** In 2007 a skin condition was indicated as the cause of hospitalisation for 2.5% of all hospital admissions and the incidence of scabies infections for all age groups was 2.4 per 10,000 populations. For children under one year the rate was 4.5 per 10,000 populations (Government of the Democratic Republic of Timor-Leste, 2006). According to World Bank (2002) among low-income populations in 2000, the estimated huge numbers of individuals are infected with pyoderma and scabies, in the developing world, based on the highest prevalence from community surveys are 400 million and 600 million, respectively. Based on the lowest prevalence, these estimated numbers are 40 million and 50 million, respectively.

Vector-borne diseases

A vector-borne disease is one in which the pathogenic microorganism is transmitted from an infected individual to another individual by an arthropod or other agent, sometimes with other animals serving as intermediary hosts. The transmission depends upon the attributes and requirements of at least three different living organisms: the pathogenic agent, either a virus, protozoa, bacteria or helminth (worm), the vector, which are commonly arthropods such as ticks or mosquitoes and the human host. In addition, intermediary hosts such as domesticated or wild animals often serve as a reservoir for the pathogen until susceptible human populations are exposed (http://ciesin.columbia.edu/TG/HH.v-bd.html). Nearly half of the world's population is infected by vector-borne diseases, resulting in high morbidity and mortality. The distribution of the incidence of vector-borne diseases is grossly disproportionate, with the overwhelming impact in developing countries located in tropical and subtropical areas (Ciesin 1994).

The majority of vector-borne diseases survives in nature by utilizing animals as their vertebrate hosts and is therefore zoonotic. For a small number of zoonoses, such as malaria and dengue, humans are the major host, with no significant animal reservoirs. There has been a worldwide resurgence of vector-borne diseases since the 1970s including malaria, dengue, Yellow fever, louse-borne typhus, plague, leishmaniasis, sleeping sickness, West Nile encephalitis, Lyme disease, Japanese encephalitis, Rift Valley fever, and Crimean-Congo hemorrhagic fever. Reasons for the emergence or resurgence of vector-borne diseases include the development of insecticide and drug resistance; decreased resources for surveillance, prevention and control of vector borne diseases; deterioration of the public health infrastructure required to deal with these diseases; unprecedented population growth; uncontrolled urbanization; changes in agricultural practices; deforestation; and increased travel (http://www.enotes.com/vector-borne-diseases/reference/vector-borne-diseases#).

Malaria is one of the most devastating diseases of the world (WHO 2005). The magnitude of malaria in terms of morbidity and mortality in human makes it a major public health problem in the tropical and subtropical countries (Farooq *et al*. 2006) resulting in approximately 200-300 million clinical cases and 1-3 million deaths each year (or more than 3000 deaths a day) worldwide (Greenwood *et al*. 2005, Kang *et al*. 2010). About 50 percent (3.3 billion) of the world's population is at risk of malaria and nearly one million people die from this disease each year resulted from an estimated 247 million malaria cases mostly of children under five years of age (Aregawi *et al*. 2008). In 2009, there were an estimated 225 million cases of malaria worldwide that accounted for approximately 781,000 deaths (WHO 2010). In 2010, 216 million malaria cases were recorded worldwide. Africa has the highest burden of malaria with 81% of the cases and 91% of the deaths due to malaria globally (WHO 2011). Of the approximately 3.4 billion people worldwide who are exposed annually, 1.2 billion are at high risk; WHO states that there were 198 million cases of symptomatic malaria in 2013 (WHO 2014).

The morbidity and mortality burden caused by malaria are responsible for nearly 3% of the world's Disability-adjusted life year (DALYs) (Benet *et al*. 1991). It is transmitted via the bite of a female *Anopheles spp.* mosquito, which occurs mainly between dusk and dawn. Comparatively other rare mechanisms for transmission include congenitally acquired disease, blood transfusion, sharing of contaminated needles, and organ transplantation (Filler *et al*. 2003, Owusu-Ofori *et al*. 2013). About 35 Anopheline species are recorded in Bangladesh (Ahmed *et al.* 1987, Jannat *et al.* 2006) of which only seven of these species were documented to be competent malaria vectors until 2009. Among these, four have been considered as the principal malaria vectors.

Due to the frequent use of DDT, malaria was mostly under control before 1971 (Sharma 1996, Haque *et al*. 2009). After the independence of Bangladesh, DDT was banned in 1985 and the number of malaria cases began to increase (Paul 1984). Since the incidence of malaria in the eastern regions was low and there was a lack of adequate funds and programs, no control efforts maintained in the malaria endemic areas of Bangladesh. Without these control efforts, malaria cases started to increase and became epidemic in the 1990s (Sharma 1996, WHO 1999). In the late 1990s, more than 500 deaths were reported with 70,000 laboratory-confirmed cases and 900,000 clinical cases of malaria in Bangladesh (Wijeyaratne *et al*. 2004).

Bangali (1996) conducted a study on the perspective of Border Malaria in Bangladesh. A record was made during 1992-95 period of all malaria cases and control of all endemic border areas of Bangladesh. Out of the total 64 districts of Bangladesh, 13 are endemic districts which are located along with the border areas with India and Myanmar (WHO 2009, Haque *et al*. 2010). About 98% of the total malaria morbidity and mortality reported from Bangladesh each year originate from endemic districts (Haque *et al.* 2009, Ahmed *et al.* 2009). About 26.9 million people of these highly endemic thirteen districts are facing health of risk.

Malaria is still considered a major public health problem in Bangladesh. Of the 11 countries of the World Health Organization South East Asian Regional Office, ten countries including Bangladesh is malaria endemic (Ahmed *et al.* 2009, Haque *et al*. 2009, Sharma *et al*. 1996). Worldwide, malaria is the fifth leading cause of death due to infectious disease, following respiratory infection, HIV, diarrhoeal disease and tuberculosis. Globally, malaria kills 1 million people every year, 90% of whom are children under age 5 (Feachem *et al.* 2009).

Lymphatic filariasis (LF) is one of the most disfiguring diseases and a major cause of clinical morbidity. It is the world’s second leading cause of permanent disability and a major impediment to socioeconomic development. The disease is endemic in 83 countries with more than a billion people at risk of infection and some 120 million people clinically affected worldwide. In 1992, the WHO Expert Committee estimated that 78 million people were infected (WHO 2002, Dreyer *et al.* 1997). This estimate was later revised to 119 million, and current estimates indicate that LF is responsible for the loss of 4.6 million DALYs per year (Gyapong *et al*. 2002). Nearly 60% of the lymphatic filariasis problem is in the South East Asia Region, 30% in the African Region, 5% in the Eastern Mediterranean Region, 4% in the Western Pacific Region and 1% in the American region (Park and Park 1986).

Several species of *Culex*, *Anopheles*, *Aedes*, and *Mansonia* mosquitoes are involved in the transmission of LF. *C. quinquefasciatus* is the major vector in Africa, Asia, and South America and transmits nocturnally periodic *W. bancrofti*. Bancroftian filariasis has however been found in rural areas especially in northern India. Except the Panjab, Haryana, Fajasthan, Jammu and Kashmir, Himachel pradesh, Sikkim, Nagaland, Meghalaya, Mizoram, Munipuri, Tripura, Chandigarh and Delhi, the entire country of

India is endemic for *W. bancrofti*. In 1955 the Govt. of India launched a national programme against filariasis known as National Filaria control Programme (Park and Park 1986).

In Bangladesh, the highest prevalence of filariasis was found in Dinajpur District, in the north-western corner of the province, where almost 14% of those examined from all parts of the district were positive; hydrocele was also very common in this district. The neighboring districts like Rangpur and Pabna, as well as Barisal district in the south also had relatively high prevalence and positive cases were found throughout the Chittagaong Hill tracts. A highly endemic focus was found among tribal people in the Matamahari river valley, in the south-west part of this later district, who cause to the Haluaghat Mission Hospital. An interesting situation was found in the Balisera valley Tea Estate area in southern Sylhet district. This emphasized the focal nature of filariasis infection, which seems to be true through Bangladesh. Only a few instances of microfilariae were found in Dhaka city. Positive cases were found in the two extreme corners of Bangladesh, Tetulia in the North-West and Tetnuf in the south-east (Wolfe and Aslamkhan 1971). About 90% of the population of Nilphamari district (Nilphamari Sadar and Paurasava, Sayedpur, Domar, Dimla, Joldhaka and Kishoreganj) lives in a rural environment, investigations on filariasis in this setting were undertaken (Rahman *et al.* 2008).

Lymphatic filariasis (LF) is one of the communicable diseases which cannot be prevented by vaccination. For prevention of this disease elimination is the mainstay. Bangladesh is situated in the South-East Asian region with an estimated population of 142.30 million. It is one of the most populous LF endemic countries. In 2001, an assessment based on microfilaria (Mf) levels found the infection in 34 of the 64 districts with 19 districts eligible for mass drug administration (MDA). It has been estimated that a population of 69 million people are living in endemic zones and the highest rates of infection and disease are in the northern part of the country (Hafiz 2012).

Fever is a common symptom in patients coming to hospitals with a variety of diseases (Chan-Tack and Bartlett 2011). **Dengue** fever is an acute viral infection characterized by fever. It is caused by dengue virus carried in a mosquito. The four dengue viruses, viz. DEN1 to DEN4, are immunologically related, but do not provide cross protective immunity against each other (CDC 2007). Infection with any of the four strains (DEN-1 to 4) may cause febrile illness and joint pain and has the potential for serious complications, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Nearly 40% of the world's population lives in areas where dengue is endemic (Guzman and Isturiz 2010), and about 250,000 individuals per year manifest the severe forms, which have the mortality rate of about 10 percent (Gubler 1997).

The first reported epidemics of dengue fever occurred in 1779-1780 in Asia, Africa, and North America; in South East Asia a global pandemic of dengue after World war-II; the epidemic remained localized in this area till 1970 involving Thailand, Myanmar and other neighboring countries; in 1980 and 1990, the epidemic DHF spread west India, Pakistan, Srilanka, Maldives (Malavige *et al.* 2004). Recent research suggests that the burden of dengue in Africa is lower than that in Asia but comparable to that reported in the Americas (Franco *et al*. 2010, Bhatt *et al*. 2013). The global prevalence of dengue has grown dramatically in recent years (Dengue Bulletin 2010). Not only is the number of cases increasing as the disease is spreading to new areas, but explosive outbreak of the disease is occurring as its epidemiological pattern is gradually changing. Primarily the virus is found in sub-tropical climates and is thought to be present in 100 countries (Gubler 1997).

Over the past four decades, dengue disease has become recognized as the world's most important mosquito-borne viral disease, emerging in countries previously considered free of disease and reemerging in countries where the disease was once controlled (Gubler 1998, Ooi and Gubler 2009). Inadequate mosquito control and increasing urbanization and air travel have placed an estimated 3 billion inhabitants of the world's tropical areas and roughly 120 million travelers at risk of dengue infection each year (Ooi and Gubler 2009, Halstead 2007, Suaya *et al.* 2009, WHO 2002). Globally, the projected number of annual dengue infection cases is 50–100 million (WHO 2012), with approximately 24,000 deaths, mainly in children, and an estimated annual burden of 750,000 disability-adjusted life years (DALYs) (Halstead 2007, WHO 2002, Gubler 2005, Ooi *et al.* 2006, Rigau-Perez and Gubler 1999, Torres and Castro 2007, Singhasivanon and Jacobson 2009). About 36 million symptomatic cases are estimated to occur annually (PDVI 2006).

In Bangladesh, the first outbreak of dengue fever was documented in 1964 in Dhaka, before that dengue fever was unknown in Bangladesh; the first epidemic of DHF occurred in mid 2000, when 5,551 dengue infections were reported from Dhaka, Chittagong and Khulna cities, occurring mainly among adults; the case fatality rate was reported 1.7%

with 93 deaths reported (Rahman *et al*. 2002). In Bangladesh the first scientifically designed survey was conducted in Chittagong in 1996-97. The positive rate was 7.1% among the selected patients. Chittagong being the most industrialized city, showed 34.3% of all reactive samples (Kalayanarooj 1998, Yunus *et al.* 1998). Khulna is another industrial area that presented the second highest number of reactive sample (31.45 %), (Kalayanarooj 1998). The real alarming information came from the spot checked by WHO consultant in different areas of Dhaka and Chittagong city when Breteau Index (BI) in Dhaka city was 30.8, a figure well above the risk levels (Knusden 1997, Mahmood and Mahmood 2011).

Leishmaniasis is a chronic inflammatory disease of the skin, mucous membrane, or viscera caused by obligate intracellular, kinetoplastoid protozoan parasites *Leishmania,* transmitted through the bite of infected sandfly (Kumar *et al*. 2004). The clinical presentation ranges from simple cutaneous lesions to life threatening visceral forms. Three clinically distinct conditions of leishmaniasis are recognized namely visceral leishmaniasis, cutaneous leishmaniasis and mucocutaneous leishmaniasis (Park and Park 1986). Visceral leishmaniasis - also known as kala azar, if left untreated, the fatality rate in developing countries can be as high as 100% within 2 years (WHO 2009). Kala-azar is also known as black sickness (skin turns black) or fever, sarkari disease, Burdwan fever, Dum Dum fever after the district in Kolkata, where *L. donovani* was first found in an autopsy (Bahr and Bell 1987).

Leishmeniasis occurs in 88 countries in tropical and temperate regions, 72 of them developing or least developed. An estimated 350 million population is at risk and 10 million people are affected from this disease worldwide (Desjeux 1992). According to WHO, the global status of leishmaniasis is shown as follows: not counting epidemics, deaths 57, 000 annually, disease burden is about 1.98 million disability adjusted life year, 12 million cases people at risk and incidence of VL cases are 500,000 annually (Desjeux 1996). According to Bora (1999), two million cases occur annually, however, there is a gross under reporting of the cases from endemic regions, and there has been a progressive increase in the case of leishmaniasis being reported from the newer areas (Bora 1999). There are an estimated 500,000 new cases of VL and more than 50,000 deaths from the diseases each year (Desjeux 2004, WHO 1993), a death toll that is surpassed among the parasitic diseases only by malaria (WHO 2002).

Kala-azar has a high mortality rate. The situation of kala-azar tends to be epidemic in multiple foci in Bangladesh. The inter-epidemic period used to be about every 15-20 years interval (WHO/IEDCR 1993, Islam 1992). In Bangladesh, kala-azar was a rarity in 1960s due to collateral effect of malaria eradication program of sand fly vector (Rahman 1983). The majority (>90%) of cases occur in just six countries: Bangladesh, India, Nepal, Sudan, Ethiopia and Brazil. Migration, lack of control measures and HIV-VL co-infection are the three main factors driving the increased incidence of VL (Boelaert *et al*. 2000, Desjeux 2001). India, Bangladesh, and Nepal account for an estimated 300,000 cases annually and 60% of the global burden of the disease. The disease has been reported from 109 districts (45 in Bangladesh, 52 in India and 12 in Nepal) of three countries. An estimated 190 million people are at risk of infection (Sundar *et al*. 2008). The actual incidence rate of the disease is estimated to be about 8-10 times higher than the reported one in all three countries (Singh *et al.* 2006).

Kala-azar is one of the major public health problems, and increasing trend of incidence is observed in Bangladesh and the disease is endemic in Mymenshing division for few decades. Kala-azar affects largely the socially marginalized and the poorest communities (Mondal *et al*. 2008). Most prevalent areas are Sirajgonj, Pabna, Tangail and Mymensingh followed by Natore, Nawabganj, Rajshahi, Manikganj, Gazipur and Jamalpur (Newsletter Beximco Pharmaceuticals, 1996). Visceral leishmaniasis in Bangladesh which was known to be existed in past two centuries. During British colonial period first kala-azar outbreak was reported in Jessor district of Bangladesh (then undivided Bengal) and at least 75,000 people were believed to die during the outbreak in 1824–25. Later kala-azar outbreaks were also reported from several districts of Bengal (Sengupta 1947). According to Malaria & Parasitic Disease Control Unit (M&PDC), Directorate General of Health Services (DGHS) of Bangladesh, kala-azar has spread to 34 out of 64 districts of Bangladesh. Among these districts Mymensingh produces highest number during the last 10 years (1999–2008) (Akhter *et al.* 1999).

Waterborne diseases

Waterborne parasitic infections are common worldwide due to the shortage of drinking water, and unhygienic conditions of storage and manipulation of contaminated water in different daily purposes (WHO 1991). Increased human consumption and pollution have caused a shortage of fresh water resources worldwide. Forced to use of recycled waste water with a low level of physico-chemical and biological contaminants (virus, bacteria and other parasites) is a common practice because absolute purification of waste water is not always possible (Caccio *et al.* 2003, Parvez *et al.* 2007).

Nearly 1.1 billion people still remain without access to improved sources of drinking water, and also about 2.4 billion have no access to improved sanitation services (WHO 2000). Drinking water contamination has devastating effects on the health of human society and implies the presence of microorganisms which could potentially create water-borne diseases threat in young and teenager people, particularly those with impaired immune systems (Steiner *et al.* 1997).

Polluted and contaminated water can cause waterborne diseases like diarrhoea, cholera, typhoid fever and dysentery. Elimelech (2006) mentioned that 2 million deaths per year were reported worldwide due to unsafe water, mostly due to waterborne, preventable diarrhoeal diseases. Out of the total mortality rate, 90% belongs to the group of children under 5 years in the developing countries (Ozkan *et al.* 2007).

Waterborne diseases have a very strong relationship with poverty and unhygienic environment. Poverty directly associated with poor housing conditions, over crowded house, lack of access to sufficient clean water and sanitary disposal of faecal waste, and cohabitation with domestic animals that may carry human pathogens (World Bank 2006). All of the above mentioned issues are common among the rural parts of developing countries, especially of South Asia, and these factors are considered to be the major risk factors to increase both diarrhoeal morbidity and mortality.

Waterborne illness has plagued humans throughout history. During the 19th century, cholera spread repeatedly from its original reservoir or source in India to the rest of the world, before receding to South Asia. Six pandemics were recorded that killed millions of people across Europe, Africa and the Americas. The seventh pandemic, which is still ongoing, started in 1961 in South Asia, reached Africa in 1971 and the Americas in 1991. The disease is now considered to be endemic in many countries and the pathogen causing cholera cannot currently be eliminated from the environment (WHO 2008). Regions of the world where cholera is currently prevalent are Africa, Asia and parts of the Middle East. Imported cases occasionally occur in richer countries in travelers returning from endemic areas (National Travel Health Network and Centre [NaTHNaC] 2007). The disease no longer poses a threat to countries with minimum standards of hygiene, but it remains a challenge to countries where access to safe drinking water and adequate sanitation cannot be guaranteed (WHO 2009).

Diarrhoeal diseases are a global burden and the major cause of childhood hospitalization, primarily for dehydration. The number of deaths due to diarrhoeal illnesses exceeds that of AIDS, tuberculosis and malaria combined, and every week, 31,000 children in low-income countries die from diarrhoeal diseases which are approximately 4,500 deaths every single day (Fricas and Martz 2007). *E. coli* is normal floara of human guts but enteropathogenic *E. coli* infection might cause non inflammatory diarrhoea and inflammatory diarrhoea (Doyle *et al*. 1996). Another most common form of pathogenic *E. coli* is Enterotoxigenic *E. coil* (ETEC), which is the most common cause of bacterial diarrhoea in children in the developing world as well as among travellers to developing countries (WHO 2009).

Typhoid fever is a serious systemic illness transmitted through oro-faecal route (WHO 2008). Presence of long-term carrier status and variable level of risk factors such as contaminated water, food and poor sanitation conditions in different geographical regions often causes patchy outbreaks and uneven disease distributions (WHO 2003). Poliomyelitis is a highly contagious and transmissible infectious disease (Kew *et al.* 2005). This disease is caused by three types of polio virus (P1, P2 and P3). The most neurovirulent types are P1 and P2 known as vaccine derived poliovirus type. Immunity against one type does not protect individuals against the other types. Several doses of oral polio vaccine (OPV) are needed to induce immunity and it provides long-term protection against poliomyelitis (Diop *et al*. 2015).

Two viruses have been associated with waterborne transmission of viral hepatitis; hepatitis A and hepatitis E virus (Frosner 1979, Siebke 1982). Outbreaks of acute infectious hepatitis have been attributed to hepatitis E virus (HEV) since the 1950s (Labrique *et al*. 1999). Large HEV outbreaks reported from Asia and Africa have been associated with faecally contaminated drinking water (Rai *et al.* 2008, Martolia *et al.* 2009). Although persons with HEV disease usually fully recover, clinical studies report that pregnant women who become infected with HEV and their newborns often die (Bista *et al.* 2006, Singh *et al*. 2003). This large outbreak of jaundice in a densely populated, low-income, urban community was likely due to HEV (Patra *et al.* 2007, Khuro *et al*.

2003). Hepatitis A is a worldwide vaccine-preventable infection. Recommendation of vaccination depends on the endemicity of the disease. There is no need of mass vaccination in high and low endemicity regions. The endemicity of this infection varies due to sanitary and hygiene conditions and socioeconomic differences among the countries and in various regions of the same country (Ceyhan *et al*. 2008).

Airborne diseases:

There are hundreds of airborne communicable pathogens (Beggs 2003, Tang *et al*. 2006, Kowalski and Bahnfleth 1998) falling into three major categories: viruses, bacteria, and fungal spores. Human-human transmission of disease can result from direct contact with an infected person or an indirect contact through an intermediate object (Beggs 2003). An important mode of indirect contact is airborne transmission occurring via the spread of fine aerosols, skin flakes, and fungal spores in room air over long distances and time scales (Morawska 2006).

The transmission of infectious disease is of global concern for social and economic reasons. For example, seasonal influenza kills 200–500 thousand people annually. In 2009-2010, influenza A (H1N1) caused 17,000 deaths worldwide, many among whom were healthy adults (Tellier 2009, Wan *et al.* 2009). According to health authorities, the 2009 pandemic influenza A (H1N1) virus caused approximately 6000 deaths in Bangladesh (Homaira 2011). Infrequent hand washing and poor respiratory hygiene (e.g. covering mouth when coughing) (Nasreen *et al.* 2010), limited access to care, lack of awareness of antiviral treatment and its availability, a huge shortage of influenza vaccines early in the pandemic, and a high prevalence of malnutrition (Nicholson *et al*. 2003) may have worsened the pandemic in low-income countries such as Bangladesh.

Risk factors for most infectious agents are difficult to quantify. Many elements must be considered, including the susceptibility of people exposed. For example, measles is highly contagious. However, immunization against this virus virtually eliminates susceptibility even if the exposure involves household contact. Other risk variations among individuals may be due to genetics, health status, or gender. Risk factors may also be related to the local environment, such as age and operational status of the ventilation equipment (Memarzadeh 2011b).

Mumps remains a prevalent viral disease with more than 90% cases going unreported (WHO 2007). The burden of mumps remains high (100-1000 cases/100000 population) in countries which do not offer routine mumps vaccination, with epidemic peaks every 2-5 years (WHO 2007, Galazka *et al.* 1999). Of late, there has been resurgence of mumps even in countries using mumps vaccine in their national immunization programs (NIPs) (Atrasheuskaya *et al*. 2007, CDC 2010, Kutty *et al.* 2014).

In the 1930s, before the advent of antibiotics, pneumonia was the third-leading cause of death in the United States. Notably, it remains a leading cause of death. In 2006, it was the eighth-leading cause of death, accounting for about 55,000 deaths (CDC 2010). It is estimated that 4 million cases of community-acquired pneumonia occur annually in the United States, of which 20 to 25 percent are severe enough to warrant hospitalization. Pneumonia is second only to delivering a baby as a cause for hospitalization in the United States today (CDC 2010). Each year, approximately 1.6 million children die from pneumonia (Black *et al*. 2010).

Tuberculosis (TB) is one of the most communicable diseases in humans. According to the World Health Organization (WHO) report, most of the estimated number of TB cases occurred in Asia (55%) and Africa (30%). TB with 8 million new cases and 1.5 million deaths worldwide annually remains as a major global health problem (Millet *et al*. 2013). Historically, TB has had implications on the course of society and has been listed as one of history's most lethal killers (Diamond *et al.* 1997). Evidence of tuberculosis disease in humans was documented in Egyptian civilization beginning in 3400 BCE (Iseman 2000, A Clinician's Guide to Tuberculosis). The estimated mortality rate from tuberculosis epidemic occurring in London, England during the Industrial Revolution was 900/100 000 in 1740 (Grigg 1958).

Justification of the study:

Communicable disease also called transmissible disease or infectious disease became more prevalent in today's culture**.** Throughout history, human populations have experienced major epidemics of infectious diseases, often resulting in large numbers of deaths, panic, disruption of trade and political instability. While all infectious diseases have the potential to spread, it is the rapid nature of the spread of epidemic diseases and the high mortality rate in newly affected populations that has marked the human psyche (WHO 2000). So, it is essential to know the current status of these infections among female inhabitants and identify the associated risk factors. People will be benefitted by knowing the actual cause of infections. This may help them for getting quick remedy. It also can make people alert to maintain a hygienic condition in Bangladesh.

Now a day, woman of low income group in the urban area is mostly engaged in house-hold work of the country. They live in the unhealthy environment and suffers from many more infectious diseases that easily transmissible from one person to another.

Objectives of the study:

Considering the above mentioned risk factors in the prevailing situation, the following objectives were selected the present study:

- Identification of the communicable diseases of public health importance;
- To determine the prevalence of type of infectious diseases such as intestinal parasitic diseases, urine infection, skin diseases, vector borne diseases, water borne diseases, airborne diseases prevailing among the female respondents;
- To find out the monthly and seasonal variation of protozoan and helminth parasitic infestation, UTI and skin disease;
- To observe the pattern of con- current mixed infections of parasites;
- To measure the haemoglobin level of the inhabitants (mild moderate and severe anaemia) and find out the percentage of anaemic condition in relation to parasitic infestation;
- Determination and identification of the risk factors associated with the diseases and the socioeconomic condition (education, occupation, monthly income etc.) of the inhabitants;
- To record the demographic characteristics of female inhabitants such as age, sex, residence, number of family members etc.

REVIEW OF LITERATURE

The purposes of review of literatures were to collect the information regarding the background, history, and previous relevant studies. A remarkable number of national and international literatures were cited and reviewed which were closely related to the present study. Further, different types of research works are still going on. As a result, we are able to know a variety of new cases and complications and the ways to save them. The summarized informations/ literatures are given below:

Intestinal Parasitic Infestations:

Ridley and Howgood (1956) demonstrated that Formol- Ether Concentration Technique is a technique that is very practical in schedule clinical laboratory. All cysts and ova become concentrated without deformation. Faecal cysts are found nearly twice and ova three times as often as by direct searching.

Kuntz in 1960 examined stool of school children of Tezgaon polytechnic, Mirpur high school and Demra secondary high school for intestinal parasitic infection. It is estimated that 10% health problems in developing countries are related to diarrhoea and helminthes where geohelminth constitute a substantial part. He recorded the gross prevalence 66% for *Ascaris lumbricoides*, 48% for Hookworm, 56% for *Trichuris trichiura* and 33% for *Enterobius vermicularis.*

Muazzem and Ali (1968) in a study on children of Dhaka recorded *Ascaris lumbricoides* (25.6%), *Ancylostoma duodenale* (16.4%), *Entamoeba histolytica/ E. dispar* (12.15%), *Trichuris trichiura* (10.64%) and *Giardia lamblia* (9.3%).

Tu *et al.* (1970), from a village of Burma reported parasitism in 90% of their study population. Out of 90%, 59% were positive for *A. lumbricoides*, 30% for *A. duodenale* and only 3% were positive for *Giardia* infestation.

From two zones of Malaysia, Joe (1971) reported the occurrence of parasitic infestation. From one area, 82% infestation of *A. lumbricoides*, 84% infestation of *T. trichiura* and 50% infestation of Hookworm were recorded. In another area, 33% infestation of *A. lumbricoides*, 31% infestation of *T. trichiura* and 24% infestation of hookworm were found. Obviously there were certain mixed infestations.

In a study of Muttalib *et al.* (1975), 933 students were examined. 533 (57.3%) of the students had single or multiple intestinal parasitic infections, of which *Ascaris lumbricoides* (366), *Entamoeba histolytica* (113) and *Trichuris trichiura* (99) were the commonest. It is suggested that chronic nutritional deficiencies are compounded by these parasites, leading to low weights, and low haemoglobins.

Jones (1976) in a study of 210 people from all age groups in the Venilale District of East Timor, 49% had *Ascaris lumbricoides*, 1% *Trichuris trichiura* and 67% hookworm infection. There were high *Ascaris* infection rates among some of the children, but the *Trichuris* and hookworm rates were almost uniformly low.

Hoque (1981) carried out a study with 593 stools from Mirpur and Mohakhali in Institute of Public Health, Mohakhali, Dhaka and found total parasitosis of 63% among the under 20 years of age of people.

Thien-Hlaing *et al.* (1984) studied the prevalence of *Ascaris* in a village in rural Burma and found that 77.1% of 783 people harboured *Ascaris lumbricoides*. They also determined age-specific prevalence, and recorded a maximum of 92.5% from 5 to 9 years of age and a minimum of 65% from 50 years older.

Gilman *et al*. (1985) studied serology and epidemiology of *G. lamblia* in Bangladesh where the age-specific prevalence was determined in two villages and malnourished children in hospital of Dhaka City. Infection was acquired early (<one year) and in 16% of infected children persisted for longer than three months. Prevalence was higher in 5 to 10-year-old village children (21%) and one to five-year-old malnourished children (51%). Over 40% of the children (7 years) acquired *G. lamblia* infection. Positive antibody titres were acquired between six months and one year and the prevalence of sero-positivity remained high in all age groups.

Farthing *et al*. (1986) stated that, infants can acquire infections at an early age suggesting that mothers can infect their children very soon after childbirth.

In 1987, a study was carried out by Begum and Ahmed among the people of three different restaurants of Dhaka city. Out of 153 respondents, 59.80% had one or more type of parasitic infection and *E. histolytica* positive cases were 4.59%. Majority of the cases respondents did not have the habit of hand washing with soap or ash after defecation.

According to Cooper and Bundy (1988), whipworm, *Trichuris trichiura* was a common parasite which infected up to 800 million people throughout tropical and temperate areas. Its clinical significance was not found clearly because of the chronic insidious nature of the disease. They discussed the scale of disease caused by *Trichuris*, pointing to possible reasons for its neglect- under-recognition, under-reporting, and/or uncertainty of pathogenesis.

Ali-Shtayen *et al.* (1989) examined total of 22970 stool specimens, collected from patients attending the Central Medical Laboratory of Nablus in the period of 1981-1986. Of these 32.3% were positive, where *E. histolytica* (22.9%), *G. lamblia* (7.3%) and *A. lumbricoides* (5.7%) were the most prevalent parasites. Other parasites *Hymenolepis nana, T. trichiura, S. stercoralis* and *E. vermicularis* were also presents in the study. Peak incidence occurred during summer and early autumn.

Muller *et al.* (1989) noted that *A. lumbricoides* infection resulted from ingestion of viable ova; sheded by infected humans on humid and shady soil and that overcrowded living conditions increased the likelihood of faecal-oral transmission of infection.

Al-Fayez and Khogheer (1989) observed that expatriates working in Jeddah, Saudi Arabia, had 40.3% prevalence rate of intestinal parasites.

Cho *et al.* (1990) found that the older children had a higher prevalence of parasite than younger children (3-4 years <1-2 years) in Guayan Province, Ecuador. Prevalence of *T. trichiura* and *E. vermicularis* was significantly different in two sexes.

Ramesh *et al.* (1991) in a study in Chandigarh, North India reported similar observation, as mentioned in Sen (1968), regarding the association of parasites, prevalence and factors like living condition, climate, soil environment, etc. Overall prevalence rates ranged from 12.5% to 66% with varying prevalence rates for individual parasites about 50% of the urban and 68% of the rural population.

Udonsi and Ogan (1993), reported that the overall parasitic infestation 78.7%, 86.9% and 84% for *A. lumbricoides, N. americanus and T. trichiura* respectively.

In 1994, Rahman showed that the prevalence and intensity of soil transmitted helminth infections were low in 0-1 year age group and above 50 years of old age groups when compared to other age groups. The prevalence and intensity of infection in five villages were quite similar due to the same socioeconomic status. The highest intensity was observed of *A. lumbricoides* followed by hookworms and *T. trichiura.*

Ferreira *et al.* (1994) studied among 407 samples of a slum area of Sao Paulo, South-Eastern Brazil. Among all of them, the most prevalent parasites were *Ascaris lumbricoides* (23.8%), *T. trichiura* (17.2%), only 4.2% harbored *A. duodenale* and 1.5% harbored *E. histolytica.*

De-Silva *et al.* (1994) noted prevalence of *T. trichiura* and *E. vermicularis* was significantly different in the two sexes in Kandy area of Sri Lanka.

Virk *et al.* (1994) carried out a study in some of the village of Dadraul and Bhawal Khera of district Shahajahanpur (Uttara Pradesh). Out of 381 individuals, 29.2% were found positive for one or the other intestinal parasites. *A. lumbricoides* suppressed all the parasites by showing a positively of 17.85%. Other parasites were hookworm, *T. trichiura, E. histolytica, E. coli* etc. Parasitic load was slightly higher in females (33.59%) than males (28.18%). The highest positively was encountered in the age group 6-14 years.

A cohort of Egyptian infants followed by Mahmud *et al*. (1995) from birth through their first year found that infants less than six months of age were at special risk for developing their first symptomatic infection. They found that the primary determining factors that predispose newborn infants to the first symptomatic *Giardia* infection among infants in rural Egypt were: poverty, low levels of education, poor access to or underutilization of antenatal and perinatal care, poor sanitation, and inadequate environmental conditions.

UNICEF (1997) in a study in rural areas of Bangladesh showed prevalence of intestinal worms among adult healthy rural population was 33.3%. Highest prevalence (40%) was found in the age group of 18- 35 years. Significant association was found between hand washing with soap and prevalence of intestinal parasite infestation. Among the infested individuals, *As. lumbricoides* had the highest prevalence (88.3%) followed by *An. duodenale* (4.5%).

Gamboa *et al.* (1998) conducted a study on three areas of La Plata, Argentina. 100, 101, and 91 children up to 14 years old, respectively, were examined for the detection of intestinal parasites. *Giardia lamblia* was the most frequent species found. The individual prevalence of intestinal parasites overall (73, 54.4, and 35.1%), of poly-parasitism (61.6, 27.2, and 12.5%), and of helminth infection (32, 10.9, and 0.0%) were the highest within the population group having significantly inferior sanitary and environmental conditions.

Atherholt *et al*. (1998) found that concentrations of *Cryptosporidium* oocysts and *Giardia* cysts in the Delaware River were positively correlated with rainfall.

Khanum *et al*. (1998) studied the prevalence of intestinal protozoan parasite, *Giardia intestinalis* among the children of three rural areas (Mirzapur, Bhaluka and Kaliganj). Among 150 samples from each area, 16.7% of them were infected by *Giardia intestinalis* from Mirzapur, 3.8% from Bhaluka and 13.9% from Kaliganj.

Glickman *et al.* (1999) examined 286 randomly selected stool samples of children aged 1-18 years from 3 rural villages in Guinea. 53% of children were infected with at least 1 type of soil-transmitted nematode such as *Ascaris lumbricoides*, *Trichuris trichiura*, hookworm and *Strongyloides stercoralis* and geophagia was reported by parents to occur in 57%, 53%, and 43% of children aged 1-5, 6-10, and 11-18 years, respectively.

Hall *et al.* (1999) noted that in urban slums of Bangladesh more than 40% children aged 1-12 years were moderately to heavily infested (defined as 15 worms/ person) with *A. lumbricoides.*

Saldiva *et al.* (1999) studied on *Ascaris-Trichuris* association and malnutrition in Brazilian children. They detected high prevalence of intestinal parasites. Prevalence of *Giardia lamblia* was 44%, *Endolimax nana* was 43%, *A. lumbricoides* was 41% and *T. trichiura* was 40%.

Roche and Benito (1999) studied on rural and urban people of Korea. In case of rural area, prevalence was 71.8% on the other hand, in the hospital based study it was 75.1% and found the prevalence of parasites as such: *E. histolytica/ E.dispar* 14.9% and 32.7% respectively, *G. lamblia* 7.2% and 8.6% respectively, *As. lumbricoides* 45.8% and 31.4% respectively, *T. trichiura* 25.7% and 36.4% respectively. The prevalence of *E. histolytica / E. dispar* slightly increased with age and *G. lamblia* was found to decrease.

Lee *et al.* (2000) performed a study in Legaspi city, the Philippines and recorded 78.1% prevalence. The infection rates of primary school children, preschool children and adolescents were 95.5%, 64.7% and 87.5%, respectively. The infection rate in urban areas was 56% and 92.3% in rural areas. The infection rates were 51% with *Trichuris trichiura*, 40% with *Ascaris lumbricoides*, 23.4% with hookworm, 15.6% with *Iodamoeba butschlii*, 14.1% with *Endolimax nana*, 9.4% with *Entamoeba coli* and 7.8% with *Giardia lamblia.* There were 51.6% with multiple infections.

Khanum (2000b), observed the prevalence of hookworm infection among children in Mirzapur (30%), Bhaluka (26.67%) and Kaliganj (30%). Out of 157 positive stool samples, a total of 136 cases were found to develop from eggs to larvae of which *N. americanus* was 65.44%, *A. duodenale* was 33.09% and a mixed infection of *A. duodenale* and *N. americanus* was 1.47%.

In 2001, Smith *et al.* through a cross sectional survey showed that rural Honduran people were infested heavily by intestinal helminthes. The overall prevalence of *As. lumbricoides* and *T. trichiura* were 45% and 38% respectively. The most intense infection for *As. lumbricoides* and *T. trichiura* were found in children aged 2-12 years old.

Kaur *et al.* (2002) conducted a study on 127 children in Delhi and 46.5% intestinal helminths and protozoa were demonstrated. *Ascaris lumbricoides* was observed 0.8%, while *Trichuris trichiura* was 2.4%. Protozoan parasites included *Giardia intestinalis* and *Entamoeba histolytica* 11% cases each, *Balantidium coli* 2.4% and *Cryptosporidium spp.* 18.9% patients. Mixed infection was not seen in any of the cases.

Lindo *et al.* (2002) explained that intestinal parasites contribute greatly to morbidity in developing countries and examined among young children in a town of Guyana. Single intestinal parasite was detected in 43.5% and multiple parasitic infections in 21.2%. The most common intestinal helminth parasite was hookworm (28.2%), followed by *Ascaris lumbricoides* (18.8%) and then *Trichuris trichiura* (14.1%). Among the protozoan, *Giardia lamblia* was detected in 10.5% while *Entamoeba histolytica* appeared rarely.

Geltman *et al.* (2003) in a study on intestinal parasite among African refugees resettled in Masachusetts found overall prevalence as 56%. Of them 14% had helminthes, 2% had multiple helminthes, 52% had protozoans and 25% had multiple protozoans. The most common pathogens were *G. lamblia* (17%), *T. trichiura* (9%). The prevalence of parasite was correlated with the age of the children. Children and adolescents were more likely than adults to have any parasite in the stool (62% versus 51%, $p < 0.01$).

Bordley (2003) observed an intestinal parasitosis of 59.5% in adolescents in Gond tribal community in Kundam block of Jabalpur district, Madhya Pradesh, India. *Ancylostoma* species and *Hymenolepis nana* were the most common species. Prevalence of intestinal parasites among boys was 61.7% and girls were 57.0%. Single infection rate was 81.8% and mixed infection rate was 18.2%. Most of the population was chronically affected with intestinal parasites.

Naish *et al*. (2004) conducted a study among school children aged 5–9 years in Peda Jalaripet, Visakhapatnam, South India. 92.6% were infected with one or more soil transmitted helminth parasites. The predominant parasite was *Ascaris lumbricoides* (91%), followed by *Trichuris trichiura* (72%) and hookworm (54%). *A. lumbricoides* infection was higher among younger children than older children and hookworm infection was more highly aggregated than either *A. lumbricoides* or *T. trichiura*. Multivariate analysis identified parental occupation, child's age and mother's education as the potential risk factors contributing to the high intensity of *A. lumbricoides* infection.

Abahusain (2005) observed the prevalence of intestinal parasites among expatriate workers in Al-Khobar, Saudi Arabia; to be 31.4% single infection and multiple infections were 9.1%. Hookworm, *As. lumbricoides* and *T. trichiura* were the most common infections in all nationalities.

In 2005, Rahman *et al*. showed the overall prevalence of infestation was 24.73%, *E. histolytica* 3.95%, *G. intestinalis* 6.31%, *A. lumbricoides* 11.84% and *T. trichiura* 2.63%.

Khanum *et al.* (2005) conducted a study on children of 2-12 years old in two different rural areas of Bangladesh. The prevalence of hookworm infection was higher in Kutumbopur (30%) than Gazirchat (26.7%). The prevalence was higher in male than female in both study areas, but it was significant in Kutubopur (x^2=7.13. $p< 0.05$) and insignificant in Gazirchat (x^2=2.38, $p> 0.05$).

Wadood *et al.* (2005) studied the frequency of intestinal parasitic infestation in a children Hospital Quetta, Pakistan, and found that overall infestation rate was 31%. Most common parasites were *H. nana* (34%), *G. lamblia* (32%), *E. histolytica/ E. dispar* (29%), *A. lumbricoides* (4%) and *A. duodenale* (1%).

Cheng *et al.* (2005) carried out a study and 14 species of parasites were found. The overall infection rate of intestinal helminth was 36.15%. The prevalence of *Ascaris lumbricoides*, hookworms, *Trichuris trichiura*, *Enterobius vermicularis* and *Clonorchis sinensis* was 9.55%, 19.73%, 11.48%, 22.06% and 0.60% respectively.

Ak *et al.* (2006) examined stool samples of 4,470 individuals. In the feces of men, women and children of 0-59 months old, 41.8%, 44.3% and 32.2% parasites were found respectively. The high prevalence of parasitic diseases in this area is one of the causes of malnutrition in 40% of children. Parasites were detected in 44.2% of feces samples collected from rural areas and in 39.5% collected from urban areas. The most common parasites were *Giardia intestinalis* (18.1%), *Entamoeba coli* (11.8%), *Ascaris lumbricoides* (4.8%), *Trichuris trichiura* (4.5%) and *Hymenolepis nana* (3.9%).

Araj *et al.* (2006) conducted a study on Lebanese patients from two different geographic regions. The prevalence of parasites at Beirut and Tripoli were 8.47% and 45.35% respectively (overall 18%). Multiple infections were measured in 8.8% and 3.5% at Beirut and Tripoli, respectively. 18 different types of parasites were harbored, the most common were: *Giardia lamblia* (20.7% vs 10.5%), *Entamoeba histolytica* (19.41% vs 1.25%), *Taenia spp*. (6.03% vs 4.08%) and *Ascaris lumbricoides* (2.09% vs 46.97%).

Kaur and Sween (2007) carried out a study in the children (aged up to 10 years) of Rajpura town. Out of 50 samples, 68% were found to harbour single or multiple infections. The detected parasites were *E. histolytica* (91.17%), *As. lumbricoides* (44.11%), *H. nana* (17.64%) and hookworm (17.64%). The percentage incidence of parasites was found to be higher in the children belonging to the age group of 5–10 years. The most common mixed infection combination was that of *E. histolytica* and *A. lumbricoides* (35.29%). The study also indicated that gastrointestinal parasitic infections were more frequent in slum areas (54.83%) than in urban areas (45.16%).

Wakid and Hamdi (2007) conducted a study in the Holy City Makkah, during Hajj, 504 food handlers from 21 countries were investigated. Intestinal parasites were noticed in 31.94%. Fifteen different intestinal parasites were identified; *Trichuris trichiura* (10.70%), *Blastocystis hominis* (9.33%), hookworm (7.54%), *Endolimax nana* (6.15%), *Entamoeba coli* (4.37%), *Entamoeba histolytica* (2.78%), *Giardia lamblia* (1.98%), *Entamoeba hartmanni* (1.79%), *Schistosoma mansoni* (1.59%), *Strongyloides stercoralis*

(1.00%), *Iodamoeba butschlii* (0.8%), *Ascaris lumbricoides* (0.8%), *Hymenolepis nana* (0.6%), *Diantamoeba fragilis* (0.2%) and *Enterobius vermicularis* (0.2%).

Wani *et al*. (2007) aimed to investigate the frequency of intestinal helminth parasites in children of Kupwara, Kashmir, India. 71.15% found positive for various intestinal helminths. By far, the highest frequency of 69.23% was noted for *Ascaris lumbricoides* followed by *Trichuris trichiura* 30.76%, *Enterobius vermicularis* 7.69% and *Taenia saginata* 7.69%. Single infection was found 33.65% and mixed infection was 37.5%. This study put emphasis on the need for improved environmental conditions, i.e., clean water supplies, enhanced sanitation and chemotherapy of school-age children in rural areas.

Khanum *et al.* (2008) carried out a study among the male children in three slum areas of Dhaka city (Mohammadpur Jeneva camp, Rayer bazaar and Kamrangirchar Shahidnagar). Highest prevalence of nematode infection (64.81%) and highest anaemic rate (85.71%) was found in Kamrangirchar slum area. The prevalence of *A. lumbricoides* was 46.10%, *T. trichiura* 3.55%, hookworm 0.71% and mixed infection 5.67%. Comparing the highest prevalence of nematode species in different age groups, it was found that *A. lumbricoides* showed 87.50% in 0-2 years and *T. trichiura* 7.14% in 8.1-10 years, while, anaemic children were more prevalent among the age 2.1-4 years**.**

Mehraj *et al.* (2008) conducted a cross sectional survey among children aged 1–5 years in Ghosia Colony Gulshan Town Karachi, Pakistan. The prevalence of intestinal parasitic infections was estimated to be 52.8%, in which *Giardia lamblia* was the most common parasite followed by *Ascaris lumbricoides*, *Blastocystis hominis* and *Hymenolepis nana*. About 43% children were infected with single parasite while 10% with multiple parasites.

Haque *et al.* (2009) conducted a prospective case-control study that was performed involving 3646 case patients (both children and adults) who presented with diarrhea to the Dhaka hospital of the ICDDR,B and 2575 control subjects with asymptomatic infection. *Cryptosporidium* species and *E. histolytica* were more prevalent in patients with acute diarrhea than in healthy control subjects, for all ages (2.1% vs. 1.4%; P =.039). *G. lamblia* assemblage was also more prevalent in case patients with diarrhea than in healthy control subjects (20% vs. 5%; P <.001).

Nkrumah and Nguah (2011) carried out a retrospective study among the median age of the 1080 children. The most common (89.5%) parasite was *Giardia lamblia.* The incidence for *Giardia lamblia* only was lowest at 13 per 1000 for those under a year old, highest at 152 per 1000 for the 15-17 year group and 97 per 1000 for all ages combined. Five (4.3%) of the 118 positive stool samples had mixed parasites infection.

Ansari *et al.* (2012) assessed the incidence of parasitic pathogens causing acute diarrhea under 5 years of age. Out of 525 children with acute diarrhea in a children's Hospital of Kathmundu, Nepal, protozoan infections were found 10.7% and helminth infections were found 1.3%. The higher prevalence of diarrhea was in the group of less than 2 years.

According to Alam *et al.* (2013) gastrointestinal protozoan parasites are important cause of diarrheal illness in Bangladesh. They conducted a study on total 540 samples from outdoor patients of ICDDR'B Hospital at Dhaka, where they found different protozoan parasites including: *E. histolytica* (1.11%), *G. intestinalis* (0.37%), and *Cryptosporidium sp*. (4.44%).

Ahmed *et al.* (2013) conducted a study on a total of 2880 stool samples of children (under 5 years old). The rate of infection of *Trichuris trichiura* was 5.27%. The highest prevalence was 10.18%, among the children of 2-3 years and none (zero) among 0-1 years. The male children (6.11%) were more infected than the female (4.27%). The mixed infection of *T. trichiura* and *Ascaris lumbricoides* (26.31%) was higher than the *T. trichiura* and *Giardia sp.* (10.52%). The highest rate of infection (6.74%) was found in June and lowest in January (4%).

Tulu *et al.* (2014) employed a cross- sectional study on 340 students of primary school in Delo- Mena district of Ethiopia. The estimated prevalence of intestinal parasites was 26.2%. Poly-parasitism was detected 6.2%. The rate of infection with single, double, triple and quadruple parasites were 20%, 4.7%, 1.2% and 0.3% respectively. The most prevalent parasites were *Schistosoma mansoni* 12.6%, pursued by *Entamoeba histolytica/dispar* 5%, *Ascaris lumbricoides* 4.7%, and *Hymenolepis nana* 4.4%. Infection rate was higher in children, who did not wash their hand before taking meal.

Banu *et al*. (2015) found higher percentage of intestinal parasite infestation in rural adolescent girls (49.62%) compared to slum dwelling (33.50%) and urban adolescent girls (18.22%). They also revealed that Body Mass Index (BMI) was lower in infected girls than non infected groups.

Motazedian *et al.* (2015) conducted cross sectional study on 1021 stool samples collected from food handlers in Shiraz, Central Iran. They found that the prevalence of parasitic organisms was 10.4%. The most species of the protozoan parasites were *G. lamblia, E. coli* and *B. hominis*. Mixed infections were observed 13.2%. Females (11.9%) are more infected than males (9%) (P=0. 024).

De Lima *et al.* (2016) recorded *Endolimax nana* parasite being more frequent in 33% of cases in the Municipality of Santa Luzia, Paraiba, Brazil, and among the most frequent helminth was *Enterobius vermicularis* with 1% of cases.

Socioeconomic factors of intestinal parasites in Bangladesh and other countries:

Sen (1968) in an epidemiological study of parasitic infestation in lower socio-economic group in Chandigarh (North India) found that intestinal parasitosis was a major health problem in India. About 50% of the urban and 68% of the rural population was affected. Slum dwellers had high rates of infestation due to poor sanitation, contaminated water supply and high population density.

Yodmani *et al.* (1982) in a study on transmission of intestinal parasites in a slum in Bangkok found that vegetables sold in the market were contaminated with eggs of *A. lumbricoides* resulting in continuous active transmission of ascariasis in the area. Soil transmitted helminth (STH) infections were in communities where poor environmental sanitation and poor personal hygiene were prevalent, as used to occur in the majority of developing countries.

Muttalib *et al*. (1983) in a study on soil pollution with *Ascaris* ova in three villages of Bangladesh, reported that 80-90% of human excreta found its way into soil or water, and refuse, garden and water sources were found to be infected predominantly by *Ascaris* ova.

Ahmed (1986) reported the factors related to prevalence of intestinal parasites and malnutrition were identified as low socio-economic status, illiteracy of mother, poor environmental sanitation, overcrowding, unhygienic housing and in sanitary disposal of refuges and human excreta. The prevalence of *Ascaris lumbricoides* were 61.5%, 17.5% for *Trichuris trichiura*, 7.41% for *Ancylostoma duodenale* and 0.7% for *Enterobius vermicularis* were observed.

In a study of Holland *et al.* (1988), strong associations were established between the socio-economic status of the children and infection with *Ascaris lumbricoides, T. trichiura* and hookworm infestation. In general the prevalence of single and multiple helminth infestations was significantly higher in children living in houses made of wood or bamboo. The same pattern applied to levels of sanitation. *A. lumbricoides* occurred more frequently in children of mothers with the least formal education and in children living in relatively crowded conditions.

Forrester *et al*. (1988) studied on clustering of *A. lumbricoides* and *T. trichiura* infection with households suggested that intensity of infection was influenced by cultural and genetic factors, as well as by hygiene, environmental and socio-economic variables.

Islam (1990) showed that there is a significant sex variation in the prevalence of intestinal parasites among the children. The overall prevalence of *A. lumbricoides* was only 1.18%. A small prevalence was observed because all the children were inhabitants of high socio-economic status. The prevalence of single infection of *A. lumbricoides* was 0.96%, mixed infection of *A. lumbricoides and T. trichiura* was 0.18%; whereas mixed infection of *A. lumbricoides* and *A. duodenale* was only 0.04%.

Omar *et al.* (1991) observed in school children of Abha, Saudi Arabia that parasitic infection mainly affected poorer section of society. Water contamination was associated with high intestinal parasitic infection.

In 1993, Lynch *et al.* worked on a group of urban slum children in Caracus of Venezuela and demonstrated the relationship that exists between poverty and condition of hygiene, prevalence of helminth infection was high in the children. The occurrence of helminth infection directly related to the degree of poverty and lack of sanitary facilites.

Rousham in 1994, worked on over 131 mothers in rural Bangladesh to examine their knowledge and perceptions on helminth infection in relation to the use of health facilities and treatment seeking behavior. Higher percentage of the mothers had obtained deworming treatment for their children. However, marked differences were found in mother's descriptions of the causes and prevention of helminth infection in two adjacent areas, Pullakardi and Shekhpara.

Xu *et al.* (1995) in a study in China found that there was a wide variability in both inter and intra-regional parasitosis within a given country among countries. These differences may be due to a variety of factors associated with the prevalence of infections such as soil composition, climate, and method of transmission. Similarly socio-economic and health conditions, education, and beliefs related to traditional health practices, as well as presence of domestic animals in the home and contamination of water and food have all been reported as factors associated with presence of these diseases.

Kang *et al.* (1998) observed overall prevalence of various parasitic infections was 97.4%. Prevalence of *G. lamblia* was 53.8%, *Cryptosporidium* 39.7% and hookworm 61.5%. The extremely high prevalence rates might be function of unprotected water supply and the open defaecation practices of villagers.

The research work carried out by Khanum *et al*. in 1999 on 600 children of different socioeconomic status of three selected areas-Mirzapur, Bhaluka and Kaliganj Thana of Bangladesh. The prevalence was higher among the children who used pond water for drinking and washing utensils, open field for defecation, used clay after defecation and lived in mud and straw house.

Mascie-Taylor *et al.* (1999) observed that people living in rural areas and in urban slums of Bangladesh would be particularly at risk to intestinal parasites because of poor sanitation, unclear water and lack of personal hygiene.

Cameiro *et al.* (2002) studied in rural municipalities in Minas Gerais, Brazil among the children and found that the prevalence of *A. lumbricoides* was 12.2%, *A. duodenale* 5%, *T. trichiura* 5%, *S. mansoni* 2.2% and *E. vermicularis* 1.8%. The result showed the protective effects of availability of water in the washbasin and better hygiene, sanitation and socio-economic status. The interactive effect of crowding was five times larger in households without water in the washbasin than in those having water. Children from families with higher purchasing capacity also had a lower risk of *A. lumbricoides* infection.

Campbell and Wallis (2002) and Lee *et al*. (2002) found in the United States that *G. lamblia* infection occurs due to drinking of inadequately treated well or river water or water contaminated by cross connections with pipes containing sewage or drinking water for animals.

Banu *et al*. (2003) conducted a study which revealed that personal habits such as nail clipping, finger sucking, wearing another person's clothes, sleeping habits and washing hands related to pinworm infection in children visiting two hospitals. Most of these children came from families who have poor habits of personal hygiene. From each hospital 200 children were randomly sampled over a period of one year.

Morales-Espinoza *et al.* (2003) studied on intestinal parasites among children in highly deprived areas in the border region of Chia pas, Mexico and found 67% prevalence and 60% had multiple parasites. The prevalence of *E. histolytica / E. dispar* was 51.2%, *G. lamblia* 18.3%, and *A. lumbricoides* 14.5%. Sources of water and lacking of refrigerator and electricity were associated with the presence of *A. lumbricoides*. Lacking of refrigerator and electricity was an indirect measure of the family's economic situation.

WHO (2003) noted that worm infections are diseases of poverty and affect people with the least ability to demand service. In some countries almost everyone is infected by worms, it is thus seemed to be an inevitable part of life.

D'Silva *et al*. (2003) carried out a study in two hospitals in the Dhaka city. The study showed that ignorance in mothers as well as among the children about pinworm infection plays a vital role in its epidemiology. Major determinants in the transmission of this worm were types of latrines and houses used, the source of water used for household needs (drinking, washing utensils, washing hands), and the habit of hand washing before eating. Most of the factors showed positive association with the pinworm infection.

Ulukanligil and Seyrek (2003) conducted a demographic survey on school children which revealed that the prevalence of helminthic infections was 77.1% in shantytown, 53.2% in apartment district and 53.1% of rural area. *Ascaris lumbricoides* was the most prevalent species and followed by *Trichuris trichiura*, *Hymenolepis nana* and *Taenia* species in three schools. Sanitation survey showed that the tap water was limited in shantytown school, toilet's sanitation was poor.

Mourad (2004) in a study on Palestinian refugee found that 29.8% had intestinal parasites. Highest prevalence (24.1%) was found among 1-4 years children. Intestinal parasites were strongly associated with crowding, source of drinking water, poor socio-economic demographic, environmental, health and hygiene condition. Among the investigated households, four types of parasites were reported *A. lumbricoides, E. vermicularis*, *E. histolytica / E. dispar* and *G. lamblia.*

Okyay *et al*. (2004) estimated that 31.8% were infected with one or more intestinal parasites, 6.4% more than one parasite, 5.7% with two parasites and 0.7% with three parasites, *E. vermicularis, G. intestinalis* and *E. coli*. Prevalence was higher in rural area, in children with less educated mother.

Al-Nakkas *et al.* (2004) conducted a study in Kuwait and reported that contamination of soil by human faeces by *A. lumbricoides* and *T. trichiura* in combination with a high degree of overcrowding and a low-income level increased the susceptibility to helminthiasis. *A. lumbricoides* was the commonest helminth parasite in both male (75%) and female (61%) children followd by *T. trichiura* in male (26.6%) and female (36.86%).

Mizarnurrahman *et al.* (2005) carried out a study on the children of 2-12 years old in two different rural areas (Gazirchat, Savar and Kutumbopur, Comilla) of Bangladesh. The prevalence was significant in Kutumbopur (χ^2=7.13, $p<0.05$) and insignificant in Gazirchat (χ^2=2.38, $p>0.05$). Most of the factors showed positive association with hookworm infection. Types of house, latrine, bare footed behavior of the children and education of the mother were taken as hygienic measures for the hookworm infection.

Dawson (2005) reported over recent decades, parasitic protozoa have been recognized as having great potential to cause waterborne and foodborne diseases. The organisms of greatest concern in food production worldwide are *Cryptosporidium, Cyclospora, Giardia*, and *Toxoplasma*. A number of outbreaks related to food preparation have been documented, probably caused by infected food handlers or contact by food handlers with infected people, particularly children.

According to Adamu *et al.* (2006) and Azam *et al.* (2007), low socio-economic status, poor living conditions, poor environmental sanitation and practices, overcrowded areas, ignorance, low literacy, improper garbage disposal, unsafe water supply and unhygienic personal habits were the causes of major proportion of burden of the diseases and death in developing countries. Opportunistic parasites detected by Adamu *et al.* in diarrhoeal children were *Cryptosporidium parvum* (8.1%), *G. lamblia* (6.3%), *B. hominis* (5.9%), *I. belli* (2.3%), *E. histolytica/ E. dispar* (1.4%), *T. trichiura* (0.9%), *Enterocytozoon* *bieneus/ Encephali tozoon intestinalis* (0.5%), *A. lumbricoides* (0.5%), *H. nana* (0.5%). Sixty one percent of pediatric diarrhoeal patients were infected with parasites.

Dhar (2011) studied on soil parasites in Haor Basin Area of Bangladesh. He found 20% soil specimen contaminated with parasites where prevalence of *Giardia spp*. was 13.3% and in both *A. lumbricoides* and *T. trichiura* prevalence was 7.5%. Children of ‘weaning food’ stage were found most vulnerable, both for intestinal infection (76.10%) and for soil contamination (85.72%). Intestinal infection and yard soil contamination was higher in non-sanitary latrine user compared to sanitary latrine user group.

Anaemia in relation to parasitic infestation:

In 1975, Islam *et al.* examined 933 students of Dhaka University. Mean hemoglobin levels were 80.5% for men and 70% for women. Among the student, 57.33% had single or multiple intestinal parasitic infections. Of these *As. lumbricoides*, *E. histolytica*, and *T. trichiura* were the commonest. It was suggested that chronic nutritional deficiencies compounded by these three parasites, leading to low weight and low hemoglobin’s count.

Bukenya (1987) undertaken a cross sectional study to find out relationship exists between prevalence of Ascariasis or hookworm, and different levels of nutritional status. Statistically significantly higher prevalence of both parasites was associated with the severely malnourished group when compared to the well nourished group. Periodic deworming, irrespective of intensity of infection, for the high risk children in endemic areas are recommended.

In a study of Stoltzfus *et al.* (1996), intestinal blood loss was measured by fecal heme and heme breakdown products. Intestinal blood loss was strongly and linearly related to hookworm egg counts. The degree of degradation of fecal heme indicated that blood loss occurred in the upper gastrointestinal tract, compatible with the behavior of hookworms. *T. trichiura* and *A. lumbricoides* infections were also common, but did not contribute significantly to intestinal blood loss in this population. The prevalence of anaemia increased steadily as hookworm infection intensity and intestinal blood loss increased.

Pegelow *et al.* in 1997 studied with the children aged 8-10 years from ten schools in the rural district Sukarja, West Java, Indonesia. A total of 348 faecal samples were examined and 365 blood samples for the measurement of hemoglobin concentration and anthropometrics data were obtained from 404 participants. The prevalence levels were of *T. trichiura* 76%, *A. lumbricoides* 44%, hookworm 9% and *E. vermicularis.* An average anaemia rate was 13%.

A survey was conducted by Hyder *et al.* (1998) on rural people of Fulabaria, Mymensingh on March 1996. 70% female was found to be anaemic. Highest prevalence (76%) was on 35-48 age groups.

Jimenez *et al*. (1999) measured the blood concentrations of haemoglobin of 82 children. Of these 57 children (31 boys and 26 girls) were positive for *G. intestinalis*. Treatment of the infected children with a single oral dose of secnidazole (30 mg/kg) led to a significant increase in their mean haemoglobin level 15 days later, from 11.6 (1.2) g/dL pre-treatment to 12.4 (1.2) g /dL post treatment ($p<0.05$). The result indicated that the therapeutic control of giardiasis could be important in programme to combat anaemia in children living in endemic areas.

Chakma *et al.* (2000) conducted the study among 776 school going children (6-14 years) of Madha Pradesh to assess the prevalence of anaemia and intestinal parasitic infestation. The results revealed that 30.3% of the children had severe anaemia (Hb<7 g/dL) and 50% children had intestinal parasites. The most common parasites were hookworm (16.3%) and *As. lumbricoides* (18.5%). Though hookworm ova loads indicated mild to moderate infestation in most of the children, the continued presence of worms in marginally nourished children could contribute significantly to blood loss in the intestine with resultant anaemia.

Ahmed *et al.* (2000) conducted a study on prevalence of iron deficiency and anaemia in adolescent school girls in 5 sub-districts of Dhaka. They found 27% prevalence in girls aged 11-16 years. Of all anaemic girls 32% had iron deficiency.

Rao *et al* (2003) worked on 818 adolescents aged 11-19 years from 27 village of Kundam blocks to assess worm infection and nutritional status including anaemia among them. High prevalence of under nutrition in terms of underweight (61.7%), stunting (51.7%) and wasting (32.8%) was observed. 82.3% adolescents were found anemic. Intestinal parasitosis was observed in 59.5% adolescents. *Ancyclostoma* sp. and *H. nana* was the most common forms of parasitosis observed among them.

Leenstra *et al.* (2004) evaluated the prevalence, severity, and risk factors of anaemia in 648 randomly selected adolescent school girls aged 12-18 years with intense malaria transmission in western Kenya. The prevalence of anaemia (Hb <120 g/L) was 21.1%; only one girl had an Hb less than 70 g/L. Malaria and schistosomiasis were the main risk factors for anaemia in younger girls (12-13 years), while menstruation was the principal risk factor in older girls (14-18 years).

Uddin *et al.* (2005) carried out the study among 138 adolescent girls (10 and 19 years of age) from two rural areas in Bangladesh (Kutumbopur, Comilla and Gazirchat, Savar, Dhaka). 96.87% of the sample, hemoglobin level was below the normal. According to the anaemic status of the adolescent girls, 10.14% was severely, 69.56% moderately and 17.39% mildly anaemic. Total parasitic prevalence was 71.01%. Anaemia was positively correlated with intestinal parasitic infestation and it was statistically significant.

Anaemia is a major contributor to maternal deaths in developing countries. Shah and Baig (2005) carried out a comparative cross sectional study with 112 pregnant Nepalese women to assess the association of anaemia with parasitic infestation, and other significant risk factors in eastern Nepal. Anaemia was found in 58.9% women and 46.5% women infected with helminth parasites. Anaemia was significantly related to hookworm infestation. There was a highly significant relationship between education and the knowledge of women regarding effect of helminthic infestations ($p<0.000$), transmission and spread of infestations ($p<0.000$).

Uddin and Khanum (2008) studied the prevalence of intestinal parasitic infestation and status of anaemia of the adolescent boys (10-19 year) of two selected villages, Kutumbopur, Comilla and Gazirchat, Dhaka. Out of 106 adolescent boys, only two (1.9%) showed severe anaemia. Among other status of anaemia, 50.9% was moderately anaemic, 39.6% mildly and 7.5% not anaemic. Adolescent boys were infected (49.01%) with one or more type of protozoan and helminth parasites.

Koukounari *et al*. (2008) reported on haemoglobin, malaria parasitaemia, helminth infection and under nutrition among 1523 school children (aged 10-21 years). Children infected with *P. falciparum* or with a heavy *S. mansoni* infection, stunted children and girls were found to have lower haemoglobin concentrations. Children heavily infected with *S. mansoni* were also more likely to be anaemic compared with uninfected children.

This study further highlights the importance of malaria and intestinal schistosomiasis as contributors to reduced haemoglobin levels among school children.

Wani *et al.* (2008) determined the relationship between soil transmited healminths (STHs) and hemoglobin status in school children of Kashmir Valley (India). Stool and blood samples were collected from 382 male and female school children in the age group of 5-15 years and 299 (78.27%) were infected with *As. lumbricoides*, *T. trichiura*, or both. Children infected by STHs were found to have lower mean values of hemoglobin than uninfected children. So that STHs creating a negative effect on the hemoglobin values.

A cross sectional community based study was carried out to determine the prevalence and distribution of anaemia among 308 adolescent in Nepal by Baral and Onta (2009). The overall prevalence of iron deficiency anaemia was 65.6% with the distribution of rural 62.4%, urban 70.0%, male 52.3% and female 78.3%. Sufficiency or deficiency of iron makes the living of adolescents different as it affects their growth requirement and cognitive performance. Iron reserve in female result better reproductive outcome.

Hoque *et al.* (2009) carried out a retrospective case-control study in a rural district hospital of South Africa among 300 pregnant women, 100 of them with anaemia referred as cases and 200 controls. The risk factors for anaemia, particularly during pregnancy, are multiple and complex and their relative contributions are known to vary by geographic areas and by seasons. Of the cases, 48% and 1% among the controls had intestinal helminthiasis, resulting in the odds ratio of 42 ($p=0.000$ and 95% CI 9.96-176.59). These parasitic infestations are known to cause chronic haemorrhage and iron deficiency resulting in the development of anaemia in pregnancy.

Fuseini *et al.* (2010) examined the association between anaemia and *Plasmodium* and or intestinal helminth infections among 300 pregnant women in the Kassena-Nankana district of Northern. One in four women were found to be infected with one or two of the following helminths: *Schistosoma mansoni* (12.3%), hookworm (7.0%), *S. stercoralis* (2.3%), *As. lumbricoides* (0.7%) and *Trichostrongylus* (0.7%). *Plasmodium* and *S. mansoni* infections alone cause mild anaemia, hookworm infections alone cause moderate anaemia. However, the anaemia caused by these parasites on a whole, are not severe (Hb<7.0 g/dL). An integrated programme for the control of these parasites is recommended in order to reduce the degree of anaemia during pregnancies.

Osazuwa *et al.* (2011) evaluated the relationship of intestinal helminth infection on the anaemia status of children and adolescents in the three rural communities in Nigeria. Faecal and blood samples were obtained from 316 children and adolescents, 38.6% were found anaemic: 75.9% of children in Evbuomore, 42.3% in Isiohor and 26.8% in Ekosodin. The overall prevalence of parasitic infection was: *As. lumbricoides* (75.6%), hookworm (16.19%) and *T. trichiura* (7.3%). There was a statistically significant association between hookworm and *As. lumbricoides* infection and anaemia ($p<0.001$).

Abrishami *et al*. (2013) conducted a study on 1500 girls from 5 regions of Mashad, Iran. 72.9% had iron deficiency anaemia while 6.4% had other disorders such as thalassemia. Study revealed that prevalence of iron deficiency anaemia is moderate in young girls and it is important to reduce the deficiency.

Urinary Tract Infection:

Smith and Bullen (1965) carried out bacterial counts of urine specimens collected from pregnant women. They reported bacteriuria persisted usually throughout the pregnancy and was present six months after delivery in about a 173rd of the patients. They also reported a significantly high incidence of premature birth in bacteriuria women (13.3%) than that observed in women (5%) without bacteriuria.

Kass (1975) reported that 6% had significant bacteriuria on a clean catch mid stream specimen with bacteriuria at their first prenatal visit and 19% developed sign symptoms of UTI at sometimes during their pregnancy.

Haque *et al*. (1976) carried out a study on 170 volunteers of both sexes. The prevalence of positive culture was 19.4% (33 out of 170). Out of 33 positive culture cases, 26 (78.8%) were females.

Rahman (1977) reported that *E. coli* was the commonest offending organism in UTI. It comprised 88.55% of the total strains of 912 screened.

Elo *et al.* (1979) studied on seasonal variations in the occurrence of urinary tract infections among children in an urban area in Finland. The incidence was highest during November and lowest during the summer months. Summer episodes, moreover, tended to be the most severe. Seasonal variations were less marked among girls, than among boys, except in the group of teenage girls in which peak incidences occurred in March and in September. Among the boys, a single peak incidence was recorded in July.

Anderson (1983) carried out a retrospective survey, covering three consecutive years and suggested that UTI presented to the general practitioner more frequently in the summer. The records of all women reported as attending this practice with a UTI showed that 213 culture positive episodes occurred in the third calendar quarter of each year. Edward's test for cyclic variation showed a significant peaking in August. These results indicate a definite seasonal fluctuation in the frequency with which symptomatic UTIs present to general practitioners in this practice. The clinical and epidemiological significance of this phenomenon remains to be determined.

Boscia *et al.* (1986) reported that UTI is comparatively higher in very elderly people, which is about 18.2% in female. This rate is increased further in hospitalized patients particularly in diabetic patients.

Nahar *et al.* (1989) screened the urine samples of 300 adult females, with or without UTI between 20-30 years from different socioeconomic background and varied marital status to identify the organism responsible for UTI, *E. coli* was found to be the most common (70.9%) organism.

Jamshed (1992) in their study on 732 subjects showed that urine samples of women of child bearing age, who were examined at Mymensingh Medical College, were positive for bacterial growth in 413 (56.4%) cases. *E.coli* was the most (91%) prevalent pathogens. About 63 specimens showed positive culture.

Foxman (2002) stated that urinary tract infections (UTIs) are considered to be the most common bacterial infection. Women are significantly more likely to experience UTI. Nearly 1 in 3 women will have had at least 1 episode of UTI requiring antimicrobial therapy. Almost half of all women will experience 1 UTI during their lifetime. Specific subpopulations at increased risk of UTI include infants, pregnant women, patients with spinal cord injuries and/or catheters, with diabetes, or acquired immunodeficiency disease syndrome and underlying urologic abnormalities.

Begum *et al*. (2006) studied UTI infection among garments workers and reported that 54.5% complained about urinary problem while 16.4% suffered from laboratory diagnosed UTI. Marital status, toilet habit and nature of job found to have an effect on the infection. Respondents with good drinking and toilet habit were less prone to the infection.

Nahar *et al.* (2006) reported 47.6% *E. coli* positive cases among inhabitants of Mirpur. Prevalence of UTI was higher in summer (52.40%) than in winter (40.40%). During the summer, 39.26% male and 60.73% female cases were detected as *E. coli* positive. The women of different age-groups were prone to *E. coli* infection. Highest positive cases (72%) were found among adult women (21-25 years).

Kattel *et al*. (2008) recorded 26% of the total urine samples showed significant bacterial growth. Fourteen different bacterial species were isolated. Among these, *Escherichia coli* (59.59%) was significantly the most predominant one, followed by *Staphylococcus aureus* (12.56%), *Klebsiella* spp. (10.78%), *Enterococcus faecalis* (7.95%), *Pseudomonas aeruginosa* (5.01%), *Acinetobacter calcoaceticus* (1.09%) and others.

According to Najar *et al*. (2009), urinary tract infection (UTI) is the most common infection experienced by humans after respiratory and gastro-intestinal infections, and also the most common cause of both community-acquired and nosocomial infections for patients admitted to hospitals. Asymptomatic bacteriuria is common in certain age groups and has different connotations. It needs to be treated and completely cured in pregnant women and preschool children. Reflux nephropathy in children could result in chronic kidney disease; otherwise, urinary tract infections do not play a major role in the pathogenesis of end-stage renal disease. Symptomatic urinary tract infections occur most commonly in women of child-bearing age.

A retrospective study was carried out by Nahar *et al*. (2010) from urine samples received at Shandhani Diagnosis Complex, Mirpur where 55.91% urine samples showed *E. coli* infection. During summer season, 64.18% female found to be positive while 35.81% male showed positive result. In winter 63.63% female and 36.36% male showed positive result for *E. coli*.

Jhora and Paul (2011) conducted a study on young adult women from Sir Salimullah Medical College and Mitford hospital. They found that *Esch. coli* was the most predominant (82.61%) urinary pathogen follwed by *S. saprophyticus* (7.01%). Rate of isolation was also high (41.38%) among female of <18 years age group.

Chazan *et al.* (2011) investigated the incidence rate of *E. coli* bloodstream infection (BSI) and the association with temperature in different seasons in the Yizrael Valley. During the study period, 2810 BSIs were recorded (35% *E. coli*). In 67.4% of the cases of *E. coli* bacteraemia, the source was urinary tract infection. The crude incidence of *E. coli* BSI was 4.1/1000 admissions. There was no difference in the number of cultures/month (mean: 29 ± 6). However, *E. coli* BSI was 19% and 21% more frequent in summer than in the transitional and winter seasons, respectively (p= 0.01). The antibiotic consumption was significantly higher in the winter period. They found higher *E. coli* BSI in summer.

Khanum *et al*. (2012) investigated that 64% cases of women patients were *Escherichia coli* positive, 66.67% in summer while 60% in winter. They performed a study on women patients from BSMMU hospital. They also found that adult age group (16-35yr) had higher risk of UTI with *E.coli* than middle age (36-50yr) and old age groups (51-70yr).

Hotchandani and Aggarwal (2012) studied on urinary tract infection in women. Uncomplicated UTIs are usually treated empirically with antibiotics. However, not everyone diagnosed with a UTI and treated with an antibiotic will necessarily have a bacterial infection. At least one-half of women who suspect that they have UTI actually do. Studies have shown that one in 7 patients given an antibiotic for UTI symptoms will return within 28 days for a further prescription of antibiotic. Also, many UTIs are self-limiting, improving without treatment even when culture is positive.

Almushait *et al.* (2013) conducted a study at the antenatal clinic of Abha General Hospital, Saudi Arabia. A urine analysis test and culture were done with midstream sample, as well as socio-demographic data sheet was completed. Among 402 pregnant women 12.7% were affected with UTI. The main causative agent was *E. coli* followed by *Staphylococci*. It was found that UTI was strongly affected by the presence of previous history of reproductive tract inflammation, UTI attacks and UTI related complaints; washing and drying the perineum area and the average of cleaning the bathtub.

Rowe and Juthani-Mehta (2013) stated that urinary tract infection and asymptomatic bacteriuria are common in older adults. Unlike in younger adults, distinguishing symptomatic urinary tract infection from asymptomatic bacteriuria is problematic, as older adults, particularly those living in long-term care facilities, are less likely to present with localized genitourinary symptoms. Overtreatment with antibiotics for suspected urinary tract infection remains a significant problem, and leads to a variety of negative consequences including the development of multidrug-resistant organisms.

Rahman *et al*. (2014) reported that higher incidence of UTI is present in adult women aged above 19 years.

Moue *et al.* (2015) worked on patients of Anwer Khan Modern Medical College and Hospital, Dhaka, Bangladesh and collected 376 urine samples, of them 79.5% were culture positive. The female was more prone to UTI (79%) than male (21%). IPD patients showed 55.5% positive culture compared to as OPD patients as 44.5%. 21-30 years aged female group showed 48.5% and 41-50 years aged male group had 46.7% UTI. The most common bacterial isolate was *E. coli* 46.8% followed by *Enterococcus faecalis* 25.9%, *Pseudomonas aeruginosa* 11.4%, *Staphylococcus saprophyticus* 8%.

Skin Diseases:

A study was carried out by Ahmed and Aftabuddin (1977) where they revealed that over 70% of patients of skin diseases were suffering from pyoderma (37.7%) and scabies (33.3%). Scabies was diagnosed as a disease of overcrowding associated with problems of maintaining community and personal hygiene. Patients with ringworm and eczema constituted 11.3% and 8.3% respectively. Seborrhoeic dermatitis was diagnosed in about 1% of patients where as pityriasis versicular, candidasis and psoriasis were present in less than 1.5%, pityriasis rosea and chicken pox were present in less than 1% of patients.

Nigam *et al.* (1977) reported on a clinic-epidemiological study of scabies among 1058 persons living in 202 households in an urban area of Jhensi city in India revealed that scabies troublesome and problematic disease is now reaching epidemic proportion in most of the world. The prevalence of scabies was found in 12.5% of population and in 26.2% of the households. Scabies was encountered more in children and younger age groups (61.4%) and it was less above 35 years (10.9%).

Church and Knowlden (1978) reported from June 1972 to May 1973, all suspected causes of scabies to the Hallamshire Hospital. 1482 cases were found in 609 households in Sheffield. This was 10 times the number referred to skin department in 1971. Infestation was transmitted by school children. The commonest source was friends and relatives.

A study was carried out by Griffith (1980) on skin diseases. He found 2.6% herpes zoster, 1.2% chicken pox, 9% fungal infection and 21% eczema.

Islam (1988) studied on disease pattern of slum area in Dhaka city where it showed prevalence of scabies 9%, pyogenic infection of skin 4%, nutritional deficiency 2% and other contagious disease 5%. This study also showed that communicative disease more than 45%.

A case study was done by Misra (1990) in Allahabad, India which deserved three squatter settlements and their living condition, health and nutritional condition. The high incidence of scabies was associated with inadequate water supplies, poor drainage system and overcrowding.

In a study on the pattern of skin and VD diseases out of 2888 persons in a textile mill conducted by Shamsuddin (1990), 17.83% were suffering from skin and VD. The highest incidence was of pyogenic infection (24.27%), followed by parasitic infection (18.44%), fungal infection (16.5%), urticaria (8.73%), venereal diseases (8.73%), eczema (7.76%), seborrhoeic dermatitis (6.99%), apthous ulcer (3.88%), erythroquamous diseases (1.36%), viral infection (0.97%), acne vulgaris (0.97%), contact dermatitis (0.78%). Age group of 31-40 years had the highest number of disease (40.38%).

Harris *et al*. (1992) studied on 90% population of the southern island on Tanna. Scabies was found 16% with 24% of children under 10 years affected. Other skin infections predominantly furuncles, abscesses, impetigo and cellulities were found in 12% overall. Chicken pox and molluscum contagiosum was found in 16% of the children under 10 yrs of age. These infections were found to be more common in larger households.

A study was conducted by Hossain (1993) on skin and sexually transmitted diseases in the out patients, department of Modernized Sadar Hospital, Feni. It was observed that the total attended patients were 56465, out of which skin and STDs patients were 32.27%. Maximum number of the patients was in age group from 0-1 years (36.09%). Scabies (20.08%), fungal infection (20.19%), pyogenic infection (19.29%), eczema (18.79%) and seborrhoeic dermatitis (8.80%) were most common diseases.

A study was done by Paller (1993) and revealed that scabies in infants and young children were manifested as a pruritic generalized eruption with frequent involvement of face, scalp, palms and sole in contrast to the lesion in older patients. The common presenting lesions were papules, vesicle, pustules and nodules. Secondery eczematization pyoderma and impetigo were very common.

A study was carried out in Lahore, Pakistan by Zaman *et al*. (1993) and found the prevalence of scabies was 6.7%, which prevailed throughout the year.

Hay and Castanon (1994) conducted a questionnaire survey on the distribution of skin disease where 207 skin patients were found to be reported of which 131 patients attended the outpatient clinic. The commonest skin diseases were pyoderma 27 (20.61%) followed by scabies 26 (19.83%).

Ahad *et al.* (1994) conducted a study of the disease pattern of patients attended in private chamber of Dermatologist and sex related disorders. He found that total 3057 and 776 patients attended in experience specialist during the year 1993. Percentage distribution of patients attendance in two chambers are 19.73% and 15.7% eczema, 18.5% and 29.3% scabies, 12.03% and 30.8% fungal infection, 30.44% and 29.3% NGU, 19.47% and 41.55% gonorrhea, 17.10% and 21.7% syphilis respectively.

Nutrition survey by Khan and Rahman (1995) in Bangladesh showed that 76% of children had below grades of protein energy malnutrition. Infection with dermatophyte or ringworm was common to both pediatric and adult during 1975 to 1976. Tinea cruris and chronic infection of toe-nails were common in adult but rare in children. But the scalp ring worm was common in children (Tinea capitis).

Bahamdam *et al.* (1995) carried out a cross sectional study about skin diseases among children in Abha, Saudi Arabia. It was found that 19.8% of the children were affected by transmissible skin diseases. The most common types were tinea capitis 9.6% and tinea pedis 1.9%.

Gibbs (1996) conducted a study in rural Africa: Tanzania. Significant skin disease was encountered in 300 individuals (26.9%). Transmissible diseases comprised the bulk of skin disease (73.9%) with younger age groups being affected most. Socioeconomic conditions were poor, with low quality, crowded housing, low levels of literacy, unsatisfactory water sources, and few households with a regular cash income. Household density was significantly associated with transmissible skin disease.

A study on skin diseases pattern at the out patients department of dermatology of Dhaka Medical Collage Hospital carried out by Bhuiya (1997), revealed that 68.44% of the cases were suffering from scabies, followed by tineasis (3.67%), eczema (3.46%), impetigo (1.78%), folliculitis (1.35%), acne vulgaris (1.33%), bulous and urticaria (1.1%). Other skin diseases such as contact dermatitis, candidiasis, pityriasis, herpes zoster, molluscum contagiosum, verrucae, vitiligo and melanoderma were diagnosed in less than 1% of patients in each case.

A study was carried on scabies and its complications in relation to socioeconomic status by Al-Amin *et al*. (1997). Total 22917 patients attending the skin VD OPD of Rajshahi Medical college hospital, Rajshahi during the period of one year was taken as study population. 20.57% had scabies among them and 18.25% were under the age of 12 years. The numbers of scabies patients in the study population were mostly in poor income group (54.46%) and average income group (36.78%).

Rahman *et al.* (1997) conducted a study about the pattern of skin diseases in skin and VD outpatient department of Bogra Medical College Mohammad Ali Hospital. Among the skin disease, the highest percentage was scabies (32%) followed by eczema (23%), acne vulgaris (7%), seborrhoeic, dermatitis (4%), viral infection (2%), herpes zoster (2%), psoriasis (1%), vitiligo (1%) and chicken pox (1%).

A profile of skin diseases was done by Anand and Gupta (1998) in children Saurashtar in India. The highest number of skin infection 25% followed by allergic 8.5% and miscellaneous disorder 8.25%. Out of 333 cases of infection, 41.014% were of pyoderma, 33.93% of parasitic infections, 13.51% of fungal infection and 10.51% of viral infection.

Another study was carried out by Islam and Nasirullah (1998) at Sylhet medical college hospital to see the pattern of skin disease among the children. A total of 43725 children were examined in 1992. Children of 3-6 yrs age were mostly affected. Most of the patient 10620 (72%) were from poor socioeconomic group. Scabies was the most common 11050 (75%) followed by impetigo 9%, eczema 5%, fungal infection 3.5%, drug rash 1%.

Rashid *et al.* (1999) reported in the texts book of community medicine and public health that the incidence of scabies is high in Bangladesh. During the year of 1990 the scabies cases constituted 19.4% of all the skin disease attending the skin and socio hygienic centre Chittagong. At the skin and venereal diseases outpatient department of the Sylhet Medical College the incidence of scabies cases were found very high nearly 50%.

A study was conducted over 100 children by Kakar (1999) in New delhi and found that most of the children (42%) were in the age group of 1-4 years. The majority (58%) belonged to lower socio economic groups with poor standards of hygiene. A history of overcrowding was obtained from 87% of cases. Most of the children (68%) reported during hot and humid month of June, July, August and September. Impetigo was the commonest (48.61%).

A survey of skin diseases and skin infestation among primary school student of Taitung of Taiwan carried out by Wu-YH *et al.* (2000) which revealed that most common skin diseases were pediculosis capitis (12.9%), verruca vulgaris (5.1%), tinea versicolor (4.4%), tinea pedis (4.1%), and scabies (1.4%). Pediculosis capitis among girls ($p<0.001$), but tinea pedis and tinea versicolor were common among boys ($p<0.05$).

Pierard (2001) studied on onychomycosis and other superficial fungal infections of the foot in the elderly. The most common infections include onychomycosis, tina pedis and tinea cruris. With the increasing life expectancy, the prevalence of infections is likely to increase further without adequate prevention and treatment. The Achilles project represents a survey of 90,085 subjects from 16 European countries. Approximately half of the total screened population had evidence of fungal foot infection and onychomycosis affecting one quarter of these individuals.

Ahammed *et al.* (2003) found that patients visiting out patient department of Comilla Medical College Hospital had skin diseases like scabies, fungal infections, atopic dermatitis and psychosexual diseases. 9.4% female had scabies while 14.1% had fungal, viral and bacterial infections.

A study was carried out by some specialist doctors (2003) at Comilla Medical College Hospital from December 2000 to February 2001 on pattern of dermatology diseases. Male patient were found more than females. The majority were within the age group of 10-20 and 20-30 years. 94 separate categories of skin disease were clinically diagnosed. Scabies, fungal infection, atopic dermatitis, and psychosexual diseases, viral infection like chicken pox were however the more common ones (Abu-Ahammed *et al.* 2003).

The study was performed by Zamanian and Mahjub (2005) to assess the prevalence of skin diseases in rural areas Hamedan of Iran in 2002. The survey included 9450 inhabitants of all ages and both sexes from representative of 33 villages. The study showed that overall prevalence of skin diseases 27% and dermatitis by 37.5%, disorders of skin color 36.3%, actinic disorders 16.5%, nail disorders 13% and acne 11.7%.

A retrospective study was conducted by Murad *et al.* (2007) on the pattern of eye diseases in a tertiary hospital in sub urban area of Tongi, Gazipur where the percentage of styes was found 22 (1.26%).

Das and Chatterjee (2007) studied amongst 2550 consecutive skin patients in male OPD. Infective dermatoses were seen in 36.41% and allergic diseases in 29.88% of patients.

Khanum *et al*. (2007) showed high re-occurrence of skin disease in patients with low socio-economic status. Among the patients prevalence of scabies was 45.94%, eczema 9.93%, pyoderma 8.23%, ring worm 3.21% and psoriasis 7.02%. Majority of patients were below 10 years and between 10 and 19 years.

A study carried out by Akhter (2008) in the Dermatology Department, BIRDEM, Dhaka. Among 145 fungal infected patients, most of the patients (42.76%) were above 50 years of age and most of them were female (35.51%). The prevalence was high in housewives (45.52%) who spend most of their time in the warmer and moist condition and unaware about their personal hygiene. Most of the patients were affected in the multiple sites (24.13%) of their body and majority of them affected by tinea corporis (37.25%). The prevalence of the infection increased in summer (32.41%). The majority (76.55%) had the recurrence history and was affected more than three times (78.38%). As it is a contagious disease most of the patients (66.90%) had the history of fungal infection in their family.

Chen *et al.* (2008) studied on epidemiologic studies of skin diseases in school children in Taiwan. The prevalence of warts on the hands was 2.81%. The prevalence of fungal infection (including tinea nigra, tinea versicolor and tinea corporis) was 0.24%.

Sardana *et al.* (2009) conducted a study about the spectrum of skin disease among Indian children. A total of 30,078 children less than 12 years of age with 32,341 new dermatoses were recorded, with a male to female ratio of 1.07:1. Most of the disease was seen in the

1-5 year age group (44.94%). The most common skin diseases were 47.15%, consisting of bacterial infections (58.09%) and scabies (21.54%), followed by eczemas (26.95%), infantile seborrheic dermatitis, scabies, and pityriasis alba.

A study was carried out by Khanum *et al.* (2010) among the children less than 12 years attending the department of skin and veneral diseases (VD) of Dhaka Medical College Hospital, with the objective of investigation about the prevalence of scabies, 55 (55.55%) cases were male and 45 (44.44%) cases were female children. Factors like occupation of the parents, sharing of bed, congested living rooms and big family size were observed to be associated with higher occurrence of scabies.

According to Emodi *et al*. (2010) infectious skin diseases constitute a high percentage of skin disorders encountered in paediatrics. Of the 16,337 children seen in childrens out patient clinic (CHOP), 1506 (1.3%) had a skin disease. Age range was one week to 16 years with a mean ± SD of 3.89 ± 3.8 years. Children aged 0 – 5 years constituted 70.24% of patients with skin diseases. The commonest skin condition was pyoderma (29.81%) seen mainly in those below 5 years, followed by scabies (13.55%).

Atraide *et al*. (2011) studied on the pattern of skin disorders in a Nigerian tertiary hospital and a total of 1,333 patients attended the Dermatology Clinic. Infectious diseases 317 (23.8%), mostly fungal 207 (15.5%) were the most common cause for attendance, followed by dermatitis 207 (15.5%) and pigmentary disorders 98 (7.4%). Preventable skin diseases are common in Port Harcourt, Nigeria.

Almaaita and Abdallat (2012) conducted a study among 1836 patients, with age range of 1 day-14 years in Jordanian children. The total number of dermatoses found was 2779, and 769 patients presented with more than one dermatosis. Infectious dermatoses were encountered in 46.85% of the cases, and noninfectious dermatoses in 53.15%. Pityriasis alba was the most commonly found dermatosis (27.1%) followed by viral warts (22.4%).

Hadiuzzaman *et al*. (2013) studied among rural children (1 day to 14 years) of which 9279 patients attending Dermatology outpatient department of Community Based Medical College Hospital, 18.89% children were identified with involvement of skin diseases. The most frequent skin condition was exposure to fungal diseases which was 25.67% followed by scabies 24.10% and eczema 20.25%.

Arun *et al*. (2014) studied on the incidence of skin diseases among 1089 school children of urban area of Hassan district of Karnataka state, India. It is observed that the skin diseases account for a major part of ill health in children. Out of every 100 children, 16 will be with skin diseases. Infectious skin diseases formed one third part (33.33%/n=64) of children in school.

Banerji (2015) stated that scabies risk is also higher in young children, the elderly and immunocompromised individuals. Institutional outbreaks of scabies have also been reported. Apart from a very itchy rash, scabies can lead to secondary bacterial infections. Topical antiscabies lotions are still the mainstay of treatment, but oral ivermectin has also proven effective under certain circumstances. Asymptomatic and symptomatic household members should all be treated at the same time.

Dimri *et al*. (2016) found that overall skin infections and subcutaneous tissue was 32.6%, followed by the disorders of skin appendages (19.8%), and dermatitis and eczema (18.8%). Of the total patients 16.9% were affected by dermatitis and 16.7% by acne. Psoriasis, urticaria, melasma, and vitiligo were present in 3.4%, 3.4%, 3.6%, and 3.3% patients, respectively.

Vector borne Diseases:

Githeko *et al.* (2010) suggests that inter-annual and inter-decadal climate variability have a direct influence on the epidemiology of vector-borne diseases. By 2100 it is estimated that average global temperatures will have risen by 1.0–3.5 ^{0}C, increasing the likelihood of many vector-borne diseases in new areas. The greatest effect of climate change on transmission is likely to be observed at the extremes of the range of temperatures at which transmission occurs. For many diseases these lay in the range 14–18 ^{0}C at the lower end and about 35–40 ^{0}C at the upper end. Malaria and dengue fever are among the most important vector-borne diseases in the tropics and subtropics. Encephalitis is also becoming a public health concern (WHO 2010).

Malaria:

Paul (1984) studied on the total history and prevalence rates of malaria in Bangladesh. He described that, the Government of Pakistan, initiates a Malaria Eradication Program (MEP) in 1961 and was successful since 1971 in controlling malaria where the rate of death due to malaria drops down to 4.22 per 100000. But after the liberation war, the program was stopped. Due to this, the death rate rose to a peak of 60.44 in 1976.

Hossain *et al*. (1996) conducted a study of clinical pattern of malaria cases in Chittagong Medical College Hospital. In this prospective study, *falciparum* malaria cases were included 80.55% patients who had a history of recent travel to hilly districts. Of them, 64.80% had severe malaria, 28.24% uncomplicated malaria and 6.95% treatment failure were also observed.

Perandin *et al*. (2003) identified of *Plasmodium falciparum*, *P. vivax*, *P. ovale* and *P. malariae* and detection of mixed infection in patients with imported malaria in Italy.

Hay *et al*. (2004) published a review on the past, present, and future global distribution and population at risk of malaria. They reviewed the spatial distribution of malaria and human populations at risk through time. They also considered the global malaria control programs from 1900 to 2002 and the consequences of changing global population at risk of malaria in their review article.

Lesko *et al*. (2007) studied on Congenital Malaria in the United States. For the 81 cases of congenital malaria reported in the United States in the past 40 years, the predominant infecting species was *Plasmodium vivax* (81%). Most mothers (96%) were foreign born, and 55 of 65 women (85%), for whom time of most recent exposure was known, were exposed 1 year or less before delivery.

Maude *et al*. (2008) worked on malaria in southeast Bangladesh. Malaria incidence in this area has decreased by around two thirds since 2003, although control measures were not significantly increased until 2005. Malaria occurred in people of all ages with the highest incidence being in young adults. This is consistent with higher occupational exposure in this group. The probability of being screened for malaria decreased with age suggesting significant numbers of adults with malaria may be being missed.

Nizamuddin *et al.* (2009) attempted to identify the potential factors for malaria epidemic in forest hills in Bangladesh in his study. It estimates the correlation between various environmental factors that contribute to malaria transmission and shows the application of remote sensing data for improved predictions of malaria epidemics in Bandarban district of Bangladesh which had the highest frequency of malaria cases in the country.

Agomo *et al*. (2009) stated that prevalence rates reported for malaria in pregnancy in Nigeria vary considerably. The accuracy of results of malaria diagnosis is dependent on training experience and motivation of the microscopist as well as the laboratory facility available. A total of 1084 pregnant women were recruited into this study. The prevalence of malaria in this population was 7.7%. Factors identified to increase the risk of malaria infection include young maternal age (<20 years).

A study was carried out by Haque *et al.* (2009) in thirteen malaria endemic districts of Bangladesh and 9750 blood samples were collected. The highest malaria prevalence was observed in Khagrachari district. The majority of the cases (90.18%) were *P. falciparum* infections. Malaria morbidity rates in five southeastern districts were 2.94%. In eight north-eastern districts, morbidity was 0.07%.

From the world malaria report of 2009, WHO stated that a total of 50.6 million people are at risk for malaria, and more than 95% of all the malaria cases in the country are reported from 13 highly endemic districts, affecting 11 million people. The three Hill Tract Districts (Bandarban, Khagrachari and Rangamati) and the Cox's Bazar district report more than 80% of all malaria cases and deaths every year, with perennial transmission in two peaks, before (March– May) and after the monsoon (September–November). A total of 154 malaria deaths were reported in 2008.

Olana *et al.* (2011) studied on Malaria, Oromia Regional State, Ethiopia during 2001–2006, a total of 905,467 clinical and 562,996 confirmed malaria cases were reported. Patients were predominantly seen at health centers rather than at hospitals, with 80.2% clinical and 72.2% confirmed malaria cases seen at health centers. Clinical malaria accounted for 10.3% of outpatient consultations in all facilities. However, this percentage varied between years (6.1%–16.0%) and zones (1.3%–21.9%). Of clinical malaria cases, 16.5% were in children <5 years of age and 54.3% were in male patients.

Faruque *et al*. (2012) conducted a nationwide study at six tertiary hospitals from December 2008 to November 2009, to investigate etiologies of febrile illnesses in Bangladesh and assessed 720 febrile patients over 12 months; 69 (9.6%) were positive for IgM antibodies against dengue virus, and four malaria patients (0.56%) were confirmed. They identified dengue cases throughout the year from rural (49%) and urban areas (51%) and followed-up 55 accessible dengue-infected patients two months after their initial enrollment: 45 (82%) patients had fully recovered, 9 (16%) reported ongoing jaundice, fever and/or joint pain, and one died.

Ayele *et al.* (2012) found that more than 75% of the total area of Ethiopia is malarious, making malaria the leading public health problem in Ethiopia. The aim of this study was to investigate the prevalence rate and the associated socioeconomic, geographic and demographic factors of malaria based on the rapid diagnosis test (RDT) survey result. Individuals with poor socioeconomic conditions are positively associated with malaria. Children and female household members are the most vulnerable to the risk of malaria.

Haque *et al.* (2014) carried out a study on malaria burden and control in Bangladesh, during the period 2008 to 2012; there were 285731 confirmed malaria cases. Malaria decreased from 6·2 cases per 1000 population in 2008, to 2·1 cases per 1000 population in 2012. Prevalence of all malaria was decreased by 65%, severe malaria decreased by 79%, and malaria-associated mortality decreased by 91%. By 2012, there was one insecticide-treated net for every 2·6 individuals (SD 0·20). Districts with more than 0.5 insecticide-treated nets per person had a decrease in prevalence of 21% for all malaria. Malaria hotspots remained in the highly endemic districts in the Chittagong Hill Tracts.

Mahmud *et al.* (2015) studied on prevalence of malaria disease among six malaria endemic areas in Savar, Dhaka, Bangladesh. The overall prevalence was found to be 23.48%. The highest malaria prevalence was observed at Islamnagar area (30.76%) than other five areas of Savar upazila. It was observed that male (30.90%) had higher positivity compare to their counterparts (16.67%) and the peoples whose ages between 21 to 25 years (88.88%) were mostly suffering from malaria.

Filaria:

Barry *et al.* (1971) investigated filariasis in entire Thakurgaon upazila of Dinajpur district of Bangladesh and revealed a microfilaria rate was 16.8% and a disease rate of 10.1% of genital hydrocoel and elephantiasis of the scrotum in the male population. Lymphoderm and elephantiasis of the limbs were rarely observed in either sex.

Wolfe and Aslamkhan (1971) surveyed for night blood for filariasis in all 17 districts of East Pakistan. Bancroftian infection was present in all districts and 28% of the 4190 people examined had microfilaraemia. Only 2 cases of *B. malayi* were located in

Chittagong and Chittagong Hill Tracts and the remaining 116 had *W. bancrofti*. The highest prevalence (14%) was in Dinajpur district in the north-west. Other important foci were present in Chittagong Hill Tracts, Rangpur, Pabna and Barisal districts.

Blood and clinical surveys were made by Wolfe and Aslamkhan (1972) on the total population of two villages in Thakurgaon thana, Dinajpur district, East Pakistan, an endemic area for Bancroftian filariasis. Infection rates of two villages were 15.6% and 16.4%, with male disease rates of 21.7% and 20.6% respectively. Disease manifestations were almost exclusively hydrocele, with only a rare case of scrotal or limb elephantiasis, but over one third of the adult male had hydroceles.

Kirsch *et al*. (1985) showed that immigrants to Germany had microfilaraemia; of the 1925 patients of the County Hospital St. George Leipzig was examined, 78 (4.1%) were positive for microfilaria. In 27 patients succeeded in proving *Wuchereria bancrofti* and in 3 *Brugia malayi*, 43 showed *Acanthocheilonema perstans*, in 5 cases a double infection was present.

Dissanayake (1989) made a seroepidemiological survey of bancroftian filariasis in two townships of SriLanka with the objectives of determining the microfilaria rates, dependence of age and sex etc. The mean microfilarial rate was 5.4%. It was found that microfilaremia was not sex-dependent but a marginally elevated incidence was seen in the 6 to 35 years of age.

Cartel *et al.* (1992) reported that in French Polynesia lymphatic filariasis was due to sub-periodic *W. bancrofti* var *pacifica*, and transmitted by the vector mosquito, *Aedes polynesiensis*. 122 subjects were microfilaria positive, which gave a microfilaria carrier prevalence rate of 21.4%. The percentage of carriers was significantly higher in males than that in females.

Gyapong *et al.* (1993) made a preliminary study regarding bancroftian filariasis in the Kassena Nankana district of the upper east region of Ghana and reported microfilaria rate of 41.1%. In case of clinical manifestations, hydrocele was found 30.8% and elephantiasis was 3.6%.

Estambale *et al.* (1994) conducted a cross-sectional parasitological and clinical survey for *W. bancrofti* infection in an endemic community of South-Eastern Kenya revealing circulating microfilariae at the rate of 13.7%. Microfilaria rate was higher in males (15.9%) than females (11.6%).

Albuquerque *et al.* (1995) studied bancroftian filariasis in two urban areas of Recife, Brazil. In some areas, microfilaremia prevalence reached 14%. Overall microfilaremia prevalence was 10% and males had higher prevalence of infection and disease than females.

Rudra and Chandra (1998) conducted a filariasis survey in tribal village of Bankura district and covering 1,386 tribal peoples. Microfilaria rate, mean microfilarial density, disease rate and endemicity rate were 3.3%, 6.3, 5.6% and 8.6% respectively.

Ottension (2000) worked on the global program to eliminate lymphatic filariasis and found 40 million people have clinical manifestations of the disease (including swelling of limbs, hydrocele, and acute adenolymphangitis), 120 million are infected in 80 countries and one billion live in risk of infection.

Rudra and Chandra (2000) working among tribal and non-tribal populations of Bankura district and reported that the tribal subjects had not only lower prevalence of microfilaremia (3.17% vs. 8.86%) and symptomatic filariasis (5.92% vs. 13.74%) than non-tribal, but also less intense infections (with mean counts for the microfilaremics of 6.50 vs. 13.55 mf/ 20 µl blood). Filariasis endemicity was therefore much lower among the tribal subjects (8.95%) than the non-tribal (22.12%).

According to Babu *et al.* (2002), filarial disease is manifested by enlargement of the limbs, scrotum and other extremities, is not the initial effect but the result of long-standing infection.

Dreyer *et al.* 2002 reported that patients with lymphedema are at risk from bacterial skin infections due to breaks in the skin (entry lesions) that develop due to poor lymphatic drainage, less resistance to fungal skin infection and occlusion secondary to lymphedema.

Beuria *et al.* (2003) reported the age related prevalence of asymptomatic, apparently uninfected individuals, was determined in a *W. bancrofti* endemic region of Orissa during 2001. The prevalence of these uninfected individuals was highest in the younger age groups (aged ≤ 15 years): decreased rapidly in those aged >15 to 40 years and then stabilized in those aged >40 years.

Khan *et al.* (2004) conducted a survey for lymphatic filariasis among tea garden workers of central Assam and reported microfilaria rate of 4.7%. Microfilaria rate was higher in male (7.3%) than females (2.1%).

Anosike *et al.* (2005) reported from Ebonyi State of eastern Nigeria that microfilarial rate were 16.9% and mean microfilarial density were 10.4 among different communities. More males were reported to be infected than females. Infection varied significantly among communities and ages ($p < 0.05$) but not sex related ($p > 0.05$). There was a gradual increase of the disease prevalence with increase in age, reaching a peak in the 40–49 year old age group (microfilarial rate 41.8% and mean microfilarial density 19.4) before a gradual decline in prevalence.

A survey on filariasis in epidemic prone areas like Thakurgaon of Bangladesh has been done by Khanum and Rahman (2006). They reported that 4.20% of the people were found infected by filariasis and among the respondents 55.67% population was illiterate. The sanitation of the study areas was very poor, most of the people were very poor and of low income groups and the females were more susceptible than male.

Khanum and Sarker (2006) worked on hydrocele in epidemic areas of Thakurgaon in Bangladesh and reported that, it is known to be endemic area of hydrocele. The prevalence of hydrocele was 17.25%. Most of the respondents were poor and ignorant about the cause and transmission of the disease. They also reported that, hydrocoele is creating a major health problem in these areas and perhaps spreading silently to other adjacent districts of the country.

During November 2004, Singh *et al.* (2006) carried out a lymphatic filariasis survey in seven randomly selected villages from four PHCs (Primary health centres) of Patna district examined 1878 night blood smears (NBS); 117 were found positive for *W. bancrofti* infection (mf rate 6.2%). Microfilaria carriers were detected from all surveyed villages. In all areas prevalence of microfilaria generally increased with age to maximum 15-34 years and then decline within most age-groups. Over all diseases rate was 9.1%. Out of 171 diseased individuals, 121 persons were having hydrocele (6.4%). Disease rate was higher in males (12.0%) than females (4.1%).

Chandra *et al.* (2007) reported from the coastal areas of Digha, the microfilaria rate, mean microfilarial density and disease rate was 9.06%, 8.63 and 7.72% respectively. The causative parasite was identified as *Wuchereria bancrofti* and *Culex quinquefasciatus* was incriminated as the vector responsible. Among the etiologies, most prevalent symptom in the area was adenolymphangitis followed by hydrocele (2.5%).

Rahman *et al.* (2008) worked on prevalence of filariasis and its occurrence among the sexes and different age groups of the population. Filariasis is highly endemic in two villages in Thakurgaon district of Bangladesh and average infection rate and disease rate were 16.1% and 21.1% respectively and more than one- third of adult males had the major disease manifestation of scrotal hydrocele.

Sabesan *et al.* (2010) stated that Lymphatic filariasis caused by *Wechereria bancrofti* and *Brugia malayi* is an important public health problem in India. Filaria is endemic in 17 states and six union territories, with about 553 million people at risk of infection. The government of India has recorded a high priority for elimination of this infection through mass chemotherapy programme, its aim to eliminate filariasis by 2015.

Omudu and Ochoga (2011) studied on epidemiology of lymphatic filariasis in Nigeria. The overall hydrocoele prevalence was 8.5%, while the overall lymphoedema prevalence was 6.4% and women accounted for 87.5% of persons with swollen limbs. Only about 15.9% of unaffected respondents knew that lymphatic filariasis is transmitted through mosquito bites, this differ significantly from affected respondents (66.6%) (X^2, $P < 0.05$). The prevalence of clinical signs and/or symptoms in the communities also showed significant variations.

Hafiz (2012) stated that filariasis is the disease of northern part of Bangladesh where up to 16.8% of the population is Mf-positive (microfilaria) and 10.1% have chronic disease.

Khanum *et al.* (2012) reported that infected patients were very poor and from low income group. Only 19.38% patients used to apply mosquito curtains while others cannot afford for every member of the family.

Chandra *et al*. (2013) studied on lymphatic filariasis in West Bengal, India. In the urban area 8.72% of the populations were filarial victims i.e. either detected as microfilaremic or with any type of filarial etiologies, whereas in the rural area it is only 2.60%. In all the age groups, prevalence of MR (microfilaria rate) and DR (filarial disease rate) were much higher in urban population than in rural population.

Aboagye-Antwi *et al*. (2015) worked on transmission indices and microfilariae prevalence in the Gomoa District of Ghana. 804 persons were interviewed, of which 284 (32.9 %; CI 31.1–34.5) acknowledged elephantiasis and hydrocoele as health related issues in the communities. 33 people (3.8 %; CI 2.1–5.5) thought sleeping under bed net could help prevent elephantiasis. Microfilariae prevalence was 4.6 % (43/941) whiles 8.7 % (75/861) were positive for circulating filarial antigen.

Dengue:

In Malaysia, Dobbins *et al.* (1975) reported 73.2% of respondents were aware about dengue fever. The high level of awareness about dengue was observed among the patients of urban areas. In this study males were found to be more in number and also aware than females.

Gubler and Casta- Valez (1991) stated that due to poor disease surveillance, low level of reporting, low case fatality rate, difficulties in diagnosis, and inconsistent comparative analyses, the true incidence and impact of dengue is likely significantly higher than that which is currently reported. Thus, the true global burden of disease and associated economic impact is unknown.

An epidemic of febrile illness of dengue fever with haemorrhagic manifestation occurred in Mangalore city, Karnataka, India in 1993 by Padbidri *et al*. (1995). The epidemic reached its peak by mid-August and then started declining. About 200 cases were reported covering all age groups and both sexes. The most observed clinical symptoms were pyrexia, myalgia, arthralgia and headache, palatile petechia, maculopapular, rash and facial flush.

Rigau-Perez *et al.* (1997) gave a literature review and case study of travelers from the United States, 1986-1994. Although dengue is not endemic in the continental United States, Hawaii, or Alaska, more than 500 laboratory-positive cases of introduced dengue were reported from 1977 through 1994 in U.S. residents who visited dengue-endemic areas throughout the world. Two competent mosquito vectors (*Aedes aegypti* and *Aedes albopictus*) are found in the southeastern United States, and both could possibly transmit an introduced virus. In Hawaii *Ae. albopictus* is the dominant mosquito on all islands; *Ae. aegypti* has only focal distribution on Molokai and the Kona coast of Hawaii.

A work by Sharma *et al.* (1998) on clinical profile of dengue hemorrhagic fever in adults during 1996 outbreak in Delhi, India showed that dengue-2 was responsible for this outbreak. All 98 patients (100%) had fever. Other symptoms reported were body aches (45.9%), abdominal pain (38.7%), purpura (33.6%), epitasis (32.6%), melaena (26.5%), haematemesis (22.4%) and ecchymoses (20%).

The study conducted by Harris *et al*. (2000) on clinical epidemics of dengue in the 1998 epidemic in Nicaragua. Of 1,027 patients 60% were laboratory-confirmed as positive cases; of these, 44% were classified as dengue fever (DF); 43% as DF with hemorrhagic manifestations (DFHem); 7% as dengue hemorrhagic fever (DHF); and 3% as dengue shock syndrome (DSS). Interestingly, secondary infection was not significantly correlated with DHF/DSS, in contrast to previous studies in Southeast Asia.

A thorough checked during and just after the outbreak in 2000, revealed the vector position in Dhaka city. The overall BI (Breteau Index) was 22.6 (ranges from 0.0 to 94 in different city wards). Out of 90 wards of Dhaka city, 46 wards were above 20 BI (Chowdhury *et al*. 2000). The health department of Bangladesh govt. also reported a high BI for Dhaka city BI-50. The increased number of vector mosquitoes resulted in increased number of cases and finally caused the outbreak in the year 2000. The number of dengue cases increased in the year 2000 not only in Dhaka city but also in other cities, eg. Chittagong, Khulna, Barisal and Rajshahi (Yunus *et al.* 2001, Ahmed *et al*. 2001).

Reiskind *et al.* (2001) studied to determine risk factors associated with dengue (DEN) virus infection among residents of Santa Clara, Peru. Demographic, social and behavioural information was obtained by standardized questionnaire from 1225 Santa Clara residents (61.3%) aged 5 years or older. Overall, antibody prevalence was 29.4% and more than doubled from the youngest to the oldest age groups, but did not differ by sex.

Endy *et al.* (2002) conducted in a cohort of 2,119 elementary school children in northern Thailand. A total of 717,106 person-school days were observed from 1998 to 2000. The incidence of inapparent and of symptomatic dengue virus infection was 4.3% and 3.6% in 1998, 3.2% and 3.3% in 1999, and 1.4% and 0.8% in 2000, respectively. Symptomatic dengue virus infection was responsible for 3.2%, 7.1%, and 1.1% of acute-illness school absences in 1998, 1999, and 2000, respectively.

Kabilan *et al.* (2003), in their study on dengue disease spectrum among infants (1 to 11 months) in the year 2001, dengue epidemic in Chennai found fever, hepatomegaly and rash in 100%, 93.1% and 55.2% of the infants respectively. Oedema of the lower extremity, retro orbital puffiness and vomiting were seen in 17.2 %, 27.6 % and 24.1 % of the infants respectively. Dengue in infancy constituted 20% of total dengue virus infections with low mortality rates in this hospital.

Siqueira *et al.* (2004) carried out a study of dengue infection in central Brazil. A total of 1,610 households were surveyed; 1,585 individuals more than five years old had blood and data collected. The seroprevalence of dengue was 29.5% and the estimate prevalence surface reached 50% in the outskirts areas. The risk of infection was significantly associated with older age (P <0.01), low education (odds ratio [OR] = 3.45, 95% confidence interval [CI] = 1.82–6.55), and low income (OR = 1.32, 95% CI = 1.02–1.71) in multivariate analysis.

Pervin *et al*. (2004) conducted a study on clinical and laboratory aspects of clinically suspected cases of dengue fever during 2000 dengue outbreak in Dhaka, Bangladesh. 52.6% patients had secondary and 47.4% had primary dengue infection. The mean age of the dengue patients was 29 ±12.9 years and most belonged to 20 -29 year age group. The clinical profile of the patients showed that the mean body temperature of the dengue patients was 101.5±1.4. Other common symptoms included: myalgia (84.5%), vomiting (36%), abdominal pain (6%), headache 20 (95%), arthralgia (68%), lethargy (80.4%) and reteroorbital pain (49.5%). Enlarged liver was seen in 13% of the dengue patients.

Teichmann *et al*. (2004) found that majority of patients (77.5%) contracted the dengue disease in South Central and South East Asia. The most important clinical characteristics were fever and prostration (100%), headache, predominantly frontal or retroorbital (86%), arthralgia (79%), morbilliform rash (66%) and myalgia (48%). The most meaningful laboratory results were: marked leucopenia (72%), thrombocytopenia (70–89%), hyponatremia (41%) and increased hepatic enzymes ALAT (41%), ASAT (45%) and LDH (62%).

Daniel *et al.* (2005) worked on urban epidemic of dengue fever occurred in Kollam city of Kerala in 2003. The presenting symptoms were: fever (96.8%), headache (77.2%), abdominal pain (62.4%), diarrhoea (15.2%), bleeding (15.2%), skin rash (13.2%), pruritus

(10.4%), sore throat (5.2%), and seizures (0.8%). The major physical findings noted included positive tourniquet test (33.67%), hepatomegaly (17.6%), bradycardia (16.8%), pleural effusion (13.2%) and ascites (12%). The most frequent abnormal laboratory findings included haemoconcentration (27.8%) and severe thrombocytopenia (<10 000 in 8.5%). Eight out of 250 patients died (case-fatality rate (CFR) = 3.2%).

Wan *et al.* (2006) studied on knowledge, attitude and practice (KAP) survey on dengue fever in an urban Malay residential area in Kualalumpur. Out of 133 respondents interviewed, 78.2% were able to identify at least one clinical sign of dengue, 73% knew that dengue fever was caused by the bite of dengue infected *Aedes* mosquitoes, 71% correctly identified breeding sites, 69.2% correctly identified the *Aedes* mosquito and 42% correctly reported biting times of the mosquito vector. Overall knowledge was categorized as poor, attitude was good and dengue control and prevention practices were moderately poor.

Ahmed *et al*. (2007) performed a research on the seasonal prevalence of *Aedes aegypti* and *Ae. albopictus* that was studied in Dhaka city, Bangladesh, from December 2001 to August 2002. The larvae of the mosquitoes were collected from both indoor and outdoor of all types of houses in the urban area of Dhaka city. *Ae. aegypti* and *Ae. albopictus* were active in both dry and wet seasons with a peak in July, when the rainfall was the highest. From September to April, the larval population level remained low. The reduction of the population during the winter months was related to the low rainfall.

Osman *et al*. (2007) studied on dengue infection in Brunei. A total of 27 samples from patients suspected of having dengue infections were selected and analyzed. All patients were seen in clinics and hospitals of Brunei. The results show that 45 people were positive for dengue specific IgM.

Khan *et al*. (2008) studied 160 clinically suspected patients in Saudi Arabia in 2004 and confirmed the dengue infection in 91 patients. Most of the patients 26 were young adults with, median age of 26 (range = 6 to 94) years and male: female ratio of 1.5:1. The common symptoms were fever (100%), malaise (83%), musculo skeletal pain (81%), head ache (75%), nausea (69%), vomiting (65%) and abdominal pain (48%).

A retrospective cross sectional study conducted in Pakistan from 2003 to 2007 on demographical and clinical features of dengue fever by Khan *et al*. (2010) revealed that the three most common presenting clinical features were nausea (59.3%), rash (36.4%) and myalgia (25.8%) which were followed by haemorrhage (18.2%), diarrhea (16.3%), cough (11%) and headache (11%). 26.3% tested positive for dengue, and the median age of IgM positive patients decreased every year from 32 years in 2003 to 24 years in 2007.

Mahmood and Mahmood (2011) stated that the prevention of dengue fever is largely based upon the identification of risk factors and awareness. Factors responsible are overpopulation, uncontrolled urbanization, and inadequate waste management. The general management of these patients needs teamwork and separate wards. The ward should have mosquito net to prevent nosocomial dengue transmission. The participation and cooperation of general people with government agencies is essential for *Aedes* control programs.

Brady *et al*. (2012) have conducted the first of a series of steps in evidence consensus mapping of global dengue incidence to better determine the population at risk. Their 2012 publication suggested an 'upper bound' total of 3.97 billion people living in 128 countries are at risk globally, 824 million in urban residences, and 763 in peri-urban residences. The same group published again in April 2013 using cartographic approaches. These data suggested 390 million infections occur annually worldwide, including both apparent and unapparent dengue infections, almost double the highest figure regularly reported to date.

Mariappan (2013) stated current emerging situation of dengue in India during the study period. In 2012 an outbreak occurred in India during which a total of 47,029 DF cases and 242 deaths were reported - three times higher than the previous year. Twelve states reported a large number of cases, including Tamil Nadu which recorded 12,264 from various districts.

Zaman *et al.* (2014) performed a study on dengue and dengue haemorrhagic fever and found that female had higher prevalence both for dengue (54%) and dengue haemorrhagic fever (60%). Highest infected age group was 21 to 30 years.

Attaway *et al.* (2014) studied on mosquito habitat and dengue risk potential in Kenya. Kenya has had outbreaks of dengue during the past 3 years, and they identified areas with the highest susceptibility to dengue infection using bioclimatic variables, elevation and mosquito habitat as input to the model.

Laul *et al*. (2016) carried out a study on dengue infection in Northern India. The common signs and symptoms of dengue infection were fever, headache, body ache, backache, retro-orbital pain, bleeding manifestations, and rash in 100%, 87%, 86%, 58%, 41%, 21% and 21%, respectively. Nonspecific or warning signs and symptoms included vomiting, weakness, abdominal pain, breathlessness, vertigo, sweating, and syncope. The final diagnosis of the patients was DF (73%), DHF (16.5%), DSS (1.7%), and EDS (4.3%).

Chen *et al*. (2016) found 4787 patients with dengue infections required ICU admission. 2.99% were critically ill (mean age: 69.7 years). Hypertension (62.9%) and diabetes mellitus (49.0%) were the 2 most common underlying diseases. 55.9% critically ill patients had cobacterial infections. The hematologic system failed most often, followed by thoracic and cardiovascular systems. Fever was the most common symptom (78.3%), followed by anorexia (32.9%) and abdominal pain (32.2%). Overall, 23.1% patients died.

Katzelnick *et al*. (2017) studied on Dengue: knowledge gaps, unmet needs, and research priorities. They discussed existing approaches to dengue diagnostics, disease prognosis, surveillance, and vector control in low-income and middle-income countries, as well as potential consequences of vaccine introduction. They also summarise current knowledge and recent insights into dengue epidemiology, immunology, and pathogenesis, and their implications for understanding natural infection and current and future vaccines.

Sun *et al*. (2017) carried out an epidemiological trend of dengue in mainland China. A total of 59,334 dengue cases were recorded during the years 2005–2015. Most dengue cases occurred in individuals aged between 21 to 50 years. The proportion of cases occurring during September and October was higher in 2012–2015 than in 2005–2011. The number of affected provinces ranged between 10 and 27 and the number of affected counties ranged between 42 and 415.

Leishmaniasis:

A cross sectional kala-azar survey was carried out by Gramiccia and Sacca (1953) in 1950 at the Iswarganj thana of Mymensingh district among the children below 15 years of age and 8.35% were positive for Kala-azar.

Ten cases of post kala-azar dermal leishmaniasis have been studied by Khan (1977). The sites of involvement and morphological character have been noted. Presence of visceral leishmaniasis along with PKDL had been searched and reported that the visceral leishmaniasis although not frequent then, the incidence of PKDL was still prevalent to some extent in this country.

A study by Rahman and Islam (1983) from 1968-70 and 1973-80, out of 218 suspected kala-azar cases from different parts of Bangladesh, 59 could be confirmed; and out of 41 patients with suspected skin lesions, 6 were confirmed as Post Kala-azar Dermal Leishmamasis (PKDL) at the Institute of Postgraduate Medicine and Research (IPGM&R) in Dhaka.

Hossain and Rashid (1987) conducted a study among the indoor patient of Mitford Hospital, Dhaka from December 1982 to June 1983, a total of nine cases of Kala-azar was identified. Two of them were from a slum area Paglabazar of Narayangonj district and the remain seven from Keranigonj thana of Dhaka district.

Eight cases of PKDL were admitted into IPGMR, Dhaka during 1983-1987 recorded by Chowdhury *et al.* (1988). Each of them had previous history of Kala-azar. The ratio of male and female was 3: 1. Maximum time interval between development of PKDL and previous Kala-azar was 17 years.

A study was carried out by Elias *et al*. (1989) in 1980-81, an epidemic outbreak of kala-azar occurred at Shahjadpur thana in Sirajganj district. During these two years 224 cases were detected as positive for leishmaniasis. Spraying the affected areas with DDT as a part of a malaria control programme in July 1981 reduced the density of sandflies and the incidence of Kala-azar.

Chowdhury *et al*. (1990) studied 273 consecutive cases of kala-azar in Rajshahi. 61% patients were within 20 years of age. Male-female ratio of prevalence was 2:1. Fever, hepatosplenomegaly, anaemia, pigmentation, weight loss were the important features. Leukopenia and high ESR (Elevated erythrocyte sedimentation) were the important laboratory findings. The death rate was 5.9%.

An outbreak investigation was carried out by Masum *et al.* (1990a), they reported that, 53 cases in Thakurgaon district were suffering from Kala-azar with chronic fever.

A study made by Masum *et al.* (1990b) reported the outbreak at Kalihati Upazila of Tangail district. Out of 36 blood samples from suspected cases, 58.33% were seropositive for kala-azar. Leishman Donovan bodies were found in 3 out of 9 aspirates. One kala-azar patient with lymph node involvement was also detected.

Chowdhury *et al.* (1991) reported that 100 kala-azar patients had attended the Dhaka Shishu Hospital within 1-12 year age group during the year 1987-90. Out of these 50 cases were from Dhaka division and other 50 were from Rajshahi division (Rajshahi, Dinajpur, Pabna). 78% of the cases were parasitologically proven and 72% were serologically positive. The most vulnerable group was 9-12 years in both sexes (47%).

Hossain *et al.* (1993) studied on 30 consecutive case of kala-azar in Patuakhali, 65% patients were 20 years of age. The ratio of prevalence among male and female was 6:5.

Birley (1993) reported that, visceral leishmaniasis is a serious disease which is fatal if left untreated. It occurs in irregular periodic epidemics and is currently increasing in Bangladesh. In the past, malaria and kala-azar were confused and embankment programs had increased the prevalence of both.

Ali and Ashford (1993) studied on a sample population of 730 individuals in Ethiopia. The overall prevalence of leishmanin positivity was 36.4%; 50.9% of males and 23.2% of females. The increase in leishmanin positivity with age parallels the age specific disease profile and indicated outdoor exposure to infection.

An epidemic of kala-azar in western upper Nile state in southern Sudan was reported by El- Hassan *et al.* (1993). 200 cases of Nomadic tribe were found in upper Nile. In Bertiu area, 50 cases were under treatment and another 52 of 1120 individual screened were confirmed. All had splenomegaly 20 cases of post kala-azar dermal leishmaniasis were also found.

Bermudez *et al.* (1993) studied leishmaniasis in the low lands of Bolivia. Cutaneous ulcers and scars were seen in 2.9%, mucocutaneous lesions in 3 and skin scars alone in 10.3%.

In Ecuador, a hospital based epidemiological survey by Barrera *et al.* (1994) on cutaneous leishmaniasis was carried over 961 persons in two study areas of the pacific coast. The prevalence of active lesions was 4.8%; in the hills of the coastal cordillera, at La Tablada, it was 3.6%. The incidence of new cases in 1991 was high; 147% in the first; village and

106% in the second. 62% had only one ulcer or scar. The incidence remained high in all the age groups.

The incidence of visceral leishmaniasis was studied by Schaefer *et al.* (1995) in an endemic rural area of Baringo District, Kenya. During the first visit, out of 2934 individuals 78 (27%) were found seropositive.

In Pabna, 55 consecutive cases of Kala-azar were studied by Sarker *et al*. (1996). Majority of the cases were within 20 years of age. Male and female ratio for the prevalence was 1: 15: 1. Most of them were from low socioeconomic groups.

One hundred hospitalized clinically suspected children of Kala-azar cases were studied by Ahmed *et al.* (1997) from 1985 to 1986. 96 were from Rajshahi medical college hospital (RMCH), 3 from IPGM&F, Dhaka and 1 from Dhaka Medical college Hospital (DMCH). After investigation 50 cases were confirmed as Kala-azar.

Khanum and Musa (1999) studied on post kala-azar dermal leishmaniasis (PKDL) in two kala-azar endemic areas of Bangladesh. The total prevalence of PKDL in the two study areas were 22.67%, being 27% in Trishal and 14% in Sripur respectively.

Akhter *et al*. (1999) investigated the effect of flood on sandfly density and prevalence of visceral leishmaniasis in a kala-azar endemic village of Bangladesh. According to them, a total of 70,170 kala-azar cases were reported throughout the country and 41,168 of them from Mymensingh district which is almost 60% of the total kala-azar cases in Bangladesh. Pabna, Sirajganj, Rajshahi, Thakurgaon and Mymensingh districts have been identified as hyper-endemic areas.

Khanum and Musa (2002) worked on impact of educational and socio- economic aspects on the prevalence of post kala-azar dermal leishmaniasis (PKDL). Illiterate persons were mostly affected (40%) followed by patients having primary and secondary education. The highest prevalence of PKDL (53.13%) was found among the people of lower income group.

During 15 January to 31 December 2002, 35 active cases of visceral leishmaniasis were identified through community-based surveillance from three section of a village in Fulbaria, Mymensingh district. Males (51%) and females (49%) were equally affected. The mean age was 20 years (range 5-45). The month of onset of illness ranged from August 2000 to November 2002 (ICDDR,B 2003).

di Martino *et al*. (2004) worked on infantile visceral leishmaniasis in the Campania region, Italy. From 1990 to March 2004, a total of 255 cases were diagnosed and treated at the Centre. There were 135 males (52.9%); the age ranged 4 months-14 years, but 189 patients (74.1%) were < or = 3 years old.

Reithinger *et al*. (2004) surveyed 1,832 people from 200 households; 8.3% and 7.8% had active cutaneous leishmaniasis lesions or scars, respectively in Afghanistan. 56% of the cutaneous leishmaniasis case-patients were women and 44% were men. Data showed that persons aged ≤15 years were at higher risk of contracting the disease than aged >15 years.

Khatri *et al*. (2006) studied on cutaneous leishmaniasis in Yemen. Most of the patients (78.7%) were residents of the Hajjah Governorate. The majority of the patients had a single noduloulcerative lesion on the face. Slit skin smear was positive for parasites in 128 (94%) cases (highly positive in 63 cases) and four leishmania isolates were obtained.

A study by Kolaczinski *et al.* (2008) in eastern Africa multivariate analysis identified low socio economic status and treating livestock with insecticide as risk factors for visceral leishmaniasis.

Hailu *et al.* (2009) worked on human visceral leishmaniasis (VL) in Ethiopia, to provide epidemiological indices of subclinical infection and active VL. 1339 individuals were investigated, the overall prevalence of LST (leishmanin skin tests) positivity, DAT (direct agglutination tests) positivity and active VL among the 1232 subjects who had not been treated previously were 30.0%, 5.4% and 0.49%, respectively. The median age of an incident VL case was 10.5 years.

A study by Adhikari *et al.* (2010) reported that in Nepal kala-zar transmission is determined by the complex interactions between environmental and socioeconomic factors. They concluded that elimination of kala-azar is directly related to poverty.

Habib *et al*. (2012) reviewed on Clinical Burden of Kala-azar in Bangladesh. Severe VL epidemics have been reported in the past. Since 1990, South Asia has experienced a resurgence of the lethal parasitic disease visceral leishmaniasis (VL). The disease has been reported from 109 districts of three countries. An estimated 190 million people are at risk of infection. There is an increasing trend of VL cases in India and fluctuating trends were found in Nepal and Bangladesh. Multi centric studies were conducted in Bangladesh, India and Nepal and major findings were that the current burden of disease is 20 times higher than the elimination target in 2010/2015.

Hasan *et al*. (2013) conducted a study in rural areas of Trishal Thana, Mymensingh District, under 9 unions of Trishal thana, 51 villages were mostly affected by visceral leishmaniasis (Kala-Azar). Among them 54.02% people were illiterate, 27% farmer, about 85.6% people live in mud made houses. Monthly expenditure of those peoples limited to below 4000 Taka. On the other hand, 11.49% had single infection, 28.73% had double infection associated with jaundice, and the other 59.77% had multiple infection associated with jaundice, ascites, anemia, oedema.

An increased number of autochthonous visceral leishmaniasis (VL) cases have recently been reported in Bologna Province in northern Italy by Varani *et al*. (2013). Over six months from November 2012 to May 2013, 14 cases occurred, whereas the average number of cases per year was 2.6 (range: 0-8) in 2008 to 2012. VL was diagnosed in a median of 40 days (range: 15-120) from disease onset. This delay in diagnosis shows the need for heightened awareness of clinicians for autochthonous VL in Europe.

Khanum *et al.* (2015) investigated on knowledge gap, attitude and practice of inhabitants for treatment, prevention and control of visceral leishmaniasis in 6 districts of Bangladesh. About 79.2% inhabitants agreed that they have heard about kala-azar disease. Regarding the transmission of kala-azar, 22.7% respondents answered by mosquito, about 38.3% said long period and irregular fever, 7.5% inhabitants knew enlargement of spleen and liver as sign and symptom of kala-azar.

Waterborne diseases:

According to reports of Umoh *et al.* (1983), cholera epidemic in Nigeria have not been consistent, the disease is very dynamic. The emergence of cholera was evident in 1970.

van Basten and Stockenbrugger (1994) reviewed the literature published after 1960 on typhoid perforation in different developing countries. Information was obtained on a total number of 1,990 cases of typhoid perforation in 66,157 patients with typhoid fever, published in 52 reports all over the world. The overall frequency of intestinal perforation in typhoid fever was 3% with an overall mortality rate of 39.6%. In an endemic area of typhoid fever, the diagnosis of typhoid perforation should be made on physical examination. Surgery is preferable to medical treatment.

The northern Nigeria has been known to be endemic for cholera infection. During the last two decades, three major epidemics have occurred: 1997. Epidemiological data from Public Health Department of Kano State Ministry of Health, Northern Nigeria, revealed that the frequency and distribution of recurrent cholera epidemics in the state during 1995 to 2001, were 2,630 in 1995/1996, 847 in 1997 and 2,347 in 1999 (Usman *et al*. 2005).

Dhawan *et al.* (1998) studied on seroprevalence of hepatitis A virus among 670 subjects in Mumbai, and immunogenicity and safety of hepatitis A vaccine. The seroprevalence of HAV was 523/670 (78%); 38% of children < 5 years were anti-HAV negative. Seroprevalence rates of 80% were reached by 15 years. Prevalence was lower in the higher socio-economic group (151/234; 64.5%) compared with the lower socio-economic group (372/436; 85%) ($p < 0.001$). One month after doses 1, 2 and 3 of the hepatitis A vaccine, seropositivity was 92%, 99% and 100%, respectively. Minor self-limited side-effects occurred in 19.5% of subjects; there were no major side-effects.

In a meta-analysis by Fewtrell *et al*. (2005), improvement in water supply, water quality, and sanitation reduced the risk of diarrhea-related morbidity by 25%, 31%, and 32 %, respectively.

Ozkan *et al.* (2007) had reported that absence of adequate and safe water supply and sanitation systems were responsible for various kinds of sicknesses such as diarrhea along with other waterborne diseases in rural areas of Turkey.

Ceyhan *et al*. (2008) conducted a study among 1173 persons between the age of 0 and 91 years from 9 randomly selected medical centres from five different geographical centres of Turkey were tested for the level of anti-hepatitis A virus (anti-HAV) immunoglobulin-G antibodies using an enzyme-linked immunosorbent assay. The overall prevalence of anti-HAV antibodies was 64.4% (1142/1173). While the rate of sero-positivity was over 80% in the 5-9 age group and more than 90% after 14 years of age in south-eastern and eastern regions, it was lower than 50% at the age of 5-9 years in central and western regions and remains under 80% in those areas. They conclude that the differences observed in HAV sero-positivity among various geographical regions in Turkey.

Lewis *et al*. (2008) studied on Hepatitis E in England and Wales. In 2005, 329 cases of hepatitis E virus infection were confirmed in England and Wales; 33 were confirmed indigenous infections, and a further 67 were estimated to be indigenous infections. These figures may nevertheless be an underestimation, because Hepatitis E should be considered in the investigation of patients with hepatitis even if they have no history of travel.

Nair *et al.* (2010) carried a study from a hospital in Kolkata, *V. cholerae* O1 was the pathogen most commonly isolated from admitted patients who had diarrhoea and the one most often identified in fatal cases over a two-year period.

Njoh (2010) worked on cholera epidemics in Cameroon. The most recent cholera outbreak in Cameroon was reported on the 2nd of September 2009, in the northern part of the country, affecting the cities of Garoua and Maroua, 144 cases were recorded, including 51 deaths. Another outbreak was experienced in Douala, in January 2004 and spread throughout the south of the country.

Kabita (2010) studied on cholera outbreaks in Nchelenga district and showed that 60% of the study respondents had poor knowledge. 82% and 82.2% of the respondents had low level of knowledge of cholera causes and prevention respectively. 92.6% had poor practice of hand washing after using the toilet. 77.8% respondents who stayed in high density area had poor practice, they did not treat water for drinking and 72.7% people who were crowded in one house disposed off refuse carelessly which is a poor practice.

Haque (2011) studied on waterborn diseases caused by using surface water. This study demonstrated that prevalence of waterborne diseases was significantly high due to unimproved water supply and water source at household level. The prevalence of waterborne diseases at baseline and follow-up was more or less same for groups of differing economic status and literacy level. This signifies that disease incidences have a specific trend which might be an outcome of lacking of water and hygiene related issues. Evidence shows that educational status and health outcomes are strongly associated.

Adagbada *et al.* (2012) studied on cholera epidemiology in Nigeria, since the first appearance of epidemic cholera in 1972, intermittent outbreaks have been occurring in Nigeria. The later part of 2010 was marked with severe outbreak which started from the northern part of Nigeria, spreading to the other parts and involving approximately 3,000 cases and 781 deaths.

A study on Hepatitis A: Epidemiology and prevention in developing countries by Franco *et al.* (2012). Hepatitis A is the most common form of acute viral hepatitis in the world. Major geographical differences in endemicity of hepatitis A are closely related to hygienic and sanitary conditions and other indicators of the level of socioeconomic development. The anti-hepatitis A virus (HAV) seroprevalence rate is presently decreasing in many parts of the world, but in less developed regions and in several developing countries, HAV infection is still very common in the first years of life and seroprevalence rates approach 100%. As the severity of disease increases with age, this has led to outbreaks of hepatits A.

Zhong yu *et al.* (2012) worked on age and gender analysis of jaundice patients. They found that youth group with hepatocellular jaundice accounts for 59.72%, viral hepatitis 31.94%; middle-aged group with cholestatic jaundice accounts for 52.31%, liver cancer, 31.94%; the elderly group has cholestatic jaundice 67.33%, with 48.67% malignant. The gender ratio of jaundice patients is male: female = 1.88:1. 47.83% Male patients has hepatocellular jaundice, and liver cancer is the most common. 31.97% Female patients has hepatocellular jaundice, and bile duct cancer is the most prevalent.

Dewan *et al*. (2013) studied on the prevalence of typhoid from 11 major hospitals in Dhaka Metropolitan Area (DMA) of Bangladesh over the period 2005–2009. The male-female ratio of typhoid cases was found to be 1.36, and the median age was 14 years. Typhoid incidence was higher in male than female. The age-specific incidence rate was highest for the 0–4 years age group (277 cases), and lowest 11 cases for 10–14 years per 100,000 people. Monsoon months had the highest disease occurrences (44.62%).

Three countries are currently polio endemic, Pakistan is one of those. Bhutta (2013) reviewed that, in 1998, 350,000 polio cases were reported in the World Health Assembly. In 2001, 119 cases were reported and in 2002 it decreased to 90 cases. However, in 2003 more cases were reported than 2002, while in second half of 2003, the number of cases reduced to 55. In 2004, 59 cases were confirmed whereas, during 2003-2004 number of cases reduced to 50% and from 2005 to 2008, number of cases continued to decrease. During 2009-2010, number of cases reached to 198 which were almost double and in 2011- 2012, 223 cases were confirmed. In 2013, 16 polio cases had been indicates that the disease is not completely eradicated from Pakistan.

Kim *et al*. (2014) gave a systematic review of the epidemiology of hepatitis E virus in Africa. Hepatitis E Virus (HEV) infection is a newly recognized serious threat to global public health and Africa is suspected to be among the most severely affected regions in the world. Taking a particularly high toll in pregnant women and their fetuses, HEV has infected human populations in 28 of 56 African countries. Since 1979, 17 HEV outbreaks have been reported about once every other year from Africa causing a reported 35,300 cases with 650 deaths.

Bhavnani *et al.* (2014) showed that unimproved water source (rivers, ponds, lakes and unprotected springs) and unimproved sanitation increased the adjusted odds of diarrhea and major risk factors of diarrhea in Ecuador. Water and sanitation management practices can actually decrease diarrhea incidences by one-third to one-fourth.

In a study of Sedhain (2014) on waterborne diseases in Nepal, the prevalence was found 50.7%. This study showed a significant association between level of education and risk of waterborne diseases. However, associations could not be established between water, sanitation and waterborne diseases. Education was found to be an influential factor for the occurrence of the diarrheal diseases in the study sites. The prevalence rate of waterborne diseases was still found to be high despite the accessibility to water and sanitation.

Gurley *et al*. (2014) studied on outbreak of Hepatitis E in Urban Bangladesh. Hepatitis E virus (HEV) causes outbreaks of jaundice associated with maternal mortality. Four deaths among pregnant women with jaundice occurred in an urban community near Dhaka, Bangladesh, in late 2008. They identified 4751 suspected HEV cases during August 2008–January 2009, including 17 deaths. HEV disease was significantly associated with drinking municipally supplied water. This outbreak of HEV was likely caused by sewage contamination of the municipal water system.

Lopez *et al.* (2015) conducted a study in Philippines on epidemiology of Cholera and revealed that 42,071 suspected and confirmed cholera cases reported from 2008 to 2013, among which only 5,006 were confirmed. 38 (47%) of 81 provinces and metropolitan regions reported at least one confirmed case of cholera and 32 (40%) reported at least one suspected case. The overall case fatality ratio in sentinel sites was 0.62%, but was 2% in outbreaks. All age groups were affected. Using both confirmed and suspected cholera cases, the average annual incidence in 2010–2013 was 9.1 per 100,000 populations.

McNalley *et al.* (2015) studied on secondary health conditions in Post-Polio Syndrome (PPS): prevalence and effects of aging. The findings indicate that: (1) individuals with PPS experience a number of serious secondary health conditions; (2) the most common conditions or symptoms are fatigue, pain, respiratory and sleep complaints, and increased risk of falls; (3) reports of the associations between the frequency or severity of conditions and age-related factors are variable, perhaps because of methodological inconsistencies between studies; and (4) there is a marked lack of longitudinal research examining the natural course of health conditions in people aging with PPS.

Razavi *et al.* (2016) stated that since 2001, Iran is recognized as a polio free country by world health organization (WHO). Afghanistan and Pakistan, the two neighboring countries of Iran, are still infected with wild poliovirus. About 2.5 million Afghan refugees live in Iran and they communicate with their compatriots. Iran and its neighbors are different regarding vaccination coverage rates, rate of access to safe drinking water, political, security and cultural issues, health system and managerial indicators.

Airborne diseases:

According to Panlilio *et al.* (2002), tuberculosis (TB) has long been recognized as a risk for health-care workers (HCWs). The rate of infection in HCWs, is 2-10 times higher than the general population.

According to CDC (2006), twelve (39%) of the 31 mumps cases were among campers. All were U.S. residents aged 10-15 years who had been vaccinated with 2 doses of measles, mumps, and rubella (MMR) vaccine after the first birthday. Nineteen (61%) of the mumps cases were among staff members; of these, nine (47%) were UK residents, five (26%) were U.S. residents, three (16%) were residents of Australia, and two (11%) were residents of Germany.

Cohen *et al.* (2007) reported on 2004-2005, mumps outbreak in England and 312 cases mumps found in the age of 2-12yrs.

Dayan *et al*. (2008) assessed the recent resurgence of mumps in the United States in 2006 and 505 cases mumps found among school children.

Brooks *et al.* (2010) stated that, in 2004, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) initiated influenza surveillance in a population-based site among children aged less than 5 years in urban Dhaka. The incidence of laboratory-confirmed influenza infection in the site during 2004–2007 was estimated at 10.2 per 100 person–years among children aged less than 5 years seeking care at ambulatory clinics.

Azziz-Baumgartner *et al.* (2012) studied on incidence of influenza in Bangladesh 2008-2010. The main objective of this study is to determine how much influenza contributes to severe acute respiratory illness (SARI), a leading cause of death in children, among people of all ages in Bangladesh. The estimated incidence of SARI associated with influenza in children < 5 years old was 6.7, 4.4 and 6.5 per 1000 person–years during the 2008, 2009 and 2010 influenza seasons, respectively. The incidence of SARI in people aged ≥ 5 years was 1.1 and 1.3 per 10 000 person–years during 2009 and 2010, respectively.

A hospital based surveillance study was conducted by Islam *et al.* (2012) at community based medical college hospital, with an objective to provide guidelines for prevention and control of influenza, out of 186 patients, 17(9.1%) of which were influenza positive. The frequency of influenza cases was highest among children aged under 5 years (47%). Surveillance data confirmed that influenza is prevalent throughout Mymensingh, affecting a wide range of ages and causing considerable morbidity and hospital care.

Khanum *et al.* (2012) carried out a study with over a total of 330 suspected outdoor TB patients from the Shyamoli Chest Clinic, Dhaka. The prevalence of TB was 29.69%, male and female ratio was 2.4:1. The highest prevalence (18.37%) was observed among the 20-24 age groups. According to occupation, the highest prevalence (21.43%) was observed among service holders, and the lowest (9.18%) was among unemployed people. The higher prevalence of TB was mostly associated with poor socio-economic condition, close contact with infected cases, illiteracy, gender related factors and health care.

Ghimire *et al*. (2012) studied on pneumonia in South-East Asia Region and estimated the incidence of pneumonia in under five children is 0.36 episodes per child, per year. Risk factors are malnutrition (40% in India), indoor air pollution, non-breast feeding, chronic obstructive pulmonary disease, etc.

Takla *et al*. (2013) reviewed on mumps epidemiology in Germany 2007–2011 and found that the main complication was orchitis affecting 6.2 % of male cases. The proportion of complications in individuals ≥15 years was higher than in younger patients.

Banu *et al*. (2013) studied on epidemiology of tuberculosis in an urban slum of Dhaka City, Bangladesh. Among 9,877 adult screened for pulmonary TB (PTB), 25 were positive for AFB (acid-fast bacilli) on microscopy and/or culture and the prevalence of new PTB cases was estimated to be 253/100,000. Only one child TB case was diagnosed among 5,147 child screened. Out of 26 cases, 21(81%) had cough for several duration and 5(19%) had no cough at the time of screening. The study revealed high prevalence of TB in urban slums.

Hashemi *et al*. (2014) worked on prevalence of tuberculosis infection among health-care workers in Hamadan, West of Iran. Out of 245 workers, 92 (38%) had positive tuberculin test and among the test-positive group, 57 (61.3%) were male and 36 (38.7%) were female. The number of personnel with positive tuberculin-test, in different hospitals of Hamadan was as follows: 52/130 (40%) in Sina Hospital and 41/115 (35.7%) in Ekbatan Hospital.

Kutty *et al.* (2014) studied on mumps in a highly vaccinated population in Orange County, NY. Of the 2503 students with 2 documented doses of mumps-containing vaccine, 320 (13%) developed mumps. Risk of mumps increased with increasing number of mumps cases in the class and household.

Kutty *et al.* (2014) studied on epidemiology and the economic assessment of a mumps outbreak. From September 24, 2009, through June 15, 2010, 790 mumps cases were reported—64% were male and highest attack rate was among 11–17 year age group (99.1 cases per 1000 individuals). Of the 658 cases with known vaccination history, 83.6% had documentation of 2 doses of mumps containing vaccine. No deaths were reported. The 2 major exposure settings were schools (71.8%) and households (22.5%).

Pneumonia is the single leading cause of death among children <5 years in Ethiopia. It was estimated that 3,370.000 children encounter pneumonia annually which contributes to 20% of all causes of deaths killing over 40,000 under five children every year and leading cause of death during postnatal period (Deribew *et al.* 2007, UNICEF 2014).

According to a recent study by Global Infectious Disease and Epidemiology Online Network (GIDEON) which covers 12,102 outbreaks of 215 infectious diseases involving 44 million cases in 219 countries between 1980 and 2013, mumps has emerged a notable ‘newcomer’ amongst human-specific infections in the last decade (Smith *et al.* 2014). According to WHO, Southeast Asia Region (SEAR) reported 36,352 cases of mumps in 2013 (WHO 2015).

Vashishtha *et al*. (2015) gave a literature review on burden of mumps in India. In Kerala Jan-Mar 2002, 179 cases mumps found where 98 were in age group 5-9yrs (John 2004). In Karnataka, 8 cases of atypical mumps found, 50% between 5-13 yrs of age, in the year of 2005 (Vandana *et al.* 2010). In Kolkata (2009) found that, 104 cases, attack rate 4.7%, the highest and lowest being in 6-10yrs (11.7%) and above 15yrs (0.9%), respectively (Saha *et al.* 2012). In Fatehgarh Sahib, Punjab (August 2011), Mishra *et al*. (2013) observed that 20 school children with mean age 9.7yrs and mostly female (91%) were infected with mumps. In Jan 2012, Ernakulum district, 95 cases mumps found among children (Amritha 2015).

Emukule *et al*. (2015) carried out a study on influenza associated disease burden in Kenya. Ten studies reporting the incidence of medically-attended and non-medically attended influenza were reviewed. For all age groups, the influenza positive proportion ranged from 5–10% among hospitalized patients, and 5–27% among all medically-attended patients. The adjusted incidence rate of hospitalizations with influenza among children <5 years ranged from 2.7–4.7 per 1,000 [5.7 per 1,000 in children <6 months old], and were 7–10 times higher compared to persons aged ≥5 years. The adjusted incidence of all medically-attended influenza among children aged <5 years ranged from 13.0–58.0 per 1,000 compared to 4.3–26.0 per 1,000 among persons aged ≥5 years.

A study was conducted by Saha *et al*. (2016) about epidemiology and risk factors for pneumonia severity and mortality in Bangladeshi children. Among 3639 children with pneumonia, 61% had severe disease, and 2% died. Increased risk of pneumonia mortality was associated with age <12 months, low weight for age, unsafe drinking water source, lower paternal education, disease severity, and having ≥1 co-morbid condition.

Abuka (2017) worked on prevalence of pneumonia in Ethiopia and found 33.5% among under five children.

MATERIALS AND METHODOLOGY

Type and duration of the study:

The present investigation was a cross sectional study. The research was conducted during the period of September 2013 to August 2015.

Study Areas:

The study was conducted among the female inhabitants of lower socioeconomic groups in twelve areas of Dhaka city, Doyagonj, Gandaria, South Shahjahanpur, North Shahjahanpur, Malibag railgate, Khilgaon taltola, Palashi, Dhaka University Shahidullah hall 3rd class employee quarter, Hajaribag, Kamrangichar, Komlapur TT para and Moghbazar railgate area.

Study population:

Nine hundred (900) female inhabitants of different age groups were taken as respondents for the present research work. The age groups were categorized into 4 major groups:

1. Children (1 to 15 yrs)
2. Adult (16 to 35 yrs)
3. Middle age (36 to 50 yrs)
4. Old age (51 to 70 yrs)

In case of infants and children, the parents or guardians of the family were also interviewed.

Development of questionnaire for data collection:

A structured questionnaire was developed according to the objectives, contents, and variables of the study. Extensive literature review was done before the development of the primary data collection instrument. Standard questionnaire was developed to obtain relevant information on the socioeconomic status (age, education, income, occupation, sanitation etc.) and biochemical parameter (haemoglobin level of the inhabitants).

MATERIALS AND METHODOLOGY

Plate 1: Dhaka metropolitan and its adjacent areas.

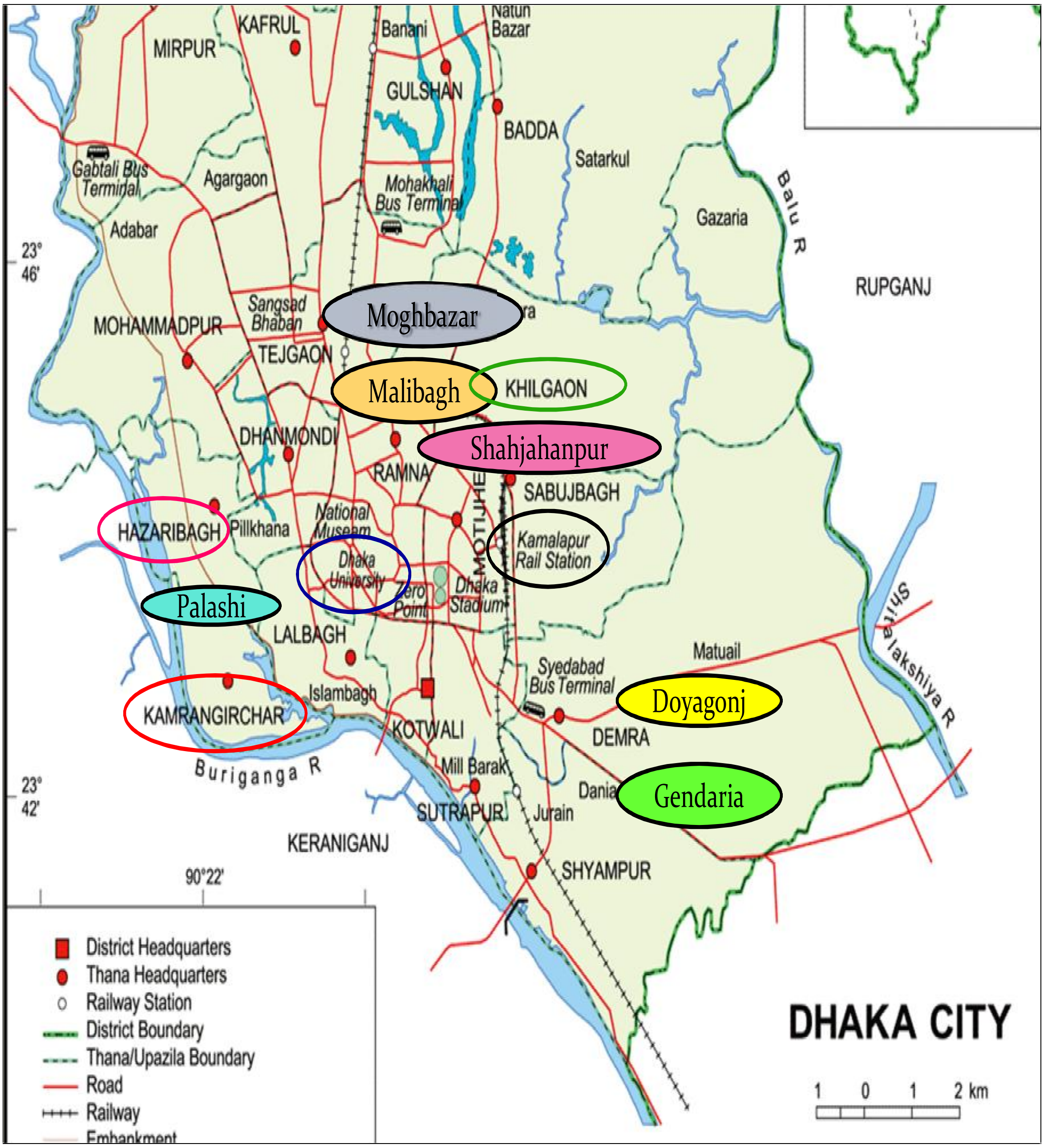


Plate 2: The location of the twelve study areas in Dhaka district, Bangladesh.

Methods of data collection:

The data were collected by face to face interview. Before starting the interview, the researcher communicated with respective community leaders and members to reach the study group. The purpose and nature of the interview was discussed clearly with the respondents and verbal consent was taken. It was explained to them, that the study would not be harmful rather helpful to them. Urine and stool samples were collected from each individual and were examined in laboratory.

Collection of socioeconomic information:

The demographic, socioeconomic, sanitation and other conditions of the household were observed and noted in additional to information from the people. Other members of the family were present during interview and also provided necessary information.

Diagnosis procedures:

- Intestinal parasitic infections were identified by examining the faecal samples. Fecal samples were analyzed by formol-ether concentration technique in Parasitology laboratory of Department of Zoology, University of Dhaka.
- The test for haemoglobin count was performed on the spot by haemoglobinometer.
- Urinary tract infection (UTI) was identified by examining the urine samples by sedimentation technique, culture and sensitivity test in Parasitology laboratory of the Department of Zoology, University of Dhaka and BIRDEM hospital, Shahbag, Dhaka respectively.
- The skin, vector-borne, waterborne and airborne diseases were identified by observing at the sign, symptoms and previous history of the diseases.

Collection, method and microscopic examination of stool samples:

After filling the questionnaire, an empty plastic container was provided to the all female inhabitants for collecting stool. The stool samples were processed and prepared for microscopic examination in the laboratory of the Department of Zoology, University of Dhaka.

Sample collection procedure:

- Samples were collected in a clean, leak proof, transparent, washed container with alcohol (70%). No antiseptic was used.

- No de-worming medication or therapy was given before taking these samples.
- Identification number labels were put on the container.
- Collection date, time and place were put on the containers.

Concentration method (Cheesbrough 1987):

The most recommended Formol-ether concentration method was applied for the present investigation. This method is rapid and good for concentrating the parasite's cyst, eggs and larvae in fresh or preserved faeces.

Requirement for the Formol-ether concentration method:

- Formol water, 10%,
- Ether (diethyl),
- Sieve (strainer) with small holes.

Formol -ether concentration method:

- By using a glass rod or stick estimated 1g of faeces was taken in 4ml of 10% formol water contained in a screw capped tube.
- Then 3-4 ml of 10% formol water was added, and the tube was closed, and mixed by shaking for about 20 seconds.
- The whole content was then strained and the sieved suspension was transferred in a beaker.
- The suspension was then transferred to a 15 ml conical/falcon (centrifuge) tube, 3-4 ml formol ether was added and mixed for 1 minute.
- The conical tube with suspension was centrifuged immediately at 3000 rpm pressure for 1-2 minutes.
- After centrifuging, the parasites were sedimented to the bottom of the tube and the faecal debris was in a layer between ether and formol water.
- Using a stick or cotton bar, the layer of faecal debris was loosen from the side of the tube and rapidly inverted the tube to discard the ether, faecal debris, and formol water.
- The upper portion of the fluid was allowed to drain out.
- After concentration, the sediment was mixed up by using the stick
- It was transferred to the slides by dropper and covered with cover glasses.
- The prepared slides were examined microscopically.

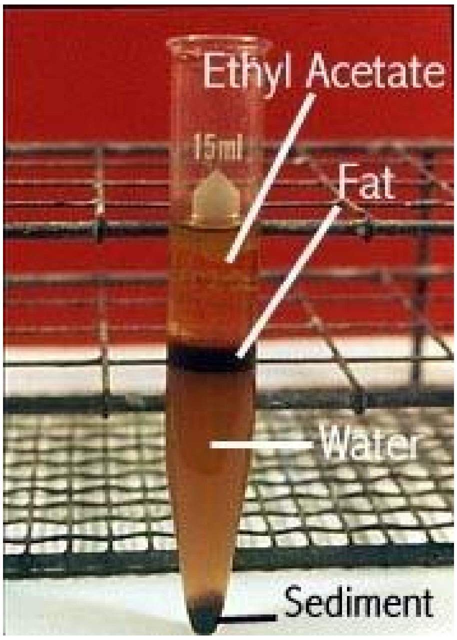


Figure: Formol-Ether concentration technique (after centrifugation)

(a): Calculation

The number of cysts or eggs per gram of stool was calculated by the drop count from the following equation:

$$N= (SS \times P) / TD$$

Here, SS= Total drops of the sub sample

P = Number of parasite (egg or cyst) observed

TD= Total number of drops examined.

The presence of parasite's cysts, eggs, and larvae were detected. Parasite was photographed with a camera fitted to a microscope. The findings were confirmed with the help of experts and books (Cheesbrough 1987, Neva and Brown 1994; Chatterjee 2004). All the findings of stool samples were recorded in the respective questionnaire.

Preservation of stool samples:

In case of delay examination, most suitable cheap and available preservative such as formalin (10%) was used.

Collection of blood sample and haemoglobin estimation:

Finger prick blood was collected from each female inhabitant to study their Hb level by Sahli haemoglobinometer. Sahli haemoglobinometer composed of a comparator with the colour standard. A graduated haemoglobinometer (distilled water) for the test and a pipette to measure 20 µL, i.e. 0.02 mL of blood were used.

Equipment required for haemoglobin measurement:

- Sahli's haemoglobinometer
- N/ 10 HCL
- Distilled water
- Sterile niddle
- 70% alcohol
- Cotton etc.

Procedure for measurement of haemoglobin by sahli's acid hematin method:

In the Sahli method, 20 µL of blood was mixed in a tube containing 0.1 mol/L hydrochloric acid (HCL) which converted the haemoglobin to acid hematin. After 10 minutes or more, 0.1 mol/L HCL was added drop by drop with mixing until the colour of the solution matches the colour of the glass standard positioned alongside the dilution tube. The concentration of haemoglobin was read from the graduated scale on the dilution tube. It was also noted that precaution was taken for entering air bubble into the pipette (Cheesbrough 2005).

Determination of anaemia from blood samples:

Anaemia was determined according to WHO (1998) criteria as follows.

Mild anaemia: ≥10.1-11.9 g/dL

Moderate anaemia: ≥7.1-9.9 g/dL

Severe anaemia: <7 g/dL

Examination of urine samples:

Proper collection of specimen: Proper collection of specimen is the most important step in a urine culture because urine is readily contaminated during urination and bacteria can multiply readily in the warm specimen before it is examined at the laboratory. Depending on the type of investigation, a single species of urine may be adequate or it may be necessary to collect urine over a 24 hour period. A fresh, cleanly collected midstream 10-20 ml urine sample is required to test different objects. The container should be clean, dry leak proof, and sufficiently wide necked for the female to use. It must be free from all traces of disinfectants. Whenever possible, the sample should be the first urine passed by the people at the beginning of the day because this will generally contain the highest concentrations of substances to be tested. The collected bottle must be labeled with the name and the date and time when the collection was completed. Urine, which contains preservatives or stabilizers, must not be used for bacteriological culture.

There are several steps to collect and examine the urine specimen. They are as follows:

- A mid stream or clean catch specimen of urine is taken and examined promptly or it is promptly chilled and held until it is examined. Especially in the case of female patients, it is essential to take special steps to avoid contamination at this stage.
- The deposit obtained from a centrifuged sample is examined microscopically, for pus cells and bacteria, Red blood cells and epithelial cells may also be present.
- A sample of the un-centrifuged tube is serially diluted and a viable count (colony count) is performed by culturing standard volumes (drops or pipettes amounts) of each dilution on plates of nutrient medium. Acceptable short-cut procedures are available. It is then possible to calculate the number of viable organisms per ml of urine.

Physical examination: Color, appearance and sediment were determined by naked eye examination.

Preparation and examination of a wet preparation (Cheesbrough 2005)/ sedimentation method:

1. 10 ml of well mixed urine has been transferred to a labeled conical tube.
2. Centrifuged at 500–1000 g for 5 minutes. Poured the supernatant fluid (by completely inverting the tube) into a second container not the original one. This can be used for biochemical tests to avoid contaminating the original urine which may need to be cultured (depending on the findings of the microscopical examination).
3. The sediment has been remixed by tapping the bottom of the tube. Then one drop of the well-mixed sediment was transferred to a slide and covered with cover glass.
   Note: Remaining sediment was not discarded because it was needed to prepare a Gram smear when WBCs and, or bacteria was seen in the wet preparation.
4. The preparation was examined microscopically using the 10X and 40X objective with the condenser iris closed sufficiently to give good contrast.

Microscopic examination:

Simple microscopic examination of urine can be a significant help in the diagnosis of UTI. A fresh drop of un-centrifuged urine placed on a slide, covered with a cover glass and examined with restricted light intensity under the high-dry objective of an ordinary clinical microscope can reveal leukocytes, epithelial cells, red cells, yeast cells, casts, crystals and bacteria. If more than 10^5 organism/ml, are present a Gram-stained smear of un-centrifuged midstream urine that shows Gram –negative rods is diagnostic evidence of UTI. Brief centrifugation of urine readily sediments pus cells, which may carry along bacteria and thus may help in microscopic diagnosis of infection. Pus cells may be present without bacteria and conversely bacteriuria may be present without pyuria. The presence of many squamous epithelial cells, lactobacilli or mixed flora on culture suggests improper urine collection.

Detection of urinary tract infection (UTI) by counting pus cells:

Infected urine always showed a large number of pus cells. Normally, depending on the number of pus cells, three types of infections were found. They are

1. Mild infection: Samples which show 10-12 pus cells.
2. Medium infection: Samples which show 13-25 pus cells.
3. Acute infection: Samples which show more than 25 pus cells.

Urine culture and sensitivity test:

General procedure and equipment

Sterilization: All media were sterilized at 121^0C, 15 p.s.i. for 15 minutes by using an autoclave (Hirayama, Japan). Glassware was sterilized at 180^0C for two hour in a hot air over (Eyela, Japan). Agar plates and slants prepared at room temperature were stored at 4^0C until use. The plates were dried at room temperature under aseptic condition before inoculation of the bacterial stain.

Growth of Microorganism: All cultures were inoculated under aseptic condition. Growth of microorganisms on solid media was carried out in agar plates in incubators (Eyela incubator, Japan; Member cool incubator, Germany).

Preparation of solution: Accurate weights of the components of various solutions were measured using a balance (Mettler A.150, Switzerland). Measurement of P^H values was performed by a P^H meter (Omega, P^H H-45 Japan). A vortex mixer (Vibriofix VFI, Germany) was used for mixing solutions, reagents and for remixing suspended microorganisms.

Detection of gram negative enteric bacteria from pus cell positive samples:

Culture examination:

Blood agar: Used for the isolation of the fastidious micro-organisms and to study the type of haemolysis produced by the organisms.

MacConkey's agar: It was used for isolation of gram negative enteric bacteria. It contains bile salts to inhibit non-intestinal bacteria and lactose with neutral red to distinguish the lactose fermenting from the non lactose fermenting organisms. Lactose fermenters produced pink colonies. Properly cultured urine samples were cultured in measured amount on solid media and colonies that appear after incubation are counted to indicate the number of bacteria per ml.

Preparation of culture media plates:

After adjusting the media from pH 7.4 to 7.6 in molten condition, they were poured into sterile plates and allowed to solidify and similarly, replicate plates were prepared from each medium. The formulation of all the culture media that were used is given in the Appendix -1.

Isolation of the media:

A modified semi quantitative technique was employed by spreading a standard bacteriological loopful over the surface of nutrient agar plate. The loop used can transfer 0.01ml of urine sample. After inoculation the plates were left on the bench for sometime in order to allow the urine to be absorbed into the nutrient agar medium. Then the medias were inoculated by simple streaking method (according to Harrigan *et al.* 1966).

Incubation of the inoculated plates and isolation of colonies:

The inoculated plates were incubated at 37^oC for 18 to 24 hours. The numbers of bacterial colonies were counted and multiplied by corresponding dilution factor given an estimate of the number of bacteria present per milliliter of urine. A significant bacterial count was taken as any count as equal to or in excess of 10^5 per milliliter. One loopful of each sample was inoculated into MacConkey agar plates. After 24 hours incubation of the plates, several colonies were found to develop in the plates. In the MacConkey plate, *Escherichia coli* colonies showed a rose pink colour and in the nutrient agar plate an opaque white colour. *Pseudomonas* showed a green color. Enterococcus showed watery granules. In Blood agar plate, Staphylococcus creates a zone.

Estimation of bacterial numbers (Cheesbrough 2005):

The approximate number of colonies were counted and bacteria number were estimated, i.e. colony forming units (CFU) per ml of urine. The bacterial number counted as follows:

- Less than 10000 organism/ml, (10^4/ml), not significant.
- 10000-100000/ml (10^4- 10^5/ml), doubtful significance (suggest repeat specimen)
- More than 100000/ml (10^5/ml), significant bacteriuria.

Identification of *Escherichia coli* and other bacteria by different biochemical test:

Isolates identified on the culture plates were further tested by using short biochemical tests according to standard methods described in manual for laboratory investigation of acute enteric infections (WHO 1983). The following biochemical tests were performed: Kliger's Iron Agar (KIA) test, Motility Indole Urease (MIU), Citrate utilization test Catalase and Oxidase test.

a) Kliger's Iron Agar (KIA) test/ TSI (triple sugar iron) agar medium:

The test was performed by using KIA test. A straight wire was burnt on flame and allowed to cool down. The wire was then immersed in 24 hours growth of the test organism was tabbed into the medium and streaked into the surface of the slant. The tubes were incubated for 24 hours at 37^0C. After incubation, the results were recorded for changes in color of the butter slant, H_2S or other gas production.

Formation of acid from the dextrose in fermentative mode indicated by yellowish of the butt, where as the yellowish of the slant indicated the oxidative mode. Production of H_2S made blackening of the medium and the gas production gave rise to bubble formation in the tube. The KIA test is designed which are all gram-negative bacilli capable of fermenting glucose with the production of acid and to distinguish the Enterobacteriaceae from other gram-negative intestinal bacilli. This differentiation is made on the basis of differences in carbohydrate fermentation pattern and H_2S production by the various groups of organism. To observe carbohydrate utilization pattern, the KIA agar slants contain lactose in one percent concentration, and glucose in a concentration of 0.1 percent, which allows for detection of the utilization of this substrate only. The acid base indicator phenol red is also used to detect carbohydrate fermentation that is indicated by a change in color of the medium from orange red to yellow in the presence of acids. Following a stab and streak inoculation and incubation of 24 hours, determination of carbohydrate fermentative activities is made as follows:

1. Alkaline slant (red) and acid butt (yellow) with or without gas production (breaks in agar butt); only glucose fermentation has occurred.
2. Acid slant (yellow) and acid butt (yellow) with or without gas production; only lactose fermentation has occurred.
3. Alkaline slant (red) and alkaline butt (red) or no change (orange red) butt; no carbohydrate fermentation has occurred.

In case of *Escherichia coli*, butt and slant were turned into yellow color with formation of gas in KIA test. Isolates those were positive for citrate, indole, catalase tests and negative for urease, oxidase were considered to be *Escherichia coli.*

b) Citrate utilization test:

In the absence of fermentable glucose of lactose, some microorganisms are capable of using citrate as a carbon source for their energy. This ability depends on the presence of citrate permease that facilitates the transport of citrate into the cell. Citrate is the first intermediate in the Krebs cycle and is produced by the condensation of active acetyl with oxaloacetic acid and acetate. These products are then enzymetically converted to pyruvic acid and carbon dioxide. During this reaction the medium became alkaline, as the carbon dioxide that generated combined with sodium and water to form sodium carbonate, an alkaline product. The presence of sodium carbonate, changes the bromothymol blue indicator in corporate into the medium from green to deep Prussian blue. Following inoculation, citrate positive cultures are identified by the presence of growth on the surface of the slant, which is accompanied by blue coloration. Citrate-negative cultures will show no growth and the medium will remain green.

c) MIU (motility indole urea agar) test:

This is best described as a multi-purpose medium for differentiation of enterobacteriacae that combines three individual tests into a single medium. For use the medium was inoculated by making a single stab into the medium with a straight wire (or equivalent) using a pure culture (or discrete single colony) of the test organism. Following incubation it is recommended that the medium should first of all be examined to determine whether or not the organism is motile. The presence of motility was apparent by the organism tracking out from the line of inoculation and often turning the medium turbid. Non-motile organisms generally grow within the stab line leaving the surrounding medium clear. Urease positive organisms (e.g. *Proteus* spp) turn the medium bright red due to the hydrolysis of the Urea in the presence of the Phenol Red Indicator often making it difficult to determine the other parameters. Indole is tested for by layering a small amount of Indole Reagent (Erlich's or Kovac's appear to work equally well) onto the surface of the medium and allowed a few minutes to react. A positive result is indicated by the formation of a red line at the interface of the reagent and the medium.

Appearance: Liquid

Colour: Golden

pH: 6.8 ± 0.2

Recommended incubation: Aerobically at 37±C for 18–24 hours. Shelf Life 182 days

Organisms	Result
Escherichia coli	No change in colour/Motile/Indole positive
Proteus mirabilis	Medium turns bright pink/Motile
Klebsiella pneumoniae	No change in colour/ Non-motile/Indole negative

In case of In

In case of *Pseudomonas*,

TSI/ KIA test- K K (slant and butt alkaline, red color),

Citrate test - (+)ve (blue color),

MIU- Motile (media looks hazy, orange color, OXI- (+).

In case of *Escherichia coli*,

TSI/ KIA test- A A (slant and butt acidic, yellow color),

Citrate test - (-)ve (green color),

MIU- Motile or non motile, (media looks hazy or clear, orange or yellow color).

In case of *Klebsiela*,

TSI/ KIA test- A A (slant and butt acidic, yellow color),

Citrate test- (+)ve (blue color),

MIU- Non motile, (media looks clear, yellow color).

In case of *Sreptococcus*, CAMP test is used in the identification of group B *Sreptococci.*

Standard CAMP test:

1. By using an inoculating loop, streak a beta-lysin-producing *Staphylococcus aureus* (ATCC25923) in a straight line across the center of a sheep blood agar plate.
2. Streak test organism in a straight line perpendicular to the *S. aureus* leaving 1cm space between the two streaks. (Multiple organisms can be tested on a single plate if they are 3 to 4mm apart).
3. Incubated the plate at 37 degree Celsius in ambient air for 18-24 hours.

Result Interpretation of CAMP Test

Positive: Enhanced hemolysis indicated by an arrow head-shaped zone of beta-hemolysis at the junction of the two organisms.

Negative: No enhancement of hemolysis.

In CAMP Spot test negative result showed no area of enhanced hemolysis near the colony in the presence of test reagent.

In case of *Enterococcus* CAMP test is negative.

Salt Tolerance Test for *Enterococcus* species:

Salt Tolerance Test is used in the identification of enterococcal group D *Streptococcus* on the basis of their salt tolerance. The ability of the bacteria to grow in the presence of variable amount of sodium chloride (NaCl) has been used to characterize several bacteria, including viridians streptococci.

This test is particularly useful for presumptive identification of the enterococcal group D organisms, which have the specific ability to grow in the presence of 6.5% NaCl incorporated into either a broth or an agar medium. This test along with Bile-Esculin test, is used in many laboratories to distinguish *Enterococcus* species from the group D streptococci, *Streptococcus bovis* and *Streptococcus lactis*. Enterococci are a significant cause of endocarditis with a high degree of mortality.

Brain Heart infusion (BHI) broth supplemented with 6.5% sodium chloride and bromcresol purple as a pH indicator is used for this purpose. The indicator is included to make reading the test results easier. The broth also includes dextrose. The fermentation of dextrose (glucose) results in the production of acid. This changes the pH of the media causing the media to turn from purple to yellow.

Procedure of the Salt Tolerance Test

1. Select no more than 2-3 colonies (preferably from an overnight culture) to inoculate a tube of salt tolerance broth

Note: It is important to lightly inoculate the tube otherwise you may get a false positive.

1. Loosen the cap and incubate aerobically for 24 hours at 37°C.
2. Continue incubation up to 72 hours if you get a negative result at 24 hours.

Results and Interpretation

1. A positive test is the presence of obvious bacterial growth (turbidity in liquid medium) in the medium, with or without a color change in the indicator. If the organism is bile-esculin-positive and grows in the 6.5% NaCl broth, the organisms are an *Enterococcus* species. If the organism is bile-esculin-positive and fails to grow in the 6.5% NaCl broth, the organism is a group D streptococcus.
2. A negative result is indicated by no growth after 72 hours. *Enterococcus* spp. typically changes the media color within 24 hours.

Organisms and their results:

1. Positive growth: *Enterococcus faecalis*
2. Negative growth: *Streptococcus bovis*

Limitation of the Procedure

1. Salt tolerance media was intended to differentiate catalase negative gram-positive cocci. Be sure to perform a catalase test before you proceed with the salt tolerance broth test. As many staphylococci can grow in media containing even 10% salt.
2. If the medium is inoculated too heavily, inoculums may be interpreted as growth, resulting in a false positive reaction.
3. To prevent interpretation of the test falsely as negative, agitate the tube gently before reading, as the growth may settle out during incubation.
4. Other species of catalase negative gram-positive organisms can grow in this media.

5. Up to 80% of group B streptococci may be salt tolerant, as will occasional isolates of group A streptococci. Aerococci may also be bile-esculin-positive and may grow in 6.5% NaCl.

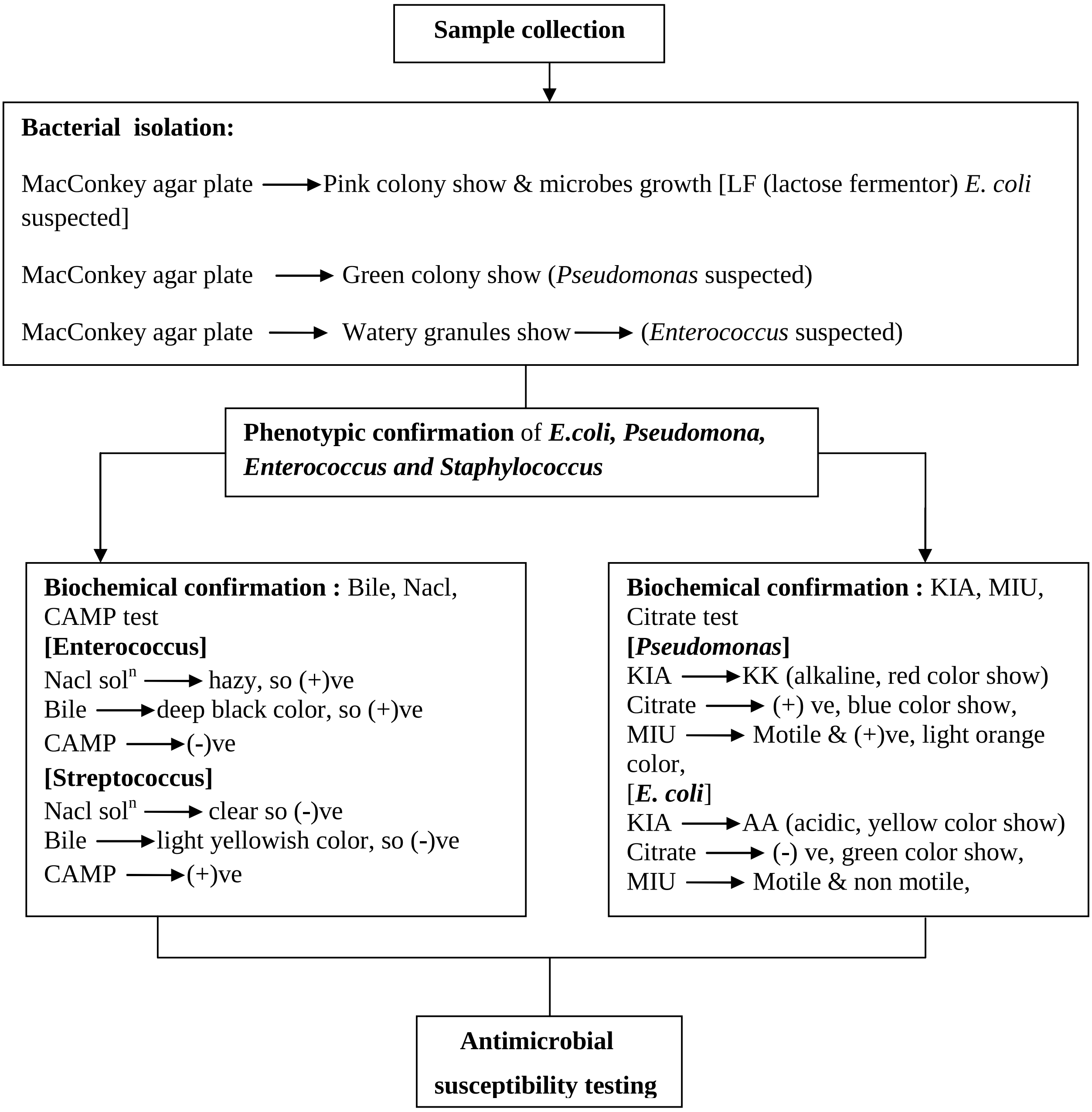


Figure: Diagram showing the design of the experiments

Antimicrobial Sensitivity pattern:

Susceptibility of *E. coli* strains to different antimicrobial agents was measured in vitro by employing the modified Kirby-Bauer method (Bauer *et al.* 1966). It is frequently used to determine the drug sensitivity of microorganisms isolated from infectious process and interpret their disease potential. This method allows for the rapid determination of the efficacy of a drug by measuring the diameter of the zone of inhibition that results from diffusion of the zone of inhibition that results from diffusion of the agent into the medium surrounding the disc. Commercially available antimicrobial discs (Mast Diagnostics, Mereyside, U.K) were used for the test. The following are the antibiotics that were tested against 36 clinical isolates. Commercially available discs (Oxoid Limited, Hampshire, England) were used for the test. The antibiotics used for *Escherichia coli* in this study (with their potency) were:

Ampicillin (10 µg), Amikacin (30 µg), Cefixime (5 µg), Ceftriaxone (30 µg), Ceftazidime 30 µg), Amoxicillin (30 µg), Ciprofloxacin (5 µg), Nalidixic Acid (30 µg), Netilmicin (30 µg), Cefuroxime (30 µg), Mecillinam (25 µg), Sulfamethoxazole/ Trimethoprime (25 µg), Gentamycin (10 µg), Chloramphenicol (30 µg), Tetracycline (30 µg) and Imipenem (10 µg), Ciprofloxacin (5 µg).

Procedure:

A suspension of test organism was prepared in normal saline (0.85%) to match the equivalent turbidity standard to that of Mc Farland 0.5 standard. A sterile cotton swab dipped into the suspension and excess fluid was removed by pushing and rotating the swab firmly against the internal wall of the tube, just above the fluid level. The medium used is Muller-Hinton agar, which is poured into plates to a uniform depth of 5 mm. The swab was then heavily incubated over the entire surface of the plate to the surface of the inoculated plates at an appropriate special arrangement with the help of a sterile forceps. The plates were then inverted and incubated at 37^0C for 24 hours. After incubation, the plates were examined and the diameters of the zone of complete inhibition were measured in mm. The zone diameters for individual antimicrobial agents were translated into susceptible, intermediate and resistant categories by referring to an interpretation table (Barry *et al*. 1985). *Escherichia coli* (ATCC-25922) was used as control strain to determine antimicrobial susceptibility.

Data management:

Individual questionnaire was checked for completeness and consistency. Separate code number was given to each of the questionnaires. The code number was used in subsequent handling of responses rather than respondent ID or name of respondent. The results of the microscopic examination of the collected sample were marked on the respective questionnaire.

Quality assurance activities:

Emphasis was given to maintain the quality of the study. For this, the synopsis was prepared according to the standard guideline with the help of supervisor then submitted for approval by the thesis committee of the department of Zoology, The University of Dhaka. The questionnaire was pre tested among a group of respondents similar to the study participants. Data was checked for inconsistency, missing values, and values out of range. Data were analyzed according to objectives of the study and study findings were compared with findings those of similar studies. Comments and advice was taken from study supervisor and fellow students who have previous experience of conducting this type of study.

Ethical consideration of the study:

The priority was given to the convenient time of the respondents as well as their positive approach for the study. Firstly they were informed about the study and then they took the decision to give answer and time for the study. The participants were assured for keeping the confidentiality about their given information.

Modifying factors and variables:

Parasitic infestation, anaemia, UTI, skin diseases, vector borne diseases, water and airborne diseases, age group, education level, occupation, family income, nail clipping, hand washing, footwear, drinking water, family size, types of house and latrine, history of illness.

Data processing and analysis:

After completion of entire data collection then to prepare the table and calculation, it has been processed and analyzed. The prevalence rate was showed by calculating percentage of infestations. Tables and graphs were prepared using MS Word and MS Excel software’s and results was analyzed by statistical test. Statistical analysis was carried out by using Statistical Package for Social Science (SPSS) using F-test.

Terminology: (According to Margolis *et al*. 1982)

Prevalence:

Prevalence was calculated by using following formula:

Prevalence = Number of infected hosts X 100 ÷ Total number of hosts (Respondents) examined (Margolis *et al.*1982).

Season: (According to Chowdhury 1978)

Winter -November to February

Summer -March to June

Rainy -July to October

In addition data were collected for monthly observations in the area for the period of study under observation.

DESCRIPTION OF THE DISEASES

Diseases by types of pathogen

Diseases that are caused by infections are called infectious diseases. An infection is a growth of germs called pathogens that causes illness. They are communicable meaning, can be spread from one person to another. Infectious organisms capable of causing communicable disease come from five major phylogenetic groups being viruses, bacteria, protozoa, fungi and parasite (protozoa and helminths). Communicable diseases, also known as transmissible diseases, are illnesses that result from the infection, presence and growth of pathogenic (capable of causing disease) biologic agents (bacteria, virus, fungi, protozoa, multicellular parasites) in an individual human or other animal host. Infections may range in severity from asymptomatic (without symptoms) to severe and fatal.

Bacteria:

Bacteria are a major group of pathogens causes several diseases called bacterial infectious disease.

Escherichia coli bacteria

E. coli is the type species of the genus *Escherichia,* which contains mostly motile gram-negative, rod shaped bacilli within the family *Enterobacteriaceae.* Three general clinical syndromes result from infection with inherently pathogenic *E. coli* strains: (i) urinary tract infection, (ii) sepsis/meningitis, and (iii) enteric/diarrhoeal disease. These conditions depend on a specific array of virulent factors possessed by the organism. *Escherichia coli* are commonly found in all warm-blooded animals.

Urinary tract infection

Urinary tract infection (UTI) is broadly defined as an infection of the urinary system, and may involve the lower urinary tract or both the lower and upper urinary tracts. *E. coli* and other bacteria get deposited into the urinary tract and accumulate itself in the urinary tract, causes UTI infection. Cystitis or pyelonephritis that arises due to *Escherichia coli* or *Staphylococcus saprophyticus*.

Symptoms of a UTI can include:

Pain when urinating; changes in frequency, appearance or smell of urine, fever, chills, loss of appetite, nausea, vomiting, lower abdominal pain, lower back pain or discomfort.

Diarrhoea caused by pathogenic *Escherichia coli*

Faecal-oral route is the main route of transmission of *E. coli*. In addition, *E. coli* can transmit to humans through a variety of ways including contact with: other humans or animals, contaminated surfaces (e.g. door handles), manure or sewage, or contaminated meat/poultry products, vegetables, raw milk, or untreated water. Large concentration of bacteria, including *E. coli* is known to transmit through water and this amount is large enough to cause illness in humans.

Symptoms of *Escherichia coli* infection:

Abdominal cramping, sudden severe watery diarrhoea that may change to bloody stools, gas, loss of appetite/nausea, vomiting (uncommon), fatigue, fever.

Diarrhoea caused by Faecal streptococci

Faecal streptococci are gram positive rounded bacteria of family enterococcaceae. Enterococci can cause urinary tract, wound, and soft tissue infections. Faecal streptococci can transmit to humans through a variety of ways like *E. coli*.

Symptoms associated with diarrhoea may include:

Loose, watery stools, abdominal cramps, pain, fever, blood in the stool, bloating, nausea, urgent need to have a bowel movement.

Cholera caused by *Vibrio cholerae*:

Cholera is an acute communicable disease of the gastrointestinal tract, caused by the bacteria *Vibrio cholerae*. The disease occurs in both epidemic and endemic forms. The disease is spread by the faecooral route, through ingestion of water or food contaminated by the bacteria from the stool of a cholera patient.

Cholera symptoms include:

Sudden onset of severe watery diarrhoea, the faeces look like rice, water, vomiting, and cramps in the legs, patient feels very thirsty.

Typhoid caused by *Salmonella typhi*

Typhoid enteric fever due to ingestion of food or water contaminated with the bacterium *Salmonella typhi*. The disease primarily affects the lymph nodes of the small intestine. The microorganisms colonize the small intestine, invade the gastrointestinal mucosa and then spread to the liver, spleen and bone marrow.

Symptoms include:

Malaise, abdominal cramping, sweating, severe headache, anorexia, cough, weakness, sore throat, dizziness, muscle pain, constipation, fever with low pulse, dry white coated tongue.

Pneumonia

Pneumonia is an inflammatory lung infection. Germs called bacteria or viruses usually cause pneumonia. Common is *Streptococcus pneumoniae* bacterial infection of the lungs and respiratory system, where the alveoli are inflamed and filled with fluid. Pneumonia usually starts when you breathe the germs into your lungs.

Symptoms of pneumonia caused by bacteria usually come on quickly. They may include:

Productive or dry cough, cough up mucus (sputum) from your lungs, mucus may be rusty or green or tinged with blood. Fever, fast breathing and feeling short of breath, shaking and "teeth-chattering" chills, chest pain that often feels worse when cough or breathe in, fast heartbeat, feeling very tired or very weak, nausea and vomiting, diarrhoea.

Tuberculosis

Tuberculosis (TB) is a contagious airborne infection caused by the bacterium *Mycobacterium spp*. (mostly *Mycobacterium tuberculosis* and occasionally *M. bovis*). Infected individuals release contagious droplets when they cough, talk, spits or sneeze. The droplets can be inhaled by susceptible adults and children. As long as viable tubercle bacilli are being discharged in the sputum, the disease is communicable. TB bacilli, which are able to remain airborne in any indoor space for up to 4 hours. The tubercle bacillus is extremely sensitive to direct sunlight, but can survive in the dark for several hours. The most dangerous period for developing clinical disease is the first six to twelve months after exposure *Mycobacterium tuberculosis* infection that generally attacks the lungs, but may affect central nervous system, circulatory system, lymphatic system, bones, joints, genitourinary system, and skin.

Symptoms include:

Persistent cough, loss of weight and appetite, excessive weakness, rapid pulse, chest pain, breath has bad smell, fever for more than 2 weeks, drenching night sweats.

Bacterial skin diseases:

Boil

Boil is a deep infection of the hair-follicle, commonly caused by the bacterium *Staphylococcus aureus*, germ enters the body through tiny nicks or cuts in the skin or can travel down the hair to the follicle then bacterial colonization begins in the hair follicles and can cause local cellulitis and inflammation, resulting in a painful swollen area on the skin caused by an accumulation of pus and dead tissue. They range from pea-sized to golf ball-sized. A yellow or white point at the center of the lump can be seen when the boil is ready to drain or discharge pus. The most common places for boils to appear are on the face, neck, armpits, shoulders, and buttocks

Symptoms:

Bumpy, red, pus-filled lumps, tender, warm, very painful, swollen lymph nodes, fever, fatigue, more boils may appear around the original one.

Carbuncles

A carbuncle is an abscess larger than a boil, usually with one or more openings; the infected mass is filled with fluid, pus and dead tissue. Fluid may drain out of the carbuncle, but sometimes the mass is so deep that it cannot drain on its own. Carbuncles may develop anywhere, but they are most common on the back and the nape of the neck. It is usually caused by bacterial infection, most commonly *Staphylococcus aureus,* or *Streptococcus pyogenes*, which can turn lethal. It may be the size of a pea or as large as a golf ball, have a white or yellow center, it may crust or spread to other skin areas.

Symptoms:

Red and irritated and might hurt when touched, fatigue, fever, discomfort or sick feeling. Itching may occur before the carbuncle develops.

Folliculitis

Folliculitis (also known as "Hot Tub Rash") is the infection and inflammation of one or more hair follicles. Most of folliculitis develops from *Staphylococcus aureus* and hot tub folliculitis is caused by the bacterium *Pseudomonas aeruginosa*. It usually occurs after sitting in a hot tub that was not properly cleaned before use. It starts when hair follicles are damaged by friction from clothing, an insect bite, blockage of the follicle, shaving, or braids too tight and too close to the scalp. In most cases of folliculitis, the damaged follicles are then infected with the bacterium. The condition may occur anywhere on the skin with the exception of the palms of the hands and soles of the feet. They may appear as red dots that come to white tips on the chest, back, arms, legs, and head, typically occur on neck, armpit, or groin area.

Symptoms:
Cluster of small red swollen bumps or white-headed pimples that develop around hair follicles. Pus-filled blisters that break open and crust over. Red and inflamed skin/ rash, itchy or burning skin, tenderness or pain. Iron deficiency anemia is sometimes associated with chronic cases.

Paronichia

A paronychia is a nail disease that is an often-tender bacterial or fungal infection of the hand or foot where the nail and skin meet at the side or the base of a finger or toenail. The infection can start suddenly (acute paronychia) or gradually (chronic paronychia). Acute paronychia is usually caused by bacteria. Painful paronychia is associated with a scaly, erythematous, keratotic rash (papules and plaques) of the ears, nose, fingers, and toes.

Symptoms:
The skin typically presents as red and hot, tenderness of the skin around the nail, painful. Pus is usually present, along with gradual thickening and browning discoloration of the nail plate, detachment of the nail.

Styes

An external styes is an infection of the sebaceous glands of Zeis at the base of the eyelashes, or an infection of the apocrine sweat glands of Moll. Styes are usually caused by the *Staphylococcus aureus* bacterium, commonly caused by the blocking of an oil gland at the base of the eyelash. It is a small, yellowish spot or swelling of the eyelid that develops as pus expands in the area. Resembling a pimple on the eyelid, a stye can grow on the inside or outside of the lid.

Symptoms may include:

A lump on the top or bottom eyelid, localized pain, redness, tenderness, crusting of the eyelid margins, burning in the eye, droopiness of the eyelid, scratchy sensation on the eyeball (itching), blurred vision, Mucous discharge in the eye, irritation of the eye. Light sensitivity, tearing. Discomfort during blinking, sensation of a foreign body in the eye.

Impetigo

Impetigo is a contagious infection of the skin caused primarily by the bacterium *Streptococcus pyogenes*, also known as Group A beta-hemolytic streptococci. Sometimes another bacterium, *Staphylococcus aureus* can also be isolated from impetigo lesions. The bacterium is usually acquired from skin to skin contact with another person with impetigo. It begins as a cluster of small blisters that expand and rupture within the first 24 hours. The thin yellow fluid that drains from the ruptured blisters quickly dries forming a honey-colored crust. The sores usually occur around the nose and mouth but can be spread to other areas of the body by fingers, clothing and towels.

Symptoms:

Red sores that pop easily and leave a yellow crust, fluid-filled blisters, itchy rash, skin lesions, swollen lymph nodes, blisters may be painful.

Virus:

Viruses are highly host specific and are incapable of multiplying outside of host cells. Inside host cell virus causes several disease called viral infectious disease.

Polio

Polioviruses are a specific group of enteroviruses, acute viral infection caused by several infectious strains, spread from one person to other due to transmission of poliovirus via the faecal-oral route, e.g., poor hand washing, contaminated food and drinking water. They have been shown to be able to survive within the soil environment for between 80 days and 96 days. The most dreadful disease, the virus mostly enters by mouth and multiplies in the oropharynx and intestine before invasion of the nervous system. The infection is mainly spread by close contact with those with apparent infections, either by pharyngeal or intestinal route. The virus is readily, therefore, spread within the family. Indirect transmission by contaminated food, milk, water, and sewage is rare.

Symptoms may include:

Fever, malaise, headache, nausea, vomiting, diarrhoea or constipation, aseptic meningitis, paralytic form (less than 1% of cases). Post - polio syndrome characterized by cold intolerance in the affected limbs, muscle pain and weakness, 30 - 40 years after exposure to the wild virus in childhood.

Infective hepatitis

It is an endemic disease characterized by jaundice and caused by a virus. It is common in children and young adults. The virus is excreted in the stools of the patient and contamination of water and food may lead to explosive outbreaks. Therefore, persons living in the same house are at great risk, particularly when standards of personal hygiene are low. Hepatitis A and Hepatitis E - water-borne viral disease that interferes with the functioning of the liver; most commonly spread through faecal contamination of drinking water and jaundice develops. Hepatitis outbreaks have occurred among intravenous drug users and homosexual men. Most people recover completely, and fulminant hepatitis and fatality are rare complications.

Hepatitis (Jaundice) symptoms include:

Fever, dark yellow urine, yellowish tinge in eyes, general paleness, fatigue, abdominal pain.

Influenza

Infection of the respiratory tract with an influenza virus belong to the family Orthomyxoviridae, results in symptoms ranging from mild non febrile illness to severe disease and complications, spreads through the air or by touch but usually is not fatal.

Symptoms include:

Fever, sore throat, cold, cough, sneezing, weakness, discomfort, headache, muscle pain, nausea, irritability, reduced oral intake, dyspnea, vomiting, diarrhoea.

Mumps

Mumps is an infection due to the mumps virus. Virus found to survive in the external environment, including in the soil. Mumps is spread by mucus or droplets from the nose or throat of an infected person, usually when a person coughs or sneezes. Surfaces of items (e.g. toys) can also spread the virus if someone who is sick touches them without washing their hands, and someone else then touches the same surface and then rubs their eyes, mouth, nose etc.

Symptoms may include:
Fever, headache, muscle aches, tiredness, loss of appetite followed by onset of parotitis (swollen and tender salivary glands under the ears-on one or both sides).

Warts
Warts are small growth on the skin caused by human papillomavirus (HPV). HPV infects the top layer of skin, usually entering the body in an area of broken skin. It can infect by touching the wart and then touching another part of your body or by sharing towels, razors, or other personal items.

Symptoms:
Small, hard, flat or raised skin lesion or lump. Abnormally dark or light skin surrounding the skin. Numerous small, smooth, flat lesions on forehead, cheeks, arms or legs. Rough, round or oval lesions on soles of feet, flat to slightly raised, painful to pressure, rough growths around or under fingernails or toenails.

Chickenpox
A disease caused by infection with the varicella zoster virus, itchy rash of blister-like lesions of skin. Chickenpox is very contagious and is spread by coughing and sneezing.

Symptoms that include:
Lesions cover the body but are usually more concentrated on the face, scalp, and trunk. Fever which develops just before or when the rash appears. If exposed, persons who have been vaccinated against the disease may get a milder illness, with less severe rash (sometimes involving only a few red bumps that look similar to insect bites) and mild or no fever.

Measles
Measles is highly infectious disease of skin caused by measles virus that belongs to Morbillivirus family, is spread through close respiratory contact with contagious air droplets. Infected persons can transmit the disease to susceptible hosts even before the appearance of the measles rash. Infected people are usually contagious from about 4 days before their rash starts to 4 days afterwards.

Symptoms can include:

Fever that lasts for a couple of days, cough, runny nose, and conjunctivitis (pink eye). A rash starts on the face and upper neck, spreads down the back and trunk, then extends to the arms and hands, as well as the legs and feet.

Dengue

Dengue fever is a severe, flu-like illness, debilitating mosquito borne disease caused by dengue viruses that affects infants, young children and adults. Dengue virus is primarily transmitted by *Aedes* mosquitoes, particularly *Aedes aegypti*. They typically bite during the day, particularly in the early morning and in the evening, but they are able to bite and thus spread infection at any time of day all during the year. When a mosquito carrying dengue virus bites a person, the virus enters the skin together with the mosquito's saliva. It binds to and enters white blood cells and reproduces inside the cells while they move throughout the body. Dengue Haemorrhagic Fever (DHF) is the more serious form of disease. Dengue fever can be painful (hence its nickname of “breakbone fever”).

Typically, people infected with dengue virus are asymptomatic (80%) or only have mild symptoms, other symptoms may include:

Severe headaches, high fever (104^{0} F), body aches, joint aches, rash, sometimes vomiting and diarrhoea.

Fungi:

The fungi, like humans, are from the domain “Eukaryota”, this means that fungal cells are more similar to human cells. Some fungi can become very aggressive forms of infection, when coming into the contact with immuno-compromised patients or other susceptible individuals, such as in an open wound or through the inhalation of spores.

Ringworm

Ringworm (generally caused by *Microsporum canis*) is a contagious fungus infection, can spread easily from one person to another by touch or contact with items contaminated by the fungus, such as combs, unwashed clothing; and shower or pool surfaces. The fungi that cause parasitic infection (dermatophytes) feed on keratin, the material found in the outer layer of skin, hair and nails. It thrives in moist and warm areas and appears on the feet, groin, chest and abdomen, scalp, or nails.

Symptoms of ringworm include:

Itchy, raised, scaly patches that may blister and ooze. Red patches are often redder around the outside with normal skin tone in the center; this may look like a ring. The patches tend to have sharply-defined edges.

Athlete's foot

Athlete's foot also known as tinea pedis, tinea pedum, and moccasin foot is a common and contagious dermatophytic fungal infection of the skin. It is most commonly caused by the fungi *Trichophyton rubrum* or *T. mentagrophytes*, but may also be caused by *Epidermophyton floccosum*. The disease is typically transmitted in moist communal areas where people walk barefoot, such as showers or bathhouses, and requires a warm moist environment, (e.g., the inside of a shoe) to incubate.

Symptoms:

Have pruritic erythema. Rash develops that becomes itchy, in some cases rash spreads to the soles. Skin may become cracked and sore; scaling, flaking, and maceration (softening and whitening of skin that has been kept wet) of the interdigital spaces between the toes. Pain, erosions and fissuring of the skin, crusting and an odor due to bacterial infection of the skin.

Onchomycosis

Onychomycosis also known as "dermatophytic onychomycosis," or "tinea unguium". It is the most common fungal disease of the nails and constitutes about a half of all nail abnormalities.

Symptoms:

Skin can become inflamed and painful underneath and around the nail. White, black, green or yellow patches on the nailbed or scaly skin next to the nail, and a foul smell, nail become thickened and discoloured, as the infection progresses the nail can become brittle, with pieces breaking off or coming away from the toe or finger completely. People with onychomycosis may experience significant psychosocial problems due to the appearance of the nail, particularly when fingers – which are always visible – rather than toenails are affected.

Candidiasis

Candidiasis or thrush is a fungal infection (mycosis) of any species from the genus *Candida* (one genus of yeasts). *Candida albicans* is the most common agent of candidiasis in humans. It is a superficial infection of mucosal membranes of the mouth, vagina, or skin causing local inflammation.

Symptoms:

Creamy, white or red, smooth, painful patches inside the mouth; cracking at the corners of the mouth (cheilitis); discomfort; itching and irritation in case of skin infection. In immunocompetent persons, candidiasis is usually a very localized infection of the skin or mucosal membranes, including the oral cavity (thrush), the pharynx or esophagus, the gastrointestinal tract, the urinary bladder, the fingernails or toenails (onychomycosis), and the genitalia (vagina, penis).

Parasites:

Parasites are broadly categorized as protozoans and helminthes. Helminths are then subdivided as trematode, cestode and nematode.

Protozoa

Protozoa are a highly diverse group of single celled eukaryotic organisms. They are distributed globally and are found in high abundances in soils.

Amoebiasis caused by *Entamoeba histolytica* -

Entamoeba histolytica is a protozoan parasite responsible for a disease called amoebiasis. It occurs usually in the large intestine and causes internal inflammation. Infection with *E. histolytica* can be asymptomatic or may cause diarrhoea and abdominal pain. However, dysentery can occur in some cases. The life cycle of *Entamoeba histolytica* does not require any intermediate host. Mature cysts are passed in the faeces of an infected human and another person can get infected by ingesting them in faecally contaminated water, food or hands. If the cysts survive the acidic stomach, they transform back into trophozoites in the small intestine. Trophozoites migrate to the large intestine where they live and multiply by binary fission. Both cysts and trophozoites are sometimes present in the faeces. Cysts are usually found in firm stool, whereas trophozoites are found in loose stool.

Symptoms that include:

Gas (flatulence), intermittent constipation, stomach ache, cramping, appendicitis (inflammation of the appendix), loose stools, bloody diarrhoea, anaemia, malnutrition, weight loss, fatigue, fever, genital and skin lesions, painful defaecation (passage of the stool), liver abscesses (can lead to death, if not treated), peritonitis (inflammation of the peritoneum which is the thin membrane that lines the abdominal wall), pleuropulmonary abscesses, toxic megacolon (dilated colon).

Giardiasis caused by *Giardia intestinalis*

Giardia intestinalis (also known as *G. lamblia* or *G. duodenalis*) is a protozoan flagellate causing giardiasis in the small intestine. It is an important cause of gastrointestinal illness and is transmitted by direct person contact or by contaminated food or water. It is found worldwide mostly in warm climates. *G. intestinalis* lives as active trophozoites in the small intestine and cysts are released with faeces. The faeces might contaminate soil, water, food or surfaces such as bathroom sinks. The cyst has a protective shell and it can survive in the environment for many weeks (in cold water many months). People become infected after accidentally swallowing the microscopic cysts. They remain in the lumen where they can feed freely or attached to the mucosa by a ventral sucking disk and absorbs nutrients from intestinal wall. After eating enough, multiply by binary fission. The trophozoites encysted as they move towards the colon. Cysts are found more often in firm stool whereas both trophozoites and cysts are present in loose stool. Because the cysts become infective almost instantly after being passed out, the disease can be transmitted during anal-oral-sexual intercourse.

Common giardiasis symptoms include:
Bloating, bad breath and farts, dehydration, diarrhoea or greasy floating stools, gas or flatulence, fatigue, loss of appetite, nausea, stomach ache, weakness, weight loss.

Diarrhea can be fatal, 50% of giardiasis cases are asymptomatic. Symptoms begin usually within two weeks after becoming infected. In healthy individuals the sickness normally persists up to three weeks, but sometimes longer.

Malaria caused by *Plasmodium* spp.

Malaria is caused by protozoan parasites of the red blood cells of the genus *Plasmodium*, transmitted by female *Anopheles* mosquito. Five species of the *Plasmodium* parasite can infect humans. The most serious forms of the disease are caused by *Plasmodium falciparum*. Young female mosquitoes first ingest the malaria parasite by feeding on an infected human carrier and the infected *Anopheles* mosquitoes carry *Plasmodium* sporozoites in their salivary glands. A mosquito becomes infected when it takes a blood meal from an infected human. Once ingested the parasite gametocytes taken up in the blood will further differentiate into male or female gametes and then fuse in the mosquito's gut. This produces an ookinete that penetrates the gut lining and produces an oocyst in the gut wall. When the oocyst ruptures, it releases sporozoites that migrate through the mosquito's body to the salivary glands, where they are then ready to infect a new human host. The sporozoites are injected into the skin, alongside saliva, when the mosquito takes a subsequent blood meal. The parasites are then carried by the blood in the victim's liver where they invade the cells and multiply. After 9-16 days they return to the blood and penetrate the red cells, where they multiply again, progressively breaking down the red cells. This induces bouts of fever and anaemia in the infected individual. In human body, malaria parasites undergo three distinct asexual replicative stages (exoerythrocytic schizogony, blood stage schizogony, and sporogony) resulting in the production of invasive forms (merozoites and sporozoites).

The signs and symptoms of malaria typically begin 8–25 days following infection. Symptoms may include:
Fever, shivering, alternating chill and perspiration, headache and body ache, joint pain, nausea, vomiting, fatigue, haemolytic anaemia.

Leishmaniasis caused by *Leishmania donovani*

L. donovani is essentially a parasite of reticulo-endothelial system of vertebrate. It is always intra-cellular. Leishmaniasis includes a diverse group of protozoan infections that can cause anything from skin sores (in its mildest form) to severe organ damage. It is transmitted by certain varieties of sand fly (serve as the vectors) infected with *Leishmania*. Infected female sandfly bites the susceptible host, the flagellates entering the circulation, change their shape as amastigote. The amastigote form while residing in the cells of the reticulo-endothelial system multiplies and continues till the cell becomes packed with the parasites. The host-cell is thereby enlarged and eventually ruptures. The parasites liberated as a result of the rupture into the circulation are again either taken up by or invade fresh cells and the cycle is repeated and the entire system becomes progressively infected. During the time of infective blood meal the amastigotes along with the blood are taken into the midgut of the sandfly and transform into promastigotes. They multiply by binary fission producing an enormous number of flagellates. The esophagus of the sandfly becomes blocked. Bites of such 'blocked' sandflies on susceptible persons, almost invariably cause infection, as in order to take a blood-meal the sandfly has to liberate the flagellates into the wound caused by its proboscis.

Infection with *L. donovani* produces the disease Kala-azar or visceral leishmaniasis characterized by the following way:
Intermittent fever, moderate weight loss, anaemia, splenomegaly (abnormal enlargement of the spleen), cough, unaltered appetite, hepatomegaly (abnormal enlargement of the liver), haemorrhagic manifestation, progressive leucopenia.

Helminths:
The name helminth refers to a group of parasitic worms. The majority of helminths which infect humans are from the two phyla platyhelminth and nematoda. Helminths are internal parasites, generally remain inside the digestive tract where they can receive nutrients from food consumed by the host as it passes through the gut. This nutrient acquisition occurs in competition with nutrient uptake by the host's gut and so can lead to malnutrition as well as diseases in the host.

Hymenolepiasis caused by *Hymenolepis nana*
Hymenolepis nana is the most common tapeworm in humans. The life cycle of *Hymenolepis nana* starts, when microscopic eggs are passed with the stool of an infected human. They then get ingested either by rodents, humans (definite hosts) or insects (intermediate hosts). If a person ingests eggs (from contaminated fingers, water, food or soil), oncospheres (hexacanth larvae) hatch in the small intestine. A larva penetrates an intestinal villus and develops into a cysticercoid. A cysticercoid develops to look more like an adult having a scolex (head) and a neck. Some proglottids degenerate, resulting in autoinfection. *Hymenolepis nana* does not necessarily need an intermediate host to complete its life cycle. Larvae can develop in spite of the high temperature of a human body. Adults live 4–6 weeks, but internal autoinfection allows hymenolepiasis to persist for years.

Hymenolepiasis is usually asymptomatic in adults. But prolonged infection or multiple tapeworms especially in children can cause more severe symptoms. Hymenolepiasis symptoms sometimes include:
Anal itching, diarrhoea (can be bloody), headache, increased appetite or loss of appetite, insomnia, muscle spasms, nausea, seizures, stomach ache.

Ascariasis caused by *Ascaris lumbricoides*

Ascaris lumbricoides, giant roundworm, is the most common parasitic worm in humans. According to some estimates 25% of humans are infected with the disease, ascariasis. Ascariasis starts, when *Ascaris lumbricoides* eggs are accidentally swallowed. They can be acquired from dirty fingers, water or food that has been contaminated with faeces of an infected human. Larvae hatch from the eggs, penetrate the intestinal wall and enter the bloodstream. They stop at pulmonary arteries and stay in the lungs for two weeks. They break into the alveoli and travel up the respiratory system to the throat to be swallowed again. The migration is needed for the larvae to develop into adults.

Ascariasis can be asymptomatic or symptoms might include:
Diarrhoea, fever, nausea, stomach ache, slower growing of a child or a teen, vomiting, weakness.
Unlike many other human roundworms, *Ascaris lumbricoides* does not usually feed on blood. When larvae migrate through the lungs, the following pulmonary symptoms may occur: breathing difficulty, cough and/or coughing up blood, eosinophilic pneumonitis.

Trichuriasis caused by *Trichuris trichiura*

The human whipworm is called *Trichuris trichiura* and causes trichuriasis. Whipworm's life cycle starts, when the female lays eggs in the large intestine of an infected human. The eggs are carried out in the faeces. If landed on warm moist soil, after 2–3 weeks the eggs become embryonated. The eggs when ingested with contaminated unwashed and uncooked vegetables, rice or beans. Larvae hatch in the small intestine and invade the intestinal villi and start growing. After a while they move to the large intestine where they penetrate the mucosa and develop into adults. Adult worms bury their thin, threadlike anterior parts into the intestinal mucosa and feed on tissue secretions (not including blood). Approximately three months is needed for eggs to develop into mature worms which may live for between 1 and 5 years. Adult females can lay eggs for up to 5 years and may shed up to 20,000 eggs per day which can survive for up to 14 days in soil.

Infections usually present asymptomatically apart from in individuals infected with numerous worms. Symptoms, where present, include:
Vague abdominal discomfort, stunted growth, nocturnal loose stools, possible dysentery, in some case rectal prolapse.

Hookworms infection caused by hookwom/ ancylostomiasis

Hookworms are the second most common bloodsucking roundworms living in the small intestine. There are thousands of hookworm species but only two of them target humans. Humans are the only known reservoir for hookworms. The hookworm larvae start the infection as filariform live on warm moist soil that has been contaminated with infected human faeces. Upon touch, a tiny filariform larva attaches to the skin and penetrates it. It burrows through tissue until it reaches a blood vessel or lymphatic duct. It travels in the bloodstream to the small pulmonary capillaries. It breaks into the lung alveoli and is taken towards the bronchus and trachea by the movement of microvilli. It is coughed up to the throat and swallowed through the esophagus to the stomach. After passing the stomach it hooks into the intestinal mucosa in the small intestine and starts sucking blood. Then within a few weeks it develops into an adult and is ready to mate. The produced eggs exit the body in the faeces. Rhabditiform (first stage, L1) larvae hatch in the faeces or in warm, moist, sandy soil within two days. They feed on organic matter and grow rapidly. They molt twice within 10 days to become filariform (third stage, L3) larvae that are infective. Filariform larvae can survive up to four weeks in the right conditions (warmth, moisture, shade).

Hookworms can cause some of the following symptoms:

Anaemia (pale skin) and protein deficiency caused by blood loss, dizziness, dyspnea (shortness of breath), decreased rate of growth and mental development in children (caused by protein and iron deficiency), fatigue (tiredness), constipation, congestive heart failure, diarrhoea, excessive coughing during larvae migration, fever, loss of appetite, nausea, rash or sore and itchy feet after larval invasion, stomach or chest pain, vomiting, weight loss.

Enterobiasis caused by *Enterobius vermicularis*

Human pinworm, *Enterobius vermicularis,* is the most common parasitic worm infection. Pinworms are easily transmitted from human to human and are particularly common in children. *Enterobius vermicularis* does not need an intermediate host to complete its life cycle. Humans get infected by accidentally swallowing or inhaling microscopic pinworm eggs. Once inside the first part of the small intestine, duodenum, pinworm larvae hatch from the eggs. Sometimes pinworms lay eggs inside the colon. If the eggs are not taken out in the faeces the larvae might have enough time to hatch. This can only happen in the large intestine or rectum and only if enough oxygen is present. The larvae migrate back up the intestinal tract and develop into adults. This is very rare but happens every now and then.

Symptoms are as follows:
Anal itching, nausea, diarrhoea, vomiting, abdominal pain, anaemia, weight loss.

Strongyloidiasis caused by *Strongyloides stercoralis*

Strongyloides stercoralis causes strongyloidiasis, unlike most parasitic worms, *Strongyloides stercoralis* has a heterogenic life cycle. So in addition to the parasitic life cycle it has a separate free-living cycle where it lives and reproduces without a host in the soil. *Strongyloides stercoralis* can autoinfect the same host over and over without any intermediate host. This makes strongyloidiasis a very persistent disease. Both rabditiform and filariform larva can be infective. Infection may be transmitted to humans when a person comes into contact with soil containing *Strongyloides* in their larval "filariform" stage. These larvae can enter a host through the skin, where they enter the circulatory system via the lymphatic system and are carried to the lungs. Once in the lungs they migrate upwards to the throat where they are then swallowed and enter the digestive tract. The infected host may be asymptomatic for this entire time, with the exception of hives at the point of entry which may be mistaken for insect bites. Once in the lower tract of the digestive system, *Strongyloides* may be excreted in faeces. The time taken from the initial penetration of the skin, through migration to the lungs and back down into the intestine to be passed out in faeces once more is in the range of 17-28 days. *Strongyloides* are the only helminth to secrete larvae and not eggs in faeces.

Minor infections can be asymptomatic but usually one or more of the following symptoms occur:
Anaemia (for example, pale skin), constipation, cough, eosinophilic pneumonitis (during larvae migration through the lungs), diarrhoea, nausea, rashes in waist and buttocks, stomach ache, vomiting, weight loss, death, distension, neurological and pulmonary complications, septicemia, shock.

Filariasis

Lymphatic Filariasis (LF) is a devastating parasitic infection caused by nematodes of the family Filarioidea. There are three types of these thread-like filarial worms: *Wuchereria* *bancrofti, Brugia malayi* and *Brugia timori*, of the three parasite species, *W. bancrofti* accounts for nearly 90% of LF infections worldwide. Man is the definite host. The adult filarial worm lives in lymphatic vessels for 6-8 years and, during their life time, produce millions of microfilariae (small larvae) that circulate in the peripheral blood and are able to infect mosquitoes when they come to feed. *Wuchereria bancrofti* is transmitted by various species of *Culex* mosquitoes. In the nocturnal periodic form, the microfilariae at night appear in the peripheral blood, reaching the maximum density at midnight. These cannot develop further unless taken up by a vector mosquito. In the stomach of the vector the microfilariae loss its sheath, pass through the gut wall into the haemocoel and invades the thoracic muscles. Growth occurs with one or more molting, reaches the proboscis and enters the muscular labium. It is the infective form and 127-320 μm in size. This development depending on temperature and humidity, taken place between 10-14 days, At the time of next blood meal the larvae ruptures the proboscis, are deposited on the skin of the new host and enters the body through the breach on the skin made by the bite of the insect. Having penetrated the infective larvae migrates in to the lymph gland and lymphatic. In *W. bancrofti* infection in course of 8-12 months, they become mature.

Symptoms may include:
Mild fever, malaise, lymphatic inflammation, chills, fever, toxaemia, lymphangitis, lymphadenitis. Elephantiasis of genitals, legs and arms. Eosinophilia due to hypersensitivity, severe deformity and disability.

Arthopod/ Ectoparasite:
Arthropods are important in causing diseases such as ticks, fleas, lice, and mites that attach or burrow into the outside of the skin of the host and called ectoparasite and remain there for relatively long periods of time (e.g., weeks to months) and causes disease.

Scabies caused by *Scaroptes scabei*
It is characterized by superficial burrows and intense itching due to skin infection with mites, transmitted by the microscopic *Scaroptes scabei*. Scabies causes a pimple-like rash. Such severe scratching can lead to sores which may become infected by bacteria. The rash is an allergic reaction to the mite and typically lasts four to six weeks from when a person is first infected. It spreads through direct skin-to-skin contact and contact with infested garments, clothing and bed linen. The female adult mite burrows into the

epidermis, depositing eggs over several days. The larvae hatch in approximately two to four days and take approximately 10 to 14 days to mature into adult mites.

Symptoms may include:

Erythematous papules, generalized pruritus that is typically worse at night. Burrows are usually located between the fingers, in the flexure of the wrist, elbows, knee or armpits, or on the genitals or breasts; however, they can sometimes be difficult to find. In infants and elderly individuals, burrows may be found on the head and neck, shoulder and hands. Vesicles, pustules or nodules.

Pediculosis caused by *Pediculus humanus* (Head lice)

Pediculosis: infestation of lice. The head louse is a parasitic insect that can be found on the head, eyebrows, and eyelashes of people. Head lice feed on human blood several time a day and live close to the human scalp. Head lice are spread by direct contact with the hair of an infested person. Spread by contact with clothing (such as hats, scarves, coats) or other personal items (such as combs, brushes, or towels) used by an infested person is uncommon. Allergic reaction is induced by a louse that parasitizes human skin to suck blood, causing intense itching. Lice are host-specific and spend their entire life on the host.

Symptoms can include:

Tickling feeling of something moving in the hair, itching, caused by an allergic reaction to the bites of the head louse; irritability and difficulty sleeping; head lice are most active in the dark, and sores on the head caused by scratching. These sores can sometimes become infected with bacteria found on the person's skin.

OBSERVATION AND RESULTS

A total of 900 female inhabitants from different slum areas of Dhaka city were studied, to determine the gastrointestinal parasitic infestation, the level of anaemia, urinary tract infections, skin infections, vector-borne, waterborne, airborne diseases, socioeconomic aspects as well as their personal hygiene. Stool, blood and urine samples were collected from the females of the study area. Through the sample examination and data analysis, some important findings were recorded during the study period.

5.1 Intestinal parasitic infestation

During the present investigation, total of 900 stool samples were collected for the identification of different parasite species, 596 (66.22%) females were found to be infected with intestinal parasites. A total of twenty six (26) parasite species were identified from the samples. Among the intestinal parasites, ten (10) were protozoans, six (6) cestodes, four (4) trematodes and six (6) nematodes (Table 1).

Among parasitic groups, nematode showed the highest prevalence (57.55%), then cestode (38.67%), protozoa (19.22%), and lowest was found in trematode (4.11%) (Table 2, Fig 1).

The prevalence of different species of intestinal parasites varied from one another. In the present investigation, prevalence of cyst of *Entamoeba histolytica* was highest (10.44%) and common *Giardia intestinalis* was 4%. The prevalence of *Chilomastix mesnili* was 1.22 % and *Balantidium coli* was lowest (0.33%) with wide gap (Table 3, Fig 2).

Among cestodes, *Hymenolepis nana* recorded as the highest (22.78%) prevalent, then *Taenia saginata* (10.33%), *Hymenolepis diminuta* (8.22%), *Diphyllobothrium latum* (3.55%), *Dipylidium caninum* (1%) and lowest (0.33%) was *Echinococcus granulosus* (Table 4, Fig 3).

Among trematodes, prevalence of *Fasciolopsis buski* was observed the highest (2.11%) within 900 samples and lowest (0.11%) was *Fasciola hepatica.* The prevalence of *Paragonimus westermani* and *Clonorchis sinensis* was 1.33% and 0.67% respectively (Table 5, Fig 4).

Table 1. Cysts, eggs and larvae of gastrointestinal parasites found in the stool samples during the study.

Groups	Name of Parasites (cysts, ova and larvae)
Protozoan	*Entamoeba histolytica*
	Entamoeba coli
	Endolimax nana
	Iodamoeba butschlii
	Chilomastix mesnili
	Trichomonas hominis
	Enteromonas hominis
	Giardia intestinalis
	Isospora hominis
	Balantidium coli
Cestode	*Diphyllobothrium latum*
	Taenia saginata
	Echinococcus granulosus
	Hymenolepis nana
	Hymenolepis diminuta
	Dipylidium caninum
Trematode	*Fasciola hepatica*
	Fasciolopsis buski
	Clonorchis sinensis
	Paragonimus westermani
Nematode	*Ascaris lumbricoides*
	Trichuris trichiura
	Ancylostoma duodenale (egg)
	Ancylostoma duodenale (larvae)
	Strongyloides stercoralis (larvae)
	Enterobius vermicularis (egg)
	Capillaria sp.

Among the nematode parasites, *Ascaris lumbricoides* showed the highest (38%) prevalence and *Capillaria sp.* was lowest (0.11%). While other remaining four species *Trichiuris trichiura*, *Ancylostoma duodenale* (egg), *Ancylostoma duodenale* (larva), *Strongyloides stercoralis* and *Enterobius vermicularis* were 30%, 10.89%, 3.55%, 2% and 1.55% respectively (Table 6, Fig 5).

Table 2. Overall prevalence of different parasitic groups in observed sample.

Group	Total samples examined	No. of infected samples	Prevalence (%)
Protozoa	900	173	19.22
Cestode	900	348	38.67
Trematode	900	37	4.11
Nematode	900	518	57.55

Analysis of variance (F-test) and Multiple Comparisons

Source of variation	F-test	Level of significant	Multiple Comparisons by LSD		Level of significant
Protozoa, Cestode, Trematode, and Nematode	287.3	0.000 Significant	Protozoa	Cestode	0.000*
				Trematode	0.000*
				Nematode	0.000*
			Cestode	Protozoa	0.000*
				Trematode	0.000*
				Nematode	0.000*
			Trematode	Protozoa	0.000*
				Cestode	0.000*
				Nematode	0.000*
			Nematode	Protozoa	0.000*
				Cestode	0.000*
				Trematode	0.000*

*. The mean difference is significant at the 0.05 level.

F-test showed that prevalence of parasitic infection among protozoa, cestode, trematode, and nematode were significantly different (F = 287.3, p=0.000). Multiple copmparison by LSD showed that, prevalence of parasitic infestation (57.55%) in nematode were significantly higher than the protozoa, cestode and trematode respectively. Prevalence of trematode (4.11%) were significantly lower (P<0.000) when compared with other groups.

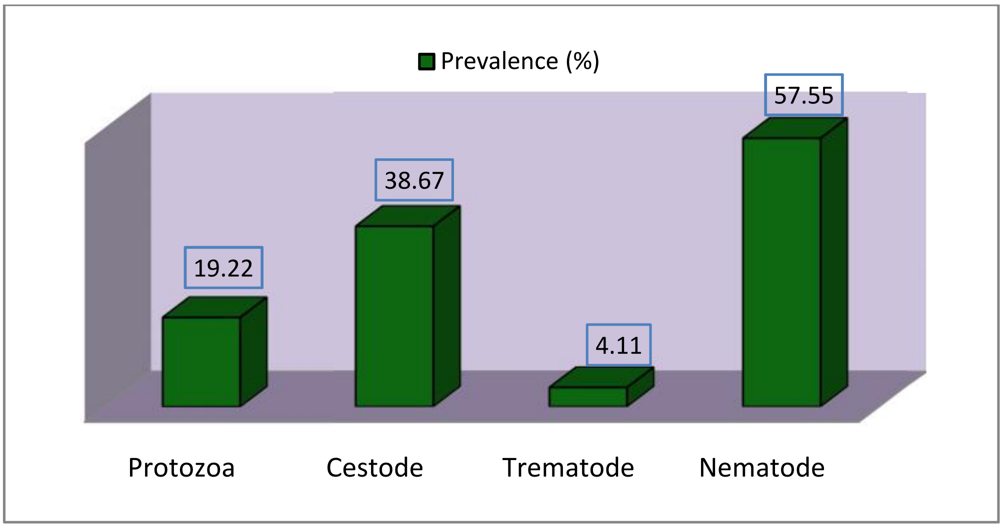


Fig 1. Overall prevalence of different parasitic groups.

Table 3. Prevalence and cyst per gram (CPG) of protozoan parasite species found in female inhabitants.

Group	Name of Parasites	Total samples examined	No. of infected samples	Prev. (%)	CPG (±SD)
Protozoan	*Entamoeba histolytica*	900	94	10.44%	786 ± 4.18
	Entamoeba coli	900	7	0.78%	54 ± 3.86
	Endolimax nana	900	6	0.67%	54 ± 4.5
	Iodamoeba butschlii	900	5	0.55%	30 ± 3.0
	Chilomastix mesnili	900	11	1.22%	90 ± 4.09
	Trichomonas hominis	900	6	0.67%	54 ± 4.5
	Enteromonas hominis	900	6	0.67%	42 ± 3.5
	Giardia intestinalis	900	36	4%	276 ± 3.83
	Isospora hominis	900	8	0.89%	72 ± 4.5
	Balantidium coli	900	3	0.33%	24 ± 4.0
Proportion test among parasitic groups by protozoa		P=0.000 Prevalence of *Entamoeba histolytica* (10.44%) was significantly higher when compared with the others respectively.			

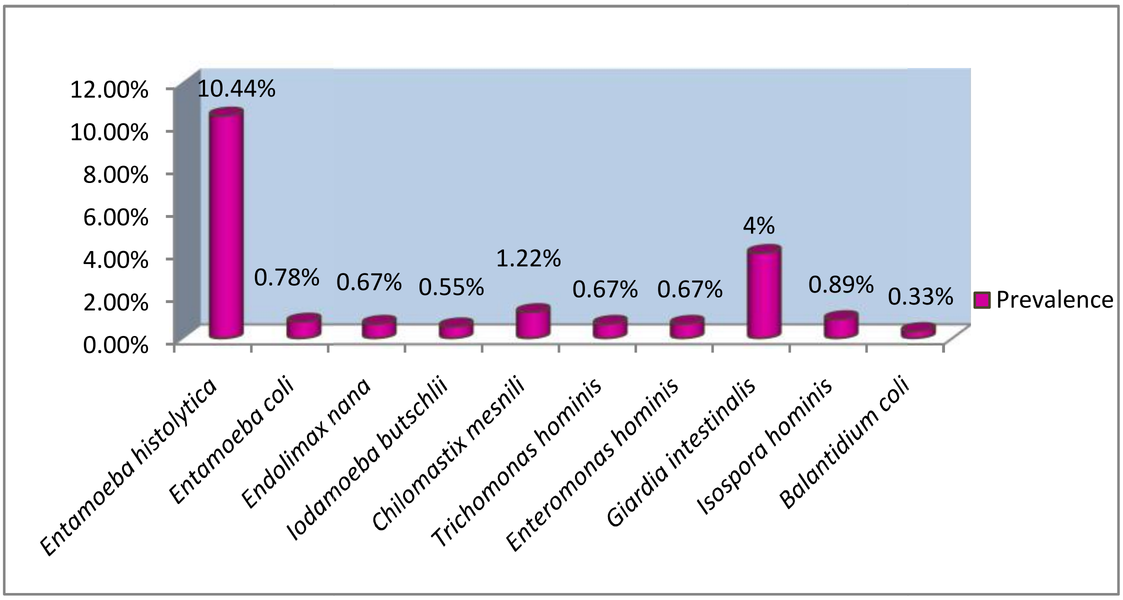


Fig 2. Prevalence of protozoan parasites found in female inhabitants.

Table 4 Prevalence and egg per gram (EPG) of cestode species found in female inhabitants.

Group	Name of Parasites	Total samples examined	No. of infected samples	Prev. (%)	EPG (±SD)
Cestode	*Diphyllobothrium latum*	900	32	3.55%	318 ± 4.97
	Taenia saginata	900	93	10.33%	1038 ± 5.58
	Echinococcus granulosus	900	3	0.33%	24 ± 4.0
	Hymenolepis nana	900	205	22.78%	2886 ± 7.04
	Hymenolepis diminuta	900	74	8.22%	810 ± 5.47
	Dipylidium caninum	900	9	1%	90 ± 5.0
Proportion test among parasitic groups by cestode		P=0.000 Prevalence of *Hymenolepis nana* (22.78%) was significantly higher when compared with the others respectively.			

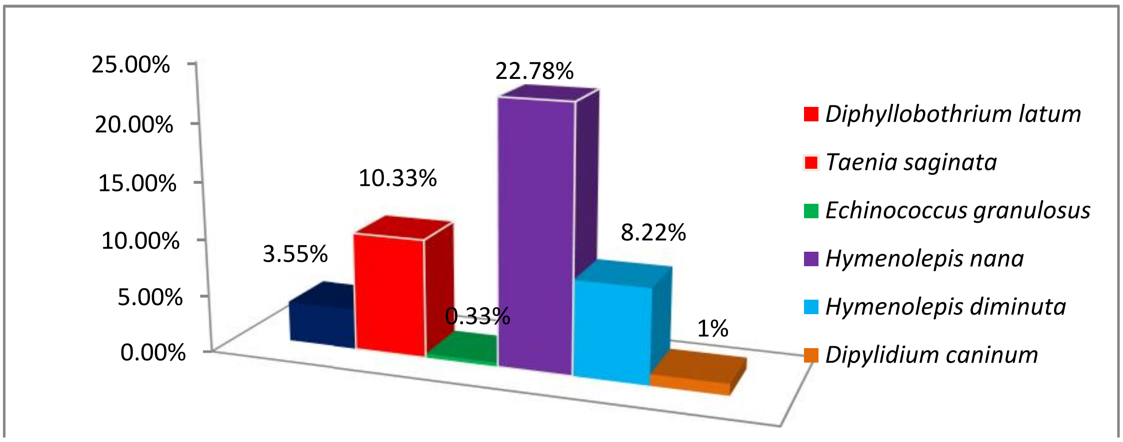


Fig 3. Prevalence of cestode parasites found in female inhabitants.

Table 5. Prevalence and egg per gram (EPG) of trematode species found in female inhabitants.

Group	Name of Parasites	Total samples examined	No. of infected samples	Prev. (%)	EPG (±SD)
Trematode	*Fasciola hepatica*	900	1	0.11%	12 ± 6
	Fasciolopsis buski	900	19	2.11%	174 ± 4.58
	Clonorchis sinensis	900	6	0.67%	48 ± 4
	Paragonimus westermani	900	12	1.33%	102 ± 4.25
Proportion test among parasitic groups by trematode		P=0.0001 Prevalence of *Fasciolopsis buski* (2.11%) was significantly higher when compared with the prevalence of *Fasciola hepatica*, *Paragonimus westermani* and *Clonorchis sinensis* respectively.			

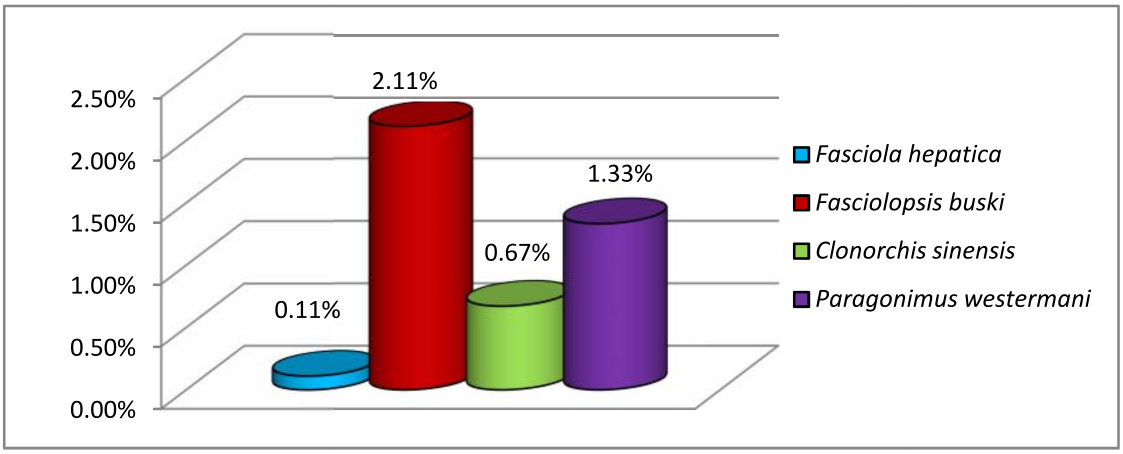


Fig 4. Prevalence of trematode parasites found in female inhabitants.

Table 6. Prevalence and EPG/ LPG (larvae per gram) of nematode species found in female inhabitants.

Group	Name of Parasites	Total samples examined	No. of infected samples	Prev. (%)	EPG/LPG (±SD)
Nematode	*Ascaris lumbricoides*	900	342	38%	39504 ± 57.75
	Trichuris trichiura	900	270	30%	14292 ± 26.47
	Ancylostoma duodenale (egg)	900	98	10.89%	1284 ± 6.55
	Ancylostoma duodenale (larvae)	900	32	3.55%	366 ± 5.72
	Strongyloides stercoralis (larvae)	900	18	2%	144 ± 4.0
	Enterobius vermicularis (egg)	900	14	1.55%	114 ± 4.07
	Capillaria sp.	900	1	0.11%	12 ± 6.0
Proportion test among parasitic groups by nematode		P=0.000 Prevalence of *Ascaris lumbricoides* (38.0%) was significantly higher when compared with the others respectively.			

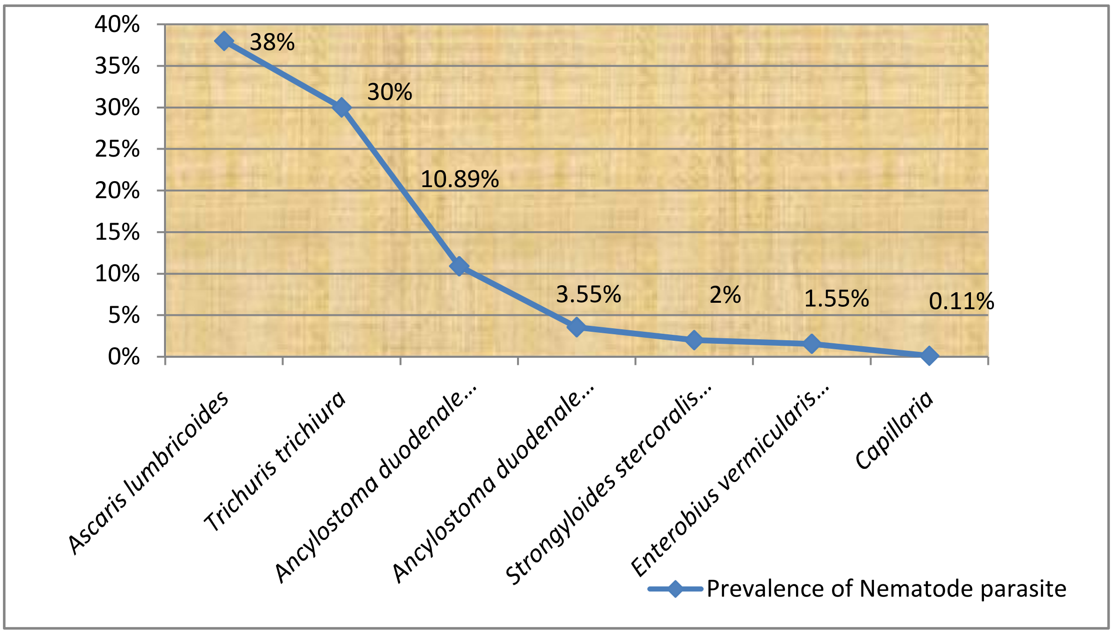


Fig 5. Prevalence of nematode parasites found in female inhabitants.

Among protozoa, CPG of *E. histolytica* was the highest, among cestode group, EPG of *H. nana* was the highest, among trematode, EPG of *F. buski* and among nematode, EPG of *A. lumbricoides* found highest.

In different study areas, comparatively higher prevalence was found (87.5%) in Kamrangichar, in Khilgaon 85%, in Moghbazar 83.33%, in Malibag 73.33%, in Doyagonj and North Shahjahanpur 70% and lowest 30% prevalence was found in Hajaribag (Table 7, Fig 6).

Table 7. Prevalence of intestinal parasites among the female inhabitants in different study areas.

Study Areas	Total no. of stool samples	Infected samples	Prevalence (%)
Doyagonj (nama para bosti)	60	42	70
Gandaria (rail line par)	60	34	56.67
South Shahjahanpur (3rd class railway colony)	80	38	47.5
North Shahjahanpur (slum areas)	40	28	70
Malibag railgate par	120	88	73.33
Khilgaon taltola jhupri	120	102	85
Kamrangichar	80	70	87.5
Shahidullah hall pukur par (3rd class family employee)	60	26	43.33
Hajaribag	60	18	30
Palashi slum	80	46	57.5
Komlapur TT para slum	80	54	67.5
Moghbazar railgate par	60	50	83.33
	900	**596**	**66.22**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of infected sample across the study area	11.629	.000	Prevalence of infected sample across the study area was significantly different.

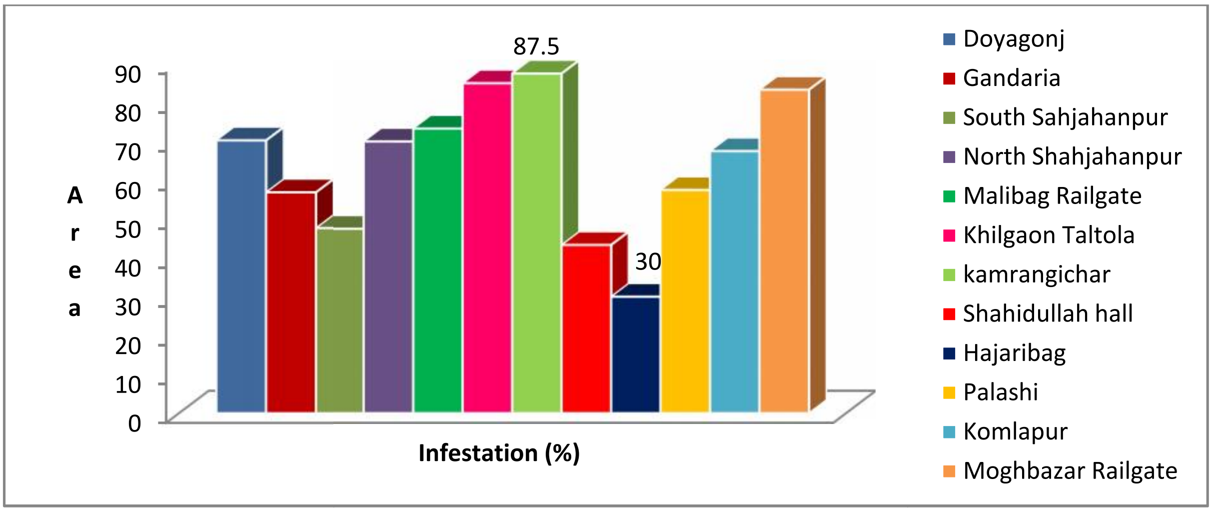


Fig 6. Prevalence of intestinal parasites among the female inhabitants in different study areas.

In different study areas, the prevalence of protozoan parasites was comparatively higher in Shahidullah hall (43.33%) and lower in South Shahjahanpur (8.75%). In case of cestodes, highest prevalence was found in Kamrangichar (71.25) and lowest was in Doyagonj (3.3%). In case of trematodes, the highest prevalence was observed in Hajaribag (15%) and lowest in Khilgaon (1.67%). Among the nematode parasites, highest prevalence was recorded in Moghbazar (70%) and Malibag (69.17%); and lowest in Hajaribag (28.33%) (Table 8, Fig 7).

E. histolytica was found highly prevalent in every area except in South Shahjahanpur, where *I. hominis* showed highest (7.5%). The highest prevalence (25%) of *E. histolytica* was found in Shahidullah hall. Higher prevalence of *G. intestinalis* observed in Kamrangichar (8.75%), and Komlapur (7.5%) while highest prevalence of *C. mesnili* (10%) observed in Shahidullah hall, *T. hominis* (3.33%) found in Doyagonj. Other protozoan parasites that found in samples were mostly non pathogenic parasites (Table 9, Fig 8).

Six cestode species were observed to infest the females of twelve study areas. Among all these parasites, most of the areas were highly infected with *H. nana* except Doyagonj and South Shahjahanpur, and the highest infestation was found in Malibag railgate (41.67%) and Kamrangichar (40%). Comparatively higher infestation showed by *T. saginata* (32.5%) in South Shahjahanpur. The highest prevalence (31.67%) of *H. diminuta* was observed in Khilgaon, and *D. latum* (18.33%) recorded in Shahidullah hall. Among cestode parasites, the infestation of *D. caninum* and *E. granulosus* were very low (Table 10, Fig 9).

In Shahidullah hall, highest prevalence (10%) of *P. westermani* was recorded. *F. hepatica* (1.67%) was only observed in Hajaribag, *F. buski* was found in Kamrangichar (7.5%), South Shahjahanpur, Shahidullah hall (5%), Malibag (3.33%) and Khilgaon (1.67%). *C. sinensis* was observed in Hazaribag (6.67%) and Malibag (1.67%) (Table 11, Fig 10).

Table 8. Prevalence of different parasitic groups among female inhabitants in different study areas. (n= No. of infected samples)

Study areas	Total no. of stool samples examined	Infected by Parasite groups			
		Infected by protozoa	Infected by cestodes	Infected by trematodes	Infected by nematodes
		n	n	n	N
		Prev. (%)	P rev. (%)	Prev. (%)	Prev. (%)
Doyagonj	60	6 (10)	2 (3.33)	0	41 (68.33)
Gandaria	60	7 (11.67)	14 (23.33)	0	27 (45.0)
South Shahjahanpur	80	7 (8.75)	28 (35.0)	4 (5.0)	38 (47.5)
North Shahjahanpur	40	10 (25.0)	16 (40.0)	2 (5.0)	27 (67.5)
Malibag railgate	120	20 (16.67)	67 (55.83)	6 (5.0)	83 (69.17)
Khilgaon taltola	120	21 (17.5)	83 (69.17)	2 (1.67)	70 (58.33)
Kamrangichar	80	27 (33.75)	57 (71.25)	6 (7.5)	53 (66.25)
Shahidullah hall pukur par	60	26 (43.33)	26 (43.33)	8 (13.33)	23 (38.33)
Hajaribag	60	12 (20.0)	16 (26.67)	9 (15)	17 (28.33)
Palashi	80	15 (18.75)	17 (21.25)	0	46 (57.5)
Komlapur TT para	80	16 (20.0)	18 (22.5)	0	51 (63.75)
Moghbazar railgate	60	6 (10.0)	4 (6.67)	0	42 (70.0)
Total	900	173 (19.22)	348 (38.67)	37 (4.11)	518 (57.55)
Analysis of variance (F-test)		F=4.691 P=0.000	F=20.88 P=0.000	F=4.76 P=0.000	F=534 P=0.000

F- test showed that, $p < 0.000$, so prevalence of protozoa, cestode, trematode and nematode were significantly different across the study area.

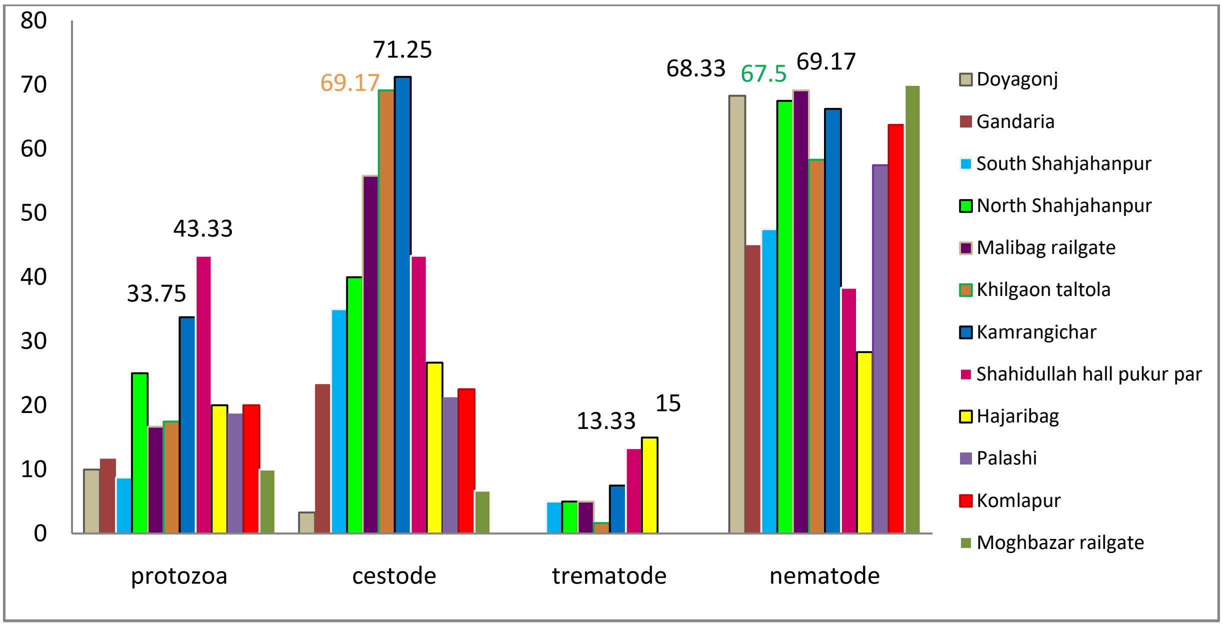


Fig 7. Prevalence of different parasitic groups among female inhabitants in different study areas.

Among nematode parasites, most highly prevalent parasite was *A. lumbricoides*, and the highest (56.67%) was found in Doyagonj and lowest (16.67%) in Khilgaon. In case of *T. trichiura* infection, the highest prevalence (50%) was recorded in Malibag. The highest (22.5%) in Kamrangichar and lowest (3.33%) in Moghbazar of *A. duodenale* (egg) were observed. In case of *A. duodenale* (larva), the highest prevalence (8.33%) recorded in Shahidullah hall; *S. stercoralis* (larva) (6.67%) in Doyagonj and Hajaribag; *E. vermicularis* (egg) (5%) in Kamrangichar. *Capillaria sp*. was only found in Hajaribag (1.67%) (Table 12, Fig 11).

Table 9. Prevalence of protozoan parasites among female inhabitants in different study areas.

Study areas	Total no. of stool samples examined	Prevalence of protozoans parasites									
		Infected by EH	Infected by EC	Infected by EN	Infected by IB	Infected by CM	Infected by TH	Infected by Eh	Infected by GI	Infected by IH	Infected by BC
		n	n	n	n	n	n	n	n	n	n
		P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)
Doyagonj	60	4 (6.67)	0	0	0	0	2 (3.33)	0	0	0	0
Gandaria	60	6 (10.0)	0	0	0	0	0	0	1 (1.67)	0	0
South Shahjahanpur	80	0	0	0	0	0	0	0	1 (1.25)	6 (7.50)	0
North Shahjahanpur	40	8 (20.0)	0	0	0	0	0	0	2 (5.0)	0	0
Malibag railgate	120	8 (6.67)	1 (0.83)	0	0	3 (2.50)	2 (1.67)	1 (0.83)	4 (3.33)	2 (1.67)	0
Khilgaon taltola	120	10 (8.33)	2 (1.67)	2 (1.67)	0	0	0	0	8 (6.67)	0	0
Kamrangichar	80	16 (20.0)	2 (2.50)	3 (3.75)	0	0	0	0	7 (8.75)	0	1 (1.25)
Shahidullah hall pukur par	60	15 (25.0)	2 (3.33)	1 (1.67)	4 (6.67)	6 (10.0)	0	0	1 (1.67)	0	1 (1.67)
Hajaribag	60	6 (10.0)	0	0	1 (1.67)	2 (3.33)	0	3 (5.0)	0	0	1 (1.67)
Palashi	80	9 (11.25)	0	0	0	0	0	2 (2.5)	4 (5.0)	0	0
Komlapur	80	8(10.0)	0	0	0	0	2 (2.5)	0	6 (7.5)	0	0
Moghbazar railgate	60	4 (6.67)	0	0	0	0	0	0	2 (3.33)	0	0
Total	900	94 (10.44)	7 (0.78)	6 (0.67)	5 (0.55)	11 (1.22)	6 (0.67)	6 (0.67)	36 (4.0)	8 (0.89)	3 (0.33)

EH =*Entamoeba histolytica*, EC = *Entamoeba coli*, EN = *Endolimax nana*, IB = *Iodamoeba butschlii*, CM = *Chilomastix mesnili*, TH = *Trichomonas hominis*, Eh = *Enteromonas hominis*, GI = *Giardia intestinalis*, IH = *Isospora hominis*, BC = *Balantidium coli*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of protozoan parasites across the study area	0.828	0.613	Prevalence of protozoan parasites across the study area was not significantly different at 5% level.

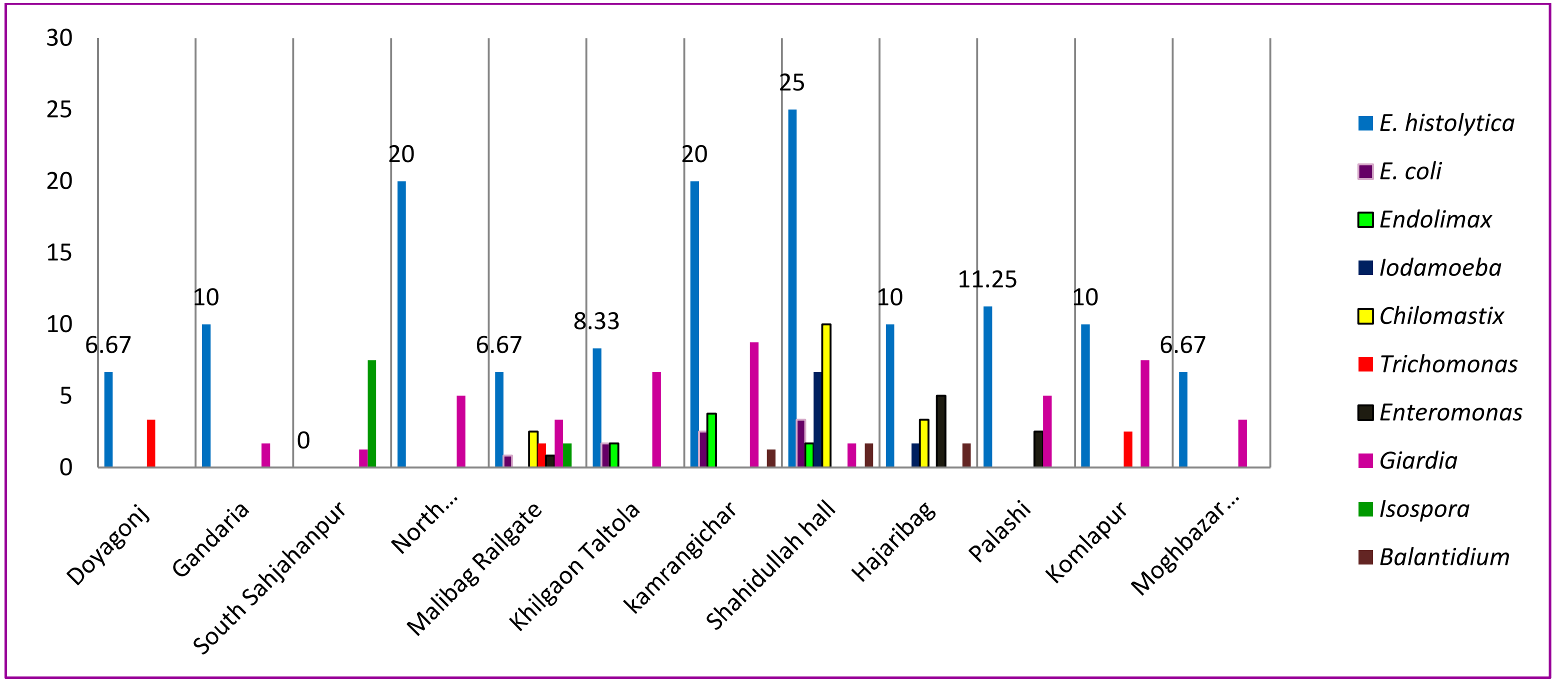


Fig 8. Prevalence of protozoan parasites among female inhabitants in different study areas.

Table 10. Prevalence of cestode parasites among female inhabitants in different study areas.

Study areas	Total no. of stool samples examined	Prevalence of Cestode parasites					
		Infected by DL	Infected by TS	Infected by EG	Infected by HN	Infected by HD	Infected by DC
		n	n	n	n	n	n
		P (%)	P (%)	P (%)	P (%)	P (%)	P (%)
Doyagonj	60	1 (1.67)	2 (3.33)	0	0	0	0
Gandaria	60	1 (1.67)	0	0	13 (21.67)	0	0
South Shahjahanpur	80	0	26 (32.5)	0	0	2 (2.5)	0
North Shahjahanpur	40	0	4 (10.0)	0	14 (35.0)	0	0
Malibag railgate	120	0	14 (11.67)	0	50 (41.67	12 (10.0)	4 (3.33)
Khilgaon taltola	120	5 (4.17)	10 (8.33)	0	44 (36.67)	38 (31.67)	0
Kamrangichar	80	14 (17.5)	8(10.0)	0	32(40.0)	20 (25.0)	0
Shahidullah hall pukur par	60	11 (18.33)	4 (6.67)	3 (5.0)	16 (26.67)	0	3 (5.0)
Hajaribag	60	0	10 (16.67)	0	12 (20.0)	2 (3.33)	2 (3.33)
Palashi	80	0	1 (1.25)	0	16 (20.0)	0	0
Komlapur	80	0	14 (17.5)	0	4 (5.0)	0	0
Moghbazar railgate	60	0	0	0	4 (6.67)	0	0
Total	900	32 (3.55)	93 (10.33)	3 (0.33)	205 (22.78)	74 (8.22)	9 (1.0)

DL =*Diphyllobothrium latum,* TS = *Taenia saginata,* EG = *Echinococcus granulosus,* HN = *Hymenolepis nana* , HD =*Hymenolepis diminuta,* DC = *Dipylidium caninum*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of cestodes across the study area	1.072	0.398	Prevalence of cestodes across the study area was not significantly different at 5% level.

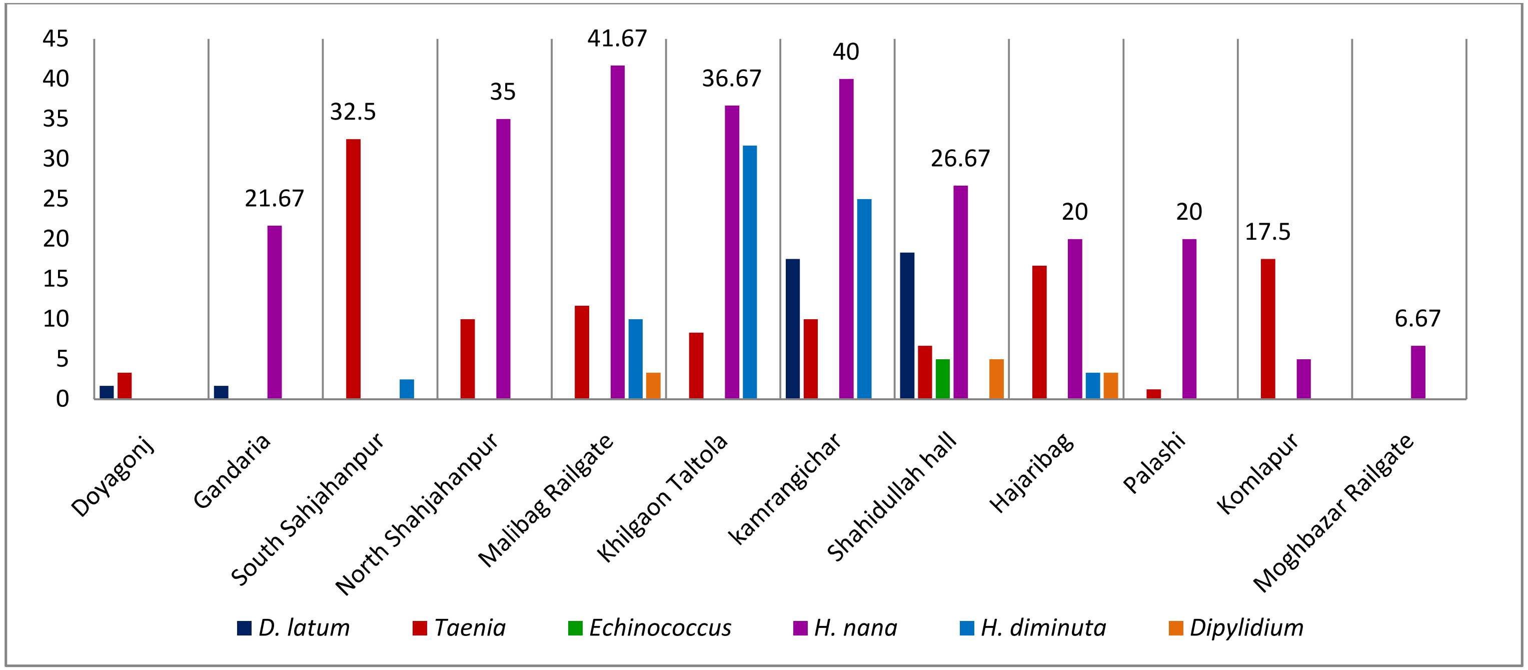


Fig 9. Prevalence of cestode parasites among female inhabitants in different study areas.

Table 11. Prevalence of trematode parasites among female inhabitants in different study areas.

Study areas	Total no. of stool samples examined	Prevalence of trematode parasites			
		Infected by FH	Infected by FB	Infected by CS	Infected by PW
		n	n	n	n
		P (%)	P (%)	P (%)	P (%)
Doyagonj	60	0	0	0	0
Gandaria	60	0	0	0	0
South Shahjahanpur	80	0	4 (5.0)	0	0
North Shahjahanpur	40	0	0	0	2 (5.0)
Malibag railgate	120	0	4 (3.33)	2 (1.67)	0
Khilgaon taltola	120	0	2 (1.67)	0	0
Kamrangichar	80	0	6 (7.5)	0	0
Shahidullah hall pukur par	60	0	3 (5.0)	0	6 (10.0)
Hajaribag	60	1 (1.67)	0	4 (6.67)	4 (6.67)
Palashi	80	0	0	0	0
Komlapur	80	0	0	0	0
Moghbazar railgate	60	0	0	0	0
Total	900	1 (0.11)	19 (2.11)	6 (0.67)	12 (1.33)

FH =*Fasciola hepatica,* FB = *Fasciolopsis buski* , CS =*Clonorchis sinensis,* PW =*Paragonimus westermani,* P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of trematodes across the study area	1.43	0.200	Prevalence of trematodes across the study area was not significantly different at 5% level.

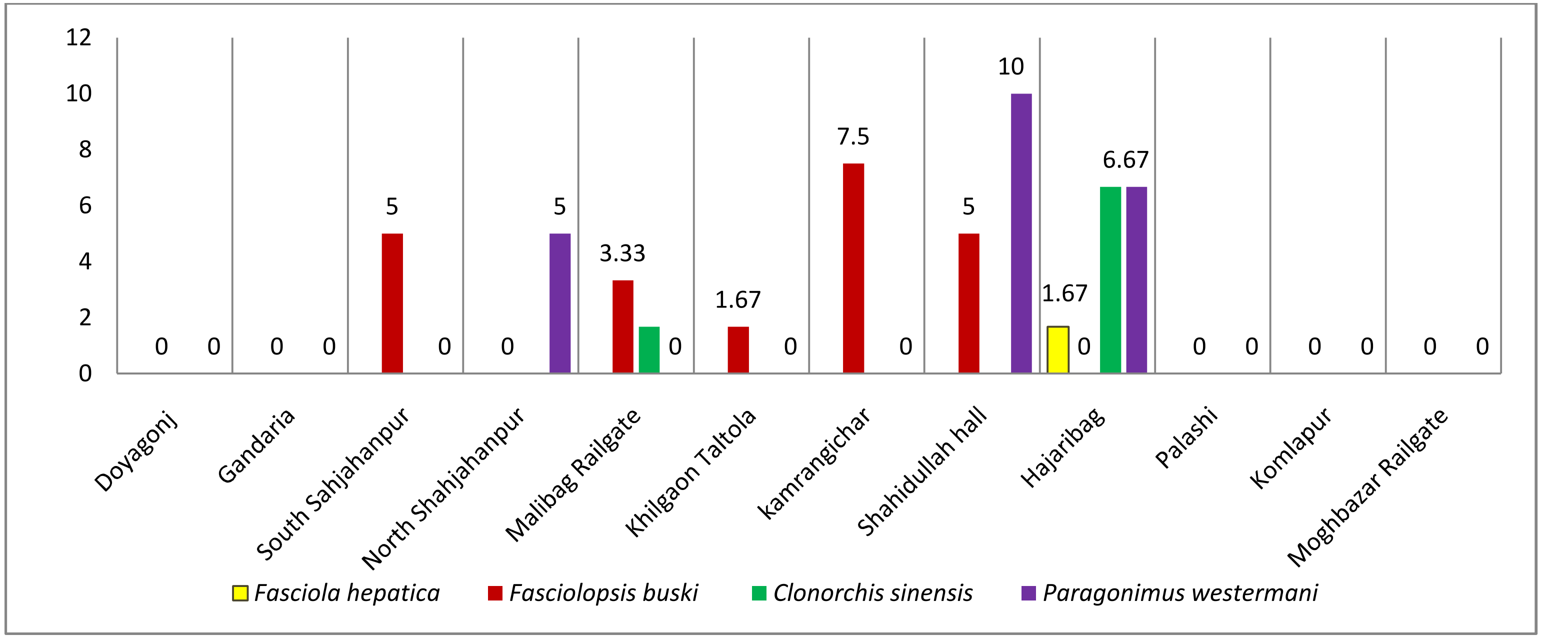


Fig 10. Prevalence of trematode parasites among female inhabitants in different study areas.

Table 12. Prevalence of nematode parasites among female inhabitants in different study areas.

Study areas	Total no. of stool samples examined	Prevalence of nematode parasites						
		Infected by AL	Infected by TT	Infected by AD (egg)	Infected by AD (larvae)	Infected by SS (larvae)	Infected by EV	Infected by C
		n	n	n	n	n	n	n
		P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)
Doyagonj	60	34 (56.67)	22 (36.67)	4 (6.67)	4 (6.67)	4 (6.67)	0	0
Gandaria	60	18 (30.0)	16 (26.67)	4 (6.67)	0	0	0	0
South Shahjahanpur	80	36 (45.0)	20 (25.0)	0	0	0	2 (2.5)	0
North Shahjahanpur	40	19 (47.5)	15 (37.5)	8 (20.0)	2 (5.0)	0	0	0
Malibag railgate	120	54 (45.0)	60 (50.0)	20 (16.67)	4 (3.33)	2 (1.67)	4 (3.33)	0
Khilgaon taltola	120	20 (16.67)	43 (35.83)	20 (16.67)	8 (6.67)	2 (1.67)	2 (1.67)	0
Kamrangichar	80	32 (40.0)	22 (27.5)	18 (22.5)	2 (2.5)	4 (5.0)	4 (5.0)	0
Shahidullah hall pukur par	60	16 (26.67)	0	8 (13.33)	5 (8.33)	2 (3.33)	0	0
Hajaribag	60	11 (18.33)	0	6 (10.0)	3 (5.0)	4 (6.67)	2 (3.33)	1 (1.67)
Palashi	80	40 (50.0)	24 (30.0)	4 (5.0)	4 (5.0)	0	0	0
Komlapur	80	34 (42.5)	30 (37.5)	4 (5.0)	0	0	0	0
Moghbazar railgate	60	28 (46.67)	18 (30.0)	2 (3.33)	0	0	0	0
Total	900	342 (38.0)	270 (30.0)	98 (10.89)	32 (3.55)	18 (2.0)	14 (1.55)	1 (0.11)

AL = *Ascaris lumbricoides*, TT = *Trichuris trichiura*, AD = *Ancylostoma duodenale*, SS = *Strongyloides stercoralis*, EV =*Enterobius vermicularis*, C =*Capillaria*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of nematodes across the study area	0.286	0.987	Prevalence of nematodes across the study area was not significantly different at 5% level.

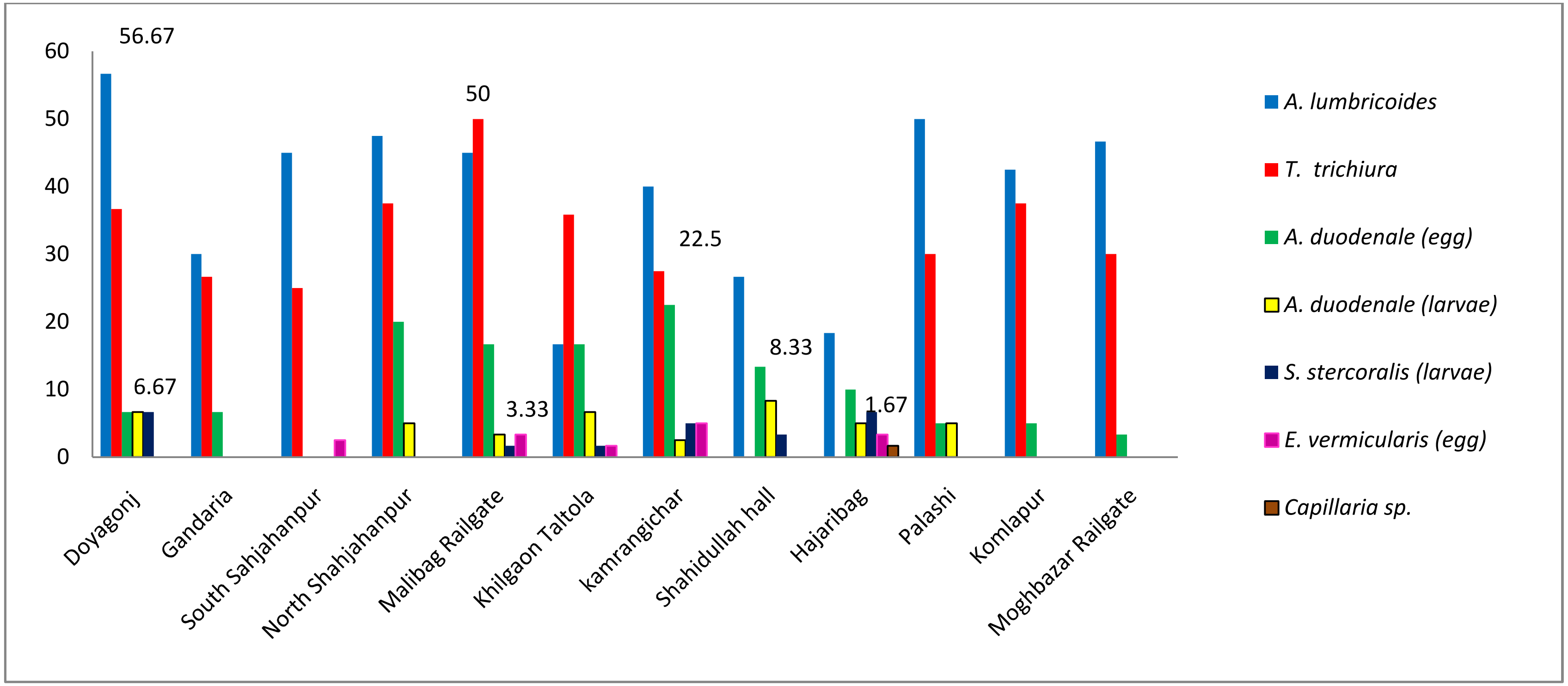


Fig 11. Prevalence of nematode parasites among female inhabitants in different study areas.

5.1.1 Temporal fluctuations of parasites:

The difference in prevalence was noticeable between the months of the study period (September 2013 to August 2015). In Sep’13 to Aug’14, the prevalence was highest (86.67%) in the month of Aug’14 and lowest (45%) in Jan’14. In Sep’14 to Aug’15, the highest prevalence (90%) found in Sep’14 and the lowest (26.67%) in Feb’15. In the remaining months of the year the prevalence fluctuated (Fig 12).

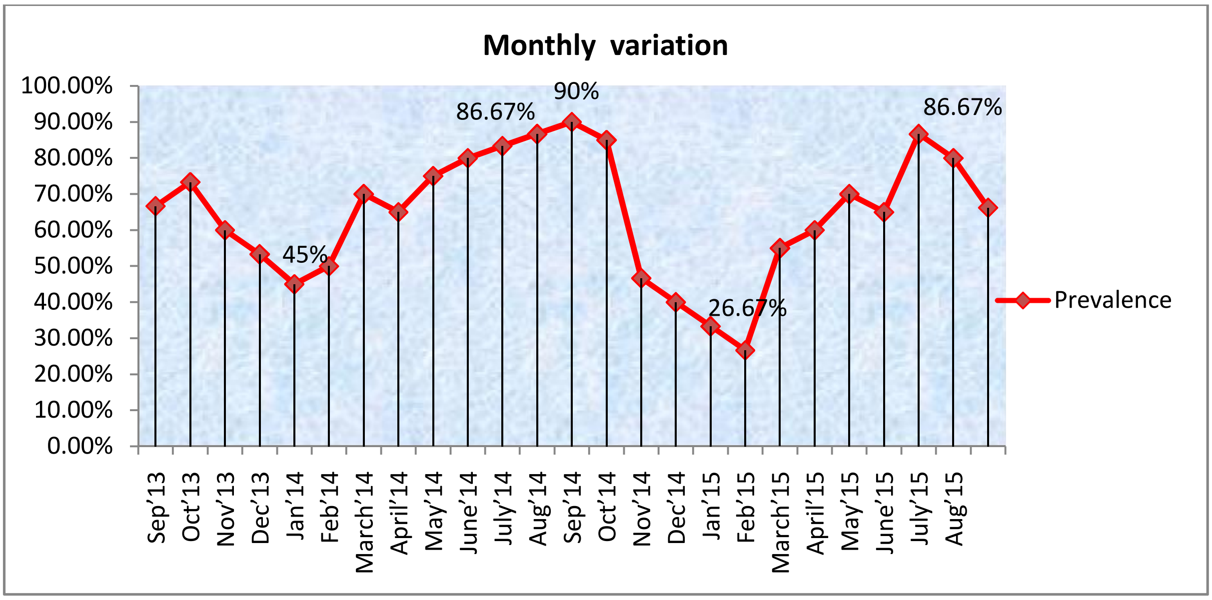


Fig 12. Monthly prevalence of overall gastrointestinal parasites studied among the female inhabitants.

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Monthly prevalence of total gastrointestinal parasites	6.435	0.000	Monthly prevalence of total gastrointestinal parasites was significantly different.

During (2013-14), the prevalence of protozoa was highest (25%) in Mar’14 and lowest (2.5%) in Jan’14, in case of (2014-15) highest (46.67%) in Nov’14 and lowest (5%) in Jun’15. In the 1st study year, it was noticed that, cestode infection was highest (81.67%) in Aug’14, and absent (0) in Sep’13, in the 2nd study year, highest (85%) in Sep’14, absent (0) in Jul’15. During (2013-14), trematode infection recorded highest (15%) in Jun’14, and absent (0) in Sep, Oct, Nov, Dec’13, Feb, Apr, May, Aug’14, in case of (2014-15) highest (20%) in Jan’14, and in Mar, Apr, May, Jun, Jul, Aug’15, infection remained low. During (2013-14), nematode was highest (80%) in Jun’14, and lowest (38.33%) in Jul’14, in case of (2014-15) highest (76.67%) in Jul’15, lowest (26.67%) in Feb’15 (Table 13, Fig 13 and 14).

Table 13. Monthly prevalence of different parasitic groups among female inhabitants.

Month	**Total no. of samples examined**	**Infected by parasite groups (Prevalence %)**							
		Infected by protozoa		Infected by cestodes		Infected by trematodes		Infected by nematodes	
		n	P (%)	n	P (%)	n	P (%)	n	P (%)
Sep’13	30	2	6.67	0	0	0	0	19	63.33
Oct’13	30	4	13.33	2	6.67	0	0	22	73.33
Nov’13	30	5	16.67	5	16.67	0	0	15	50
Dec’13	30	2	6.67	9	30	0	0	12	40
Jan’14	40	1	2.5	14	35	4	10	18	45
Feb’14	40	6	15	14	35	0	0	20	50
Mar’14	40	10	25	16	40	2	5	27	67.5
Apr’14	40	3	7.5	14	35	0	0	21	52.5
May’14	40	9	22.5	22	55	0	0	30	75
Jun’14	40	8	20	31	77.5	6	15	32	80
Jul’14	60	7	11.67	34	56.67	2	3.33	23	38.33
Aug’14	60	14	23.33	49	81.67	0	0	47	78.33
Sep’14	40	14	35	34	85	4	10	27	67.5
Oct’14	40	13	32.5	23	57.5	2	5	26	65
Nov’14	30	14	46.67	14	46.67	4	13.33	13	43.33
Dec’14	30	12	40	12	40	4	13.33	10	33.33
Jan’15	30	7	23.33	9	30	6	20	9	30
Feb’15	30	5	16.67	7	23.33	3	10	8	26.67
Mar’15	40	12	30	12	30	0	0	22	55
Apr’15	40	3	7.5	5	12.5	0	0	24	60
May’15	40	14	35	14	35	0	0	28	70
Jun’15	40	2	5	4	10	0	0	23	57.5
Jul’15	30	3	10	0	0	0	0	23	76.67
Aug’15	30	3	10	4	13.33	0	0	19	63.33
Total/Avg.	**900**	**173**	**19.22%**	**348**	**38.67%**	**37**	**4.11%**	**518**	**57.55%**

P= Prevalence, n= Number of infected sample

Analysis of variance (F-test)

Source of variation	F- test	Sig.	Comments
Monthly prevalence of protozoa, cestode, trematode and nematode	47.293	0.000	Monthly prevalence of parasite groups was significantly different.

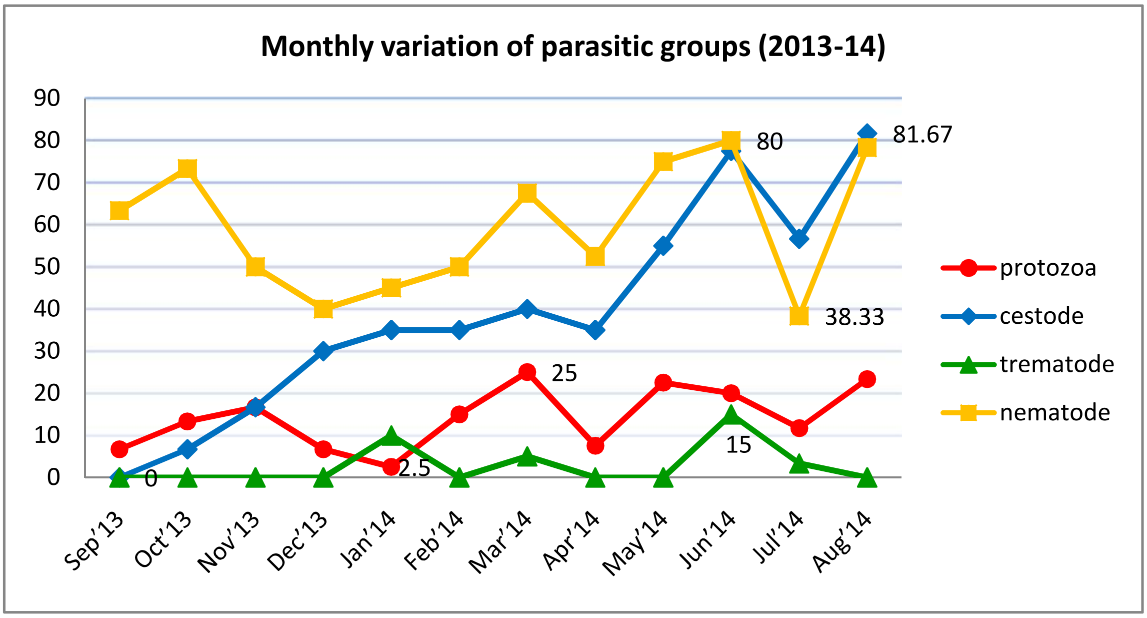


Fig 13. Monthly prevalence of different parasitic groups among female inhabitants (2013-14).

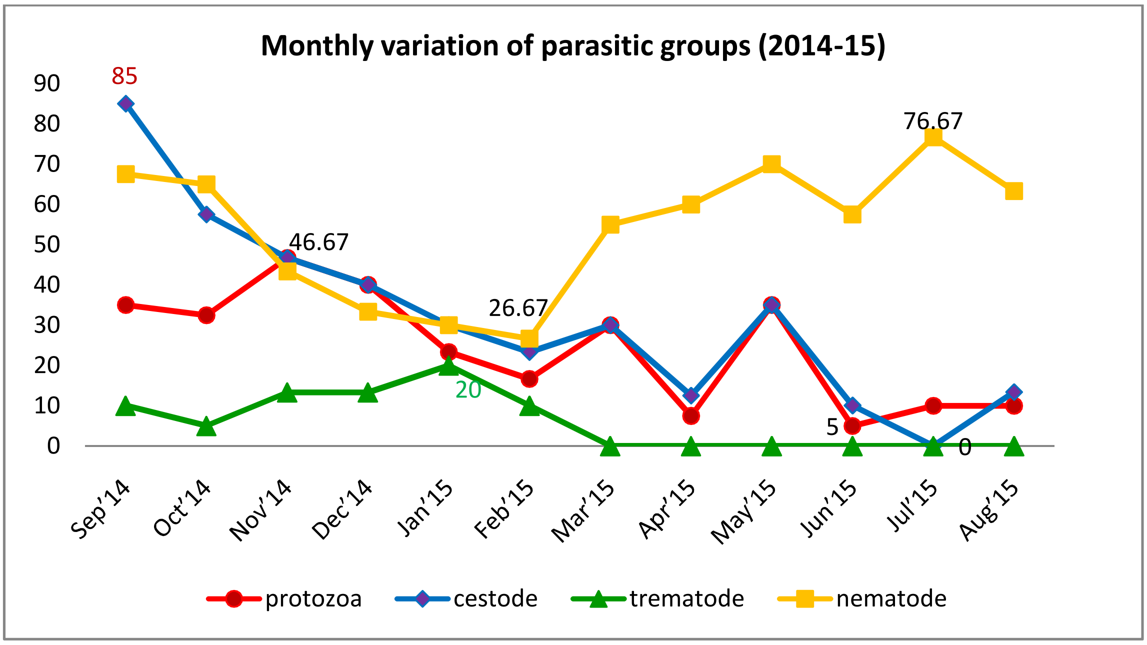


Fig 14. Monthly prevalence of different parasitic groups among female inhabitants (2014-15).

The most prevalent species of protozoan group was *E. histolytica* and *G. intestinalis.* During Sep'13- Aug'14, it was noticed that, *E. histolytica* infection was higher (20%) in Mar'14 and the lower (5%) in Apr'14, absent in Jan, Feb, Jun'14; and in Sep'14-Aug'15, the infection was higher (33.33%) in Nov'14 and lower (2.5%) in Apr'15, absent in Jun'15. In case of *G. intestinalis* (Sep'13- Aug'14), infection was higher (6.67%) in Jul and Aug'14 and absent in Sep, Oct, Dec'13 and Feb'14; and next year, infection was higher (10%) in Sep'14 and May'15, and absent in Nov'14, Jan and Feb'15 (Table 14, Fig 15).

In case of cestodes, *D. latum* found highest in Aug'14 (8.33%) and in next year Oct'14 (25%); T. *Saginata* was highest in Feb'14 (35%) and in 2nd year May'15 (35%); During Sep'13- Aug'14, *H. nana* was highest in Jun'14 (65%) and next year (Sep'14- Aug'15), in Sep'14 (50%); *H. diminuta* was highest (40%) in Aug'14 and in 2nd year highest (40%) in Sep'14 (Table 15, Fig 16).

In case of trematodes, the most prevalent species was *F. buski* and *P. westermani*. During Sep'13- Aug'14, *F. buski* was higher (10%) in Jan and Jun'14 and in next year (Sep'14- Aug'15), the infection was higher (10%) in Sep'14. In case of *P. westermani* (Sep'13- Aug'14), it was noticed that infection was only in the month of Mar'14 (5%) and in second study year, the infection was higher (13.33%) in Nov'14 (Table 16, Fig 17).

In case of nematodes, *A. lumbricoides* showed the highest (65%) infection in May'14 and (53.33%) in July'15. During (2013-14), *T. trichiura* was highest (75%) in Jun'14 and during (2014-2015), it was highest (50%) in May'15. In case of *A. duodenale* (egg), highest infestation was in May'14 (40%) and in Sep'14 (25%). *A. duodenale (larvae)* infestation was recorded highest (13.33%) in Oct'13 and Aug'14; and during 2014-15, higher prevalence (10%) was found in Nov'14 and Mar'15. *S. stercoralis* infection was rare, was found in Oct'13, May and Aug'14; and in next year, in Oct, Dec'14, Jan, Feb'15. *E. vermicularis* infection was observed in Jan, May, Aug'14 during first study year, and next study year found in Sep'14, Jan'15 (Table 17, Fig 18 and 19).

Table 14. Monthly prevalence of different protozoan parasites among the female inhabitants of study areas.

Month	Total samples	Infected by protozoa (P= Prevalence %)									
		EH	EC	EN	IB	CM	TH	Eh	GI	IH	BC
		n	n	n	n	n	n	n	N	n	N
		P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)
Sep’13	30	2 (6.67)	0	0	0	0	0	0	0	0	0
Oct’13	30	2 (6.67)	0	0	0	0	2 (6.67)	0	0	0	0
Nov’13	30	4 (13.33)	0	0	0	0	0	0	1 (3.33)	0	0
Dec’13	30	2 (6.67)	0	0	0	0	0	0	0	0	0
Jan’14	40	0	0	0	0	0	0	0	1 (2.5)	0	0
Feb’14	40	0	0	0	0	0	0	0	0	6 (15.0)	0
Mar’14	40	8 (20.0)	0	0	0	0	0	0	2 (5.0)	0	0
Apr’14	40	2 (5.0)	0	0	0	0	0	0	1 (2.5)	0	0
May’14	40	6 (15.0)	0	0	0	1 (2.5)	0	1 (2.5)	2 (5.0)	0	0
Jun’14	40	0	1 (2.5)	0	0	2 (5.0)	2 (5.0)	0	1 (2.5)	2 (5.0)	0
Jul’14	60	4 (6.67)	0	0	0	0	0	0	4 (6.67)	0	0
Aug’14	60	6 (10.0)	2 (3.33)	2 (3.33)	0	0	0	0	4 (6.67)	0	0
Sep’14	40	8 (20.0)	1 (2.5)	2 (5.0)	0	0	0	0	4 (10.0)	0	0
Oct’14	40	8 (20.0)	1 (2.5)	1 (2.5)	0	0	0	0	3 (7.5)	0	1 (2.5)
Nov’14	30	10 (33.33)	1 (3.33)	0	1 (3.33)	4 (13.33)	0	0	0	0	0
Dec’14	30	5 (16.67)	1 (3.33)	1 (3.33)	3 (10.0)	2 (6.67)	0	0	1 (3.33)	0	1 (3.33)
Jan’15	30	4 (13.33)	0	0	1 (3.33)	1 (3.33)	0	1 (3.33)	0	0	0
Feb’15	30	2 (6.67)	0	0	0	1 (3.33)	0	2 (6.67)	0	0	1 (3.33)
Mar’15	40	8 (20.0)	0	0	0	0	0	2 (5.0)	2 (5.0)	0	0
Apr’15	40	1 (2.5)	0	0	0	0	0	0	2 (5.0)	0	0
May’15	40	8 (20.0)	0	0	0	0	2 (5.0)	0	4 (10.0)	0	0
Jun’15	40	0	0	0	0	0	0	0	2 (5.0)	0	0
Jul’15	30	2 (6.67)	0	0	0	0	0	0	1 (3.33)	0	0
Aug’15	30	2 (6.67)	0	0	0	0	0	0	1 (3.33)	0	0
	900	**94 (10.44)**	**7 (0.78)**	**6 (0.67)**	**5 (0.55)**	**11 (1.22)**	**6 (0.67)**	**6 (0.67)**	**36 (4.0)**	**8 (0.89)**	**3 (0.33)**

EH =*Entamoeba histolytica*, EC = *Entamoeba coli*, EN = *Endolimax nana*, IB = *Iodamoeba butschlii*, CM = *Chilomastix mesnili*, TH = *Trichomonas hominis*, Eh = *Enteromonas hominis*, GI = *Giardia intestinalis*, IH = *Isospora hominis*, BC = *Balantidium coli*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Monthly prevalence of different protozoan parasites	26.83	0.000	Monthly prevalence of different protozoan parasites was significantly different.

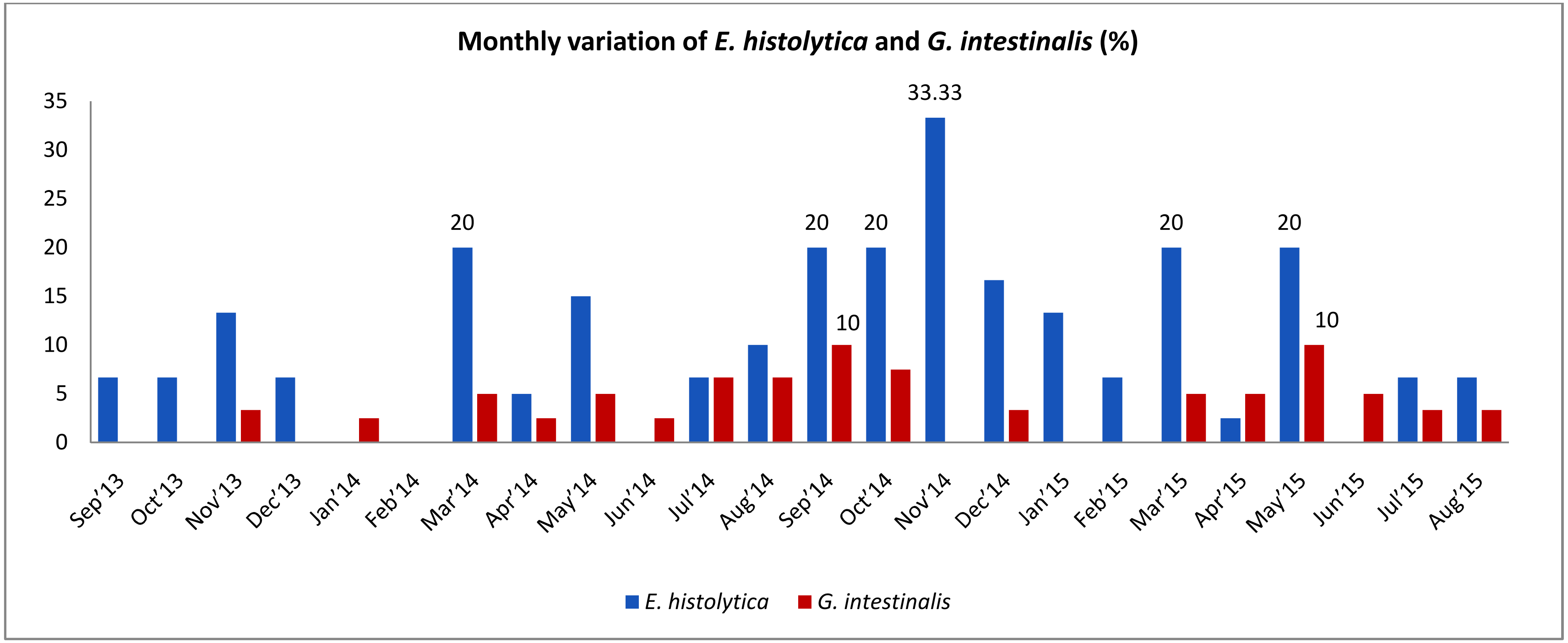


Fig 15. Monthly prevalence of major protozoan parasites among the female inhabitants of study areas.

Table 15. Monthly prevalence of different cestode parasites among the female inhabitants of study areas.

Month	Total samples examined	Infected by cestodes					
		DL	TS	EG	HN	HD	DC
		N	n	n	n	n	n
		P (%)	P (%)	P (%)	P (%)	P (%)	P (%)
Sep'13	30	0	0	0	0	0	0
Oct'13	30	1 (3.33)	2 (6.67)	0	0	0	0
Nov'13	30	1 (3.33)	0	0	4 (13.33)	0	0
Dec'13	30	0	0	0	9 (30.0)	0	0
Jan'14	40	0	12 (30.0)	0	0	2 (5)	0
Feb'14	40	0	14 (35.0)	0	0	0	0
Mar'14	40	0	4 (10.0)	0	14 (35.0)	0	0
Apr'14	40	0	2 (5.0)	0	12 (30.0)	0	0
May'14	40	0	8 (20.0)	0	12 (30.0)	8 (20.0)	0
Jun'14	40	0	4 (10.0)	0	26 (65.0)	4 (10.0)	4 (10.0)
Jul'14	60	0	0	0	20 (33.33)	14 (23.33)	0
Aug'14	60	5 (8.33)	10 (16.67)	0	24 (40.0)	24 (40.0)	0
Sep'14	40	4 (10.0)	8 (20.0)	0	20 (50.0)	16 (40)	0
Oct'14	40	10 (25.0)	0	0	12 (30.0)	4 (10.0)	0
Nov'14	30	6 (20.0)	0	1 (3.33)	10 (33.33)	0	1 (3.33)
Dec'14	30	5 (16.67)	4 (13.33)	2 (6.67)	6 (20.0)	0	2 (6.67)
Jan'15	30	0	4 (13.33)	0	8 (26.67)	0	1 (3.33)
Feb'15	30	0	6 (20.0)	0	4 (13.33)	2 (6.67)	1 (3.33)
Mar'15	40	0	0	0	12 (30.0)	0	0
Apr'15	40	0	1 (2.5)	0	4 (10.0)	0	0
May'15	40	0	14 (35.0)	0	0	0	0
Jun'15	40	0	0	0	4 (10.0)	0	0
Jul'15	30	0	0	0	0	0	0
Aug'15	30	0	0	0	4 (13.33)	0	0
	900	**32 (3.55)**	**93 (10.33)**	**3 (0.33)**	**205 (22.78)**	**74 (8.22)**	**9 (1.0)**

DL =*Diphyllobothrium latum*, TS = *Taenia saginata*, EG = *Echinococcus granulosus*, HN = *Hymenolepis nana* , HD =*Hymenolepis diminuta*, DC = *Dipylidium caninum*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Monthly prevalence of different cestode parasites	10.485	0.000	Monthly prevalence of different cestode parasites was significantly different.

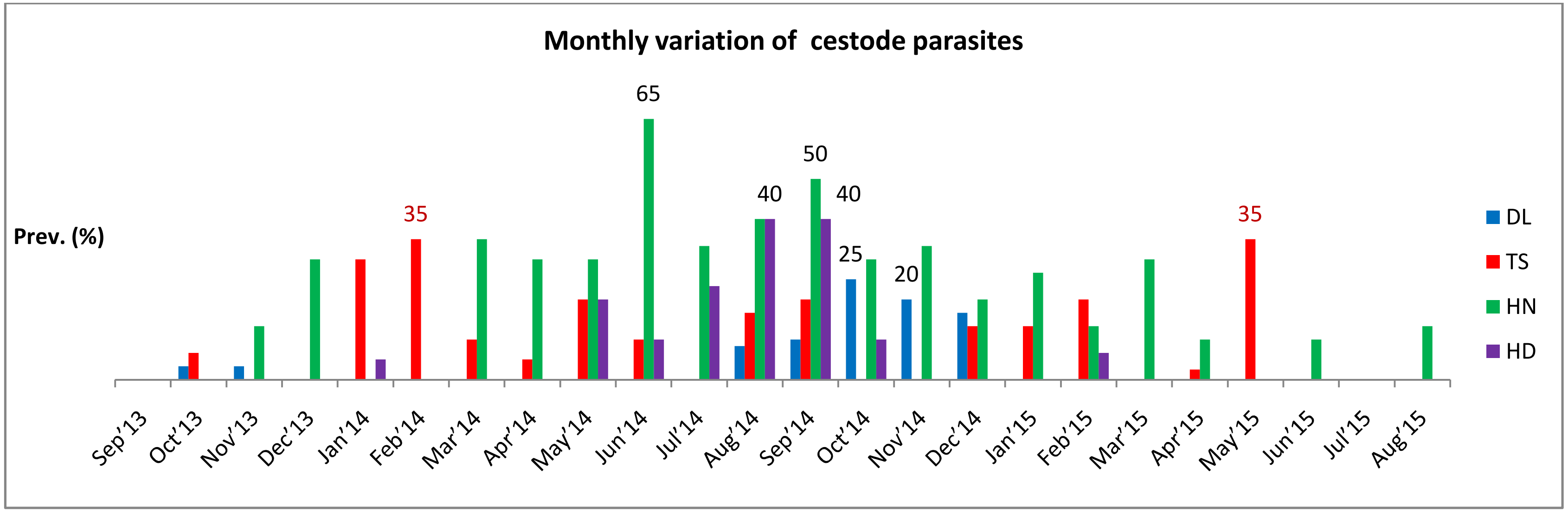


Fig 16. Monthly prevalence of different cestode parasites among the female inhabitants of study areas.

Table 16. Monthly prevalence of different trematode parasites among the female inhabitants of study areas.

Month	Total samples examined	Infected by trematodes							
		FH		FB		CS		PW	
		n	P (%)	n	P (%)	n	P (%)	n	P (%)
Sep’13	30	0		0		0		0	
Oct’13	30	0		0		0		0	
Nov’13	30	0		0		0		0	
Dec’13	30	0		0		0		0	
Jan’14	40	0		4	10	0		0	
Feb’14	40	1	5	0		0		0	
Mar’14	40	0		0		0		2	5
Apr’14	40	0		0		0		0	
May’14	40	0		0		0		0	
Jun’14	40	0		4	10	2	5	0	
Jul’14	60	0		2	3.33	0		0	
Aug’14	60	0		0		0		0	
Sep’14	40	0		4	10	0		0	
Oct’14	40	0		2	5	0		0	
Nov’14	30	0		1	3.33	0		4	13.33
Dec’14	30	0		2	6.67	0		2	6.67
Jan’15	30	0		0		4	13.33	2	6.67
Feb’15	30	0		0		0		2	6.67
Mar’15	40	0		0		0		0	
Apr’15	40	0		0		0		0	
May’15	40	0		0		0		0	
Jun’15	40	0		0		0		0	
Jul’15	30	0		0		0		0	
Aug’15	30	0		0		0		0	
	900	**1**	**0.11**	**19**	**2.11**	**6**	**0.67**	**12**	**1.33**

FH =*Fasciola hepatica*, FB = *Fasciolopsis buski* , CS =*Clonorchis sinensis*, PW =*Paragonimus westermani*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Monthly prevalence of different trematode parasites	1.866	0.141	Monthly prevalence of different trematode parasites was not significantly different at 5% level.

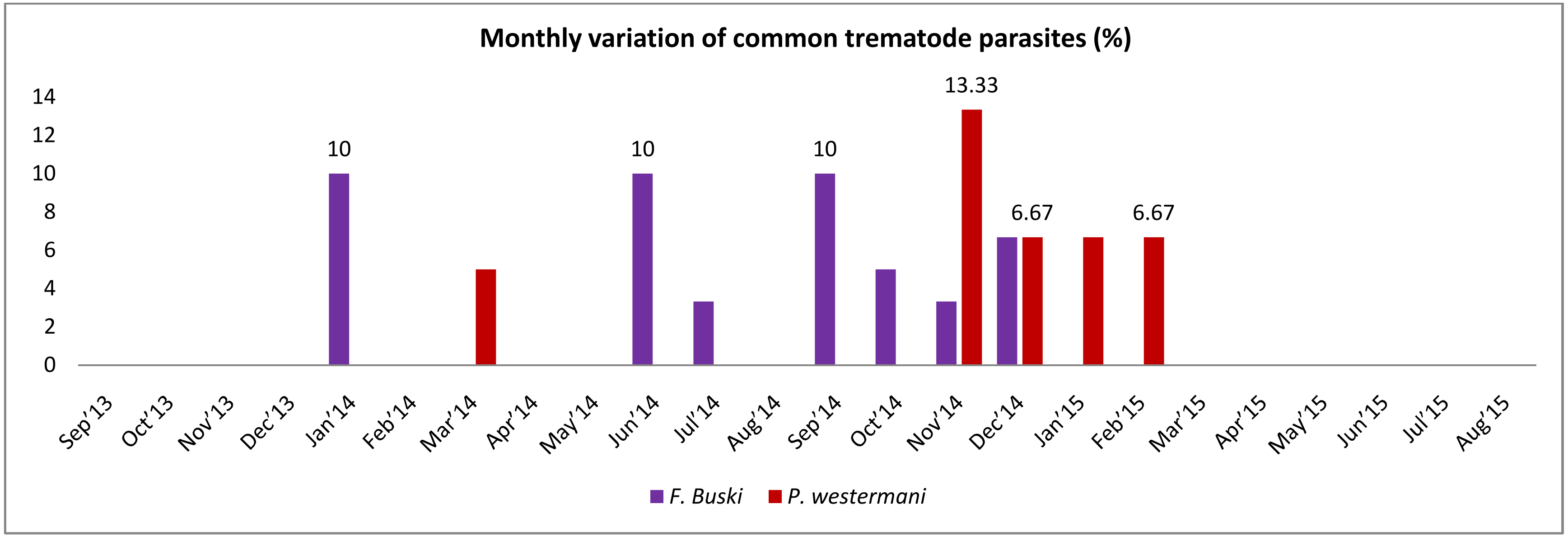


Fig 17. Monthly prevalence of different trematode parasites among the female inhabitants of study areas.

Table 17. Monthly prevalence of different nematode parasites among the female inhabitants of study areas.

Month	Total samples	Infected by nematodes						
		AL	TT	AD (egg)	AD (larvae)	SS (larvae)	EV	C
		n	n	n	n	n	n	n
		P (%)	P (%)	P (%)	P (%)	P (%)	P (%)	P (%)
Sep’13	30	16 (53.33)	10 (33.33)	0	0	0	0	0
Oct’13	30	18 (60.0)	12 (40.0)	4 (13.33)	4 (13.33)	4 (13.33)	0	0
Nov’13	30	10 (33.33)	8 (26.67)	4 (13.33)	0	0	0	0
Dec’13	30	8 (26.67)	8 (26.67)	0	0	0	0	0
Jan’14	40	16 (40.0)	10 (25.0)	0	0	0	2 (5.0)	0
Feb’14	40	20 (50.0)	10 (25.0)	0	0	0	0	0
Mar’14	40	19 (47.5)	15 (37.5)	8 (20.0)	2 (5.0)	0	0	0
Apr’14	40	12 (30.0)	18 (45.0)	0	0	0	0	0
May’14	40	26 (65.0)	12 (30.0)	16 (40.0)	2 (5.0)	2 (5.0)	4 (10.0)	0
Jun’14	40	16 (40.0)	30 (75.0)	4 (10.0)	2 (5.0)	0	0	0
Jul’14	60	0	23 (38.33)	0	0	0	0	0
Aug’14	60	20 (33.33)	20 (33.33)	20 ?(33.33)	8 (13.33)	2 (3.33)	2 (3.33)	0
Sep’14	40	20 (50.0)	10 (25.0)	10 (25.0)	2 (5.0)	0	4 (10.0)	0
Oct’14	40	12 (30.0)	12 (30.0)	8 (20.0)	0	4 (10.0)	0	0
Nov’14	30	10 (33.33)	0	6 (20.0)	3 (10.0)	0	0	0
Dec’14	30	6 (20.0)	0	2 (6.67)	2 (6.67)	2 (6.67)	0	0
Jan’15	30	5 (16.67)	0	2 (6.67)	1 (3.33)	2 (6.67)	2 (6.67)	0
Feb’15	30	6 (20.0)	0	4 (13.33)	2 (6.67)	2 (6.67)	0	1 (3.33)
Mar’15	40	20 (50.0)	16 (40.0)	0	4 (10.0)	0	0	0
Apr’15	40	20 (50.0)	8 (20.0)	4 (10.0)	0	0	0	0
May’15	40	20 (50.0)	20 (50.0)	2 (5.0)	0	0	0	0
Jun’15	40	14 (35.0)	10 (25.0)	2 (5.0)	0	0	0	0
Jul’15	30	16 (53.33)	10 (33.33)	0	0	0	0	0
Aug’15	30	12 (40.0)	8 (26.67)	2 (6.67)	0	0	0	0
	900	**342 (38.0)**	**270 (30.0)**	**98 (10.98)**	**32 (3.55)**	**18 (2.0)**	**14 (1.55)**	**1 (0.11)**

AL = *Ascaris lumbricoides*, TT = *Trichuris trichura*, AD = *Ancylostoma duodenale*, SS = *Strongyloides stercoralis*, EV =*Enterobius vermicularis*, C =*Capillaria*, P = Prevalence, n =No. of infected sample

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Monthly prevalence of different nematode parasites	43.408	0.000	Monthly prevalence of different nematode parasites was significantly different.

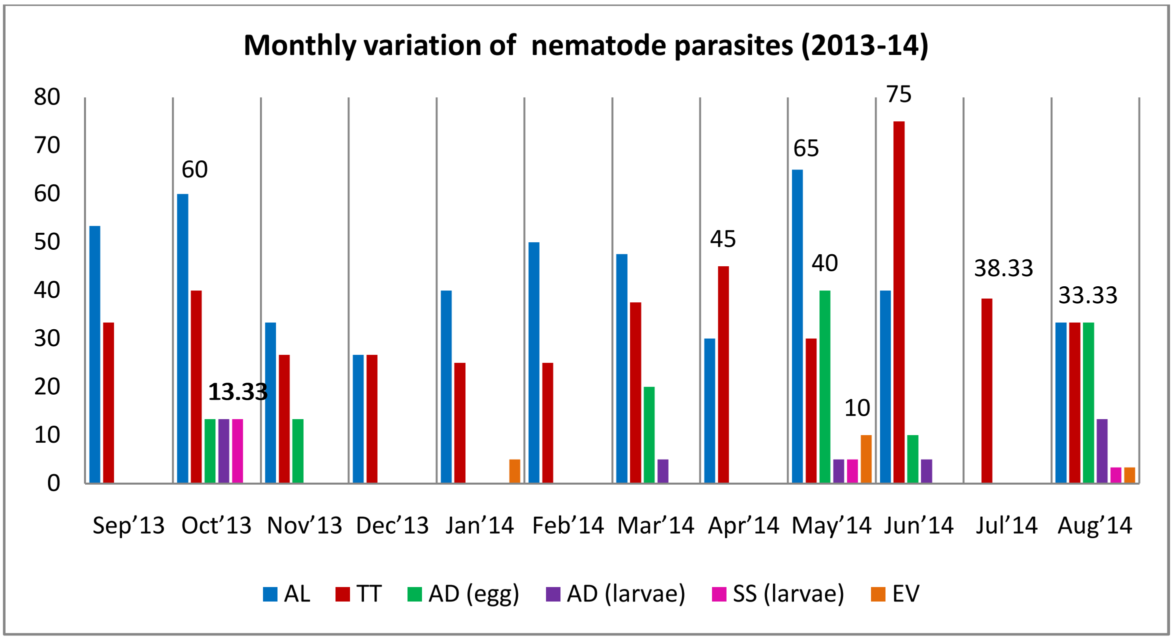


Fig 18. Monthly prevalence of different nematode parasites among the female inhabitants.

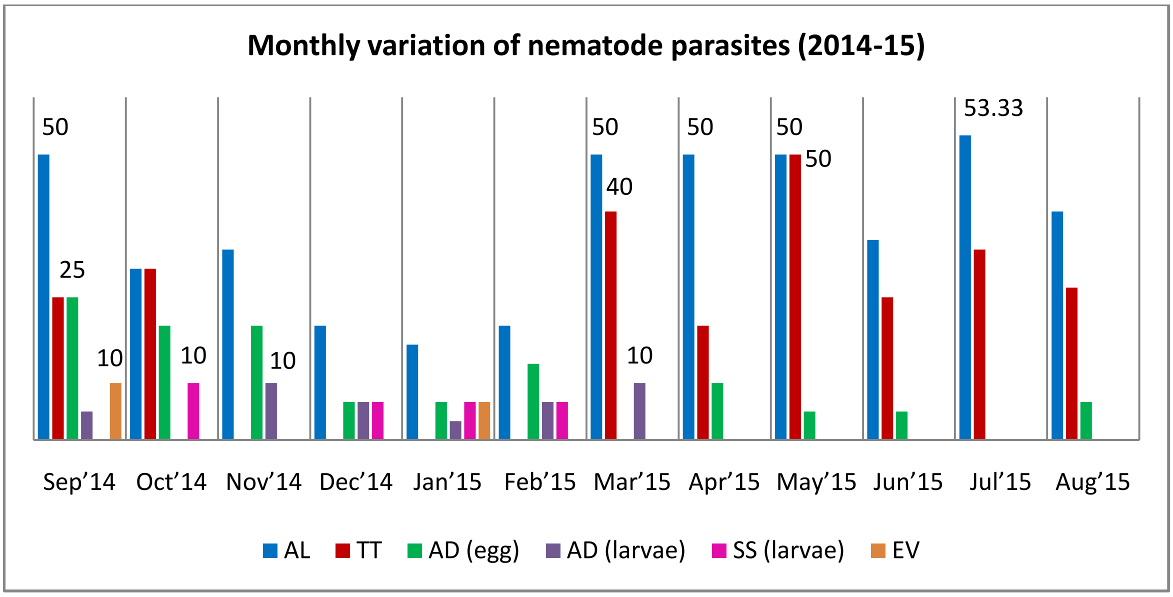


Fig 19. Monthly prevalence of different nematode parasites among the female inhabitants.

5.1.2 Seasonal variation in parasitic prevalence:

The peak prevalence (86%) was observed in rainy’14 and lowest (30%) in winter’15 (Table 18, Fig 20).

Among the parasitic groups, protozoa were found highest (43.33%) in win’14 (Nov-Dec) and trematodes (15%) in winter’15 (Jan-Feb). In cestodes, highest infestation (70%) was recorded in rainy’14 and in nematodes, highest (68.75%) observed in summer’14 (Table 19, Fig 21).

Overall peak prevalence (82.5%) was recorded in rainy season, moderate in summer (67.5%) and lowest (44.61%) in winter (Table 20, Fig 22).

Table 18. Seasonal prevalence of parasites during the study period Sep’13 to Aug’15 among female inhabitants.

Season	Total samples examined	Infected samples	Prevalence (%)
Rainy’13 (Sep’13-Oct’13)	60	42	70.0
Winter’13 (Nov’13- Dec’13)	60	34	56.67
Winter’14 (Jan’14- Feb’14)	80	38	47.5
Summer’14 (Mar’14- Jun’14)	160	116	72.5
Rainy’14 (Jul’14- Oct’14)	200	172	86.0
Winter’14 (Nov’14- Dec’14)	60	26	43.33
Winter’15 (Jan’15- Feb’15)	60	18	30.0
Summer’15 (Mar’15- Jun’15)	160	100	62.5
Rainy’15 (Jul’15- Aug’15)	60	50	83.33
	900	**596**	**66.22**

Analysis of variance (F-test) and Multiple Comparisons

Source of variation	F-test	Level of significant	Multiple Comparisons by LSD		Level of significant
Seasonal (Winter, Summer and Rainy) prevalence of infected sample	51.317	0.000 Significant	Winter	Summer	0.000*
				Rainy	0.000*
			Summer	Winter	0.000*
				Rainy	0.000*
			Rainy	Winter	0.000*
				Summer	0.000*

*. The mean difference was significant at the 0.05 level.

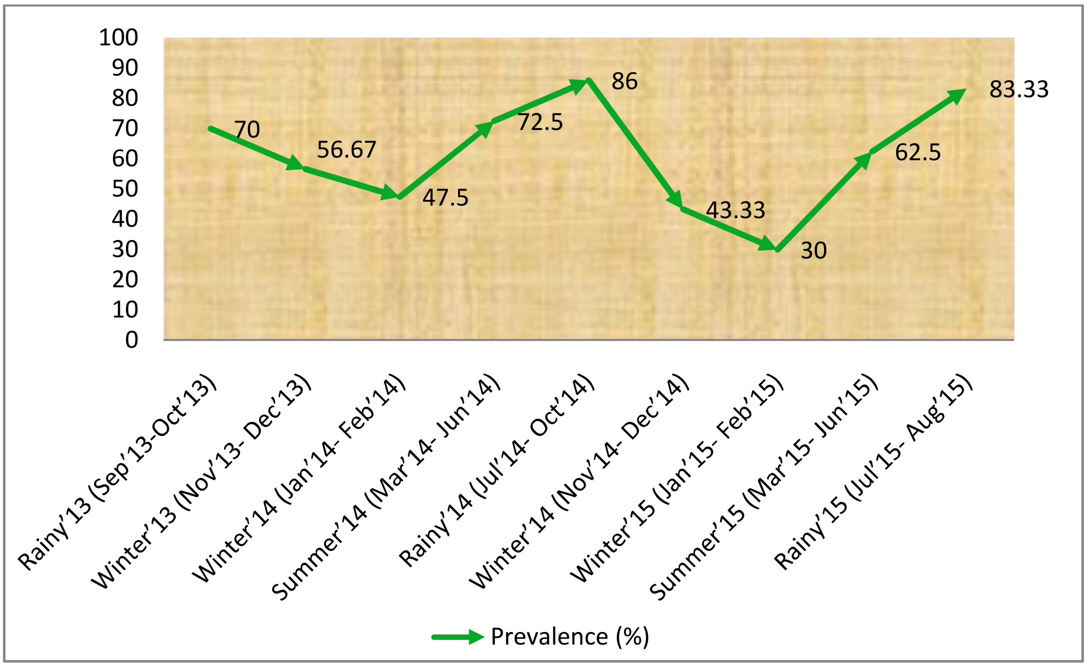


Fig 20. Seasonal prevalence of parasites during Sep'13 to Aug'15 in female inhabitants.

In case of *E. histolytica*, *G. intestinalis*, *E. coli* and *E. nana*, highest prevalence was 10.62%, 5.31%, 1.25% and 1.56% respectively in rainy season. In case of *I. butschlii*, *C. mesnili*, *E. hominis* and *I. hominis*, highest was 1.92%, 2.5%, 1.15% and 2.31% respectively in winter and in case of *T. hominis*, highest was 1.25% in summer (Table 21, Fig 23).

In case of cestodes, *H. nana* was found highest (26.25%) in summer; *H. diminuta* (18.12%) and *D. latum* (6.25%) was highest in rainy season; *T. saginata* (15.38%), *E. granulosus* (1.15%) and *D. caninum* (1.92%) was highest in winter (Table 22, Fig 24).

Among four trematode parasites, winter was the peak season, the highest prevalence of *P. westermani*, *F. buski*, *C. sinensis* and *D. latum* was 3.84%, 2.69%, 1.54% and 0.38% respectively in winter and lowest prevalence was found in rainy season except *F. buski* (Table 23, Fig 25).

In case of *A. lumbricoides* (45.94%) and *T. trichiura* (40.31%), summer is the season for peak infestation, and remaining parasites such as *A. duodenale* (egg and larva) (13.75% and 4.37%), *S. stercoralis* (3.12%) and *E. vermicularis* (1.87%) was found highest in rainy season (Table 24, Fig 26).

Table 19. Seasonal prevalence of different parasitic groups among the female inhabitants. (P = Prevalence, n =No. of infected sample)

Season	**Total no. of samples examined**	**Infected by parasite groups (Prevalence %)**							
		Infestation of protozoa		Infestation of cestodes		Infestation of trematodes		Infestation of nematodes	
		n	P (%)	n	P (%)	n	P (%)	n	P (%)
Rainy'13 (Sep-Oct'13)	60	6	10.0	2	3.33	0	0	41	68.33
Winter'13 (Nov-Dec'13)	60	7	11.67	14	23.33	0	0	27	45.0
Winter'14 (Jan-Feb'14)	80	7	8.75	28	35.0	4	5.0	38	47.5
Summer'14 (Mar-Jun'14)	160	30	18.75	83	51.87	8	5.0	110	68.75
Rainy'14 (Jul-Oct'14)	200	48	24.0	140	70.0	8	4.0	123	61.5
Winter'14 (Nov-Dec'14)	60	26	43.33	26	43.33	8	13.33	23	38.33
Winter'15 (Jan-Feb'15)	60	12	20.0	16	26.67	9	15.0	17	28.33
Summer'15 (Mar-Jun'15)	160	31	19.37	35	21.87	0	0	97	60.62
Rainy'15 (Jul-Aug'15)	60	6	10.0	4	6.67	0	0	17	28.33
	900	**173**	**19.22**	**348**	**38.67**	**37**	**4.11**	**518**	**57.55**

Analysis of variance (F-test) and Multiple Comparisons

Parasite	Source of variation	F-test	Level of significant	Multiple Comparisons by LSD		Level of significant
Protozoa	Seasonal (Winter, Summer and Rainy) prevalence of Protozoa	.076	.927	Winter	Summer	.776
					Rainy	.705
				Summer	Winter	.776
					Rainy	.920
				Rainy	Winter	.705
					Summer	.920

<table>
<tr><th>Parasite</th><th>Source of variation</th><th>F-test</th><th>Level of significant</th><th colspan="2">Multiple Comparisons by LSD</th><th>Level of significant</th></tr>
<tr><td rowspan="6">Cestode</td><td rowspan="6">Seasonal (Winter, Summer and Rainy) prevalence of Cestode</td><td rowspan="6">5.754</td><td rowspan="6">.003</td><td rowspan="2">Winter</td><td>Summer</td><td>.259</td></tr>
<tr><td>Rainy</td><td>.001*</td></tr>
<tr><td rowspan="2">Summer</td><td>Winter</td><td>.259</td></tr>
<tr><td>Rainy</td><td>.023*</td></tr>
<tr><td rowspan="2">Rainy</td><td>Winter</td><td>.001*</td></tr>
<tr><td>Summer</td><td>.023*</td></tr>
<tr><td rowspan="6">Trematode</td><td rowspan="6">Seasonal (Winter, Summer and Rainy) prevalence of Trematode</td><td rowspan="6">7.389</td><td rowspan="6">.001</td><td rowspan="2">Winter</td><td>Summer</td><td>.001*</td></tr>
<tr><td>Rainy</td><td>.001*</td></tr>
<tr><td rowspan="2">Summer</td><td>Winter</td><td>.001*</td></tr>
<tr><td>Rainy</td><td>1.000</td></tr>
<tr><td rowspan="2">Rainy</td><td>Winter</td><td>.001*</td></tr>
<tr><td>Summer</td><td>1.000</td></tr>
<tr><td rowspan="6">Nematode</td><td rowspan="6">Seasonal (Winter, Summer and Rainy) prevalence of Nematode</td><td rowspan="6">23.128</td><td rowspan="6">.000</td><td rowspan="2">Winter</td><td>Summer</td><td>.000*</td></tr>
<tr><td>Rainy</td><td>.000*</td></tr>
<tr><td rowspan="2">Summer</td><td>Winter</td><td>.000*</td></tr>
<tr><td>Rainy</td><td>.935</td></tr>
<tr><td rowspan="2">Rainy</td><td>Winter</td><td>.000*</td></tr>
<tr><td>Summer</td><td>.935</td></tr>
</table>

*. The mean difference was significant at the 0.05 level.

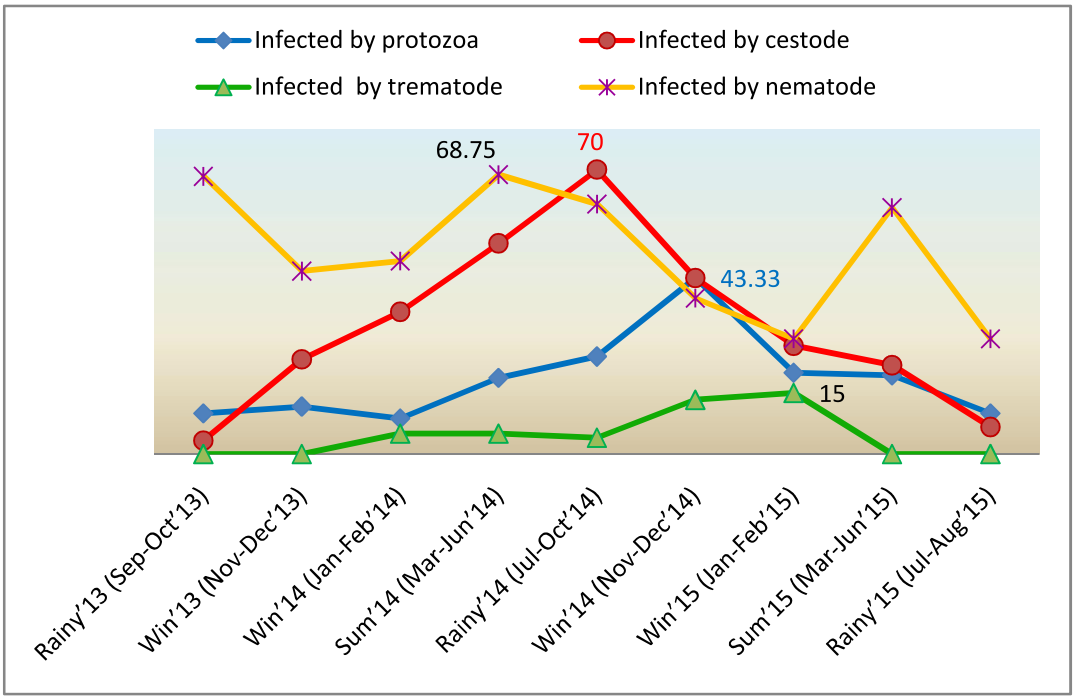


Fig 21. Seasonal prevalence of parasitic groups among the female inhabitants.

Table 20. Overall seasonal prevalence of parasites among the female inhabitants.

Winter (Nov-Feb)			Summer (Mar-Jun)			Rainy (Jul-Oct)		
Total samples examined	No. of infected samples	Prevalence (%)	Total samples examined	No. of infected samples	Prevalence (%)	Total samples examined	No. of infected samples	Prevalence (%)
260	116	44.61	320	216	67.5	320	264	82.5
Proportion test: Winter vs Summer p= 0.0000 significant, Winter vs Rainy p = 0.0000 significant, Summer vs Rainy p = 0.0002 significant.								

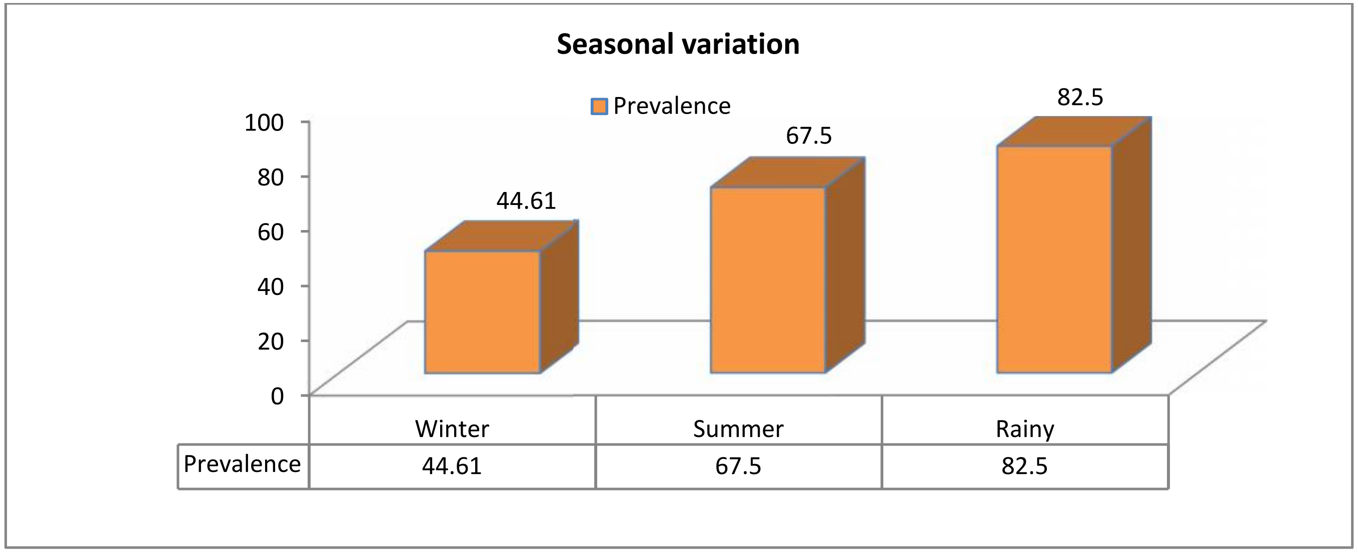


Fig 22. Overall seasonal prevalence of parasites among the female inhabitants.

Table 21. Seasonal prevalence of different protozoan parasites among the female inhabitants.

	Winter (Nov-Feb)			Summer ((Mar-Jun)			Rainy (Jul-Oct)		
Parasites	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)
Entamoeba histolytica	260	27	10.38	320	33	10.31	320	34	10.62
Entamoeba coli		2	0.77		1	0.31		4	1.25
Endolimax nana		1	0.38		0	0		5	1.56
Iodamoeba butschlii		5	1.92		0	0		0	0
Chilomastix mesnili		8	2.5		3	0.94		0	0
Trichomonas hominis		0	0		4	1.25		2	0.77
Enteromonas hominis		3	1.15		3	0.94		0	0
Giardia intestinalis		3	1.15		16	5		17	5.31
Isospora hominis		6	2.31		2	0.62		0	0
Balantidium coli		2	0.77		0	0		1	0.31

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Seasonal prevalence of different protozoan parasites	.010	.990	Seasonal prevalence of different protozoan parasites was not significantly different.

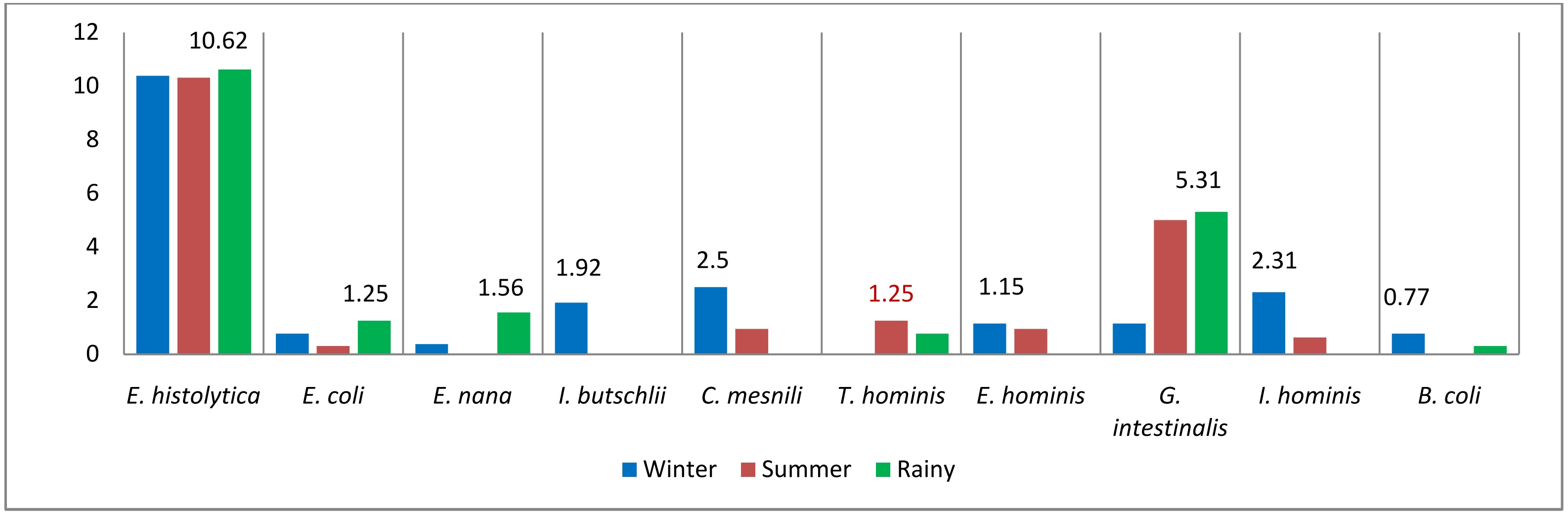


Fig 23. Seasonal prevalence of different protozoan parasites among the female inhabitants.

Table 22. Seasonal prevalence of different cestode parasites among the female inhabitants.

	Winter (Nov-Feb)			**Summer ((Mar-Jun)**			**Rainy (Jul-Oct)**		
Parasites	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)
Diphyllobothrium latum	260	12	4.61	320	0	0	320	20	6.25
Taenia saginata		40	15.38		33	10.31		20	6.25
Echinococcus granulosus		3	1.15		0	0		0	0
Hymenolepis nana		41	15.77		84	26.25		80	25
Hymenolepis diminuta		4	1.54		12	3.75		58	18.12
Dipylidium caninum		5	1.92		4	1.25		0	0

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Seasonal prevalence of different cestode parasites	.192	.828	Seasonal prevalence of different cestode parasites was not significantly different.

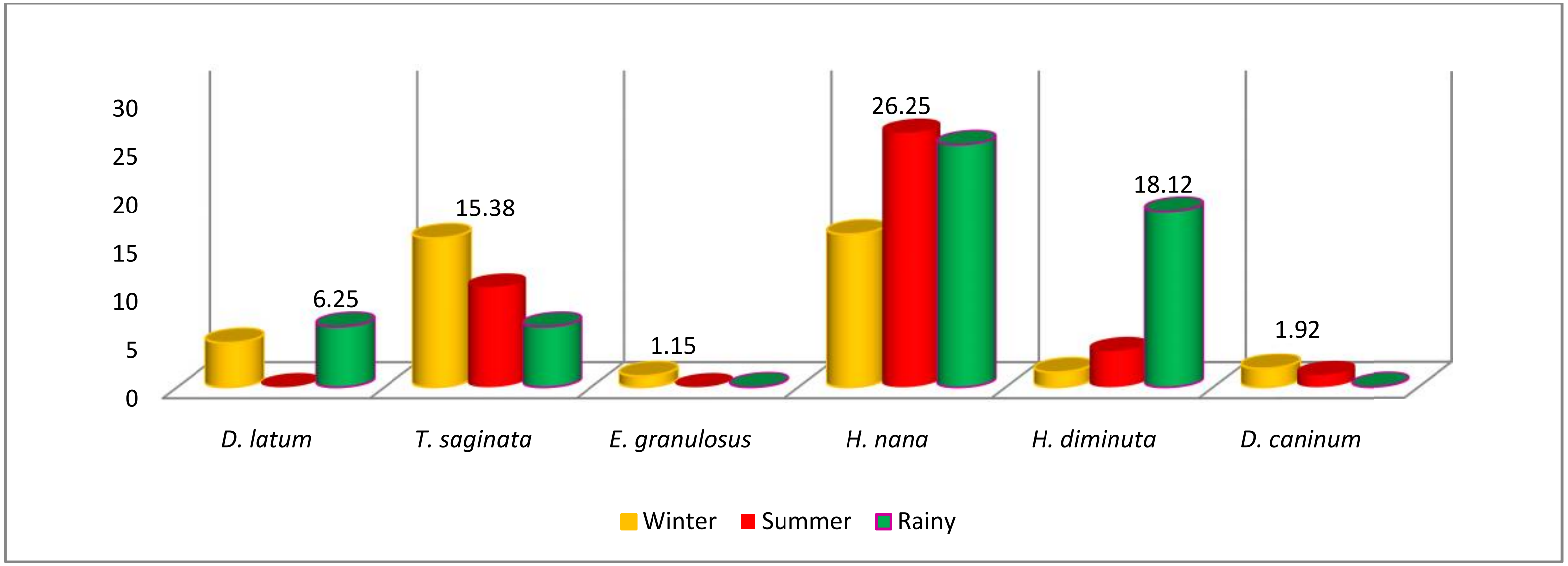


Fig 24. Seasonal prevalence of different cestode parasites among the female inhabitants.

Table 23. Seasonal prevalence of different trematode parasites among the female inhabitants.

	Winter (Nov-Feb)			Summer ((Mar-Jun)			Rainy (Jul-Oct)		
Parasites	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)
Fasciola hepatica	260	1	0.38	320	0	0	320	0	0
Fasciolopsis buski		7	2.69		4	1.25		8	2.5
Clonorchis sinensis		4	1.54		2	0.62		0	0
Paragonimus westermani		10	3.84		2	0.62		0	0

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Seasonal prevalence of different trematode parasites	2.195	.167	Seasonal prevalence of different trematode parasites was not significantly different.

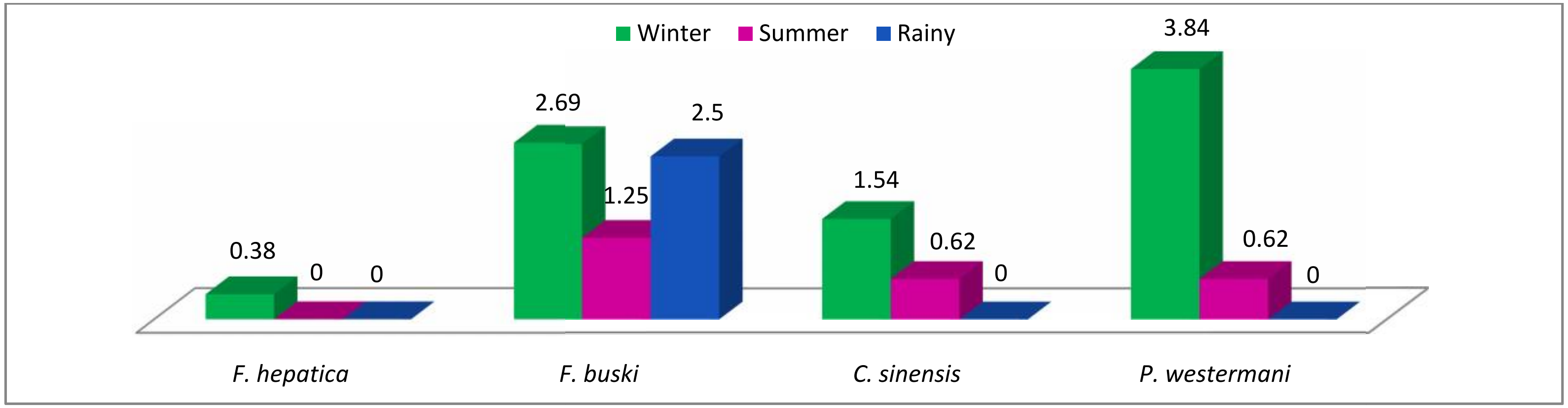


Fig 25. Seasonal prevalence of different trematode parasites among the female inhabitants.

Table 24. Seasonal prevalence of different nematode parasites among the female inhabitants.

	Winter (Nov-Feb)			**Summer (Mar-Jun)**			**Rainy (Jul-Oct)**		
Parasites	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)	Total sample examined	No. of infected samples	Prev. (%)
Ascaris lumbricoides	260	81	31.15	320	147	45.94	320	114	35.62
Trichuris trichiura		36	13.85		129	40.31		105	32.81
Ancylostoma duodenale (egg)		18	6.92		36	11.25		44	13.75
Ancylostoma duodenale (larvae)		8	3.08		10	3.12		14	4.37
Stongyloides stercoralis (larvae)		6	2.31		2	0.62		10	3.12
Enterobius vermicularis (egg)		4	1.54		4	1.54		6	1.87
Capillaria sp.		1	0.38		0	0		0	0

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Seasonal prevalence of different nematode parasites	.295	.748	Seasonal prevalence of different nematode parasites was not significantly different.

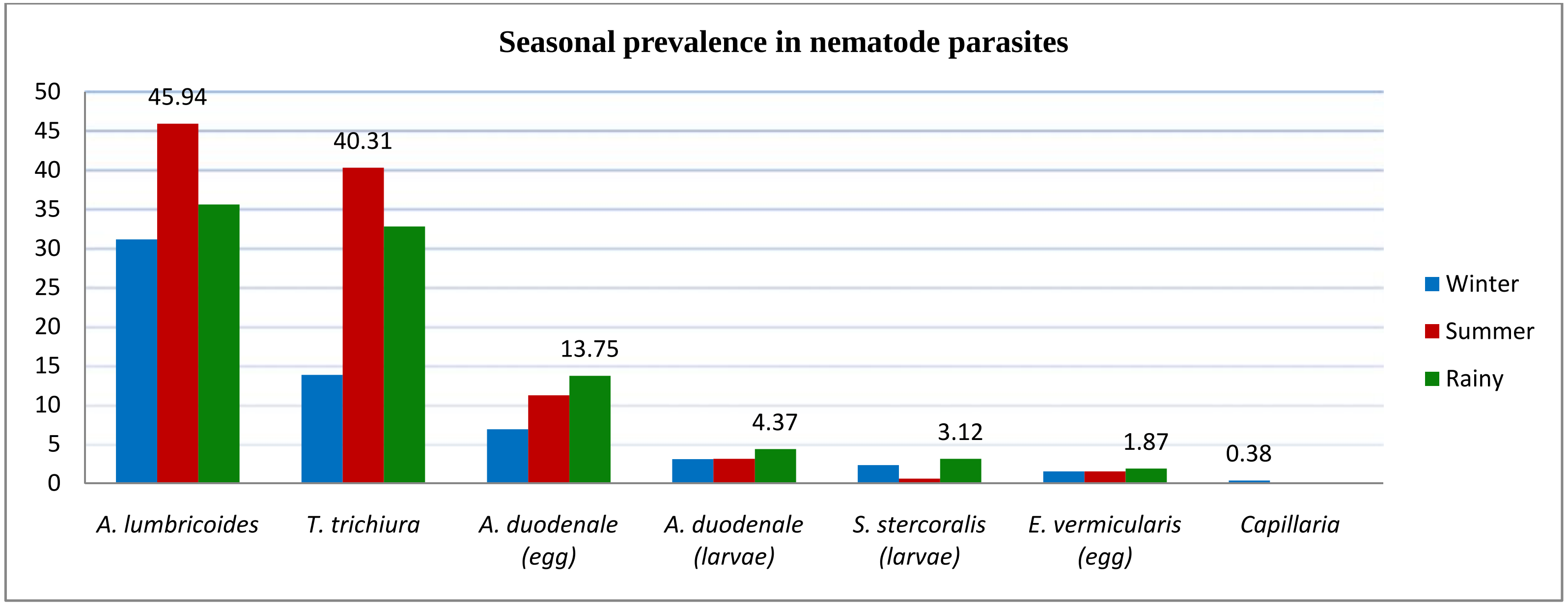


Fig 26. Seasonal prevalence of different nematode parasites among the female inhabitants.

5.1.3 Prevalence of single and mixed infections:

Out of 596 infected cases, 148 (16.44%) had single infection and 178 (19.78%) double infection, 184 (20.44%) triple infection, 75 (8.33%) quadruple infection (with four different species). The presence of five or more parasite species at a time in a single host was considered as multiple infection, 11 (1.22%) had multiple infection. Among 12 study areas, the single infection was highly prevalent (70%) in Moghbazar, lowest (2.5%) in North Shahjahanpur, whereas, double and triple infection were highest 35% and 37.5% in Doyagonj and Khilgaon respectively. Quadruple infection showed highest prevalence (38.33%) in Shahidullah hall and multiple infection found (8.33%) in Hazaribag (Table 25, Fig 27).

Highest prevalence (55%) of single infection was recorded in Jul’14 (2013-14) and Jul’15 (76.67%) (2014-15). Peak prevalence of double infection was found in Oct’13 (43.33%) and in Oct ’14 (40%). During 2013-14, the triple infection was highly prevalent (75%) in Aug’14 and during 2014-15, in Mar’15 (40%). Quadruple found highest (25%) in May’14 and in Nov’14 (40%), and multiple infections were in Jun’14 (7.5%) and in Feb’15 (16.67%) (Table 26, Fig 29 and 30).

The peak prevalence of single (29.37%) and double (24.06%) infection were found in rainy season and lowest (5% and 13.08% respectively) in winter. The triple infection was highly prevalent (24.69%) in summer, lowest (10.38%) in winter. In case of quadruple (13.08%) and multiple (3.08%) infections, highest recorded in winter; lowest 4.69% quadruple but no multiple infections found in rainy season (Table 27, Fig 31).

Table 25. Prevalence of single, double, triple, quadruple and multiple (more than four) infections of parasites in study areas.

Study areas	Total no. of stool samples examined	Single infection		Double infection		Triple infection		Quadruple infection		Multiple infection	
		No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)
Doyagonj	60	14	23.33	21	35	7	11.67	0		0	
Gandaria	60	13	21.67	17	28.33	4	6.67	0		0	
South Shahjahanpur	80	0		17	21.25	21	26.25	0		0	
North Shahjahanpur	40	1	2.5	12	30.0	11	27.5	4	10	0	
Malibag railgate	120	10	8.33	18	15.0	38	31.67	19	15.83	3	2.5
Khilgaon taltola	120	33	27.5	24	20	45	37.5	0		0	
Kamrangichar	80	5	6.25	24	30.0	26	32.5	15	18.75	0	
Shahidullah hall pukur par	60	0		0		0		23	38.33	3	5
Hajaribag	60	0		0		2	3.33	11	18.33	5	8.33
Palashi	80	10	12.5	16	20	18	22.5	2	2.5	0	
Komlapur	80	20	25.0	21	26.25	12	15	1	1.25	0	
Moghbazar railgate	60	42	70	8	13.33	0		0		0	
Total	**900**	**148**	**16.44**	**178**	**19.78**	**184**	**20.44**	**75**	**8.33**	**11**	**1.22**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of single, double, triple, quadruple and multiple infections of parasites in study areas	4.175	.005	Prevalence of single, double, triple, quadruple and multiple infections of parasites across the study areas were significantly different.

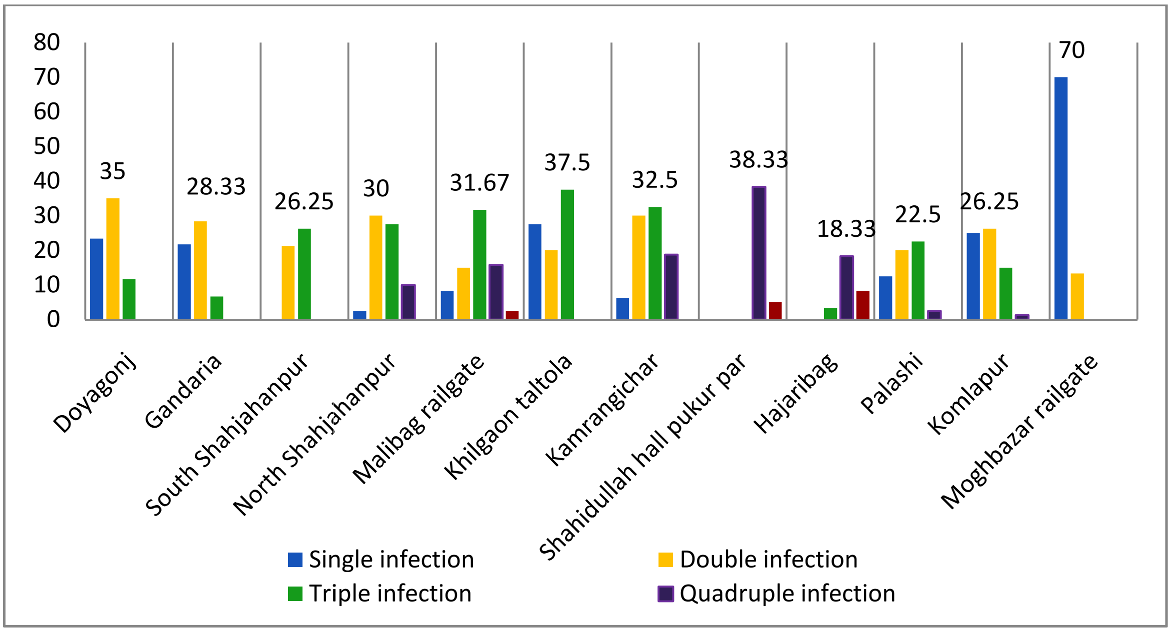


Fig 27. Prevalence of single, double, triple, and quadruple infections of parasites in different study areas.

The prevalence of only protozoan infection was 1.22%, only cestode was 4.78%, and only nematode was 10.44%. There was no single infection of trematode (Fig-28).

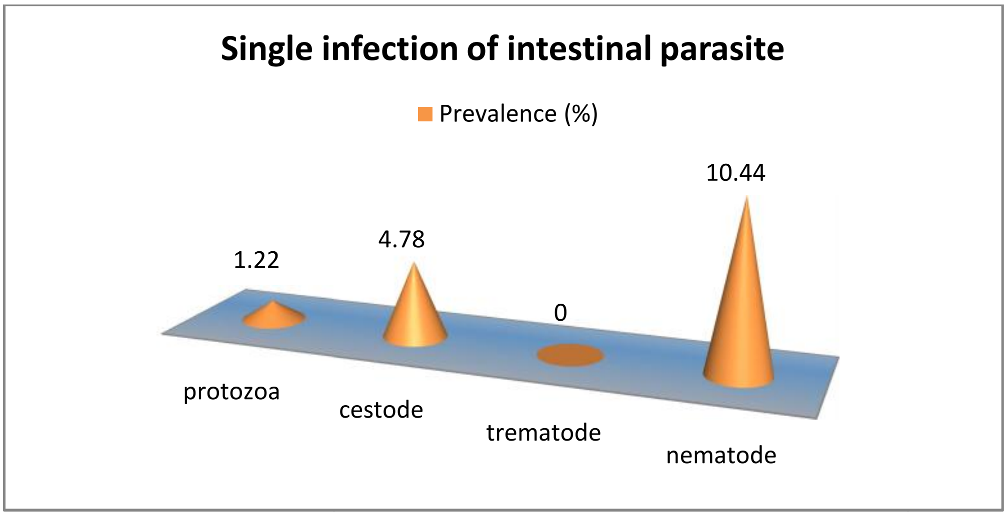


Fig 28. Single infection of intestinal parasites in female inhabitants

Table 26. Monthly prevalence of single, double, triple, quadruple and multiple infections of parasites among female inhabitants.

Month	Total no. of stool samples examined	Single infection		Double infection		Triple infection		Quadruple infection		Multiple infection	
		No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)
Sep'13	30	12	40.00	8	26.67	0		0		0	
Oct'13	30	2	6.67	13	43.33	7	23.33	0		0	
Nov'13	30	6	20	10	33.33	2	6.67	0		0	
Dec'13	30	7	23.33	7	23.33	2	6.67	0		0	
Jan'14	40	0		7	17.5	11	27.5	0		0	
Feb'14	40	0		10	25	10	25	0		0	
Mar'14	40	1	2.5	12	30	11	27.5	4	10	0	
Apr'14	40	10	25	11	27.5	5	12.5	0		0	
May'14	40	0		0		20	50	10	25	0	
Jun'14	40	0		7	17.5	13	32.5	9	22.5	3	7.5
Jul'14	60	33	55	17	28.33	0		0		0	
Aug'14	60	0		7	11.67	45	75	0		0	
Sep'14	40	0		8	20.0	15	37.5	13	32.5	0	
Oct'14	40	5	12.5	16	40.0	11	27.5	2	5	0	
Nov'14	30	0		0		0		12	40.00	2	6.67
Dec'14	30	0		0		0		11	36.67	1	3.33
Jan'15	30	0		0		2	6.67	8	26.67	0	
Feb'15	30	0		0		0		3	10	5	16.67
Mar'15	40	0		4	10	16	40.0	2	5	0	
Apr'15	40	10	25	12	30	2	5	0		0	
May'15	40	0		15	37.5	12	30	1	2.5	0	
Jun'15	40	20	50.0	6	15.0	0		0		0	
Jul'15	30	23	76.67	3	10	0		0		0	
Aug'15	30	19	63.33	5	16.67	0		0		0	
Total	**900**	**148**	**16.44**	**178**	**19.78**	**184**	**20.44**	**75**	**8.33**	**11**	**1.22**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Monthly prevalence of single, double, triple, quadruple and multiple infections of parasites	5.192	.001	Monthly prevalence of single, double, triple, quadruple and multiple infections of parasites was significantly different.

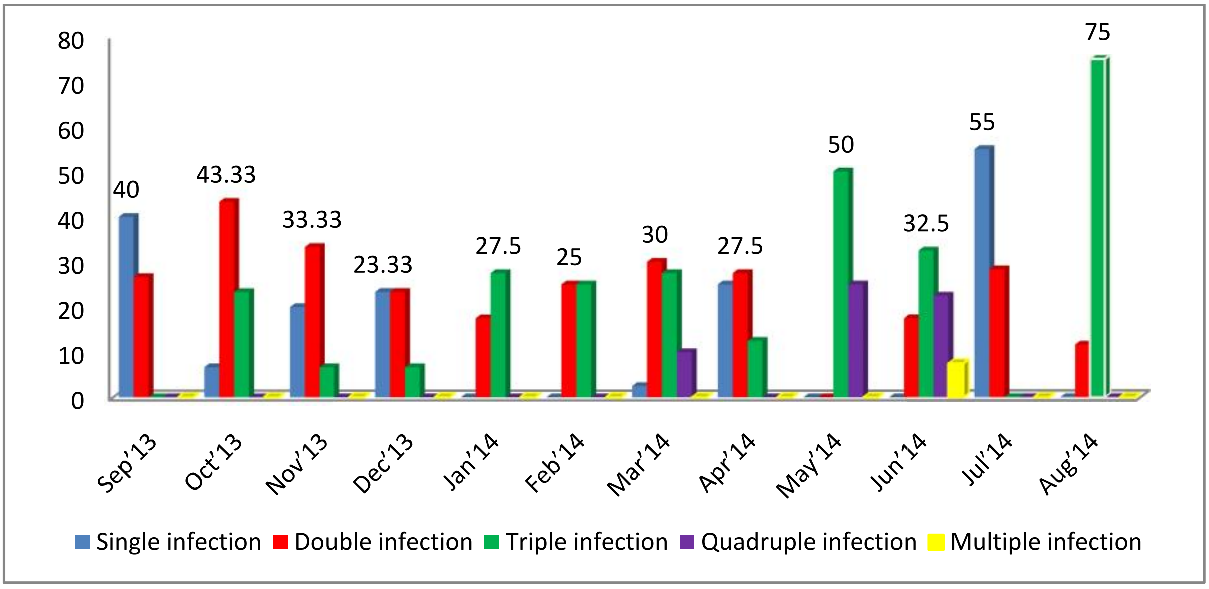


Fig 29. Monthly prevalence (2013-14) of single double, triple, quadruple and multiple infections of parasites among female inhabitants.

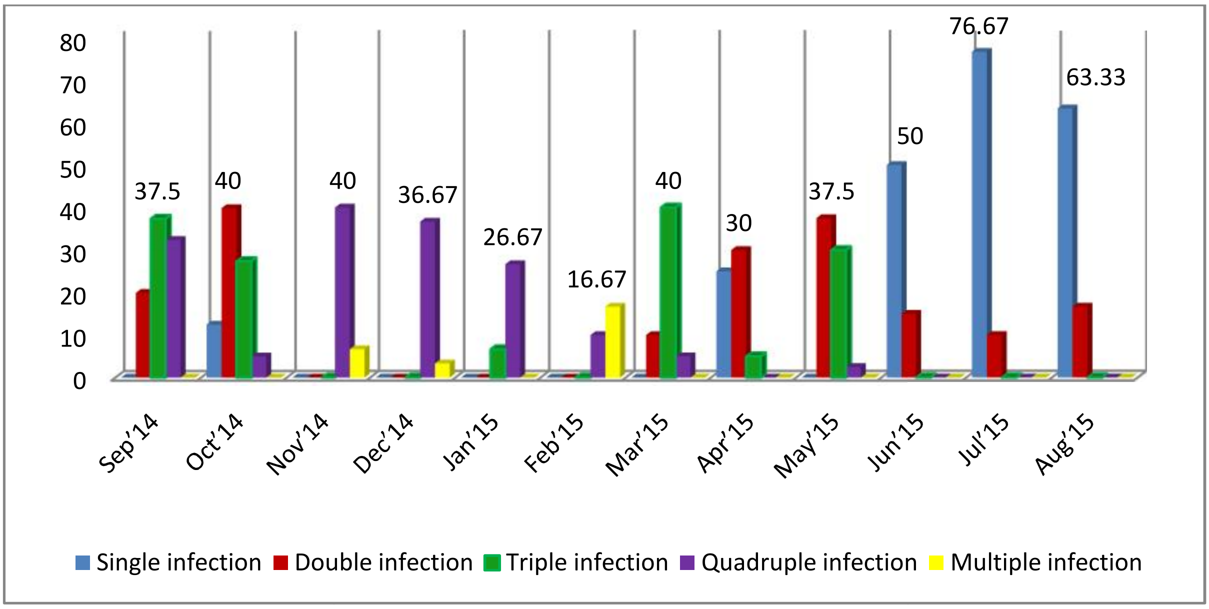


Fig 30. Monthly prevalence (2014-15) of single double, triple, quadruple and multiple infections of parasites among female inhabitants.

Table 27. Seasonal prevalence of single, double, triple, quadruple and multiple infections of parasites among female inhabitants.

Season	Total no. of stool samples examined	Single infection		Double infection		Triple infection		Quadruple infection		Multiple infection	
		No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)	No. of parasite positive cases	Prevalence (%)
Winter	260	13	5.00	34	13.08	27	10.38	34	13.08	8	3.08
Summer	320	41	12.81	67	20.94	79	24.69	26	8.12	3	0.94
Rainy	320	94	29.37	77	24.06	78	24.37	15	4.69	0	
Total	**900**	**148**	**16.44**	**178**	**19.78**	**184**	**20.44**	**75**	**8.33**	**11**	**1.22**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Seasonal prevalence of single, double, triple, quadruple and multiple infections of parasites	3.414	.052	Seasonal prevalence of single, double, triple, quadruple and multiple infections of parasites was significantly different.

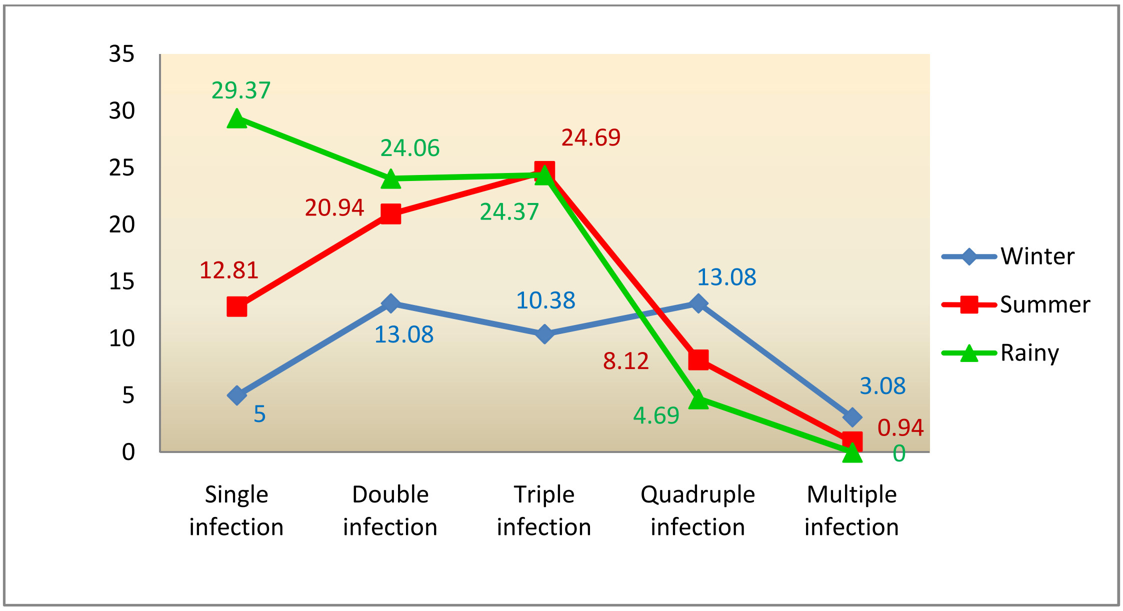


Fig 31. Seasonal prevalence of single double, triple, quadruple and multiple infections of intestinal parasites among female inhabitants.

5.1.4 Prevalence in different age groups:

Age of the females appears to be an important variable for the infestation of intestinal parasites. Considering all of the four age groups, the highest prevalence (75.65%) was found in children group (1 to 15 years), 71.5% in old age group, 63.2% in adult age group and minimum infection (58.67%) was found in middle age group (Table 28, Fig 32).

Table 28. Overall prevalence of parasitic infection in different age groups among the female inhabitants.

Age groups (In years)	Total sample examined	No. of infected samples	Prev. (%)
Children group (1 to 15 yrs)	193	146	75.65
Adult group (16 to 35 yrs)	250	158	63.20
Middle age group (36 to 50 yrs)	271	159	58.67
Old age group (51 to 70 yrs)	186	133	71.50
	900	**596**	**66.22**

Relationship between age and prevalence of intestinal parasitic infection: r = - 0.284, p = 0.716. Not significantly correlated at 5% level. Inverse correlation implies that as age increase prevalence tend to decrease.

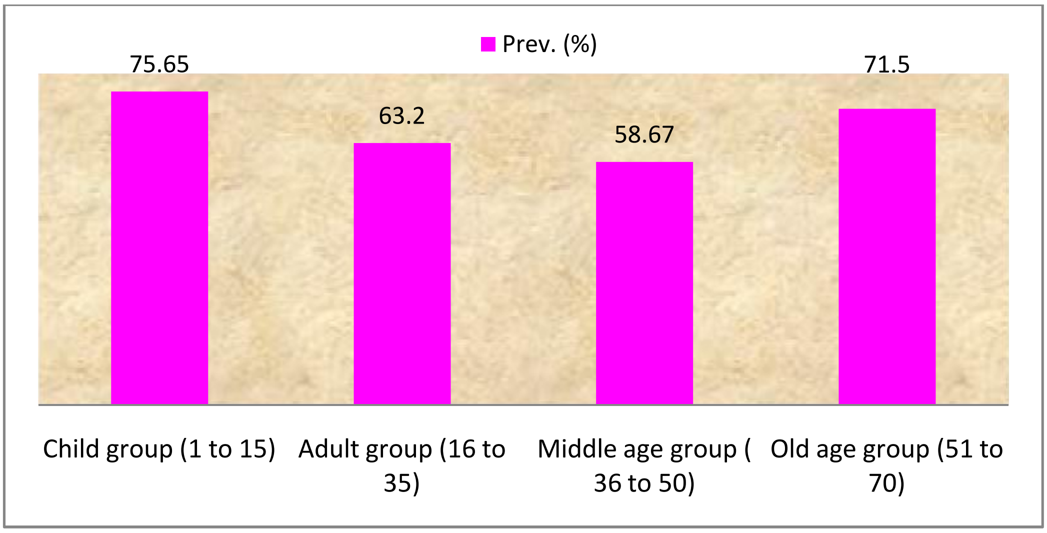


Fig 32. Overall prevalence of parasitic infection in different age groups among the female inhabitants.

The infestation of nematodes found highest in all age groups, it was 58.60% in old age group, 43.6% in middle age, 42.8% in adult, and 31.61% in children. Among children (28.49%) and adult age group (10.40%), protozoa were the 2nd highest infestation group. Highest infestation (13.98%) of cestodes was observed in children group. Among the middle (8.49%) and old age group (9.68%), cestodes were the 2nd highest infestation group (Table 29, Fig 33).

Table 29. Overall prevalence of parasitic group in different age among female inhabitants.

Age group	**Children group (1-15) (yr)**		**Adult group (16-35) (yr)**		**Middle age group (36-50) (yr)**		**Old age group (51-70) (yr)**	
Parasite group	**193**		**250**		**271**		**186**	
	Infected	**Prev.(%)**	**Infected**	**Prev.(%)**	**Infected**	**Prev.(%)**	**Infected**	**Prev.(%)**
Protozoa	55	28.49	26	10.40	10	3.69	6	3.22
Cestode	27	13.98	22	8.80	23	8.49	18	9.68
Trematode	3	1.55	1	0.40	10	3.69	0	0
Nematode	61	31.61	109	43.60	116	42.80	109	58.60
Total	**146**	**75.65**	**158**	**63.2**	**159**	**58.67**	**133**	**71.50**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Age groups by prevalence of parasitic group	.036	.991	Prevalence of parasitic group by age group was not significantly different.

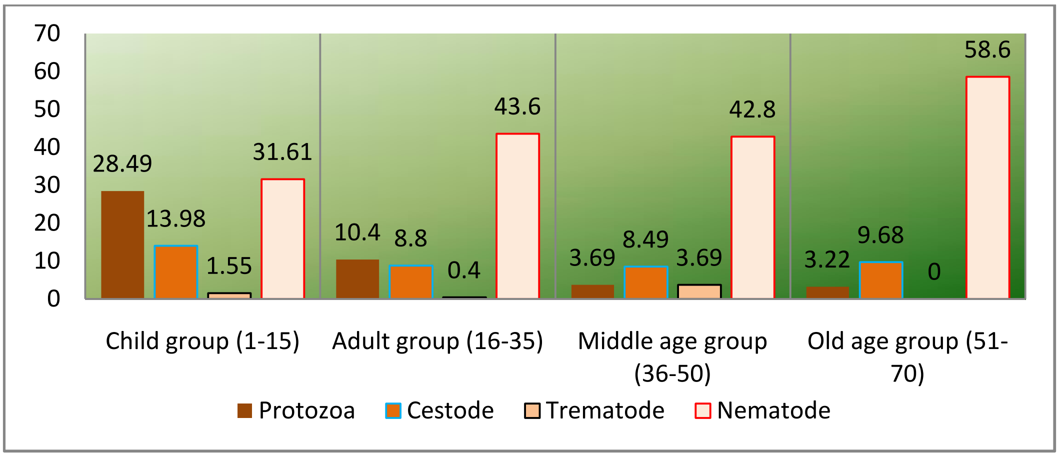


Fig 33. Overall prevalence of parasitic group in different age among female inhabitants.

E. histolytica showed highest prevalence among children (18.13%), then adult (4.8%) and old age group (2.69%), and *G. intestinalis* showed highest (7.77%) in children. (Table 30, Fig 34).

Table 30. Overall prevalence of parasites in different age groups of the female inhabitants.

Age group (yr) & total no. of sample	Children group		Adult group		Middle age group		Old age group	
	193		250		271		186	
Parasite name	**Infected**	**Prev.(%)**	**Infected**	**Prev.(%)**	**Infected**	**Prev.(%)**	**Infected**	**Prev.(%)**
E. histolytica	35	18.13	12	4.8	2	0.74	5	2.69
E. coli	0		2	0.8	0		0	
E. nana	1	0.52	0		1	0.37	0	
I. butschlii	0		1	0.4	0		0	
C. mesnili	1	0.52	0		2	0.74	0	
T. hominis	1	0.52	2	0.8	0		0	
E. hominis	2	1.04	0		0		0	
G. intestinalis	15	7.77	6	2.4	4	1.48	1	0.54
I. hominis	0		2	0.8	1	0.37	0	
B. coli	0		1	0.4	0		0	
D. latum	4	2.07	7	2.8	2	0.74	0	
T. saginata	10	5.18	1	0.4	2	0.74	4	2.15
E. granulosus	0		1	0.4	0		0	
H. nana	8	4.14	6	2.4	10	3.69	14	7.53
H. diminuta	5	2.59	4	1.6	8	2.95	0	
D. caninum	0		3	1.2	1	0.37	0	
F. hepatica	0		1	0.4	0		0	
F. buski	2	1.04	0		5	1.84	0	
C. sinensis	0		0		2	0.74	0	
P. westermani	1	0.52	0		3	1.11	0	
A. lumbricoides	26	13.47	44	17.6	55	20.29	63	33.87
T. trichiura	0		36	14.4	29	10.70	42	22.58
A. duodenale (egg)	30	15.54	12	4.8	20	7.38	2	1.07
A. duodenale (larvae)	0		9	3.6	6	2.21	1	0.54
S. stercoralis (larvae)	0		6	2.4	3	1.11	1	0.54
E. vermicularis	5	2.59	1	0.4	3	1.11	0	
Capillaria	0		1	0.4	0		0	
Total	**146**	75.65	**158**	63.2	**159**	58.67	**133**	71.50

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of each parasites in different age groups	.073	.975	Prevalence of each parasite in different age groups was not significantly different.

In children, highest prevalence of *T. saginata* was 5.18% and lowest of *D. latum* was 2.07%; on the contrary, highest of *D. latum* (2.8%) and lowest (0.4%) of *T. saginata* found in adult group. Among middle (3.69%) and old age group (7.53%), *H. nana* infestation was found highest (Table-30, Fig 35).

Highest prevalence of *F. buski* (1.84%) and *P. westermani* (1.11%) was found among the middle age group and lowest (0.4%) of *F. hepatica* in adult age group (Table-30, Fig 36).

A. lumbricoides (33.87%) and *T. trichiura* (22.58%) were highly prevalent among the old age group. High infestation of *A. duodenale* (egg) (15.54%) and *E. vermicularis* (2.59%) was found in children group; *A. duodenale* (larvae) (3.6%) and *S. stercoralis* (2.4%) in adult group (Table-30, Fig 37).

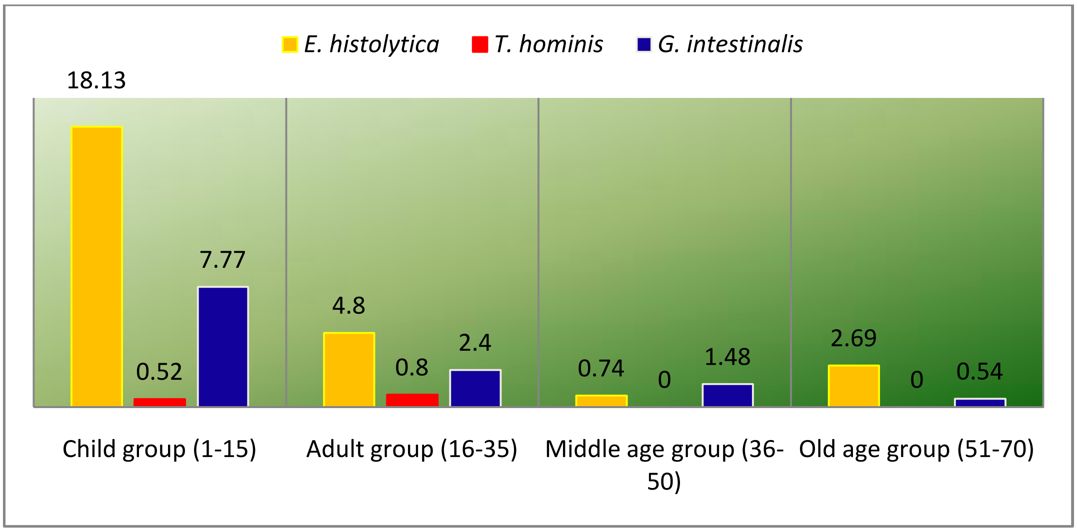


Fig 34. Prevalence of pathogenic protozoan parasites according to age.

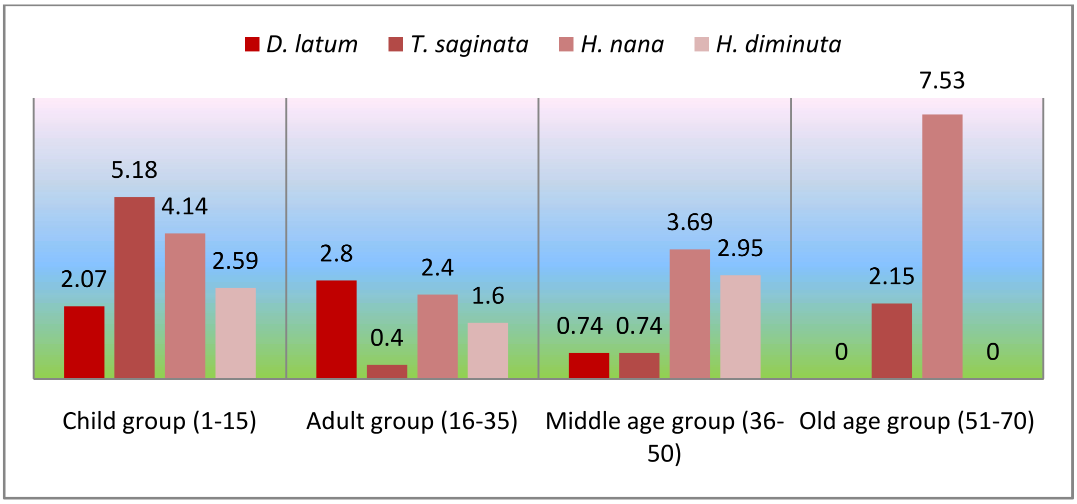


Fig 35. Prevalence of cestode parasites according to age.

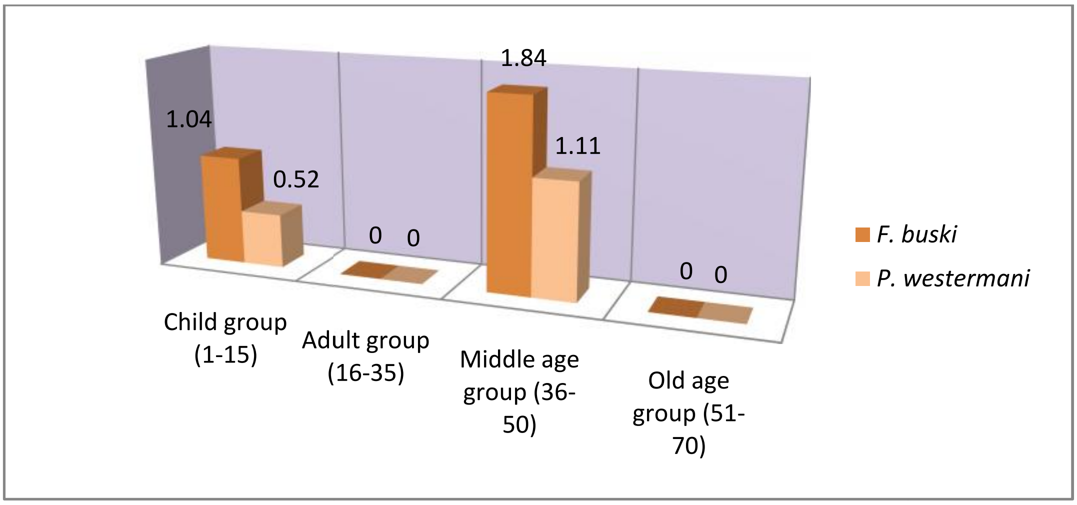


Fig 36. Prevalence of common trematode parasites according to age.

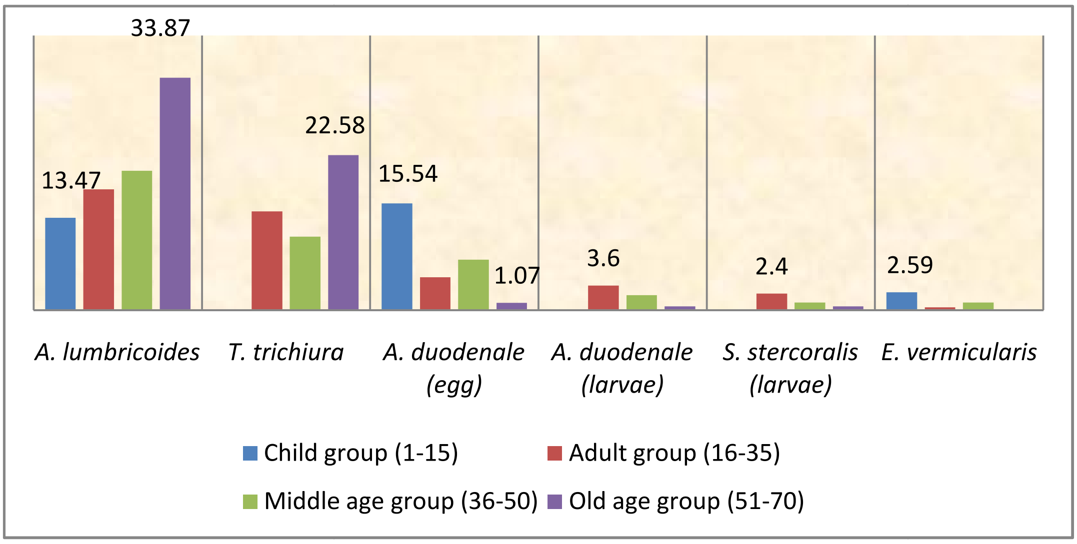


Fig 37. Prevalence of nematode parasites according to age.

5.2 Status of anaemia in relation to parasitic infestation among the female inhabitants:

A number of anaemic cases were identified in different selected study areas. During the present study, out of 900 female inhabitants of lower socioeconomic groups, the overall percentage of anaemic (42.22%) and non anaemic (57.78%) cases were recorded (Fig 38). Proportion test: anaemic vs non anaemic, P = 0.000 significantly different.

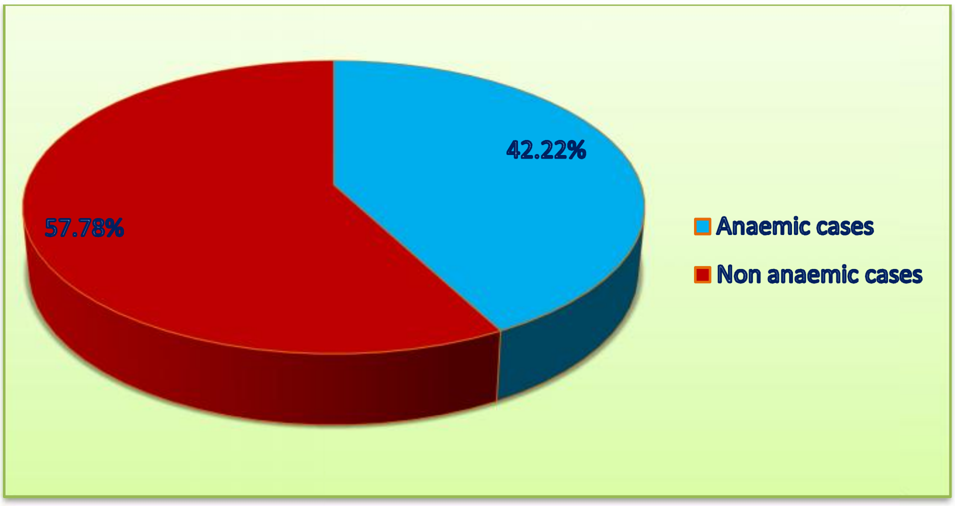


Fig 38. Overall percentage of anaemic and non anaemic cases in female inhabitants.

Comparatively higher anaemic (49.60%) cases were found in adult group, 45.02% in middle age group, 39.25% in old age group and 31.61% in children group. It was also noted that the percentages of non anemic inhabitants were much higher than anemic cases in all age groups (Table 31, Fig 39).

Table 31. Percentage of anaemic female inhabitants in different age groups.

Age groups (In year)	Status of anaemia			
	No. of anaemic cases	Percentage (%)	No. of non anaemic cases	Percentage (%)
Children group (1 to 15)	61	31.61	132	68.39
Adult group (16 to 35)	124	49.60	126	50.40
Middle age group (36 to 50)	122	45.02	149	54.98
Old age group (51 to 70)	73	39.25	113	60.75
Total (900)	**380**	**42.22**	**520**	**57.78**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Status of anaemia by age group	9.886	.020	Status of anaemia was significantly different across the age group.

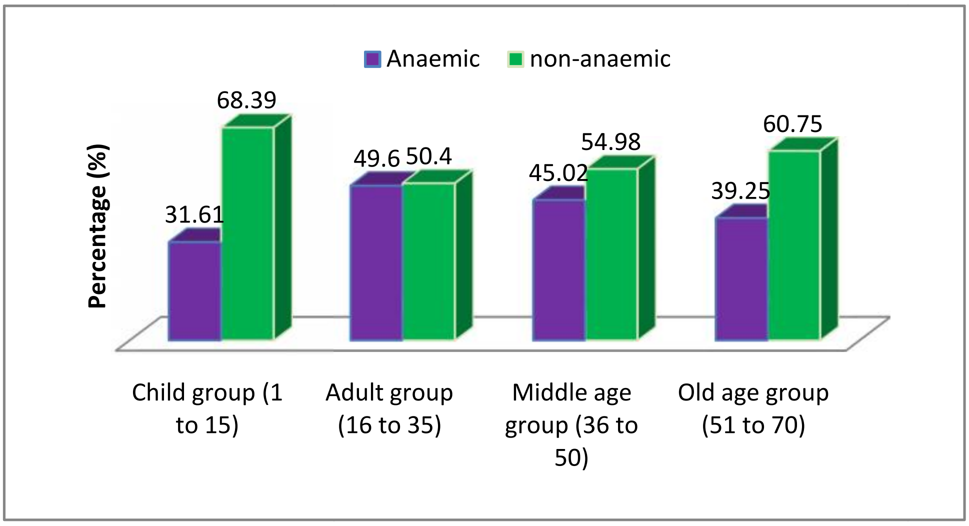


Fig 39. Percentage of anaemic female inhabitants in different age groups.

The levels of anaemia (mild, moderate and severe) of female inhabitants were recorded from 12 different study areas. Out of total anaemic cases, mild anaemia was 57.1%, moderate 31.05% and severe anaemia 11.84%. The highest percentage of severe anaemic cases was found in adult group which was recorded as 14.52% (Table 32, Fig 40 and 41).

Table 32. Levels of anaemia according to age groups of the female inhabitants.

Age groups (In year)	**Total no. of anaemic cases n (%)**	**Level of anaemia**		
		Severe anaemic cases n (%)	**Moderate anaemic cases n (%)**	**Mild anaemic cases n (%)**
		<7 g/dL (Hb)	≥7.1- 9.9 g/dL (Hb)	≥10.1-11.9 g/dL (Hb)
Child group (1 to 15)	61 (31.61%)	6 (9.84%)	20 (32.79%)	35 (57.38%)
Adult group (16 to 35)	124 (49.6%)	18 (14.52%)	36 (29.03%)	70 (56.45%)
Middle age group (36-50)	122 (45.02%)	15 (12.29%)	40 (32.79%)	67 (54.92%)
Old age group (51 to 70)	73 (39.25%)	6 (8.22%)	22 (30.14%)	45 (61.64%)
Total	**380 (42.22)**	**45 (11.84%)**	**118 (31.05%)**	**217 (57.10%)**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Level of anaemia by age group	13.095	.002	Level of anaemia was significantly different across the age group.

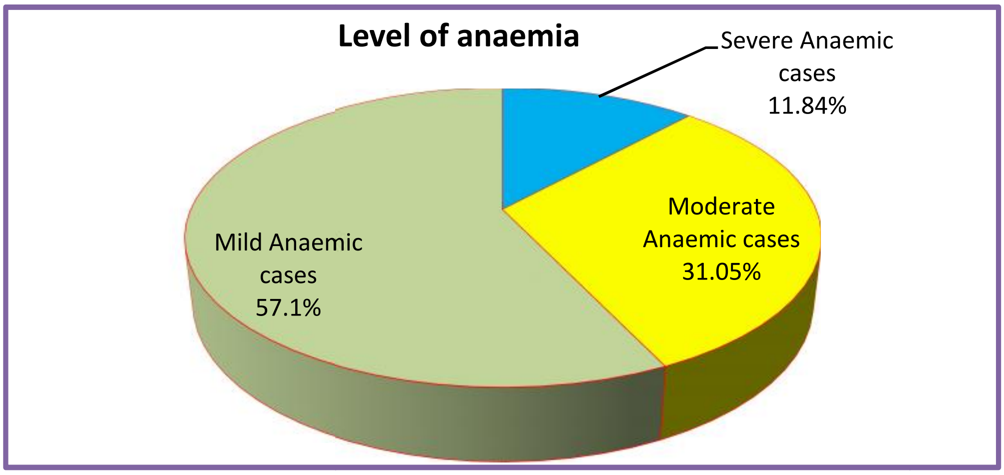


Fig 40. Levels of anaemia among the female inhabitants.

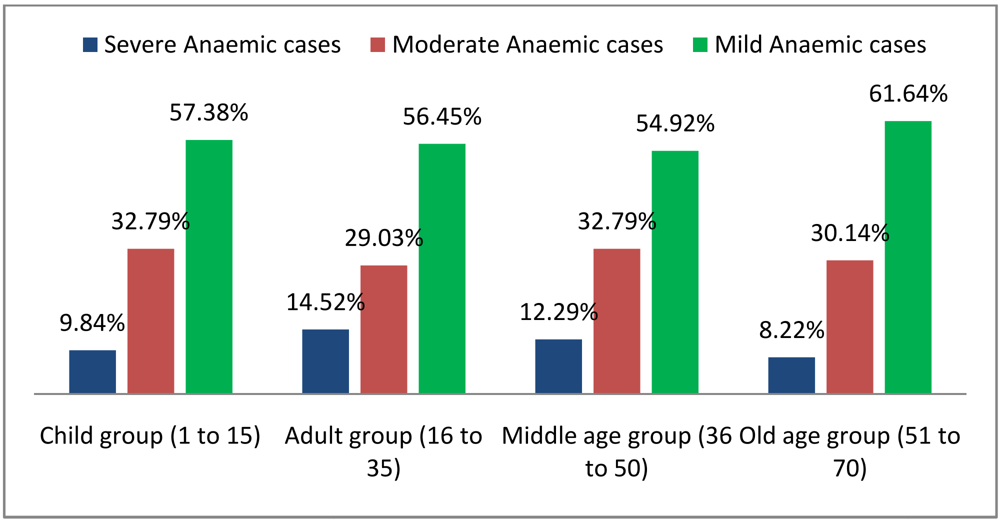


Fig 41. Levels of anaemia according to age groups of the female inhabitants.

Maximum anemic cases, was found in Kamrangichar (53.75%), 51.67% in Doyagonj, and lowest (32.5%) in South Shahjahanpur (Table-33, Fig 42).

In all age groups, comparatively higher percentage was found in anaemic parasite positive cases (70.53%) than non anaemic parasite positive cases (63.08%) that prove that parasitic infestation is one of the main reasons for anaemia. Children and old age group was highly affected and showed highest percentage (83.61%) and (75.34%) respectively (Table 34, Fig 43).

Table 33. Status of anaemia among the female inhabitants in different study areas.

Study Areas	Total sample examined	No. of anaemic cases	Percentage of anaemia (%)
Doyagonj (nama para bosti)	60	31	51.67
Gandaria (rail line par)	60	30	50.0
South Shahjahanpur (3rd class railway colony)	80	26	32.5
North Shahjahanpur slums	40	15	37.5
Malibag railgate	120	49	40.83
Khilgaon taltola jhupri	120	50	41.67
Kamrangichar	80	43	53.75
Shahidullah hall pukur par (3rd class family employee quarter)	60	20	33.33
Hajaribag	60	27	45.0
Palashi	80	28	35.0
Komlapur TT para	80	35	43.75
Moghbazar railgate	60	26	43.33
	900	**380**	**42.22**

Chi-square = 13.61, p = 0.092 not significant at 5% level.

Study area was not significantly associated with anaemia.

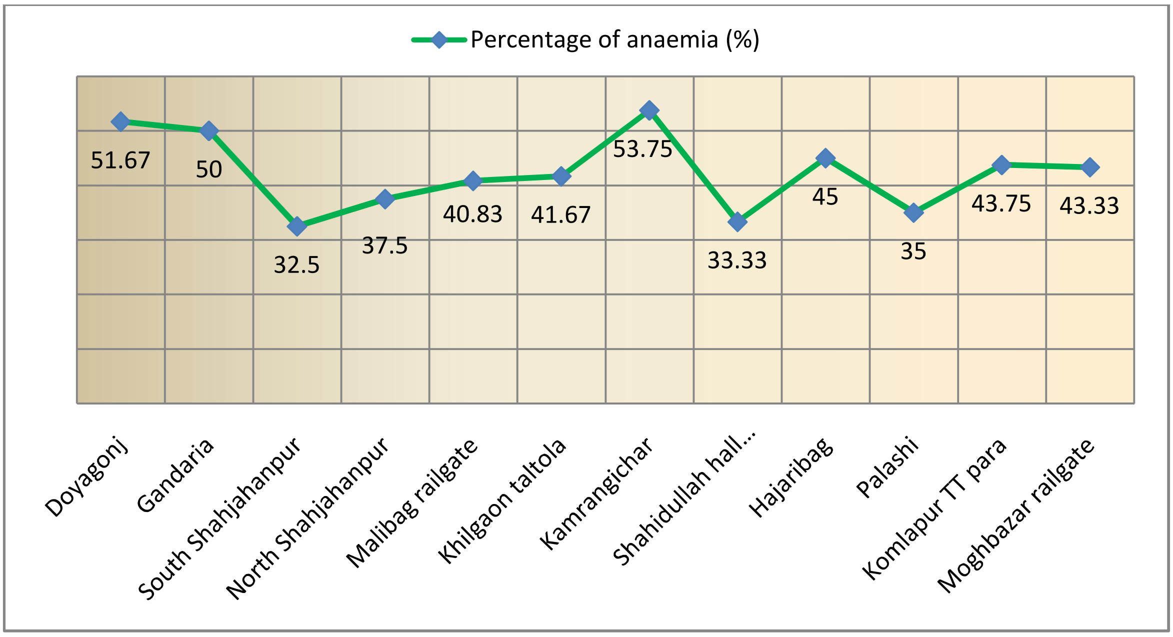


Fig 42. Status of anaemia among the female inhabitants in different study areas.

Table 34. Relationship between parasitic infections and anaemia among the female inhabitants of different age groups.

Age groups (In year)	Total no. of blood samples of the respondents examined	Status of anaemia and parasite positive cases					
		Anaemic cases			Non anaemic cases		
		No. of anaemic cases	No. of parasite positive cases	Prevalence (%)	No. of non anaemic cases	No. of parasite positive cases	Prevalence (%)
Children group (1 to 15)	193	61	51	83.61	132	95	71.97
Adult group (16 to 35)	250	124	89	71.77	126	69	54.76
Middle age group (36 to 50)	271	122	73	59.84	149	86	57.72
Old age group (51 to 70)	186	73	55	75.34	113	78	69.03
	900	**380**	**268**	**70.53**	**520**	**328**	**63.08**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Parasite positive cases by anaemic and non anaemic	2.045	.203	Parasite positive cases by aneamic and non anaemic were not significantly different across the age group.

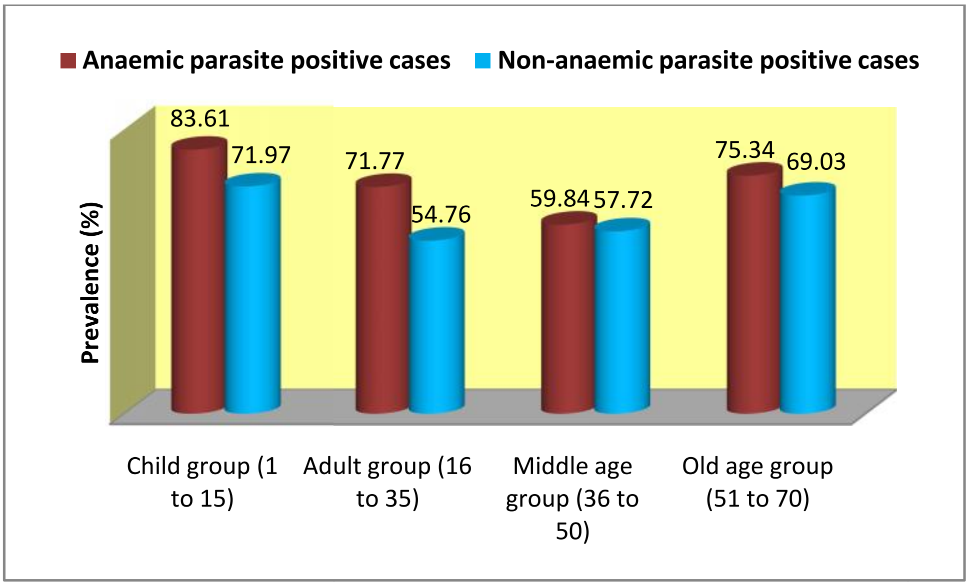


Fig 43. Relationship between intestinal parasitic infections and anaemia among the female inhabitants of different age groups.

Anaemic females with parasitic infestation showed the highest (97.67%) prevalence in Kamrangichar and lowest (30.3%) in Hazaribag (Table 35, Fig 44). Parasitic infection was higher (70.53%) among the anaemic cases than non anaemic cases (63.08%) (Table 36, Fig 45).

Table 35. Percentage of parasitic infection among the anaemic females in different study areas.

Study Areas	Total no. of blood samples of the respondents examined	Status of anaemia and parasite positive cases					
		Anaemic cases			Non anaemic cases		
		No. of anaemic cases	No. of parasite positive cases	Percentage (%)	No. of non anaemic cases	No. of parasite positive cases	Percentage (%)
Doyagonj (nama para bosti)	60	31	22	70.96	29	20	68.96
Gandaria (rail line par)	60	30	23	76.67	30	11	36.67
South Shahjahanpur (3rd class railway colony)	80	26	15	57.69	54	23	42.59
North Shahjahanpur	40	15	12	80.0	25	16	64.0
Malibag railgate	120	49	39	79.51	71	49	69.01
Khilgaon taltola	120	50	46	92	70	56	80
Kamrangichar	80	43	42	97.67	37	28	75.67
Shahidullah hall pukur par (3rd class family employee)	60	20	9	45.0	40	17	42.5
Hajaribag	60	27	8	29.63	33	10	30.30
Palashi	80	28	14	50.0	52	32	61.54
Komlapur TT para	80	35	19	54.28	45	35	77.78
Moghbazar railgate	60	26	19	73.08	34	31	91.18
	900	**380**	**268**	**70.53**	**520**	**328**	**63.08**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Percentage of parasitic infection among the anaemic females by study area	.470	.500	Percentage of parasitic infection among anaemic and non anaemic females was not significantly different across the study area.

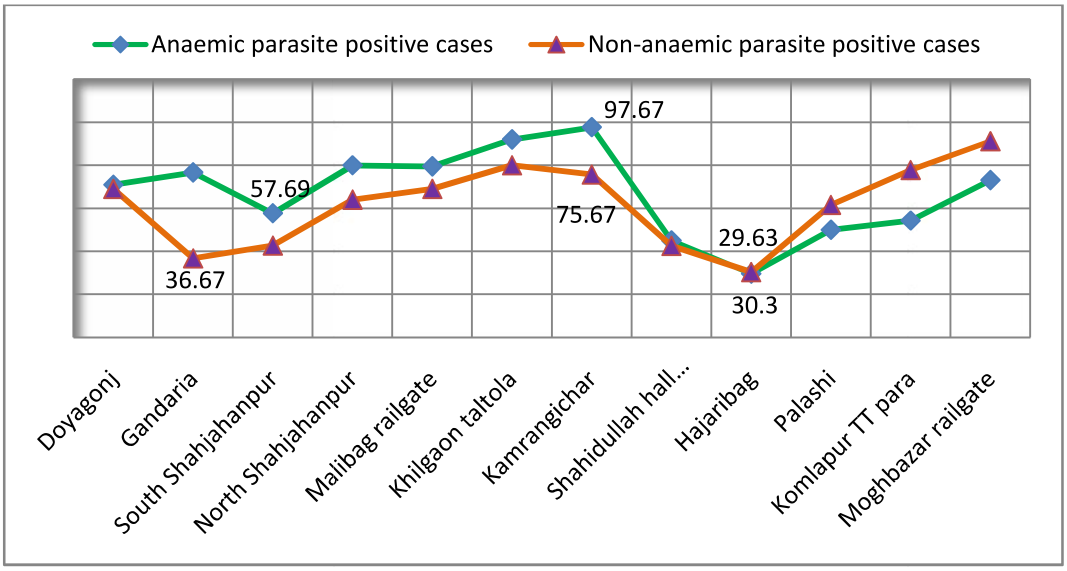


Fig 44. Percentage of parasitic infection among the anaemic females in different study areas.

Table 36. Association of anaemia with intestinal parasitic infection.

Status of anaemia	**Parasitic infection**	
	Positive infection n (%)	**Negative infection n (%)**
Anaemic (380)	268 (70.53%)	112 (29.47%)
Not anaemic (520)	328 (63.08%)	192 (36.92%)

Chi-square = 2.89, p = 0.089 not significant at 5% level.

Status of anaemia was not significantly associated with intestinal parasitic infection.

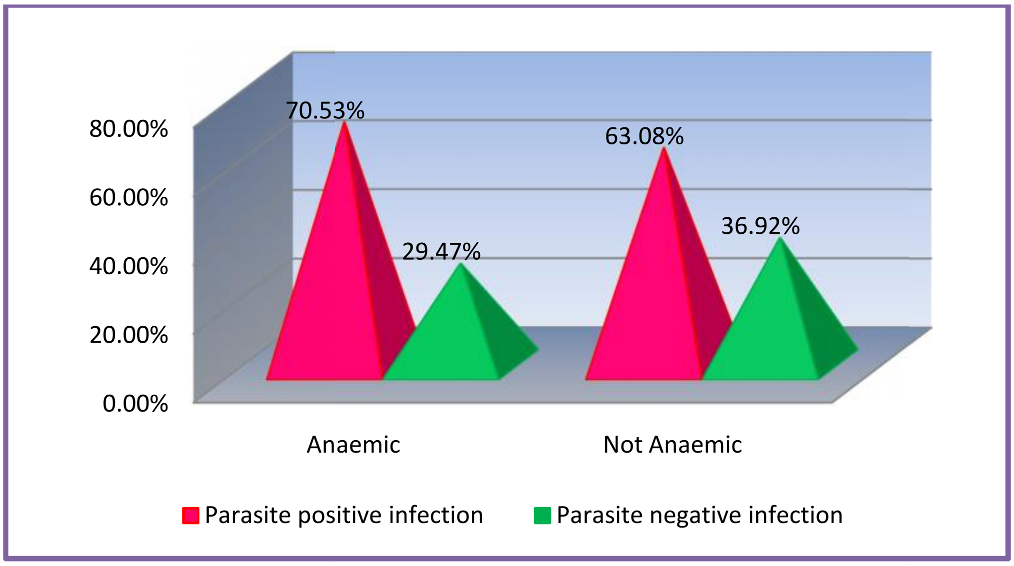


Fig 45. Association of anaemia with intestinal parasitic infection.

5.3 Urinary Tract Infections (UTIs)

Out of the 900 samples of female inhabitants, 283 samples showed positive result and the prevalence was 31.44%, and 617 samples showed negative result and the prevalence was 68.56% (Fig 46).

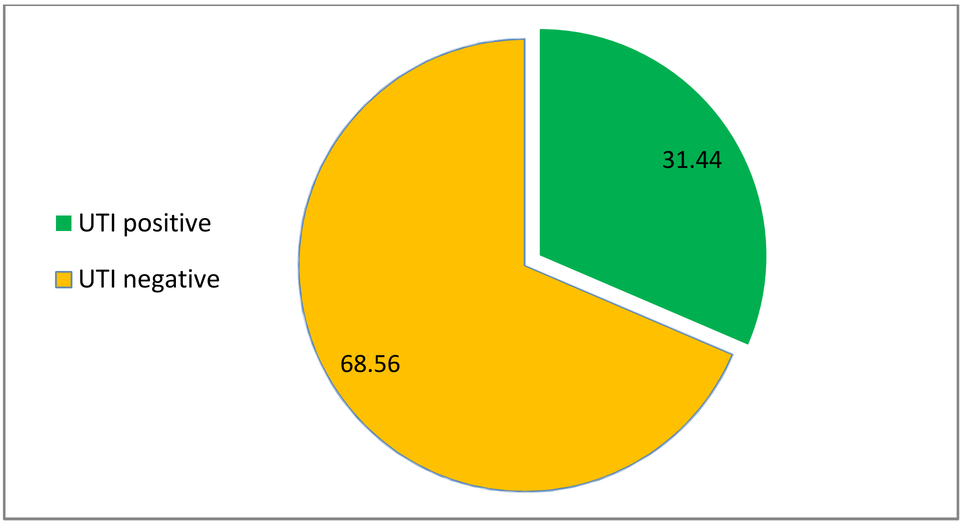


Fig 46. Prevalence of UTIs positive samples among female inhabitants of lower socioeconomic groups in Dhaka city.

In the present study, the highest prevalence of urinary tract infection was observed among adult age females (46.8%), followed by middle age (35.42%) and old age females (23.66%). The lowest prevalence was found among children group (13.47%) (Table 37, Fig 47).

Table 37. Prevalence of UTIs among the different age groups of female inhabitants.

Age groups (In years)	Total sample	Positive sample	Prevalence (%)
Children group (1 to 15)	193	26	13.47
Adult group (16 to 35)	250	117	46.8
Middle age group (36 to 50)	271	96	35.42
Old age group (51 to 70)	186	44	23.66

Chi-square = 55.08, p = 0.000, significant at 5% level.

Prevalence of UTIs was significantly associated with age group.

Monthly prevalence of UTIs studied among the female inhabitants:

The highest prevalence of UTIs was found in July’14 (53.33%), July’15 (60%) and Aug’15 (56.67%), whereas lowest (10%) in Jan’14, Dec’14 and Jan’15 (Fig 48).

Chi-square = 17.12,   p = 0.028, significant at 5% level.

Monthly variation was significantly associated with the prevalence of UTIs.

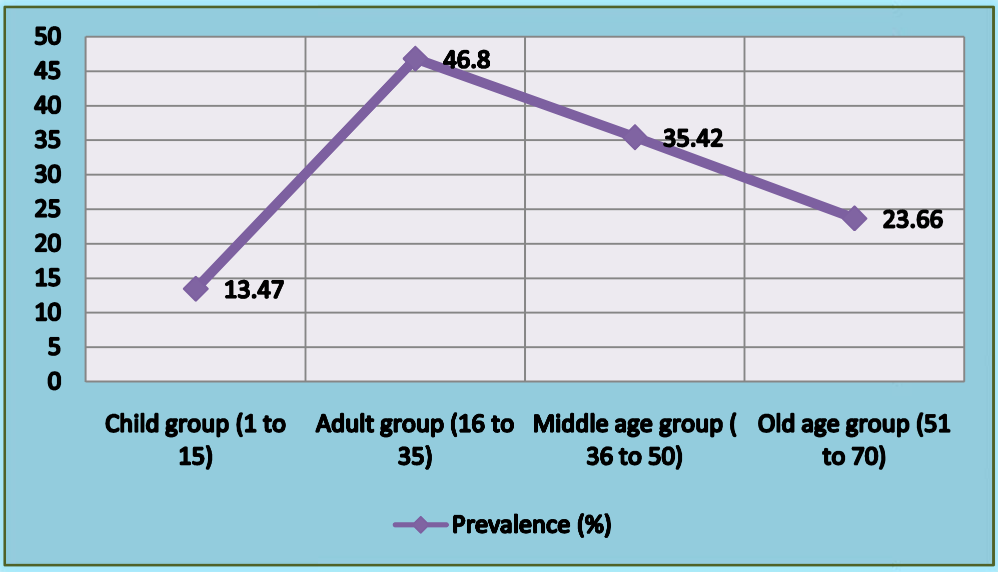


Fig 47. Prevalence of UTIs among the different age groups of female inhabitants.

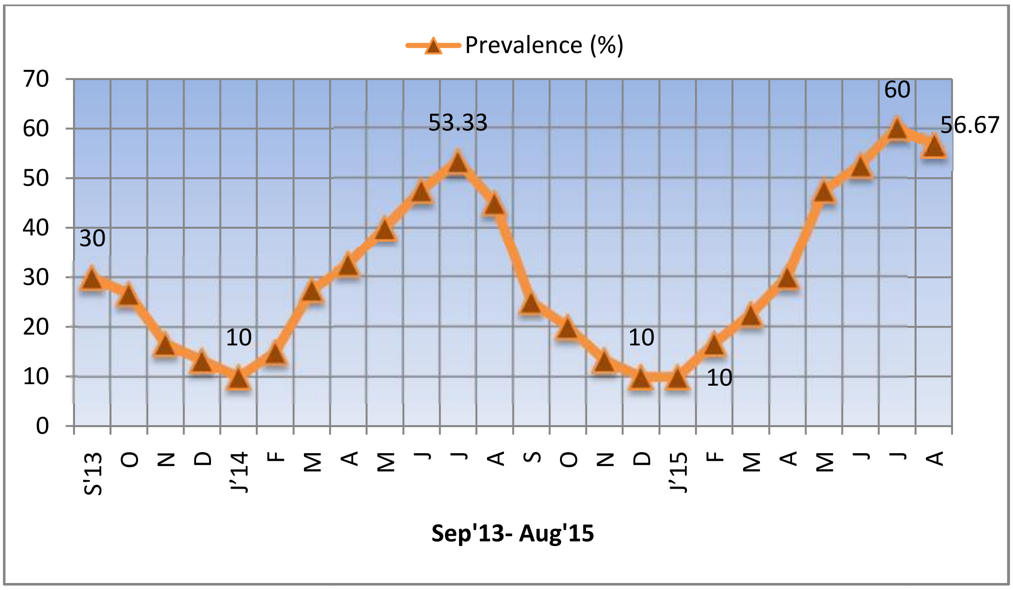


Fig 48. Monthly prevalence of UTIs studied among the female inhabitants.

Comparatively higher UTIs were showed in rainy seasons, 28.33%, 38.50% and 58.33% in 2013, 2014 and 2015 respectively. Lowest UTIs observed in winter season, 15.0% in 2013, 12.5%, 11.67% in 2014 and 13.33% in 2015 (Table 38, Fig 49).

Table 38. Seasonal prevalence of UTIs studied among the female inhabitants.

Season	Total sample examined	UTIs positive	Prevalence (%)
Rainy'13 (Sep'13-Oct'13)	60	17	28.33
Winter'13 (Nov'13- Dec'13)	60	9	15.0
Winter'14 (Jan'14- Feb'14)	80	10	12.5
Summer'14 (Mar'14- Jun'14)	160	59	36.87
Rainy'14 (Jul'14- Oct'14)	200	77	38.50
Winter'14 (Nov'14- Dec'14)	60	7	11.67
Winter'15 (Jan'15- Feb'15)	60	8	13.33
Summer'15 (Mar'15- Jun'15)	160	61	38.12
Rainy'15 (Jul'15- Aug'15)	60	35	58.33
	900	**283**	**31.44**

Chi-square = 71.03, p = 0.000, significant at 5% level.

Prevalence of UTIs was significantly associated with season.

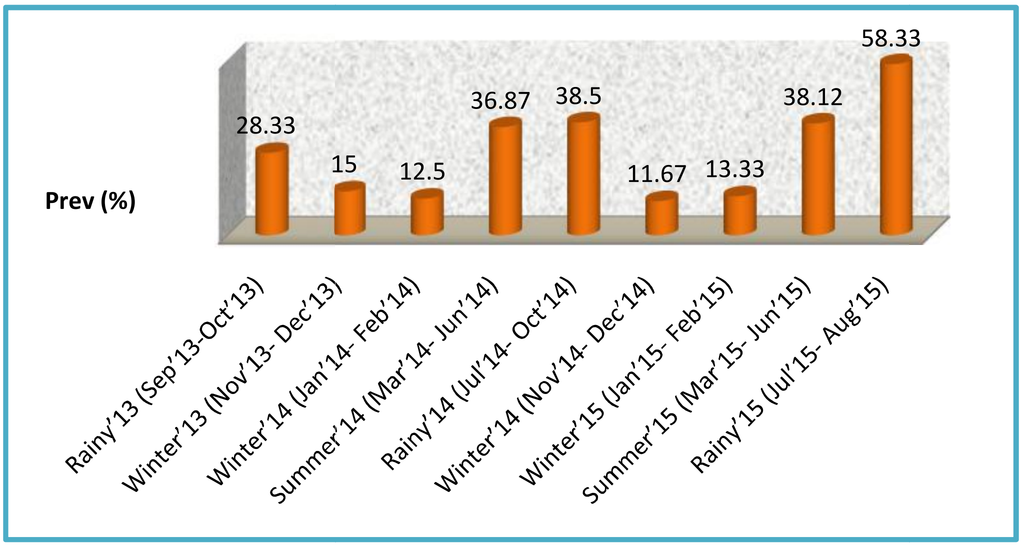


Fig 49. Seasonal prevalence of UTIs studied among the female inhabitants.

Overall peak prevalence (40.31%) of UTIs was observed in rainy season, lowest (13.08%) prevalence was in winter (Fig 50).

The percentage of *E. coli* was found highest (65.72%) for causing UTIs, other bacterias: *Streptococcus* (10.25%), *Staphylococcus* (8.13%), *Pseudomonas* (7.07%), *Enterococcus* (5.30%) were also found responsible for UTIs (Table 39, Fig 51).

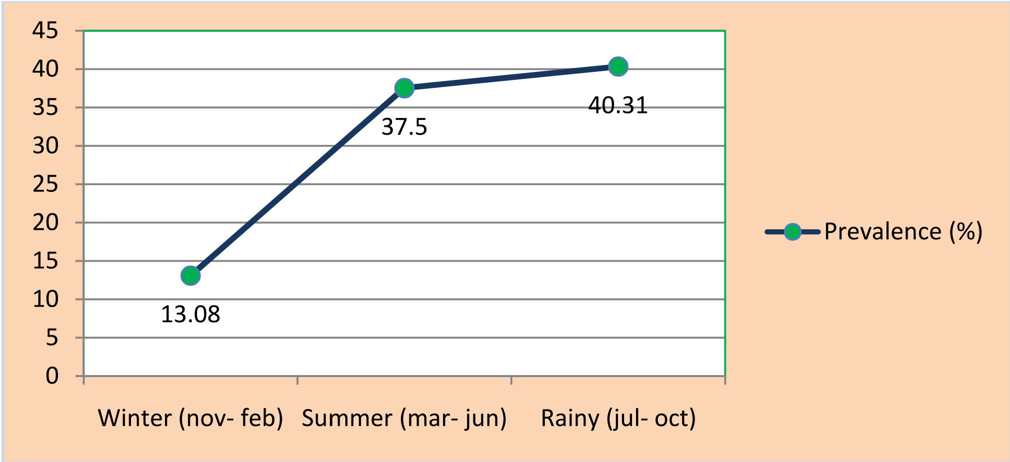


Fig 50. Overall seasonal prevalence of UTIs among female inhabitants.

Table 39. No. of isolates causing UTIs by different bacterial parasites.

Bacteria	No. of isolates	Prevalence (%)	Total UTIs positive sample
Escherichia coli	186	65.72	283
Staphylococccus	23	8.13	
Pseudomonas	20	7.07	
Streptococcus	29	10.25	
Enterococcus	15	5.30	
Other bacteria	10	3.53	

Chi-square = 205.24, p = 0.000, significant at 5% level.

Prevalence of different bacteria was significantly associated with isolates causing UTIs**.**

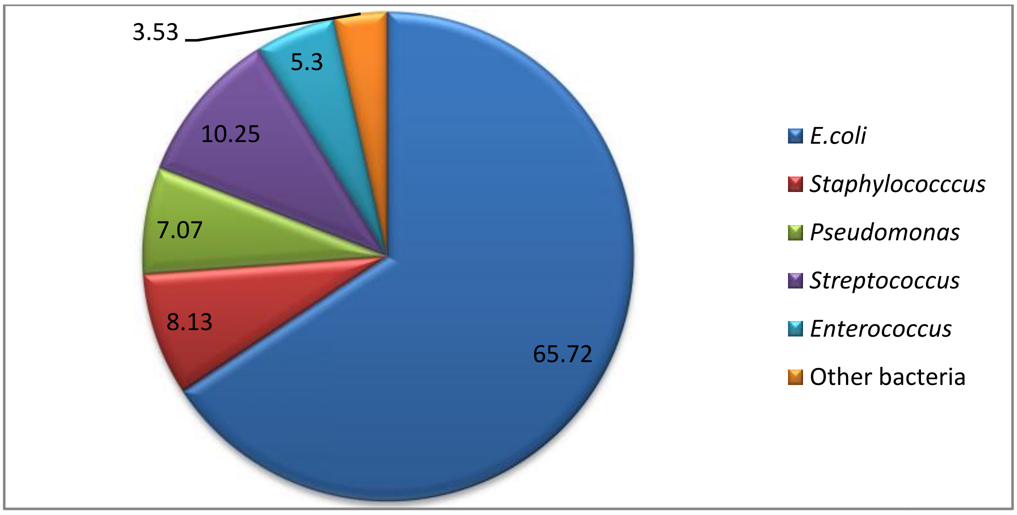


Fig 51. No. of isolates causing UTIs by different bacterial parasites.

5.4 Skin diseases among the female inhabitants:

Out of 900 females, 372 (41.33%) were infected with different types of skin diseases, among them 168 (45.16%) were infected with bacteria, 97 (26.07%) were with fungus, 72 (19.35%) with virus and 35 (9.41%) with arthropod/ ectoparasite (Fig 52).

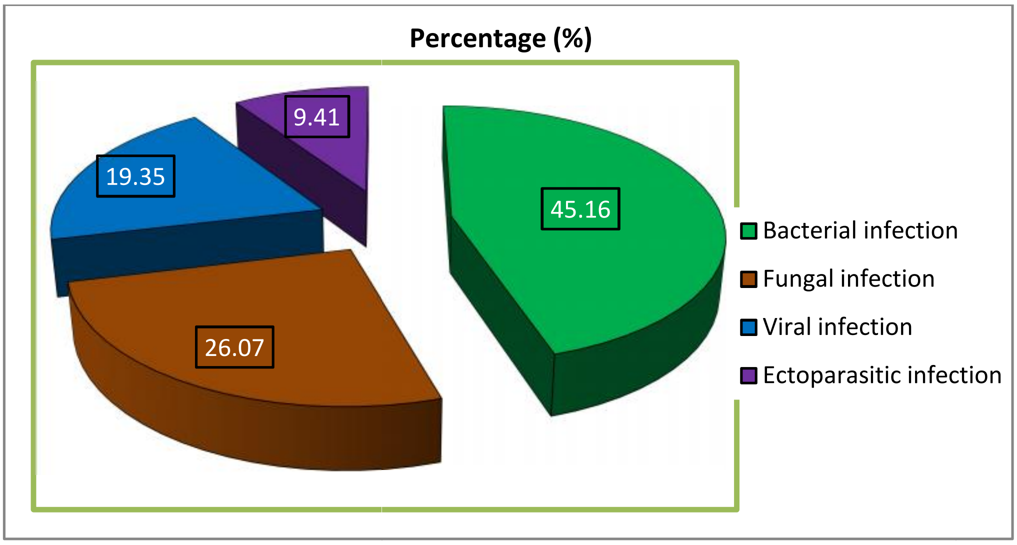


Fig 52. Prevalence of skin infections in female inhabitants.

In the present investigation, out of 168 bacterial infected females, the highest number 64 (38.09%) were affected by boil disease, 44 (26.19%) by carbuncles, 26 (15.48%) with folliculitis, 19 (11.31%) with paronichia, and the lowest number of females 8 (4.76%) by styes, 7 (4.17%) were affected by impetigo (Fig 53).

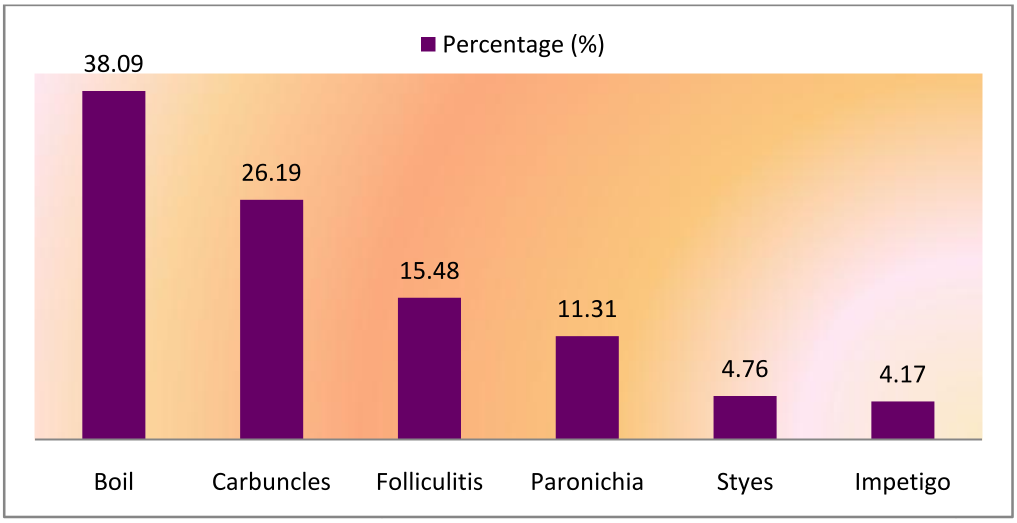


Fig 53. Prevalence of bacterial infections among the female inhabitants.

It was observed that, 97 females were suffering from different fungal infections; the highest (29.90%) was infected by ringworm, then athlete's foot (34.02%), onchomycosis (25.77%) and candidiasis (10.31%) respectively (Fig 54).

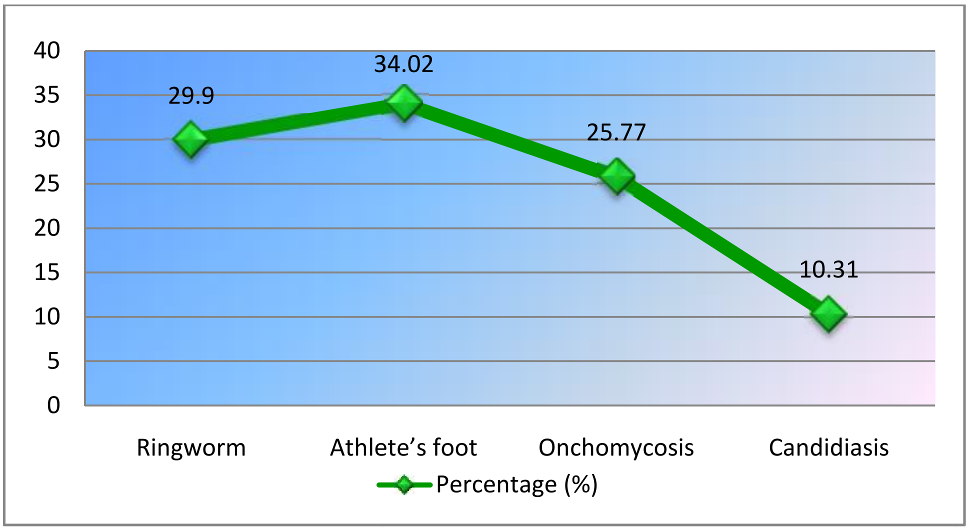


Fig 54. Prevalence of fungal infections among the female inhabitants.

Among 72 viral infected females, the highest infection (36.11%) was observed by wart infection, then 2nd highest (34.72%) was chicken pox and lowest (29.17%) was measles (Fig 55).

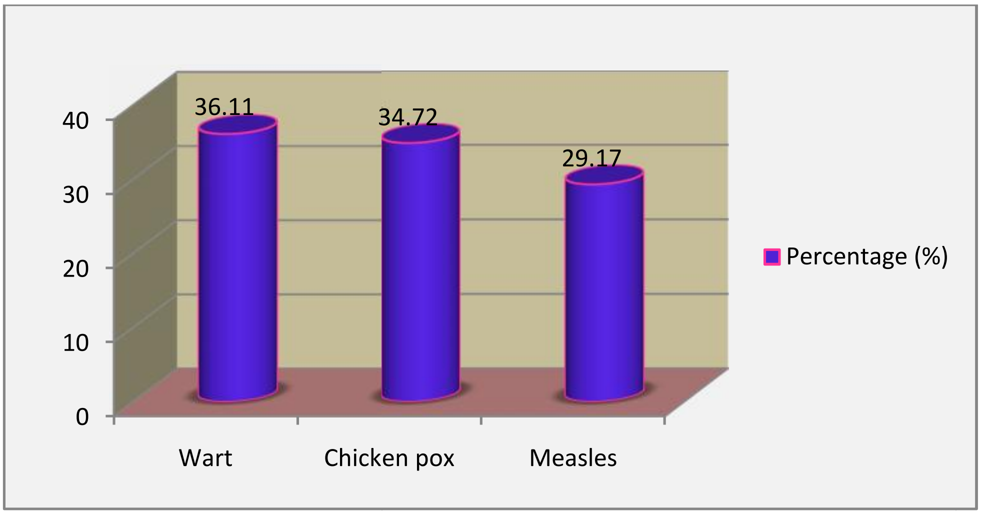


Fig 55. Prevalence of viral infections among the female inhabitants.

In the present study, 2 types of arthropod diseases were recorded, the highest (54.28%) scabies and the lowest (45.71%) pediculosis infection was found among female inhabitants (Fig 56).

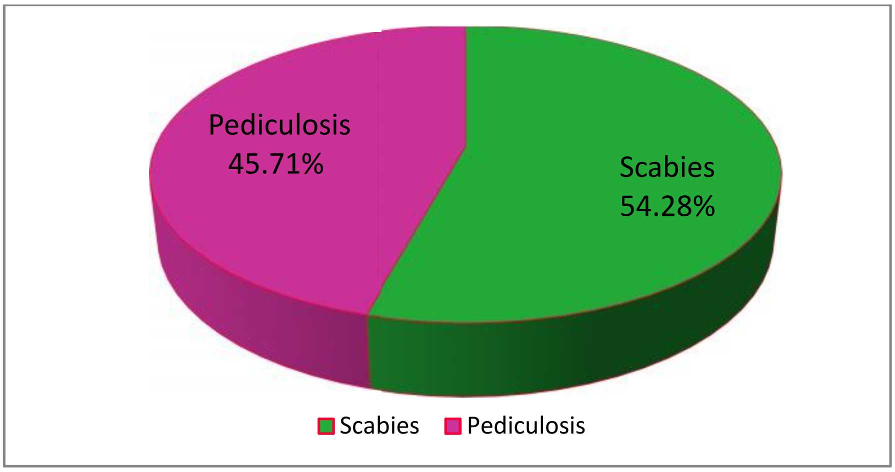


Fig 56. Prevalence of arthropod infections among the female inhabitants.

In the present investigation, It was observed that, adult group was most prone to bacterial (51.19%) and fungal (46.39%) infections. Overall skin infection was also recorded highest (44.09%) in adult group. The viral (43.05%) and arthropod/ ectoparasitic (54.28%) infections were found highest among the children group (Table 40, Fig 57).

Table 40. Overall skin diseases in different age groups among the female inhabitants.

Age group in year	Bacterial infection	Prev. (%)	Fungal infection	Prev. (%)	Viral infection	Prev. (%)	Arthropod infection	Prev. (%)	Total	Prev. (%)
Child group (1-15)	24	14.28	6	6.18	31	43.05	19	54.28	80	21.50
Adult group (16-35)	86	51.19	45	46.39	24	33.33	9	25.71	164	44.09
Middle age group (36-50)	44	26.19	36	37.11	11	15.28	4	11.43	95	25.54
Old age group (51-70)	14	8.33	10	10.31	6	8.33	3	8.57	33	8.87
	168	**45.16**	**97**	**26.07**	**72**	**19.35**	**35**	**9.41**	**372**	**41.33**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Skin infections by age group	0.000	1.00	Prevalence of skin infections was not significantly different across the age group.

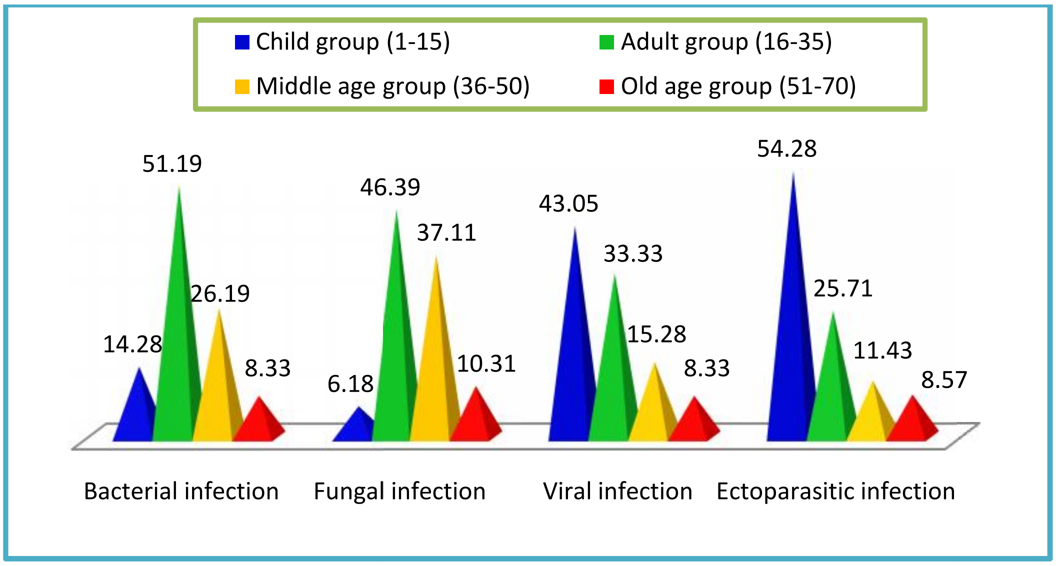


Fig 57. Overall skin diseases in different age groups among the female inhabitants.

Among the bacterial infection, in case of boil, carbuncles, folliculitis and styes, adult group showed highest (57.81%, 56.82%, 50% and 50% respectively) infection and middle age group showed 2nd highest (28.12%, 22.73%, 38.46% and 37.5% respectively) percentage. In case of paronichia and impetigo infection, child group showed highest (36.84% and 71.43%) and adult group showed 2nd highest (26.31% and 28.57%) prevalence (Table 41, Fig 58).

Table 41. Bacterial infections in different age groups among the female inhabitants.

Bacterial infection	Age group in years								Total	Prev. (%)
	Child group (1-15)	Prev. (%)	Adult group (16-35)	Prev. (%)	Middle age group (36-50)	Prev. (%)	Old age group (51-70)	Prev. (%)		
Boil	3	4.69	37	57.81	18	28.12	6	9.37	64	38.09
Carbuncles	6	13.64	25	56.82	10	22.73	3	6.82	44	26.19
Folliculitis	2	7.69	13	50.0	10	38.46	1	3.85	26	15.48
Paronichia	7	36.84	5	26.31	3	15.79	4	21.05	19	11.31
Styes	1	12.5	4	50.0	3	37.5	0	0	8	4.76
Impetigo	5	71.43	2	28.57	0	0	0	0	7	4.17
	24	**14.28**	**86**	**51.19**	**44**	**26.19**	**14**	**8.33**	**168**	**45.16**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of bacterial infection	5.17	0.008	Prevalence of various bacterial infections by age group was significantly different.

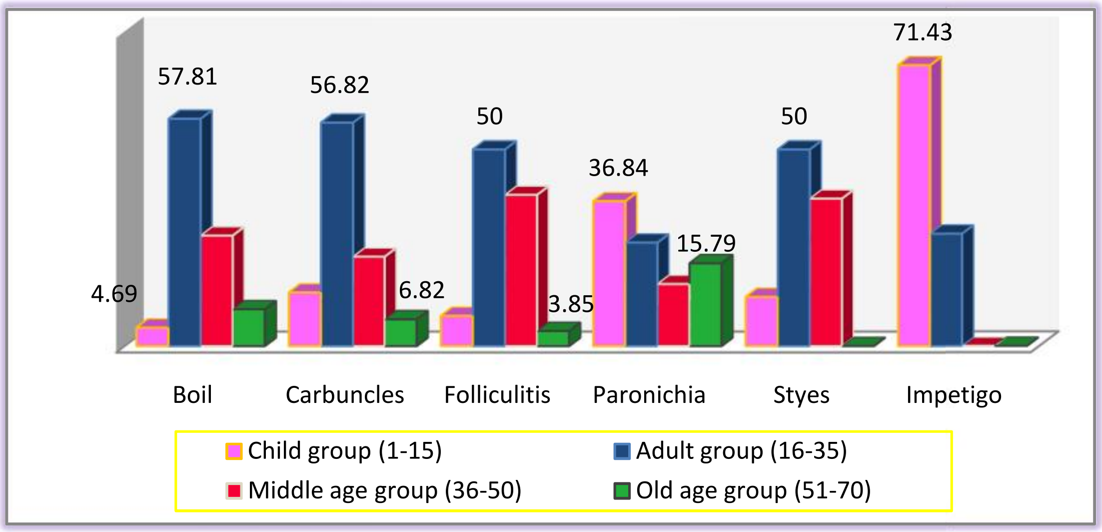


Fig 58. Bacterial infections in different age groups among the female inhabitants.

In case of fungal infection, in children (30%) and old (20%) age group, candidiasis showed the higher prevalence. Among adult age group, onchomycosis was found highest (52%), athlete's foot was found 2nd highest (48.48%) and candidiasis showed lowest (40%) percentage. Ringworm infection was recorded highest (48.27%) then 2nd highest were athlete's foot (39.39%) and candidiasis showed lowest (10%) percentage in middle age group (Table 42, Fig 59).

Table 42. Fungal infections in different age groups among the female inhabitants.

Fungal infection	Age group in years								Total	Prev. (%)
	Child group (1-15)	Prev. (%)	Adult group (16-35)	Prev. (%)	Middle age group (36-50)	Prev. (%)	Old age group (51-70)	Prev. (%)		
Ringworm	1	3.45	12	41.38	14	48.27	2	6.90	29	29.90
Athlete's foot	1	3.03	16	48.48	13	39.39	3	9.09	33	34.02
Onchomycosis	1	4.0	13	52.0	8	32.0	3	12.0	25	25.77
Candidiasis	3	30.0	4	40.0	1	10.0	2	20.0	10	10.31
	6	**6.18**	**45**	**46.39**	**36**	**37.11**	**10**	**10.31**	**97**	**26.07**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of different fungal infection	9.05	0.002	Prevalence of different fungal infections by age group was significantly different.

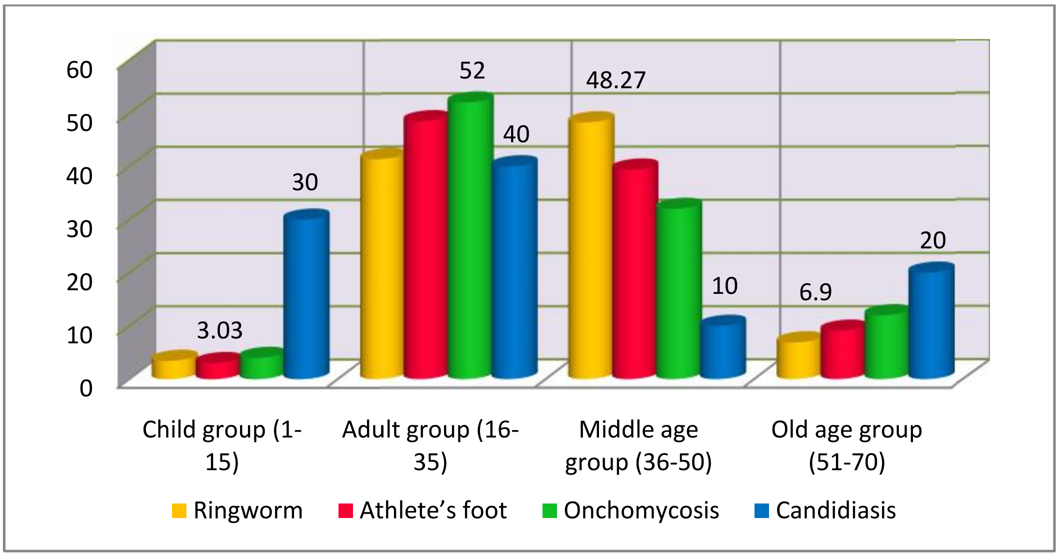


Fig 59. Fungal infections in different age groups among the female inhabitants.

Among the viral infection, in children group, chicken pox showed highest prevalence (52%) then measles (42.86%) and lowest (34.61%) was found wart. Wart prevalence found highest (42.31%) in adult group then measles (28.57%) and chicken pox (28%). In case of middle (19.05%) and old (9.52%) age group, measles was the highest infection (Table 43, Fig 60).

Table 43. Viral infections in different age groups among the female inhabitants.

Viral infection	Age group in years								Total	Prev. (%)
	Child group (1-15)	Prev. (%)	Adult group (16-35)	Prev. (%)	Middle age group (36-50)	Prev. (%)	Old age group (51-70)	Prev. (%)		
Wart	9	34.61	11	42.31	4	15.38	2	7.69	26	36.11
Chicken pox	13	52.0	7	28.0	3	12.0	2	8.0	25	34.72
Measles	9	42.86	6	28.57	4	19.05	2	9.52	21	29.17
	31	**43.05**	**24**	**33.33**	**11**	**15.28**	**6**	**8.33**	**72**	**19.35**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of different viral infection	19.62	0.002	Prevalence of different viral infections by age group was significantly different.

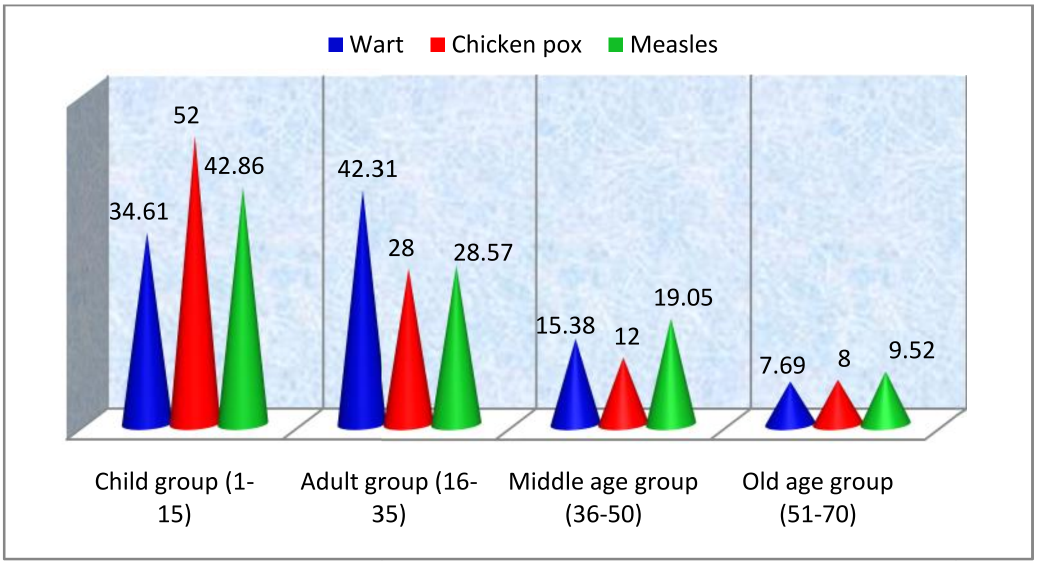


Fig 60. Viral infections in different age groups among the female inhabitants.

In case of arthropod infection, both scabies and pediculosis infestation was observed highest percentage in children group (47.37% and 62.5%) then adult group (31.58% and 18.75%) and lowest (10.53% and 6.25%) in old age group (Table 44, Fig 61).

Table 44. Arthropod infections in different age groups among the female inhabitants.

Ectoparasitic/ Arthropod infection	Age group in years								Total	Prev. (%)
	Child group (1-15)	Prev. (%)	Adult group (16-35)	Prev. (%)	Middle age group (36-50)	Prev. (%)	Old age group (51-70)	Prev. (%)		
Scabies	9	47.37	6	31.58	2	10.53	2	10.53	19	54.28
Pediculosis	10	62.5	3	18.75	2	12.5	1	6.25	16	45.71
	19	**54.28**	**9**	**25.71**	**4**	**11.43**	**3**	**8.57**	**35**	**9.41**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of arthropod infection	17.36	0.009	Prevalence of arthropod infections by age group was significantly different.

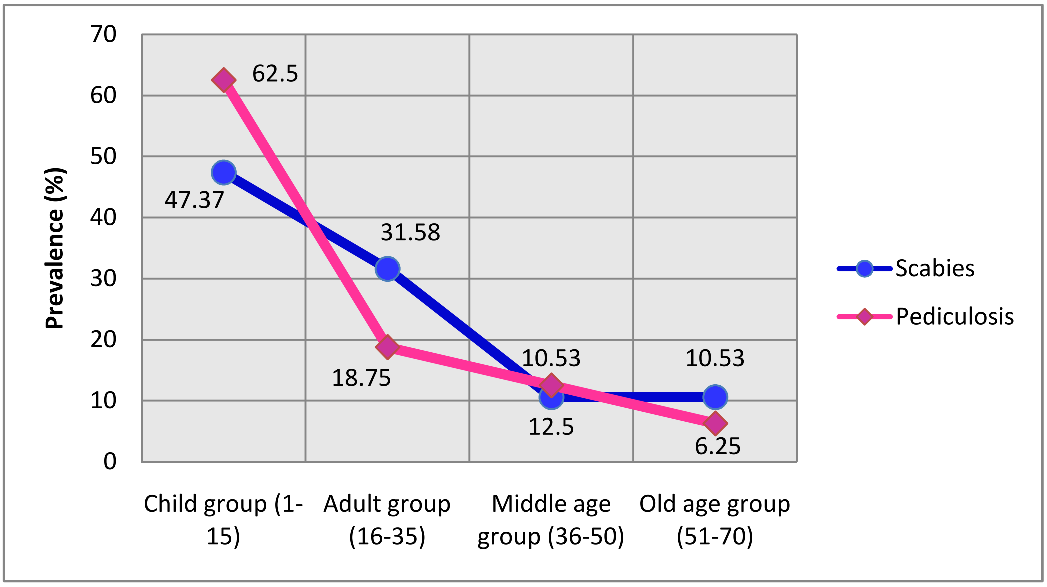


Fig 61. Arthropod infections in different age groups among the female inhabitants.

5. 5 Vector-borne diseases among the female inhabitants:

During the present investigation, out of 900 female inhabitants, 444 (49.33%) females were found to be infected by different types of vector-borne diseases. Four types of vector-borne diseases were recorded such as malaria (2%), filaria (7.33%), dengue (34.67%) and leishmaniasis (5.33%) (Fig 62).

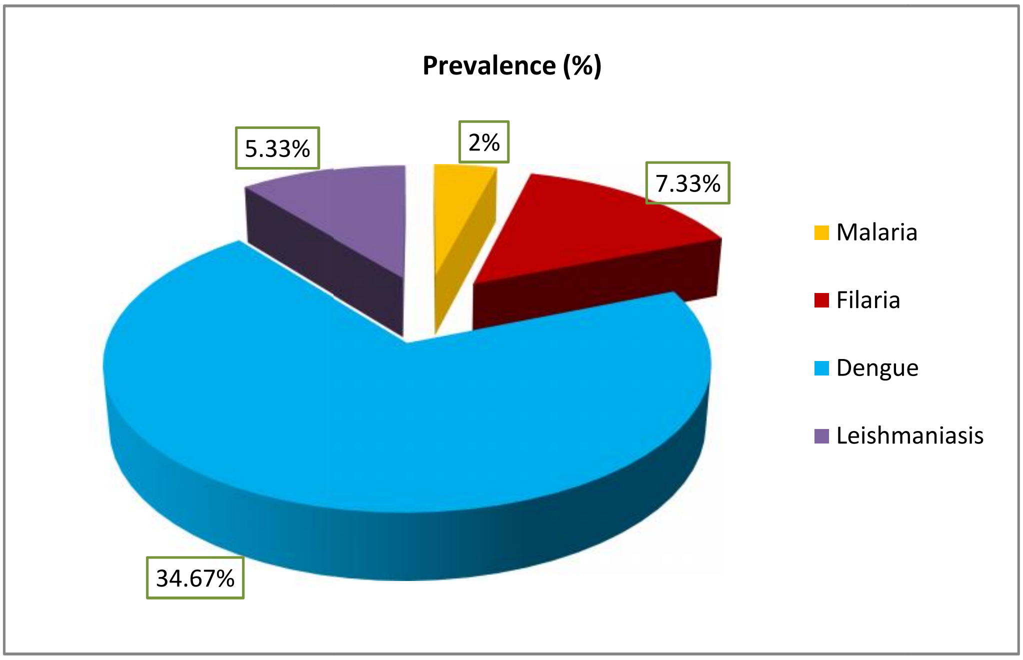


Fig 62. Prevalence of vector-borne diseases found among the female inhabitants.

Dengue (64.25%) and malaria (4.66%) infection was found highest among children and lowest 17.2% and 0.54% respectively in old age group. Highest prevalence of filaria (12.18%) and leishmaniasis (8.12%) found in middle age group and lowest (2.07% in both cases) in children group (Table-45, Fig 63).

Table 45. Prevalence of vector-borne diseases in different age groups of female inhabitants.

Type of diseases	Age groups	Positive cases	Prevalence (%)
Malaria	Children group (1 to 15)	9	4.66
	Adult group (16 to 35)	5	2.00
	Middle age group (36-50)	3	1.11
	Old age group (51 to 70)	1	0.54
Filaria	Children group (1 to 15)	4	2.07
	Adult group (16 to 35)	14	5.60
	Middle age group (36-50)	33	12.18
	Old age group (51 to 70)	15	8.06
Dengue	Children group (1 to 15)	124	64.25
	Adult group (16 to 35)	97	38.80
	Middle age group (36-50)	59	21.77
	Old age group (51 to 70)	32	17.20
Leishmaniasis	Children group (1 to 15)	4	2.07
	Adult group (16 to 35)	10	4.00
	Middle age group (36-50)	22	8.12
	Old age group (51 to 70)	12	6.45

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of malaria, filaria, dengue and leishmaniasis by age group	7.98	0.003	Prevalence of malaria, filaria, dengue and leishmaniasis by age group was significantly different.

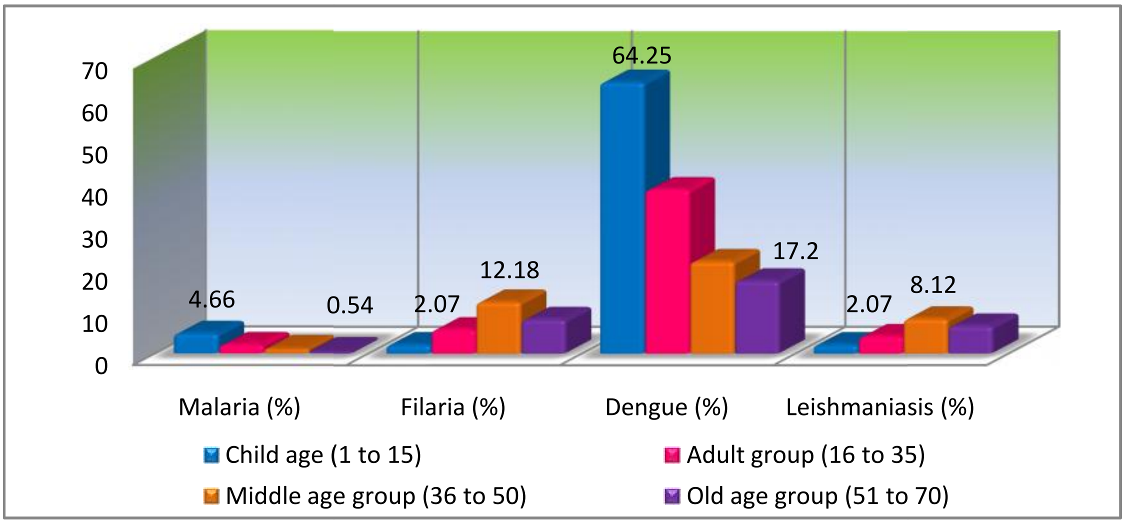


Fig 63. Prevalence of vector-borne diseases in different age groups of female inhabitants.

5.6 Waterborne diseases among the female inhabitants:

Out of 900 female inhabitants, 539 (59.87%) were found to be infected by different types of waterborne diseases. Four types of waterborne diseases such as cholera/ diarrhoea (28%), typhoid (17.11%), polio (5.11%) and hepatitis A/ jaundice (9.67%) were found (Table 46).

Table 46. Prevalence of waterborne diseases recorded among the female inhabitants.

Waterborne diseases	Positive result	Prevalence (%)
Cholera/ diarrhoea (Bacterial)	252	28
Typhoid (Bacterial)	154	17.11
Polio (Viral)	46	5.11
Hepatitis A/ E / Jaundice (Viral)	87	9.67
Chi-square = 23.37, p = 0.000 Significant at 5% level. Type of waterborne diseases was significantly associated with positive cases.		

5.7 Airborne diseases among the female inhabitants:

During the present investigation, a total of 526 (58.44%) were found to be infected by different types of airborne diseases. Four types of airborne diseases recorded, such as influenza (viral) (25.11%), mumps (viral) (10.22%), pneumonia (bacterial) (17.44%) and tuberculosis (bacterial) (5.67%) (Fig 64).

In statistical analysis, Chi-square = 16.86, p = 0.000 Significant at 5% level.

So, different types of airborne diseases were significantly associated with positive cases.

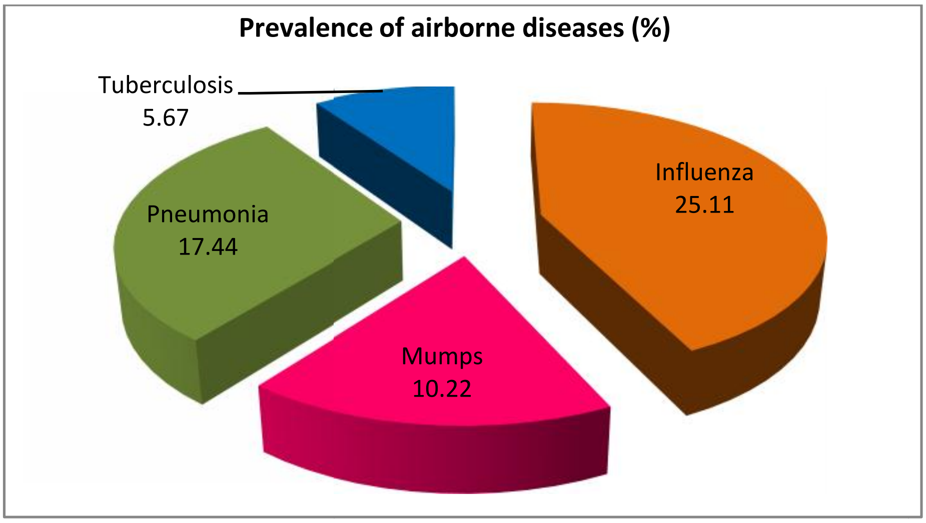


Fig 64. Airborne diseases found among the female inhabitants.

5.8.1 Risk factors and socioeconomic aspects of the female inhabitants in relation to parasitic infection

The main source of disease transmission may be contributed by socio economic condition (education, income, occupation etc.) and personal hygiene (habit of hand washing, type of latrine, footwear, nail clipping etc.).

The level of education showed a great impact on the prevalence of parasitic infection. Out of total samples, highest prevalence (77.95%) was in illiterate group and the lowest (37.14%) among the inhabitants whose education level was above primary (Table-47, Fig 65).

Table 47. Relationship between parasitic infection and educational status of the female inhabitants.

Educational status	No. of inhabitants	Parasite positive cases	Prevalence (%)
Illiterate	313	244	77.95
Can sign name only	288	191	66.32
Primary	229	135	58.95
Above	70	26	37.14
Total/ Avg.	**900**	**596**	**66.22**

Relationship between educational status and prevalence of parasite infection:

$r = -0.975$, $p = 0.025$. $P < 0.05$, so education was significantly correlated with prevalence of parasite infection. Inverse correlation implies that as the level of education increase, the parasitic infection tend to decrease.

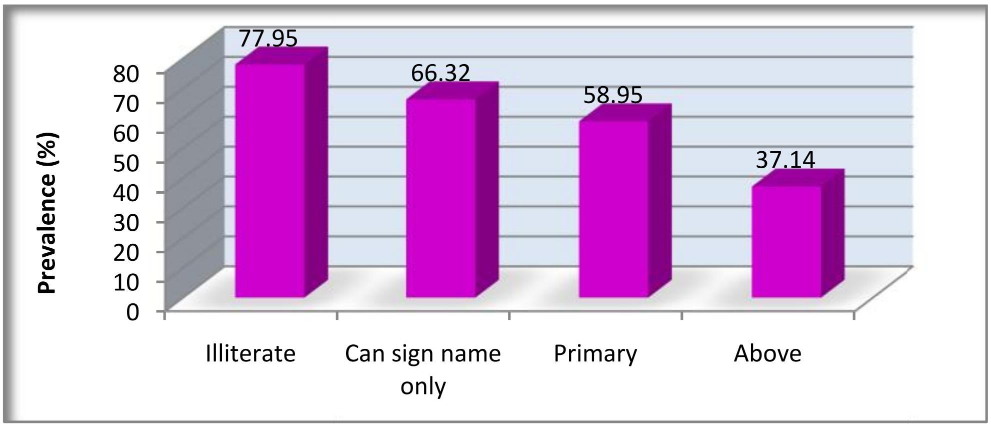


Fig 65. Relationship between parasitic infection and educational status of the female inhabitants.

Occupation of the inhabitants showed association with the prevalence of parasitic infestation. Out of total samples of all occupational categories, prevalence rate was highest (80.73%) among the garments workers followed by 75% in housemaids, 64.63% in housewives, and 55.25% in unemployed groups and lowest (44.71%) among the students (Fig 66).

Relationship between occupation and prevalence of parasitic infection:

Chi-square = 61.69, p = 0.000

Occupation was significantly associated with prevalence of parasite infection.

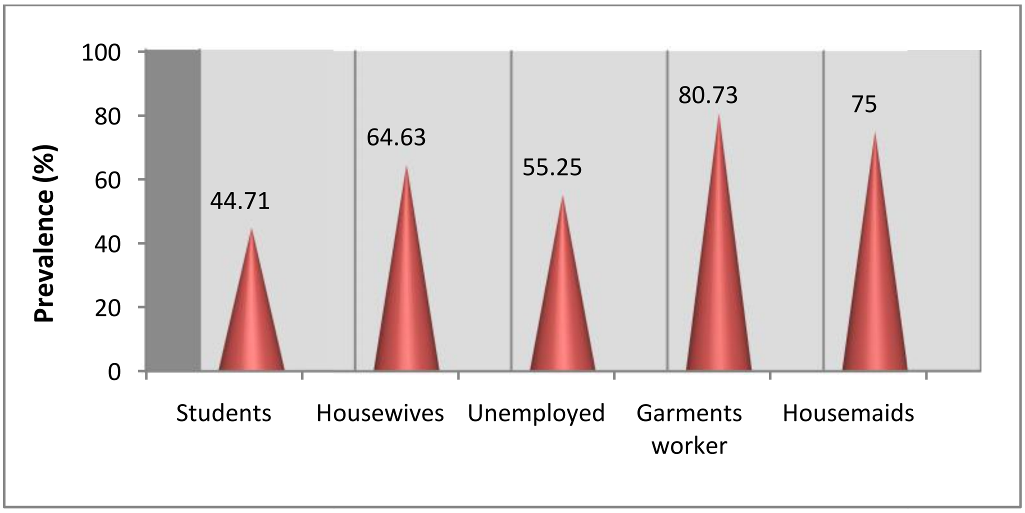


Fig 66. Relationship between parasitic infection and status of occupation of the female inhabitants.

In the present study, family incomes of the female inhabitants were categorized in four groups**.** The highest prevalence (82.90%) was observed in the low income group of Tk. 1000-3000, the lowest prevalence (47.2%) was found in the higher income stratum of Tk. 7000 and above (Fig 67).

Relationship between monthly family income and prevalence of parasitic infection:

r = - 0.998 p = 0.002. Monthly income was significantly correlated with prevalence of parasitic infection. Inverse correlation implies that as monthly income increase prevalence of parasite infection tend to decrease.

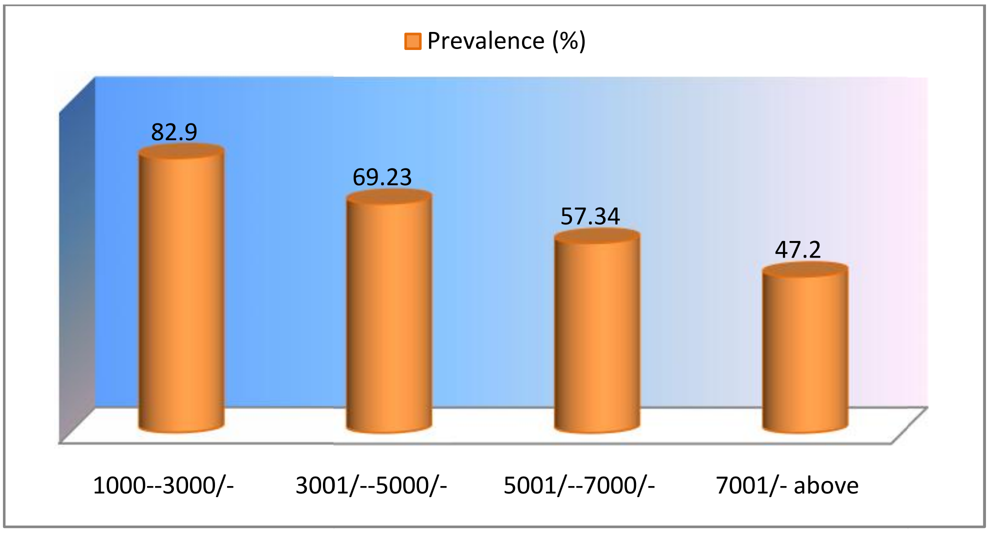


Fig 67. Relationship between parasitic infection and monthly family income of the female inhabitants.

Types of latrine use:

Out of the total samples, highest percentage (86.47%) was observed among open space users followed by 72.90%, 61.85%, and 56.37% in the users of bamboo slit, kacha pit latrine and sanitary latrine respectively (Fig 68).

Chi-square = 48.11, p = 0.000

Type of latrine was significantly associated with prevalence of intestinal parasite.

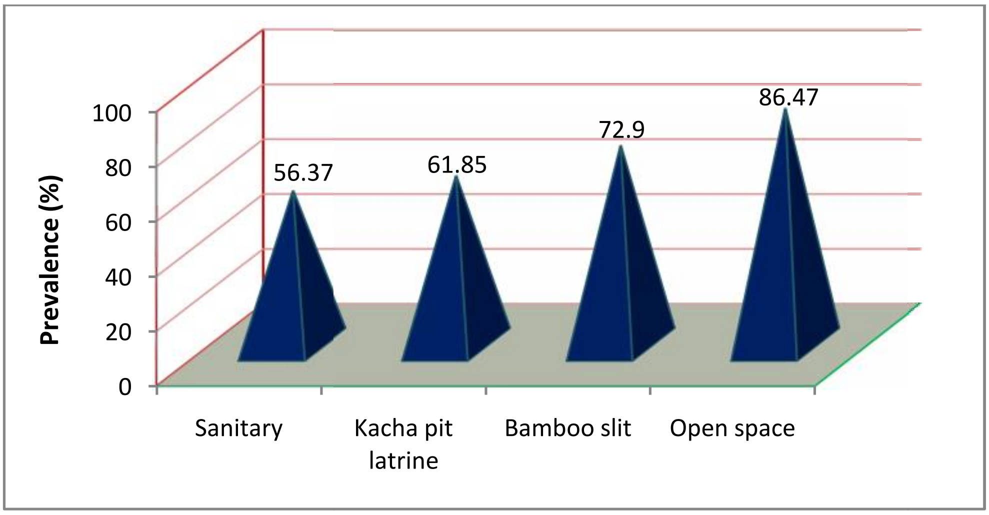


Fig 68. Occurrence of intestinal parasites among the female inhabitants according to the types of latrine use.

Sources of drinking water:

Tap and tube well appears to be the major sources of drinking water for all places and the prevalence was found 69.81% and 64.81% respectively. A few of the respondents used river/ pond/ lake water for drinking purpose but the infestation was remarkably higher (92.86%) among the users of these sources of water. The lowest 48.53% prevalence was found among the females those used boiled water, but whether they boil the water properly or not (Table 48, Fig 69).

Table 48. Occurrence of intestinal parasites according to the sources of drinking water.

Source of drinking water	No. of respondents	No. of parasite positive cases	Prevalence (%)
Tap water (supply)	414	289	69.81
Tube-well water	395	256	64.81
Boiled water	68	33	48.53
Well water	9	5	55.55
River/Pond/Lake	14	13	92.86
Total/ Avg.	**900**	**596**	**66.22**

Chi-square = 60.51, p = 0.000

Source of drinking water was significantly associated with prevalence of intestinal parasite.

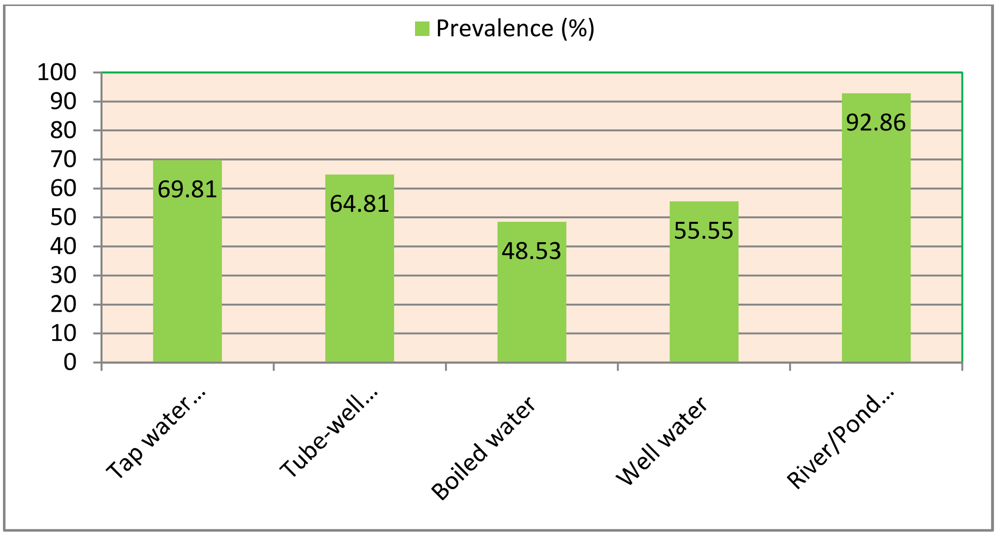


Fig 69. Occurrence of intestinal parasites according to the sources of drinking water.

Habit of hand washing:

Majority of the respondents used only water for hand washing before eating. The rate of infestation was lower (45.89%) among the females who used soap with water for hand washing before eating, compared to the females (77.93%) who used only water for this purpose (Fig 70).

Chi-square = 94.35, p = 0.000

Hand washing habits before eating was significantly associated with prevalence of intestinal parasite.

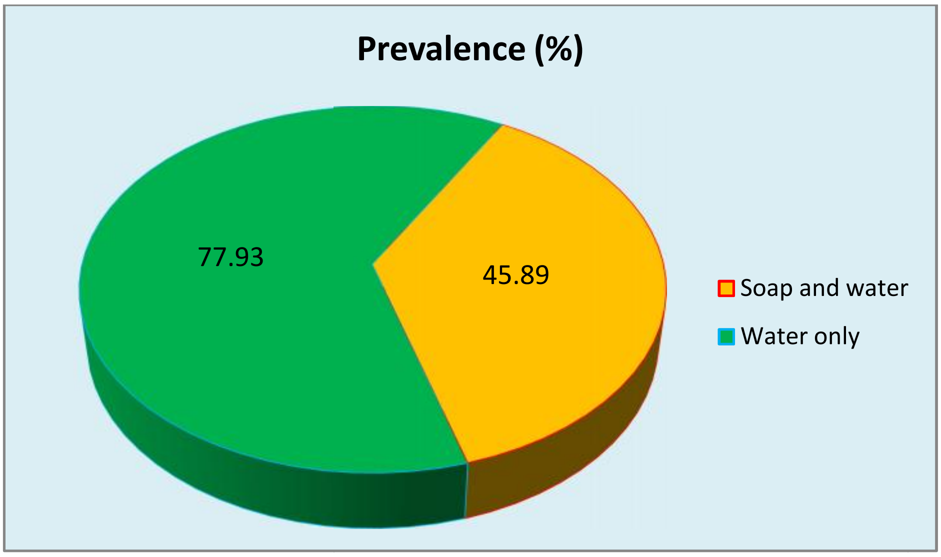


Fig 70. Relationship of intestinal parasitic infections and pre-eating hand washing habit.

Majority of the respondents used only water (71.43%) for hand washing after defaecation in all study places. It is evident from the figure 71 that, 81.37% of the inhabitants who used soil and water for hand washing were highly infected whereas the inhabitants using soap and water were found to be lowest (39.53%) infected. Use of ash and water for hand washing purpose was also practiced where 68.75% prevalence were observed (Fig 71).

Chi-square = 58.72, p = 0.000

Hand washing habits after defaecation was significantly associated with prevalence of intestinal parasite.

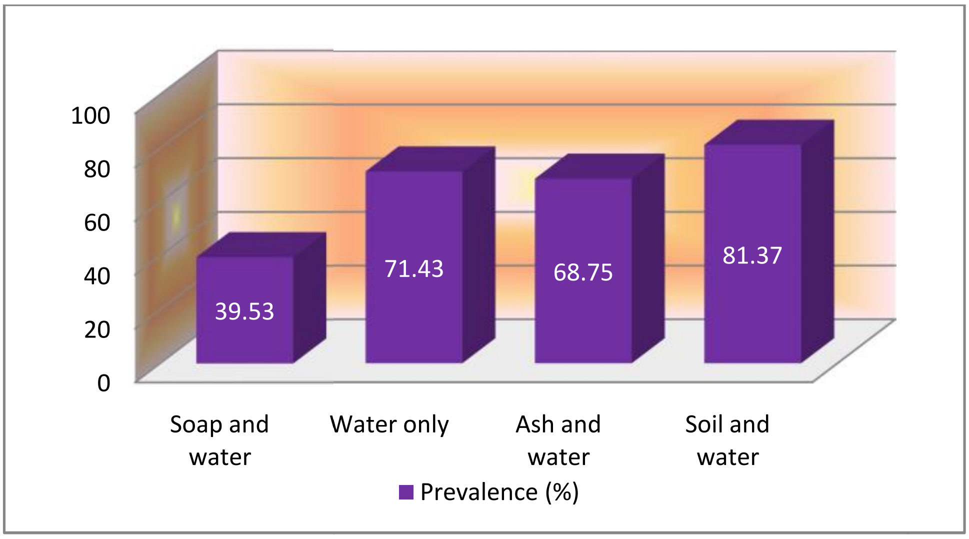


Fig 71. Relationship of intestinal parasitic infections and habit of hand washing after defaecation.

Habit of nail clipping of the female inhabitants:

Regular nail clipping appears to be a protective factor in the prevalence of parasite infection. The prevalence of infection was lower (37.62%) among the regular nail clippers compared to irregular nail clippers (81.93%) (Fig 72).

Chi-square = 178.78, p = 0.000

Nail cutting habits was significantly associated with prevalence of parasite.

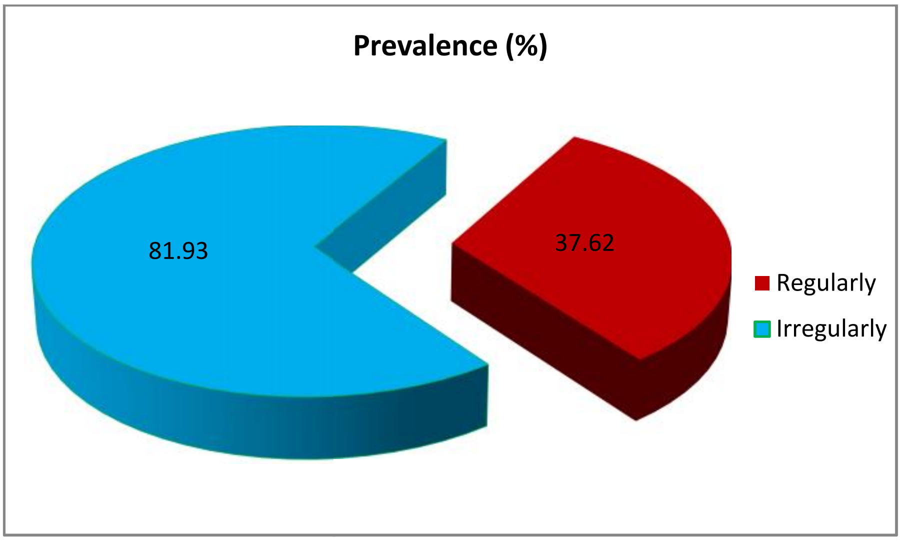


Fig 72. Relation between parasitic infection and nail cutting habits of the female inhabitants.

Habit of footwear of the female inhabitants:

Regular use of shoes appears to be a protecting and preventive factor in the prevalence of infection. It was found that prevalence of parasitic infection among the females were 32.95% who used shoes regularly. On the other hand 79.91% of the females had parasite infections who were bare footers (Fig 73).

Chi-square = 91.46, p = 0.000.

Habit of footware was significantly associated with prevalence of parasite infection.

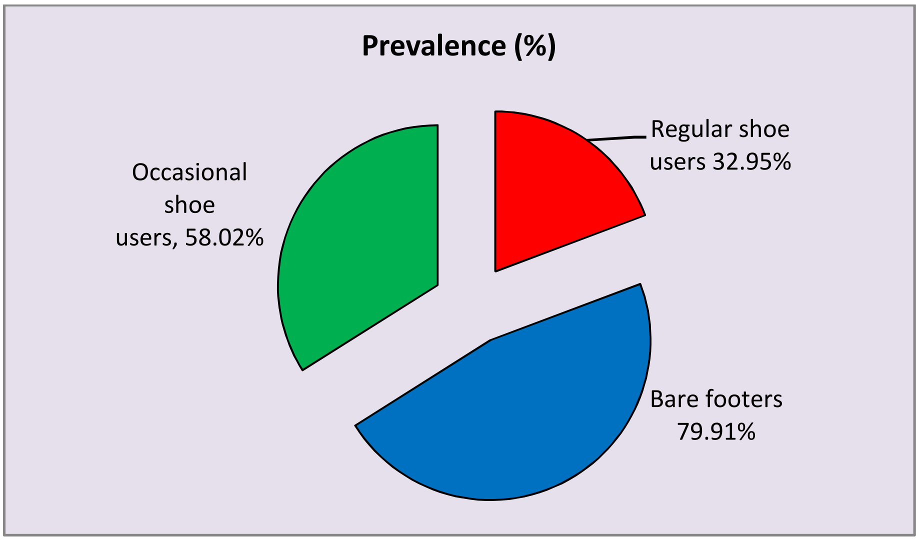


Fig 73. Relationship between parasitic infection and habit of footwear of the female inhabitants.

5.8.2 Risk factors and socioeconomic aspects of the female inhabitants in relation to skin infections

In the present investigation, the female inhabitants were frequently infected by bacterial, fungal, viral and arthropod infections. The prevalence of overall skin infection among inhabitants was 23.39% among the pre school group, 30.38% in the illiterate group, 29.57% in primary level group, 16.67% in above primary group. The highest prevalence was found in illiterate group (Table 49, Fig 74a).

The prevalence of bacterial infections among female inhabitants was 24.40% among pre school group, 31.55% in the illiterate group, the highest 35.12% in primary level group; and lowest 8.93% in above primary group (Table 49, Fig 74b).

Regarding the fungal infections, among the inhabitants, highest prevalence (32.99%) was observed in the illiterate group and lowest (11.34%) in pre school age group (Table 49, Fig 74b).

In case of viral infections, highest prevalence (31.94%) was recorded among pre school age group, 29.17% in the illiterate group, 23.61% in primary level group and lowest (15.28%) in above primary group (Table 49, Fig 74b).

In case of arthropod infections, Majority 12 (34.28%) were found in pre school age group, 7 (20.0%) in the illiterate group, 11 (31.43%) in primary level group, 5 (14.28%) in above primary group (Table 49, Fig 74b).

Regarding overall skin infected females, the highest 92 (24.73%) found in students, 79 (21.24%) in garments worker, 73 (19.62%) in housewives, the lowest 59 (15.86%) in unemployed female, and 69 (18.55%) in housemaids. (Table 50, Fig 75).

In the present study, the prevalence of bacterial infections was 24.40% in students, 14.28% in housewives, and 21.43% in housemaids. The highest prevalence (27.38%) was found among the garments worker and the lowest (12.5%) among the unemployed females (Table 50, Fig 76).

Among the fungal infected females, the highest prevalence was recorded (28.86%) among the housewives and the lowest (12.37%) among the garments worker; 24.74% found in students, 20.62% in unemployed females and 13.40% in housemaids (Table 50, Fig 76).

The prevalence of viral infection was 18.05% in housewives, 22.22% in garments worker, and 19.44% in housemaids. The highest prevalence (25.0%) was found among the students and the lowest among the unemployed females (15.28%) (Table 50, Fig 76).

Among the arthropod infected females, the highest prevalence was found among the students (25.71%) and the lowest prevalence was found among the garments worker (14.28%) (Table 50, Fig 76).

In case of monthly family income, the inhabitants of 3001-5000/- tk income group was highly (26.07%) infected by different skin infections. Regarding bacterial infections, 7000/- above tk income group was highly (28.57%) infected. Among fungal infected female inhabitants, the highest prevalence (31.96%) was observed in 5001/-7000/- tk income group. Among viral infected females, the highest (27.78%) was found in 3001/-5000/- tk income group. In case of arthropod infections, 1000/- 3000/- tk income group was found highest (31.43%) (Table 51, Fig 77 and 78).

The highest prevalence (34.68%) of skin diseases was found those lived in tin shed houses. It was also found that, 33.60% prevalence among female inhabitants lived in tin shed with bamboo surrounding houses and 31.72% in bamboo and plastic sheet roof with surrounding houses (Table 52, Fig 79).

In case of bacterial skin infections, the highest prevalence was 42.85% those lived in tin shed houses, 33.93% in tin shed with bamboo surrounding houses and lowest 23.31% in bamboo and plastic sheet roof houses (Table 52, Fig 80).

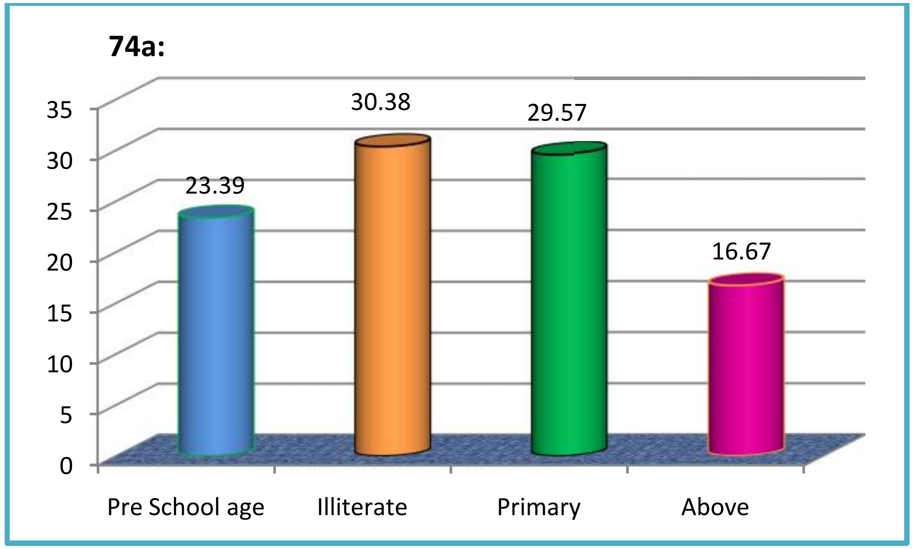
Among fungal skin infected females, the lowest prevalence (22.68%) was found those lived in tin shed houses, 35.05% in tin shed with bamboo surrounding houses and highest 42.27% prevalence lived in bamboo and plastic sheet roof houses (Table 52, Fig 80).

In case of viral skin infections, 26.39% prevalence observed among female inhabitants those lived in tin shed house, 29.17% in tin shed with bamboo surrounding houses and 44.44% lived in bamboo and plastic sheet roof houses (Table 52, Fig 80).

In case of arthropod skin infections, highest (45.71%) prevalence recorded those lived in tin shed houses, 37.14% found in tin shed with bamboo surrounding houses and lowest (17.14%) in bamboo and plastic sheet roof houses (Table 52, Fig 80).

Table 49. Prevalence of different types of skin infections among the female inhabitants in relation to different educational status.

Educational Status	Bacterial infection	Prev. (%)	Fungal infection	Prev. (%)	Viral infection	Prev. (%)	Arthropod infection	Prev. (%)	Total	Prev. (%)
Pre School age	41	24.40	11	11.34	23	31.94	12	34.28	87	23.39
Illiterate	53	31.55	32	32.99	21	29.17	7	20.0	113	30.38
Primary	59	35.12	23	23.71	17	23.61	11	31.43	110	29.57
Above	15	8.93	31	31.96	11	15.28	5	14.28	62	16.67
Total	**168**	**45.16**	**97**	**26.07**	**72**	**19.35**	**35**	**9.41**	**372**	**41.33**



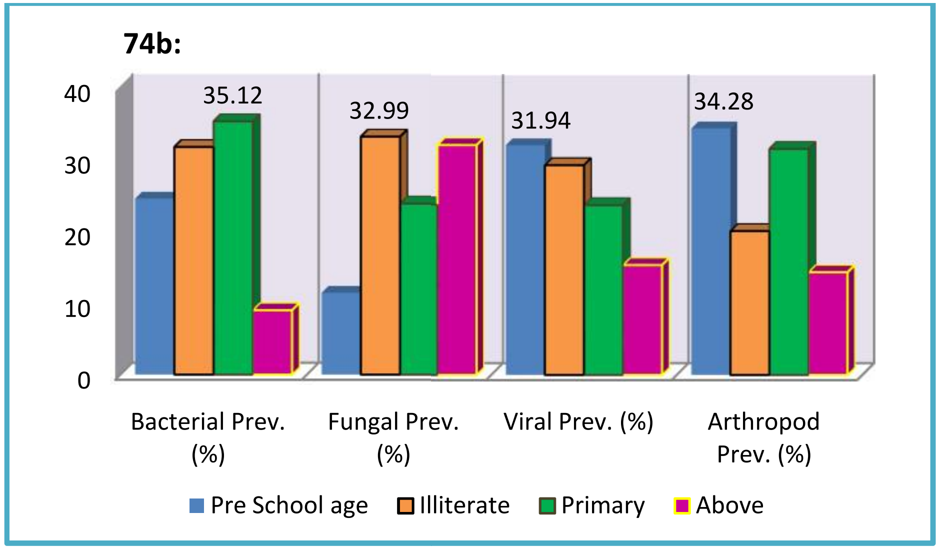


Fig 74a and 74b. Prevalence of different types of skin infections among the female inhabitants in relation to different educational status.

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of bacterial, fungal, viral and arthropod infections by education	0.000	1.00	Prevalence of bacterial, fungal, viral and arthropod infections by education was not significantly different.

Table 50. Prevalence of different types of skin infections among the female inhabitants in different occupation.

Occupation	Bacterial infection	Prev. (%)	Fungal infection	Prev. (%)	Viral infection	Prev. (%)	Arthropod infection	Prev. (%)	Total	Prev. (%)
Students	41	24.40	24	24.74	18	25.0	9	25.71	92	24.73
Housewives	24	14.28	28	28.86	13	18.05	8	22.86	73	19.62
Unemployed	21	12.5	20	20.62	11	15.28	7	20.0	59	15.86
Garments worker	46	27.38	12	12.37	16	22.22	5	14.28	79	21.24
Housemaids	36	21.43	13	13.40	14	19.44	6	17.14	69	18.55
Total	**168**	**45.16**	**97**	**26.07**	**72**	**19.35**	**35**	**9.41**	**372**	**41.33**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of bacterial, fungal, viral and arthropod infections by occupation	0.000	1.00	Prevalence of bacterial, fungal, viral and arthropod infections by occupation was not significantly different.

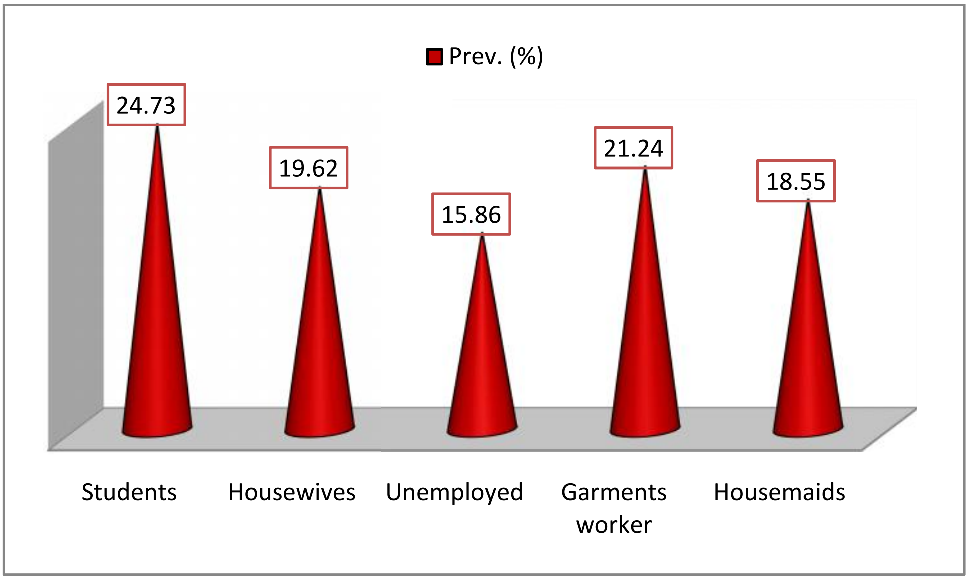


Fig 75. Prevalence of skin infections among the female inhabitants in different occupation.

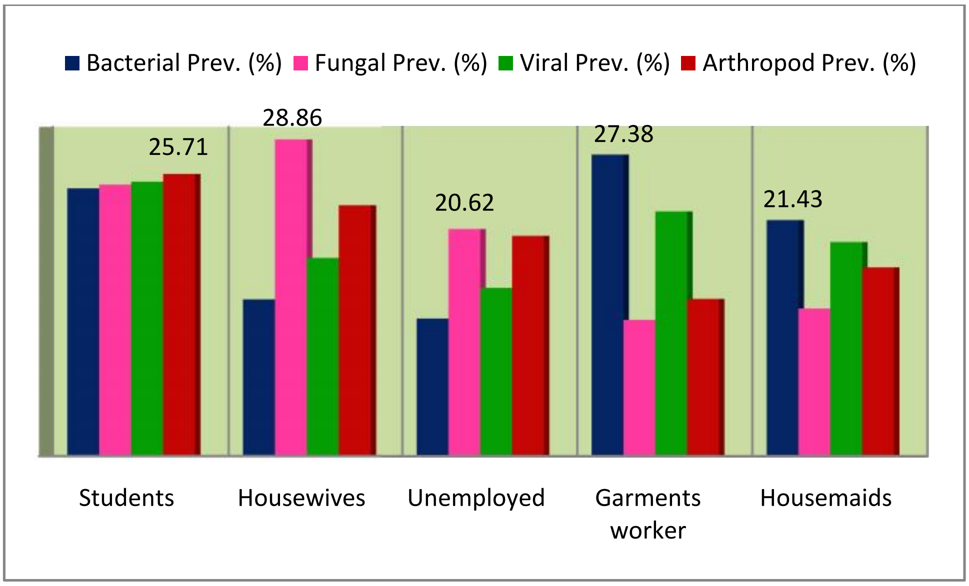


Fig 76. Prevalence of bacterial, fungal, viral and arthropod infections among the female inhabitants in different occupation.

Table 51. Skin infections among the female inhabitants according to their monthly income.

Monthly income	Bacterial infection	Prev. (%)	Fungal infection	Prev. (%)	Viral infection	Prev. (%)	Arthropod infection	Prev. (%)	Total	Prev. (%)
1000--3000/-	45	26.78	20	20.62	17	23.61	11	31.43	93	25.0
3001/--5000/-	38	22.62	30	30.93	20	27.78	9	25.71	97	26.07
5001/--7000/-	37	22.02	31	31.96	16	22.22	8	22.86	92	24.73
7001/- above	48	28.57	16	16.49	19	26.39	7	20.7	90	24.19
Total	**168**	**45.16**	**97**	**26.07**	**72**	**19.35**	**35**	**9.41**	**372**	**41.33**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of bacterial, fungal, viral and arthropod infections by monthly income	0.01	1.00	Prevalence of bacterial, fungal, viral and arthropod infections by monthly income was not significantly different.

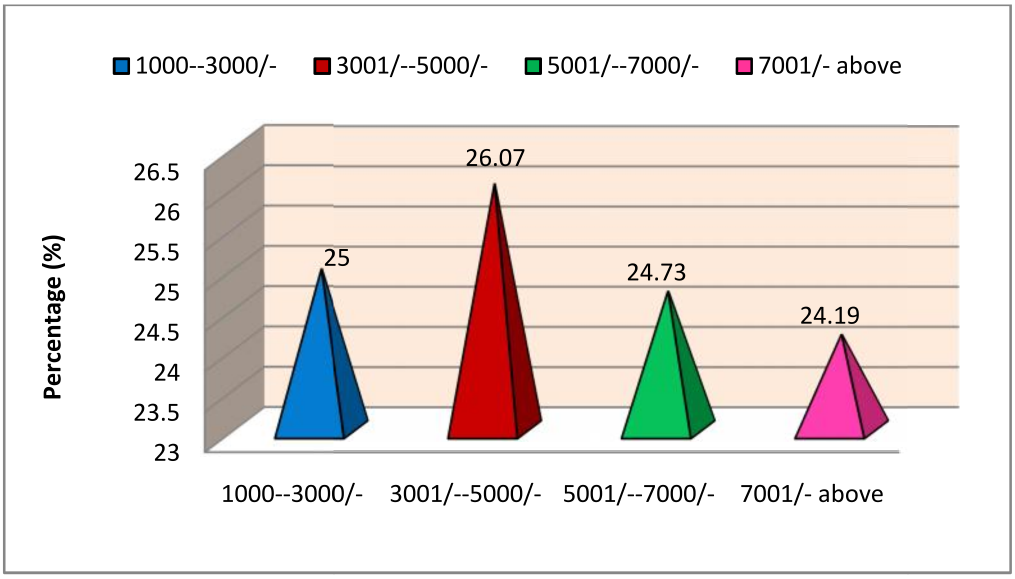


Fig 77. Prevalence of skin infections among the female inhabitants according to their monthly income.

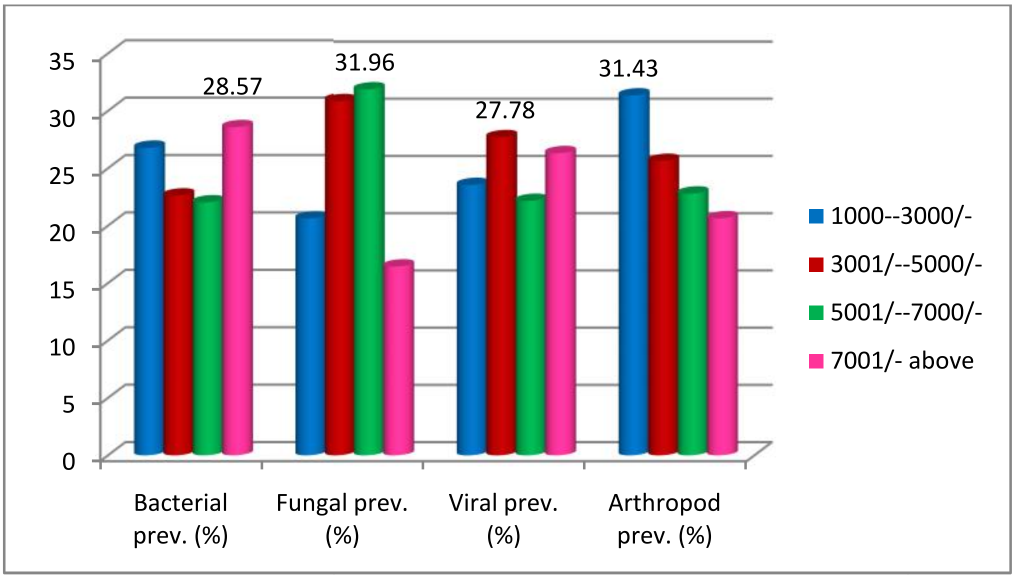


Fig 78. Different types of skin infections among the female inhabitants according to their monthly income.

Table 52. Skin infections among the female inhabitants in relation to different types of living houses.

House type	Bacterial infection	Prev. (%)	Fungal infection	Prev. (%)	Viral infection	Prev. (%)	Arthropod infection	Prev. (%)	Total	Prev. (%)
Tin shed	72	42.85	22	22.68	19	26.39	16	45.71	129	34.68
Tin shed with bamboo surrounding	57	33.93	34	35.05	21	29.17	13	37.14	125	33.60
Bamboo and plastic sheet roof with surrounding	39	23.31	41	42.27	32	44.44	6	17.14	118	31.72
Total	**168**	**45.16**	**97**	**26.07**	**72**	**19.35**	**35**	**9.41**	**372**	**41.33**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of bacterial, fungal, viral and arthropod infections by housing type	0.000	1.00	Prevalence of bacterial, fungal, viral and arthropod infections by housing type was not significantly different.

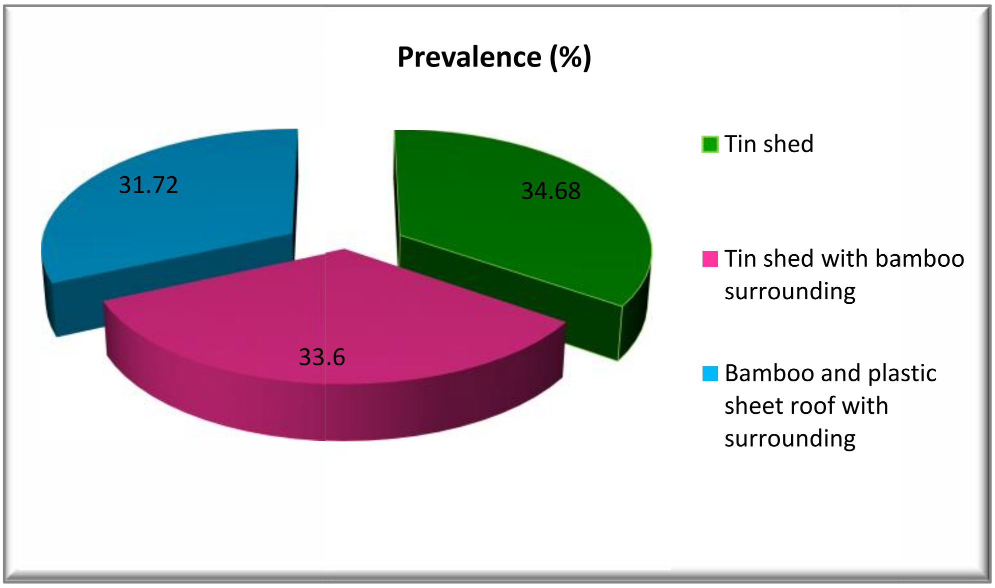


Fig 79. Prevalence of skin infections among the inhabitants according to house type.

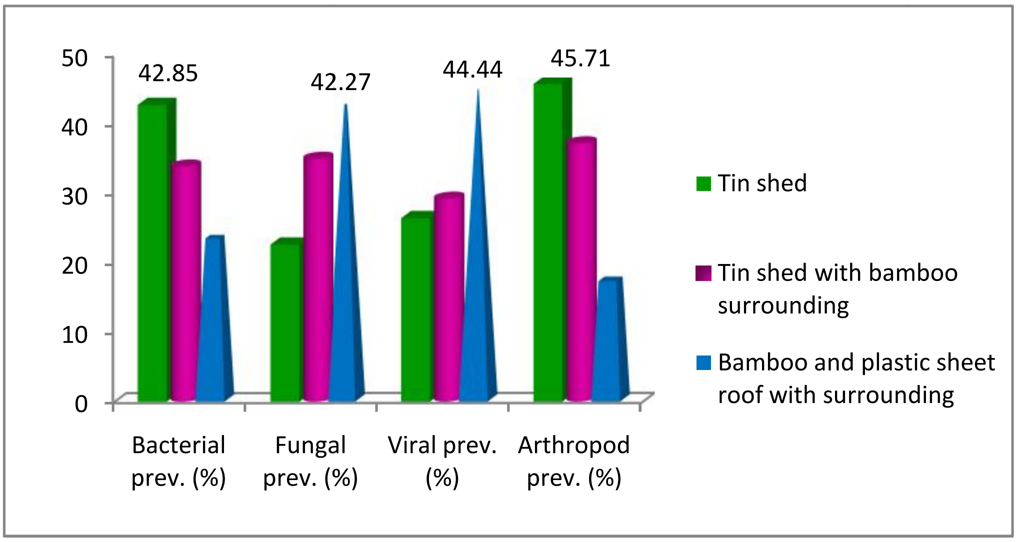


Fig 80. Different types of skin infections among the female inhabitants in relation to different types of living houses.

It was observed that most of the families were overcrowded (62.09%) where the percentages of all disease were high. Among the bacterial infections, 62.5% infected members were included in overcrowding family, among the fungal, 55.67% members, among the viral, 68.05% infected members and among the arthropod, 65.71% members were included (Table 53, Fig 81 and 82).

Table 53. Bacterial, fungal, viral and arthropod infections among the members of the overcrowded family.

Type of infection	Overcrowding				Total	(%)
	Yes	(%)	No	(%)		
Bacterial	105	62.5	63	37.5	**168**	**45.16**
Fungal	54	55.67	43	44.33	**97**	**26.07**
Viral	49	68.05	23	31.94	**72**	**19.35**
Arthropod	23	65.71	12	34.28	**35**	**9.41**
Total	**231**	**62.09**	**141**	**37.90**	**372**	**41.33**

Chi-square = 299.24, $p = 0.392$ not significant at 5% level.

Prevalence of bacterial, fungal, viral and arthropod infections was not significantly associated with overcrowding.

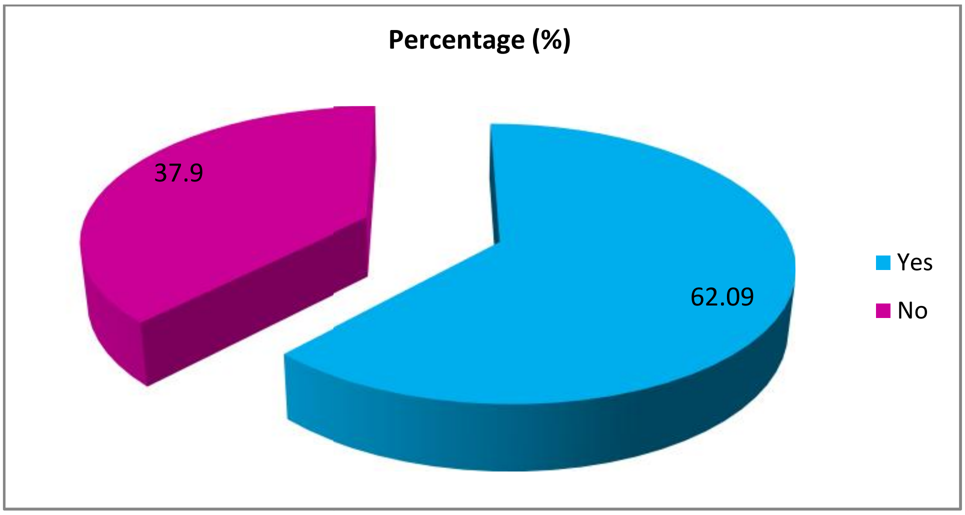


Fig 81. Overall skin infections among the members of the overcrowded family.

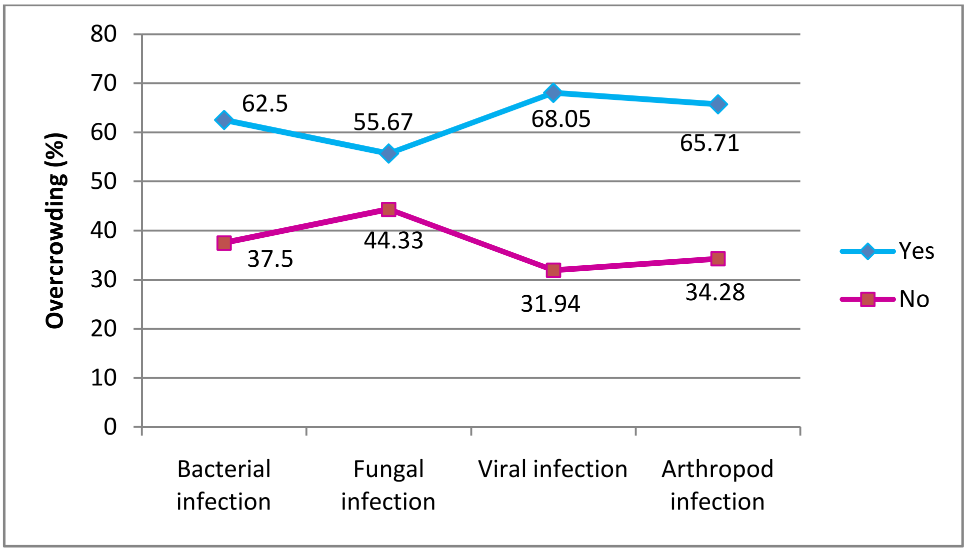


Fig 82. Different types of skin infections among the members of the overcrowded family.

It was found that, the female inhabitants with the habit of not taking bath regularly suffer mostly (62.36%) with all skin infections. 57.74% bacterial infections, 73.19% fungal infections, 52.78% viral infections and 74.28% arthropod infections were found among inhabitants with the habit of not taking bath regularly (Table 54, Fig 83 and 84).

Table 54. Skin infections in relation to the habit of taking bath regularly.

Type of infection	Habit of taking bath regularly				Total	(%)
	Yes	(%)	No	(%)		
Bacterial	71	42.26	97	57.74	**168**	**45.16**
Fungal	26	26.80	71	73.19	**97**	**26.07**
Viral	34	47.22	38	52.78	**72**	**19.35**
Arthropod	9	25.71	26	74.28	**35**	**9.41**
Total	**140**	**37.63**	**232**	**62.36**	**372**	**41.33**

Chi-square = 11.32 p = 0.010 significant at 5% level.

Prevalence of bacterial, fungal, viral and arthropod infections was significantly associated with habit of taking bath regularly.

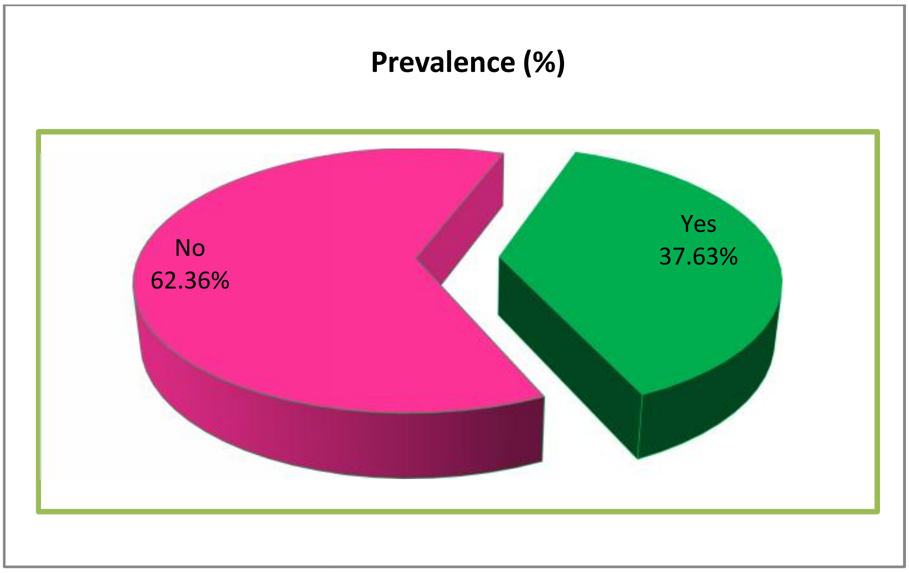


Fig 83. Skin infections in relation to the habit of taking bath regularly.

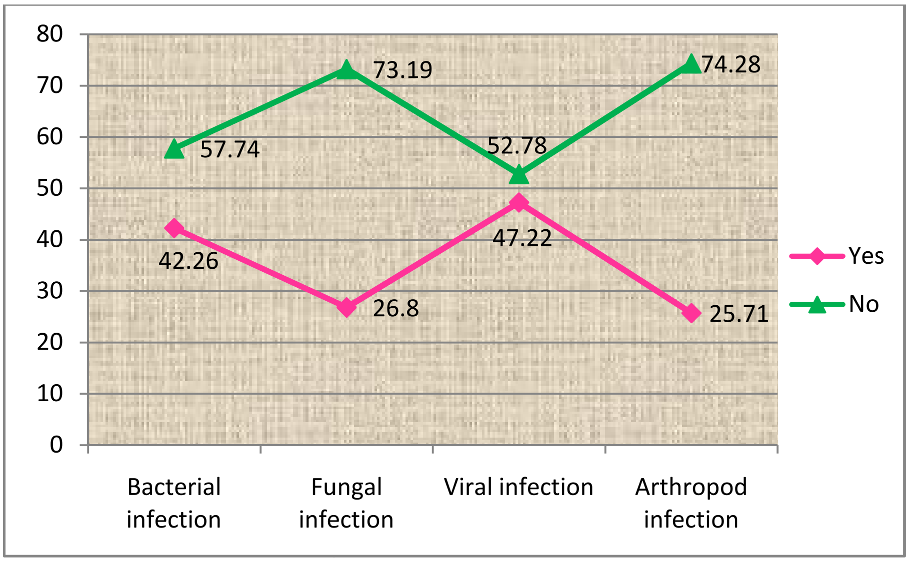


Fig 84. Different types of skin infections in relation to the habit of taking bath regularly.

Occurrence of the diseases and relation with washing clothes.

Regarding the habit of washing of used clothes, 39.52% females washed their clothes 1 day in a week and they suffered mostly, 26.88% 2 days, 21.24% 3 days and 12.36% >4 days in a week washed their clothes (Fig 85).

In case of bacterial infections, 36.90% infected females washed their clothes 1 day in a week, 27.38% 2 days, 18.45% 3 days and 17.26% >4 days in a week washed their clothes (Fig 86).

Regarding fungal infections, highest 44.33% infected female inhabitants washed their clothes 1 day in a week, 29.90% 2 days, 22.68% 3 days and 3.09% >4 days in a week washed their clothes. (Fig 86).

In case of viral infections, highest 29.16% infected females washed their clothes 1 day in a week, 19.44% 2 days, 33.33% 3 days and lowest 18.05% >4 days in a week washed their clothes (Fig 86).

In case of arthropod infections, 60.0% infected females washed their clothes 1 day in a week, 31.43% 2 days, 5.71% 3 days and 2.86% >4 days in a week washed their clothes (Fig 86).

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of bacterial, fungal, viral and arthropod infections by washing clothes in a week	7.31	0.005	Prevalence of bacterial, fungal, viral and arthropod infections by washing clothes in a week was significantly different.

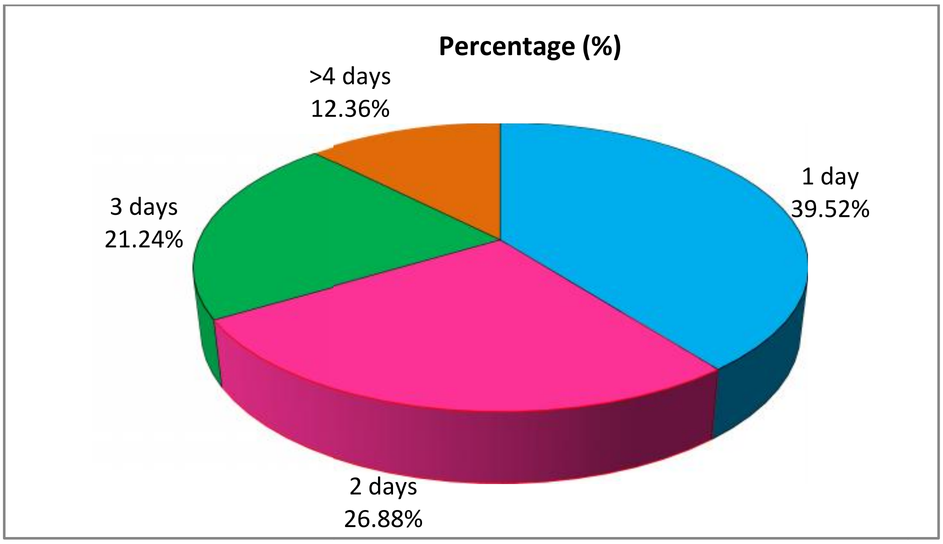


Fig 85. Skin infections in relation with washing clothes.

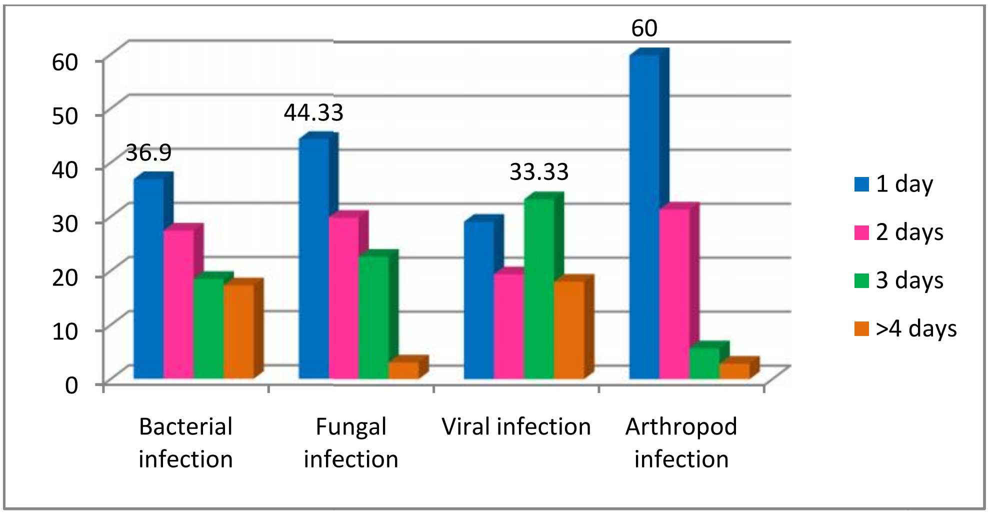


Fig 86. Occurrence of the diseases and relation with washing clothes.

It was found that the percentage of recurrence of infections of bacterial diseases was 53.57%, of fungal diseases was 59.79%, of viral diseases was 51.39%, of arthropod diseases was 74.28% and 56.72% for overall skin diseases (Table 55, Fig 87 and 88).

Regarding seasonal variation, highest percentage of diseases occurred in summer (35.75%), then rainy (35.48%) and lowest was in winter (28.76%). It was found that, the percentage of both bacterial (40.48%) and fungal (40.21%) infections increase in summer. The highest percentage of viral (40.28%) was in rainy and arthropod (51.43%) was in winter (Table 56, Fig 89 and 90).

Table 55. History of recurrence of infections among female inhabitants.

Type of infection	Recurrence history				Total	(%)
	Present	(%)	Absent	(%)		
Bacterial	90	53.57	78	46.43	**168**	**45.16**
Fungal	58	59.79	39	40.21	**97**	**26.07**
Viral	37	51.39	35	48.61	**72**	**19.35**
Arthropod	26	74.28	9	25.71	**35**	**9.41**
Total	**211**	**56.72**	**161**	**43.28**	**372**	**41.33**

Chi-square = 6.28, p = 0.090 not significant at 5% level.

Prevalence of bacterial, fungal, viral and arthropod infections was not significantly associated with recurrence history.

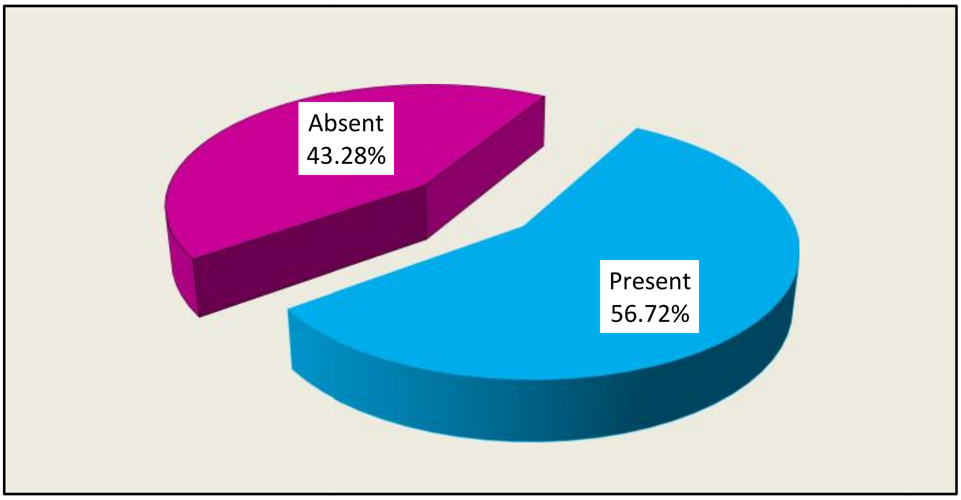


Fig 87. History of recurrence of infections among the female inhabitants.

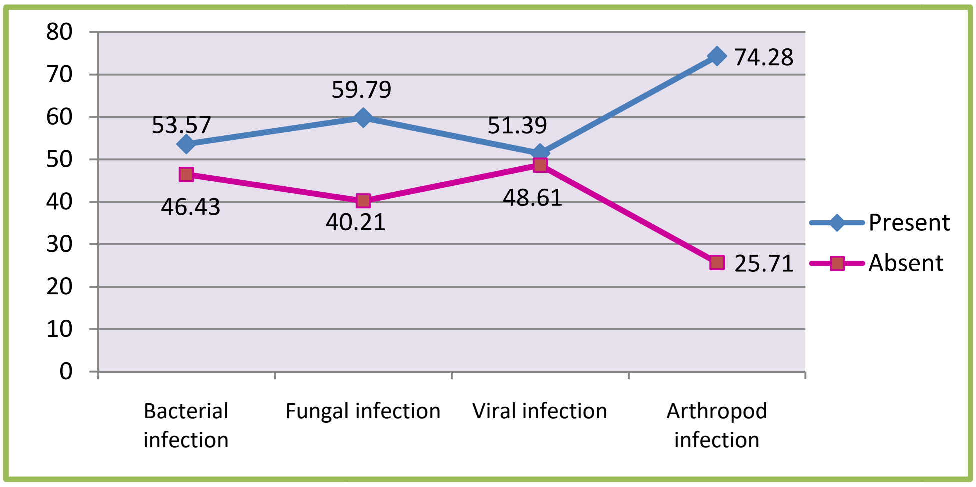


Fig 88. History of recurrence of infections of skin diseases among the female inhabitants.

Table 56. Prevalence of bacterial, fungal, viral and arthropod infections in relation to seasonal variation.

Diseases	Seasonal variation						Total	(%)
	Winter	**%**	**Summer**	**%**	**Rainy**	**%**		
Bacterial	41	24.40	68	40.48	59	35.12	**168**	**45.16**
Fungal	22	22.68	39	40.21	36	37.11	**97**	**26.07**
Viral	26	36.11	17	23.61	29	40.28	**72**	**19.35**
Arthropod	18	51.43	9	25.71	8	22.86	**35**	**9.41**
Total	**107**	**28.76**	**133**	**35.75**	**132**	**35.48**	**372**	**41.33**

Analysis of variance (F-test)

Source of variation	F	Sig.	Comments
Prevalence of seasonal variation of bacterial, fungal, viral and arthropod	0.020	0.980	Prevalence of seasonal variation of bacterial, fungal, viral and arthropod was not significantly different.

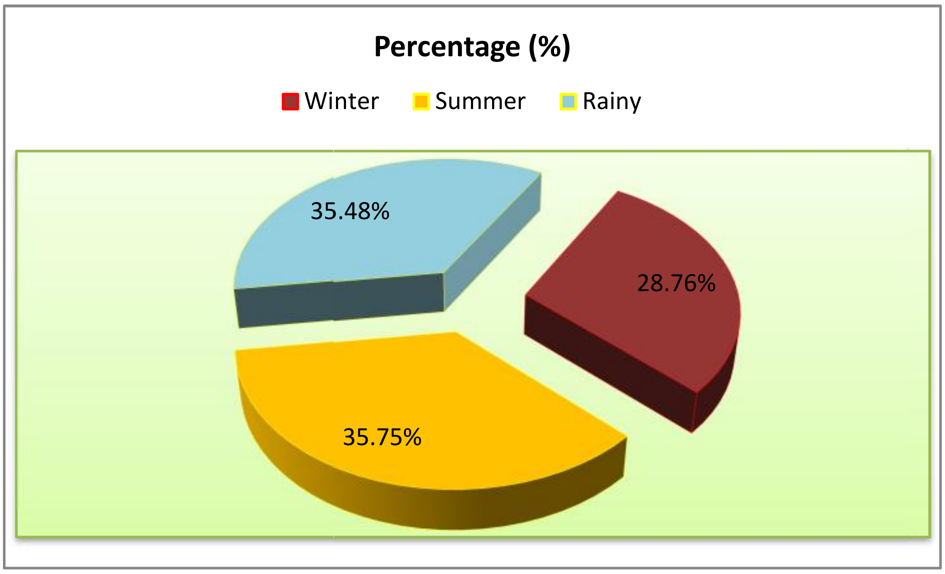


Fig 89. Skin infections in relation to seasonal variation.

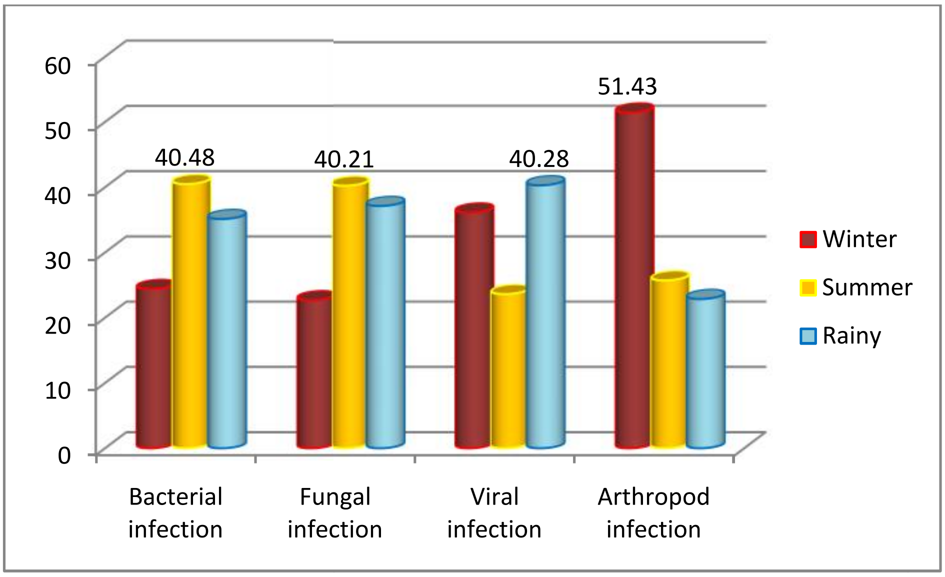


Fig 90. Prevalence of different types of skin infections in relation to seasons.

5.8.3 Prevalence of vector-borne diseases in relation to risk factors and socioeconomic aspects of the female inhabitants

In the present study, 4 types of vector-borne diseases were found such as filaria, malaria, dengue and leishmaniasis. In case of these vector-borne diseases, the result of all socioeconomic factors (education, income, and occupation) were found almost similar, because of their transmission process are more or less similar that's why here common characteristics were discussed.

Educational status showed a great impact on the prevalence of vector-borne diseases. As the level of education increased vector-borne infection decreased. Out of the total sample, highest prevalence (59.74%) was in illiterate group, then 56.94% found those can sign name only, 35.81% in primary group and the lowest 15.71% among the inhabitants whose education level was above primary level (Fig 91).

Chi-square = 68.66,   p = 0.000 significant at 5% level.

Educational status was significantly associated with vector-borne diseases.

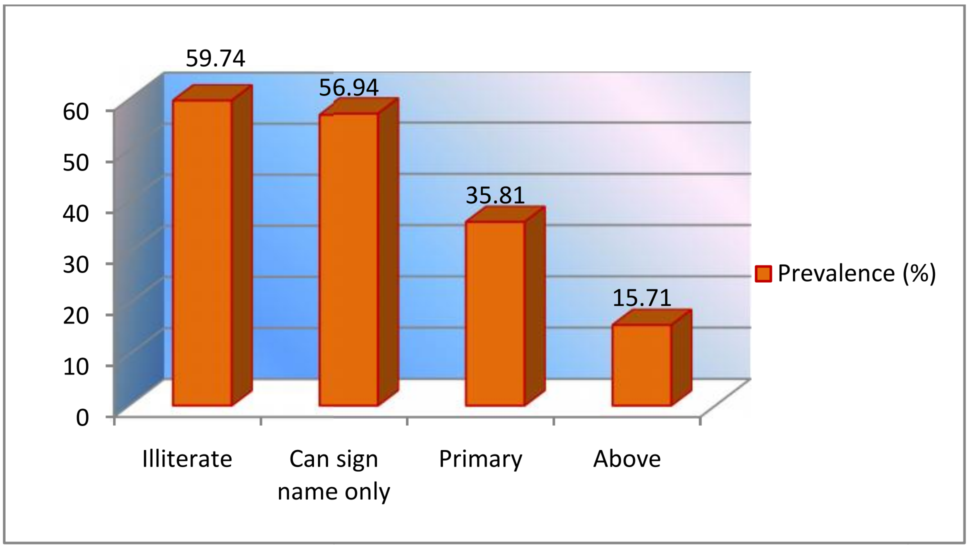


Fig 91. Association between vector-borne diseases and educational status.

Occupation is also an important factor for all vector-borne diseases because slum people are neglected in terms of health issues of the society. Among the total infected females (444), the highest prevalence (68.29%) was found among students, 65.74% among unemployed females, 62.80% among housewives, 37.08% among housemaids and lowest 25.52% found among garments worker (Fig 92).

Chi-square = 107.07, p = 0.000 significant at 5% level.

Occupation was significantly associated with positive cases of disease.

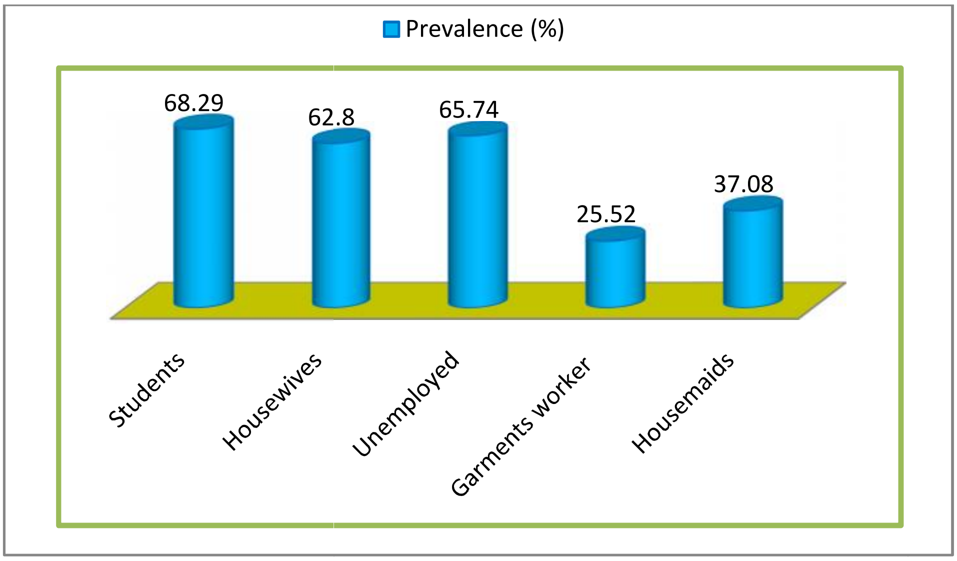


Fig 92. Association between vector-borne diseases and occupation.

In the present study, the highest prevalence of infestation (52.75%) was observed in the income group of Tk. 3001-5000, the lowest (43.2%) in the upper income stratum of Tk. 7000 and above, 96 infected females (49.74%) belonging to 1000-3000 TK. income group and 102 (46.79%) belonging to 3001-5000 TK. income group (Fig 93).

Chi-square = 4.16   p = 0.245 not significant at 5% level.

Monthly income was not significantly associated with positive cases.

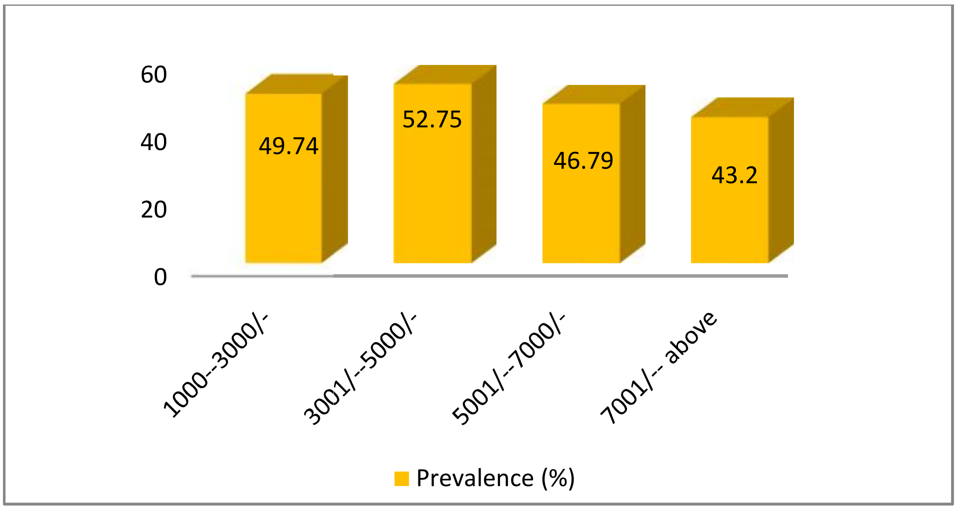


Fig 93. Association between vector-borne diseases and monthly family income.

Fig 94 showed that, most of the house had 5 and above family members, and the highest (52.88%) prevalence were observed there (Fig 94).

Chi-square = 5.43   p = 0.019 significant at 5% level.

Household size was significantly associated with positive cases.

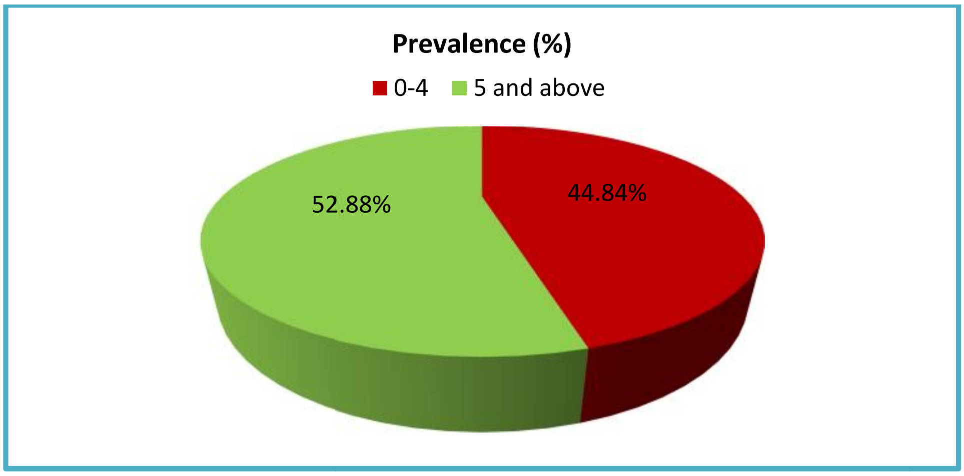


Fig 94. Association between vector-borne diseases and household size.

The highest prevalence of vector-borne diseases (61.85%) found in people living in bamboo and plastic sheet roof surrounded house, 48.50% in people living in tin shed with bamboo surrounding house and lowest prevalence (35.40%) was found in tin shed house (Fig 95).

Chi-square = 41.72   p = 0.000 significant at 5% level.

Type of house was significantly associated with positive cases.

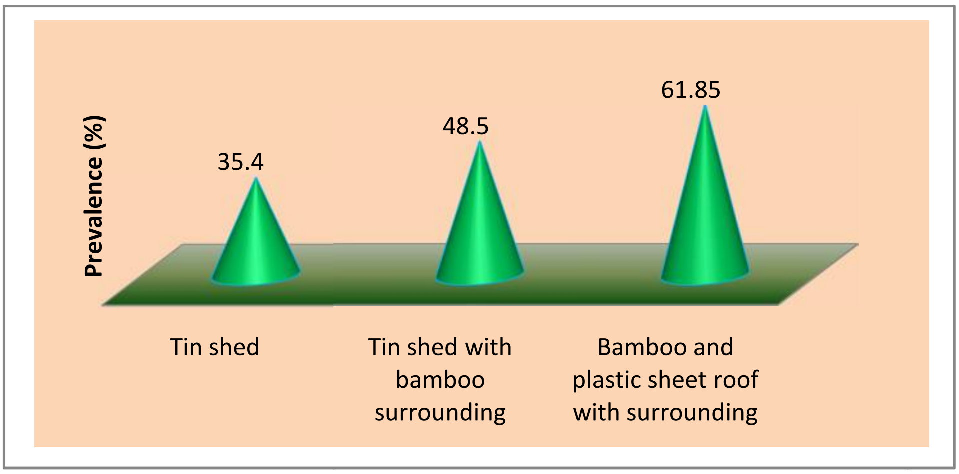


Fig 95. Association between vector-borne diseases and type of house.

Use of bed net is vital and preventive factor for protection from mosquito bite. Out of total inhabitants, 157 females use bed net while sleeping and among them 17.20% were infected. 743 females didn't use bed net and highest 56.12% were found to be infected with different vector-borne diseases (Fig 96).

Chi-square = 77.02 p = 0.000 significant at 5% level.

Use of bed net was significantly associated with positive cases.

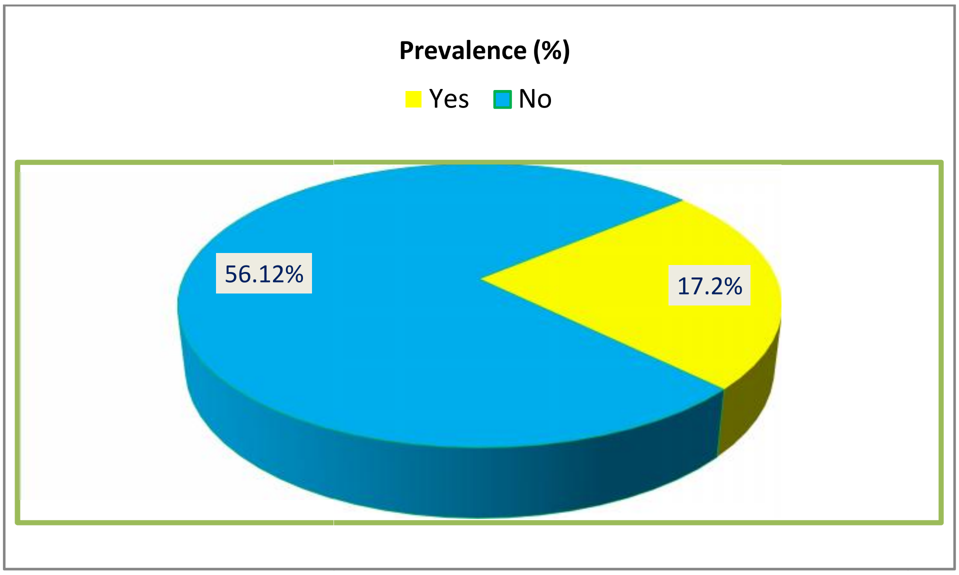


Fig 96. Association between vector-borne diseases and use of bed net of the female inhabitants.

In the present investigation, out of total inhabitants, 284 females slept outside room and among them highest 64.79% were infected; 616 females slept inside room and among them 42. 21% were infected (Fig 97).

Chi-square = 38.75 p = 0.000 significant at 5% level.

Sleeping place was significantly associated with positive cases.

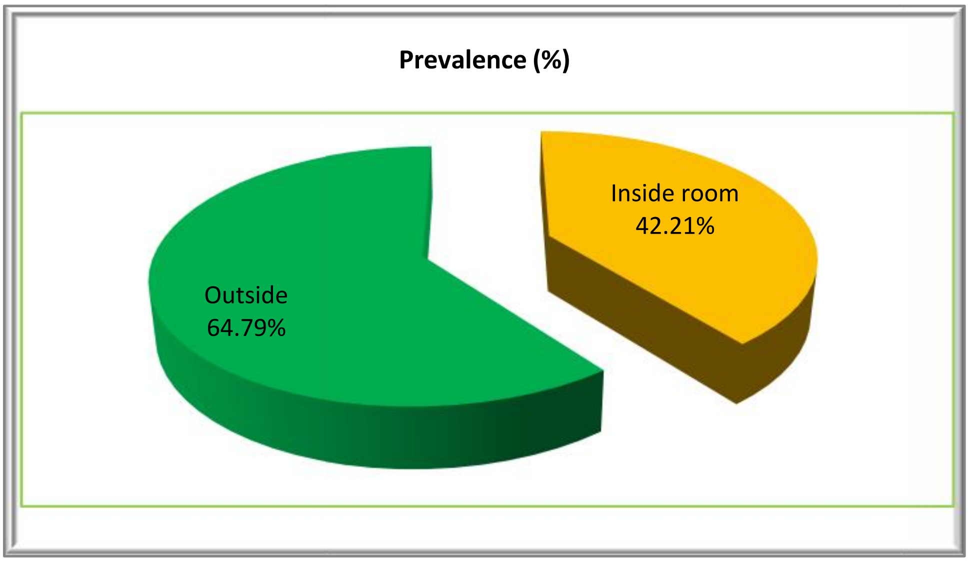


Fig 97. Association between vector-borne diseases and sleeping place.

5.8.4 Risk factors and socioeconomic aspects of the female inhabitants in relation to waterborne diseases

Waterborne diseases such as diarrhoea, cholera, typhoid, polio, jaundice etc. have very strong relationship with poverty, unhygienic environment and other socioeconomic conditions.

In the present investigation it was observed that the major proportion of the waterborne infections (71.50%) was found in children group, 64.80% in adult group, 58.60% in old age and the lowest prevalence (47.97%) was found in middle age group. Children were significantly more affected with waterborne diseases (Fig 98).

Chi-square = 13.03, $p = 0.004$ significant at 5% level.

Age group was significantly associated with waterborne diseases.

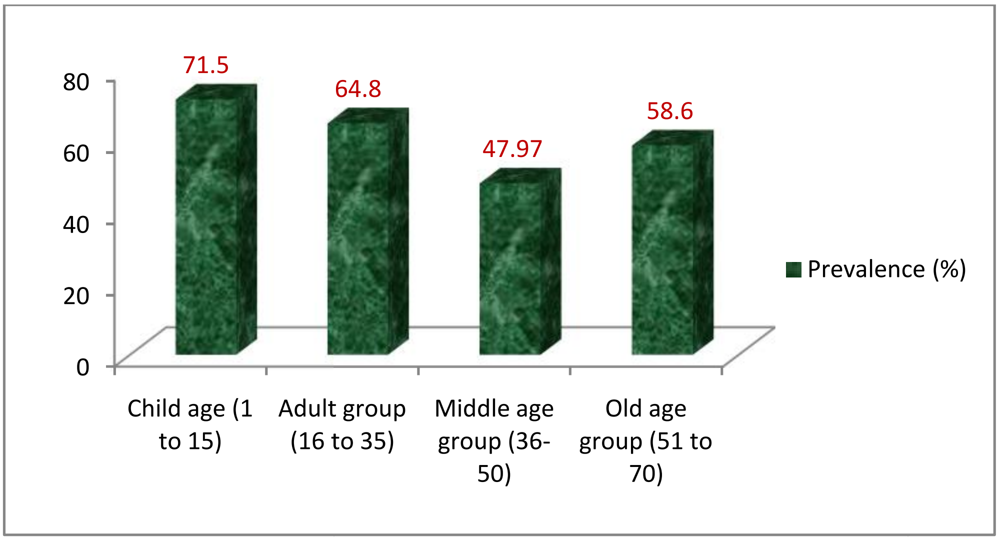


Fig 98. Association between waterborne diseases and age groups.

Among the respondents, highest prevalence (70.93%) was observed in illiterate group, then 68.75% found those can sign name only, 42.79% in primary level group and the lowest found (30.0%) among the inhabitants whose education level was above primary level (Fig 99).

Chi-square = 48.56 $p = 0.000$ significant at 5% level.

Education was significantly associated with waterborne diseases.

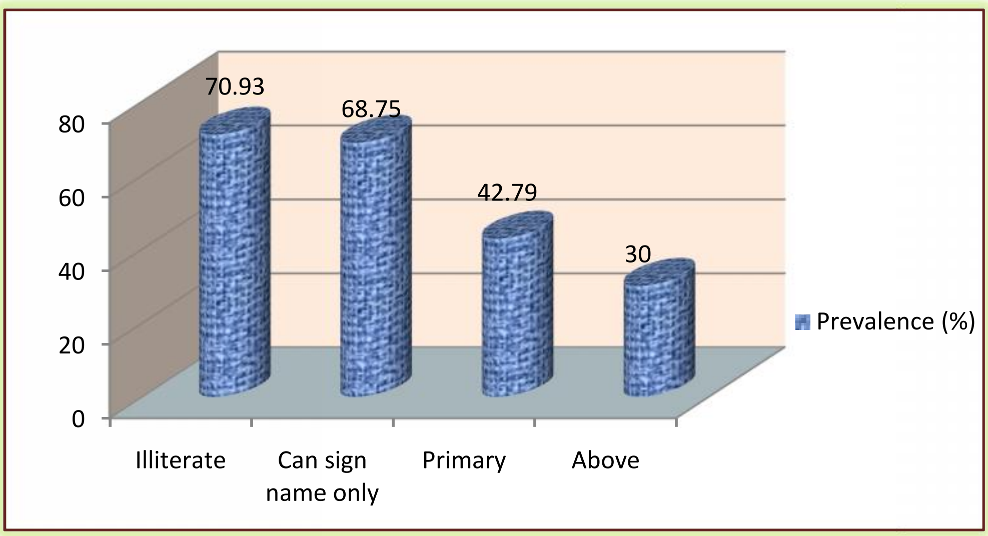


Fig 99. Association between waterborne diseases and educational status.

In the present study, the highest prevalence was observed in garments worker (68.75%) and lowest (47.97%) was in students. Among 164 housewives, 87 female (53.05%) was infected, out of 181 unemployed females 58.56% infected; among 240 housemaids 64.58% was infected females (Fig 100).

Chi-square = 12.09 p = 0.016 significant at 5% level.

Occupation was significantly associated with waterborne diseases.

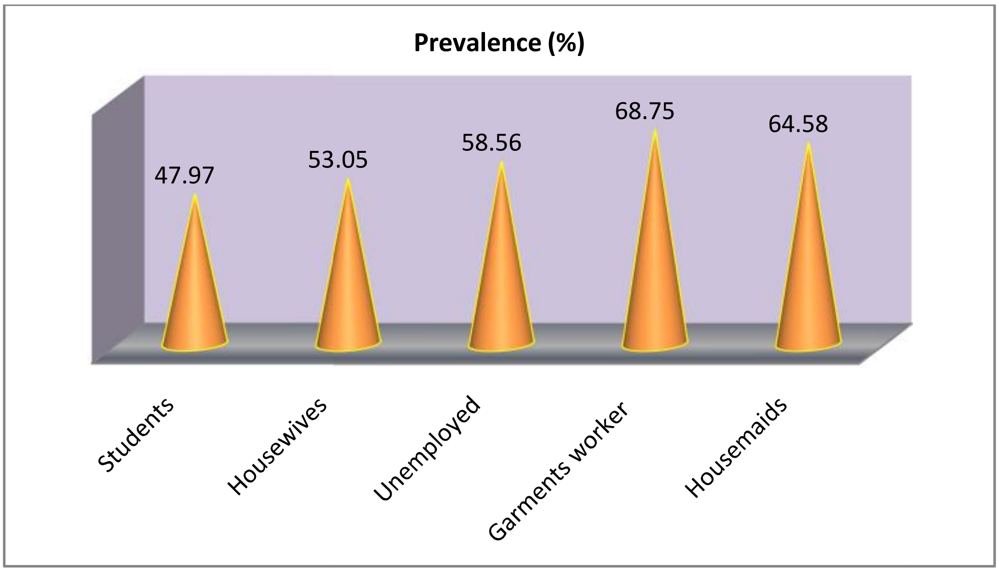


Fig 100. Association between waterborne diseases and occupational status.

Out of total female inhabitants, 73.57% infection found those who had income up to 1000-3000 taka/ month, 68.96% up to 3001-5000 taka/ month, 46.79% up to 5001-7000 taka/ month and only 35.20% up to 7001 to above taka/ month (Fig 101).

Chi-square = 41.23 p = 0.000 significant at 5% level.

Monthly income was significantly associated with waterborne diseases.

The house members belong to 5 and above was observed 66.80% infection and 51.13% prevalence was found with 1 to 4 family members (Fig 102).

Chi-square = 4.65 p = 0.031 significant at 5% level.

Household size was significantly associated with waterborne diseases.

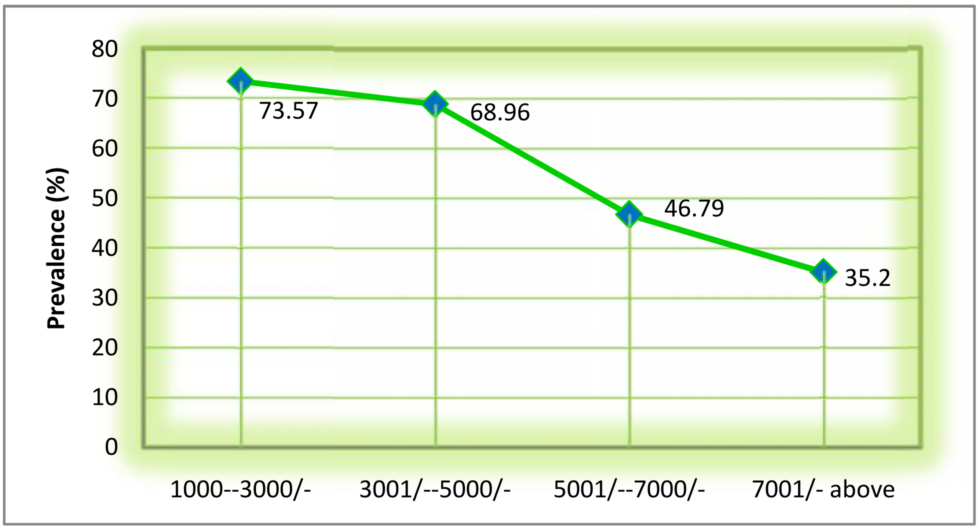


Fig 101. Association between waterborne diseases and monthly income.

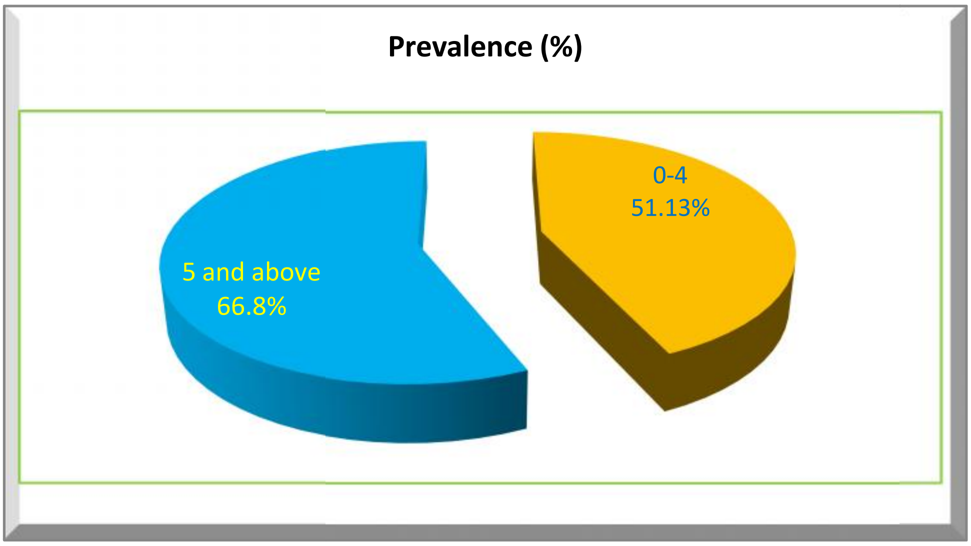


Fig 102. Association between waterborne diseases and household size.

Prevalence of waterborne infections according to drinking water source

In most areas, the main source was tap water for drinking purpose. Out of 414 respondents, 66.91% were found to be infected with various waterborne diseases for drinking tap water, 44.44% for well water and lower infection (36.76%) was found among females those using boiled water but they didn't boil properly. The highest prevalence (85.71%) was recorded those female inhabitants using river/ pond/ lake water (Fig 103).

Chi-square = 61.82,   p = 0.000 significant at 5% level.

Source of water was significantly associated with positive cases.

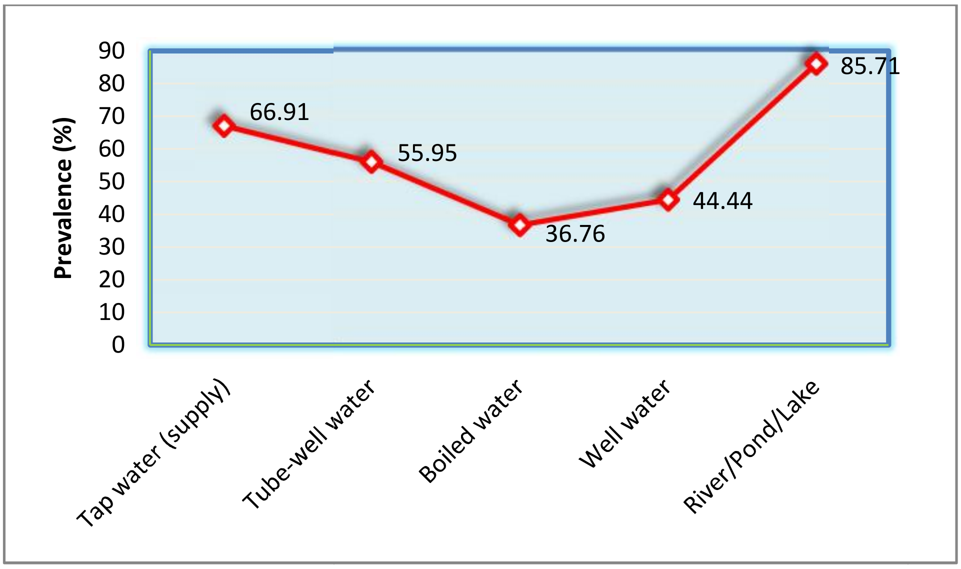


Fig 103. Prevalence of waterborne infections according to source of water.

Prevalence of waterborne infections according to type of latrine used

The prevalence of waterborne infections was found among the female inhabitants, who were using kacha pit latrine (53.61%), bamboo slit (71.37%). The highest infection (75.94%) was computed among females those using open space for defaecation and lowest prevalence (48.77%) was observed in respondents using sanitary latrine (Fig 104).

Chi-square = 21.72,   p = 0.000 significant at 5% level.

Type of latrine was significantly associated with positive cases.

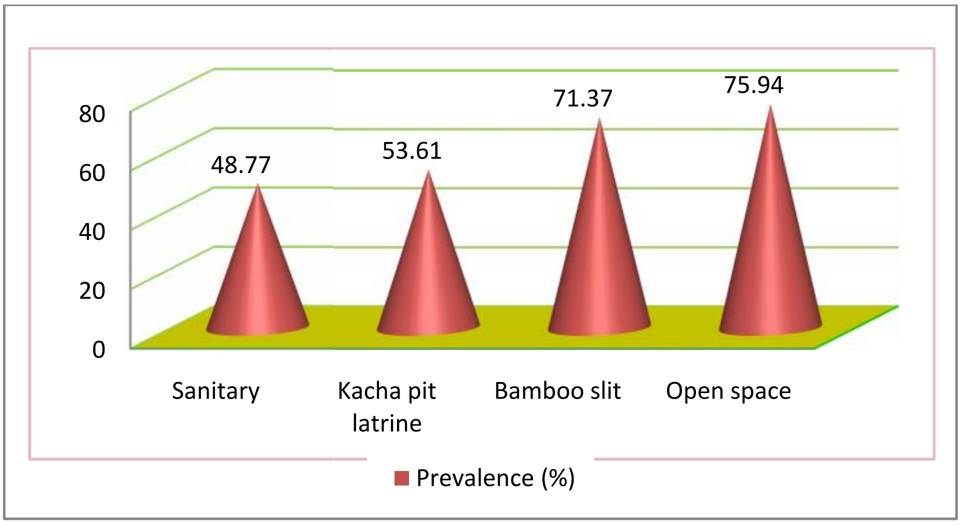


Fig 104. Prevalence of waterborne infections according to type of latrine.

5.8.5 Risk factors and socioeconomic aspects of the female inhabitants in relation to airborne diseases

In the present investigation, 4 types of airborne diseases were found such as influenza, mumps, pneumonia and tuberculosis. In case of airborne diseases, the infections were easily transmitted from one individual to another through air that's why their behavior, socioeconomic factors were found more or less same.

It was observed that, in children group of age 1 to 15, the highest prevalence was 69.43% and the lowest (48.80%) was found in adult group, 55.72% in middle age and 63.98% found in old age group (Table 57, Fig 105).

The prevalence of airborne infections 65.28% and 45.41% found in case of females who can sign only and primarily educated females respectively. The highest prevalence (66.77%) was found in illiterate group and the lowest (35.71%) was found whose education level was above primary level (Table 57, Fig 106).

The prevalence of airborne infections was found 67.48% among students, 45.73% in housewives, 54.70% in case of unemployed females, 64.06% among garments worker and 60.83% in case of housemaids (Table 57, Fig 107).

Table 57. Association between socioeconomic status and airborne diseases.

Explanatory variables	No of respondents	No. of positive cases	Prevalence (%)
Age groups			
Children (1 to 15)	193	134	69.43
Adult group (16 to 35)	250	122	48.80
Middle age group (36-50)	271	151	55.72
Old age group (51 to 70)	186	119	63.98
Chi-square = 10.07, p = 0.01 significant at 5% level. Age group was significantly associated with airborne diseases.			
Education			
Illiterate	313	209	66.77
Can sign name only	288	188	65.28
Primary	229	104	45.41
Above	70	25	35.71
Chi-square = 27.83, p = 0.000 significant at 5% level. Education was significantly associated with airborne diseases.			
Occupation			
Students	123	83	67.48
Housewives	164	75	45.73
Unemployed	181	99	54.70
Garments worker	192	123	64.06
Housemaids	240	146	60.83
Chi-square = 11.43, p = 0.022 significant at 5% level. Occupation was significantly associated with airborne diseases.			
Monthly income			
1000--3000/-	193	134	69.43
3001/--5000/-	364	231	63.46
5001/--7000/-	218	114	52.29
7001/- above	125	47	37.60
Chi-square = 22.55, p = 0.000 significant at 5% level. Monthly income was significantly associated with airborne diseases.			
Household/Family size			
0-4	397	186	46.85
5 and above	503	340	67.59
Chi-square = 8.18, p = 0.004 significant at 5% level. Household family size was significantly associated with airborne diseases.			

Most of the airborne diseases were found in respondents whose monthly income were low (1000-3000 taka) and the prevalence was 69.43%. The lowest infection (37.60%) was found in those who had 7001/- income above (Table 57, Fig 108).

67.59% airborne infections were found in people with ≥ 5 members and those belong to 1- 4 members had 46.85% infection with various airborne diseases (Table 57, Fig 109).

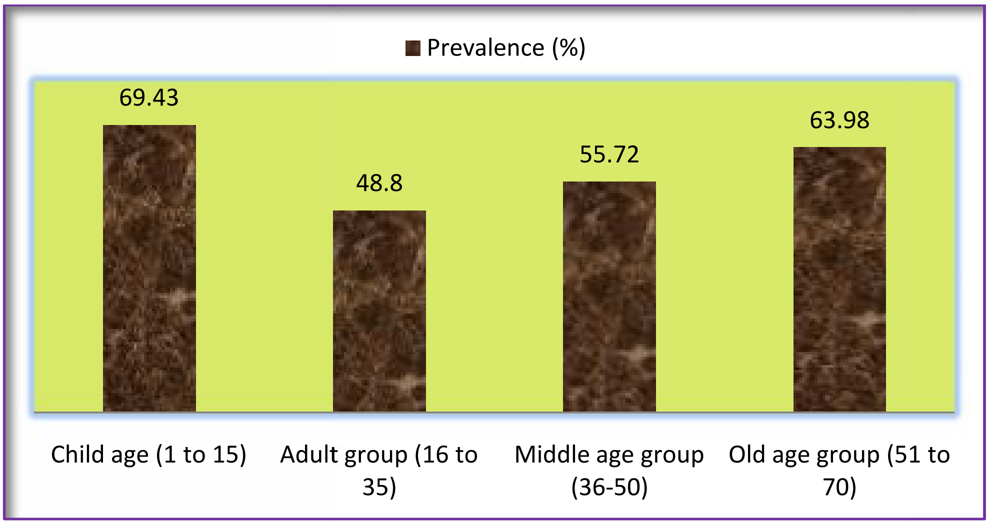


Fig 105. Association between airborne diseases and age groups.

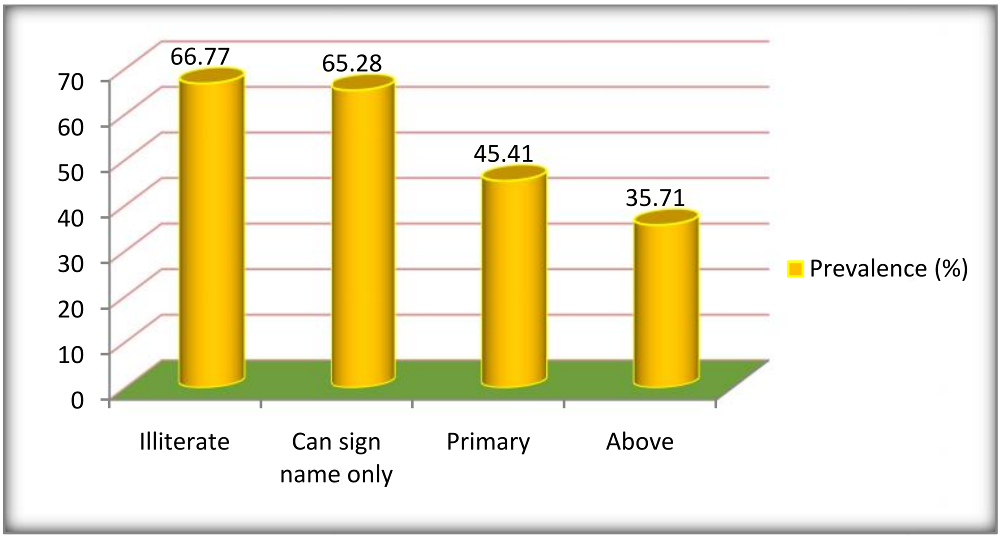


Fig 106. Association between airborne diseases and educational status.

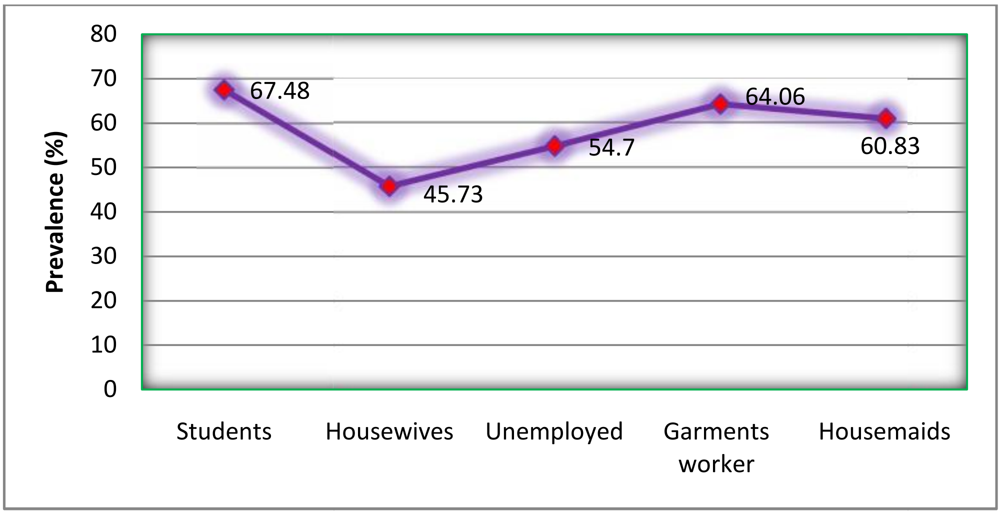


Fig 107. Association between airborne diseases and occupational status.

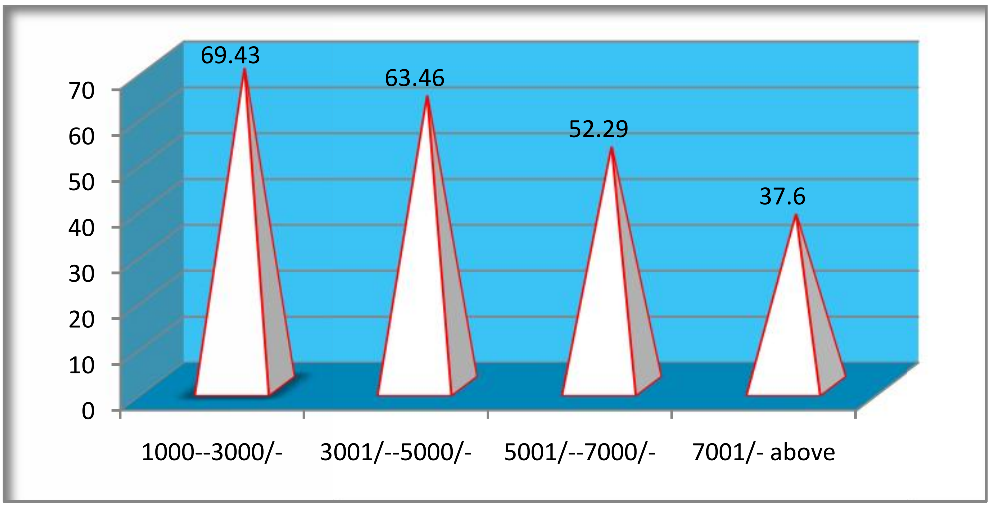


Fig 108. Association between airborne diseases and monthly income.

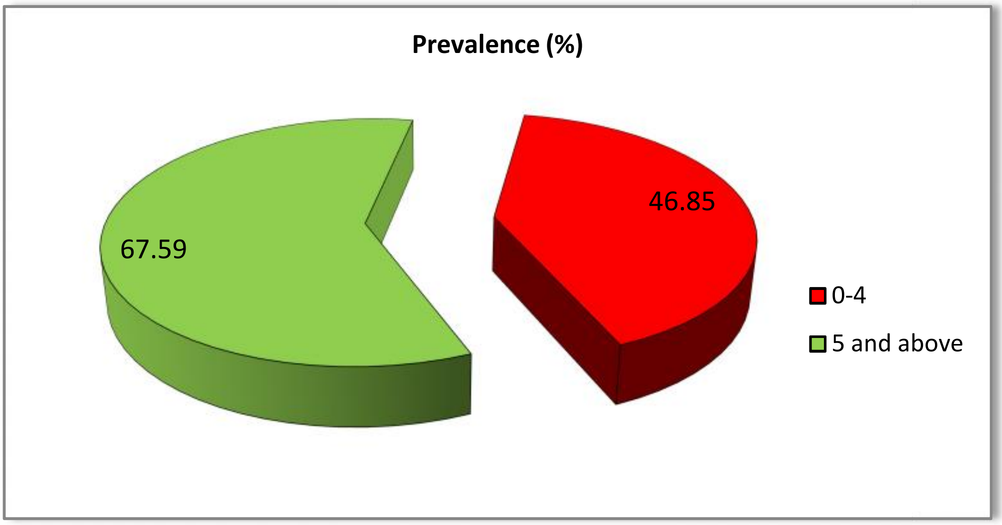


Fig 109. Association between airborne diseases and family size.

DISCUSSION

There are very few studies on communicable diseases among the female inhabitants of lower socioeconomic groups in Bangladesh and other developing countries of the world. A communicable disease is a disease that is spread from one person to another through the environment. Different infectious disease is common among slum areas because of their unhygienic environmental condition and female group (children, girls and women) are the main victim. In Bangladesh poor women are neglected population; they have poor knowledge about personal hygiene and work hard all day long. During pregnancy and after giving birth to child, because of lack of proper care, they suffer from many diseases. Children and girls grow in impoverished environment with ignorance and carelessness. They become susceptible to many infections and infections are easily passed from one to another and so many diseases occur.

Parasitic infestation:

Parasitic disease is a major public health problem in the developing and underdeveloped countries including Bangladesh. It imposes a continual and unacceptable threat to the well being of millions of people in the tropics and subtropics and the cost of parasites in terms of human misery and economic loss is incalculable (Cox 1982). The protozoan and helminth parasites are oldest pathogens and remain an important part of infectious diseases among the world's poor which are the most susceptible population. Many factors like, poor hygienic habits, poor standard of living, lack of health education, ignorance, poverty, poor socio-economic conditions are some of the many reasons behind high prevalence of parasitic infections in Bangladesh. Previous investigators have shown that intestinal parasite is a major health problem in our country and present data also support this statement. But the intestinal parasites of human beings have received very little attention in Bangladesh. They mainly ignore the parasitic diseases.

Intestinal parasites are transmitted either directly through the contamination of water, soil and food by faeces, or indirectly through poor hygienic and living conditions (Bauer *et al.* 1974, Gamboa *et al.* 1998). Amoebiasis is believed to affect about 450 million people worldwide and leads to about 40,000-110,000 deaths per year. It has long been known that the majority of infected individuals are asymptomatic and that only about 10% develop disease (Utzinger *et al.* 1999). Giardiasis is a common protozoan infection of the intestinal tract and occurs worldwide (McClatchey 1994). Several studies estimated that 1.05 and 1.3 billion persons harbor the whipworm, (*Trichuris trichiura*) and the roundworm (*Ascaris lumbricoides*) respectively (Chan *et al.* 1994, deSilva 1997, Stephenson *et al.* 2000). Among the children, an estimated 59 million cases of *Ascaris* infection are associated with significant morbidity, the estimate on acute illness was 12 million cases per year with approximately 10,000 deaths (deSilva 1997, WHO 2002). *Ascaris* was the predominant soil-transmitted helminth parasites in any areas of the Southeast region, although *Trichuris* predominates in some parts of Southeast Asia, Africa, and the Caribbean (Stephenson *et al.* 2000). In Asia, hookworm is highly endemic in South China, Southeast Asia, and the Indian Subcontinent. Hookworm is common throughout Sub Saharan Africa and in some regions of Egypt because of its virulence and worldwide prevalence. Stoll (1962) reported hookworm as a great infection of mankind.

Dhaka is the capital of the country that has highly dense population. There are many slums with poor sanitation and lack of access to drinking water making the slum-dwellers more vulnerable to different waterborne diarrheal diseases. In the present study, the prevalence of parasitic infestations was investigated among the female inhabitants of urban slum areas (in Dhaka city) to observe the association with anaemia and health condition of people. Also relative impacts of protozoan and helminth infections on females socio economic condition and their personal hygiene were investigated. The major findings of the present investigation have been compared with other studies in this field.

Overall prevalence of parasites:

Out of 900 samples, the parasitic infestation was recorded as 66.22% which is lower than the findings (99.03%) of Muttalib *et al.* (1976) in Bangladesh, Suguti *et al.* (1985) in Nepalese people (86.8%), Idris (1979) found 89.76%, Uddin and Khanum (2008) reported 84.21% in Comilla and Dhaka. Alternatively the present prevalence is higher than the findings (24.4%) of Hafez *et al.* (1986) amongst the people of Riyadh, Saudi Arabia, Ahmed and Hady (1989) in Riyadh, Saudi Arabia (10.94%), Al-Madani and Mahfouz (1995) among the Asian female housekeepers (46.5%) in Aba District, Saudi Arabia, Chandrashekhar *et al.* (2005) (21.3%), Peruzzi *et al*. (2006) in Italy (13.24%) and Rahman (2009) among the people of Chittagang and Chittagang Hill Tracts (33%). The cause behind the contradiction might be the geographical difference, differences in study population, different socio- economic condition and gender majority. Huq and Shaikh (1976) found 65.80% prevalence, Chowdhury (1978) 52.76% in the people of Dhaka, Farag (1985) 53% of the Yemini people, Reinthaler *et al.* (1988) 62% from the people of southwest Nigeria, Rao *et al.* (2003) 57% among tribal adolescent girls of Nepal, Tang and Luo (2003) 51.7% in China, Ikeh *et al*. (2006) 50.5% in Nigeria, which were closely related with present findings. The overall prevalence was found highest because of slum areas where hygienic conditions are very poor and people of Bangladesh are not conscious about personal hygiene.

A total of twenty six parasite species were identified from the samples. Among them ten were protozoans such as *Entamoeba histolytica*, *Entamoeba* coli, *Endolimax nana, Iodamoeba butschlii, Chilomastix mesnili, Trichomonas hominis*, *Enteromonas hominis, Giardia intestinalis*, *Isospora hominis, Balantidium coli.* Six cestodes such as *Diphyllobothrium latum, Taenia saginata, Echinococcus granulosus, Hymenolepis nana, Hymenolepis diminuta, Dipylidium caninum.* Four trematodes such as *Fasciola hepatica, Fasciolopsis buski*, *Clonorchis sinensis*, *Paragonimus westermani*. And six nematodes such as *Ascaris lumbricoides, Trichuris trichiura, Ancylostoma duodenale* (egg), *Ancylostoma duodenale* (larvae), *Strongyloides stercoralis* (larvae), *Enterobius vermicularis* (egg), *Capillaria spp.*

Begum and Rahman (1975) found five species of protozoa (*E. histolytica, E. coli, E. nana, I. butschii, G. lamblia)* and four species of helminth *(A. lumbricoides, A. duodenale, T. trichiura* and *E. vermicularis*) predominant in Bangladesh. In another study Muttalib *et al.* (1976) detected *E. histolytica, G. intestinalis, A. lumbricoides, A. duodenale*, *T. trichiura, F. buski, S. stercoralis, H. nana, and Oxyris vermicularis* from rural children of Bangladesh. Chowdhury (1978) investigated in the populations of Dhaka and reported eight species of parasites (*E. histolytica*, *G. intestinalis, A. lumbricoides, T. trichiura*, hookworm, *S. stercoralis, H. nana* and *E. vermicularis).* Khaled (1983) found eight species of intestinal parasites in members of Bangladesh rifles (*E. histolytica, G. intestinalis, A. lumbricoides, T. trichiura, S. stercoralis, H. nana, E. vermicularis* and hookworm.

In Indonesia, Higgins *et al.* (1984) studied human intestinal parasitic infections. They listed *E. coli, E. histolytica, E. hartmanni, E. nana, I. butschlii, C. mesnili, G. lamblia, A. lumbricoides, T. trichiura* and *N. americanus*. In Yemen Arab Republic, Farag (1985) reported three species of protozoan parasites (*G. lamblia, E. histolytica* and *E. coli*) and ten species of helminth (*T. trichiura, A. lumbricoides, Schistosoma mansoni, H. nana, N. americanus, Trichostrongylus sp., Fasciola sp., Taenia sp., S. stercoralis* and *E. vermicularis*). In Riyadh Saudi Arabia, Ahmed and Hady (1989) found *G. lamblia, E. histolytica, E. coli, E. nana, C. mesnili, S. stercoralis, E. vermicularis, A. lumbricoides* and *H. nana*. In Nigeria, Alakija (1986) reported *E. coli, T. hominis, E. nana, E. histolytica, I. butschili, G. lamblia, B. coli, A. lumbricoides,* hookworm, *T. trichiura, S. stercoralis, Taenia* and *S. mansoni* from rural people. The abundance of these intestinal parasites may be related to poor hygienic condition, poverty, illiteracy, over-population and environmental degradation.

In the present investigation, among parasitic groups, nematode showed the highest prevalence (57.55%), then cestode (38.67%), protozoa (19.22%), and lowest found in trematode (4.11%), so helminth infections were recorded to be higher compared to protozoan infection which is incompatible with the previous published result. Hafez *et al.* (1986) reported 14.9% of prevalence for protozoans and 9.5% for helminth from the population of Riyadh, Saudi Arabia and Alakija (1986) also found higher (44.2%) prevalence of protozoa than helminth (22.4%) in the rural people of Nigeria. Highest prevalence of helminth found in some study like Muazzam and Ali (1968) showed 67% of prevalence of helminth among children of East Pakistan and Saha and Chowdhury (1981) reported 75% of children (unde 5 years) of Rangpur and Dinajpur districts were found to be suffering from helminth disease. This condition usually contributed by different level of environmental conditions which facilitate the transmission of the infective stages of the parasites. Reinthaler *et al*. (1988) stated that contaminated drinking water is clearly the main source of the high levels of protozoan infection. But in the present study higher rate of parasitization with helminth suggest that these parasites have highly effective distribution and contact mechanism from one person to another.

Prevalance of each species of intestinal parasites:

Entamoeba histolytica* and *Giardia intestinalis:

In the present investigation, prevalence of cyst of *E. histolytica* was highest (10.44%) among protozoa and *G. intestinalis* was found 4%.

Chowdhury (1978) showed 15.19% of prevalence for *E. histolytica* from the people of

Dhaka, Aza *et al*. (2003) recorded 21%, Azian *et al.* (2007) noted 26.2% in Pahang, Malaysia. The prevalence seems to be high in some study due to unhygienic condition, inadequate sanitation of the study area promoting fecal-oral transmission of cyst. Hamimah *et al.* (1982) found 2.3% prevalence in Kualalumpur, Malaysia, Hafez *et al*. (1986) stated 8.8% people of Riyadh districts, Saudia Arabia, Azam *et al.* (2007) observed 3.6% in Gazipur and Khanum *et al.* (2014) estimated 4.61%. Some result was found comparatively lower, this may be due to improvement of health and sanitation.

The prevalence of *G. intestinalis* found in the present study, was also relatively low compared to 10.2% (Farag 1985), 9.57% (Chowdhury 1978), 25% in Turkey (Ozcelik *et al*. 1995), 18.5% in workers from Nepal (Reddy *et al*. 1998) and 11.67% in Thai orphans (Popruk *et al.* 2011), which were higher than the present findings. But Hamimah *et al.* (1982) found 2.6% and Khaled (1983) also recorded lower (0.4%) rate of infection than this study. Khanum *et al.* (2014) estimated 3.71% prevalence of *G. intestinalis* and Reinthaler *et al*. (1988) found 4.2%, which were close to present study.

Entamoeba coli (0.78%), *Endolimax nana* (0.67%), *Chilomastix mesnili* (1.22%) and *Trichomonus hominis* (0.67%) also appear to have been detected in very few studies and they were very uncommon. Chavalittamrong and Jirapinyo (1984) reported 1.4% of *T. hominis*, Azar Shokri *et al.* (2012) studied on mentally retarded residents in central institution of southern Iran, and found *E. coli* (9.8%), *E. nana* (2.3%), and *C. mesnili* (0.8%). Above findings were mostly higher than the present study.

Hymenolepis nana, Taenia saginata* and *Fasciolopsis buski:

In the present study, among cestodes, *H. nana* recorded the highest (22.78%) prevalence. This was higher than the findings of 3.0% in Abha, Saudi Arabia (Omar *et al.* 1991), 6.0% in the province of Afghanistan (Jalili and Cerven 1993), 6.7% (Machado and Costacruz 1998), 2% in Yemen (Azazy and Aitiar 1999), 9.9% in India (Mirdha and Samantray 2002), 4.9% in Bangladesh (Muscat *et al*. 2004). It is obvious from above comparison that the prevalence of *H. nana* recorded during the present study is higher as compared to previous records. Afzal (1981) studied the intestinal parasites in eight school children of Mansehra (Pakistan) and recorded 27.25% *H. nana*, which was higher than present study. Rim *et al*. (2003) investigated that the prevalence of *Teania spp.* was only 0.6% in Laos. But the present study revealed a higher rate of prevalence (10.33%).

In trematode, prevalence of *F. buski* was observed the highest (2.11%) and *P. westermani* is a rare parasite found in stool and prevalence was 1.33%. Idris (1979) showed that the prevalence of *F. buski* was 36.16% in a village named Maradia near Dhaka, whereas Nahar (1973) showed that the prevalence was only 0.31% in Dhaka city. This observation reflects that the infection by *F. buski* might have focal endemicity. According to Graczyk *et al*. (2001), lower incidences with focal endemicity are observed in Taiwan, Bangladesh, India and Thailand. Bunnag *et al.* (1983) reported 10.7% prevalence of fasciolopsiasis among primary school students in Central Thailand.

***Ascaris lumbricoides*:**

The present result revealed that *A. lumbricoides* showed the highest (38%) prevalence. Thuriaux (1973) reported 22% in Yemen Arab Republic, Obiamiwe (1977) recorded 19.5% in Benin City, Nigeria, both results were found comparatively lower than the present findings. Elkins (1984) found 94% in Madras, Osazuwa *et al.* (2011) determined 75.6% in Nigeria which was quite different from the findings of the present work; this difference might be due to the study population, location, prevailing environment and socioeconomic status. Reinthaler *et al.* (1988) recorded 40% in Southwest Nigeria, Alam and Khanum (2005) found 34.38% in Dhaka, Uddin and Khanum (2008) showed 37.5% in Gazipur, Bangladesh. Three results were close to present findings. The highest prevalence of *A. lumbricoides* is mainly attributed to high rate of egg production by the females, longevity of the eggs, use of night soil, poor personal hygiene and consumption of unclean vegetables.

Trichuris trichiura:

Trichuris trichiura was the second common parasite in the present study and the prevalence was 30%. Shield *et al*. (1981) showed 15.9% in Papua New Guinea, Hafez *et al*. (1986) reported 2.5% of people in Saudi Arabia, these prevalence were lower than the present finding. According to Ejezie (1981) 75.8% and Kobayashi *et al.* (1996) 43.8% was suffering from trichuriasis, both were higher than present study. Reinthaler *et al.* (1988) recorded 23.2% in Nigeria and Wani *et al*. (2008) 27.92% in Kashmir valley, both were close to present findings. The infection record here by this parasites was also due lack of information and knowledge for the victim due to unhygienic condition of the surrounding the habitat.

***Ancylostoma duodenale*:**

In the present study, prevalence of hookworm (*A. duodenale)* egg was 10.89%, and larva was 3.55%. Khaled (1983) obtained 2.4% prevalence in the members of Bangladesh rifles, Farag (1985) found 1.0% in people of yemen Arab Republic, which were lower than the present hookworm egg infestation. Nuruzzaman and Huda (1976) found 50%, Saha and Chowdhury (1981) found 20% which were much higher than present investigation. Muttalib *et al.* (1976) reported 7.1% in students of the University of Dhaka, Adenusi and Ogunyomi (2003) found 6.1% in Nigeria, both similar to present finding.

Enterobius vermicularis:

The prevalence of *E. vermicularis* was found very low (1.55%) among the prevalences of other nematode parasites and from other author findings like Kuntz *et al.* (1960) found 33% prevalence, Kitvatanachai *et al*. (2000) reported 15.95%. Present result was higher than the finding of Chowdhury 1978 (0.28%) of people of Dhaka, Hafez *et al.* 1986 (0.2%) in the people of Riyadh, Saudi Arabia. Shield *et al.* (1981) reported 1.6% prevalence, close to the present result. Since the females *E. vermicularis* oviposit outside the host, eggs are seldom found in the faeces. The eggs are collected at the perianal region by scotch tape swab. But in this study, this specific diagnosis method was not applied. For this reason, prevalence of this worm was low.

Strongyloides stercoralis:

Among nematodes, *S. stercoralis* were found 2% in the present study. Similar low prevalence in Bangladesh was observed by other authors such as 1.6% by Idris (1979), 0.9% by Hyder *et al*. (1998), 1% by Muscat *et al*. (2004) and 1.2% by Uddin (2007) in a study in Chittagong city. Outside Bangladesh the prevalence was also low, such as 0.7% in Ecuador's rural areas (Jacobsen *et al.* 2007) and 0.9% in Thailand (Waikagul *et al*. 2002). Hirata *et al*. (2007) found 4.7% in Japan which was higher than the present study.

Prevalence of parasites in different study areas:

In different study areas, the highest prevalence (87.5%) was found in Kamrangichar and lowest prevalence (30%) was found in Hajaribag. Kamrangichar is an island Thana surrounded by mainly Buriganga River. The population is very dense in this area they live in unhygienic environment, there is lack of fresh water supply, lack of sanitary latrines, defaecate in open areas, they walk barefooted most of the time and most important is, this area is surrounded by polluted Buriganga River which facilitates the growth of intestinal parasite. Hajaribag was urban Thana of Dhaka metropolitan city where chemical pollution occurred mostly as many chemical factories found there; as a result survival of parasite's egg and cyst in that environment is very low because of that chemical pollution that's why lower prevalence of infection observed there.

Monthly variation of intestinal parasites:

Monthly prevalence of the parasites was estimated during the study period. In the first study year, the prevalence was highest (86.67%) in the month of Aug'14 and lowest (45%) in Jan'14; in the second study year, the highest (90%) in Sep'14 and the lowest (26.67%) in Feb'15. In the month of August and September, water availability is high because of continuous rain, and the percentage of contamination of food and water is high due to poor sewage disposal and drainage system and also due to poor sanitary habit of the people. Amin (2002) found highest prevalence (36- 43%) between July and October and gradually decreased to 32% during December. In the present investigation, five peaks were observed in the month of Oct'13, Mar'14, Sep'14, May'15 and July'15. According to Khanum *et al.* (2010), four peaks were observed in months of December, May, July and September and only one small peak in the month of February.

Seasonal variation of intestinal parasites:

In the present study, the peak prevalence (86%) was recorded in rainy'14 and lowest (30%) in winter'15. Contamination of domestic water-supply due to heavy rainfall and flood during rain season, poor disposal of human excreta may be the main cause of higher level of parasitization in rainy season. It was also observed that, in the rainy season, the environment become unhygienic and polluted water usually flow over the environment, ingestion of cysts and eggs that are transmitted primarily by the faecal oral route with contamination of drinking water, vegetables and food and eating uncooked vegetables and fruits. Khanum *et al.* (2010) observed 29.3% incidence during the rainy season and the lowest (19.38%) in the winter season among the outdoor patients of Dhaka University Medical centre, Bangladesh which was lower than the present study.

E. histolytica (10.62%) and *G. intestinalis* (5.31%) both parasites were found highest in rainy season. Khanum *et al.* (2010) carried out a study where highest prevalence of *E.*

histolytica (5.09%) and *G. intestinalis* (7.0%) was observed during the rainy season, which were near to the present findings. In the present study, in case of nematodes, *A. lumbricoides* (45.94%) and *T. trichiura* (40.31%) were recorded highest in summer season. *A. duodenale* (egg) (13.75%), *A. duodenale* (larvae) (4.37%) and *S. stercoralis* (3.12%) were found highest in rainy season. According to Khanum *et al.* (2010), highest prevalence of *A. lumbricoides* (16.28%) was observed in the rainy season; in case of *T. trichiura* highest prevalence (3.19%) was observed in the summer. Consumption of more vegetables, contaminated with cysts or ova and stagnancy of drinking water and leakage of domestic sewage to drinking water in rainy season is the probable causes of high rate of infection in summer and rainy season respectively.

Prevalence of single and mixed parasitic infections:

Out of 596 infected cases, 16.44% had single infection, 19.78% double, 20.44% triple, 8.33% quadruple and 1.22% multiple infections. Khanum *et al.* (1999) found 11.57% for double infection, Alam and Khanum (2005) also found 12.65% of mixed infection by *A. lumbricoides* and *T. trichiuris,* which were lower than the present findings. In 1983, Talukdar studied on 500 healthy army recruits and recorded 52.80% single infections and 9.20% multiple infections. Kang *et al.* (1998) in a study on a village of Vellore, India of the infected persons, 23.1% had only one type of parasite and 74.3% excreted multiple parasites. Uddin and Khanum (2008) carried out a study in Gazipur where 86.96% had single infection and 13.04% had infection with mixed parasites. Similar study in China showed that the proportion of individuals infected with one parasite was 36.5%, two parasites 12.7%, three parasites 3.0%, and four parasites 0.08% (Tang and Lou 2003). Baldo *et al.* (2004) observed 34.2% children were infected with more than one parasite. Above studies were found higher than the present study.

Parasitic prevalence in age groups:

The highest prevalence (75.65%) was found in children group (1-15 yrs) then old (71.5%), adult (63.2%), and lowest 58.67% in middle age group, so the parasitic infestation was found inversely correlated with age of the females which decrease with the increase of age due to better immune response in upper ages but again infestation becomes higher after the age of 50 because in older age group, immunity becomes low again. Highest infection in children also due to the contaminative attitudes of them, by ways of not washing hands before eating and having uncovered foods. Similar high prevalence (73.3%) was found in children below 5 years by Ara *et al*. (1997). According to Steketee 2003 and Garzon 2003, children are the worst affected. This could be due to the fact that child are exposed to environmental hazard favoring parasitic infections. Children at slum areas play in dirty and muddy field and often eat contaminated food mixed with mud. In another study by Uddin *et al.* **(**2005), highest (87.50%) was also noted among the female adolescents aged 12-14 years, Singh *et al.* (1984) recorded a maximum of 92.5% from 5 to 9 years of age, Anwar *et al.* (1998) found 98% among 11-12 years children but Khanum *et al.* (2010) found lowest prevalence in 08-10 years age group. So it was evident that children age group were more vulnerable for parasitic infestation than other age groups. In present study there was no significant correlation between age group and parasitic infestation (p -value 0.716), According to Tadesse (2005), there was no significant association found also statistically (p -value 0.33).

In the present investigation, *E. histolytica* showed highest prevalence (18.13%) among children (1-15 yrs) and lowest (0.74%) in middle age group ((36-50 yrs). Muttalib *et al.* (1976) found highest (63.09%) in 1-year-old children and lowest (32.64%) in 7 years old. Sharma *et al.* (2004) found 6.1% *E. histolytica* in school children (4-19 years). On the contrary, Schmidt and Roberts (1989) stated that children under 5 years old have lower rate of infection with *E. histolytica.*

G. intestinalis showed highest (7.77%) in children (1-15 yrs) and lowest (0.54%) in old age group (51-70 yrs). Shakur and Ehsan (1993) observed 21% prevalence in the children up to 5 years. Reinthaler *et al*. (1988) reported highest (7.8%) prevalence in 2-5 years age group and lowest (2.6%) in 31-60 years age- group. The reasons behind the present observation may be due to locality of the habitat, sanitation and food habit.

Highest infestation of *A. lumbricoides* (33.87%) found in old age group (51-70 years) and lowest (13.47%) in children 1- 15 years age group. This result indicates that old people are more vulnerable to *A. lumbricoides,* may be these types of patients take their food with dirty hand; avoid washing of hand after defaecation. Khanum *et al.* (1997) observed that *A. lumbricoides* showed 60.86% in 2.1-4 years. Khanum *et al.* (1999) found the age group 4.1-6.0 years had highest prevalence (40.78%). Khanum *et al.* (2001) found positive 20.39% for *A. lumbricoides* of age group 2-16 years. Findings of above studies were much more different from present study.

Prevalence of *T. trichiura* was highest (22.58%) in old age group and lowest (3.88%) in 21-30 years age group and absent in 1-15 years age group. Sharma *et al.* (2004) in school children (4-19 years) found 43.6% *T. trichura*. Kabatereine *et al.* (2001) reported the highest prevalence (28%) among the peoples of 10-15 years in Kampala, Uganda. Ahmed and Talukder (2002) found 39% among the school children (aged 9-16 years), which were also different from present finding.

The prevalence of *A. duodenale* was highest (15.54%) in 1-15 years children age group and lowest (1.07%) in old age group. Reinthaler *et al*. (1988) found highest (25.4%) prevalence in 6-15 years old which was higher than present findings. Kabatereine *et al.* (2001) reported 12.9% among the peoples of 10-15 years that was close to this study. Shakur and Ehsan (1993) observed 7.0% in the children up to five years which was lower findings than present investigation.

E. vermicularis (2.59%) were highest in children group; though it was found very little amount in present study. Marquardt and Demaree (1985) recorded about 50 to 60% of infection in children. This may be due to lack of their fastidious habits.

Anaemia due to parasitic infestation:

Due to several causes such as parasitic infection, intake of inadequate food, over bleeding during menstruation, abnormal of pregnancy, abortion etc. anaemia is the common health threat among the female inhabitants. Parasitic infestation is one of the main reasons for anaemia.

In the present study, 42.22% were found anaemic cases. Ahmed *et al*. (1998) reported prevalence of anaemia 22% which was lower than present findings. A few studies carried out among adolescent girls in Nepal reported that prevalence ranges from 42-60% (Baral 2003, Rikimaru *et al.* 2003, Tiwari 2000, Regmi and Adhikari 1994). Uddin *et al.* (2005) reported 96.87% among the parasite infested adolescent girls that were very much higher than the present study.

In the present study, higher anaemic (49.60%) cases were found in adult group, notably, 14.52% severe cases of anaemia were observed also in adult (16 to 35 yrs) age. In the upper age group married girls were dominating and most of them experienced pregnancy which was the contributory factors for severe anaemia amongst them. Most of the adolescent girls have poor awareness about the body and its function and response. Anaemia was alarmingly higher among the pregnant adolescent girl which might be due to faulty dietary habit, poor maternal reserve of iron and the burden of parasitic infestation. Begum (1993) found 17% of the girls anaemic (Hb<12 g/dL) in her study. Hyderi (1993) recorded 22% of the girls anaemic. A study by Dreyfuss *et al.* (2000) showed the prevalence of anaemia to be 73% in the plains of Nepal with 88.9% women infected with helminths.

Prevalence of parasitic infestation was higher (70.53%) among anaemic cases than non anaemic cases (63.08%) which imply that parasitic infestation is one of the causes of anaemia. Shah and Baig (2005) reported that anaemia significantly related with helminth infection. In developing countries iron requirement in adolescent girls is higher because infectious diseases such as malaria, schistosomiasis and hookworm contribute to affect iron absorption (Brabin and Brabin 1992). The role of hookworm in causing anaemia is well documented. Hookworms injure their human host by causing intestinal blood loss leading to iron deficiency and protein malnutrition (Hotez and Pritchard 1995, Stoltzfus *et al.* 1997). Hookworms subsequently digest host hemoglobin by employing a carefully orchestrated cascade of hemoglobinases that align the brush border membrane of the parasite's alimentary canal (Loukas *et al.* 2000, Hotez *et al*. 2002, Hotez *et al.* 2003, Williamson *et al*. 2003). Studies of the anaemia associated with hookworm blood loss indicate that there is a disproportionate reduction in plasma hemoglobin concentration after some threshold worm burden is exceeded (Bundy *et al*. 1995). Although the threshold might be expected to be well established because of the accurate estimates of blood loss caused by each hookworm species (Martinez-Torres *et al.* 1967).

Urinary tract infection (UTI):

Urinary tract infection (UTI) is one of the most important causes of morbidity in the general population, and is the second most common cause of hospital visits (Ronald and Pattulo 1991). Recurrent urinary tract infection is a common problem and can affect women of all ages, particularly the elderly and pregnant women (Peter and Mary O'Reilly 2002). This may be attributed to lack of consciousness, lack of proper research, abuse of chemotherapeutic agents and ignorance of people and little or no preventive measure. Recurrent infections can lead to irreversible damage of the kidneys, resulting in renal hypertension and renal failure in severe case (New 1992). In the community, women are more prone to develop UTI. About 20% of women experience a single episode of UTI during their lifetime, and 3% of women have more than one episode of UTI per year (Gebre-Selassie 1998). Pregnency also makes them more susceptible to infection (Pastore *et al*. 1999).

Out of the 900 samples of female inhabitants, 31.44% prevalence was found. Haque *et al*. (1976) found 19.4%, Leblebicioglu and Esen (2001) reported 1.7%, Begum *et al*. (2006) found 16.4% laboratory diagnosed UTI and Almushait *et al.* (2013) observed 12.7% were affected with UTI, These findings were lower than present study. According to Moue *et al*. (2015), prevalence rate of infection of urinary pathogen was 79.5%; Mazed *et al.* (2008) demonstrated that the rate of UTI was 48.61% that was higher than present study. Similar study by Kattel *et al.* (2008), in which 26% of urine specimens showed significant bacterial growth and Wagenlehner *et al.* (2006) from Germany reported that the incidence of nosocomial UTI was 28%.

The highest prevalence of urinary tract infection was recorded among adult age (16-35 years) females (46.8%) than middle (36-50), old (51-70) and children group (1-15), because sexual activity occurs in adult group mainly and this is one of the factor of bacterial transmission. Khanum *et al*. (2012) investigated that higher risk of UTI with *E .coli* in adult age than middle age and old age groups among female out patients in BSMMU. Moue *et al.* (2015) found 48.5% in the age group 21-40 years which was close to present findings. Many studies also indicate that people at this age are the main victims of UTI because of this age spend the maximum time for study purpose outside the home. In slum area, these groups of women are working outside for long period and avoid urination. They are unconscious about their health. They ignore this type of problem. Nahar *et al.* (2006) found that highest percentage of positive cases 72% among the adult women (21-25 years) which was higher than present study. UTI is always a very common infection among the women revealed by the studies of several workers (Fowler and Stamey 1977).

The highest prevalence of UTIs was found in July'14 (53.33%) and in July'15 (60%), whereas lowest (10%) in Jan'14, Dec'14 and Jan'15. Anderson (1983) reported a rise in the incidence of UTI in August. They attribute this to hot and humid conditions during these months. In a study by Hasan *et al.* (2007), rise in the incidence of UTI was reported during the monsoon months i.e. from July to September, which supports present result. Statistically, monthly variation was significantly associated with the prevalence of UTIs.

Overall peak infection (40.31%) was observed in rainy season because rain water mixed with drainage and sewage system, often mixed with the regular storage water in tanks, this water used for bathing and cleaning, allowing bacteria and germs to travel to the body and; also a humid day could dehydrate you a lot more, if you avoid drinking lots of water, the infection arises. But Khanum *et al*. (2012) performed a study on women patients and found 66.67% in summer while 60% in winter and Nahar *et al.* (2006) recorded higher during the summer (52.40%) than in the winter (40.40%), those studies were different from present study. Prevalence of UTIs was significantly associated with season.

The percentage of *Escherichia coli* recorded highest (65.72%), other bacterias *Streptococcus* (10.25%), *Staphylococcus* (8.13%), *Pseudomonas* (7.07%), *Enterococcus* (5.30%) were also found responsible for UTIs. Chazan *et al.* (2011) recorded 67.4% cases of *E. coli* bacteraemia and Khanum *et al*. (2012) reported 64% cases of women patients were *E. coli* positive, which were close to present findings. Nahar *et al.* (2006) observed 47.6% cases *E. coli* positive and Nahar *et al*. (2010) found 55.91%, Moue *et al.* (2015) showed 31.5% prevalence of *E. coli* and second isolated pathogen was *Enterococcus faecalis*. Above results were lower than present result. According to Jhora and Paul (2011), *E. coli* was the most predominant (82.61%) urinary pathogens followed by *Staphylococcus saprophyticus* (7.01%), this finding very much higher than the present findings.

Skin Diseases:

Skin diseases are found more or less in all age, sexes and classes of the society and create a community health problem in developing countries. People with insanitary, overcrowding, poor housing, lack of knowledge regarding disease ran mission and suffer more with the disease.

Out of 900 female inhabitants, 41.33% were infected with different types of skin diseases, among them 45.16% infected with bacteria, 26.07% with fungus, 19.35% with virus and 9.41% with arthropod. Bahamden *et al.* (1995) in Saudi Arabia found 19.8% children were affected by transmissible skin diseases, Basit (1996) reported 1.5% in East Pakistan, Saw *et al*. (2001) showed a 28% prevalence of skin disease in Sumatra, Indonesia. Above findings were lower than present study.

A similar study was conducted by Kiprono *et al*. (2015), where among the 152 infectious skin diseases, fungal infections predominated 50.7% followed by bacterial 29.6% and viral 19.7%. El-Khateeb *et al*. (2014) observed 5.9% bacterial infections among primary school children in Damietta, Egypt and this was very lower than present study.

Hossain (1993) observed 20.91% fungal infection, Mridula *et al*. (2015) found in children 21.6%, and these results were near to present study result. Anand and Gupta (1998) observed 13.51% fungal infected patients which were lower than present finding.

Rahman *et al.* (1997) found 2% viral infection, Hossain (1993) found 7.50% and both were lower than the present result. Parthasaradhi and Al Gufai (1998) recorded 12.80% viral infections that were near to present finding. According to Arun *et al*. (2014), 56.25% viral infections were found which was much higher than present observation.

In the present study, regarding the bacterial infected females, the highest 38.09% were infected by boil disease, 26.19% by carbuncles, 15.48% by folliculitis, 11.31% by paronichia, 4.76% by styes and 4.17% by impetigo. A closely related study conducted by Sultana (2013) in BIRDEM observed skin diseases. Among the bacterial infected patients, 35% were suffering from boil disease, 18% folliculitis, 10% styes, 22% carbuncles and 15% paronichia. Kakar (1999) found 48.61% impetigo, Steer *et al*. (2009) found 25.6% in children and Romani *et al*. (2015) found 19.6% which was higher than present study.

In case of fungal infections; the highest (29.90%) was affected by ringworm, then athlete’s foot (34.02%), onchomycosis (25.77%) and candidiasis (10.31%) respectively. A similar study by Sultana (2013) observed 100 fungal infected patients among them 51% were suffering from ringworm, 19% candidiasis, 19% athlete’s foot and 11% onchomycosis. Khanum *et al*. (2007) observed 3.21% were infected by ringworm which was lower than present findings. Tuncel and Erbagci (2005) found 8.06% onchomycosis that was lower than present study. Onayemi *et al*. (2005) found 4.9% candidiasis in Nigeria and Yahya (2007) observed 2.8%, both were lower than present observation.

Among viral infected females, the highest infection (36.11%) was observed by wart infection, then chicken pox (34.72%), measles (29.17%). Patel *et al*. (2010) studied on incidence of childhood dermatosis in India and found viral warts were the most common viral infections. Nanda *et al*. (1999) recorded 13.1% viral warts of children in Kuwait and Tuncel and Erbagci (2005) observed 5.3% common warts, both were lower than present finding.

2 types of arthropod diseases were identified in the present investigation, the higher (54.28%) scabies and the lower (45.71%) pediculosis infection was found. Wu-YH *et al.* (2000) also revealed that most common skin diseases were pediculosis capitis (12.9%) and scabies (1.4%). Heukelbach *et al.* (2005) found 43.4% prevalence of pediculosis and 8.8% prevalence of scabies in the slum of north-east Brazil. El-Khateeb *et al*. (2014) recorded pediculosis prevailed 47.5% which was very close to present finding of pediculosis. Rahman *et al.* (1997) found the highest 32% scabies, Begum (1999) reported that scabies constituted the bulk of the disease being responsible for 24.0% of all disorders, both were lower than present finding. Khanum *et al*. (2007) observed the highest 45.94% and Sen *et al*. (2015) found 69.00% scabies, which were similar to present study.

In the present investigation, overall skin infection was recorded highest (44.09%) in adult group (16-35 yrs). It was also noticed that, adult group was also found highest in bacterial (51.19%) and fungal (46.39%) infections. The viral (43.05%) and arthropod (54.28%) were observed highest among the children group because of younger groups are dependent on parents and guardian for their every work and also they have more interactive social life.

Shamsuddin (1990) reported that age group of 31-40 years had the highest number of skin diseases (40.38%). Khanam (2005) found that the most prevalence was in 40-49 age groups (25.33%). Another study carried by Islam and Nasirullah (1998) found children of 3-6 years age were mostly affected. Farah *et al*. (1999) found that, 76.25% were above 15 years and 23.25% were below 15 years age suffering from skin diseases. Mridula *et al*. (2015) observed maximum cases were seen in 0 to 5 year age group (50%). So above findings are different from present study.

In case of particular disease prevalence, in Thailand, highest incidence of scabies (57.4%) was found in children age up to 9 years of age (Vibhagool 1970), Nigam *et al.* (1977) reported that scabies encountered more in younger age groups (61.4%), Kakar (1999) found that 46% were in the age group of 1-4 years with complicated scabies, which supported the result of present findings of arthropod diseases. Romani *et al*. (2015) observed the prevalence of scabies was highest in children aged five to nine years (43.7%) and in impetigo with a peak in children aged five to nine years (34.2%). Scabies was very strongly associated with impetigo, with an estimated 93% population attributable risk. Children are the vulnerable age group includes child and school going girls those are easily infected by different skin diseases.

Vector-borne diseases:

Two common communicable diseases causing febrile illness in Bangladesh are dengue and malaria (WHO Bangladesh communicable diseases. available at http://www.whoban.org/communicable_dis.html) Thousands of persons have been affected by dengue fever on an annual basis, and there have been recent outbreaks in 2000, 2001, and 2002 (Pacific Disaster Management Information Network Asia-Pacific Disease Outbreak/Surveillance Report. 2004, WHO 2003). Worldwide, malaria is the fifth leading cause of death due to infectious disease, following respiratory infection, HIV, diarrheal disease and tuberculosis. Lymphatic filariasis (LF) is the second most common vector-borne parasitic disease after malaria. Leishmaniasis gives rise to important public health problems (Manson 1982, Thakur 1984, Khanum *et al*. 2008). Serious secondary bacterial infections such as pneumonia, dysentery and pulmonary tuberculosis often contribute to the high fatality rate of leishmanial patients. Others complications include hemolytic anemia, acute renal damage and severe mucosal hemorrhage (WHO expert committee report 1991).

Out of 900 female inhabitants, 49.33% were found to be infected by four types of vector-borne diseases such as malaria (2%), filaria (7.33%), dengue (34.67%) and leishmaniasis/ kala-azar (5.33%). In Dhaka city malarial and filarial patients are mainly those coming for treatment purpose or females carry the infection from endemic district and spread the diseases in areas.

Faruque *et al*. (2012) worked on febrile patients and 0.56% malaria patients were confirmed which were lower than my findings. Haque *et al.* (2009) found a much higher overall prevalence of malaria 21.6% in Matiranga Upazilla, Koltas *et al.* (1999) reported 40% at Cukurova region of Turkey and Agomo *et al*. (2009) reported 7.7% in Nigeria. Above results were higher than present observation.

Barry *et al*. (1971) found that filarial disease rate 10.1%. Go (1993) described that in Marinduque of Philippines microfilaria rate were 16%. Rahman *et al*. (2008) observed average infection rate and disease rate were 16.1 % and 21.1% respectively. Above findings were higher than the present study. Khanum and Rahman (2006) found 4.20% prevalence of filaria in Thakurgaon district which is lower than present study. Eigege *et al*. (2002) studied in Nigeria and reported prevalence rates ranging from 6%–47%. In Dhaka city, many people come from different district for various income purposes, disease treatment purposes thats why percentage was little high.

Daniel *et al*. (2005) found 66.4% dengue fever patient while Zaman *et al.* (2014) worked on dengue and found 54% prevalence in female and both results were higher than present study. Faruque *et al*. (2012) found, 9.6% were positive for dengue virus which was lower than present finding.

Shanmugham *et al*. (1977) reported 50.35% prevalence of kala-azar in Madras, Ali and Ashford (1993) observed 36.4% in Ethiopia and Shiddo *et al.* (1995) found 26% in Somalia, all were much higher than the present finding.

Dengue (64.25%) and malaria (4.66%) infection was found highest among children (1-15yrs) and; lowest 17.2% and 0.54% respectively in old age group. Highest prevalence of filaria (12.18%) and leishmaniasis (8.12%) found in middle age (36-50yrs) group and lowest (2.07% in both cases) in children group.

Maude *et al*. (2008) stated that, malaria occurred in people of all ages with the highest incidence being in young adults. Haque *et al*. (2009) observed the prevalence was significantly higher in children. Children and female household members are the most vulnerable to the risk of malaria (Ayele *et al*. 2012). Above studies supported the present study. Anik (2013) revealed that the individuals above 14 years of age were most (46.7%) infected by *Plasmodium* parasite, percentage was much higher than present study.

According to Mahmud *et al*. (2015) age between 21 to 25 years (88.2%) were mostly suffering from malaria. This finding did not agree with the present finding.

Sharma *et al.* (2012) performed a study on dengue patients and he found that, the two age groups with the highest frequencies were persons 46–60 years of age (28.5%) and persons 18–25 years of age (21.5%) groups, and this result was different from present study.

From the result by Islam (2004), the highest of infected persons (30.69%) by filaria was under the age group 31-40 years; Anosike *et al.* (2005) reported that disease prevalence reaching a peak in the 40–49 year old age group; from information by Hawlader (2007), the highest (43.18%) was from the age group 41-60 years. According to Ahmed (2009) highest 31.4% was from the age group 41-60 years, all these result supported the present study.

According to Khanum *et al*. (2015), highest (28.9%) and comparatively the higher prevalence of leishmaniasis (25.2%) were in 30-39 and 40-49 years age-groups respectively which supported the present study. Aikat *et al*. (1979) observed frequent occurrence in the age group is 0-10 years. According to Manson (1982) and Thakur (1984), in Bangladesh the maximum numbers of cases were reported in the age group of 11-20 years. Hasan *et al*. (2013) found that the highest prevalence in the 1-10 age groups (36.78%). The above result did not support the present finding. Kala-azar can occur in all age groups including infants below the age of one year. But the majority of cases are reported in the age group 5 to 30 years (Park and Park 1986).

Waterborne diseases:

Waterborne diseases are transmitted or spread through contaminated water. In the present investigation, 59.87% were found to be infected by four types of waterborne diseases such as cholera/ diarrhoea (28%), typhoid (17.11%), polio (5.11%) and hepatitis A/ jaundice (9.67%).

Sedhain (2014) worked on waterborne diseases in Nepal and the prevalence of waterborne diseases was found 50.7%. Present study showed approximate similarity with this result but little higher than this. Alajo *et al.* (2006) found 52% cholera patients, this result was higher than the present study, Poulos *et al.* (2011) reported 22–38% of cholera patients in Jakarta, Indonesia and Kolkata, India which was near to my study result.

According to Sun *et al*. (2013) prevalence of typhoid fever was 54.36% that was so much higher than the present finding. According to CDC (1998), in 1996, 97 were confirmed as polio by the clinical classification method, As of January 7, 1998, 71.4% polio have been confirmed in Bangladesh. Zhong yu *et al.* (2012) found hepatocellular jaundice accounts for 59.72%, viral hepatitis 31.94% which was so much higher than present observation.

The highest prevalence (71.50%) of waterborne infection was found in children group, then adult group (64.80%), old age (58.60%) and lowest in middle age group (47.97%). As the direct literature was not available on age prevalence of waterborne infection, it was not possible to compare this result with others. But in particular result found of each disease are described below.

Lanata *et al*. (2002) calculated that 11 million cholera cases occur globally every year among children under 5 years of age. Siddique *et al.* (2011) observed that cholera was the most common cause of severe dehydration from acute watery diarrhoea among children less than 5 years of age at two district hospitals in rural Bangladesh. Both results were supported the present study. However, adults and older children can also get cholera, and mortality can be high in all age groups (Deen *et al*. 2008, Gunnlaugsson *et al*. 2000, Lawoyin *et al*. 1999), because most cholera cases occur in poor communities.

Dewan *et al*. (2013) found prevalence of typhoid incidence rate was highest for the 0–4 years age group in Dhaka Metropolitan Area (DMA) of Bangladesh. Polio mainly affects children under 5 years of age (WHO 2017). Hepatitis A is a common form of hepatitis in children (http://kidshealth.org/en/parents/hepatitis.html). Above all results supported the overall prevalence of the present study.

Airborne diseases:

City-level airborne epidemics are constant threats to healthy living. With the fast growth of the world’s population and the constant increase in human mobility, the danger of outbreaks of epidemics is rising. Tuberculosis and in some cases influenza, the common cold, and other diseases spread by the airborne route.

In the present investigation, total 58.44% were found to be infected by four types of airborne diseases such as influenza (25.11%), mumps (10.22%), pneumonia (17.44%) and tuberculosis (TB) (5.67%). Islam *et al.* (2012) found 9.1% prevalence on influenza which was lower than present study. According to Kutty *et al.* (2014), 13% developed mumps found in a highly vaccinated population in Orange County, NewYork, which was close to present finding. Saha *et al*. (2016) observed 61% severe pneumonia in Bangladeshi children. Hashemi *et al*. (2014) worked on prevalence of tuberculosis and recorded 38% positive tuberculin test. Above two results were found much higher than the present study records.

The highest prevalence of airborne diseases (69.43%) observed in children group and the lowest (48.80%) in adult group. Literature on this type of direct study was not available so couldn't compare the result with others. But individual result on age prevalence of each airborne disease was available which is described later.

Islam *et al.* (2012) recorded the frequency of influenza cases was highest among children aged under 5 years (47%). Takla *et al*. (2013) found mumps complications in individuals ≥15 years was higher. Abuka (2017) worked on prevalence of pneumonia in Ethiopia and found 33.5% among under five years children. Khanum *et al.* (2012) studied on TB, the highest prevalence (18.37%) was observed among the 20-24 age groups. So, most of the airborne diseases attacked the children group except TB from above study results as well as present study.

Socioeconomic aspects of intestinal parasites:

Level of education of the female inhabitants was found to influence greatly the prevalence of parasitic infestation. As the education level increases, parasitic infestation decreases. This result indicates that literate people were much more alert than illiterate or little educated people. Health education and sanitation are two important components of primary health care system introduced by the World Health Organization (WHO) as a basis for the prevention and control of communicable diseases (Asaolu and Ofoezie 2003). About half of the inhabitants of Dhaka, Bangladesh, live in slums and only 6% of them have access to primary education and 3% to primary health care (Crompton and Savioli 1993).

Rowsan (1993) showed that the prevalence of helminth infection were very much high (92.3%) among the children whose mother were illiterate. Ara *et al*. (1997) showed that the prevalence was high (92.3%) among the illiterate population in Bangladesh. The prevalence was found same in case of above two studies but higher than present study.

This prevalence reflects that educational levels are inversely correlated with the risk of infections as educated persons or parents are more conscious about their hygiene. Other studies in some parts of the world showed that prevalence of parasitic infection among the illiterate population was high, e.g. 68.70% in Pakistan, 62.52% Mexico (Mehraj *et al*. 2008, Quihui *et al*. 2006).

Parasitic infestation was also associated with the occupation of the female inhabitants. Family income had influence on prevalence of parasitic infestation. It has been observed that, the prevalence of the parasites was higher (82.9%) in low monthly income family and lowest (47.2%) was found in the upper income category. Bangladesh is one of the world's most densely populated countries with 150 million people, 40 percent of whom live below the national poverty line (HIES-2005). In this study most of the stool samples were collected from slum areas where most people were of low income group. In slum areas, people live in crowded environment and use open latrines open space which is favorable for intestinal parasitic infections. In a similar study, Ara *et al*. (1997) showed the intestinal parasitic infection was highest (34.5%) in children of low income group parents. Quihui *et al*. (2006) showed that parasitic prevalence was more in low income group (63.11%) than high income group (36.89%). Both result supported the present study.

A significant association between the parasitic prevalence and types of latrine was observed in the present study ($p<0.05$). Highest prevalence of parasites in the study was 86.47% among open space users. The highest percentage (80.58%) was also observed among open field users by Banu (2011) which was very close to present finding. According to Ahmed and Talukdar (2002), 44.8% used open type latrine and passed stool in the field or bush.

Reinthaler *et al*. (1988) stated that contaminated drinking water is clearly the main source of the high levels of protozoan infection. Here prevalence of parasite in female inhabitants drinking river, pond and lake water (92.86%) was higher than females drinking tape water (69.81%) and tube well water (64.81%), but this two are also highest than those used boiled water (48.53%). Purified water can reduce the rate of intestinal parasite infection but females inhabitants at slum areas did not boil their water properly thats why prevalence rate was found little higher also those who used boil water. Khanum *et al*. (2010) found that the rate of infection was higher (28.3%) among the patients, who used drink unboiled drinking water. Bidinger *et al.* (1981) in a study on the aspects of intestinal parasitism in villagers from rural peninsular, India, noted that animals and wind can act as sources of water supply contamination and of direct infection.

During the study period, a significant association (p- value 0.000) was found between the habit of washing hand after defaecation and parasite infestation. Female inhabitants using soap and water for washing hand after defaecation had much lower prevalence (39.53%) than those using soil and water (81.37%) and those using water only (71.43%). Because of slum area's soil is source of dust and germ. Children and other groups in these areas used to defaecate here and there and so cyst and eggs are mixed with soil. According to Khanum *et al*. (2010), the highest infection was 80% among the people who used to wash their hands with only water after defaecation. Female inhabitants those use only water after defaecation, parasites remain in the nail and during taking meal by that contaminated hands obviously they have the infection. So this is also a possible source of infection of parasite.

Khanum *et al.* (2010) also found 79.22%, 37.20% prevalence of nematode parasites in case of children who cut nail irregularly and regularly respectively which resembles the present study. In this study prevalence of parasite infestations were lower in children cutting nail regularly (32.62%) than who did not (81.93%). This suggests that cutting nail regularly can reduce parasitic infections. So nail is the main route of contamination. Statistically there is significant association, between nail cutting habit and prevalence of parasitic infestation ($p<0.05$). Ejezie (1981) studied on school children in Lagos State, Nigeria, and found that high prevalence of *A. lumbricoides* was 74.2% due to customs of indiscriminate defaecation, eating contaminated products, and poor hand washing.

The hygienic condition and climate were much poor in urban slum areas and more favored the survival of parasites in soil. Dumping of household debris, animals faeces, disposing the faeces of children over there is a common practice in the studied community. This high level of soil contamination by soil transmitted helminth and parasitic protozoa indicate that the Earth's crust was a possible source of enteric infection and probably playing a major role in spreading enteric diseases among children (Swan *et al.* 2001, Redlinger *et al.* 2002). Poor management methods of household sewages expose those to mechanical vectors like houseflies, cockroaches and rats that transfer eggs, cysts of intestinal parasites to yard soil which then ultimately becomes a source of infection;

then the infectious cysts in soil can be transferred onto vegetables or other household elements which are then transmitting to the members of the households through faecal-oral route or by ingesting raw fruits and vegetables. Presence of these parasites in the environment can be a public health indicator (Saathoff *et al.* 2002).

Socio economic aspects of skin infection:

In case of **educational status**, the overall highest prevalence (30.38%) of skin infection was found in illiterate group because this group do not know about the disease caused organisms or disease transmission, they have poor knowledge regarding disease prevention also, so they easily get infected by diseases. Khanam *et al*. (2005) found that illiterate group had high (30.66%) prevalence.

The prevalence of bacterial infections was the highest 59 (35.12%) in primary level group and second highest (29.57%) of overall skin infection found also in this group, because school was the principle source of many infection as higher proportion of the respondents were in primary school going children and poor socio-economic class which may be major contributing factor for ill maintaining of personal hygiene. The study was supported by Rouf *et al.* (1998) who showed that school going children (6-15 years) took major part (30.93%) regarding disease suffering. According to Sayal *et al.* (1998) school going children formed majority (41.3%) of cases followed by preschool children (32%).

Regarding the fungal infections, highest prevalence (32.99%) was observed among the illiterate group, because of ignorance they suffered most. In case of viral and arthropod infections, highest found in preschool group, this group includes mainly kids and they are the susceptible for any infection. Although education is not directly related to skin infection, it creates awareness which is necessary for prevention of diseases.

Regarding **occupational status**, the highest 92 (24.73%) infected females with skin disease was found in students. In case of bacterial infection, the highest prevalence (27.38%) was found among the garments worker. In case of fungal infection, the highest prevalence (28.86%) was found among the housewives, they have poor knowledge regarding disease prevention. Regarding viral (25.0%) and arthropod (25.71%), the highest prevalence was found among the students, with their main possible source of infection from school. Ahammed *et al.* (2003) reported that 43.2% patients were students of them 38% scabies (arthropod disease) patients.

In case of **monthly family income**, the inhabitants of 3001-5000/- tk income group was highly (26.07%) infected by different skin infections. Regarding bacterial infections, 7000/- above tk income group was highly (28.57%) infected, among fungal infected female inhabitants, highest 31.96% was observed in 5001/-7000/- tk income group, among viral infected females, the highest (27.78%) was found in 3001/- 5000/- tk income group, in case of arthropod infections, 1000/- 3000/- tk income group was found highest, lower income group people are less concern about their infection and they ignore it until it become severe but here the highest percentage of infection was found different in different income group. This study is comparable with the study done by Al-Amin *et al.* (1997) found that poor income group (54.16%) was more affected with scabies (arthropod infection) and least from higher income group (9.76%). Mridula *et al*. (2015) found that, 63% of cases were seen in children from families with income< 5000 per month.

In the present investigation, it was found that, the female inhabitants with the habit of not taking bath regularly suffered mostly with all skin infections, and here the infections was significantly associated with habit of taking bath regularly, p = 0.010 significant at 5% level. Those female inhabitants wash their used clothes 1 day in a week, suffered mostly with all skin infection except viral infection. Prevalence of overall skin infections by washing clothes in a week was significantly different (p= 0.005). According to Arun *et al*. 2014, observation on hygiene showed that 70.30% (n=126) children did not bath daily and 59.78% (n=107) children did not wear clean clothes.

As complete cure of skin infection is very difficult, in favorable temperature and moisture it can grow repeatedly. So, its recurrence history is common. In case of individual bacterial, fungal, viral and arthropod infection, recurrence history was found, incomplete treatment and lack of knowledge regarding prevention of disease were also a contributing factor but infections were not significantly associated with recurrence history.

Regarding **seasonal variation**, highest percentage of diseases occurred in summer (35.75%) and lowest in winter (28.76%). It was also found that, the percentage of both bacterial (40.48%) and fungal (40.21%) infections increase in summer. The highest percentage of viral (40.28%) was in rainy and arthropod (51.43%) was in winter. It was compared with the study carried by Ahmed and Aftabuddin (1977) reported that greater number of patients was affected by fungal infection in monsoon (50%). This result was different from present finding. In another study by Khanam (2005) found that the highest percentage of diseases occur in winter season (38.8%). Separately scabies occurred in winter season (53.31%) and ringworm in monsoon (43.75%). This result was also different from present finding.

Hot temperature and humidity of summer and monsoon have great influence on skin infection. Due to climate change, winter and monsoon are reducing and summer is increasing day by day. So, in long term summer most fungal infections occurred. But arthropod infection was highest in winter, maybe winter season favorable for this organism growth.

From these observation it can be said that bacterial, fungal, viral and arthropod is very frequent in our country under certain prevailing conditions, such as lack of personal hygiene, under nutrition, overcrowding, bad housing, low socio-economic condition etc. this was reflected in the present series, the majority of the females belong to low income group are treated in hospital out door. So, the present study will try to give approximate picture of the whole country.

Socio economic aspects of vector-borne diseases:

In the present investigation, 4 types of vector-borne diseases such as filaria, malaria, dengue and leishmaniasis were found. Regarding educational status, the highest prevalence of overall vector-borne infection (59.74%) was in illiterate group, as the level of education increased vector-borne infection decreased. So, illiteracy is one of the important social risk factors of the disease, because illiterate people do not conscious about the disease and usually unhygienic. Educational status was significantly associated with vector-borne infections (P value- 0.000).

Occupation is also an important factor for the disease, because NTD (neglected tropical disease) are of poor people so called neglected disease. In case of occupation, the highest prevalence of infection (68.29%) was found among the students then among unemployed females (65.74%), housewives (62.80%), housemaids (37.08%), and garments worker (25.52%). School is a possible source of many infections that’s why prevalence rate was high in students, other high findings revealed that, the low earning people can not afford to buy mosquito curtain, aerosol, coil or other types of repellent and they easily infected by this disease as mosquito can easily bite them. So, poverty is another important social factors for the disease. Statistically, occupation was significantly associated with positive cases ($P< 0.05$).

Use of bed net/ mosquito net is very much essential, as the mosquito bite mostly in the sleeping time. Lowest 17.20% infected females were found, those used bed net while sleeping, and the highest 56.12% were found to be infected with different vector-borne diseases, those didn’t use bed net. In case of filarial disease, according to Islam (2004), the estimated value was 13.79%, according to Hawlader (2007) only 17.5% and according to Ahmed (2009) only 19.38% patients used mosquito curtains. So, Households who were using mosquito nets were found to be at a lower risk of infection compared to the households who were not using mosquito nets. Statistically significant association found between use of bed net and vector-borne diseases.

The vector-borne disease is transmitted by mosquito bite mainly. If people sleep in such a place where mosquito can bite easily, the infection get higher. Most of the females of the study area used to sleep in floor of the room or out of the room, some sleep outside or under the tree, so mosquito can easily bite the victim. Out of total inhabitants, the highest 64.79% infected females were found, those sleep outside room. So sleeping place is also an important factor for the transmission of the disease and statistically, significant association was found also in the present investigation.

Individuals with poor socio-economic conditions are positively associated with malaria infection. Improving the housing condition of the household is one of the means of reducing the risk of malaria.

Socio economic aspects of water and airborne diseases:

Socioeconomic status of an area plays an important role in cholera transmission. *V. cholera* spreads rapidly where living conditions are crowded, water sources unprotected and where there is no hygienic disposal of feces, such as refugee camps and countries that are environmentally underdeveloped (Steffen *et al*. 2003).

In the present investigation it was observed that the highest prevalence of waterborne infections was found in illiterate group (70.93%), in garments worker (68.75%), those had income up to 1000-3000 taka/ month (73.57%), and the household belong to 5 and above family members (66.80%). Statistically, education, occupation, income and household size were found significantly associated with waterborne diseases ($p<0.05$). The highest prevalence of infection was recorded those female inhabitants using river/ pond/ lake water (85.71%); and 2nd highest found those using tap water and it was the main source of water for drinking purpose. Open space users for defaecation were highly infected (75.94%) by different waterborne diseases. In both cases result was found statistically significant. Direct literature was not available on socioeconomic aspects of waterborne infection, so it was not possible to compare this result with others.

Regarding educational status, the highest prevalence (66.77%) of airborne infections was found in illiterate group and the lowest (35.71%) found among the respondent whose education level was above primary level. As the level of education increased airborne infection decreased like vector and waterborne diseases. Regarding occupational status, highest percentage found in students (67.48%). Most of the airborne diseases were found whose monthly income was low 1000-3000 taka (69.43%). The family with 5 and above members (67.59%) was highly infected by different airborne diseases. Education, occupation, income and household size were significantly associated with airborne diseases ($p< 0.05$). Literature on this type of study was not available so couldn't compare the result with others.

SUMMARY

Bangladesh is a tropical country, where the temperature, climate and environment favor the growth of different micro organisms. The present study was conducted among the female inhabitants living in mainly slum areas and they are infected with helminth and protozoan parasites, virus, bacteria, fungus etc. and cause gastrointestinal diseases, UTIs, skin diseases, vector-borne, waterborne, airborne and many more communicable diseases. Bangladesh is known to be an endemic zone of several infectious diseases. It is one of the poorest countries in the world. It beat a burden of over population. Like other developing countries, people still struggling against poverty, malnutrition and illiteracy. Apart from these, we are facing the burden of many communicable diseases. The overall aim of the thesis was to identify communicable diseases of public health importance.

The present study comprised of 900 female inhabitants from twelve slum areas in Dhaka city to identify communicable diseases. Stool, blood and urine samples were collected from female inhabitants. The prevalence of intestinal parasitic infestation was determined; haemoglobin was measured in order to observe level of anaemia, prevalence of UTI, skin, vector-borne, waterborne and airborne diseases were recorded. Different aspects of socioeconomic status and their personal hygiene were also studied.

Parasitic infestation among the female inhabitants:

During the study period (Sep 2013-Aug 2015), 66.22% were found to be infected with 26 types of intestinal parasites among them ten were protozoans, six cestodes, four trematodes and six nematodes.

Among parasitic groups, the highest prevalence (57.55%) was found in nematode and lowest (4.11%) in trematode. The most prevalent protozoan parasites were *E. histolytica* (10.44%) and *G. intestinalis* (4%). In case of cestodes, most prevailing parasites were *H. nana* (22.78%), *T. saginata* (10.33%) and *H. diminuta* (8.22%). Among trematodes, *F. buski* was observed the highest. In nematode, most dominant parasites were *A. lumbricoides* (38%), *T. trichiura* (30%), *A. duodenale* (10.89%) eggs.

Among twelve study areas, the highest (87.5%) prevalence of infection was found in Kamrangichar and lowest (30%) was found in Hajaribag. Prevalence of infected sample

across the study area was significantly different (F= 11.629, p<0.000). In terms of total protozoan parasitic infestations, the highest prevalence (43.33%) was found in Shahidullah hall and lowest (8.75%) recorded in South Shahjahanpur. The prevalence of cestode parasitic group was higher in Kamrangichar (71.25%) and lowest was in Doyagonj (3.3%). Among trematodes, the highest prevalence was observed in Hajaribag (15%) and lowest in Khilgaon (1.67%). In case of nematodes, highest was recorded in Moghbazar (70%) and Malibag (69.17%); and lowest among Hajaribag slum dwellers (28.33%).

In area wise, the prevalence of *E. histolytica* was found highest (25.0%) in Shahidullah hall pukur par. Regarding *G. intestinalis*, the highest 8.75% and 7.5% prevalence were observed among the inhabitants in Kamrangichar and Komlapur slum areas respectively. Prevalence of protozoan parasites across the study area was not significantly different at 5% level (F=0.828, p>0.613). These two parasites was found highly prevalent in almost all study areas.

In case of cestodes, the highest (41.67%) infestation of *H. nana* was found in Malibag railgate slum areas. The highest prevalence of *T. saginata* (32.5%) and *H. diminuta* (31.67%) was found in South Shahjahanpur and Khilgaon taltola slum areas respectively. Prevalence of cestodes across the study area was not significantly different at 5% level (F= 1.072, p>0.398). Among trematodes, the most prevalent *P. westermani* and *F. buski* was found highest in Shahidullah hall (10%) and Kamrangichar (7.5%) repectively. Prevalence of trematodes across the study area was not significant also (F=0.200, p>0.200).

According to area wise prevalence, the highest prevalence of *A. lumbricoides* was 56.67% in Doyagonj and lowest, 16.67% in Khilgaon. In case of *T. trichiura*, the highest prevalence (50%) was recorded in Malibag. In Kamrangirchar and Moghbazar, highest (22.5%) and lowest (3.33%) prevalence of *A. duodenale* (egg) were found respectively. Prevalence of nematode parasites across the study area was not significantly different (F=0.286, p>0.987).

Temporal fluctuations of Parasites:

During 2013-14 study years, the prevalence was highest (86.67%) in the month of Aug’14 and lowest (45%) in Jan’14. In the 2014-15 study years, the highest prevalence

(90%) was found in Sep’14 and the lowest (26.67%) in Feb’15. Monthly prevalence of total gastrointestinal parasites was significantly different (F=6.435, p<0.000). Among two years of the study period, protozoan infestation was found highest (46.67%) in Nov’14 and lowest (5%) in Jun’15, cestode group were highest (85%) in Sep’14, trematodes recorded highest (20%) in Jan’14, nematodes were highest (80%) in Jun’14. Monthly prevalence of parasite groups was significantly different (F=47.293, p<0.000).

In case of protozoan parasites, monthly prevalence of *E. histolytica* infection was higher (33.33%) in Nov’14 and *G. intestinalis* was higher (10%) in Sep’14 and May’15. In case of cestode parasites, most prevalent parasite *H. nana* and *H. diminuta* was highest in Jun’14 (65%), and Aug, Sep’14 (40%) respectively; T. *Saginata* was highest in Feb’14 and May’15 (35%). Among trematodes, *F. buski* was found higher (10%) in Jan, Jun’14 and Sep’14; *P. westermani* infection was higher (13.33%) in Nov’14. In case of nematodes, *A. lumbricoides* showed the highest (65%) infection in May’14. *T. trichiura* (75%) and *A. duodenale* (egg) (40%) was highest in Jun’14 and May’14 respectively. Monthly prevalence of different protozoa, cestode nematode parasites was significantly different except trematode.

Rainy’14 (86%) was the peak season for parasitic infestation and statistical difference was found significant at the 0.05 level (F=51.317, p<0.000). Rainy’14 were also the peak season for cestode (70%) group infection. In case of protozoa, tremaode and nematode group, highest prevalence was found in winter’14 (43.33), winter’15 (15%) and summer’14 (68.75%) respectively. *E. histolytica* (10.62%) and *G. intestinalis* (5.31%) both protozoan parasites were found highest in rainy season too. In case of cestodes, *H. nana*, *H. diminuta* and *T. saginata* were recorded highest in summer (26.25%), rainy (18.12%) and winter season (15.38%) respectively. Among trematodes, *F. buski* (2.69%) and *P. westermani* (3.84%) showed highest in winter. In case of nematodes, *A. lumbricoides* (45.94%) and *T. trichiura* (40.31%) were recorded highest in summer season. Statistically, seasonal prevalence of different protozoan, cestode, trematode and nematode parasites was not found significantly different.

Prevalence of single and mixed infections:

The prevalence of double (19.78%) and triple (20.44%) infection dominated over the single (16.44%), quadruple (8.33%) and multiple (1.22%) infection. In case of area, single infection was highest (70%) among the female inhabitants in Moghbazar railgate par and lowest (2.50%) in North Shahjahanpur. Double, triple, quadruple and multiple infection were found highest in Doyagonj (35%), Khilgaon (37.5%), Shahidullah hall (38.33%) and Hazaribag (8.33%) respectively. Prevalence of single and all mixed infections across the study areas were significantly different ($F= 4.175$, $P< 0.005$).

During two years of the study period, peak prevalence of single, double, triple, quadruple and multiple infections was found in Jul'15 (76.67%), Oct'13 (43.33%), Aug'14 (75%), Nov'14 (40%) and Feb'15 (16.67%) respectively. Monthly prevalence of single, double, triple, quadruple and multiple infections of parasites was significantly different ($F= 5.192$, $p< 0.001$).

In rainy season, highest prevalence of single (29.37%) and double (24.06%) infection were found; summer is the peak season for triple (24.69%) infection; highest prevalence of quadruple (13.08%) and multiple (3.08%) infections was recorded in winter season. Seasonal prevalence of single, double, triple, quadruple and multiple infections of parasites was significantly different ($F= 3.414$, $p< 0.052$).

In case of female, age had impact on the causation of parasitic infestation as highest prevalence (75.65%) was found in children group of 1-15 years and the lowest (58.67%) in the middle age group 36-50 years. The prevalence was negatively correlated with age groups ($r = -0.284$, $p<0.716$).

Highest prevalence found in children, in case of protozoa (28.49%) and cestode (13.98%) infection; In case of trematode, highest (3.69%) was in middle age group and incase of nematode, highest (58.60%) observed in old age group. Prevalence of parasitic group by age was not statistically significant ($F= .036$, $p> .991$).

E. histolytica (18.13%) and *G. intestinalis* (7.77%) showed highest in children. *T. saginata* observed highest (5.18%) also in children but *H. nana* showed highest (7.53%) in old age group. *F. buski* (1.84%) and *P. westermani* (1.11%) were found highest in middle age group. *A. lumbricoides* (33.87%) and *T. trichiura* (22.58%) observed highest in old age group. Infestation of *A. duodenale* (egg) (15.54%) and *E. vermicularis* (2.59%) were highest in children group. Prevalence of each parasite in different age groups was not found significantly different ($F= .073$, $p>.975$).

Anaemia in relation to parasitic infestation among the female inhabitants:

Anaemia was found as a common health problem among the female group. Percentage of anaemia was found to vary in different places and age groups of the female inhabitants.

By measuring the haemoglobin level from the blood samples, it was observed that, overall percentage of anaemic and non anaemic cases was recorded as 42.22% and 57.78% respectively. The highest percentage (49.60%) found among adult age group. Statistically the age groups were found significant with anaemia ($F=9.886$, $p<0.020$).

Out of total anaemic cases, 57.1% girls were mildly anaemic, 31.05% moderately anaemic and 11.84% severely anaemic. The highest percentage (14.52%) of severe anaemic cases was found in adult group. Level of anaemia was significantly different across the age group ($F=13.095$, $p<0.002$).

The highest percentage of anaemic cases (53.75%) was determined among Kamrangichar slum dwellers. On the contrary, the least cases (32.5%) were found in South Shahjahanpur area. Study area was not significantly associated with anaemia ($\chi^2=11.76$, $p>0.092$).

In all age groups, higher percentage was found in anaemic parasitic positive cases than non anaemic parasite positive cases. Amongst anaemic cases, parasitic infections were higher (70.53%) than the non anaemic cases (63.08%). But anaemia was not significantly associated (χ^2=2..89, $p<0.089$) with parasite infection.

Urinary Tract Infections (UTIs) among the female inhabitants:

Overall prevalence of urinary tract infection was found 31.44% among the female inhabitants. Among all age groups, the highest prevalence was observed among adult age females (46.8%) and statistically, prevalence of UTIs was significantly associated with age group (chi-square= 55.08, $p< 0.000$).

The highest prevalence of UTIs was found in July’15 (60%), and seasonally it found highest in Rainy’15 (58.33%). Monthly variation was significantly associated with the prevalence of UTIs (chi-square= 17.12, $p< 0.028$) and also seasonal variation (chi-square= 71.03, $p< 0.000$).

The highest percentage of *E. coli* (UTIs causing bacteria) was 65.72%, other bacterias: *Streptococcus* (10.25%), *Staphylococcus* (8.13%), *Pseudomonas* (7.07%), *Enterococcus*

(5.30%) were also found responsible for UTIs. Prevalence of different bacteria was significantly associated with isolates causing UTIs (chi-square= 205.24, p< 0.000).

Skin diseases among the female inhabitants:

Prevalence of skin diseases was recorded 41.33% among the female inhabitants, among them 45.16% bacterial infection, 26.07% fungal, 19.35% viral and 9.41% arthropod infection were observed. Among all age groups, adult group was mostly infected by bacterial (51.19%) and fungal (46.39%) infections. The highest prevalence (44.09%) of overall skin infection was also recorded in adult group. Children group was most prone to viral (43.05%) and arthropod (54.28%) infections. But prevalence of skin infections was not significantly different across the age group (F= 0.000, p>1.00).

Regarding bacterial infections, the highest 38.09% were infected by boil disease, 26.19% by carbuncles, 15.48% folliculitis, 11.31% paronichia, and the lowest 4.76% styes, 4.17% were affected by impetigo. According to age group, in case of boil (57.81%), carbuncles (56.82%), folliculitis (50%) and styes (50%), adult group showed highest infection. In case of paronichia (36.84%) and impetigo (71.43%), children group showed highest infection. Prevalence of various bacterial infections by age group was significantly different (F= 5.17, p<0.008).

In case of fungal infections, the highest 29.90% was affected by ringworm, then athlete's foot (34.02%), onchomycosis (25.77%) and candidiasis (10.31%). Ringworm infection was recorded highest (48.27%) in middle age group, athlete's foot (48.48%), onchomycosis (52%) and candidiasis (40%) observed highest in adult group. Prevalence of different fungal infection by age group was significantly different (F= 9.05, p<0.002).

Among viral infections, the highest 36.11% was infected by wart infection, then 34.72% chicken pox and lowest 29.17% measles. Wart was found highest (42.31%) in adult group, chicken pox (52%) and measles (42.86) recorded highest in children. Prevalence of different viral infection by age group was significantly different (F= 19.62, p<0.002).

Among arthropod infections, scabies (54.28%) and pediculosis (45.71%) were found. Both scabies (47.37%) and pediculosis (62.5%) was observed highest in children group. Prevalence of arthropod infections by age group was significantly different (F= 17.36, p<0.009).

Vector, water and airborne diseases among the female inhabitants:

Overall prevalence of vector-borne diseases recorded 49.33% among the female inhabitants, among them malaria (2%), filaria (7.33%), dengue (34.67%) and leishmaniasis (5.33%) were found. Dengue (64.25%) and malaria (4.66%) were found highest among children and filaria (12.18%) and leishmaniasis (8.12%) found highest in middle age group. Prevalence of malaria, filaria, dengue and leishmaniasis by age group was significantly different (F= 7.98, p<0.003).

Total prevalence of waterborne diseases recorded 59.87% among the female inhabitants, among them cholera/ diarrhoea (28%), typhoid (17.11%), polio (5.11%) and hepatitis A/ Jaundice (9.67%) were observed. The major proportion of the waterborne infections (71.50%) was found in children and age group was significantly associated with waterborne disease (Chi-square = 13.03, p<0.004).

Overall prevalence of airborne diseases recorded 58.44%, among 900 female inhabitants. Among them four diseases were identified, which are influenza (25.11%), mumps (10.22%), pneumonia (17.44%) and tuberculosis (5.67%) and highest (69.43%) prevalence of airborne infections was observed in children. Age group was significantly associated with airborne disease (Chi-square = 10.07, p<0. 01).

Socioeconomic aspects and personal hygiene of the female inhabitants in relation to parasitic infestation:

Education was significantly correlated with prevalence of parasite infestation (r = -0.975, p<0.025). The highest prevalence of infection (77.95%) was found in illiterate group. Among all occupational categories, prevalence rate was highest (80.73%) among the garments workers. Occupation was significantly associated with prevalence of parasite infection (Chi-square = 61.69, p<0.000). The highest prevalence (82.90%) was observed in the low income group of Tk. 1000-3000. Relationship between monthly family income and parasitic infection was significantly associated (Chi-square = 61.69, p<0.000). A significant association between the prevalence of parasite infection and types of latrine was observed (Chi-square = 48.11, p< 0.000) and majority of the respondents (86.47%) used open space for defaecation. Source of drinking water was also significantly associated with parasitic infection (Chi-square = 60.51, p<0.000) where river/ pond/ lake water users showed remarkably higher infestation (92.86%).

The prevalence of infestation was lower (39.53%) among the females who used soap with water for hand washing after defaecation, compared to the females (71.43%) who used only water for this purpose. Hand washing habits after defaecation was significantly associated with prevalence of intestinal parasite (Chi-square = 58.72, $p<0.000$). The prevalence of infections among the regular nail clippers was 37.62% whereas, it was 81.93% among the irregular nail clippers. Nail cutting habits was significantly associated with prevalence of parasite (Chi-square =178.78, $p<0.000$). It was observed that prevalence of parasitic infection among the female inhabitants were 32.95% among shoe users whereas bare footers had highest 79.91% parasite infections. Habit of footware was significantly associated with prevalence of parasite infection (Chi-square = 91.46, $p<0.000$).

Socioeconomic aspects of the female inhabitants in relation to skin infections:

Regarding educational status, the highest prevalence (30.38%) of overall skin infection was found in illiterate group. Bacterial infection was found highest 59 (35.12%) in primary level group. Highest prevalence (32.99%) of fungal infection was observed in the illiterate group. In case of viral (31.94%) and arthropod (34.28%), the highest found in preschool age group. Education seems not to have significant effect on prevalence of bacterial, fungal, viral and arthropod infections ($F= 0.000$, $p>1.00$).

In case of occupational status, the highest 24.73% skin infection was found in students. The highest prevalence (27.38%) of bacterial infection was found among the garments worker. In fungal infected females, the highest prevalence (28.86%) was found among the housewives. In viral (25.0%) and arthropod (25.71%), the highest prevalence was found among the students. Prevalence of bacterial, fungal, viral and arthropod infections in relation to occupation was not found statistically significant ($F= 0.01$, $p> 1.00$).

The highest prevalence (34.68%) of overall skin diseases was found in those living in tin shed houses. The highest was also observed in tin shed houses in bacterial (42.85%) and arthropod (45.71%) infection. In case of fungal (42.27%) and viral (44.44%) skin infections, highest prevalence was found in those who lived in bamboo and plastic sheet roof houses. Prevalence of bacterial, fungal, viral and arthropod infections by housing type of the inhabitants was not significantly different ($F= 0.000$, $p>1.00$).

Prevalence of bacterial, fungal, viral and arthropod infections was not significantly associated with overcrowding (Chi-square = 299.24, p>0.39). But the highest prevalence of overall skin diseases (62.09%) and in particular disease infection like bacterial (62.5%), fungal (55.67%), viral (68.05%) and arthropod (65.71%) was found among the members of overcrowded family.

The female inhabitants with the habit of irregular bathing suffer mostly (62.36%) with all skin infections and here the infections was significantly associated with habit of taking bath regularly (Chi-square = 11.32, p<0.010). It was observed that, female inhabitants among slum areas suffered mostly with all skin infection except viral infection, who washed their clothes 1 day /week and in this case result was statistically significant (F= 7.31, p<0.005).

Recurrence history is found in all types of skin diseases in slum areas female inhabitants. The highest percentage of overall skin diseases (35.75%), bacterial (40.48%) and fungal (40.21%) diseases was found in summer; and the highest percentage of viral (40.28%) was in rainy and arthropod infection (51.43%) was in winter. Prevalence of seasonal variation of bacterial, fungal, viral and arthropod was not found significantly different (F= 0.020, p>0.980).

Socio economic aspects of vector-borne diseases:

Regarding educational status, the highest prevalence of overall vector-borne infection (59.74%) was found in illiterate group. In case of occupation, the highest prevalence of infection (68.29%) was found among the students. Although the number of students was very less but infection rate was highest among them. The highest prevalence of infestation (52.75%) was recorded in the income group of Tk. 3001-5000. The highest (52.88%) prevalence was observed among the female inhabitants including =>5 family members (Chi-square =5.43, p<0.019). Educational status, occupational status, household size was significantly associated with vector-borne disease but monthly income was not.

The highest prevalence of vector-borne diseases was recorded 61.85% in those living in bamboo and plastic sheet roof house. Bed net non users were mostly infected (56.12%) with diseases (Chi-square = 77.02, p<0.000). The highest 64.79% infected females were found in those who sleep outside room. Type of house, use of bed net and sleeping place was found significantly associated with vector-borne diseases (P<0.05).

Socio economic aspects of water and airborne diseases:

In case of waterborne and in airborne infection, the highest infection was found in illiterate group. Regarding occupational status in waterborne disease, the highest prevalence was found in garments worker (68.75%) and in airborne it was highest (67.48%) among students. In both waterborne and airborne cases, highest prevalence was observed among those monthly income was low (1000-3000 taka). The family with 5 and above members was highly infected by different waterborne (66.80%) and airborne diseases (67.59%). Statistically, education, occupation, income and household size were found significantly associated with waterborne and airborne diseases (p<0.05).

The highest prevalence of waterborne infection was recorded in those female inhabitants using river/ pond/ lake water (85.71%); and 2nd highest (66.91%) found in those using tap water. Source of water was significantly associated with diseases (Chi-square = 61.82, p<0.000). The highest infection (75.94%) was recorded among females using open space for defaecation and result was found statically significant (Chi-square = 21.72, p<0.000 significant at 5% level).

CONCLUSION

The prevalence of helminthiasis and protozoan infection is widespread in Bangladesh. Among all the parasites, *Ascaris lumbricoides* appears to be the most prevalent parasites in all areas and the highest parasitic infestation was found among children group. The female inhabitants of the slum areas were more vulnerable to parasitic infestation due to the differences in hygienic conditions, rate of literacy, malnutrition, status of anaemia, and prevailing socioeconomic condition. Mostly polluted area Kamrangichar near the polluted buriganga river were found to harbor more parasites than other slum areas. Seasonally the peak prevalence of infection was observed in rainy season.

Hookworm and other parasitic infection was another reason for anaemia. The findings of the present study clearly indicate that anaemia was significantly higher amongst the infected female inhabitants which reaffirm the fact that parasitic infection is one of single most contributory factors of anaemia among the female inhabitants. The highest percentages of anaemia found among adult age group due to married girls were prevailing and more than one time of abortion/ miscarriage/ stillbirth had anaemia and parasitic infestation. The prevalence of anaemia is disproportionately high in developing countries, due to poverty, inadequate diet, risky and high frequency of pregnancy and lactation and poor access to health services.

The other important findings of the present study were urinary tract infection, various infectious viral, bacterial, fungal skin diseases, parasitic vector-borne diseases, viral bacterial origin water and airborne diseases.

The highest prevalence of urinary tract infection was observed among adult age group. In case of skin diseases, the highest prevalence was found also among the adult age group. Adult age group people were vulnerable to many diseases, because most of them, of this age remain unaware about their health.

Level of education, occupation of the respondents and their family income, sanitary practice like-use of shoes, water purification, habit of hand washing, defaecation practice, nail clipping all had adverse impact on the prevalence of parasitic infestation, as well as bacterial, viral waterborne diseases, airborne, skin and vector-borne diseases.

Due to lack of awareness about the symptoms of diseases or the knowledge about the unbearable effect of worm infection, bacterial, viral fungal infection can have effect on an individual. Current efforts are needed to improve sanitation and water supplies, but are not sufficient. As advocated by World Health Organization, the control of the infection in the community can only be achieved through a coordinated effort in the community.

Dhaka is the capital of Bangladesh and its population of 10 million makes it the largest city in Bangladesh. The city is expanding rapidly and the sanitation is improving day by day but in some areas also remains in previous bad condition. Although the rate of parasitic infection is relatively high, possibly because of the large influx of villagers from rural areas to dwell in the city, poor knowledge of personal hygiene and lower socio-economic stratum of its people. Under above circumstances incidence of intestinal parasites is likely to be common. Information on the prevalence and intensity of human intestinal parasites of the people of Dhaka city is very meager. Such information is necessary in planning the control of parasitic infection.

Infections transmitted by water continue to be a public health problem in developing countries. Although water is essential for life, it can also cause devastating effects as an effective carrier of pathogens, able to transmit disease to a large proportion of the population in a very short time span. Diarrhoea can occur in association with other infectious diseases such as malaria and measles, as well as chemical agents. Communicable diseases also account for most of the reported deaths among conflict-affected populations due to displacement, malnutrition and limited access to basic needs. In addition to assessing the disease incidence and prevalence, the prevention and control of disease outbreaks require a thorough understanding of the environmental and host factors, the transmission pattern and other characteristics of causative organisms.

Due to the lack of adequate sanitation, infectious diseases are rampant in developing countries. Vaccination, either through scarification or parenteral injection has been shown to be effective in eliminating infectious diseases throughout the world.

RECOMMENDATIONS

The following recommendations are being made in the light of the present study to control and prevention of all infectious diseases (communicable diseases) like parasitic infestation, UTI, skin, vector-borne, waterborne, airborne infection. The way means to control this disease is to improve socio-economic condition, change the behavior and taking appropriate preventive measure.

To prevent and control the communicable diseases:

- All infectious diseases are partly due to the ignorance and unhygienic condition of the habit and habitat of the female inhabitants. They should be educated and be made aware about the causes and possible routes of transmission of these diseases from various sources including food and drinking water by communicating information through health and family planning workers.

- The selected inhabitants as well as their family members should be motivated to involve themselves in the health care activities and for practicing personal hygiene such as washing hands before taking meals and after defaecation, nail clipping, regular use of footwear etc.
- The government should strengthen the urban sanitation and safe water supply program within their own resources.
- Practicing good hygiene and regularly washing the hands with soap and water may help reduce the risk of acquiring infections. This is especially important after exposure to soil because many types of parasite eggs, cyst, and fungi live in the dirt. Good hygiene may also reduce the risk of passing a contagious infection on to others.
- They must be aware and discouraged to take food and drinks openly in unhygienic condition.
- Food and water should be covered to prevent contamination of flies that act as the carrier of soil parasites. Eating of raw unwashed vegetables should be avoided.
- Keeping himself clean by regular bathing, drying well after bathing, washing used clothes regularly, avoidance of sharing of used dress and others things should be avoided from passing the infection.
- Avoid swallowing water when swimming or playing in lakes, ponds, streams.

- Fungi prefer warm, moist environments. Therefore, patients should limit their exposure to such conditions.
- All family members should be treated with regular deworming therapy (at least 3 months interval) by rotation.
- Providing iron and folic acid supplements to female inhabitants through school or through the community outreach programme.
- Right after urinating, splash vaginal spot with water should be done and continual wiping from entrance to back again is a good practice.
- Communities should be improved in mosquito, sand fly control through the primary health care approach.
- Drains should be cleaned, bushes jungles near the houses should be cleaned to avoid mosquito breeding place and insecticides should be sprayed there regularly.
- Use of mosquito curtain, burning of mosquito coil should be encouraged for personal protection.
- Cracks in the mud walls of houses should be repaired.
- Measures should be taken to improve living style, educational status of the people.
- Mass media i.e. Radio. Television etc. should be utilized to improve the knowledge about all diseases and measures against it. Newspaper should be published bulletins and features on communicable diseases in a month or quarterly or half yearly basis.

Behavior change through communication:

- Behavior change through communication is a multi-level tool for promoting and sustaining the desired behavior in individuals and communities by using a variety of communication channels and creating demand for information and service.
- Private practitioners are to be encouraged in the prevention and control of diseases by arranging seminar, symposium, and discussion in TV, radio and newspaper.
- Government should take necessary steps to uplift the socio-economic condition of the community.
- Municipal health worker should make regular visit in their respective areas and establish good relationship with the community people.
- Creation of public awareness through health education and motivation is of almost importance for control and prevention of disease. Health education through mass

media should be provided in simple, easily understandable way regarding the cause and preventive measures

- School curriculum should contain health education regarding personal hygiene and periodic check up of the students with isolation of infected person from the school.
- The media can influence through food advertisements. Mass media can encourage new behaviors. Multimedia approaches that combine face-to-face and mass media are appropriate for nutrition education.
- In addition to government agencies, other sectors such as industry and trade, consumer organizations, insurance companies, sports organizations etc. can utilizes the mass media.

Community aspects:

Advocate and create awareness on equal rights and needs of girls and boys; promote safe and supportive environment for growth and development.

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Questionnaire Form:

ID No : **Date of interview** :

1. **Study area :**
2. **Name** : **3. Age** : ..…….year
4. **Educational status:**

   a) Illiterate b) Can sign only c) Pre School age

   d) Primary e) Above
5. **Marital status**: Married/ Unmarried
6. **Source of income/ profession:**

   a) Students b) Housewives c) Unemployed d) Garments Worker e) Housemaids
7. **Monthly Income:**

   a) TK.1000-3000 b) TK.3001-5000 c) Tk.5001-7000 d) 7000+
8. **Type of house:**

   a) Tin shed b) Tin shed with bamboo surrounding

   c) Bamboo and plastic sheet roof with surrounding
9. **Type of latrine:**

   a) Sanitary b) Kacha pit latrine c) Bamboo slit d) Open space
10. **Are there any drain/ ditch/ water logging/ bush around the house?** Yes/ No
11. **Washing hand before eating:** a) Soap and water b) Water only
12. **Washing hand after defaecation:**

    a) Soap and water b) Water only c) Ash and water d) Soil and water
13. **Habit of footware:**

    a) Regular shoe users b) Bare footers c) Occasional shoe users
14. **Sources of drinking water:**

    a) Tap water (supply) b) Tube-well water c) Boiled water d) Well water

    e) River/Pond/Lake water
15. **Nail cutting habits:** Regularly/ Irregularly
16. **Number of rooms in a house:**
17. **Number of person living in a room:**
18. **Number of person sleeping in a bed/ floor:**

19. Use of mosquito net: a) Regular b) Sometimes c) Never

20. Habit of regularly bath: Yes/ No

21. Types of clothes wearing regularly:

a) Cotton b) Synthetic c) Nylon d) Others

22. Habit of clothes sharing: Yes/ No

23. Habit of towel sharing: Yes/ No

24. Number of days washing your clothes in a week:

a) Once b) twice c) thrice d) more

25. Habit of wearing the same cloth after bath without washing: Yes/ No

26. Habit of bed sharing: Yes/ No

27. Habit of bed linen washing:

a) One time in a week b) One time in a month c) Above one month

28. Sharing of combs: Yes/ No

29. Hair washing with- a) Shampoo b) Soap c) Nothing

30. Disease category name:

a)) Intestinal (protozoan & nematode) parasitic disease b)Skin disease c) Urinary tract infection d) Vector-borne disease e) Waterborne disease f) Airborne disease

31. How long suffering from this disease:

a) Years b) Months c) Weeks d) Days

32. Other members of the family suffering from the disease: Yes/ No

33. If yes, relation with the respondent:

a) Father b) Mother c) Sister d) Brother e) Child f) Cousin g) Others

34. History of recurrence with the same diseases: Yes/ No

35. If yes, how many times? a) Twice b) Three c) More than three

36. Treatment history of present diseases:

a) 1st time b) 2nd time c) More than twice

37. Skin diseases pattern:

a) Bacterial b) Fungal c)Viral d) Arthropod

38. Site of distribution of lesion:

a) Scalp b) Limbs c)Hands d)Face e) Foot f)Groin g) Chest h) Waist i) Other single site j) Multiple site

Disease Diagnosis Form

1. Do you have suffered from any disease in the last one month? Or symptoms of the disease?

a) Generalized weakness b) Diarrhoea c) Abdominal pain

d) Vomiting e) Others

2. Result after microscopic examination in stool sample:

a) Cyst of…………………………

b) Egg of …………………………

c) Larvae of ………………………

3. Blood test: Haemoglobin measurement and level of anaemia

Level of anaemia		
Severe anaemic case	Moderate anaemic case	Severe anaemic case
<7 g/dL (Hb)	>7.1-9.9 g/dL (Hb)	> 10.1- 11.9 g/dL (Hb)

4. Result after microscopic examination in urine sample:

a) Epithelial cell b) Pus cell c) RBC d) Any crystal

5. Result after urine culture:

a) *Escherichia coli* b) *Streptococcus* c) *Staphylococcus*

d) *Pseudomonas* e) *Enterococcus*

6. Skin diseases pattern:

a) Boil b) Carbuncles c) Folliculitis d) Paronichia

e) Styes f) Impetigo g) Ring worm h) Athlete's foot

i) Wart j) Candidiasis k) Chicken pox l) Onchomycosis

m) Pyoderma n) Measles o) Scabies p) Pediculosis

q) Pigmentory disorder r) Pityriasis versicolor s) Others

7. Type of vector-borne diseases they had infected:

a) Malaria b) Filaria c) Dengue d) Leishmaniasis e) Others

8. Type of waterborne diseases they had infected:

a) Cholera/ Diarrhoea b) Polio c) Typhoid d) Hepatitis A/ E/ Jaundice

e) Others

9. Type of airborne diseases they had infected:

a) Influenza b) Mumps c) Pneumonia d) Tuberculosis e) Others

Media composition:

The composition of media which is used given below:

All the media which used were autoclaved at 121^0C for 15 minutes at 15lb pressure.

MACCONKEY AGAR (MAC)

Ingredients	gm/litre
Peptone	20.0
Lactose	10.0
Bile salts	5.0
Sodium chloride	5.0
Neutral red	0.075
Agar	12.0

pH 7.4 ± 0.2

Directions

Suspend 52g in 1 litre of distilled water. Bring to the boil to dissolve completely. Sterilize by autoclaving at 121°C for 15 minutes. Dry the surface of the gel before inoculation.

Incubation and Colonial characteristics

The plate is incubated for 24 hours at 35-37°C**.** After 24 hours at 35-37°C typical *E. coli* colonies are red in colour and non mucoid.

Storage conditions and Shelf life

Store the dehydrated medium at 10-30°C and use before the expiry date on the label. Store the prepared plates of medium at 2-8°C.

Appearance: Dehydrated Medium: Straw pink coloured, free-flowing powder.

Prepared medium: Dark red coloured gel.

BLOOD AGAR MEDIA

Ingredients	gm/litre
Peptone	15
Liver extract	2.5
Sodium chloride	5.0
Yeast extract	5.0
Agar	15.0

pH 7.2 ± 0.2

MULLER-HINTON AGAR

Ingredients	gm/litre
Beef extract	2.0
Bactocasaimino acid	17.5
starch	1.5
Bacto agar	17.5
Distilled water	1000ml

pH 7.3+0.1

TRIPLE SUGAR IRON AGAR/ KIGLER'S IRON AGAR

Ingredients	gm/litre
Beef extract	3.0
Yeast extract	3.0
Peptone	15.0
Protease Peptone	5.0
Lactose	10.0
Dextrose	1.0
Ferrous sulfate	0.2
Sodium chloride	5.0
Sodium thiosulfate	0.3
Phenol red	0.024
Agar	15.0
Distilled water	1 litre

pH 7.4 + 0.2

CITRATE AGAR, SIMMONS' (SIMMONS' 1926, Modified)

Ingredients	gm/litre
NaCl	5.0
$Mg SO_4$	0.2
NH_4PO_4	1.0
K_2HPO_4	1.0
Sodium citrate	2.0
Agar	15.0
Water	1000ml

pH 6.8 + 0.2

Table: Concentrations and diffusion zone breakpoints for resistance against antimicrobial agents tested for *E. coli* (CLSI 2010).

Antimicrobial agent	Drug code	Disc drug concentration (µg)	Diffusion zone breakpoint (mm)		
			Resistant	Intermediate	Susceptible
Ampicillin	AMP-10	10	≤13	14-17	≥17
Cefixime	CFM-5	5	≤15	16-18	≥19
Ceftriaxone	CRO-30	30	≤13	14-20	≥21
Ceftazidime	CAZ-30	30	≤14	15-17	≥18
Ciprofloxacin	CIP-5	5	≤15	16-20	≥21
Gentamycin	CN-10	10	≤12	13-14	≥15
Nalidixic Acid	NA-30	30	≤13	14-18	≥19
Tetracycline	TE-30	30	≤11	12-14	≥15
Cotrinoxazole/ Sulfamethoxazole	SXT-25	25	≤10	11-15	≥16
Imipenem	IMP-10	10	≤13	14-15	≥16
Augmentin	AUG-30	30	≤13	14-17	≥18
Netilmicin	NET-30	30	≤12	13-14	≥15
Amikiacin	AK-30	30	≤14	15-16	≥17

Multiple comparisons (by LSD) of the prevalence of infected sample among the study area

(I) Study area	(J) study area	Mean Difference (I-J)	Std. Error	Sig.
Moghbazar	Doyagonj	.133	.081	.101
	Gandaria	.267*	.081	.001
	Hajaribag	.533*	.081	.000
	Kamrangichar	-.042	.076	.584
	Khilgaon	-.017	.070	.813
	Komlapur	.158*	.076	.038

	Malibag	.100	.070	.156
	North Shajahanpur	.133	.091	.143
	Palashi	.258*	.076	.001
	Shahidulllah hall	.400*	.081	.000
	South Shajahanpur	.358*	.076	.000
Doyagonj	Moghbazar	-.133	.081	.101
	Gandaria	.133	.081	.101
	Hajaribag	.400*	.081	.000
	Kamrangichar	-.175*	.076	.022
	Khilgaon	-.150*	.070	.033
	Komlapur	.025	.076	.742
	Malibag	-.033	.070	.636
	North Shajahanpur	.000	.091	1.000
	Palashi	.125	.076	.100
	Shahidullah hall	.267*	.081	.001
	South Shajahanpur	.225*	.076	.003
Gandaria	Moghbazar	-.267*	.081	.001
	Doyagonj	-.133	.081	.101
	Hajaribag	.267*	.081	.001
	Kamrangichar	-.308*	.076	.000
	Khilgaon	-.283*	.070	.000
	Komlapur	-.108	.076	.155
	Malibag	-.167*	.070	.018
	North Shajahanpur	-.133	.091	.143
	Palashi	-.008	.076	.913
	Shahidullah hall	.133	.081	.101
	South Shajahanpur	.092	.076	.228
Hajaribag	Moghbazar	-.533*	.081	.000
	Doyagonj	-.400*	.081	.000
	Gandaria	-.267*	.081	.001
	Kamrangichar	-.575*	.076	.000
	Khilgaon	-.550*	.070	.000
	Komlapur	-.375*	.076	.000
	Malibag	-.433*	.070	.000
	North Shajahanpur	-.400*	.091	.000
	Palashi	-.275*	.076	.000
	Shahidullah hall	-.133	.081	.101
	South Shajahanpur	-.175*	.076	.022
Kamrangichar	Moghbazar	.042	.076	.584
	Doyagonj	.175*	.076	.022
	Gandaria	.308*	.076	.000
	Hajaribag	.575*	.076	.000

	Khilgaon	.025	.064	.697
	Komlapur	.200*	.070	.005
	Malibag	.142*	.064	.028
	North Shajahanpur	.175*	.086	.043
	Palashi	.300*	.070	.000
	Shahidullah hall	.442*	.076	.000
	South Shajahanpur	.400*	.070	.000
Khilgaon	Moghbazar	.017	.070	.813
	Doyagonj	.150*	.070	.033
	Gandaria	.283*	.070	.000
	Hajaribag	.550*	.070	.000
	Kamrangichar	-.025	.064	.697
	Komlapur	.175*	.064	.007
	Malibag	.117*	.057	.043
	North Shajahanpur	.150	.081	.065
	Palashi	.275*	.064	.000
	Shahidullah hall	.417*	.070	.000
	South Shajahanpur	.375*	.064	.000
Komlapur	Moghbazar	-.158*	.076	.038
	Doyagonj	-.025	.076	.742
	Gandaria	.108	.076	.155
	Hajaribag	.375*	.076	.000
	Kamrangichar	-.200*	.070	.005
	Khilgaon	-.175*	.064	.007
	Malibag	-.058	.064	.364
	North Shajahanpur	-.025	.086	.772
	Palashi	.100	.070	.156
	Shahidullah hall	.242*	.076	.002
	South Shajahanpur	.200*	.070	.005
Malibag	Moghbazar	-.100	.070	.156
	Doyagonj	.033	.070	.636
	Gandaria	.167*	.070	.018
	Hajaribag	.433*	.070	.000
	Kamrangichar	-.142*	.064	.028
	Khilgaon	-.117*	.057	.043
	Komlapur	.058	.064	.364
	North Shajahanpur	.033	.081	.682
	Palashi	.158*	.064	.014
	Shahidullah hall	.300*	.070	.000
	South Shajahanpur	.258*	.064	.000
North Shajahanpur	Moghbazar	-.133	.091	.143
	Doyagonj	.000	.091	1.000

	Gandaria	.133	.091	.143
	Hajaribag	.400*	.091	.000
	Kamrangichar	-.175*	.086	.043
	Khilgaon	-.150	.081	.065
	Komlapur	.025	.086	.772
	Malibag	-.033	.081	.682
	Palashi	.125	.086	.147
	Shahidullah hall	.267*	.091	.003
	South Shajahanpur	.225*	.086	.009
Palashi	Moghbazar	-.258*	.076	.001
	Doyagonj	-.125	.076	.100
	Gandaria	.008	.076	.913
	Hajaribag	.275*	.076	.000
	Kamrangichar	-.300*	.070	.000
	Khilgaon	-.275*	.064	.000
	Komlapur	-.100	.070	.156
	Malibag	-.158*	.064	.014
	North Shajahanpur	-.125	.086	.147
	Shahidullah hall	.142	.076	.063
	South Shajahanpur	.100	.070	.156
Shahidullah hall	Moghbazar	-.400*	.081	.000
	Doyagonj	-.267*	.081	.001
	Gandaria	-.133	.081	.101
	Hajaribag	.133	.081	.101
	Kamrangichar	-.442*	.076	.000
	Khilgaon	-.417*	.070	.000
	Komlapur	-.242*	.076	.002
	Malibag	-.300*	.070	.000
	North Shajahanpur	-.267*	.091	.003
	Palashi	-.142	.076	.063
	South Shajahanpur	-.042	.076	.584
South Shajahanpur	Moghbazar	-.358*	.076	.000
	Doyagonj	-.225*	.076	.003
	Gandaria	-.092	.076	.228
	Hajaribag	.175*	.076	.022
	Kamrangichar	-.400*	.070	.000
	Khilgaon	-.375*	.064	.000
	Komlapur	-.200*	.070	.005
	Malibag	-.258*	.064	.000
	North Shajahanpur	-.225*	.086	.009
	Palashi	-.100	.070	.156
	Shahidullah hall	.042	.076	.584

*. The mean difference is significant at the 0.05 level.

Multiple Comparisons by LSD among parasite groups across the study area

(I) parasite group	(J) parasite group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Protozoa	Cestode	-.19*	.018	.000	-.23	-.16
	Trematode	.15*	.018	.000	.12	.19
	Nematode	-.38*	.018	.000	-.42	-.35
Cestode	Protozoa	.19*	.018	.000	.16	.23
	Trematode	.35*	.018	.000	.31	.38
	Nematode	-.19*	.018	.000	-.22	-.15
Trematode	Protozoa	-.15*	.018	.000	-.19	-.12
	Cestode	-.35*	.018	.000	-.38	-.31
	Nematode	-.53*	.018	.000	-.57	-.50
Nematode	Protozoa	.38*	.018	.000	.35	.42
	Cestode	.19*	.018	.000	.15	.22
	Trematode	.53*	.018	.000	.50	.57

Based on observed means.

The error term is Mean Square (Error) = .152.

*. The mean difference is significant at the .05 level.

Multiple Comparisons by LSD among the study area of infected sample by parasite group.

(I) study area	(J) study area	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Moghbaz	Doyagonj	.01	.036	.726	-.06	.08
	Gandaria	.02	.036	.640	-.05	.09
	Hajaribag	.00	.036	.815	-.08	.06
	Kamrangi	-.23*	.033	.000	-.30	-.16
	Khilgaon	-.15*	.031	.000	-.21	-.09

	Komlapur	-.05	.033	.142	-.11	.02
	Malibag	-.15*	.031	.000	-.21	-.09
	North Sh	-.13*	.040	.001	-.21	-.05
	Palashi	-.03	.033	.417	-.09	.04
	Shahidul	-.13*	.036	.000	-.20	-.06
	South Sh	-.02	.033	.472	-.09	.04
Doyagonj	Moghbaz	-.01	.036	.726	-.08	.06
	Gandaria	.00	.036	.907	-.07	.07
	Hajaribag	-.02	.036	.559	-.09	.05
	Kamrangi	-.24*	.033	.000	-.31	-.18
	Khilgaon	-.16*	.031	.000	-.22	-.10
	Komlapur	-.06	.033	.065	-.13	.00
	Malibag	-.16*	.031	.000	-.22	-.10
	North Sh	-.14*	.040	.000	-.22	-.06
	Palashi	-.04	.033	.235	-.10	.03
	Shahidul	-.14*	.036	.000	-.21	-.07
	South Sh	-.04	.033	.274	-.10	.03
Gandaria	Moghbaz	-.02	.036	.640	-.09	.05
	Doyagonj	.00	.036	.907	-.07	.07
	Hajaribag	-.02	.036	.483	-.09	.04
	Kamrangi	-.25*	.033	.000	-.31	-.18
	Khilgaon	-.17*	.031	.000	-.23	-.11
	Komlapur	-.07*	.033	.049	-.13	.00
	Malibag	-.17*	.031	.000	-.23	-.11
	North Sh	-.14*	.040	.000	-.22	-.07
	Palashi	-.04	.033	.189	-.11	.02
	Shahidul	-.15*	.036	.000	-.22	-.08
	South Sh	-.04	.033	.223	-.11	.02
Hajaribag	Moghbaz	.01	.036	.815	-.06	.08
	Doyagonj	.02	.036	.559	-.05	.09
	Gandaria	.02	.036	.483	-.04	.09
	Kamrangi	-.22*	.033	.000	-.29	-.16
	Khilgaon	-.14*	.031	.000	-.20	-.08
	Komlapur	-.04	.033	.223	-.11	.02

	Malibag	-.14*	.031	.000	-.20	-.08
	North Sh	-.12*	.040	.003	-.20	-.04
	Palashi	-.02	.033	.574	-.08	.05
	Shahidul	-.12*	.036	.001	-.19	-.05
	South Sh	-.02	.033	.639	-.08	.05
Kamrangi	Moghbaz	.23*	.033	.000	.16	.30
	Doyagonj	.24*	.033	.000	.18	.31
	Gandaria	.25*	.033	.000	.18	.31
	Hajaribag	.22*	.033	.000	.16	.29
	Khilgaon	.08*	.028	.004	.02	.14
	Komlapur	.18*	.031	.000	.12	.24
	Malibag	.08*	.028	.004	.02	.14
	North Sh	.10*	.038	.006	.03	.18
	Palashi	.20*	.031	.000	.14	.26
	Shahidul	.10*	.033	.002	.04	.17
	South Sh	.21*	.031	.000	.15	.27
Khilgaon	Moghbaz	.15*	.031	.000	.09	.21
	Doyagonj	.16*	.031	.000	.10	.22
	Gandaria	.17*	.031	.000	.11	.23
	Hajaribag	.14*	.031	.000	.08	.20
	Kamrangi	-.08*	.028	.004	-.14	-.02
	Komlapur	.10*	.028	.000	.05	.16
	Malibag	.00	.025	1.000	-.05	.05
	North Sh	.02	.036	.520	-.05	.09
	Palashi	.12*	.028	.000	.07	.18
	Shahidul	.02	.031	.500	-.04	.08
	South Sh	.13*	.028	.000	.07	.18
Komlapur	Moghbaz	.05	.033	.142	-.02	.11
	Doyagonj	.06	.033	.065	.00	.13
	Gandaria	.07*	.033	.049	.00	.13
	Hajaribag	.04	.033	.223	-.02	.11
	Kamrangi	-.18*	.031	.000	-.24	-.12
	Khilgaon	-.10*	.028	.000	-.16	-.05
	Malibag	-.10*	.028	.000	-.16	-.05

	North Sh	-.08*	.038	.039	-.15	.00
	Palashi	.02	.031	.479	-.04	.08
	Shahidul	-.08*	.033	.016	-.15	-.01
	South Sh	.02	.031	.418	-.04	.09
Malibag	Moghbaz	.15*	.031	.000	.09	.21
	Doyagonj	.16*	.031	.000	.10	.22
	Gandaria	.17*	.031	.000	.11	.23
	Hajaribag	.14*	.031	.000	.08	.20
	Kamrangi	-.08*	.028	.004	-.14	-.02
	Khilgaon	.00	.025	1.000	-.05	.05
	Komlapur	.10*	.028	.000	.05	.16
	North Sh	.02	.036	.520	-.05	.09
	Palashi	.12*	.028	.000	.07	.18
	Shahidul	.02	.031	.500	-.04	.08
	South Sh	.13*	.028	.000	.07	.18
North Sh	Moghbaz	.13*	.040	.001	.05	.21
	Doyagonj	.14*	.040	.000	.06	.22
	Gandaria	.14*	.040	.000	.07	.22
	Hajaribag	.12*	.040	.003	.04	.20
	Kamrangi	-.10*	.038	.006	-.18	-.03
	Khilgaon	-.02	.036	.520	-.09	.05
	Komlapur	.08*	.038	.039	.00	.15
	Malibag	-.02	.036	.520	-.09	.05
	Palashi	.10*	.038	.008	.03	.17
	Shahidul	.00	.040	.958	-.08	.08
	South Sh	.10*	.038	.006	.03	.18
Palashi	Moghbaz	.03	.033	.417	-.04	.09
	Doyagonj	.04	.033	.235	-.03	.10
	Gandaria	.04	.033	.189	-.02	.11
	Hajaribag	.02	.033	.574	-.05	.08
	Kamrangi	-.20*	.031	.000	-.26	-.14
	Khilgaon	-.12*	.028	.000	-.18	-.07
	Komlapur	-.02	.031	.479	-.08	.04
	Malibag	-.12*	.028	.000	-.18	-.07

	North Sh	-.10*	.038	.008	-.17	-.03
	Shahidul	-.10*	.033	.002	-.17	-.04
	South Sh	.00	.031	.919	-.06	.06
Shahidul	Moghbaz	.13*	.036	.000	.06	.20
	Doyagonj	.14*	.036	.000	.07	.21
	Gandaria	.15*	.036	.000	.08	.22
	Hajaribag	.12*	.036	.001	.05	.19
	Kamrangi	-.10*	.033	.002	-.17	-.04
	Khilgaon	-.02	.031	.500	-.08	.04
	Komlapur	.08*	.033	.016	.01	.15
	Malibag	-.02	.031	.500	-.08	.04
	North Sh	.00	.040	.958	-.08	.08
	Palashi	.10*	.033	.002	.04	.17
	South Sh	.11*	.033	.002	.04	.17
South Sh	Moghbaz	.02	.033	.472	-.04	.09
	Doyagonj	.04	.033	.274	-.03	.10
	Gandaria	.04	.033	.223	-.02	.11
	Hajaribag	.02	.033	.639	-.05	.08
	Kamrangi	-.21*	.031	.000	-.27	-.15
	Khilgaon	-.13*	.028	.000	-.18	-.07
	Komlapur	-.02	.031	.418	-.09	.04
	Malibag	-.13*	.028	.000	-.18	-.07
	North Sh	-.10*	.038	.006	-.18	-.03
	Palashi	.00	.031	.919	-.06	.06
	Shahidul	-.11*	.033	.002	-.17	-.04

Based on observed means.

The error term is Mean Square (Error) = .152.

*. The mean difference is significant at the .05 level.

Table. Association between vector-borne diseases with house type, use of bed net, sleeping place.

Type of house	No. of respondents	No. of positive cases	Prevalence
Tin shed	274	97	35.40
Tin shed with bamboo surrounding	301	146	48.50
Bamboo and plastic sheet roof with surrounding	325	201	61.85
Chi-square = 41.72 p = 0.000 significant at 5% level. Type of house was significantly associated with positive cases.			
Use of bed net			
Yes	157	27	17.20
No	743	417	56.12
Chi-square = 77.02 p = 0.000 significant at 5% level. Use of bed net was significantly associated with positive cases.			
Sleeping place			
Inside room	616	260	42.21
Outside	284	184	64.79
Chi-square = 38.75 p = 0.000 significant at 5% level. Sleeping place was significantly associated with positive cases.			

Table. Association between waterborne diseases with source of water and sanitation.

Characteristics	No. of respondents	No. of positive cases	Prevalence (%)
Sources of water			
Tap water (supply)	414	277	66.91
Tube-well water	395	221	55.95
Boiled water	68	25	36.76
Well water	9	4	44.44
River/Pond/Lake	14	12	85.71
Chi-square = 61.82 p = 0.000 significant at 5% level. Source of water was significantly associated with positive cases.			
Type of latrine			
Sanitary	408	199	48.77
Kacha pit latrine	97	52	53.61
Bamboo slit	262	187	71.37
Open space	133	101	75.94
Chi-square = 21.72 p = 0.000 significant at 5% level. Type of latrine was significantly associated with positive cases.			

Protozoan parasite

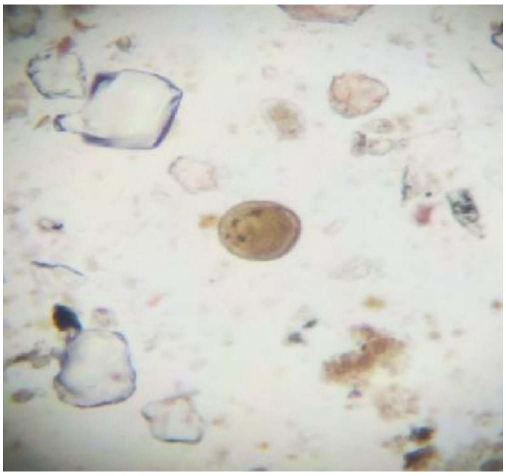

Fig: *Entamoeba histolytica*

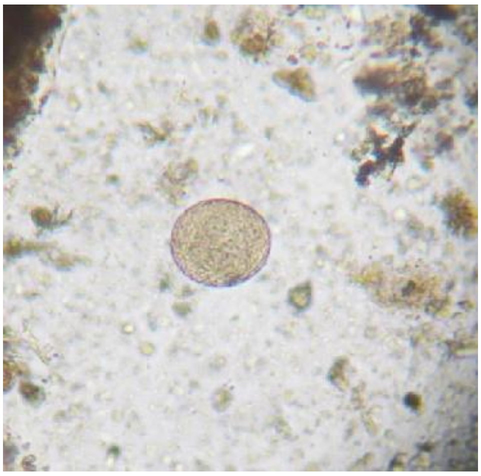

Fig: *Entamoeba coli*

Fig. *Endolimax nana*

Fig. *Iodamoeba butschlii*

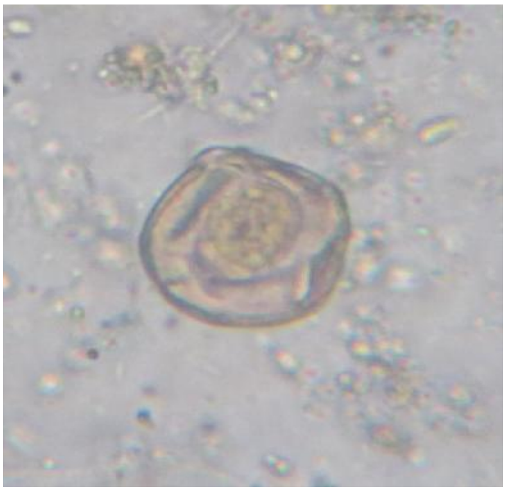

Fig: *Chilomastix mesnili*

Fig: *Trichomonas hominis*

Fig: *Enteromonas hominis*

Fig: *Giardia intestinalis*

Fig: *Isospora hominis*

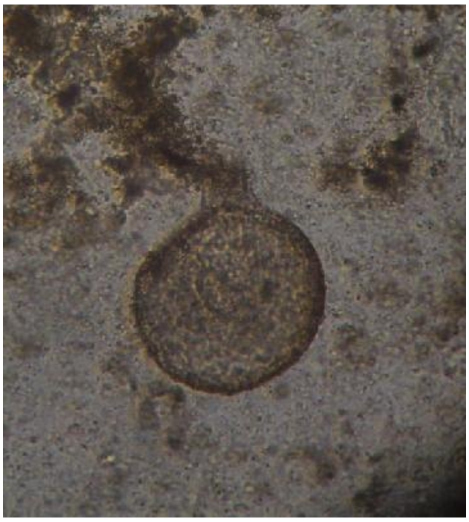

Fig: *Balantidium coli*

Cestode parasite

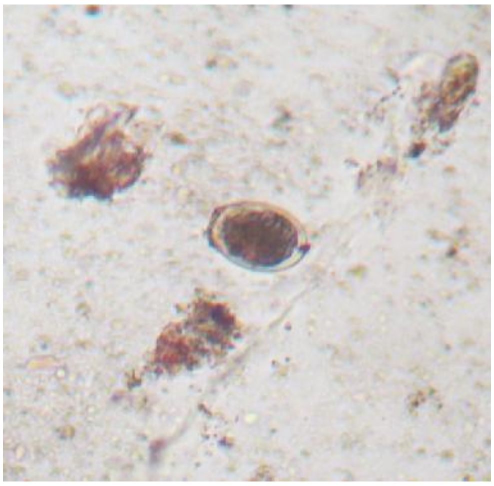

Fig: *Diphyllobothrium latum*

Fig: *Taenia saginata*

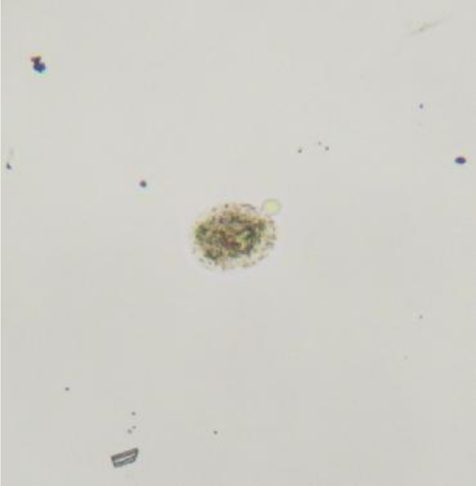

Fig: *Echinococcus granulosus*

Fig: *Hymenolepis nana*

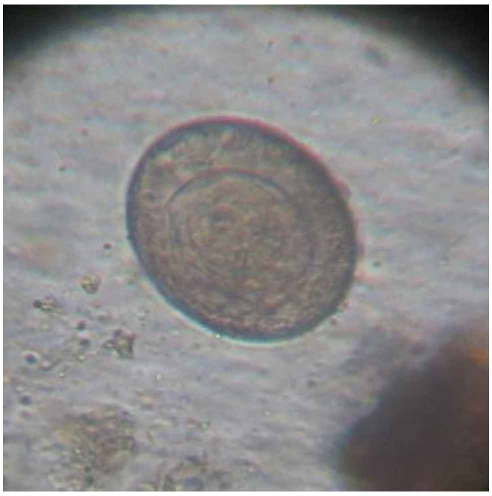

Fig: *Hymenolepis diminuta*

Fig: *Dipylidium caninum*

Trematode parasite

Fig: *Fasciola hepatica*

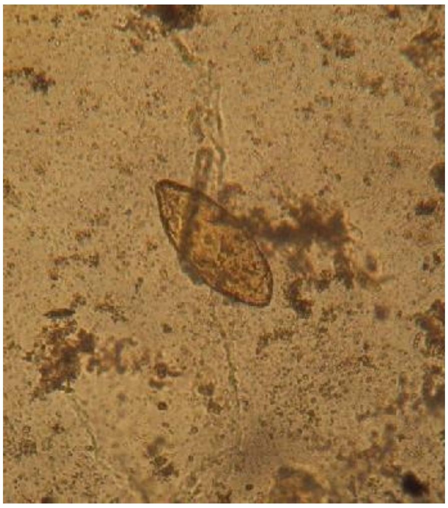

Fig: *Fasciolopsis buski*

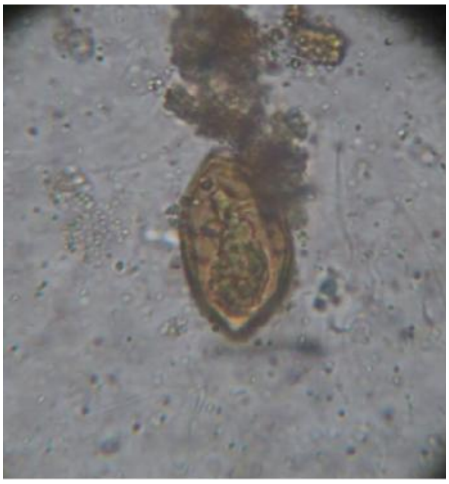

Fig: *Clonorchis sinensis*

Fig: *Paragonimus westermani*

Nematode parasite

Fig: *Ascaris lumbricoides* (40X)

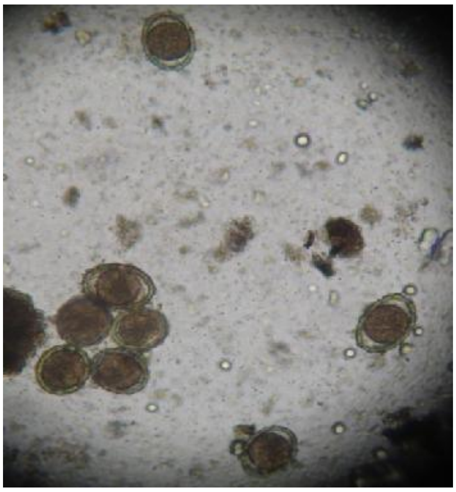

Fig: *Ascaris lumbricoides* (10X)

Fig: *Trichuris trichiura* (40X)

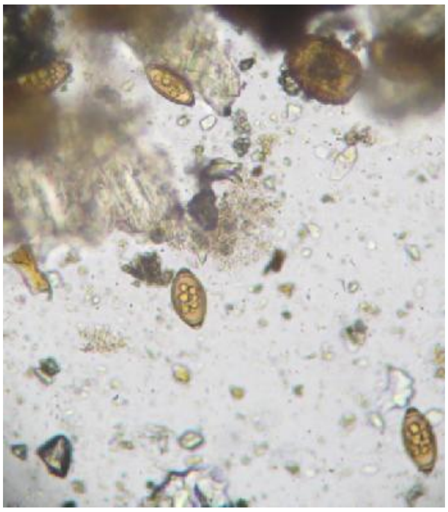

Fig: *Trichuris trichiura* (10X)

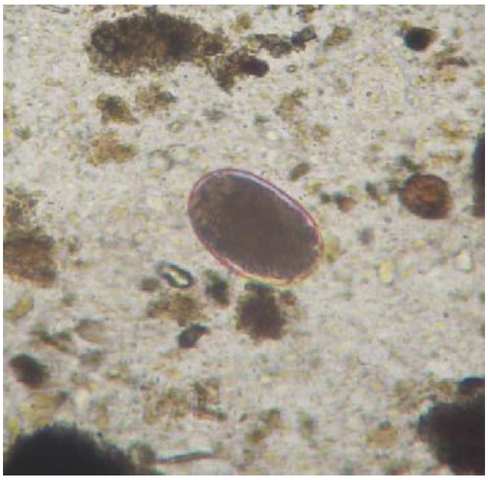

Fig: *Ancylostoma duodenale(egg)*

Fig: *Ancylostoma duodenale* (Larva)

Fig: *Strogyloides stercoralis*

Fig. *Enterobius vermicularis*

Fig. *Capillaria sp.*

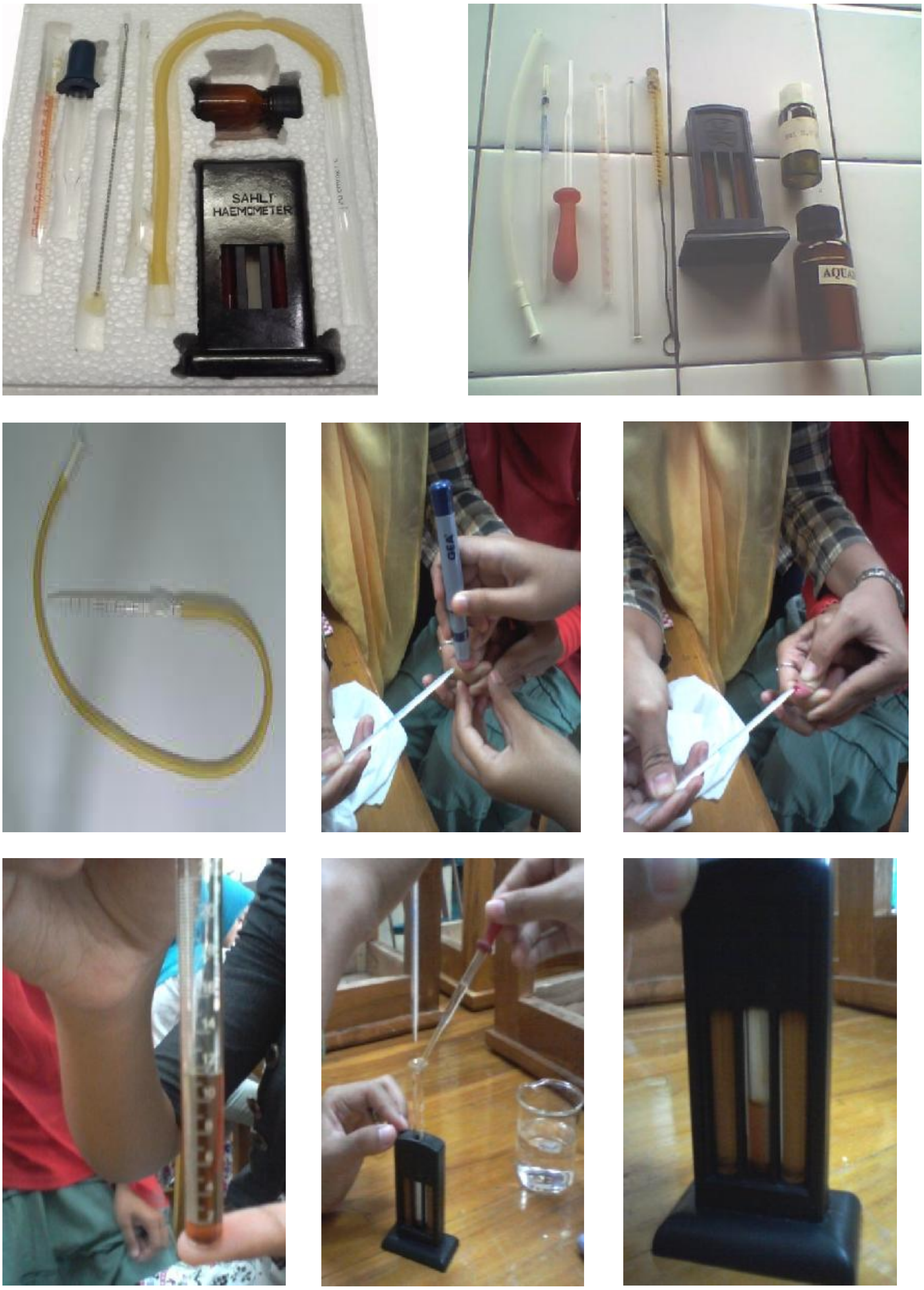

Plate: Haemoglobin count of Sahli's acid hematin method

Urinary tract infection (UTI)

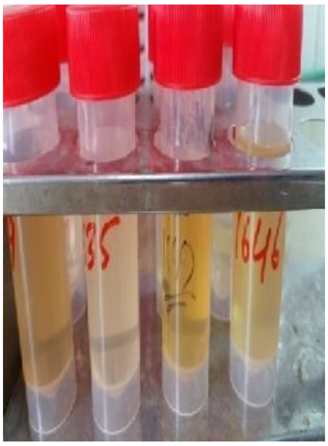

Fig: Urine sample

Fig: Centrifuge matchine

Fig: Sedimented urine in slide

Fig: Microscopic examination

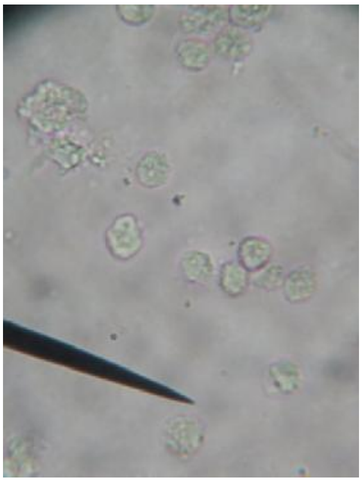

Fig: Pus cell

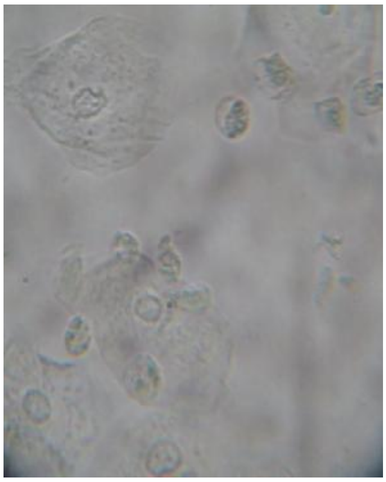

Fig: Epithelial cell

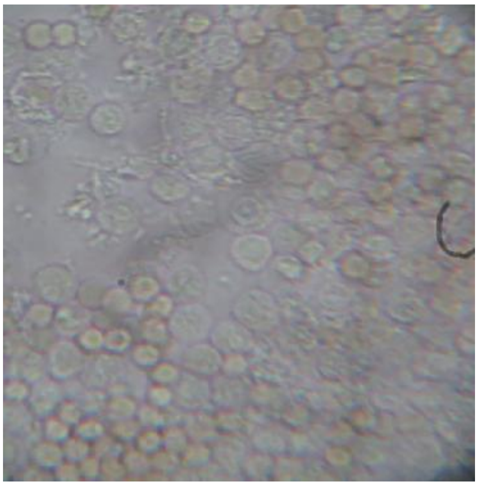

Fig: Pus cell with RBC

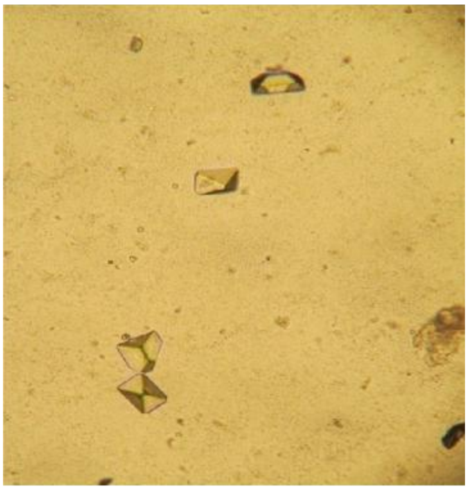

Fig: Crystals

Plate: UTI detection by counting pus cell in sedimentation mehod

UTI- Culture and sensitivity test (Biochemical test)

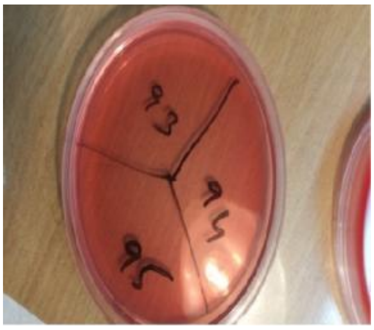

Fig: MacConkey agar plate

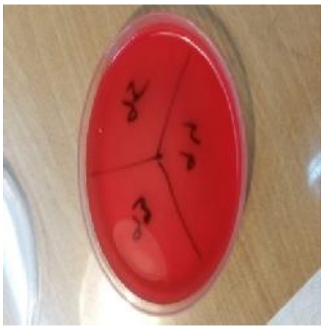

Fig: Blood agar plate

Fig: Urine streaking process

Fig: Urine streaking on plate

Fig: 24hrs incubation at $37^{0}C$

Fig: Bacteria growth on plate

Fig: Bacteria growth on agar plate

Fig: Kliger's Iron Agar test

Fig: Motility indole urease test

Fig: Citrate utilization test

Fig: Mac Farlin solution test

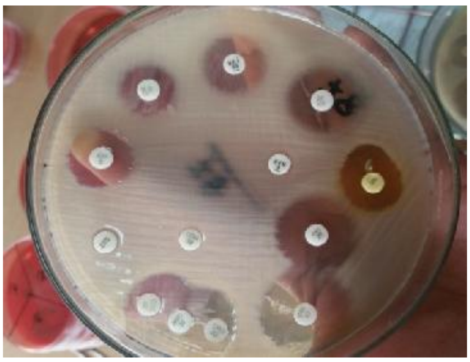

Fig: Antimicrobial sensitivity test

Skin infection

Fig: Boil infection

Fig: Carbuncles

Fig: Folliculitis

Fig: Paronichia

Fig: Styes on eyes

Fig: Impetigo

Plate: Bacterial infection

Skin infection

Fig: Ringworm

Fig: Athlete's Foot

Fig: Onchomycosis

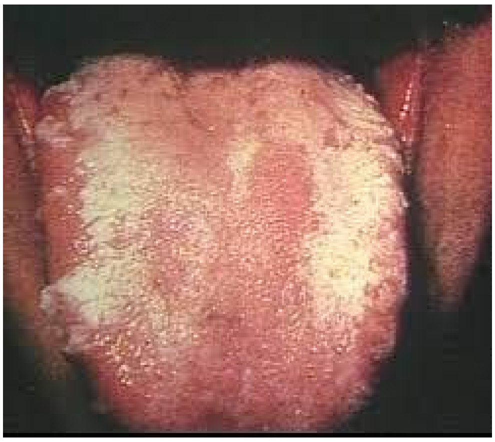

Fig: Candidiasis

Plate: Fungal infection

Fig: Wart

Fig: Chicken pox

Fig: Measles

Plate:Viral infection

Fig: Pediculosis

Fig: Scabies

Plate: Arthropod (Ectoparasitic) infection

Fig: Filariasis

Fig: Leishmaniasis

Fig Dengue rashes on skin

Fig: Mumps

Fig: Polio

Plate: Vector-borne, waterborne and airborne disease

Photograph of the conditions of slum inhabitants