STUDY ON HEALTH AND DRUG POLICIES OF BANGLADESH TO ENSURE HEALTH FOR ALL

A

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CERTIFICATE OF DECLARATION

This is to certify that the thesis entitled, "Study on Health and Drug Policies of Bangladesh to Ensure Health for All", submitted by Md. Aknur Rahman, Registration no. 93/2018-2019, session 2018-2019, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, for the complete fulfillment of Degree of Doctor of Philosophy, is a record of original work carried out by him under our direct supervision as per the code of academic and research ethics of the Faculty of Pharmacy, University of Dhaka.

The contents of dissertation report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma. The thesis fulfills the requirements and regulations of the University of Dhaka and in our opinion meets the necessary standards for submission.

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DECLARATION

I, do, hereby, declare that the materials embodied in this thesis entitled, "Study on Health and Drug Policies of Bangladesh to Ensure Health for All", prepared for submission to the University of Dhaka, Dhaka - 1000, Bangladesh for the Degree of Doctor of Philosophy in Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, are the original research work of mine and have not been previously submitted elsewhere for the award of any degree or diploma.

19/10/2021

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Md. Aknur Rahman

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ABBREVIATIONS

ADR	Adverse Drug Reaction
BCG	Bacille Calmette-Guerin
BCSIR	Bangladesh Council of Scientific and Industrial Research
BPC	Bangladesh Pharmacy Council
BRAC	Bangladesh Rural Advancement Committee
DGDA	Directorate General of Drug Administration
EM	Essential Medicine
EPI	Expanded Program on Immunization
GMP	Good Manufacturing Practice
GO	Government Organization
HAI	Health Action International
IPD	Interpupillary Distance
IRP	International Reference Price
LMICS	Low and Middle Income Countries
LPG	Lowest-Price Generic
MPR	Median Price Ratio
MR	Measles and Rubella
MSH	Management Sciences for Health
NCL	National Control Laboratory
NDP	National Drug Policy
NGO	Non-Government Organization
NHP	National Health Policy
NRA	National Regulatory Authority
OB	Obstetrics
OOP	Out-Of-Pocket
OPV	Oral Polio Vaccine
OTC	Over-the-Counter
PCV	Pneumococcal Conjugate Vaccine

PHC	Primary Health Care
PIC	Pharmaceutical Inspection Convention
PIS	Pharmaceutical Inspection Scheme
R & D	Research and Development
RUD	Rational Use of Drug
SPSS	Statistical Package for the Social Science
TRIPS	Trade-Related Aspects of Intellectual Property Rights
WHA	World Health Assembly
WHO	World Health Organization
WTO	World Trade Organization

ABSTRACT

Background

National Health and Drug policy are the standard guidelines to ensure the healthy life of the citizens of a country. According to World Health Organization, "Health is the physical, social and mental wellbeing and not merely absence of any disease". Health is one of the basic needs of people in Bangladesh and improvement of nutritional and public health status is a Constitutional commitment of the Government of Bangladesh according to the Constitution, Article 15 and 18, respectively. The present study is focusing on the critical analysis of National Health Policy (NHP), perceptions of the service providers and service receivers regarding NHP, and Primary Health Care (PHC) in Netrokona Sadar Upazila - A Case Study on Expanded Program on Immunization (EPI), National Drug Policy (NDP), availability, affordability and price variation of essential antibiotics in Bangladesh. All issues, in the purview of NHP and NDP, have been analyzed to have an endeavor in contributing to ensure health for all. The objectives of the study were-(i) to check the consciousness of people in health sector about NHP and NDP, analyze the national budget for research and education on health and drugs, contribute on improvement of the NHP and NDP by taking some valuable suggestions from the respondents, find out the drawbacks that are in the policies and find out the strategies to deal with them; (ii) to find the areas of cooperation between Government Organizations (GOs) and Non-Government Organizations (NGOs) in the arena of PHC focusing the EPI and find the weaknesses in providing the PHC services; (iii) to measure prices of essential antibiotics for treating prevalent conditions in Bangladesh, assess the affordability of standard treatment regimens using these medicines, compare the prices of medicines found in the country with international reference prices and compare the prices of medicines of different years with statistical significance testing and (iv) to inform the policy makers to address those issues.

Methods

The study was conducted as survey as well as case study. Both primary and secondary sources of data were used in the study. NHP, NDP, EPI and availability, affordability and price

variation of essential antibiotics of Bangladesh were analyzed. A total of 1100 respondents were selected for the study. The data were collected by random sampling method.

Results

NHP was consulted with the doctors, health personnel and researchers and important feedbacks were obtained. Majority of the respondents informed that they were acquainted with NHP and put some suggestions regarding the appropriateness of NHP. Role of public servant was addressed by the respondents. Some areas were identified which were not properly addressed in NHP such as management of diseases caused by Zika virus, Nipah virus, Dengue and Chikungunya, non-communicable disease, epidemic disease control. Some suggestions were also given by the respondents. Those were - need revision in NHP; update of NHP at a regular basis; involve civil society, and public representatives; ensure more punishment in case of false drug manufacture. The study showed that most of the service receivers did not know about NHP. It was observed that the percentage of people who knew about NHP was increasing with respect to the educational level. If the people are well informed about NHP, they can get better health service. The respondents put some important comments- the NHP does not ensure enough number of doctors, pharmacists (virtually absent / non-existent), nurses, and other stuffs; some medicine especially antibiotics should be prescribed by the doctors only; the NHP cannot resolve the communication gap between the service providers and the service receivers; does not ensure enough necessary supplies; does not ensure skilled doctors, pharmacists and the health workers in primary and secondary level hospitals; does not utilize the referral system properly etc. In case of service providers, acquaintance with NHP was not satisfactory. In fact, the scenario for service providers was worse than service receivers. In both the cases, it did not cross 50% and most of the service providers were not aware about the policy and as a result, they could not provide better treatment to the patients. It was evident from the study that diseases like child tuberculosis, diphtheria, whooping cough, tetanus, hepatitis B virus, Hib V, polio and measles can be prevented by vaccines through EPI as part of the endeavors of primary health care services of the government. In the journey of primary health care services through EPI, collaboration of GOs and NGOs works effectively to a great extent. The study also found some areas to be improved such as more coordination and endorsement of contributions of the players in the smooth running of the EPI.

Maximum respondents (99%) opined that right use of drug practice can prevent abuse of antibiotics. Awareness and training needs were soughed in this respect. It was found that some of the respondents (22%) did not know about essential drug program. It was found that only 26 (5%) respondents out of 500 knew the exact number of essential drugs in Bangladesh. In surveyed pharmacies, the essential medicines were less available in general medicine stores as compared to the Model pharmacies. A comparative study on price variation across years had shown a insignificant increase in price. The median prices of surveyed medicines were obtained, and a gross comparison was done that indicated percent increase or decrease in price. In the studied programs, the median price ratios of surveyed medicines varied from 0.36% - 2.56% and 0.33% - 2.39% in year 2015 and 2019, respectively. While noting the WHO target that consumer should pay no more than four times the IRPs, we observed that medicine prices were lower in Bangladesh compared to IRPs. The study confirmed that the essential antibiotics were affordable in Bangladesh.

Conclusion

Based on our findings, it can be inferred that the idea of ensuring health for all is not a very difficult task. The major plus point has been the positive gesture of all the related stakeholders of health and medication. Contribution and cooperation of all - politicians, GOs, NGOs, civil society etc. to the NHP and NDP can make them fullest and confident to ensure health for all in Bangladesh.

Chapter 1
Introduction

Chapter 1

Introduction

1.1 Introduction

It is universally recognized that health is the source of all happiness. National Health and Drug policy are the standard guidelines to ensure healthy life of the citizen of a country. According to World Health Organization, "Health is the physical, social and mental wellbeing and not merely absence of any disease". Health is the basic need of people in Bangladesh. Medical care to Bangladeshi citizens is one of the basic necessities (The Bangladesh Constitution, Article 15). Improvement of nutritional status and public health status is a Constitutional commitment of the Government of Bangladesh (The Bangladesh Constitution, Article 18). It is one of the fundamental obligations of human being to ensure the basic necessities of life according to the Constitution of the People's Republic of Bangladesh[1]. Progress of a nation depends on the condition of health of population of the country. The Government is doing whatever they need to do to ensure proper health facilities to all.

Bangladesh is the eighth-most populated country in the world with almost 2.11% of the world's population[2]. For this huge population, a great amount of medicine, supplies and health service providers (Physicians, pharmacists, nurses and health workers) are required. But like other 3rd world countries, they don't have enough of them. But the Government tries to cope with this problem and as a consequence the mortality rate is decreasing. Mortality rate of infants (under age 5) was 55.56 and 41.01 per thousand in 2005 and 2010, respectively whereas it is reduced to 26.1 in 2020[2].

"With the aim of building up a non-communal, progressive, democratic welfare state by the 50th anniversary of Bangladesh's independence in 2021 in accordance to the planning of the present Government (Vision 2021), targets have been set to provide over 2122 kilocalorie daily food for the poor population, eradicate all forms of infectious diseases, ensuring primary health

care for all, increasing life expectancy at birth to 70 by 2021, bring down the child mortality rate gradually from 54 per thousand at present to 15 per thousand, lowering maternal mortality rate from 3.8% to 1.5% and increase usage of contraception prevalence to 80% by 2021[3]."

The present study is focusing on the critical analysis of National Health Policy (NHP) of Bangladesh, perceptions of the service providers and service receivers regarding NHP and Primary Health Care in Netrokona Sadar Upazila - A Case Study on Extended Program on Immunization, National Drug Policy (NDP) of Bangladesh, Availability, Affordability and Price Variation of Essential Antibiotics in Bangladesh. All issues, in the purview of NHP and NDP, have been analyzed to have an endeavor in contributing to ensure health for all. A brief background regarding the issues are introduced below.

1.2 National Health Policy (NHP) of Bangladesh

Health is an acknowledged human right. It is necessary to ensure equitable health services, gender equality and health care for people with disability and marginalized population with the objective of achieving universal health. Improvement of health-care services is essential for poverty alleviation. Some of the important items of NHP of Bangladesh is highlighted here.

1.2.1 Objectives of the NHP

The major objectives of NHP of Bangladesh are cited below:

i. To ensure accessibility of primary health services and emergency medical services for all.
ii. To increase and expend the easy availability of equality-based, client-oriented quality health care services.
iii. To encourage people in receiving services based on right and dignity in order to prevent and limit diseases.

1.2.2 Primary Principles of NHP

The primary principles of NHP are given below:

i. Irrespective of caste, religion, creed, income, gender, disability and geographical location, make each and every citizen of Bangladesh aware, with the help of media, about health, nutrition and reproductive health services based on social justice and equity especially through ensuring constitutional rights for women and children and taking initiatives to change their behavior to undertake life style harmonizing with good health.

ii. Provide primary health services to every citizen of Bangladesh residing in any geographical locations within the territory of Bangladesh.

iii. Give special attention to the more crucial health problems of the disadvantaged, poor, marginalized, old and physically and mentally disabled population, and ensure equitable distribution and proper utilization of the existing health resources with this aim.

iv. Involve people in all relevant processes including planning, management, local fund-raising expenditure, monitoring, and review of health care system with an aim to decentralize health management and create scope for establishing people's rights and responsibilities in the development of health sector.

v. Create scope for coordinated efforts and opportunity for partnership between Government and private organizations with an aim to ensure effective health service to all, particularly through examining the possibility of installing expensive medical equipment in public health centers in partnership with private sector.

vi. Undertake appropriate and acceptable administrative reorganization to decentralize service- providing methods and supply system, and adopt demand based human resource development strategy with the objective of developing health-services to reach all citizens.

vii. Adopt effective, success-oriented efficient technology, and encourage proper application, procedural development and research in order to strengthen health, nutritional and reproductive health services to ensure their proper utilization.

viii. Effective coordination of family planning activities with health in order to achieve expected goals of family planning.

ix. Effectively coordinate nutrition projects with health services.

x. Make people aware about rights, opportunities, roles, responsibilities, rules and regulations concerning health services for all.

xi. Establish the inherent principle of self-reliance in health sector through implementing primary health care and essential service delivery programs to ensure overall and sound reproductive health to fulfill people's expectation and demands.

xii. Develop trained professional work force consisting of required qualified doctors, pharmacists and health care personnel at all levels to attain health related national goal.

xiii. Ensure quality health services for all citizens by innovative implementation of information and communication technology, e-health and telemedicine.

xiv. Update essential drug list and ensure proper availability of those everywhere. Adopt necessary measures to develop and expand local pharmaceutical industries.

xv. Develop health safety net to ensure health services, medicines, equipment, etc. as emergency relief to the victims of disaster and climate change hazards.

xvi. Expand the domain of health care by including alternative healthcare services (e.g. Homeopathy, Unani and Ayurveda) alongside existing health care services.

1.2.3 Ethics in Medical Profession

As regulatory authorities are not active enough due to insufficient human resource, operational cost and legal aid, medical practices, education and research occasionally deviate from ethical practice. Relevant policies need to be reviewed and modernized.

1.2.4 Knowledge of People About Healthy Lifestyle

People are not sufficiently aware about different diseases, health problems, malnutrition, good health and healthy lifestyle. Counseling of patients is not acknowledged as a profession in our society. Practice and perspective about health need to be changed. Strong social initiatives are necessary to make lifestyle healthier and more productive.

1.3 Service Providers and Service Receivers regarding NHP

Policy is effective when it is practiced as per expectation of people. NHP is an important document which is supposed to be implemented as per for the betterment of all stakeholders. Both service providers and service receivers are important players regarding proper implementation of NHP. The study consulted these key players to observe the present status of NHP in the field level. Compiling the valuable comments and suggestions from the respondents, endeavor was taken to contribute to the policy both in development and implementation.

1.4 Primary Health Care in Netrokona Sadar Upazila - A Case Study on Expanded Program on Immunization (EPI)

Of the basic principles of NHP, primary health services to people is very important arena to be analyzed. For that, a case study was done to know the inside of primary health care of Bangladesh. So, Primary Health Care (PHC) is a significant area to study and the focus would be given to the Expanded Program on Immunization (EPI).

Recently, although Bangladesh is progressing tremendously, ensuring health for all is quite challenging. Community clinics are playing important role along with other health services of the governmen. Non-Government Organization(s) (NGOs) are also contributing to this service to a remarkable extent. Government and NGOs are, in cooperation, working to reach to the grass root levels to ensure health for the people of Bangladesh. Engagement of all players, especially NGOs in providing health services, is also a center point of the study. The present study focuses on the Expanded Program on Immunization (EPI).

Health services based on primary health services have been expanding gradually in Bangladesh to improve the health status of the people, especially in rural areas and maternal health where more than 85% of the people are living and are underserved and underprivileged groups[4]. The study focused on the degree of people's getting the public health services of Bangladesh. It suggests that the people's getting the health services is not satisfactory. Bangladesh, being a poor

country with scarce resources, cannot afford to provide sophisticated medical care to the entire population[5]. Emphasis, is, therefore, given to primary health care covering the unnerved and undeserved population with the minimum cost in the shortest time. People's perceptions and reality regarding participation in freshly opened areas inside the Bangladesh public health healthcare delivery system were explored[6]. The noble findings suggest that the effectiveness and ability of community teams to operate as spaces for participation and supply the means for developing capabilities to participate is limited, being constrained by poverty, social inequality and dependency relationships, invisibility, low self-esteem and absence of political clout.

The Government of Bangladesh is spending a handsome amount of money to provide free primary health care services to the people through various efforts. Present scenario of providing primary health care services and the prospective areas of improvement are important arenas to be looked through.

1.5 National Drug Policy (NDP) of Bangladesh

NDP is an important instrument of a country regarding manufacturing, distribution and reaching the drugs and medicines to ultimate consumers maintaining efficacy, affordability and standard. The World Health Organization (WHO) defines NDP as, "a comprehensive framework in which each component plays an important role in achieving one or more of the general objectives of the policy (access, quality, and rational use)[7]". WHO recommends all countries to formulate comprehensive and implement national drug policy (NDP). A policy is a living document and will usually develop over time. A national drug policy is a commitment to a goal and a guide for action. National drug policy expresses and prioritizes the medium to long-term goals set by the government for the pharmaceutical sector and identifies the main strategies for attaining quality in pharmaceutical sector. The NDP deals with both public and private sections of pharmaceutical issues and comprises all the notable thespians of this medicine-producing arena[8].

In 1977, Essential Medicine (EM) was defined as "medicines that are of utmost importance, and are basic, indispensable and necessary for the health needs of the population[9]". In

2002, EMs were again redefined as, "EMs are those that satisfy the priority health care needs of the population. The implementation of the concept of EMs is intended to be flexible and adaptable to many different situations; exactly which medicines are regarded as essential remains a national responsibility[9]".

According to Article 15 (a), 15(d), and 18(1) of the Bangladesh Constitution, it is the commitment of Government of Bangladesh to provide effective health care service to the people of the country. Good quality drugs are pre-requisite along with the competent and skilled physicians and standard medical devices and supplies for promoting improved health care service. Quality and safe veterinary drugs and vaccines are required for ensuring safe food and keeping live stocks healthy for the protection of public health. The pharmaceutical industry of Bangladesh is one of the fastest growing sectors. Once almost 80% demand of drugs were imported, currently, more than 97% of medicines are being produced in the country. Quality drugs locally produced are now being exported to 113 countries across the world, including the developed countries. A significant progress has been made in the field of traditional medicine alongside that of allopathic drug sector. Currently, the Ayurvedic, Unani, Herbal, Homeopathic and Biochemic drug industries that are local resource based according to their self-fundamental principles and in pursuance of GMP guidelines of WHO, successfully trying to produce drugs (NDP 2016).

NDP 1982 is an epoch-making event in the history of Bangladesh. Before 1982, there was no NDP in Bangladesh[10]. The medicine market in Bangladesh was filled with unnecessary, harmful, and unsafe medicines before NDP 1982 and multinational companies were controlling the pharmaceutical markets of Bangladesh[11,12]. Only 14 countries, including Bangladesh, had NDP in 1982[13, 14]. On April 27, 1982, an expert committee was formed. Expert Committee consisted of renowned academicians, regulatory personnel, and health activists[15]. Bangladesh NDP 1982 was highly praised by WHO and other international organizations at that time [12, 16]. After that, the glory of Bangladesh has increased in relation to the policy [17].

The second NDP of 2005 consisted of a number of promising endeavors for the drug

industry of the country; however, those endeavors did not acquire the expected targets of the drug policy. Price protection was made relax in Bangladesh by NDP, 2005[18, 19]. There were no specific obligations regarding EMs production[19]. Also, there were no special instructions regarding EMs pricing in NDP, 2005[19]. Similarly, there was no clear-cut direction regarding combination drugs in NDP, 2005[19]. It can be concluded that the purity of NDP, 1982 was shortened by NDP, 2005[15, 20].

A great endeavor has been given in the formulation of NDP, 2016 to make the policy more effective and pro-people. Some of the important points of NDP, 2016 have been highlighted below:

i) The drug registration process has to be updated in accordance with the standards of the developed countries from time to time, for ensuring safe use, efficacy and usefulness;

ii) The Directorate General of Drug Administration (DGDA) has to be strengthened by appropriate expansion of existing human resources and infrastructural facilities for serving as an effective National Regulatory Authority (NRA). The NRA has to be, at least, recognized by WHO and to be a member of PIC/S (The Pharmaceutical Inspection Convention /The Pharmaceutical Inspection Scheme);

iii) The manufacture, sale and distribution of fake, adulterated, harmful, un-registered, counterfeit, misbranded and substandard drugs and medical devices must be prohibited, and exemplary punishment bestowed upon people responsible for such offences;

iv) The selection, quantity fixation, procurement, storage and distribution system of drugs must be strengthened so that drugs are accessible to the public all over the country. Appropriate preservation methods, such as temperature and humidity control, must be ensured at all drug wholesale shops or pharmacies or drug storage facilities and during drug transport and distribution for maintaining quality, appropriate use and dispensing;

v) Development and implementation of apposite guidelines to regulate all sorts of advertisements and promotion of drugs in public media and prevention of unethical

marketing and multi-level marketing of all recognized system of drugs for ensuring safe, rational and effective use;

vi) Ensuring accessibility to drugs at affordable price and fixing drug prices by transparent and rational methods. The government, from time to time, is to continue the process of drug pricing /re-pricing of enlisted drugs;

vii) Encouragement of foreign research-based pharmaceutical industries to invest, produce and market drugs in the country with the objective of promoting transfer of technology and technical knowledge for innovative drugs or high-technology (e.g. biotechnology) based drugs;

viii) Inspiring drug manufacturers to carry out effective Research and Development (R&D) in their respective pharmaceutical industries. For reducing taxation on imported machineries for research laboratories and also providing encouragement for the Universities, competent research agencies and drug manufacturers to engage in collaborative joint effort for applied research. Encouraging collaboration among government, universities, research institutes, professionals and drug manufacturers to adopt basic and applied research programs;

ix) Ensuring Pharmacovigilance and appropriate monitoring of Adverse Drug Reactions (ADR) through motivation for all concerned people to be accurately informed about adverse drug events;

x) Ensuring employment of skilled staff and their regular training, so that Good Manufacturing Practices (GMP) are effectively followed and implemented in drug manufacturing companies of all recognized systems;

xi) Taking necessary steps and providing diverse incentives to expand export of drugs manufactured in the country;

xii) Modernizing the National Control Laboratory (NCL) as central drug testing laboratory to test and analysis of drugs and established its branches in different divisional level phase wise; establishing central autonomous national reference laboratory, establishing specialized modern laboratories for Unani, Ayurvedic, Herbal and Homeopathic - Biochemic system of drugs;

xiii) Involving Bangladesh Council of Scientific and Industrial Research (BCSIR), as a competent research organization, in test and analysis of modern and traditional

medicine and with the activities of reference laboratory;

xiv) Recognizing research organizations as third-party quality evaluator, established at public, private and autonomous level for testing and analysis;

xv) Preparing separate essential drug lists for Allopathic, Unani, Ayurvedic, Herbal and Homeopathic system of medicines with a view of protecting public health;

xvi) Prohibiting sales and distribution of drugs without prescription from registered physician to ensure rational use of drugs;

xvii) Publishing list of Over-the-Counter (OTC) drugs for general use aligning with the systems of developed countries;

xviii) Including scientific technology-based quality control system in the manufacturing of Unani, Ayurvedic, Herbal and Homeopathic-Biochemic system of drugs for quality improvement;

xix) Considering those substances as drugs that have medicinal value, manufactured as pharmaceutical dosage form and possessing therapeutic indications and ensuring appropriate regulation accordingly. The cosmetic products leading to physiological changes in the body should bring under the regulatory control of DGDA;

xx) Enlisting medical devices and surgical equipment that come in contact with the human body under the regulatory control of DGDA;

xxi) creating Clinical trials and Bio-equivalence study facilities at public and private sectors with expert and trained personnel of relevant field;

xxii) Supporting the development of the pharmaceutical sector in Bangladesh in light of the WTO/TRIPS agreement;

xxiii) Transforming the 'Directorate General of Drug Administration' to 'Directorate General of Food and Drug Administration' for assurance of quality and safety of different types of food in addition to drugs and rearranging the jurisdiction and organizational structure to establish legal control over these products;

xxiv) Introducing Community Pharmacy and Hospital Pharmacy gradually and that would be implemented by DGDA.

The present study regarding NDP aimed at critical analysis of the policy by considering the perceptions, comments and suggestions of respondents. It also focused on the availability,

affordability and price variation of essential antibiotics of Bangladesh by collecting the data from the related entities and compared them to international standards and market.

1.6 Availability, Affordability and Price Variation of Essential Antibiotics in Bangladesh

Lack of regular access to essential medicines is a great global public health concern. Essential medicines are identified by the WHO as those medicines which meet the global health needs of the majority population. The WHO Model Essential Medicines List is updated, in a transparent process, every two years. While access has improved considerably since the introduction of the essential medicines concept in 1977, one - third of the world's population is still not treated with the necessary medicines that are required for their treatment. As many as 90% of the population pay out-of-pocket (OOP) for their medicines in low and middle - income countries (LMICs). The United States (US) has also seen a shift towards high-deductible insurance plans, within the last decades[21].

In 2001, a resolution (WHA 54.11) endorsed by the Member States of the World Health Assembly, called for a standardized methodology for monitor medicines prices to help improve access. The World Health Organization / Health Action International (WHO / HAI) Project on Medicine Prices and Availability was established in response. The primary aim of this project was to develop a standardized method for measuring medicines' prices, availability, affordability and price components in a reproducible way so as to allow international comparisons over time. In 2003, after testing in nine countries, the standard WHO / HAI methodology was released, with a second edition published in 2008[21].

Poor medicine availability, high prices and poor affordability are key impediments to medicine access for common people. In many high-income countries including the US, there are growing concerns about reduced medicine access for reasons including high medicine prices and copayments / deductibles, uninsured populations, insufficient transparency in medicine price components, and health agencies' low ability to negotiate procurement prices[22].

For assessing the surveyed medicines' consumer prices, WHO / HAI methodology employs international reference prices (IRPs) as an external benchmark. For measuring prices, a median price ratio (MPR) is calculated by comparing the median consumer price of a given medicine with the respective IRP. IRPs used in this survey were taken from the 2015 Management Sciences for Health (MSH) International Drug Price Indicator Guide.

In 1986, the MSH reference prices were first published. The MSH reference prices are procurement prices obtained from both sellers and buyers and collected from government agencies, pharmaceutical suppliers, and international development organizations. The MSH prices are widely accepted as an appropriate reference standards[23]. These MSH procurement prices report the actual prices obtained by non-profit suppliers and government tenders, the robust nature of this data ensures international comparability[24].

Governments should be procuring medicines on the international market at close to IRPs patient prices in the private sector have to consider additional costs in the pharmaceutical supply chain (markups, tariffs, taxes and other costs). The WHO has set a target of four times the IRP for patient prices in the private sectors because of these additional costs. Recognizing medicine availability and prices as important components of access, the WHO medium term strategic plan 2008 – 2013 defines global and national targets for generic essential medicines, targeting 80% availability in all sectors and median consumer prices to be no more than four times the IRP. In studied programs, the median price ratios of surveyed medicines in Bangladesh varied from 0.36 - 2.56 and 0.33 - 2.36 in Year 2015 and 2019, respectively.

The WHO / HAI Project has been successful in developing a standard method that has been used in measuring price, availability and affordability of essential medicines. As of 2014, more than 100 surveys had been conducted across the world, highlighting variations in medicine availability and prices by region, therapeutic category, and sectors[22].

Medicines included in this survey are used globally. The medicines are used for treating common conditions and appearing on most treatment guidelines. Many of the surveyed medicines were included in the 2009, study of medicine availability and prices in 36 developing and

middle-income countries[23].

The availability of essential medicines across model pharmacies and general retail stores was investigated by the study. Prices were obtained from BDNF - 2, BDNF - 3, BDNF - 4 and DGDA website of year 2003, 2006, 2015 and 2019, respectively, and essential antibiotics prices of 2015 according to BDNF 4 and 2019 according to DGDA were then compared with the MSH IRPs. The current survey was performed using standard methodology described in guideline Price measurement, availability and affordability and price components of medicines[22].

In the mid - 1990s, civil society organizations in developed and developing countries including Health Action International (HAI), the Consumer Project on Technology and Oxfam started to draw attention to the need for increased access to medicines as part of the fight against poverty. Unaffordable medicine prices were considered as a barrier to accessing treatment, but at this time, only a few small-scale studies in developing countries had been carried out for measuring medicine prices and making international comparisons. Methodological difficulties left many of these study results open to criticism. Both WHO and the NGOs recognized that the availability and affordability of essential medicines had to be improved through developing evidence-based national policies and programs.

To this end, the WHO / HAI Project on Medicine Prices and Availability was established in 2001:

i. For developing a reliable methodology for collecting and analyzing medicine price, availability, affordability and medicine price component data across health - care sectors and regions in a country;
ii. For publishing survey data on a publicly accessible web site to improve price transparency; and
iii. For advocating for appropriate national policies and monitor their impact.

1.7 The Main Objectives of the Present Study

The specific objectives of the study are given below:

i. To check consciousness of people in health sector about NHP and NDP, analyze the national budget for research and education on health and drugs, contribute on improvement of the NHP and NDP by taking some valuable suggestions from the respondents of the survey, find out the drawbacks that are in the policies and come out with the strategies to deal with them;

ii. To find the area of cooperation of GOs and NGOs in the arena of PHC focusing EPI and find the weaknesses in providing the primary health care services;

iii. To measure prices of essential antibiotics for treating prevalent conditions in Bangladesh, assess the affordability of standard treatment regimens using these medicines, compare the prices of medicines found in the country with international reference prices and compare the prices of medicines of different years with statistical significance testing;

iv. To inform the policy makers to address the issues;

Chapter 2
Materials and Methods

Chapter 2

Materials and Methods

2.1 Research Methodology

Research methodology is a collective term for the structured process of conducting research. It usually encompasses the procedures followed for analyzing and interpreting the data gathered. This research study is descriptive-cum-empirical as well as suggestive in nature. The current study is a survey as well as a case study type. The present study has included secondary sources consisting of books, newspapers, periodicals, articles from the national and international levels. Internet sources have been used for the research. Attempts have been made to include the latest information whenever available. At the same time, primary data have been collected through questionnaires, field visits, interviews with some officials and experts on the topic. The study has been conducted in Bangladesh. A random sampling method has been used for the study. Purposive Sampling Method was also used throughout the study. The Comments and suggestions of the respondents were taken on the general aspect of the NHP. Responses of service receivers and service providers were also taken on NHP. A case study was done regarding the Primary Health Care of NHP to observe the practical situation happening in the ground. Comments and suggestions of the respondents were taken on NDP, followed by observation of availability, affordability, and price variation of essential antibiotics of Bangladesh. A total of (200+200+200+500=) 1100 respondents have been selected for the study. For the case study on EPI, 30 respondents (20 service receivers, 5 officials from GoB and 5 officials from BRAC) were selected. In addition, 18 antibiotics and 25 pharmacies have been selected for the study.

2.2 Study Area

The study was conducted at educational institutions, hospitals, medicine stores/ pharmacies, DGDA, at Dhaka, Khulna, and Netrokona. Data were collected from primary and secondary sources. Primary data were collected from the respondents of the study area. Research design is the plan, structure, and strategy of investigation conceived to obtain answers to research questions and to control variance. It is a detailed outline of how an

investigation would be taken place. A research design typically includes how data is to be collected, what instruments would be employed, how the instruments would be used, and the intended means for analyzing the collected data.

The activities of collecting and analyzing data, developing and modifying theory, elaborating or refocusing the research questions, and identifying and addressing validity threats are usually all ongoing more or less simultaneously, each influencing each of the others. The design would have to be fitted well with its uses and environment.

The study was an empirical study. In order to achieve the purpose of the study, both qualitative and quantitative methodologies have been adopted. The design was a survey type design using a structured questionnaire to collect data through face to face interviews, observation, and mobile communication with officials of different categories.

2.3 Sampling Method

A total of (200+200+200+500=) 1100 respondents have been selected for the study. A purposive sampling method was used to select NHP Generals (200), Service receivers on NHP (200), and Service Providers on NHP (200) for assessing the National Health Policy. Moreover, reviewing the National Drugs Policy (NDP), 500 respondents have been selected from six universities in Bangladesh by a simple random sampling method.

2.4 Sample Size of the Study

2.4.1 Study on NHP

Necessary literature and existing similar systems in different countries were consulted for the study of NHP. The respondents were somehow related to the health profession.

Necessary information about the study was attained by supplying the questionnaire. Respondents' perceptions and suggestions were also taken for fulfilling the specific purpose of the research. The survey was conducted among 200 people related to the health sector. Primary data was collected considering the knowledge of people about national drug policy in our country.

A total of 200 respondents were surveyed (Table 2.1). They are doctors, health personnel, researchers, etc. A purposive sampling procedure has been applied considering the representation of different stakeholders in the country.

Table 2.1: List of respondents of NHP.

Sl. no.	Designation	Numbers
1.	Doctors	40
2.	Health Personnel	120
3.	Researchers (from different institutions)	40
Total		**200**

2.4.2 Service Receivers and Service Providers regarding NHP

The responses of both the service providers and service receivers regarding NHP were taken for the purpose. Respondents of this part of the study were doctors, nurses, staff, patients, and people related to this sector. Bangabandhu Sheikh Mujib Medical University was selected for this purpose. All of the respondents were related to the health sector and patients.

Necessary information about the study was attained by supplying the questionnaire. Respondents' perceptions and suggestions were also considered for fulfilling the specific purpose of the research. Within a particular time, the survey was conducted in Bangabandhu Sheikh Mujib Medical University among 200 service providers (doctors, nurses, and other staff) and 200 service receivers (patients and their relatives) by the purposive sampling procedure. Primary data was collected by taking consideration of the knowledge of people about the National Health Policy in Bangladesh.

2.4.3 Primary Health Care in Netrokona Sadar Upazila - A Case Study on Expanded Program on Immunization (EPI)

The study used both the primary and secondary sources of data. For collecting the primary data, the questionnaire, interview, and discussion were used as the instruments. Bangladesh

Rural Advancement Committee (BRAC), a non-government organization, was selected as the service provider regarding primary health care focusing EPI. Upazila health complex was explored for the same purpose. Program Head, Health, Nutrition, and Population of BRAC head office, was also interviewed. Due to time and resource constraints, 20 service recipients, 5 service providers (NGO), and 5 service providers (GO) were randomly interviewed. Both qualitative and quantitative data were collected for the study. Various books, journals, and internet open sources were used to collect the necessary information. A field visit was done to collect valuable information.

2.4.4 Study on NDP

Necessary literature and existing similar systems of different nations were reviewed throughout the study. Depending on the gathered data from the literature review, the plan was made to carry the research.

The World Health Organization / Health Action International (WHO / HAI) methodology was followed for this study[25]. The survey was conducted to identify the consciousness and thinking of the respondents.

Teachers, students, and researchers were used as the respondents for this study. Some Universities were randomly selected for the study purpose. All of the respondents were from the Drugs / Medicines background.

Necessary information about the study was attained by supplying the questionnaire. Respondents' perceptions and suggestions were also taken into consideration for fulfilling the specific purpose of the research. Within the particular time, the survey was conducted in different Universities among 500 students, teachers and researchers by a simple random sampling method. Primary data collected considering the knowledge of people about national drug policy in the country were given in Table 2.2.

Table 2.2: List of Universities surveyed regarding NDP.

Name of the institutions	Number of Respondents
University of Dhaka	55
University of Asia pacific	61
State University of Bangladesh	138
Northern University of Bangladesh	56
World University of Bangladesh	42
Khulna University	148
Total	**500**

It is to be mentioned that due to variation in the number and availability of the students, different numbers of respondents had been taken from different universities as a sample.

The respondents were asked few questions about the NDP as well as the safe use of antibiotics and the Rational Use of Drug (RUD). The following figure shows the number of respondents from different Universities (Figure 2.1).

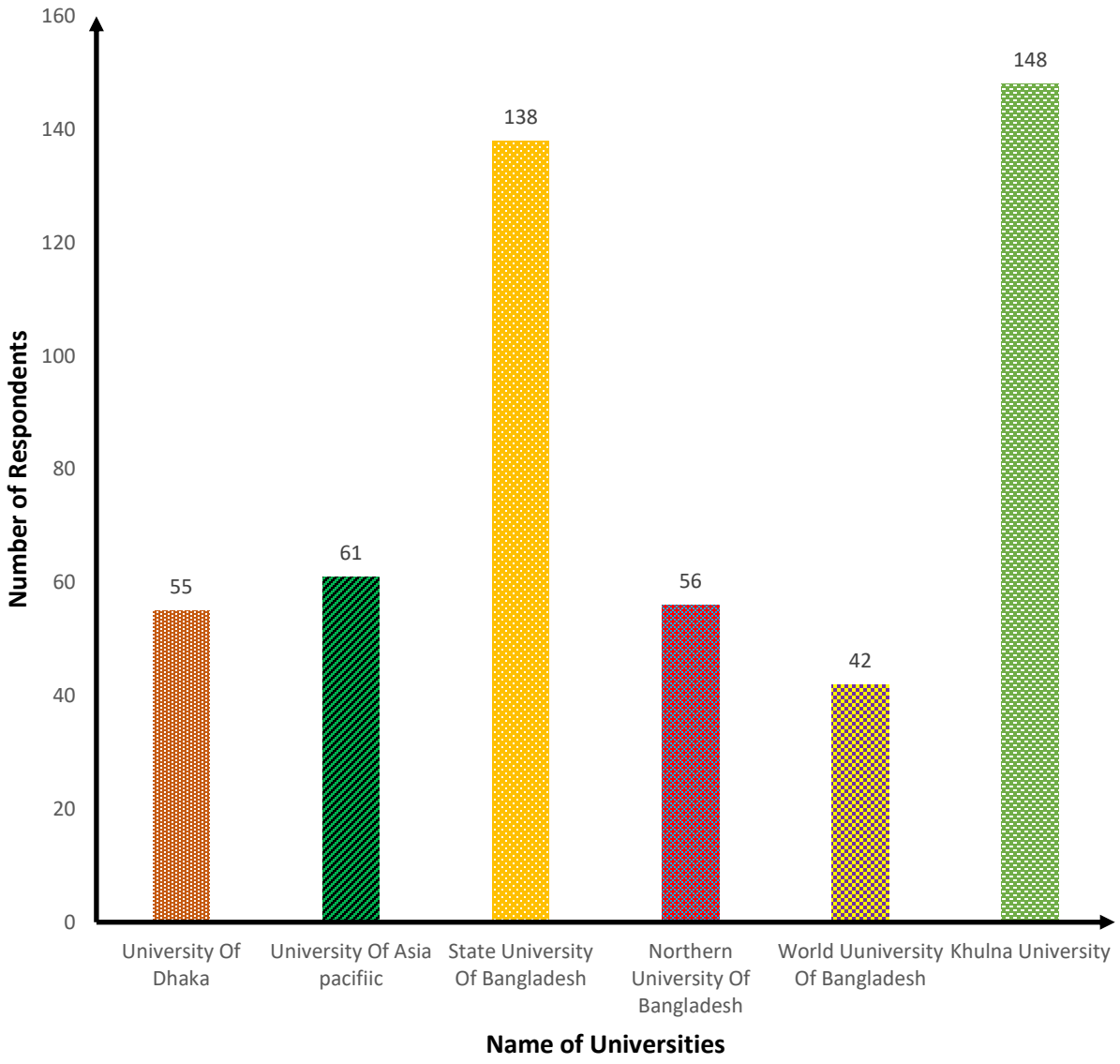

Figure 2.1: Respondents of different Universities regarding NDP.

2.4.5 Availability, Affordability and Price variation of Essential antibiotics in Bangladesh

Using the WHO / HAI methodology, the availability, affordability and prices of 18 essential antibiotics were analyzed. The availability of 18 essential medicines was taken from 25 private pharmacies (Model pharmacies and general medicine stores). The medicine shops were located in different areas of the Dhaka Metropolitan City.

The prices of 18 essential medicines were studied. The medicine prices, so obtained, were compared with IRPs. A comparative study was also done on the variation of prices across years. A comparative statistical analysis among the prices of different years was performed by using SPSS software. The local unit prices were collected from Bangladesh National Formulary which is the directory for all drugs produced locally and marketed in Bangladesh[26]. IRPs were used to compare local prices to an international standard.

The WHO / HAI methodology also assesses the affordability of medicines, expressed as the number of day's wages required by the lowest-paid unskilled government worker to purchase a full course of the treatment. To determine the meaning of drug prices in terms of affordability for the mass people, some common treatment costs were measured and compared with the wage of the lowest-paid unskilled worker, which at the time of the study was 8000 Bangladeshi Taka per month. All prices were converted to United States Dollar (USD) using the exchange rate on 30.06.2015 ($1 USD = 77.78 Bangladeshi Taka). The international prices of 2015 were taken as reference unit price.

Survey Medicines

18 essential antibiotics were selected from the Essential drug list of Allopathic drugs published by the DGDA for the survey. All medicines taken were strength and dosage-form specific. Table 2.3 lists the surveyed medicines. There were 18 medicines common to all pharmacy facilities. All surveyed medicines are commonly used and have an available IRP.

Table 2.3: List of medicines surveyed.

Beta-Lactam antibiotics	**Dosage form taken to check availability**	**Dosage form taken to check affordability and**
Amoxicillin	Capsule / Dry Syrup / Injection	Cap 250mg
Ampicillin	Capsule / Dry Syrup / Injection	Cap 250mg
Phenoxymethyl Penicillin	Tablet / Syrup	Tab 250mg
Benzathine Penicillin	Injection	Inj 12 lac unit/vial
Flucloxacillin	Capsule / Syrup / Injection	Cap 250mg
Procaine Penicillin	Injection	Inj 4 lac unit/vial

Cephradine	Capsule / Syrup / Injection	Cap 250mg
Cephalexin	Capsule / Tablet / Syrup	Cap 250mg
Benzyl Penicillin	Injection	Inj 5 lac unit/vial
Cloxacillin	Capsule / Syrup / Injection	Cap 500mg
Amoxiclav	Tablet / Capsules / Dry Syrup / Injection	Tab 250mg +/125mg
Other antibacterials		
Erythromycin	Tablet / Oral Suspension / Injection	Tab 250mg
Chloramphenicol	Cap / Eye / Ear Drops / Ointment	Cap 250mg
Doxycycline	Capsule	Cap 100mg
Co-Trimoxazole	Tablet / Suspension	Tab 800mg +/160mg
Metronidazole	Tablet / Oral Liquid / Injection	Tab 400mg
Tetracycline Hydrochloride	Capsule / Injection	Cap 250mg
Nalidixic Acid	Tablet / Syrup	Tab 500mg

Price Component

Prices were obtained from BDNF - 2, BDNF - 3, BDNF - 4, and DIMS Apps of years 2003, 2006, 2015, and 2019, respectively, and Essential antibiotics' prices of 2015 according to BDNF - 4 were then compared with the MSH 2015 IRPs. The prices of medicines were compared with IRPs. A comparative study on price variation across years was also done. To facilitate international comparisons, medicine-specific median price ratios (MPRs) were calculated when prices were available from at least four facilities. The MPR refers to the ratio of a medicine's local median unit price as compared to the 2015 MSH international median unit reference price.

Availability of Medicines

The availability of medicines was expressed in two ways. One was the national availability of medicines, which was calculated by counting the number of manufacturing company in the country. The number of manufacturers were collected from Bangladesh National Formulary[27-30]. Medicine availability was collected for different years as in 2001, 2003, 2006, 2015, and 2019. The data for the year of 2019 were taken from the DGDA website.

We investigated the availability of essential medicines across model pharmacies and general

retail stores. The availability of medicine in retail pharmacies was expressed as a percentage to the number of sites on the data collection day. Only those medicines were considered available, which were existed at the time of data collection. Availability of 18 essential medicines was obtained from 25 private pharmacies (Model pharmacies and general medicine stores), and a comparison of mean percentage availability between 10 Model pharmacies and 15 General medicine stores were also analyzed using WHO / HAI methodology.

Affordability of Medicines

The affordability of medicine was calculated as the number of days' wages that the lowest-paid unskilled worker would have to pay for the standard treatment. As the government hospitals provide medicines to the patients free of cost, only the prices of private sector medicines were considered. The most common disease conditions were taken as standard for the treatment approaches. The affordability analysis expresses the survey results in a different way. Instead of comparing medicine prices with an index price, the cost of a course of therapy for essential conditions can be compared with the daily wage of the lowest-paid unskilled government worker.

2.5 Sample Size Selection

In this study design, the random sampling procedure was followed for collecting data. For sample size selection, the study determined the population who were students of different universities and studied drugs/ medicine related subjects. The total sample size for the study was 500. Considering the sampling plan, 500 respondents were targeted. The sampling framework for the sample survey is described below.

To select a statistically significant sample size which represents the entire target population (within the confines as specified) was determined by the following equation[31].

$$\mathrm{n} = \frac{z^2 \mathrm{pq}}{d^2} \times \mathrm{deff}$$

where,

n = the desired sample size when target population is greater than 10,000

z = the standard normal deviate

p = the assumed proportion in the target population estimated to have a particular characteristic

q = 1.0 – p

d = degree of accuracy desired

deff = design effect.

Following is the brief explanation of what each of the parameters shown above entails;

i) n - in instances where our target population exceeds 10,000, 'n' represents the sample size which can represent the entire target population

ii) z - this relates to how confident we wish to be that the results obtained from the sample estimate are accurate. 'z' has been set at 1.96 which equates to a confidence level of 95% (this can be considered to be a customary figure).

iii) p - this is the estimate of the percentage of the target population which has completed adult education. Hence, to ensure that we maximize the expected variance and therefore, select a sample size that is sure to be large enough, an estimate of 50% has been taken.

iv) d - this relates to the level of accuracy of the data retrieved from the sample population. This has been set at 5%, which means that the results obtained are within an accuracy of 5%.

v) deff - design effect has been considered 1.30 for this study.

Hence, using the figures above for the parameters defined in the equation for determining sample size, we see the following:

$$n = \frac{(1.96)^2(0.5)(0.5)}{(0.5)^2} \times 1.30$$

$$= 499.408$$

Therefore, in instances where a particular target group is more than 10,000, the sample size was considered 500 for this survey. The sample has been randomly selected from six Universities in Bangladesh regarding drugs / medicines related discipline to represent the entire population.

2.6 Source of Data

Data were collected by conducting interviews, discussion, and observation using primary sources, i.e., interviews with the respondents from the selected study areas. Primary data were collected through interviews. Data were also collected from the secondary sources through literature review, i.e., reference books on national health and drug policy, newspapers, periodicals, articles from the national and international level. Internet sources have been used for the study as well. An attempt was made to include the latest information which are available. The nature of the study requires combining analytical and empirical approaches in the methodology. Accordingly, both the qualitative and quantitative information and data were required. In order to generate a database of the study, all the necessary information was collected from different primary and secondary sources. Data were also analyzed and presented through the use of necessary Figures, Tables etc.

2.7 Tools of Data Collection

In the empirical study, fieldwork plays an integral role. The study based on four main data collection tools, namely: in-depth interview guideline / checklist, observation of respondent, cross-checking of data collected from field using mobile / telephone, and review of related documents. All these tools are closely related to each other. Although different approaches were applied in this study, the main objective was to ensure that they complemented each other. The findings were presented in a Table and narrative way because this work is both the quantitative and qualitative in nature.

2.8 Methods of Data Collection

We conducted the face to face interview with the respondents of the selected institutions of the study areas. As per the plan for data collection, we communicated the concerned officials by

emails, telephone / mobile phone for an appointment with the respective respondents. We took the help of our peers during conducting data collection.

2.9 Review of Documents

Secondary sources of information, i.e., reference books, journals, research report, newspapers, magazines, etc. were used in this study. The sources have not been analyzed and explained. But this study was dependent on primary information, i.e., face to face interview, observation note, and telephonic / mobile phone conversations.

2.10 Data Analysis

This study has followed the descriptive data analysis process, which included four stages- registration of questionnaires, data processing, computerizing, and interpretation of data. Quantitative data has processed and analyzed using descriptive statistics. Qualitative data has been condensed and interpreted following the need of the research through content analysis, classification, and coding. Every day filled in questionnaires entered into the register book and kept in a file. Then the interview questionnaires were edited and checked carefully for verifying the filled questions, and examined the consistency between answer and question and then noted adequately. Before computerizing, data coding had been completed by the demand of Statistical Package for the Social Science (SPSS) 23. After the entry of data in SPSS, a validation check was made to ensure that data were correctly inputted into the program. The data table had been properly checked for internal consistency before the output Tables. Getting a description of findings, a qualitative analysis was presented in the content of the dissertation.

Chapter 3
Results and Discussion

Chapter 3

Results and Discussion

Comments and suggestions of the respondents were taken on the general aspect of the NHP. Responses of service receivers and service providers were also taken on NHP. The case study was done regarding Primary Health Care of NHP to observe the practical happening in the ground. Comments and suggestions of the respondents were taken on NDP, followed by observation of availability, affordability and price variation of essential antibiotics of Bangladesh. The results of the study regarding the issues are displayed as Tables, Figures and a discussion on findings on each issue was done as well. The detailed is following.

3.1 National Health Policy (NHP)

Question 1: Are you acquainted with the National Health Policy (NHP)?

The respondents were asked whether they were familiar with NHP. The results of this question obtained from the participants were summarized in the Figure 3.1.

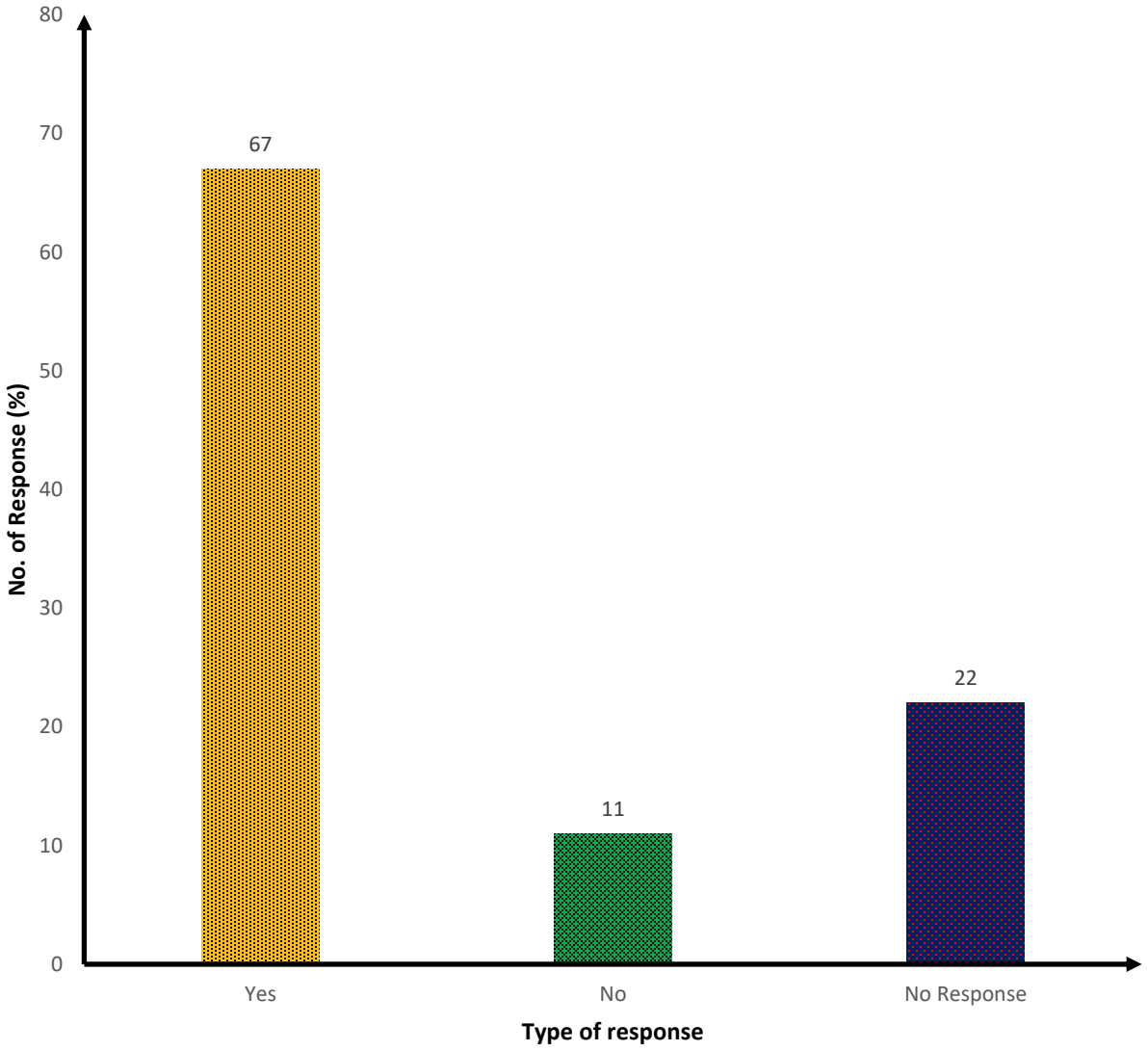

Figure 3.1: Responses of the respondents' acquaintance with the National Health Policy (NHP).

Here, out of 200 participants, 135 answered 'yes', 22 answered 'no' and 43 remained silent. It meant that most of the respondents were acquainted with the NHP. That is, 67% of the respondents answered 'yes', 11% answered 'no' and 22% gave 'no response', respectively.

Question 2: If yes, what are the suggestions regarding its appropriateness, the way it is now?

In response to the question 2, those who were acquainted with NHP, added some

suggestions which are summarized below:

i) The regulatory authority should take some steps about it;
ii) Regulatory authority should be stricter regarding this issue;
iii) Some strict laws should be formulated regarding NHP;
iv) There should be provision of research work in the policy;
v) NHP should be a live document and updated whenever necessary;
vi) Awareness should be built among mass people by spreading the NHP widely;
vii) It should be more specified;
viii) Modification is needed;
ix) Stakeholders should involve themselves for ensuring the appropriateness of the policy.

Question 3: If no, do you think you should have been acquainted with the NHP?

The respondents who (22 respondents) were not acquainted with the NHP, most of them felt that they should have been acquainted with the NHP. 20 respondents answered 'yes', 2 had 'no response' to this question.

Question 4: What role can a public servant play to promote NHP?

In responses to the question 4, from the preferences, some roles that government servants can perform are listed below:

1.	Governance	6.	Hospital & community pharmacy
2.	Coordination	7.	Formulating rules & regulation
3.	Financing & budgeting	8.	Facilitating rural area
4.	Monitoring & evaluation of health-related issue	9.	Proper execution of existing legal framework
5.	Impact assessment & policy feedback	10.	Waste management

Question 5: What are the areas not appropriately covered in NHP?

In responses to the question 5, some answers of the respondents are given below:

i) Zika virus, Nipah virus related diseases have not been mentioned properly;
ii) Dengue, Chikungunya type of diseases are not mentioned in NHP;
iii) Noncommunicable disease was not mentioned properly;
iv) In NHP epidemic disease control was not highlighted.

Question 6: How can those areas be improved?

In response to the question 6, some respondents gave some important points for improving the present NHP. These are listed below:

i) Need revision in NHP;
ii) Update of NHP at a regular basis;
iii) Involve civil society;
iv) Involve public representatives;
v) Punishment should be more in case of spurious drug preparation.

Question 7: Whether procurement Acts/Rules are followed in procuring medical equipment/ drugs/medicines using public funds?

The responses to the question 7 were summarized in the following Figure 3.2.

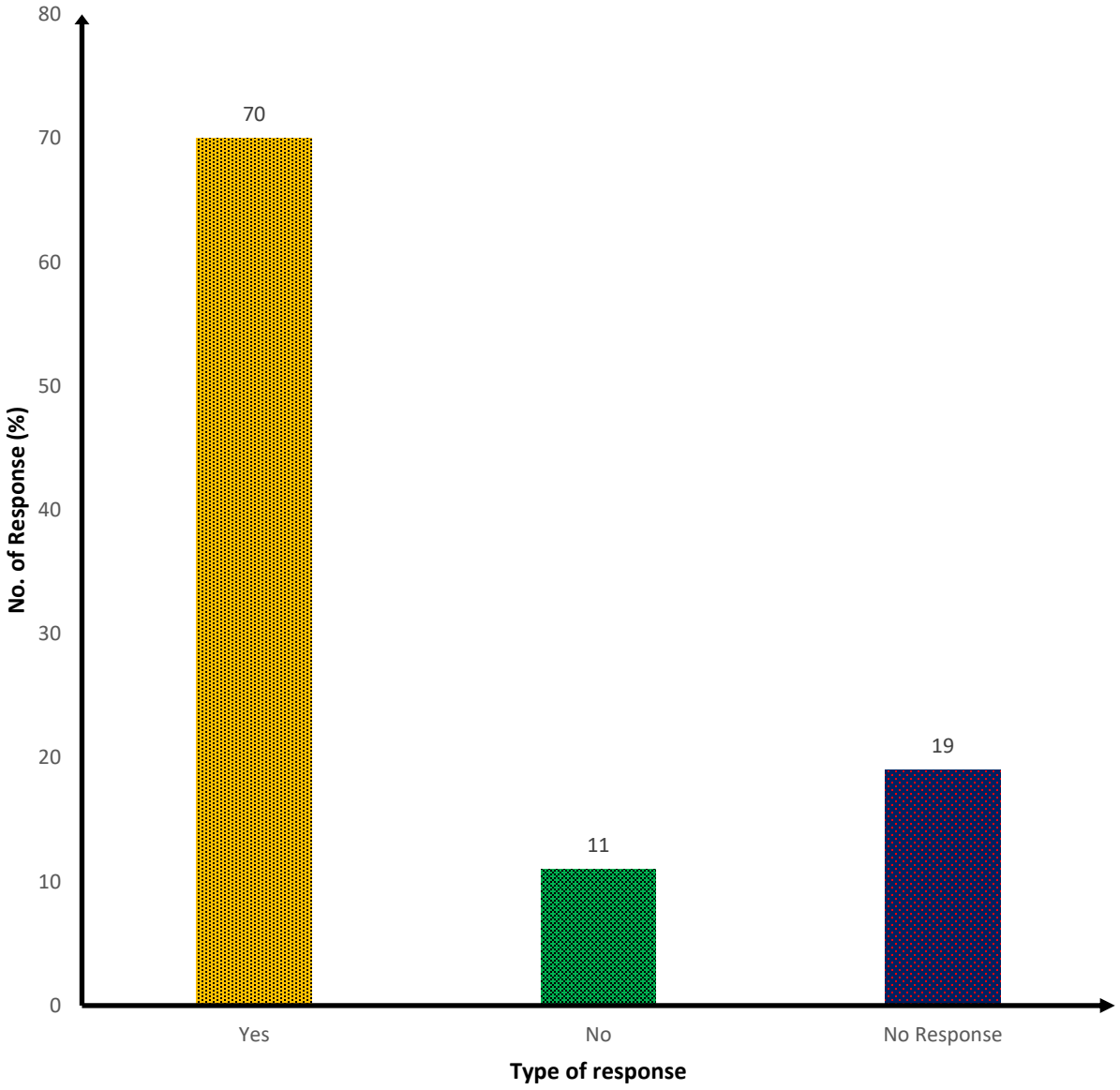

Figure 3.2: Whether procurement Acts / Rules are followed in procuring medical equipment / drugs / medicines using public funds.

In response to the question 7, 140 respondents answered 'yes', 22 answered 'no' and the rest 38 gave 'no response'. It was evident from the Figure 3.2 that 70% of respondents answered 'yes', 11% answered 'no' and the rest 19% gave 'no response'. The result indicated that, while using public fund for procuring medical equipment / drugs / medicines, Procurement Acts / Rules were followed.

Question 8: Whether your organization has personnel who are trained on public procurement management?

The responses to the question 8 were summarized in Figure 3.3.

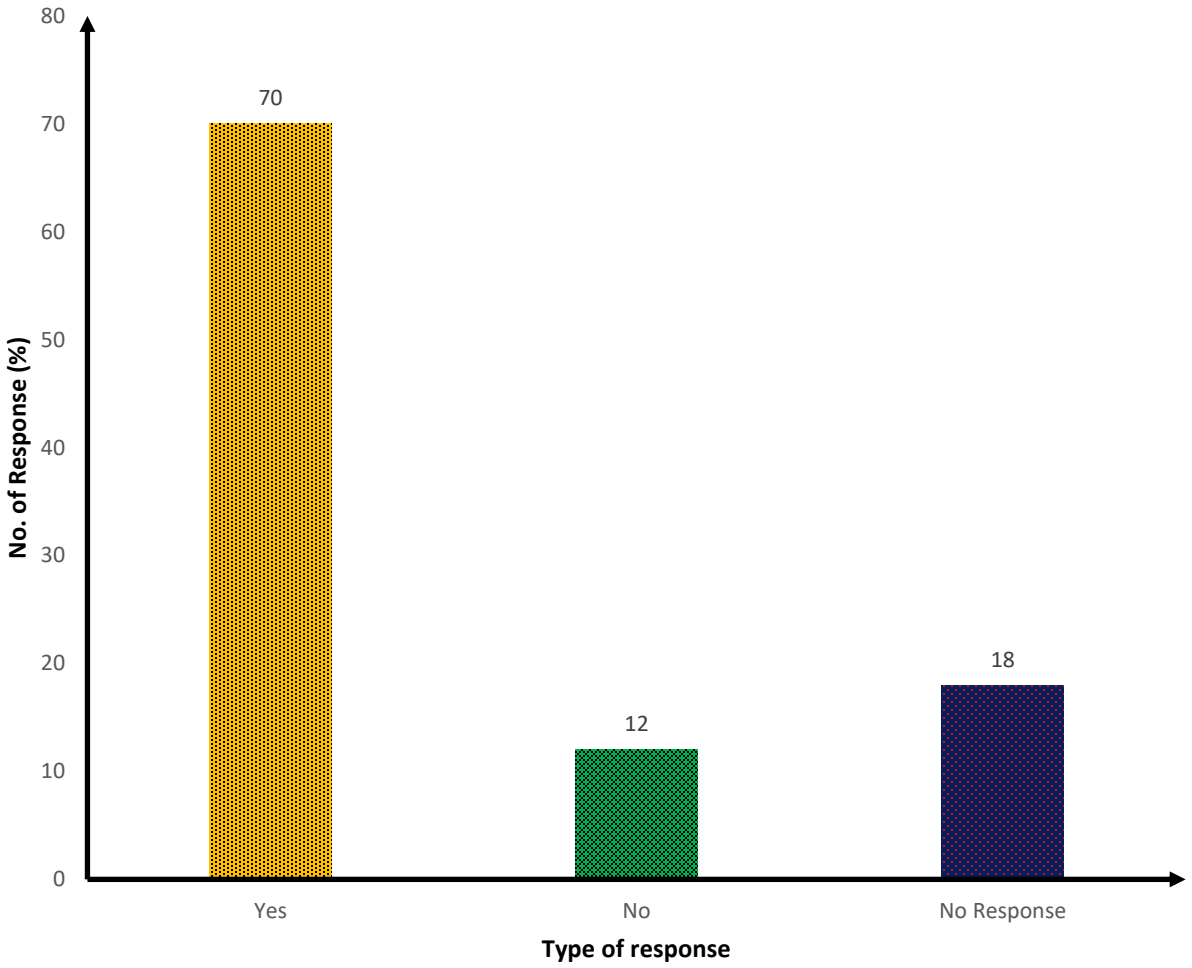

Figure 3.3: Whether respective organization has personnel who are trained on public procurement management.

From Figure 3.3, 141 respondents answered 'yes', 23 respondents answered 'no' and 36 respondents gave 'no response'. That is, 70% of the respondents gave positive answer, 12% answered 'no' and 18% gave 'no response', respectively. The result indicated that the majority of the respondents claimed that their organizations had trained people on public procurement management.

Question 9: Whether the packages are included in procurement plan and approved before going for procurement?

The responses to the question 9 were summarized in Figure 3.4.

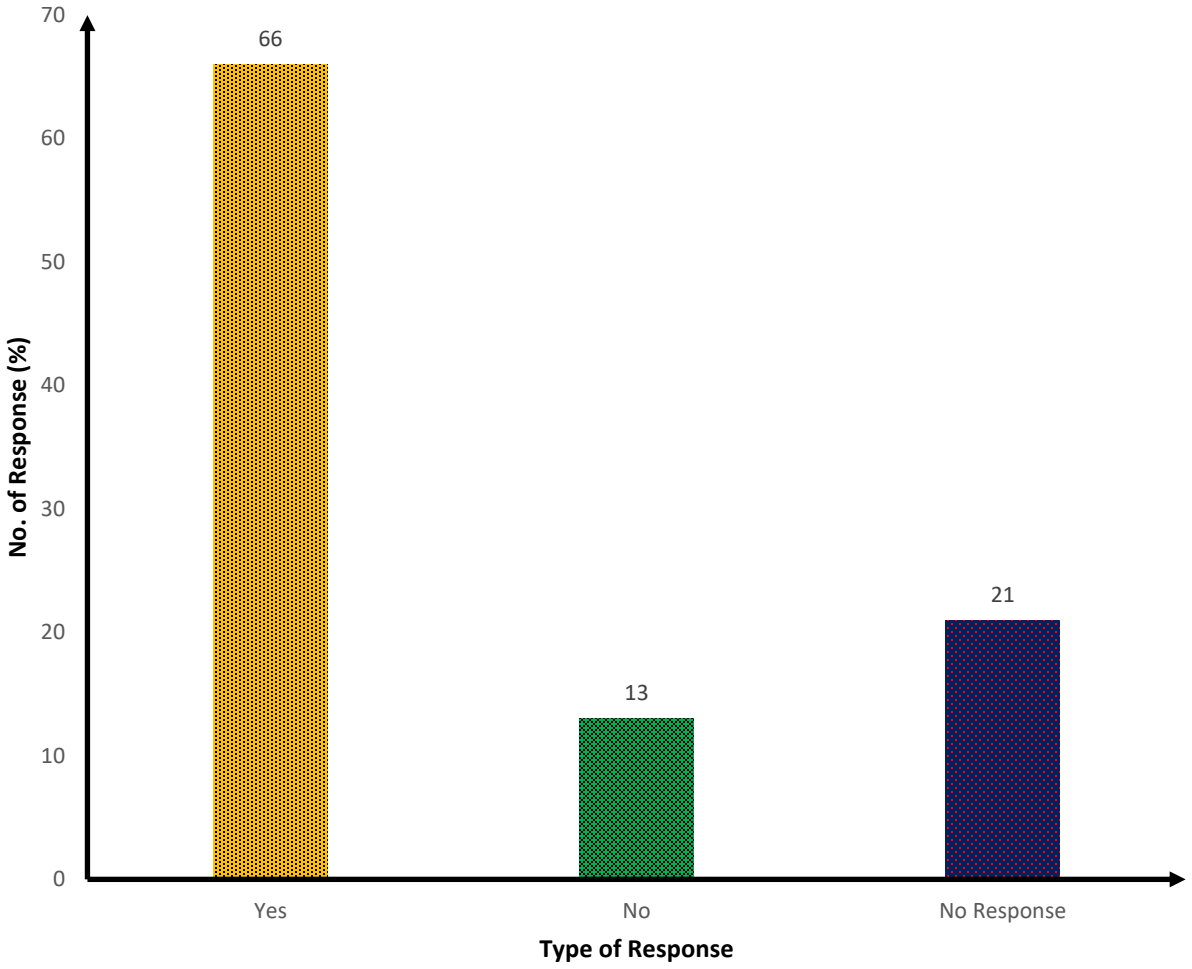

Figure 3.4: Whether the packages are included in procurement plan and approved before going for procurement.

It was seen in the figure 3.4 that out of 200 respondents, 133 answered 'yes' (66%), 25 answered 'no' (13%) and 42 gave 'no response' (21%). The result indicated that they had procurement plan, the packages were included in the plan and those were duly approved.

Question 10: In case of medical equipment/drugs/medicine purchasing, do your organization follow national or international quality standards?

In response to the question above, the results were depicted in the Figure 3.5.

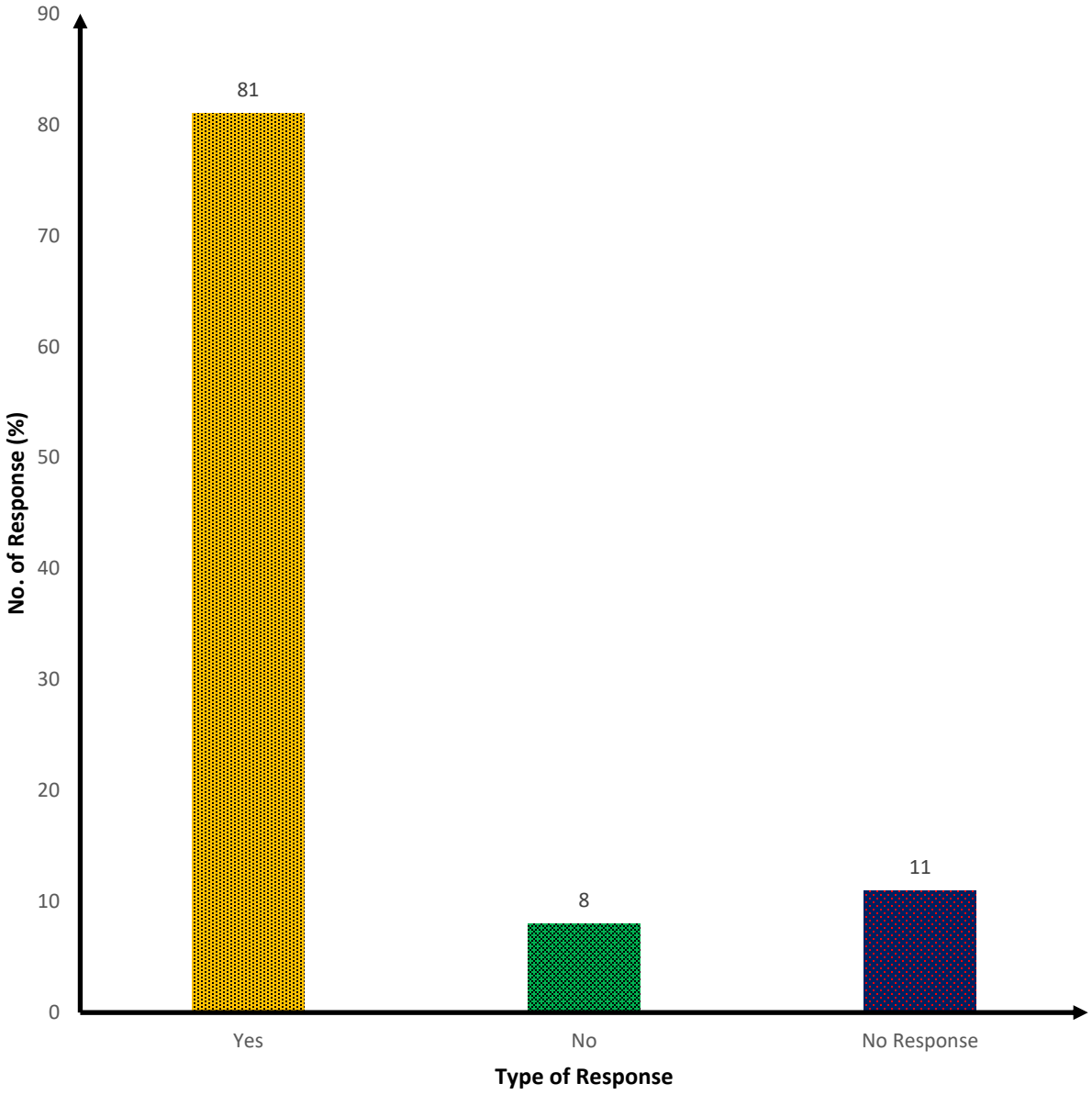

Figure 3.5: Responses in case of purchasing medical equipment / drugs / medicine whether the organization follows national or international quality standards.

In Figure 3.5, it was observed that 162 respondents answered 'yes'. It was about 81% of

the respondents. On the other hand, 16 answered 'no' and 22 gave 'no response'. That is, 8% answered 'no' and 11% gave 'no response'. This indicated that national and international standards were being followed by the organization while purchasing medical items.

Question 11: Does your organization go for post procurement audit?

The responses to the question 11 were depicted in Figure 3.6.

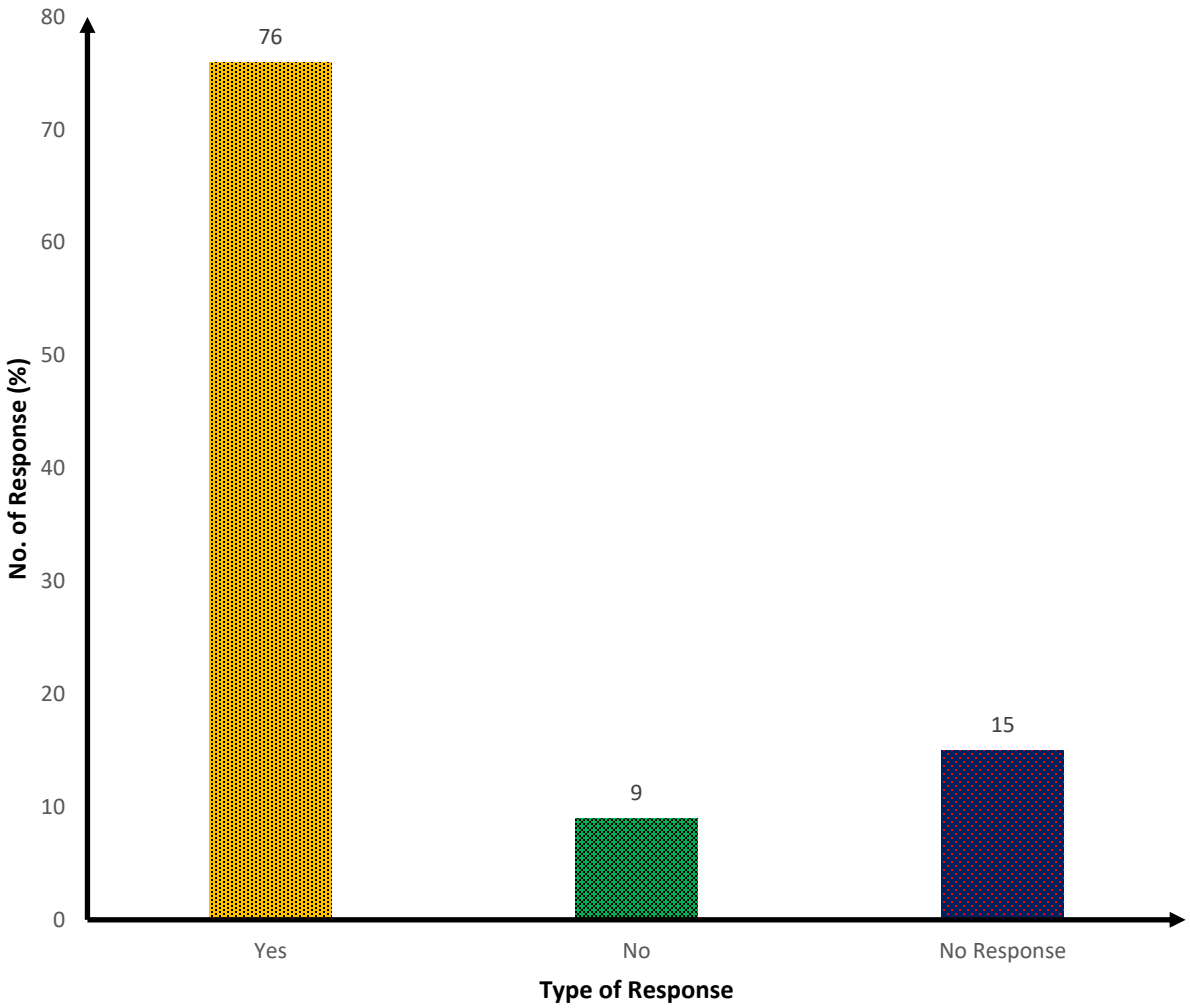

Figure 3.6: Responses on whether the organizations go for post-procurement audit.

It was observed from the Figure 3.6 that 152 from 200 respondents answered 'yes'. It was

about 76% of the respondents. On the other hand, 31 answered 'no' and 17 gave 'no response'. That is, 15% answered 'no' and 9% gave 'no response'. Auditing is an important instrument for further improvement of a system. Positive result showed good gesture for improvement.

Question 12: Overall opinion about NHP.

Majority from the respondent has marked NHP as very good. Few from the respondents gave different opinions. Those opinions are given below:

i) Need revision in NHP;
ii) Update of NHP at a regular basis;
iii) Involve civil society;
iv) Involve public representative;
v) Ensure implementation of the policy;
vi) Ensure development of health workforce in rural area;
vii) Incorporate new things related to health;
viii) Electronic – Government Procurement (e-GP) system can be introduced.

NHP was consulted with the doctors, health personnel and researchers and important feedbacks came out.

Majority of the respondents informed that they were acquainted with NHP and put some suggestions regarding the appropriateness of NHP, for example- The regulatory authority should take some steps about it; Regulatory authority should be more strict regarding this issue; Some strict laws should be formulated regarding NHP; There should be provision of research work in the policy; NHP should be a live document and updated whenever necessary; Awareness should be built among mass people by spreading the NHP widely; It should be more specified; Modification is needed; Stakeholders should involve themselves for ensuring the appropriateness of the policy.

Role of public servants were addressed by the respondents. They came out with some preferences, which were governance, coordination, financing & budgeting, monitoring & evaluation, impact assessment and policy feedback, hospital and community pharmacy, formulating rules and regulations, facilitating rural areas, proper execution of existing legal

framework and waste management.

Some areas were identified which were not properly addressed in NHP such as zika virus, nipah virus related disease, Dengue, Chikungunya type of disease, non- communicable disease, epidemic disease control. Some suggestions were also given by the respondents; these were- need revision in NHP; update of NHP at a regular basis; involve civil society; involve public representative; punishment should be more in case of spurious drug preparation.

Most of the respondents opined that their organizations had trained procurement personnel, procurement Act and Rules were followed in procuring medical items, procurement was done as per approved procurement plan, national and international standards were followed in procuring drugs, medicine and medical items and procurement audit was done in the organization. These all were positive gesture in proper implementation of NHP.

3.2 Service Receivers and Service Providers

Service Receivers

The data were collected from different service receivers. 200 service receivers participated in this survey. Among the service receivers, 128 were male and 72 were female.

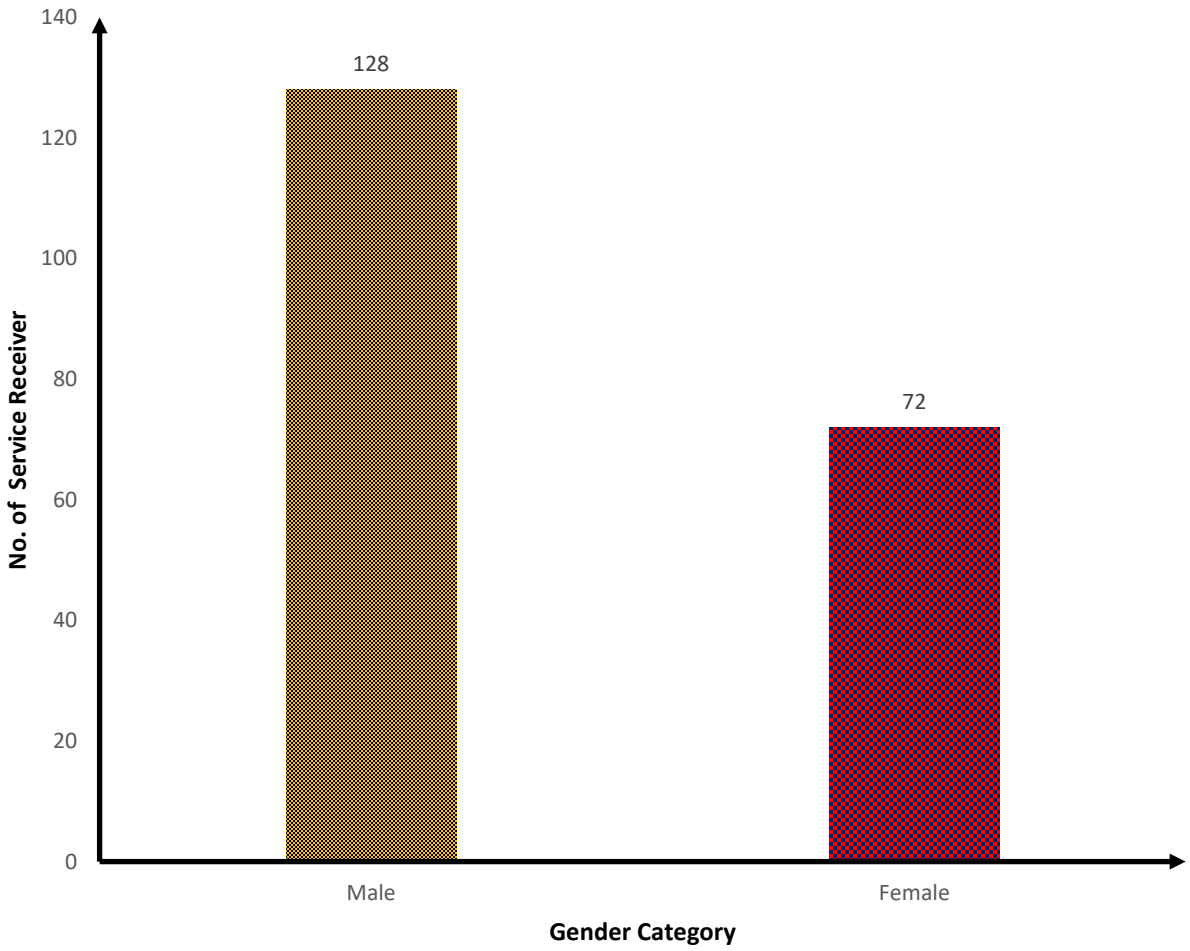

Figure 3.7: List of service receivers by gender.

The service receivers were also determined by locations which were shown in the Figure 3.8.

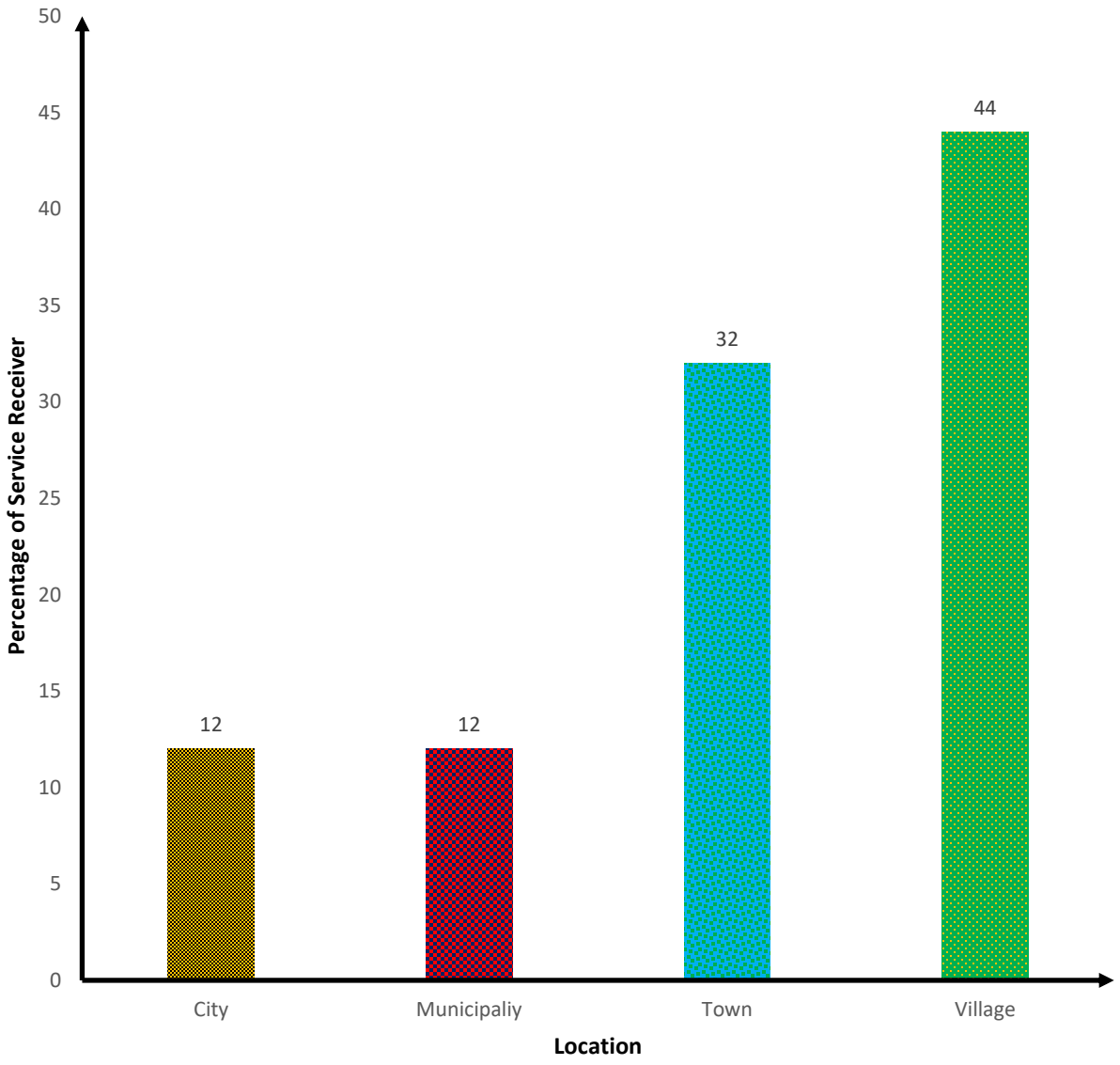

Figure 3.8: Service receivers by locations.

Among the respondents, 44% were from village, 12% from city corporation, 12% from municipality and 32% from town.

How many service receivers know about "National Health Policy".

The responses to the issue were given in Figure 3.9.

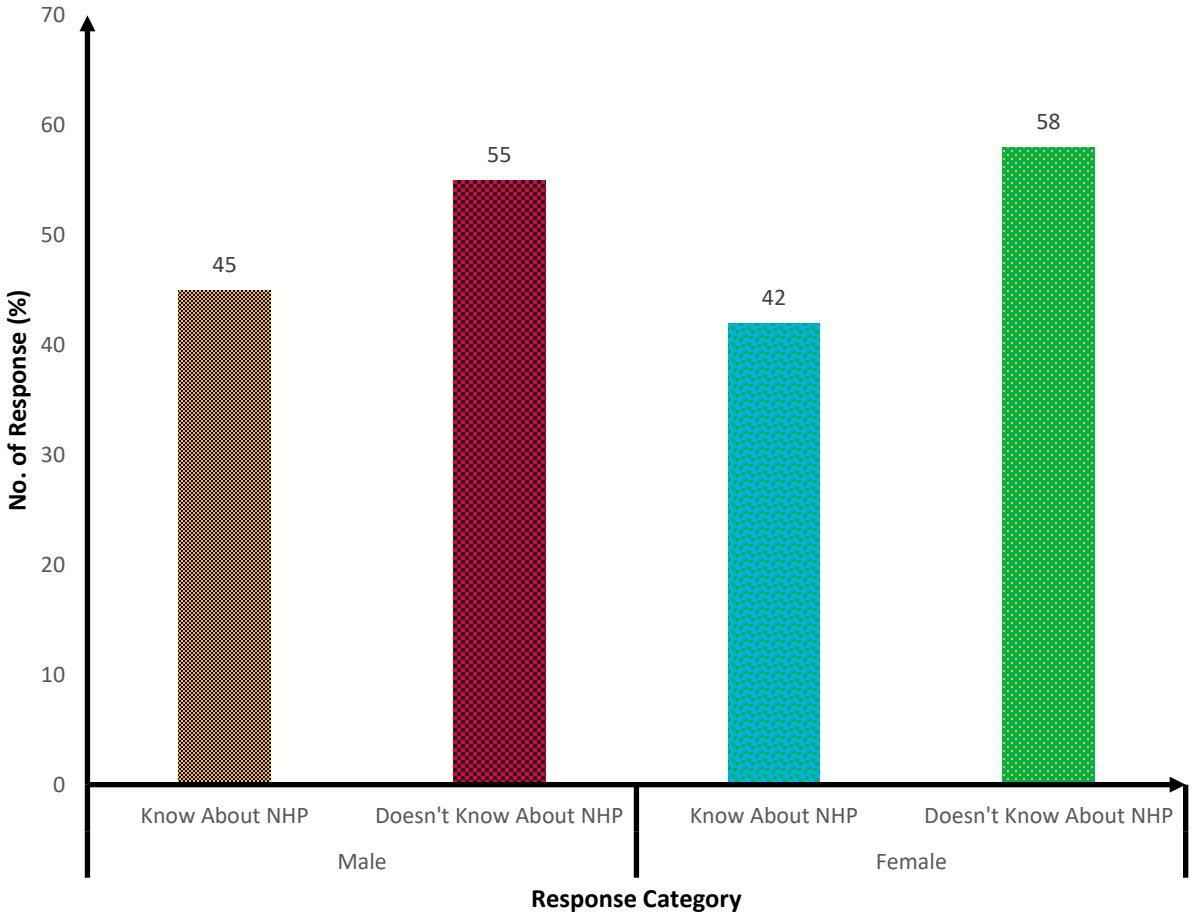

Figure 3.9: Knowledge of service receivers about NHP.

Most of the service receivers don't know about National Health Policy. From Figure 3.8, it was evident that among the 128 men, only 58 knew about the National Health Policy. In case of female, it was worse. Among 72 women, only 30 knew about this. In both the cases, it did not cross 50%, that meant most of them were unaware about the National Health Policy. This figure showed that 45% men and 42% women knew about the policy which was very poor as most of the people, especially healthcare receivers, should know about the health policy to ensure that they could get proper treatment.

The knowledge on NHP among the respondents regarding locations was observed in Figure 3.10.

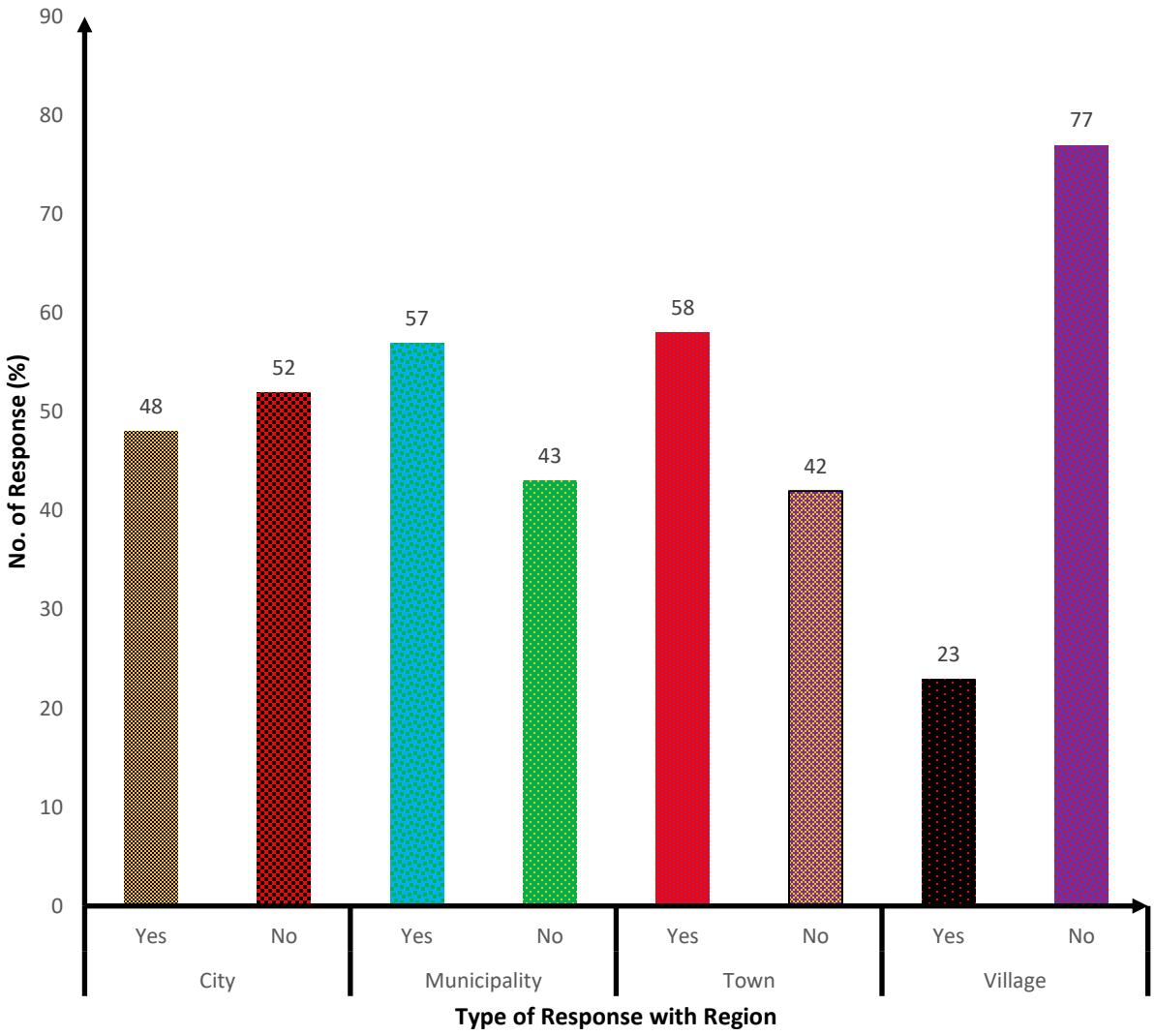

Figure 3.10: Knowledge of service receivers from different regions about NHP.

From the Figure 3.10, it was observed that the knowledge about NHP among the villagers was very low. 77% of them did not know about the policy. It seemed that villagers were far away from the policy. As a result, they received very poor facilities. However, situation in town and municipality was quite good comparing the scenario of the village. 58% people in town and 57% people in municipality knew about the National Health Policy. Rest of the people did not know about the policy. Comparing situation of Town and municipality, less percentage of people in the city corporation had knowledge about the policy. It was only 48%. Though it was better than the scenario of the village, it could be said that it was a good scenario. Villagers live in a remote place, but people in a city corporation are not. They should know about the policy. Many labor class people

live in the city corporation. They mostly do not know about the National Health Policy.

Education had a good relationship with the knowledge about the National Health Policy. The results of the relationship between education and knowledge about NHP were viewed in the Figure 3.11.

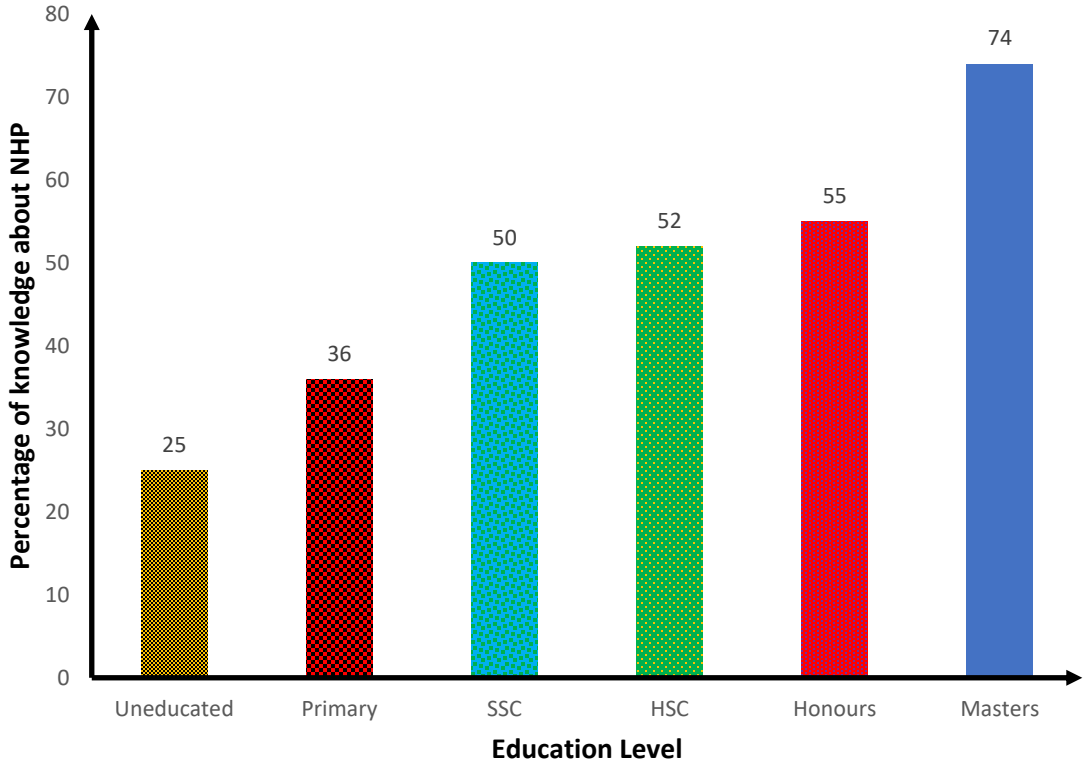

Figure 3.11: Education and Knowledge about the Policy.

From Figure 3.11, it seemed that percentage of people was increasing with respect to the educational level. Where 25% uneducated persons knew about the policy, 74% with master degree had the knowledge about the policy. More than 50% people with at least SSC degree had a higher knowledge about the National Health Policy. It was 36%, 50%, 52%, and 55% with respect to people with primary level education, SSC level education, HSC level education and honors level education, respectively. So, awareness program should continue among the people with low educational background. Most of them does not lead a very healthy life and do not get proper

health facility.

Source of Information about the National Health Policy

From where the information of NHP was got by the respondents was asked and the results were given in the Figure 3.12.

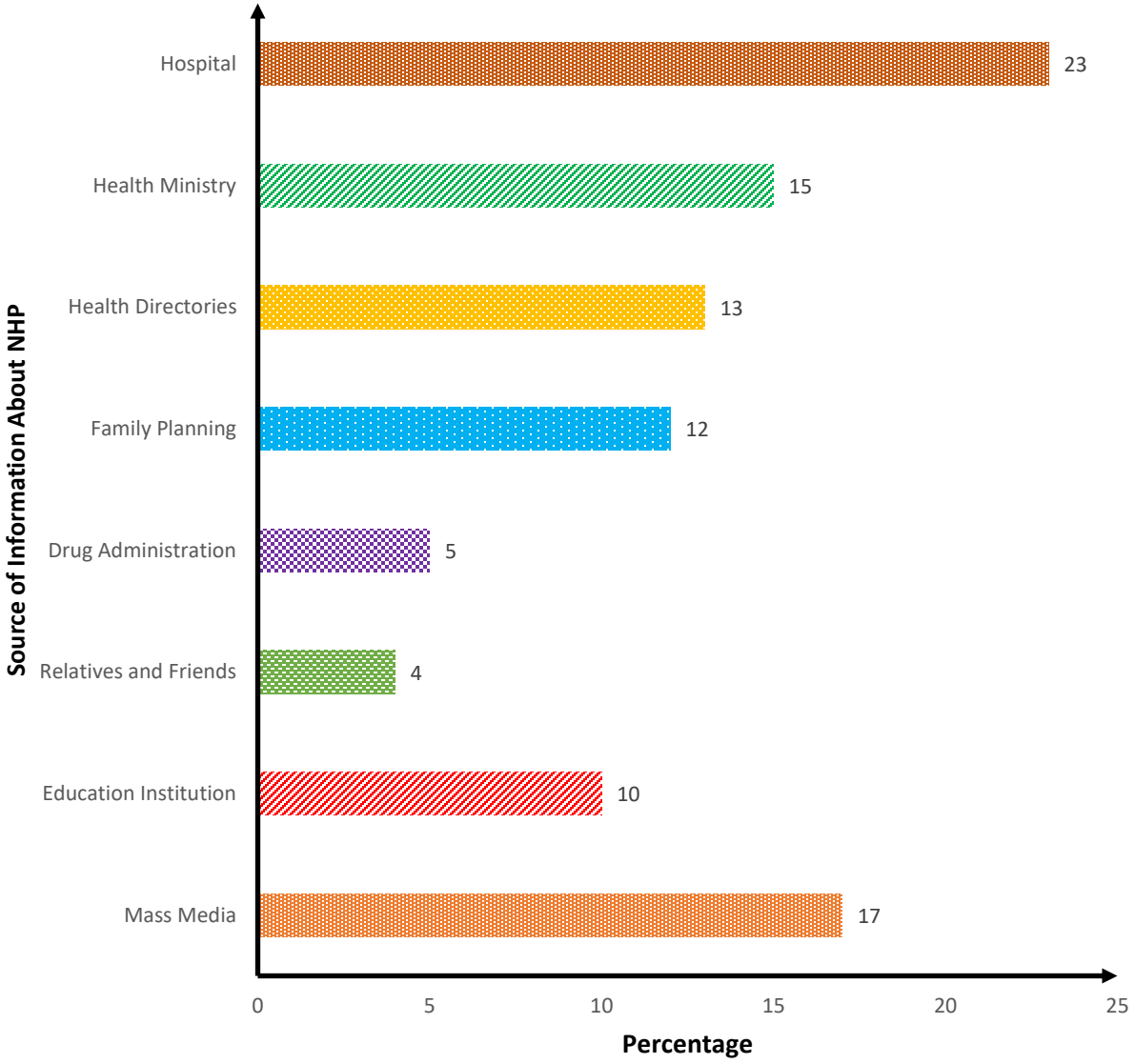

Figure 3.12: Source of information about NHP.

From figure 3.12, it seemed that education had a good relationship with knowledge of the policy. But educational intuitions did not play as a main source of information of National

Health Policy. It only contributed 10%. It seemed that education made people aware to know about various government policies, but educational institutions did not provide much knowledge about the National Health Policy. However, the main source was the hospital. It contributed 23%. Mass media also played an important role in this regard. 17% people knew about the information of National Health Policy from mass media. However, participation of Drug Administration department in this case was not quite satisfactory. It contributed only 5% which was the second less. Health Ministry and Health Directories also played a good role in providing information about National Health Policy (15%).

Motive that driven people to know about the National Health Policy

A question was asked to the service receivers about the motive that driven them to get the information about the National Health Policy. In this regard, some suggestions of the respondents are given below-

i) To get a better treatment and lead a healthy life;
ii) To full-fill basic rights providing by the government;
iii) As a conscious citizen, everyone should have knowledge over it;
iv) To know the health scenario of Bangladesh;
v) To get proper treatment in the hospital;
vi) To make aware others about their health;
vii) For professional reason.

Is the National Health Policy self-contained or not?

Most of the people who knew about the policy did not consider the National Health Policy as self-contained. The results were summarized in Figure 3.13.

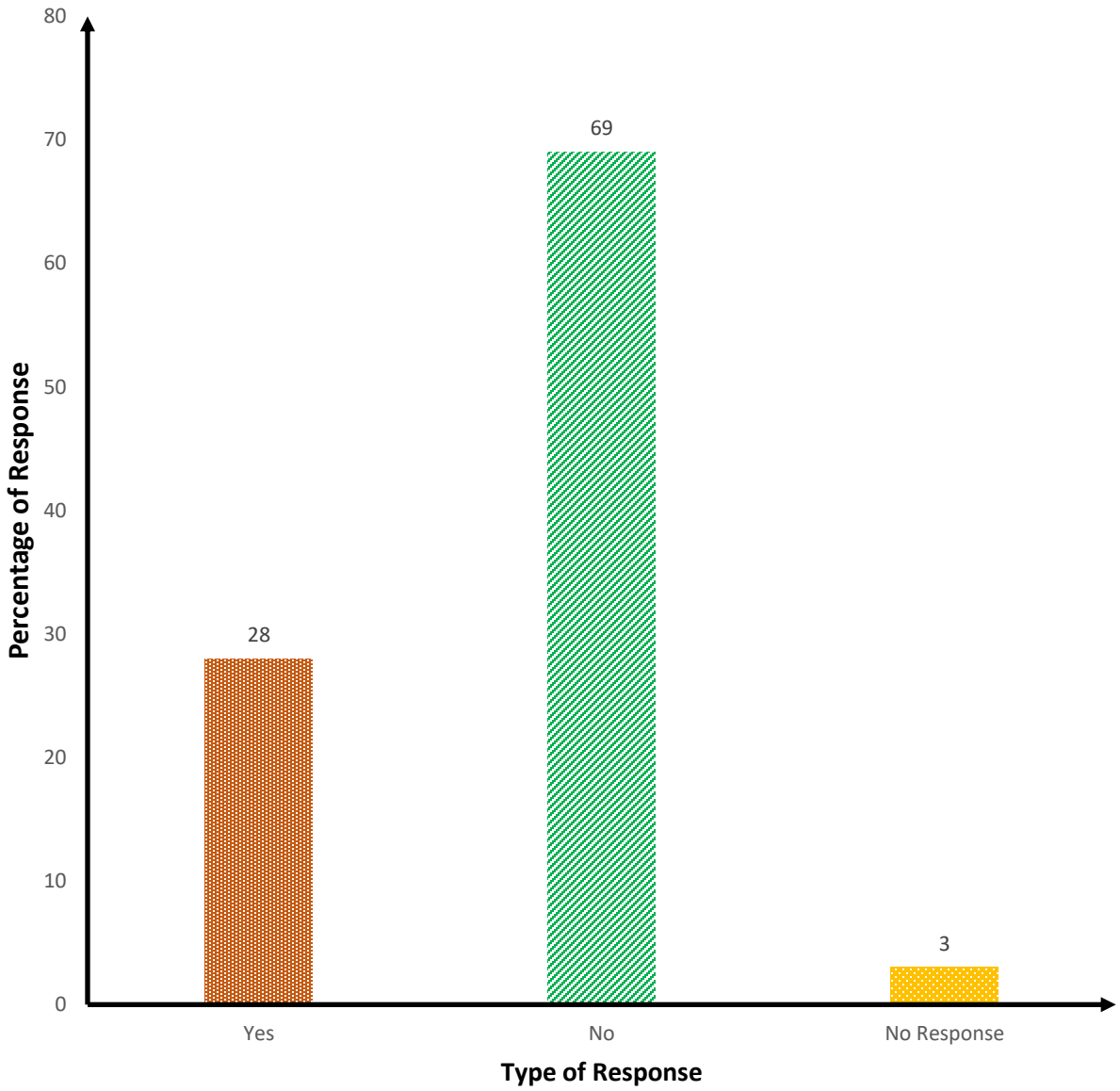

Figure 3.13: Responses on whether the NHP is self-contained or not.

From the Figure 3.13, it was evident that only 28% people thought that the policy was good enough to provide better health service. 3% people did not give any response. Other 69% people did not consider it as a good heath policy. Their thinking was that the policy should be changed and should be enforced in hospitals especially primary level hospitals and other medical sectors so that every people could get a better treatment.

Anomaly in the National Health Policy

A question was asked to the service receivers about the anomaly in the National Health Policy. In this regard, some suggestions of the respondent are given below-

i. The NHP does not ensure enough number of doctors, nurses and other stuffs as required;
ii. Some medicine especially antibiotics should be prescribed by the doctors only. But it is not ensured by the NHP;
iii. The NHP cannot resolve the communication gap between the service providers and the service receivers;
iv. Does not ensure enough necessary supplies;
v. Does not ensure skilled doctors in primary and secondary level hospitals;
vi. Does not ensure enough health workers;
vii. Does not utilize the referral system;
viii. The NHP does not say anything about the corruption of the service providers;
ix. Treatment facilities are not enough;
x. In union and upazilla level, lack of proper work distributions in the health sector.

Issues should be included in the National Health Policy

A question was asked to the service receivers about the issues which should be included in the National Health Policy. In this regard, some suggestions of the respondent are given below-

i. The National Health Policy should ensure that the doctors' fee is minimized in their private practice;
ii. The hospital pharmacy should be opened in every hospital even in the primary level hospitals and the policy should ensure that a qualified A grade pharmacist be present in the hospital;
iii. It should raise voice against corruption and should be strict in punishing the corrupted service providers;
iv. The policy should ensure that the government doctors pay more attention in hospital than the privet practice;
v. The policy should ensure the placement of expert doctors, nurses and other stuffs in primary level hospitals;

vi. The policy should ensure the ambulance service become fast and reach to the patient in the minimal time;
vii. The policy should ensure that the National Health Policy should be enforced at every position in the health sector;
viii. The policy should ensure that the hospitals are free from the brokers
ix. Hospitals related information should be available for all and the NHP should ensure it. Mass media can be used for spreading the health related news;
x. Without the OTC drugs, drugs should be prescribed by the doctors and a pharmacist should recheck it;
xi. Monitor a health conscious program in very locality;
xii. The policy should ensure better treatment at low cost especially in rural region.

Duties of government officers in implementing the National Health Policy

A question was asked to the service receivers about the duties of the government officers in implementing the National Health Policy. In this regard, some suggestions of the respondents are given below–

i. The officers should do their duties properly;
ii. They should stop corruption in their work place & be honest with their duties;
iii. They should conduct seminar on NHP in every region of country so that everybody knows about the NHP;
iv. They should ensure that NHP is maintaining in every hospital, clinic and service providers (Physicians & nurse) should maintain it;
v. Ensure health insurance for every people;
vi. Increase the manpower in hospitals;
vii. Ensure medicines at a low rate for the poor people;
viii. Should go on a round at least once at a week;
ix. They can prepare a model for health sector so that patients can get treatment at a minimal time.

Comments of the service receivers about the National Health Policy

i. The NHP should be more realistic;

ii. The NHP should ensure better treatment;
iii. The policy should be implemented in every sector;
iv. Seminar should be conducted so that people know about the NHP;
v. It should be applied in the field not only limited to paperwork;
vi. NHP should include in academic education of medical, pharmacy & nursing so that every student can know about it.

Service providers

The data were collected from service providers. The gender category of service providers was given in Figure 3.14.

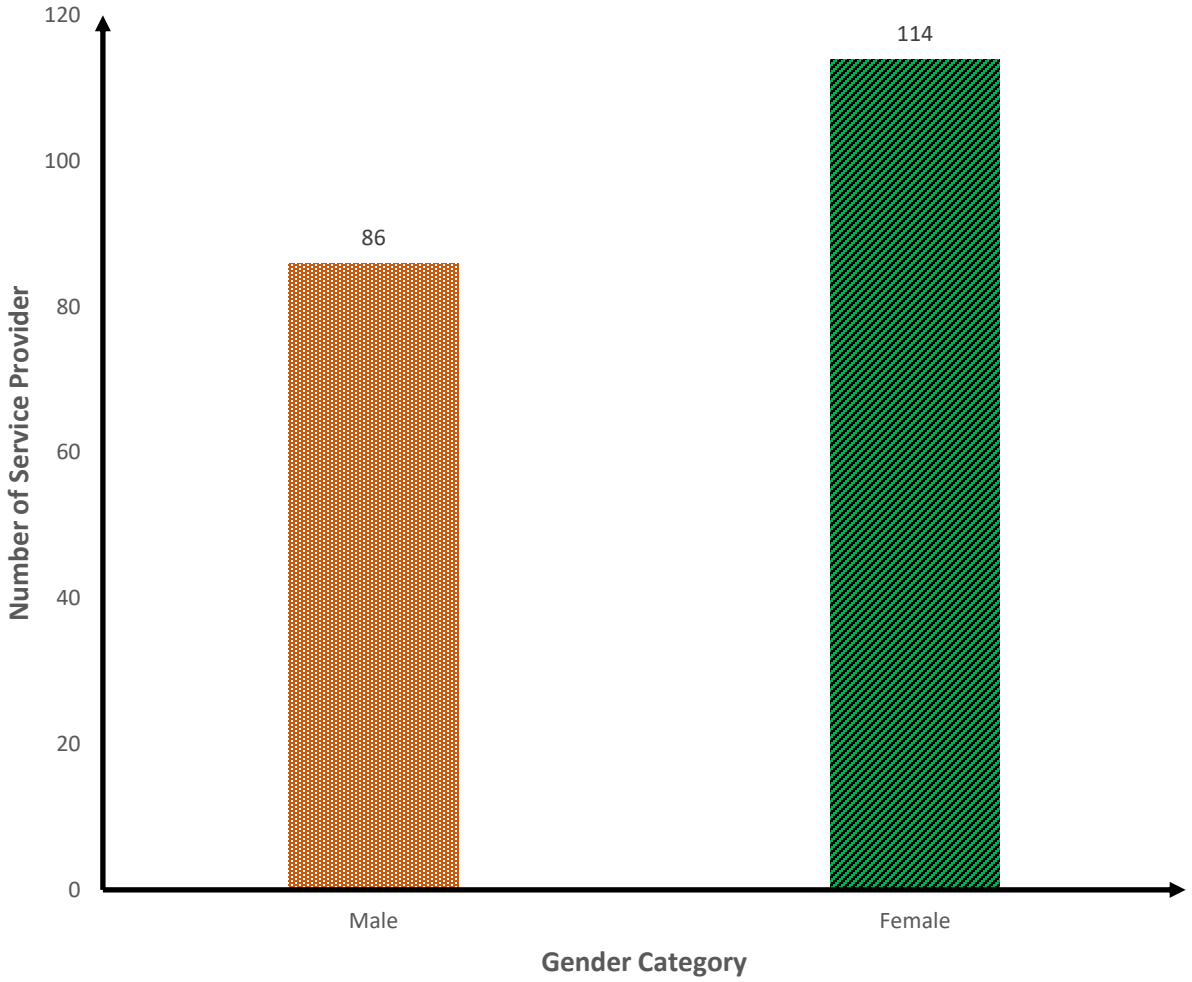

Figure 3.14: Number of service providers by gender.

From Figure 3.14, it was observed that 200 service providers participated in this survey. Among the service providers, 86 were male and 114 were female.

The service providers were segregated as per the education level. The segregation was given in Figure 3.15.

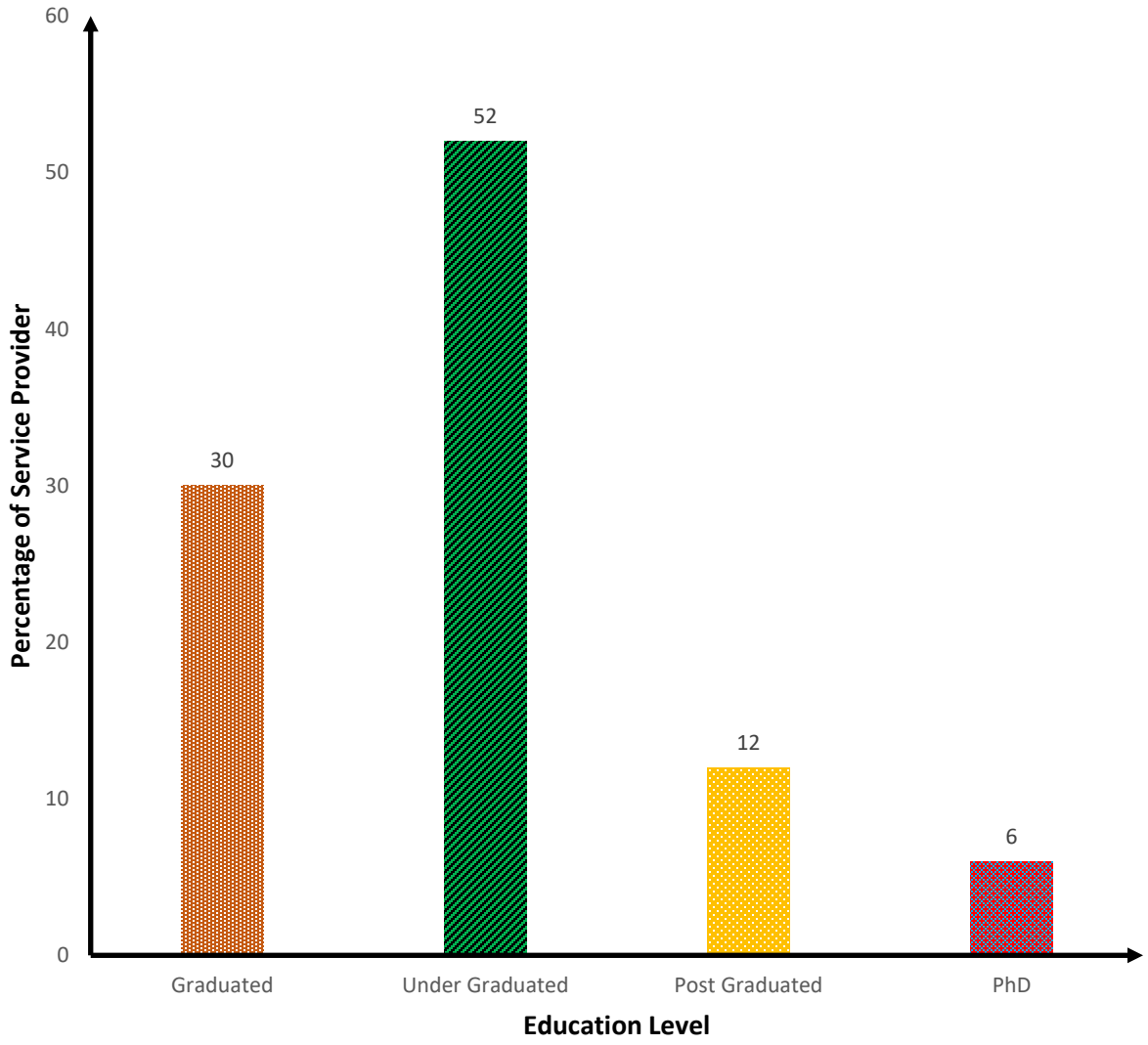

Figure 3.15: Number and % of service providers by education.

From the Figure 3.15, it was seen that among the participants, 52% were under graduate, 30% were graduate, 12% were post graduate and 6% were with the PhD degree holders.

Service providers acquainted with the National Health Policy

The scenario, in this case, was not quite satisfactory. In fact, the scenario for service providers was worse than service receivers. The results were given in Figure 3.16.

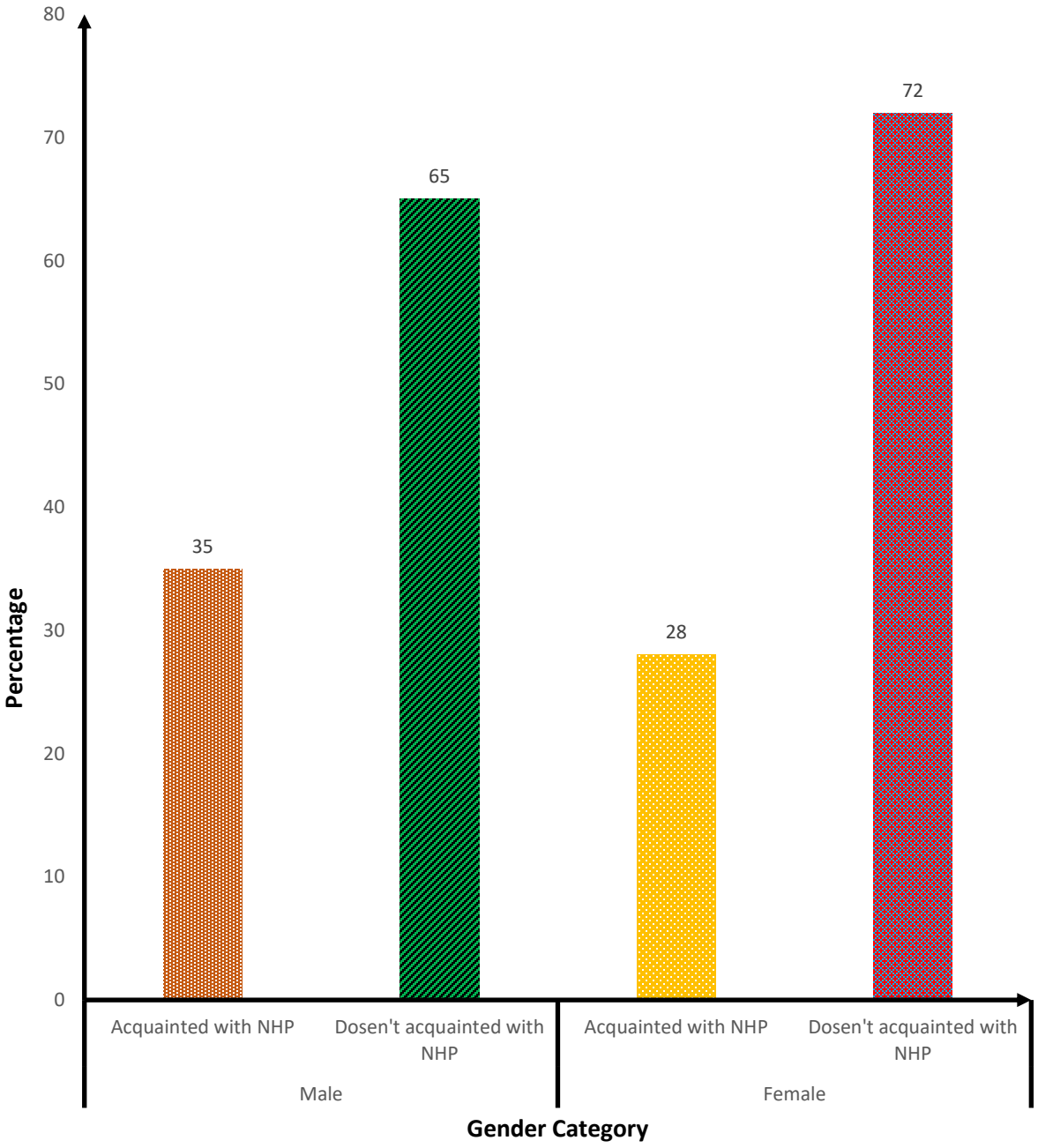

Figure 3.16: Knowledge of Service Provider about the NHP.

From the Figure 3.16, among the 86 men, only 35% people knew about the National Health Policy. In case of women, it was only 28%. That meant that in both the cases, it did not cross 50% and majority of the service providers were not aware of the NHP and as a result, they could not provide better treatment to the patients.

However, like service receivers, education has a quite good relationship with the knowledge about the National Health Policy. The results were shown in Figure 3.17.

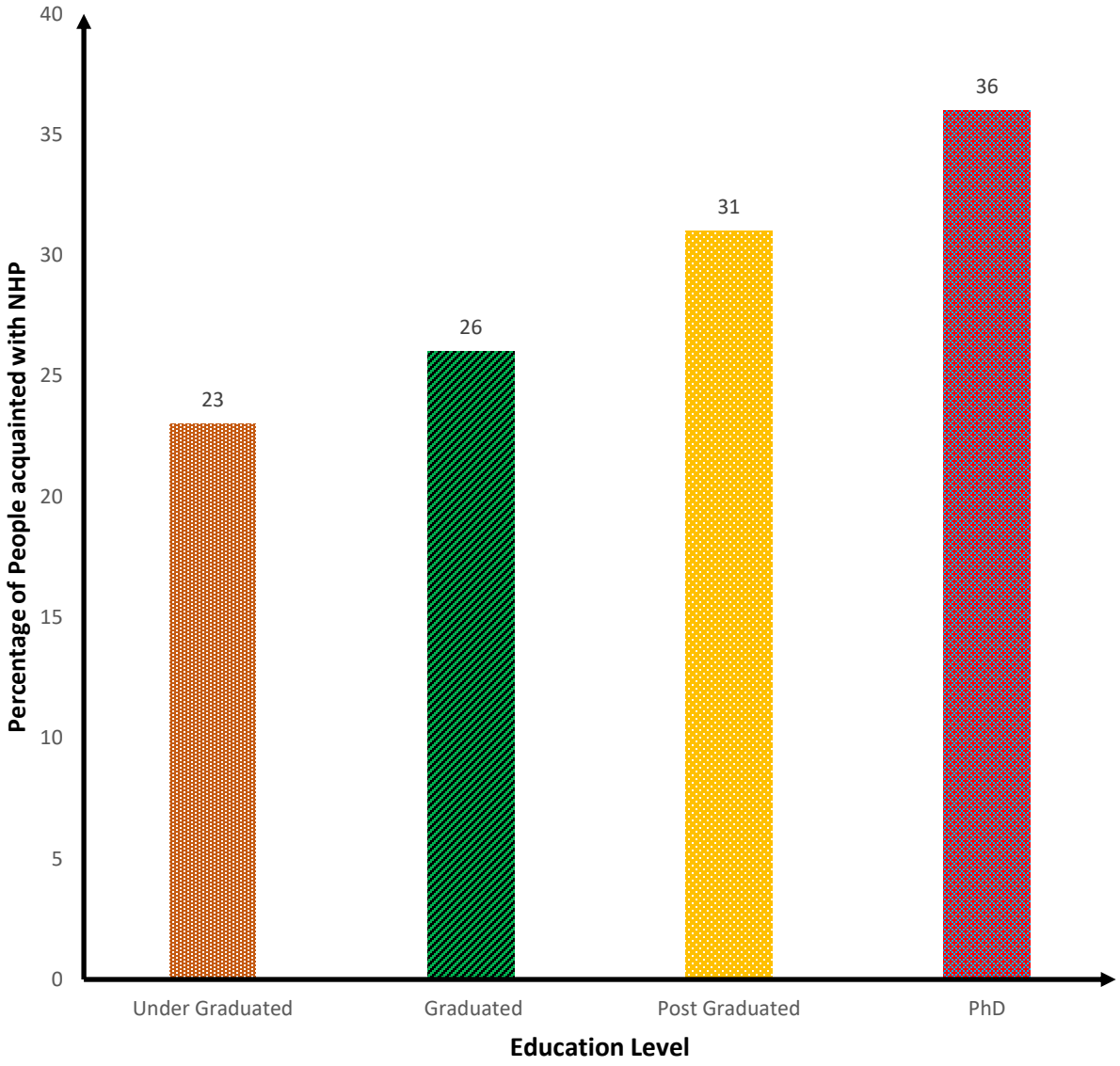

Figure 3.17: Education and Knowledge about the NHP

From the Figure 3.17, it was seen that 36% PhD holders knew about the policy whereas 23% under graduate knew about the policy. In case of graduate and post graduate, it was 26% and 31% respectively. Though the percentage was increasing with the education level, the scenario was not satisfactory as they were the people who were providing health care to the public.

Knowledge of service providers by profession was analyzed, which was summarized in Figure 3.18.

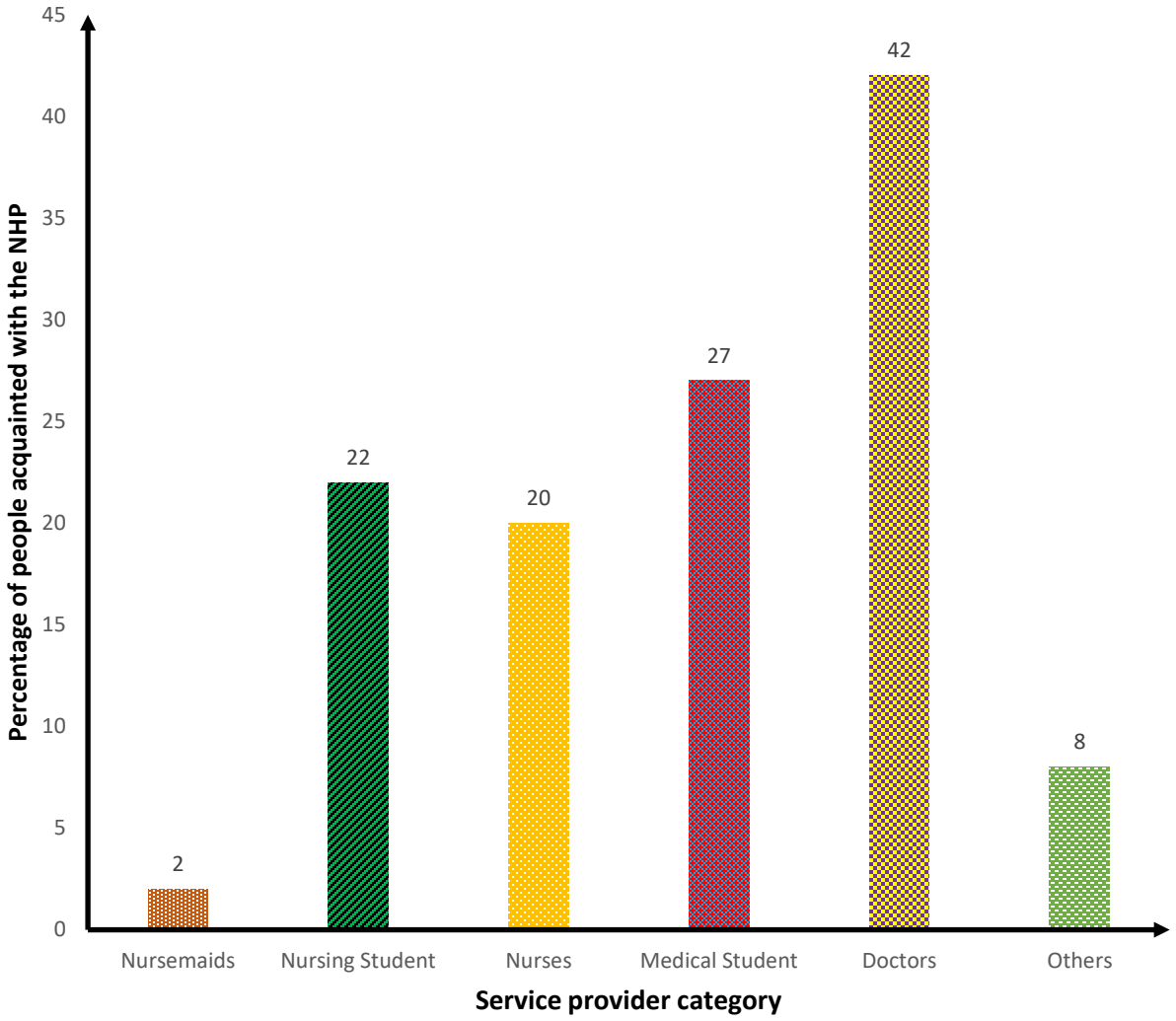

Figure 3.18: Knowledge of the Service Providers from different positions about the NHP.

From the Figure 3.18, it was evident that among the heath service providers, most doctors

knew about the policy. About 42% doctors had knowledge over the policy. Though they had more percentage than the others, it was not enough as it did not cross 50%. Medical students secured the second position in this case, it was 27%. Nurses were 20%, nursing students were 22%. That meant that newer nurses were more informed about the policy. From the data, it was evident that the result was not quite satisfactory.

People living in the Dhaka city knew more about the National Health Policy. The results were summarized in Figure 3.19.

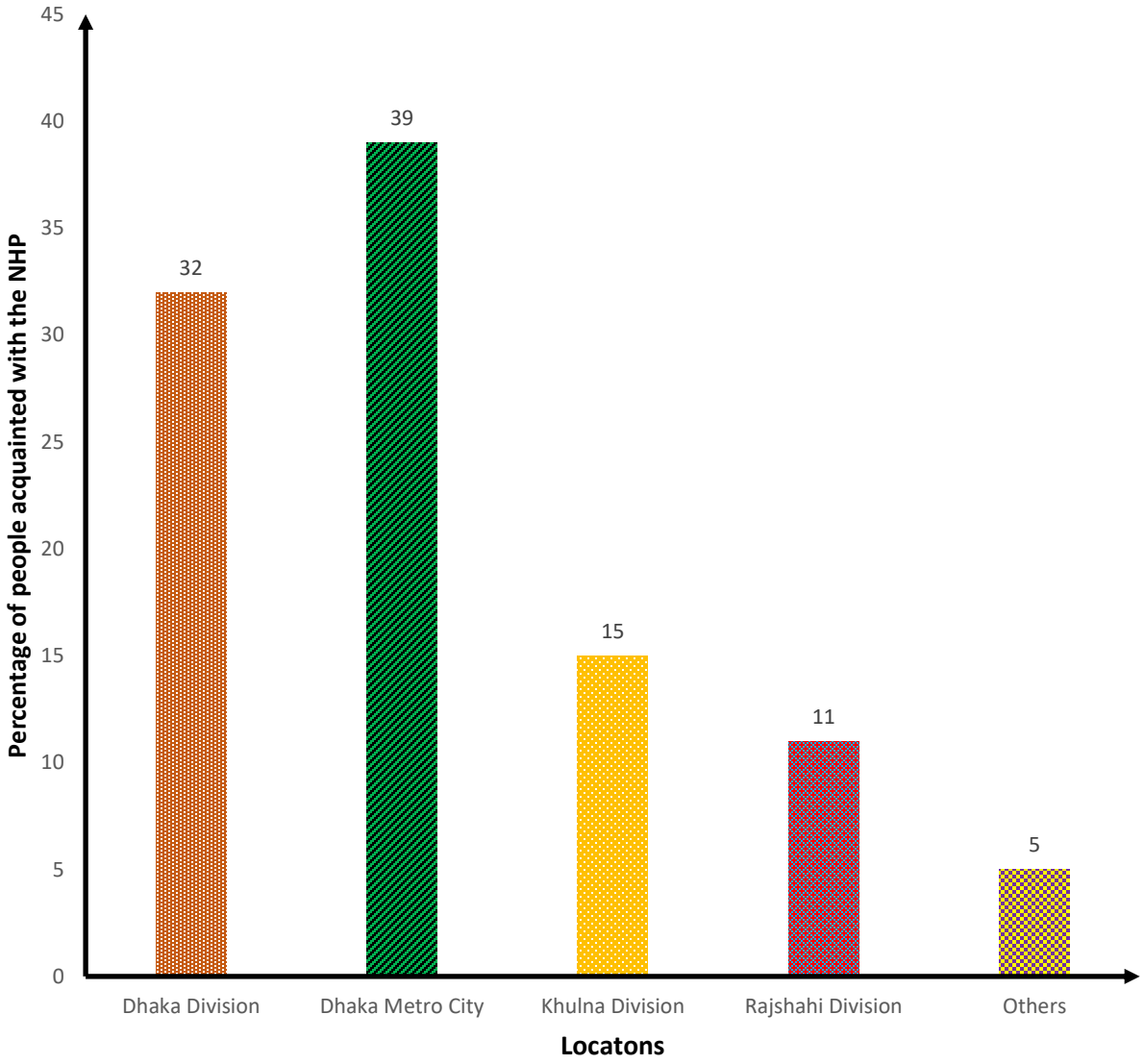

Figure 3.19: Knowledge of people from different regions about the NHP.

From the Figure 3.19, it was seen that the percentage for Dhaka metro city was 39%. Though it was not a good scenario, it was better than other areas. In Dhaka division, it was 32%. In Rajshahi and Khunla division, it was 15% and 11%, respectively. The scenario became worse in these places. It seemed that the percentage was decreasing in the villages. The villagers knew about NHP less than people living in the cities.

Suggestions Regarding its Appropriateness

Suggestions from the respondents regarding its appropriateness are given below:

i. Regulatory authority should take some steps about it;
ii. Regulatory authority should be stricter regarding the issue;
iii. Some strict laws should be formulated regarding NHP;
iv. There should be some research work regarding the NHP;
v. The NHP should be updated from time to time;
vi. Awareness building should be done by spreading the NHP among mass people;
vii. Some respondents suggested to make it more specific;
viii. Some respondents suggested to modify it.

Whether they should be acquainted with the National Health Policy

A question was asked to the participants who did not know about the policy whether they should be acquainted with the policy. In this question, most of them responded positively. The results were summarized in Figure 3.20 below.

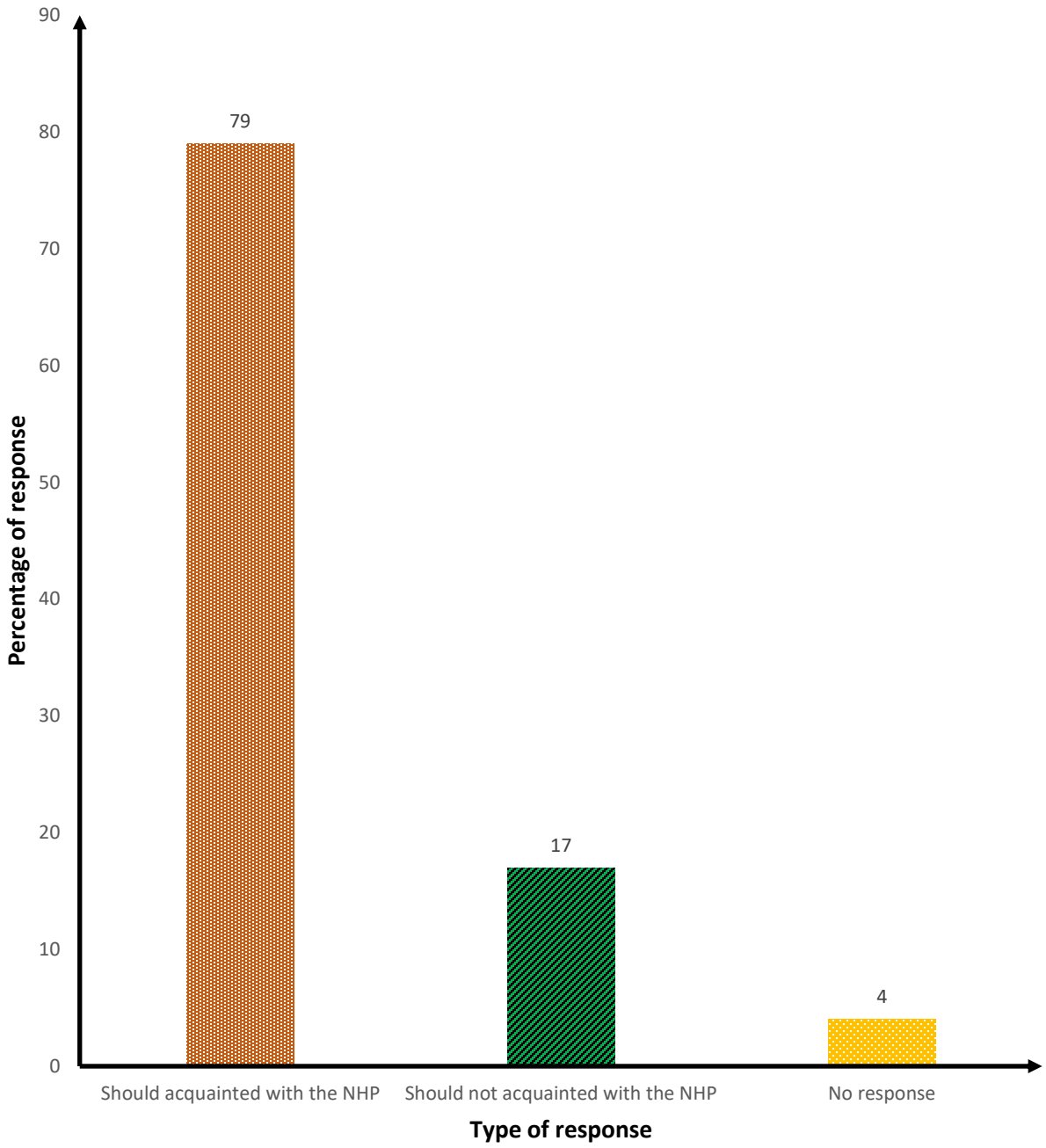

Figure 3.20: Responses on whether the respondents should be acquainted with the NHP.

From the figure above, it was seen that 79% of the respondents wanted to know about the policy. And another 17% people did not want to know about the policy. It was a quite good thing as most of the respondents wanted to know about the policy.

Neglected Areas in the National Health Policy

Some neglected areas of NHP identified by the respondents are given below:

i. It does not ensure the proper facilities in the government hospitals especially in primary level hospitals;
ii. It does not ensure proper facilities of physicians, nurses, technicians;
iii. Ratio of personnel related with the health profession is not good. The policy does not ensure to maintain a good ratio;
iv. Some medicine especially antibiotics should be prescribed by the doctors only. But it is not ensured by the NHP;
v. In upazilla level, lack of proper work distributions in the health sector is found;
vi. The policy does not ensure proper communication between two hospitals. As a result, serious patients handling become difficult in case of shortage of medicine, personnel or other facilities related with treatment;
vii. Number of beds in hospitals are not adequate regarding the number of patients. This matter is not considered in the policy.

Implementation of the National Health Policy

The respondents were asked whether they face difficulties in implementation of NHP. Most of them faced problem in implementation of the policy. The results were summarized in Figure 3.21 below:

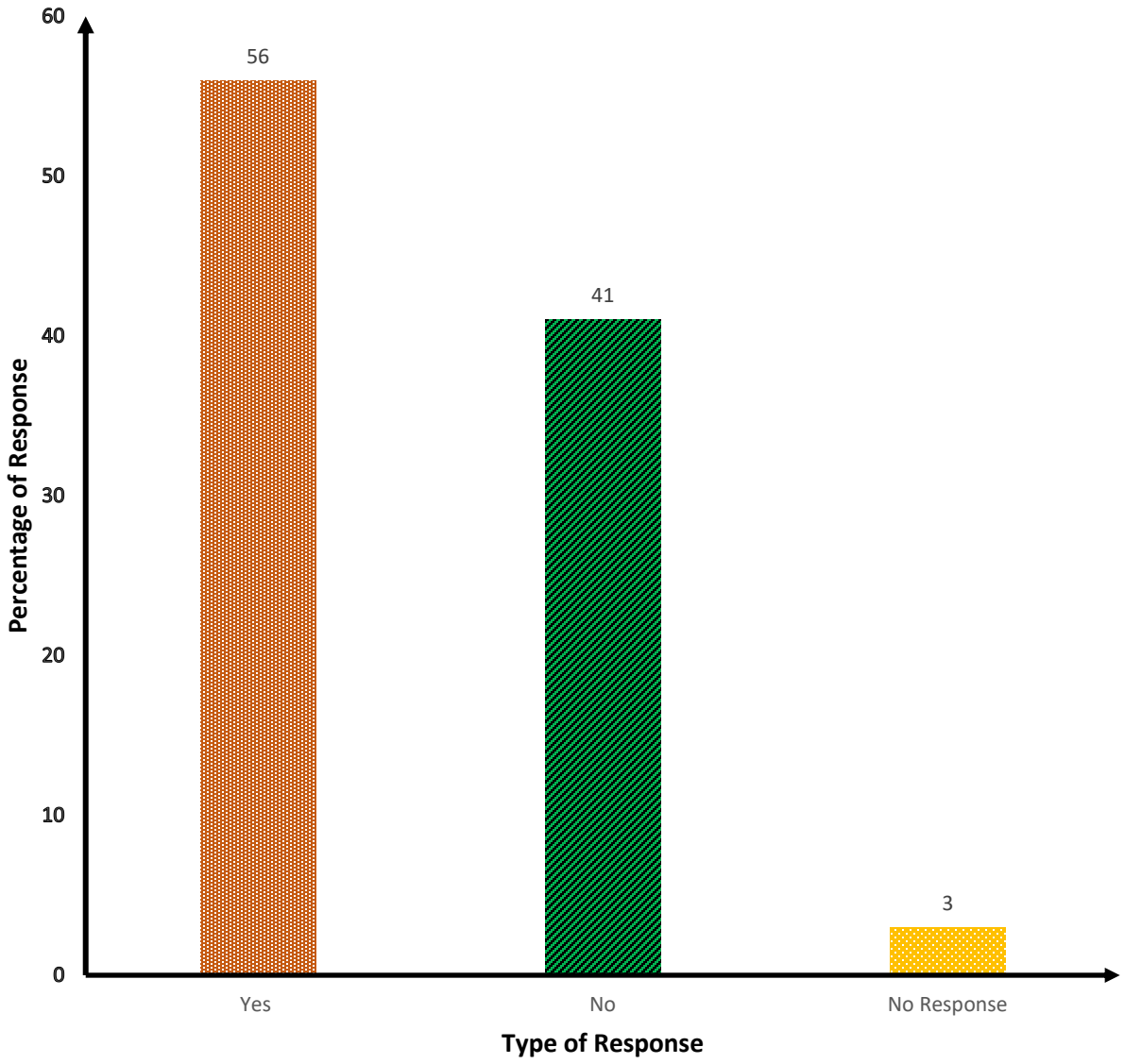

Figure 3.21: Responses on facing problems in implementing the policy.

From the Figure 3.21, it was evident that 56% of them faced problems and 41% of them did not face problems and 3% did not respond.

Problems in implementation of the National Health Policy

A question was asked to the service providers about the neglected area in the National Health Policy. In response to the question, some suggestions of the respondents are given here:

i. The number of medical personnel is not enough to better treatment to the mass amount of patients.

ii. Many people especially in the rural area do not come to hospital to get treatment due to superstition. Implementing the policy in that case becomes difficult.

iii. Political problem is common in Bangladesh. Implementation becomes difficult due to local politicians.

iv. Communication is another problem. Due to lack of proper communication facilities, patients do not get treatment in time and can cause serious damage to them.

v. Lack of knowledge of people about the policy creates problem to implement the policy.

Cooperation from the top management

A question was asked regarding the cooperation from the top management. The results were summarized Figure 3.22 below:

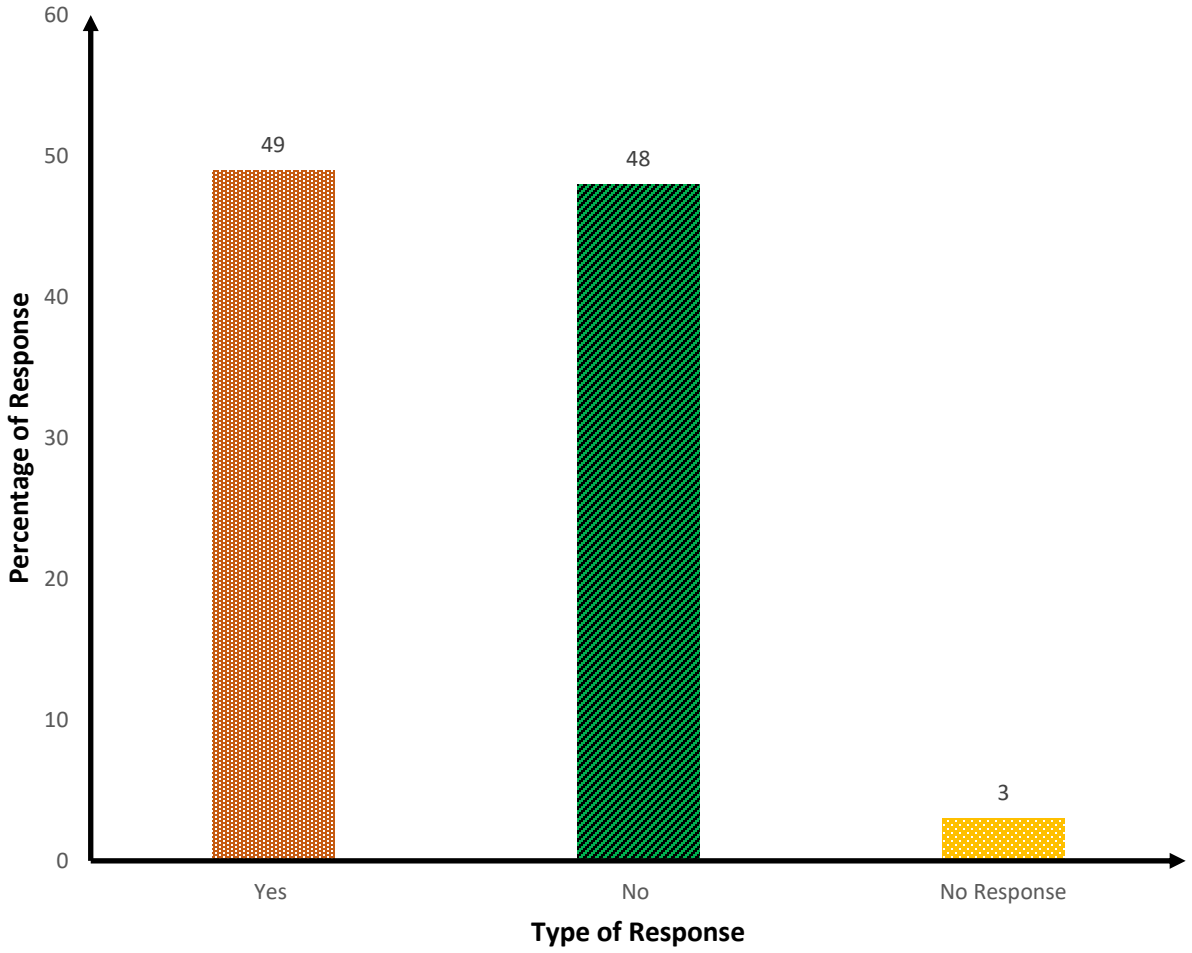

Figure 3.22: Responses on Cooperation from the top management

From the Figure 3.22, it was evident that 49% of the respondents said that they got proper cooperation from the top management while 48% claimed that they did not get adequate cooperation from the top management and 3% of them did not give any response.

Areas of non-cooperation

Some areas of non-cooperation are summarized below.

i. Heath workers do not get proper facilities especially transport system as transportation in the village is difficult;
ii. Political system in Bangladesh creates problems in implementing the policy;
iii. Many personnel in the top management do not know about the policy properly. Sometimes they are not interested in implementing the policy;
iv. Medicine delivery system is not efficient enough to provide a better treatment to the patients.

For better implementation of policy for the sake of mass people, concerted effort must be ensured. So, top management who are in strategic positions should cooperate to implement the policy in a better way to serve people to the fullest.

3.3 Primary Health Care in Netrokona Sadar Upazila - A Case Study on Expanded Program on Immunization (EPI)

Public Health Care in Bangladesh

Primary Health Care (PHC) refers to -essential health care- that is supported by scientifically sound and socially acceptable strategies and technologies that create universal health care accessible to all people and families in a community. It is through their full participation and at a value that the community and also the country will afford to keep up at each stage of their development within the spirit of self - reliance and self - determination[32]. In other words, PHC is an approach to health beyond the traditional health care system that focuses on health

equity - producing social policy[33]. PHC includes all areas that play a role in health, such as access to health services, environment and lifestyle[34]. Therefore, primary healthcare and public health measures, taken together, may be considered as the cornerstones of universal health systems[35].

Bangladesh government is struggling to ensure basic health at the grass root level. As part of the initiative, the following data can be visualized. There are 467 government hospitals at the upazila level and below, which altogether have 18,791 hospital beds. At the upazila level, there are 436 hospitals with 18,301 beds. At the union level, there are 31 hospitals with 490 beds and 1,362 health facilities for outpatient services only. So, at the union level, there are 1,393 health facilities. At the ward level, there are 12,584 community clinics in operation till date[36].

EPI in Netrokona Sadar Upazila

Primary health care includes very basic health care services like EPI, ORS, sanitation and family planning services, comprehensive reproductive health care, reduction of mortality and morbidity of mother and children etc. Out of these many, EPI was selected to study for the study. EPI is the instrument to prevent the diseases of the mother and children. Table 3.1 indicates about the diseases which are prevented by various kinds vaccines under EPI (*Tathasahyeka, EPI, DG Health, Ministry of Health and Family Welfare, Government of Bangladesh*).

Table 3.1: Diseases to be prevented by EPI.

Sl no.	Name of disease	Name of vaccine
1	Children tuberculosis	BCG
2	Diphtheria	Pentavalent
3	Hoping cough	Pentavalent
4	Tetanus	Pentavalent
5	Hepatitis B virus	Pentavalent
6	Hib V	Pentavalent
6	Polio	Oral polio vaccine
7	Hum	Measles Rubella

We selected Netrokona Sadar Upazila to study the impact of EPI program of the government. A brief of the population status of the area is given in the Table 3.2.

Table 3.2: Population status of Netrokona Sadar Upazila.

Item	Male	Female	Total
Total population	1,45,225	1,31,538	2,76,763
Children (0-59 month)	23,719	20,380	44,099
Adolescent (1 year reg.)		5,860	5,860
Female (15- 49 years)		62,730	62,730
Pregnant women (1 year reg.)		7,666	7,666
Others			1,56,408

We visited Netrokona Sadar Upazila for searching EPI related information and the scenario has been given in the Table 3.3. (*Health bulletin 2016, UHFPO office, Netrokona Sadar Upazila, Ministry of Health and Family Welfare*).

Table 3.3: Information regarding EPI centers and related personnel from the government.

SL no.	Item	Number
1	EPI center	288
2	Health inspector	3
3	Assistant health inspector	12
4	Health assistant	45

One health assistant and one family planning worker are employed to ensure immunization in immunization center of the respective ward of the union at the root level. There are 288 EPI centers in Netrokona Sadar. 3 health inspector, 12 assistant health inspector and 45 health assistant are employed for ensuring immunization of the centers. Immunization program is implemented by the efforts of the personnel and other resources dedicated every month for the purpose. Government as well as NGO, Bangladesh Rural Advancement Committee (BRAC) are having endeavor to make the program a success. Every day, each health nurse of BRAC visits 15 household and he / she finds out / identifies the immunization requiring child, adolescent and pregnant mother. He / she informs them about the immunization center and the date of immunization fixed by the Upazila Health and Family Planning Officer (UHFPO). If necessary,

the incumbents are carried to the immunization center for ensuring their vaccination. As an example, data of immunization in Netrokona Sadar Upazila is given in Table 3.4 (*Health bulletin, 2016*).

Table 3.4: Monthly Immunization Report (Children 0 - 11 Month), December 2016.

Item	BCG	Pentavalent (1+2+3)	PCV (1+2+3)	OPV (1+2+3)	IPD	MR vaccine (1 dose)	Total
Total number of vaccine taken	503	1,616	1,586	1,616	459	511	6,291

Table 3.4 showed different types of vaccines for different diseases and also the number of vaccines given. For the month of December 2017, the total number of vaccines given to 288 EPI centers was 6,291.

The Case study of EPI at Netrokona Sadar

One of the immunization centers of Netrokona Sadar was selected for the case study and 20 vaccine takers were interviewed through the questionnaire. The immunization center was the house of Nurul Islam Master, Village: Rajendrapur, Block: Kha- 1, Ward no. 1, Union: Challisha, Thana: Netrokona Sadar. The respondents were asked how they were informed about the EPI. The status of the observation is given in the Table 3.5.

Table 3.5: Sources of EPI information.

Sources of EPI information	Health inspector/ health assistant	Family welfare assistant	BRAC health nurse	Others
Number	2	4	11	2
Percentage (%)	10.5	21.0	57.9	10.5

Table 3.5 showed that 1 respondent did not respond to the issue. From the responses, it was observed that health inspector / health assistant, family welfare assistant, BRAC health nurse and others gave the information to the vaccine takers were 10.5%, 21.0%, 57.9% and 10.5%, respectively. It was evident from the data that contribution of GO and NGO (BRAC) in providing the information of EPI was complementary and / supplementary.

When asked the service provider of NGO (BRAC) about success of the EPI, the respondents' comments are given in the following Table 3.6.

Table 3.6: Comments of service providers about success of EPI.

Item	Very good	Good	Satisfactory	Moderate	Not good
Number	5	0	0	0	0
Percentage (%)	100	0	0	0	0

It was observed from Table 3.6 that among the very good, good, satisfactory, moderate and not good, the very good comment was 100%. From the data, it was observed that EPI was a successful endeavor of primary health care service.

When the service providers of government side were asked about success of the EPI, the respondents' (5) comments are summarized in the following Table 3.7.

Table 3.7: Comments of service providers about success of EPI.

Item	Very good	Good	satisfactory	Moderate	Not good
Number	5	0	0	0	0
Percentage (%)	100	0	0	0	0

It was seen from table 3.7 that among the very good, good, satisfactory, moderate and not good, the very good comment was 100%. From the data, it was observed that EPI was a successful endeavor of primary health care service.

From the above two Table 3.6 and 3.7, both NGO and GO commented about 100% success of EPI. We visited the awareness and mobilization briefing session of BRAC at Village: Rajendrapur, Block: Kha - 1, Ward no. 1, Union: Challisha, Thana: Netrokona Sadar near to the EPI centre of the house of Nurul Islam Master. A BRAC health worker was giving briefing to the mother and adolescent and persuaded and mobilized them for going to the EPI center to take vaccines. A Figure of the BRAC's effort was given in Figure 3.23.

Figure 3.23: Briefing session for mobilization program of BRAC.

We visited the EPI center and observed that GO and NGO (BRAC) were working together to make the immunization program a success. In the EPI center, one health worker and one

family welfare assistant from UHFPO were immunizing the mother, children and adolescent. At the same time, one health nurse (BRAC) was mobilizing the vaccines takers to the Center. As a symbol of cooperation and coordination in the field was given in Figure 3.24.

Figure 3.24: Immunization at the EPI Center.

According to the information from the Deputy Commissioner's (DC) office of Netrokona district, there are 63 NGOs in Netrokona. They meet in coordination meeting monthly in DC office and discussed various issues of collaboration and problems as well related to their activities.

Coordination meeting of NGOs is also held at Upazila level. Especially, EPI and other health issues are discussed in the meetings of civil surgeon and UHFP office. This is how collaboration is being performed between GO and NGOs at the local level.

We met with Dr. Mohammad Ariful Alam, Program Head, Health, Nutrition and Population of head office of BRAC and discussed related issues of EPI. He opined that EPI is one of the successful sectors of primary health care of Bangladesh. He added that government works for the hard part, as for example, supply of vaccines and equipments and BRAC works for the soft part of EPI, as for example, mobilization. Through excellent cooperation and coordination between GO and NGO, EPI became an excellent program. But he claimed that government does not recognize the contribution of NGOs in this arena.

We also visited UHFPO of Netrokona Sadar upazila. UHFPO uttered that BRAC is supporting the mobilization for EPI, but sometimes, expected cooperation is not observed.

From the information and data included in the study, it is observed that diseases like tuberculosis, diphtheria, whooping cough, tetanus, hepatitis B virus, Hib V, polio and measles can be prevented by vaccines through EPI as a part of the efforts of primary health care services of the government. In the journey of primary health care services through EPI, collaboration of GO and NGO works effectively to a great extent. Government ensures the hard part of the EPI like procurement and supply of vaccines, pushing or injecting vaccines etc. Along with government, NGO works for the soft part like awareness and mobilization of the incumbents / clients. The study finds that via collaboration and cooperation between GO and NGO, EPI becomes a very successful program of the government. The study also finds some areas need to be improved. The areas identified might be proper coordination, endorsement of contributions of the players in smooth running of the EPI.

3.4 National Drug Policy (NDP)

Data from 500 respondents were collected by supplying questionnaire to the respondents. Later, the data were entered into the program of MS Excel Work book. The questionnaire, responses and analyses are presented below.

Question 1. Are you acquainted with National Drug Policy (NDP)?

In response to the question above, 460 of the respondents out of 500 answered 'yes' and rest 40 answered 'no'. The results were given in Figure 3.25.

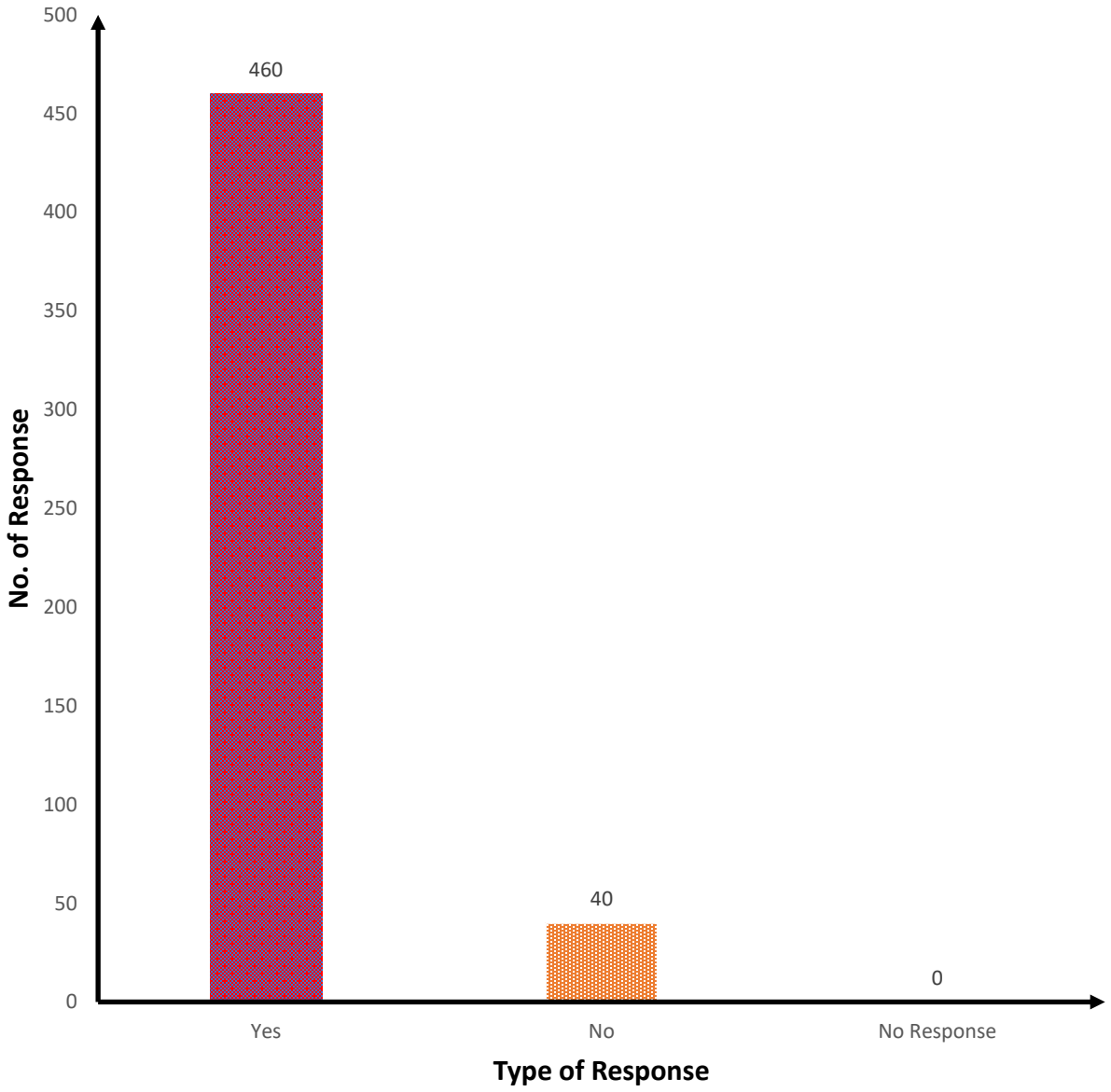

Figure 3.25: Acquaintance with the National Drug Policy (NDP).

From the above figure 3.25, it was observed that 92% of the respondents were acquainted with drug policy and 8% were not acquainted. That is, most of the respondents were acquainted with the NDP. But 100 % of the population related to pharmaceutical sciences are supposed to know about the NDP. Drug policy incorporates the life cycle of a drug. It controls every step

of drug like production, distribution, advertisement, sale etc. Appropriate and detailed knowledge of drug is incomplete without knowing the NDP of one's own country.

Question 2. If yes, what are your suggestions regarding its appropriateness the way it is now?

Some suggestions were given by the respondents in response to the question above. The suggestions were– (i) Regulatory authority should take some step and should be much stricter regarding this issue; (ii) Stakeholders should come forward to ensure the appropriateness of the policy; (iii) Strict law promulgation about NDP was suggested; (iv) Incorporation of some research work was suggested in the policy; (v) Drug policy should be a live document; (vi) Awareness building was suggested by spreading the policy among the mass people.

Question 3. If no, do you think you should have been acquainted?

In response to the above question, it was observed that 9 answered 'yes', 7 answered 'no' and 24 had 'no response'. It was observed that maximum respondents had no response regarding the question, which was unexpected. The reasons of it need to be explored. The result was shown in Figure 3.26.

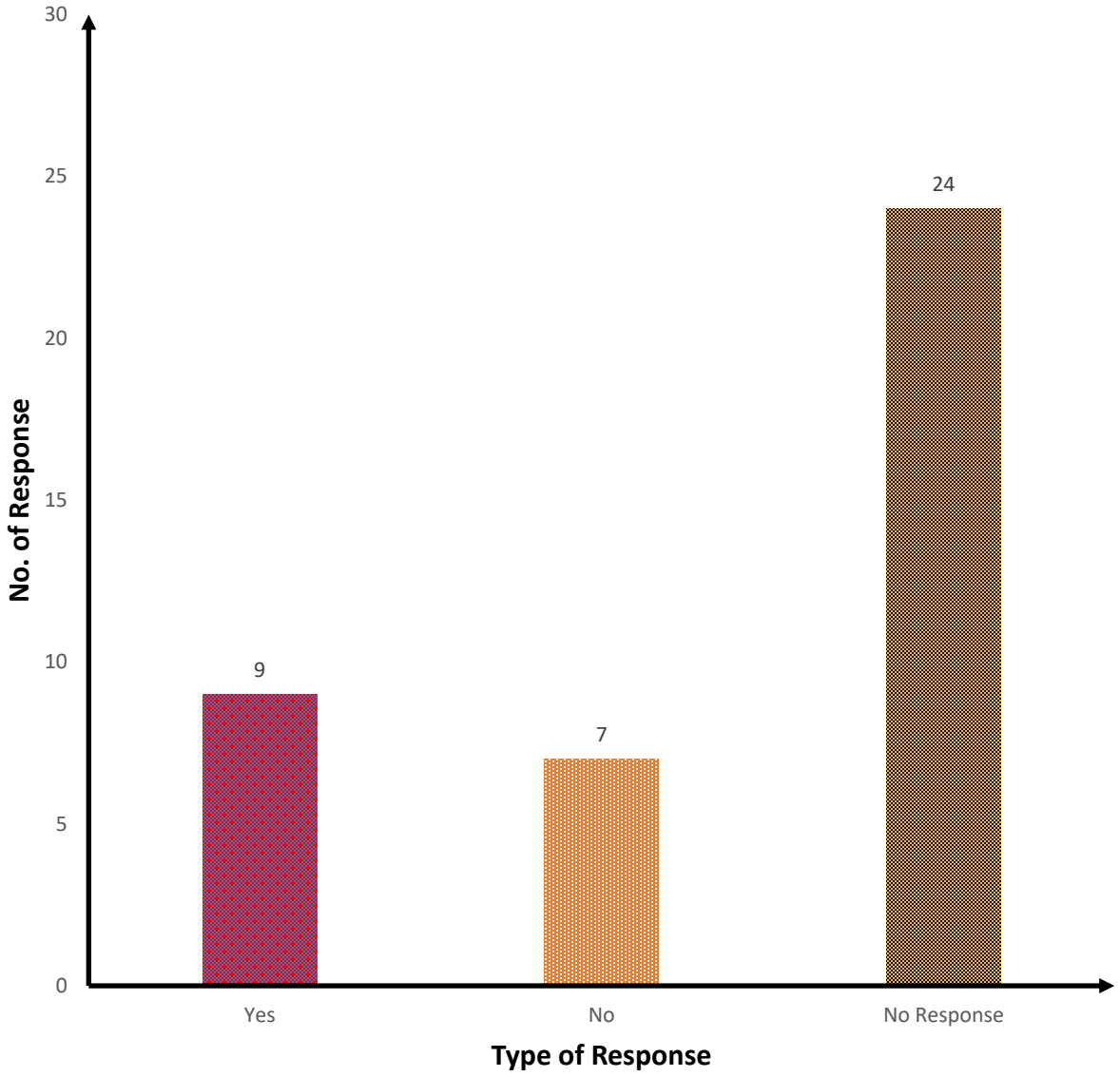

Figure 3.26: Responses to whether respondents should have been acquainted with the NDP.

In response to the question above, it was seen that 22.5% of the respondents answered 'yes', 17.5% answered 'no' and the rest 60% had 'no response'. It showed that maximum respondents did not show interest to be acquainted with NDP. But relevant people should know in detailed about the NDP.

Question 4. Do you think the present syllabus (syllabus of B.Pharm and M.Pharm) related to drug policy issue is comprehensive?

For the question above, 212 respondents answered 'yes', 280 answered 'no' and 8 remained silent. The responses were shown in Figure 3.27.

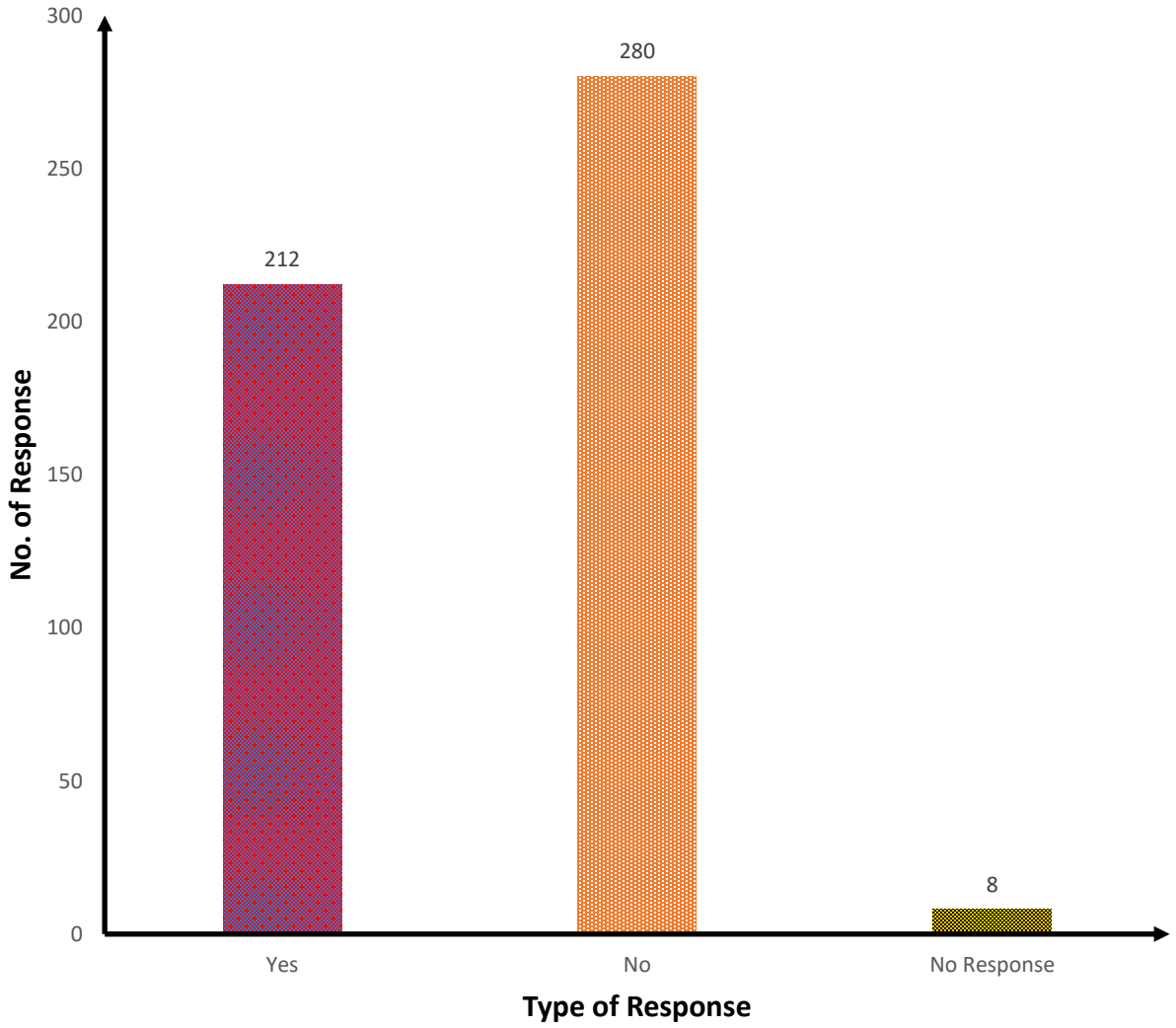

Figure 3.27: whether the present syllabus (syllabus of B.Pharm and M.Pharm) related to drug policy issue is comprehensive.

It was observed from the figure above that 42% of the respondents answered 'yes', 56% replied 'no' and 2% gave ' no response'. Most of the answers were against the present syllabus of the NDP. Only traditional knowledge about drug and medicine is not enough in order to have a good population with pharmaceutical knowledge. Knowledge of drug policy is also important as 'drug policy' plays a vital role in all the drug related aspects. it was inferred from the study that the present syllabus related to drug policy should be revisited, updated and

transformed as per the local and global market need.

Question 5. If no, what are your suggestions to improve the present syllabus?

In response to the question 5, some respondents suggested some important points to improve the present syllabus of B.Pharm and M.Pharm. Those were - (i) More topics regarding drug policy should be added; (ii) Teaching should be more elaborate; (iii) Irrelevant topics should be dropped; (iv) Repetition of topics should avoided; (v) Topics of NDP should be included from the first year and (vi) Syllabus should be a live document.

Question 6. In your opinion, is Adverse Drug Reaction Monitoring (ADRM) an important issue?

In response to the question on importance of ADRM, 490 of the respondents answered 'yes', 2 answered 'no' and 8 were silent. Responses were given in Figure 3.28.

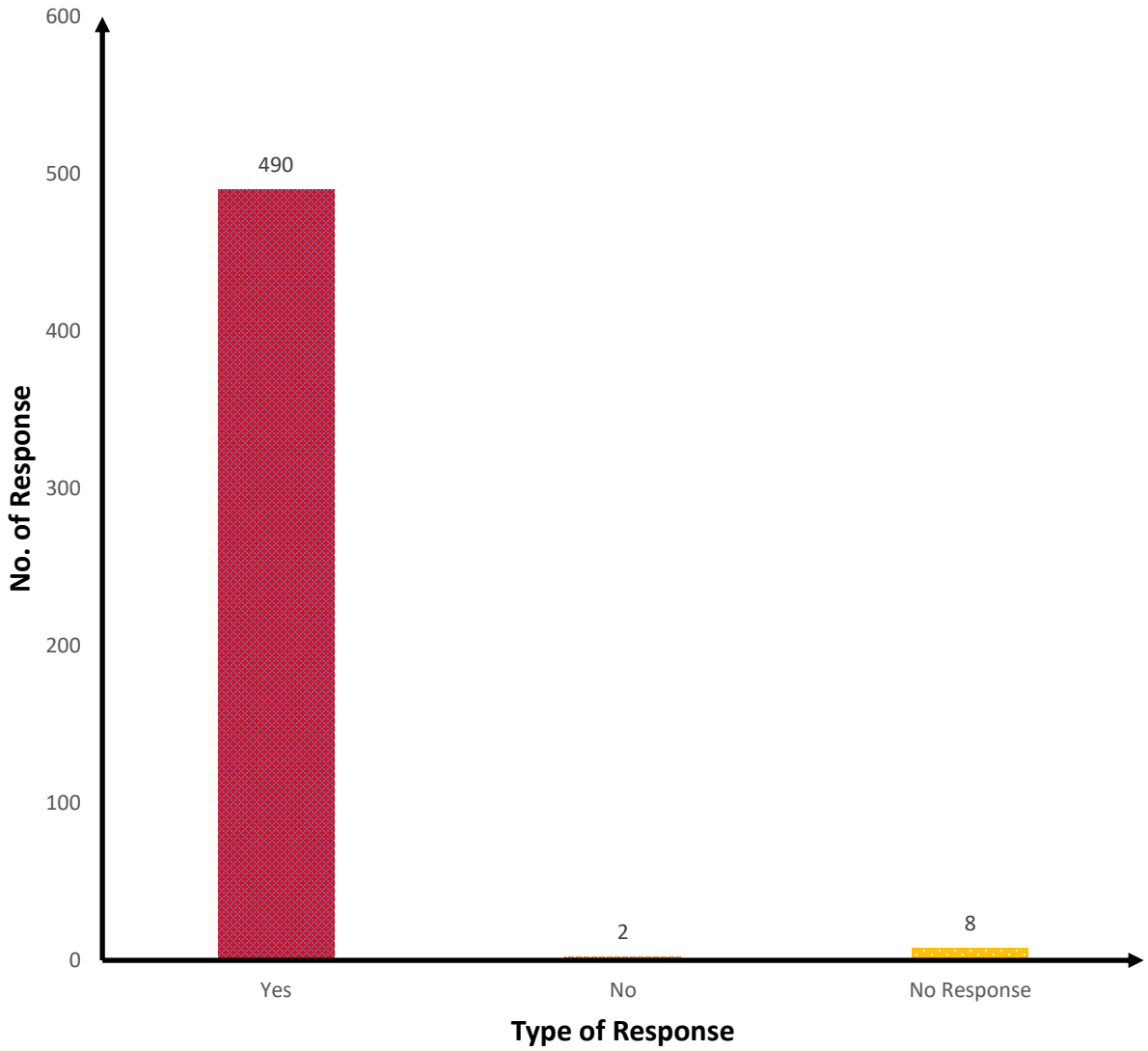

Figure 3.28: Responses to whether the Adverse Drug Reaction Monitoring (ADRM) is an important issue.

It was seen from the Figure 3.28 that 98% of the respondents agreed with the issue of ADRM. On the other hand, 2% of the respondents didn't respond to the question. This indicated that ADRM was given importance by all concerned because it is very much related to maintaining good health of people.

Question 7. Do you think that Rational Use of Drug (RUD) is an important issue today?

In response to the question above, it was seen that 490 respondents answered 'yes', 4

answered 'no' and 6 remained silent. Results were given in Figure 3.29.

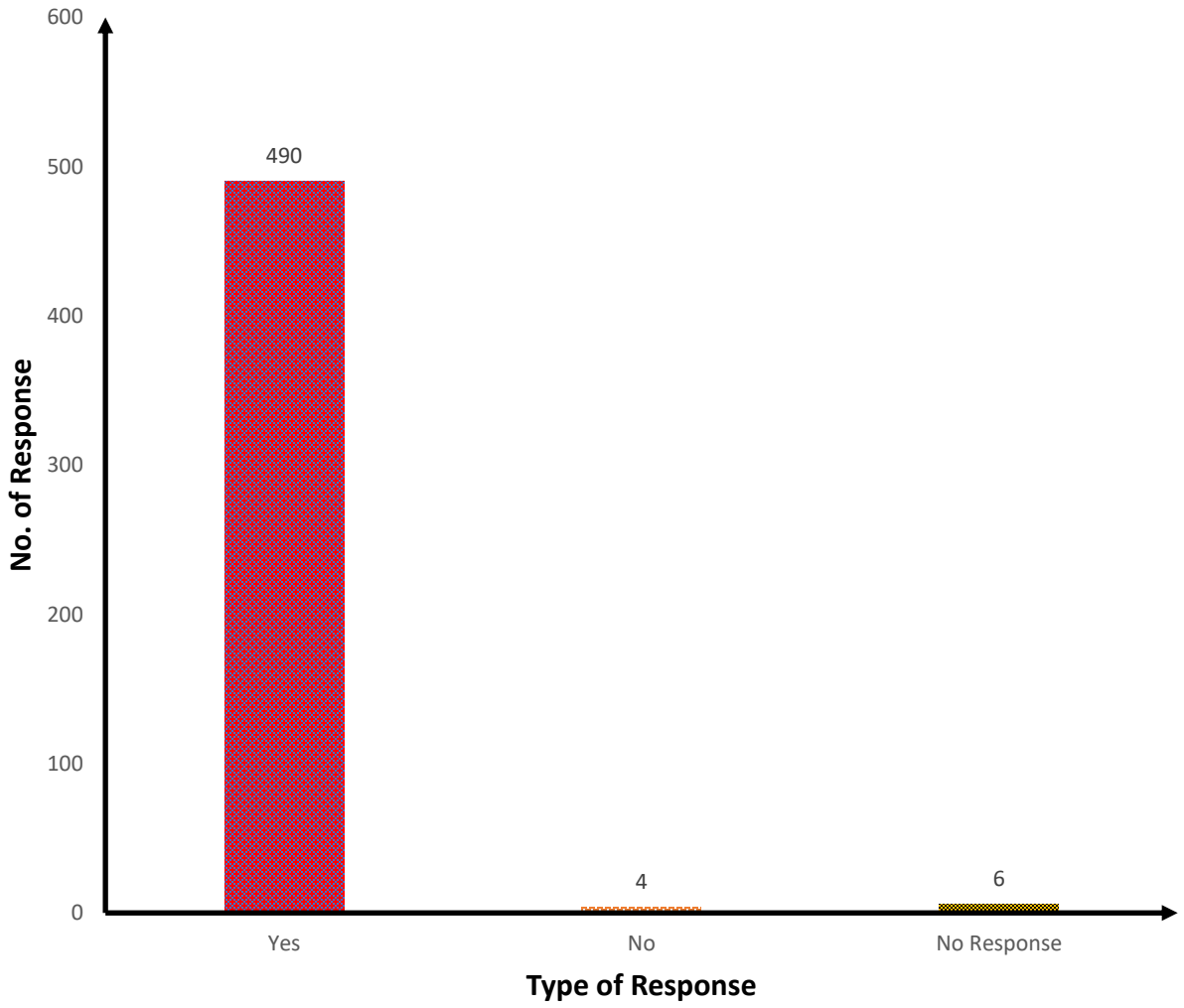

Figure 3.29: Responses to whether the Rational Use of Drug (RUD) is an important issue today.

From the Figure 3.29, it was seen that 98% of the respondents uttered that RUD was an important issue. Only 1% respondent answered 'no' and 1% didn't response to the question. It means that practicing RUD can ensure better treatment. So, the importance of RUD can be understood by the relevant people in detail**.** But it is a matter of regret that RUD is not properly maintained in our country. Therefore, according to the respondents' opinion, more care should be given to the safest use of drug by ensuring RUD.

Question 8. It is widely known that abuse of antibiotics is very common all over the country. Do you think RUD can prevent the abuse of antibiotics?

It was evident that 495 respondents opined in favor of practice of RUD to prevent abuse of antibiotics, 2 respondents answered 'no' and 3 respondents remained silent. The responses were given in Figure 3.30.

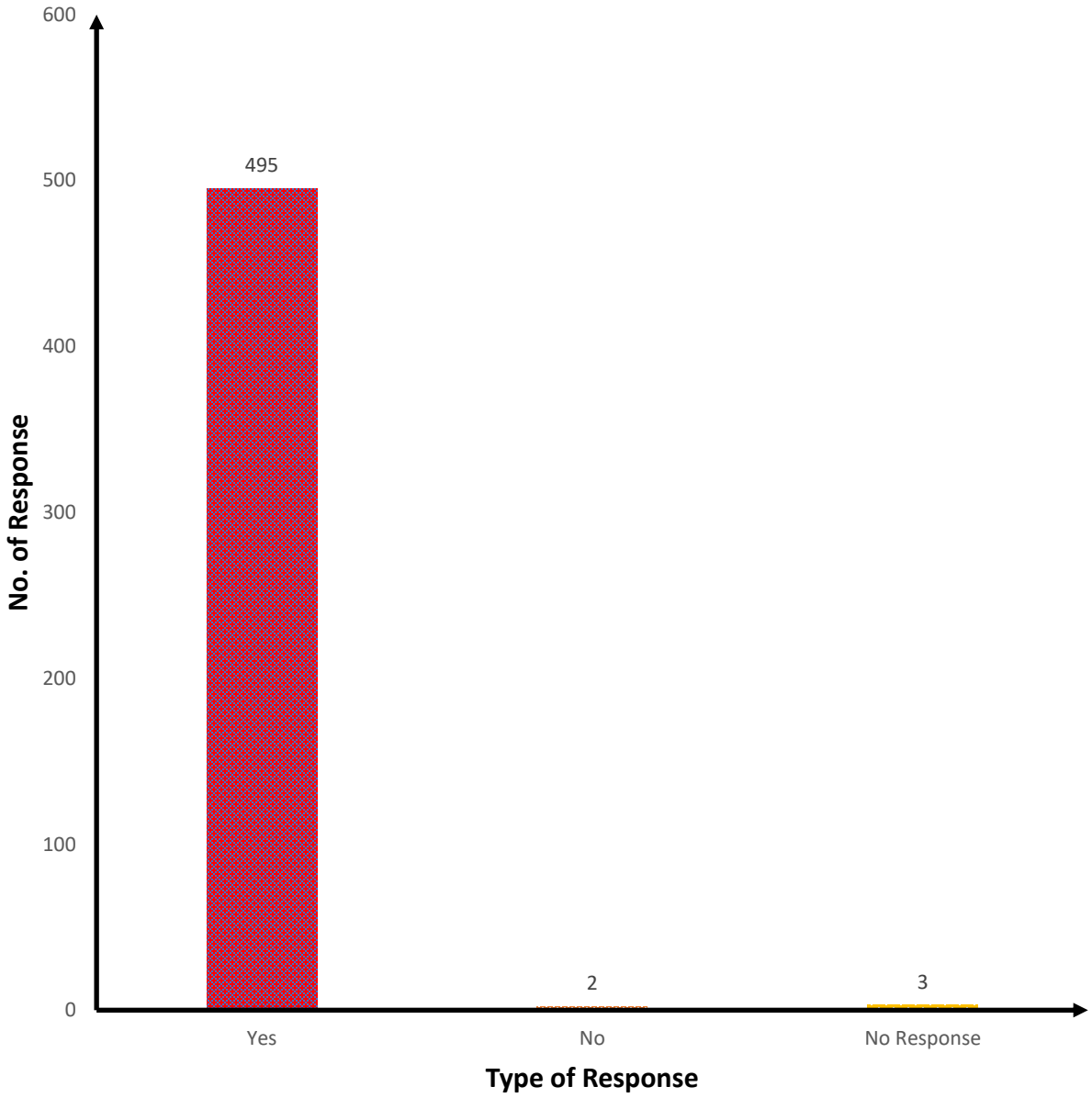

Figure 3.30: Responses regarding whether RUD can prevent abuse of antibiotics.

From the above Figure 3.30, it was seen that 99% of the respondents thought that RUD can prevent the abuse of antibiotics. Less than 1% replied 'no' regarding the question and 3 remained silent. The result indicates that right use of drug practice can prevent abuse of antibiotics.

Therefore, endeavors towards training and awareness building regarding RUD might be fruitful for combating the abuse of antibiotics in the country.

Question 9. Sustainable Development Goals (SDGs) contain some specific goals regarding use of drugs to improve public health. Do you think that it is important to incorporate the SDGs in our current drug policy?

It was seen that 441 respondents endorsed incorporation of SDGs in the current drug policy, 13 answered 'no' and 46 did not respond. The results were given in Figure 3.31.

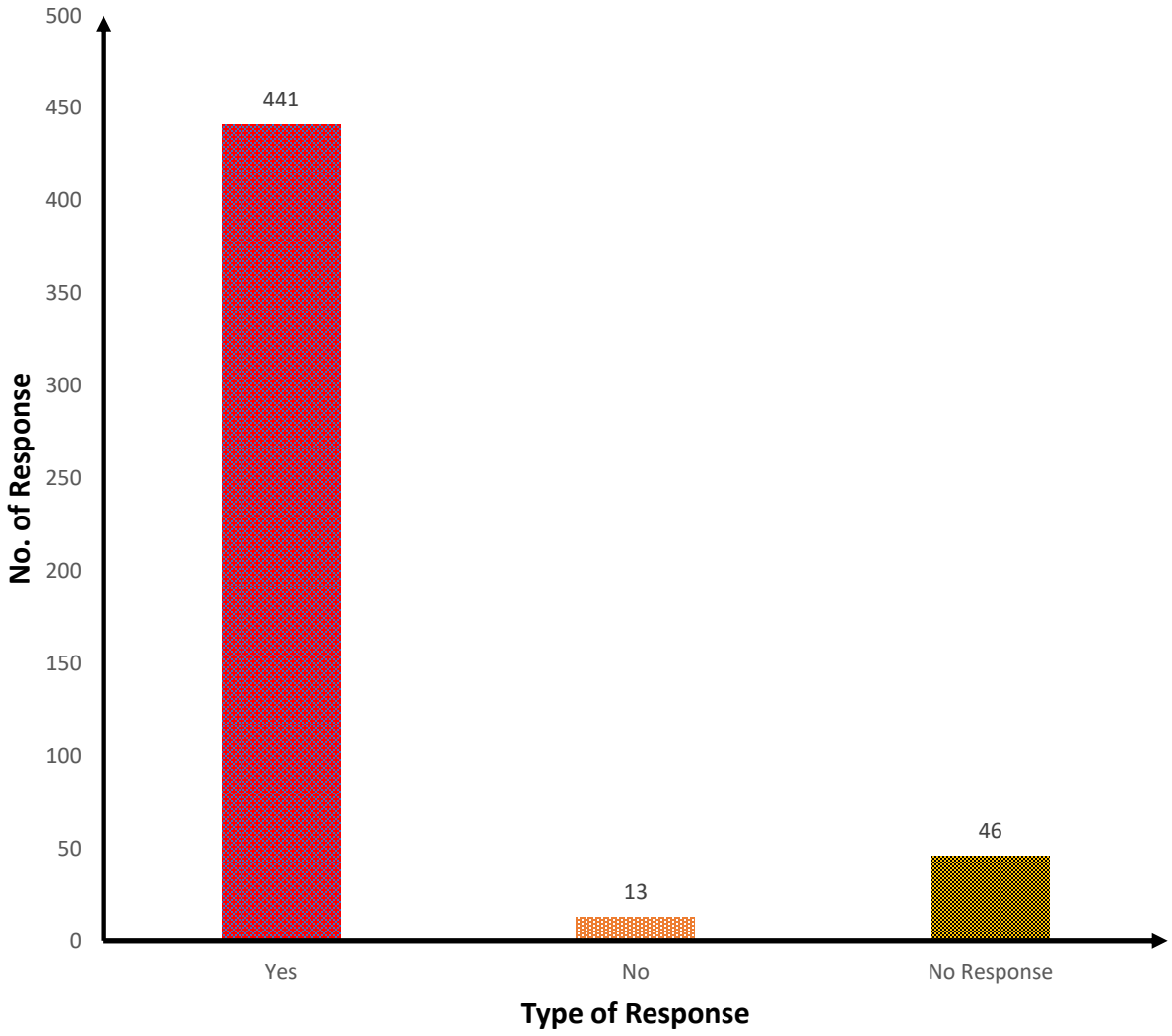

Figure 3.31.: Responses regarding importance of incorporation of SDG in the NDP.

In response to the question regarding incorporation of SDGs into the drug policy, 88% said 'yes' and 3% said 'no' where as 9% of the respondents didn't respond to the question. Therefore, maximum felt the importance of incorporation of SDGs in the drug policy to keep pace with the global market.

Question 10. Do you have any idea about essential drug program in Bangladesh?

In response to the question regarding idea of essential drug program, 372 respondents said 'yes', 110 answered 'no' and 18 did not respond. The results were given in Figure 3.32.

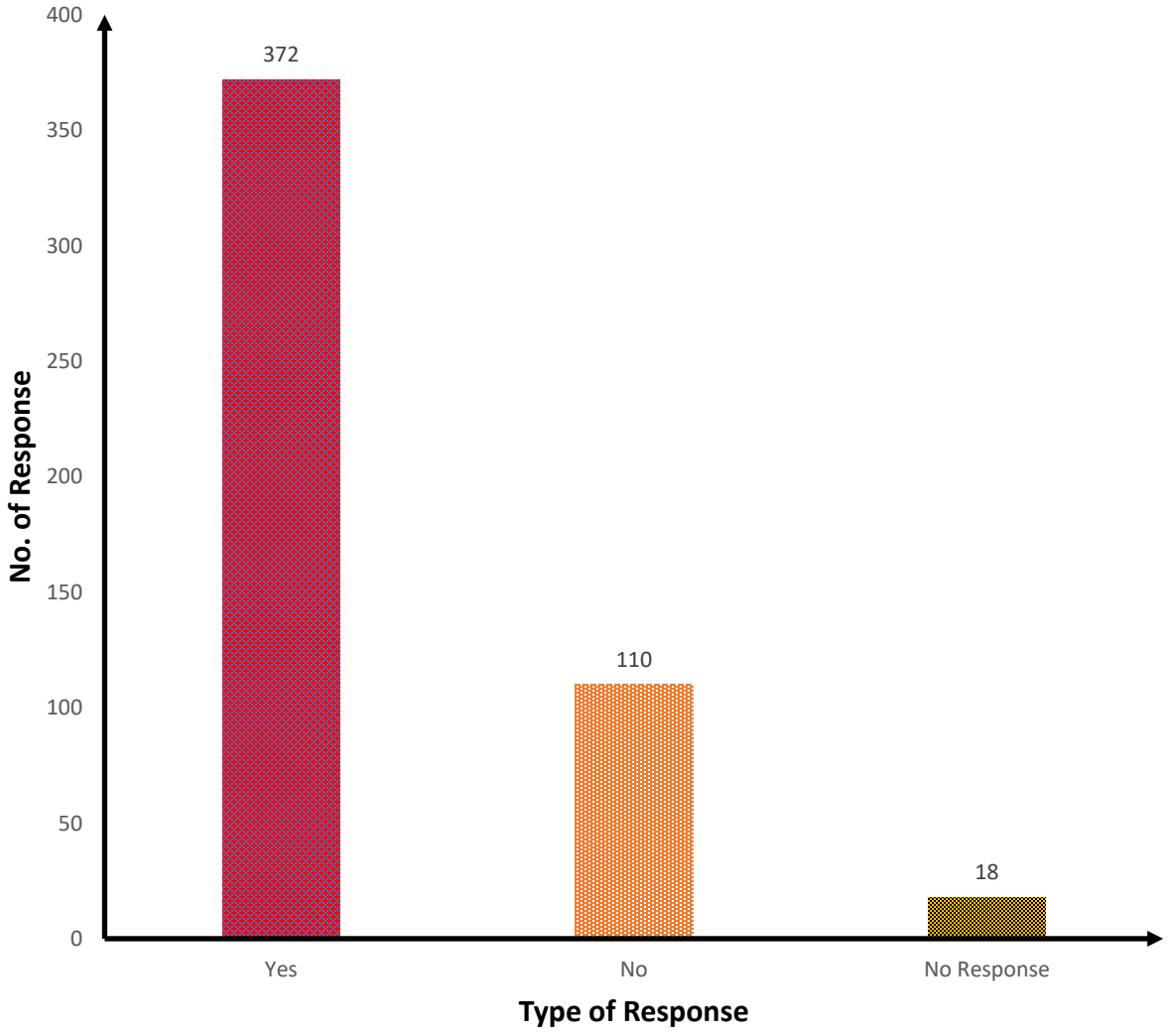

Figure 3.32: Responses regarding the idea of essential drug program.

It was observed from the above Figure that 74% of the respondents answered 'yes', 22%

answered 'no' and 4% did not respond. So, it was inferred that maximum respondents felt the necessity of knowing about essential drug program.

Question 11. How many drugs are included as essential drugs in NDP 2016?

It was a little bit tricky question because the right answer of the question was not served in the answer. The right answer is 285. Only 26 respondents were able to give the right answer among 500 respondents. 442 gave wrong answer and 32 did not respond. The results were summarized in Figure 3.33.

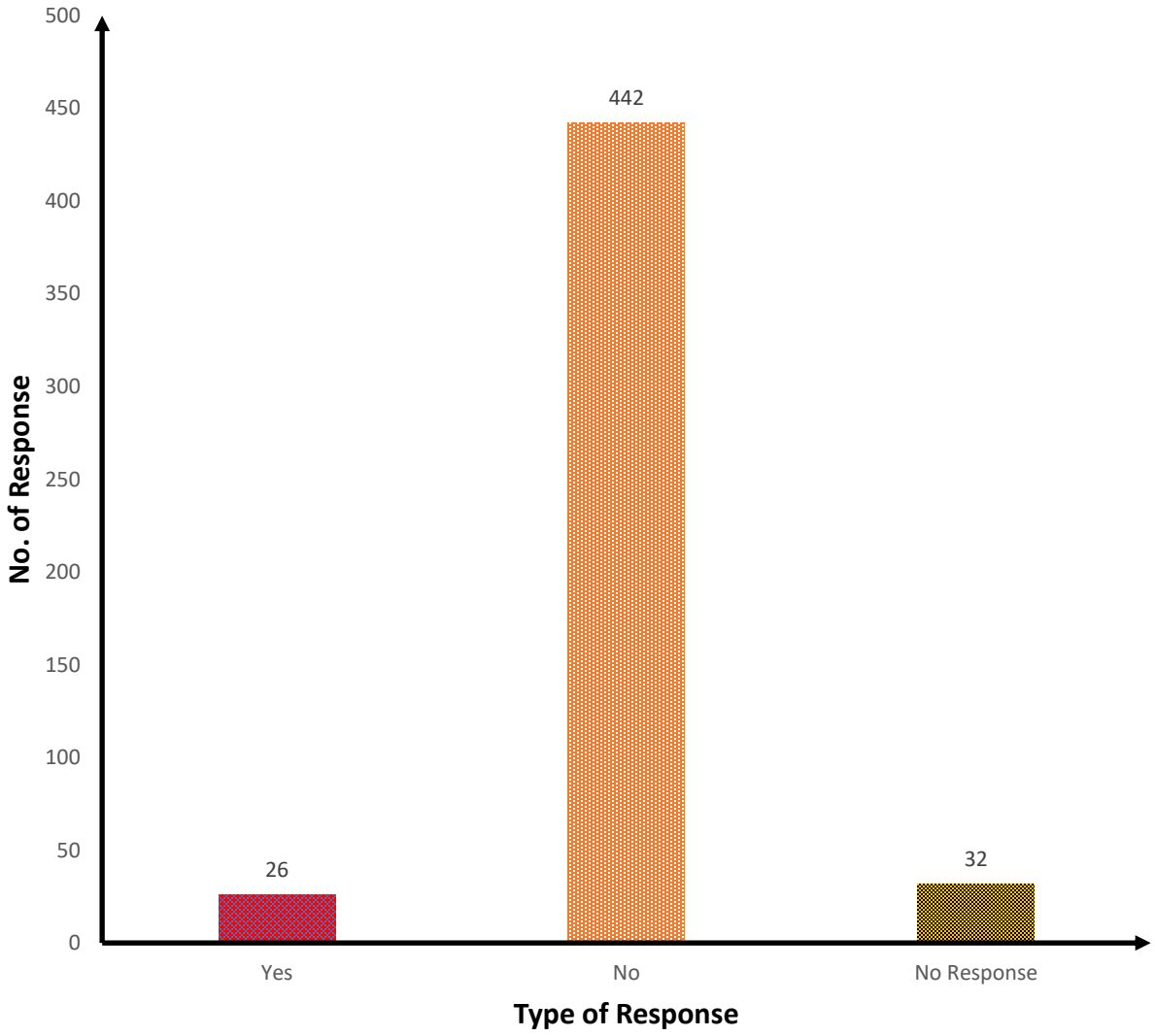

Figure 3.33: Response regarding the number of essential drugs in NDP 2016.

It was seen from the above figure that the percentage of right answer was only 5% where as percentage of wrong answer was 85% and 10% were silent. Everyone of drug and medicine discipline should know the number of essential drugs enlisted in the NDP. Therefore, it is an important point to study why this information of essential drug list is not known to all concerned.

Question 12. Do you think that the fund allocated in the national budget for research and education on drug is enough?

In response to the question 12, it was observed that 445 out of 500 respondents said 'no', 40 said 'yes' and 5 did not respond.

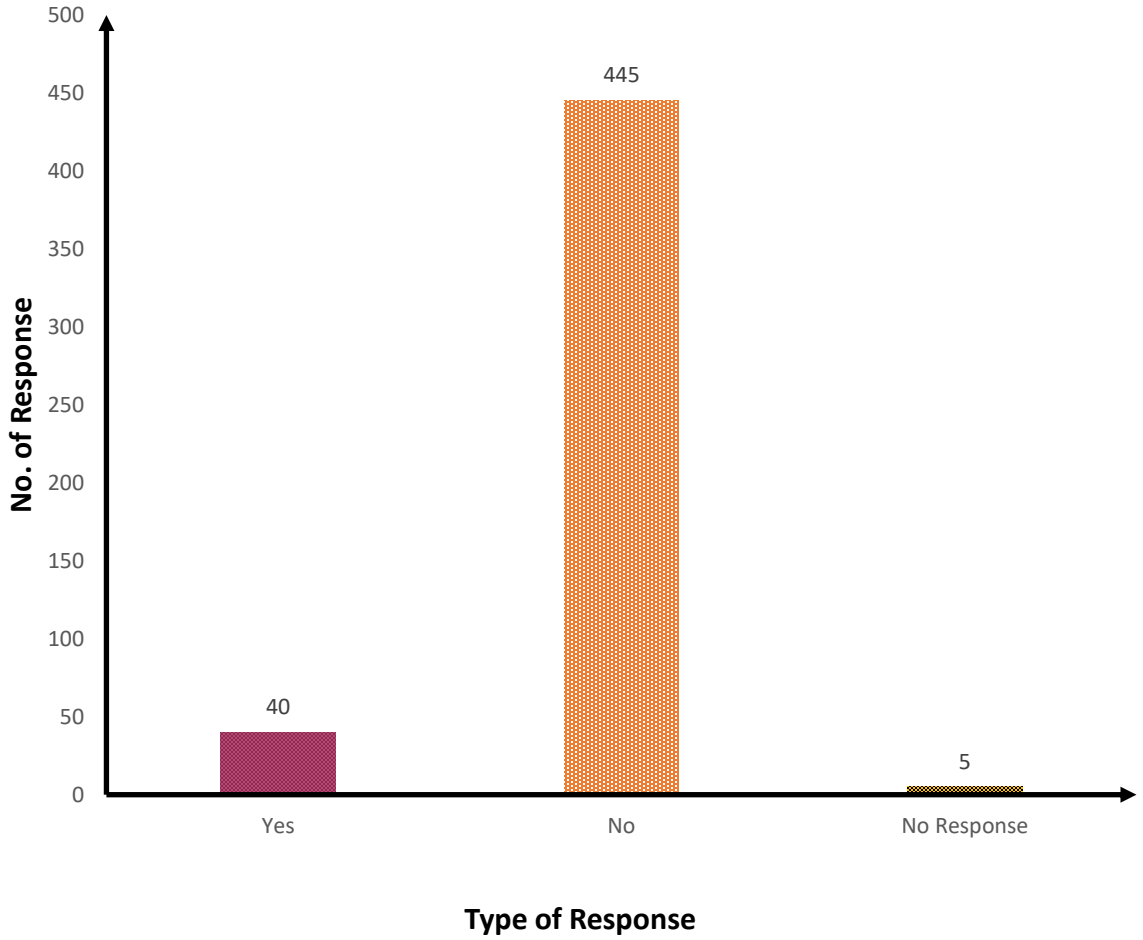

Figure 3.34: Responses to whether the fund allocated in the national budget for research and education on drug is sufficient.

From the Figure 3.34, majority (91%) of the respondents opined that the allocation of budget for our research purpose was not sufficient. 8% opined that budget was sufficient and 1% gave no response. The results of the study indicated that the present budget allocated to research and education on drug is not enough. So, budget on research and education on drug should be revisited and commensurate with the actual need.

Question 13. If no, give your comment.

Some of the comments in response to the question above are given here- (i) Budget needs to be increased; (ii) Regulatory committee should be constructed for proper management and (iii) Logics for increase of budget should be found out.

Students, teachers and researchers of different universities of pharmaceutical sciences were the respondents for the study. The understanding and perception of different respondents about NDP, ADRM, essential drug, sustainable development goals as well as Rational Use of Drugs came out throughout the study. We found the positive gestures of the respondents. Most of the respondents gave positive answers highlighting the importance of ADRM, RUD and safe use of antibiotics. 99% respondents gave their opinions in favor of right use of drug practice, which can prevent abuse of antibiotics. They aspired for awareness building and training needs in this respect.

We found by the study that some of the respondents did not know essential drug program in the country. The percentage of the respondents who did not know about it was 22%, respectively. We found that only 26 (5%) respondents out of 500 knew the exact number of essential drugs in the country. A study by Mr. AK Mohiuddin in 2018 observed that although the NDP gives clear guideline to production and distribution of essential drugs with incentives, still 80% of under privileged people doesn't have sustainable access. About 90% of the medical in-patient have to go for drug purchase from outside[37].

For the improvement of the drug policy, most of the respondents suggested to make regulatory authority to strictly execute the drug policy. The goal was to transform the policy into reality. Therefore, NDP is supposed to be spread over widely among the mass population. NDP, 2016 also immaculately talked that DGDA needs to be strengthened through appropriate

expansion of existing human resources and infrastructural facilities to render service as an effective National Regulatory Authority (NRA). The National Regulatory Authority has to be, at least, recognized by WHO and to be a member of PIC/S (The Pharmaceutical Inspection Convention/The Pharmaceutical Inspection Scheme)[38].

Almost 91% of the respondents said that budget allocation for research and education was not sufficient and they suggested to increase the budget and to make a committee to look after the issue. Drug Control Committee (DCC), Standing Committee for imports of raw materials and finished drugs, Pricing Committee and a number of other relevant Committees, which comprise of experts of different fields, are there for advising Licensing Authority and recommending it about the matters related to drugs and medicines[39]. However, from the study, there needs some improvement in implementation of the policy.

3.5 Availability, Affordability and Price Variation of Essential Antibiotics in Bangladesh

The data for each medicine were collected from different sites and national formularies. Then the data were entered into the program of MS Excel Workbook, given by the WHO/HAI. Data were checked and re-entered into the program for avoiding errors. Prices of medicines of different years were collected for a comparative study. The medicine unit prices collected from the facility survey were entered into the MS Excel-based Workbook, followed by automated and manual error-checking, and built-in automated analysis feature of the workbook. A comparative statistical analysis among prices of different years was performed by using SPSS statistical software.

Price of medicines

The median unit prices of selected medicines (shown in Table 3.8) of different years (2003, 2006, 2015 and 2019) were collected. Data were entered into the MS Excel-based Workbook. A comparative statistical analysis among prices of different years was performed by using SPSS statistic software (shown in Table 3.9). There were some medicines of which prices

changed dramatically. Sometimes, prices increased and sometimes, remained almost the same.

Table 3.8: Median unit price of medicines in different years.

Medicines	**Strength**	**Dosage form**	**Price in Different Years**			
			2003	**2006**	**2015**	**2019**
Amoxicillin	250mg	Capsule	3.29	3.02	3.54	3.51
Ampicillin	250mg	Capsule	2.51	2.5	3.25	3.25
Phenoxymethyl penicillin	250mg	Tablet	1.47	1.46	1.98	2.2
Benzathine Penicillin	12 lac units / vial	Injection	23.56	23.12	24.98	24.21
Flucloxacillin	250mg	Capsule	5.5	5.5	5.52	5.52
Procaine Penicillin	4 lac Units / vial	Injection	6.81	7.6	14.05	10
Cephradine	250mg	Capsule	6.5	6.5	6.525	6.65
Cephalexin	250mg	Capsule	6.285	6.5	6.575	6.5
Benzyl Penicillin	5 lac Units / vial	Injection	6.365	6.36	11.29	8.76
Cloxacillin	500mg	Capsule	5.5	5.355	5.8	5.92
Amoxiclav	250mg	Tablet	20.22	16.25	16.57	20
Erythromycin	250mg	Tablet	4.5	4.35	4.75	4.82
Chloramphenicol	250mg	Capsule	2.5	2.35	2.5	2.5
Doxycycline	100mg	Capsule	2	2	2.03	2.06
Co-Trimoxazole	800mg + 160mg	Tablet	2	2	2.02	2.01
Metronidazole	400mg	Tablet	1.01	1.01	1.13	1.14
Tetracycline	250mg	Capsule	1.01	1	1.1	1.3
Nalidixic Acid	500mg	Tablet	3.85	3.87	4.87	4.03

The unit price of drugs of different years in BDT were shown in the following Figure 3.35.

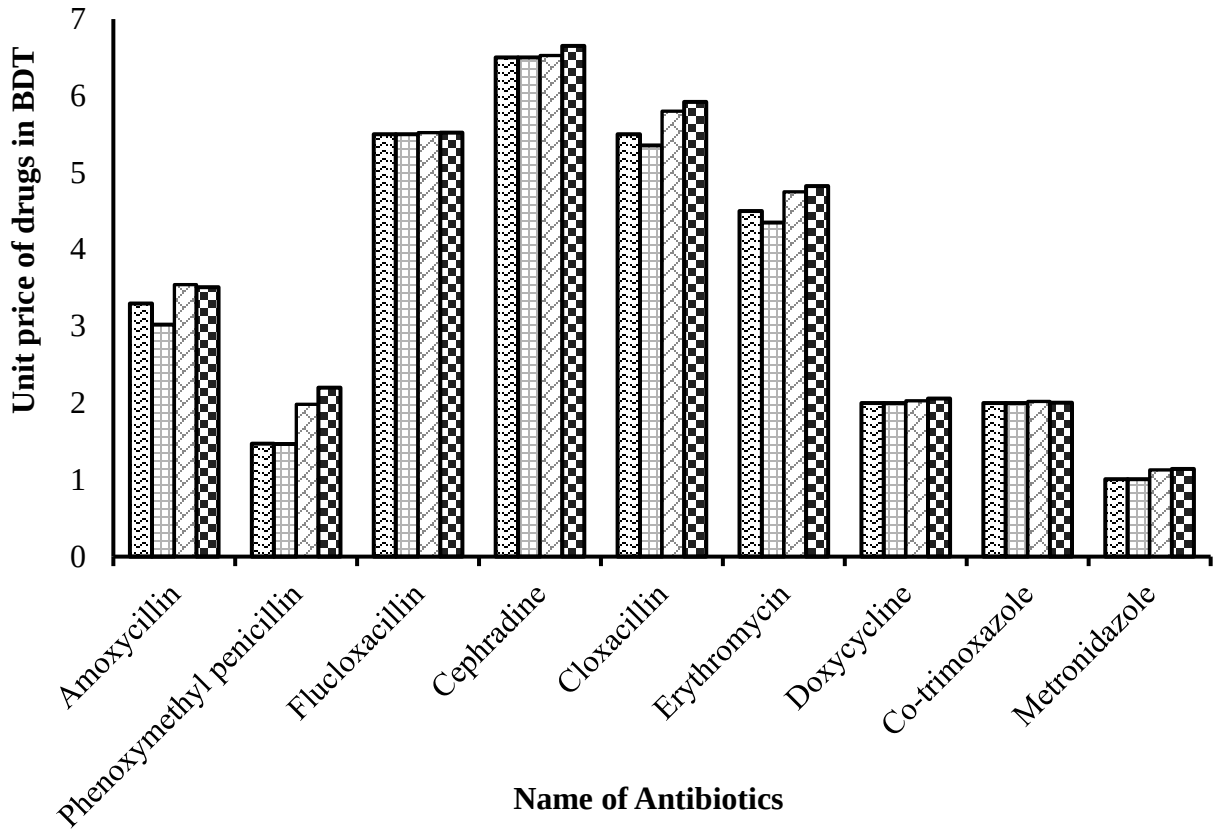

Figure 3.35: Prices of some selected Essential Antibiotics of different years.

Here, =Year 2003, = Year 2006, = Year 2015 & = Year 2019.

From Figure 3.35 it was seen that the median unit price of Amoxicillin capsule (250 mg) was Tk. 3.29 in 2003, 3.02 in 2006, 3.54 in 2015 and 3.51 in 2019, respectively; that of Phenoxymethyl Penicillin tablet (250 mg) was Tk. 1.47 in 2003, 1.46 in 2006, 1.98 in 2015 and 2.2 in 2019, respectively; that of Flucloxacillin capsule (250 mg) was Tk. 5.5 in 2003, 5.5 in 2006, 5.52 in 2015 and 5.52 in 2019, respectively; that of Cephradine capsule (250 mg) was Tk. 6.5 in 2003, 6.5 in 2006, 6.52 in 2015 and 6.65 in 2019, respectively; that of Cloxacillin capsule (500 mg) was Tk. 5.5 in 2003, 5.35 in 2006, 5.8 in 2015 and 5.92 in 2019, respectively; that of Erythromycin tablet (250 mg) Tk. 4.5 in 2003, 4.35 in 2006, 4.75 in 2015 and 4.82 in 2019, respectively; that of Doxycycline capsule (100 mg) was Tk. 2.00 in 2003, 2.00 in 2006, 2.03 in 2015 and 2.06 in 2019, respectively; that of Co-trimoxazole tablet (800mg+160 mg) was Tk. 2.00

in 2003, 2 in 2006, 2.02 in 2015 and 2.00 in 2019, respectively; that of Metronidazole tablet (400 mg) Tk. 1.01 in 2003, 1.01 in 2006, 1.13 in 2015 and 1.14 in 2019, respectively.

Table 3.9: Statistical hypothesis testing.

Paired t-Test	**Year-2003 vs Year 2006**	**Year 2003 vs Year 2015**	**Year 2003 vs Year 2019**	**Year 2006 vs Year 2015**	**Year 2006 vs Year 2019**	**Year 2015 vs Year 2019**
p-value	Can't reject Null; p-value= 0.325> α=0.05	Can't reject Null; p-value=0.168> =.05	Might reject Null; p-value =0.02< α=0.05	Might reject null; p-value =0.032< α=0.05	Might reject Null; p-value=0.007 < α=0.05	Can't reject null p-value=0.510> α=0.05
Result	Price difference not statistically significant	Price difference not statistically significant	Significant Price difference exist	Significant Price difference exist	Significant Price difference exist	Price difference not statistically significant

Here, the Null Hypothesis (H0) is there is no significant difference between the mean of two year's medicine price (i.e., population mean is the same). And the alternative hypothesis (H1) is there is significant difference between the mean of two year's medicine price (i.e., population mean is not equal). At 95% confidence level α=0.05.

Comparison between year 2003 and 2006: Medicine prices from year 2003 to 2006 were not changed much. Median prices of maximum medicine decreased in 2006 compared to year 2003. This difference of prices between year 2003 and year 2006 was not statistically significant (p value = 0.325).

Comparison between year 2003 and 2015: Median prices of maximum medicine increased in 2015 moderate compared to year 2003. This difference of prices between year 2003 and year 2015 was not statistically significant (p value = 0.168).

Comparison between year 2003 and 2019: Median prices of selected medicines increased in 2019 much compared to year 2003. This difference of prices between year 2003 and year 2019 was statistically significant (p value = 0.020).

Comparison between year 2006 and 2015: Median prices of selected medicines increased in 2015 much compared to year 2006. This difference of prices between year 2003 and year 2015 was statistically significant (p value = 0.032).

Comparison between year 2006 and 2019: Median prices of selected medicines increased in 2019 greatly compared to year 2006. This difference of prices between year 2003 and year 2019 was statistically significant (p value = 0.007).

Comparison between year 2015 and 2019: Median prices of selected medicines increased in 2019 greatly compared to year 2015. This difference of prices between year 2015 and year 2019 was not statistically significant (p value = 0.510).

Table 3.10: Price variation of essential antibiotics given in percentage across years.

Medicine	**Strength**	**Dosage form**	**Standard Price (BDT) Year 2003**	**Price increased or decreased in Percentage**		
				Year 2006	**Year 2015**	**Year 2019**
Amoxycillin	250mg	Capsule	3.295	-8.34% (3.02)	7.43% (3.54)	6.52% (3.51)
Ampicillin	250mg	Capsule	2.515	-0.6% (2.5)	29.2% (3.25)	29.2% (3.25)
Phenoxymethyl penicillin	250mg	Tablet	1.47	0% (1.47)	35% (1.985)	49.6% (2.2)
Benzathine Penicillin	12 lac units / vial	Injection	23.56	-1.8% (23.12)	6% (24.98)	2.7% (24.21)
Flucloxacillin	250mg	Capsule	5.5	0% (5.5)	0.36% (5.52)	0.36% (5.52)
Procaine	4 lac	Injection	6.815	11.5% (7.6)	106%	46.7% (10)

Penicillin	units / vial				(14.05)	
Cephradine	250mg	Capsule	6.5	0% (6.5)	0.38% (6.525)	2.3% (6.65)
Cephalexin	250mg	Capsule	6.285	3.4% (6.5)	4.6% (6.575)	3.4% (6.5)
Benzyl Penicillin	5 lac units / vial	Injection	6.365	0% (6.365)	77% (11.29)	37.7% (8.765)
Cloxacillin	500mg	Capsule	5.5	-2.6% (5.355)	5.4% (5.8)	7.6% (5.92)
Amoxiclav	250mg	Tablet	20.22	-19.6% (16.2)	-18% (16.57)	-1% (20)
Erythromycin	250mg	Tablet	4.5	-3.3% (4.35)	5.5% (4.75)	7.2% (4.825)
Chloramphenicol	250mg	Capsule	2.5	-6% (2.35)	0% (2.5)	0% (2.5)
Doxycycline	100mg	Capsule	2	0% (2)	1.5% (2.03)	3% (2.06)
Co-Trimoxazole	800mg + 160mg	Tablet	2	0% (2)	1% (2.02)	0.25% (2.01)
Metronidazole	400mg	Tablet	1.01	0% (1.01)	11.8% (1.13)	12.8% (1.14)
Tetracycline	250mg	Capsule	1.01	-0.9% (1)	8.9% (1.1)	28.7% (1.3)
Nalidixic Acid	500mg	Tablet	3.855	0.39% (3.87)	26% (4.87)	4.5% (4.03)

A graph was drawn using selected antibiotics and it showed a great deviation in price over years (Figure 3.36.1 and 3.36.2).

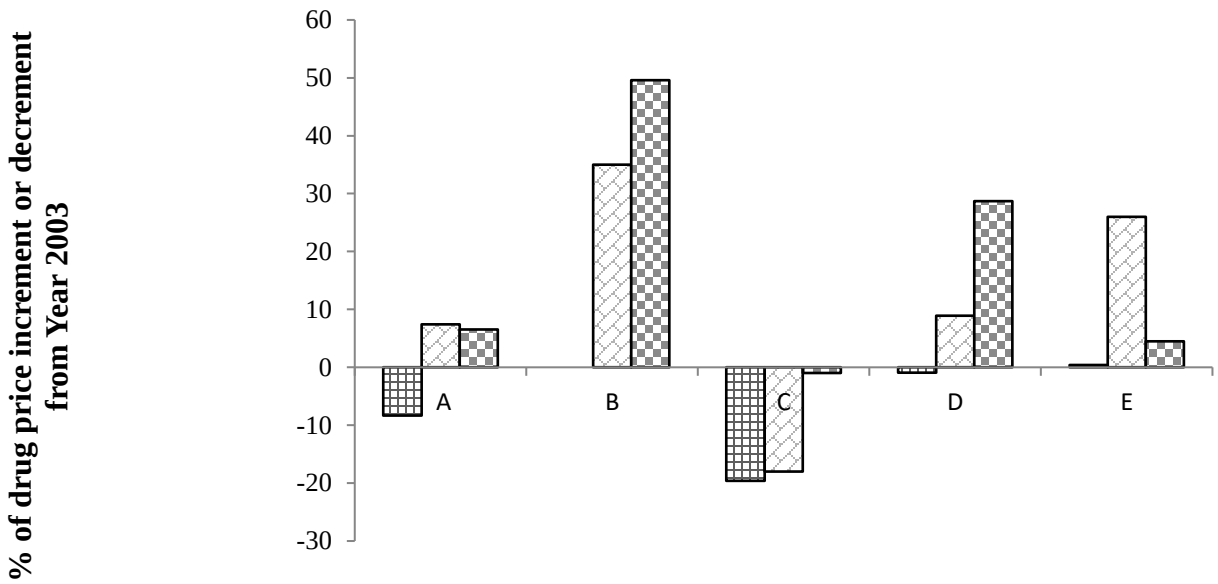

Figure 3.36.1: Price variation in percentage of selected antibiotics across years taking Year 2003 (BDNF-2) drug price as standard (in column chart).

Here, ▦ = Year 2006, ▨ = Year 2015 & ▩ = Year 2019. **A** = Amoxicillin capsule 250 mg, **B** = Phenoxymethyl Penicillin tablet 250 mg, **C** = Amoxiclav tablet 250 mg, **D** = Tetracycline cap 250 mg & **E** = Nalidixic Acid tablet 500 mg.

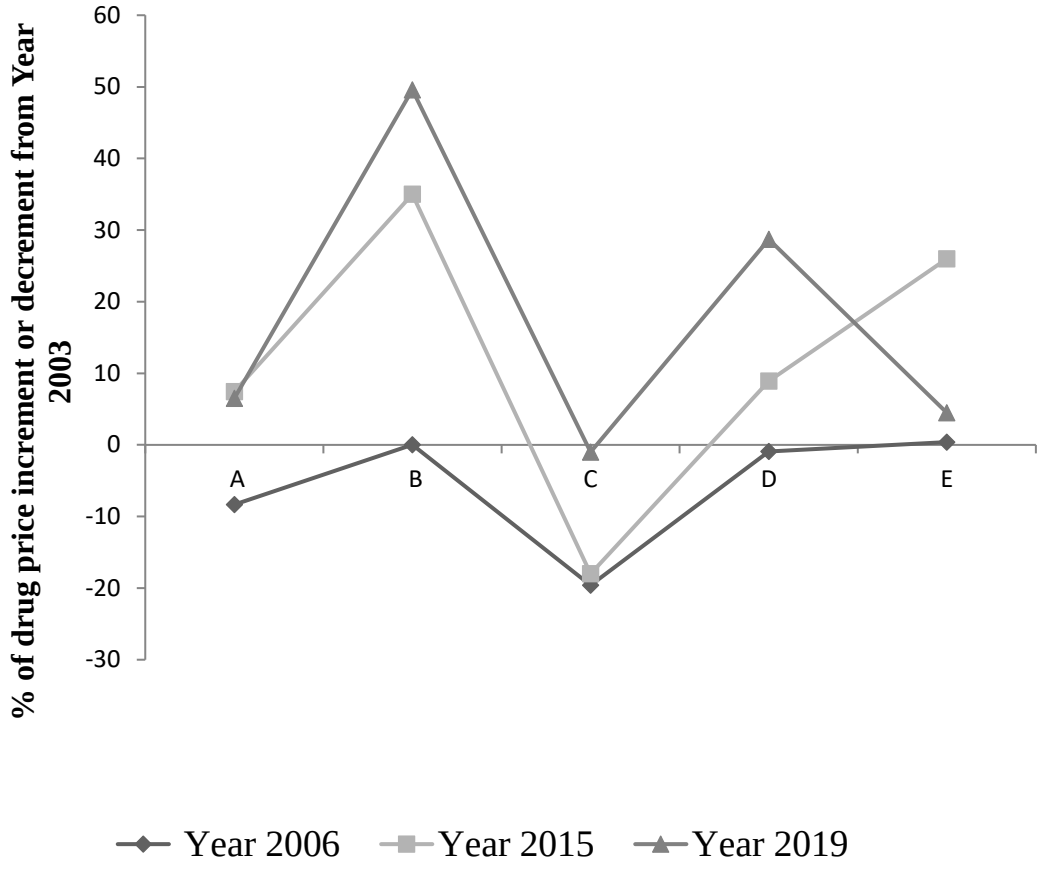

Figure 3.36.2: Price variation in percentage of selected antibiotics across years taking Year 2003 (BDNF-2) drug price as standard (in line chart).

From Figure 3.36.1, it was observed that the median unit price of Amoxicillin capsule (250 mg) decreased 8.34% from 2003 to 2006, increased 7.43% from 2003 to 2015, and 6.52% from 2001 to 2019; that of Phenoxymethyl Penicillin tablet (250 mg) increased 0% from 2003 to 2006, 35% from 2003 to 2015 and 49.6% from 2003 to 2019; that of Amoxiclav tablet (250 mg) decreased 19.6% from 2003 to 2006, 18% from 2003 to 2015 and 1% from 2001 to 2019; that of Tetracycline capsule (250 mg) decreased 0.9% from 2003 to 2006, 8.9% from 2003 to 2015 and 28.7% from 2003 to 2019; that of Nalidixic Acid tablet (500 mg) increased 0.389% from 2003 to 2006, 26% from 2003 to 2015 and 4.5% from 2003 to 2019, respectively. The results were also shown in line chart of Figure 3.36.2.

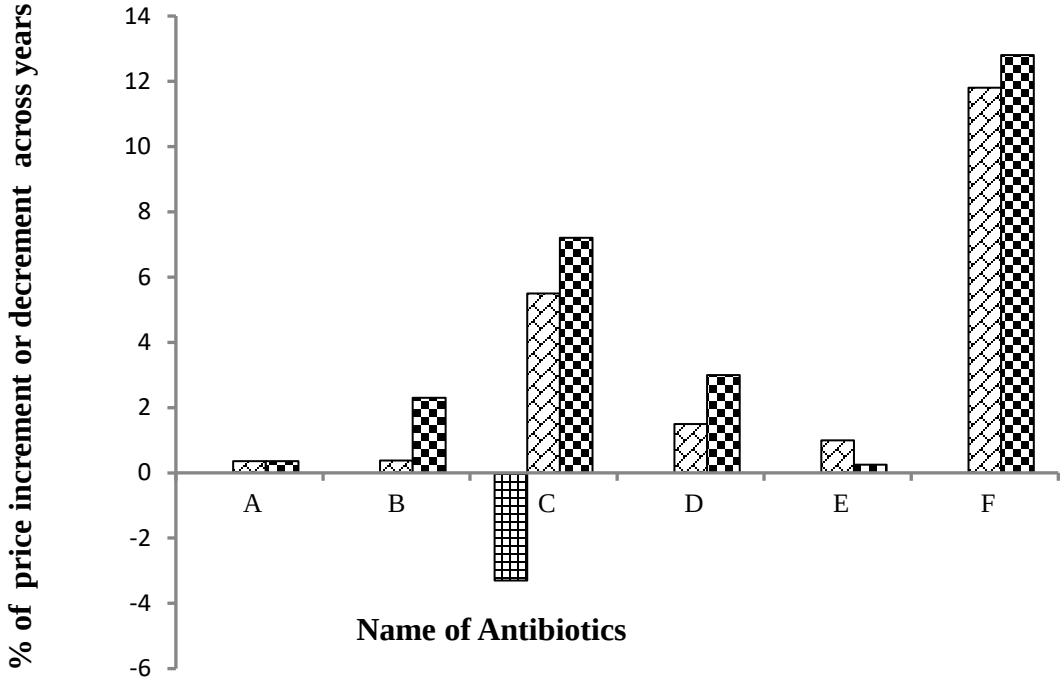

Figure 3.37.1: Price variation of selected antibiotics across years from year 2003. Drug price of year 2003 was taken as standard (in column chart).

Here, ▦ = Year 2006, ▨ = Year 2015 & ▩ = Year 2019.

A = Flucloxacillin capsule 250 mg, **B =** Cephradine capsule 250 mg, **C** = Erythromycin tablet 250 mg, **D** = Doxycycline capsule 250 mg, **E** = Co-trimoxazole tablet 800 mg + / 160 mg & **F** = Metronidazole tablet 400mg.

From Figure 3.37.1, it was observed that the Median unit price of Flucloxacillin Capsule 250 mg increased 0% from 2003 to 2006, increased 0.36% from 2003 to 2015 and 0.36% from 2001 to 2019; that of Cephradine Capsule 250 mg increased 0 % from 2003 to 2006, 0.38% from 2003 to 2015 and 2.3% from 2003 to 2019 ; that of Erythromycin Tablet 250 mg decreased 3.3% from 2003 to 2006, 5.5% from 2003 to 2015 and 7.2% from 2001 to 2019; that of Doxycycline

Capsule 250 mg increased 0% from 2003 to 2006, 1.5% from 2003 to 2015 and 3% from 2003 to 2019; that of Co-trimoxazole Tablet 800 mg+160 mg increased 0% from 2003 to 2006, 1% from 2003 to 2015 and 0.25% from 2003 to 2019; that of Metronidazole Tablet 400 mg increased 0% from 2003 to 2006, 11.8% from 2003 to 2015 and 12.8% from 2003 to 2019, respectively. The results were also shown in Figure 3.37.2.

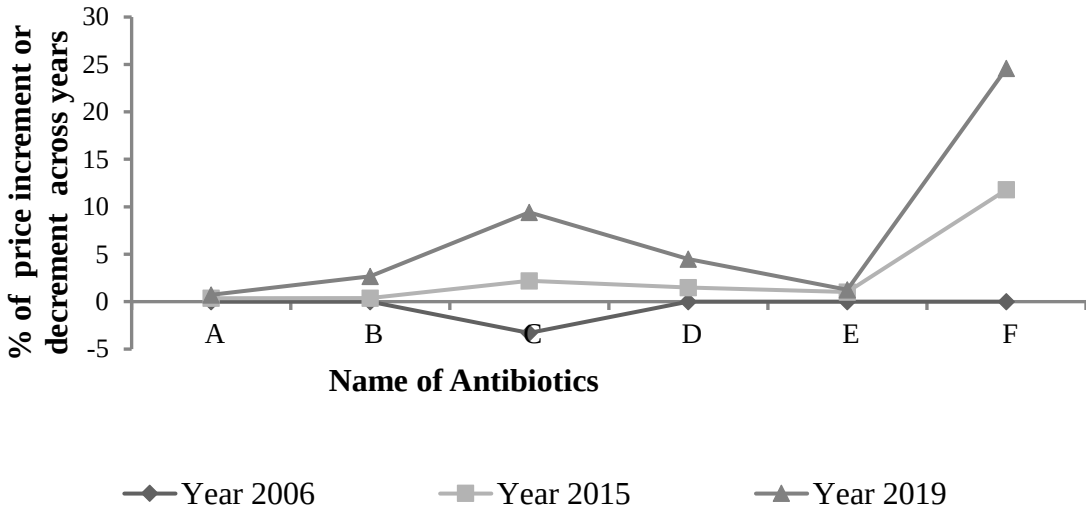

Figure 3.37.2: Price variation of selected antibiotics across years from year 2003. Drug price of year 2003 was taken as standard (in line chart).

A = Flucloxacillin capsule 250 mg, **B =** cephradine capsule 250 mg, **C** = Erythromycin tablet 250 mg, **D** = Doxycycline capsule 250 mg, **E** = Co-trimoxazole tablet 800 mg + / 160 mg & **F** = Metronidazole tablet 400 mg.

Median Price Ratio (MPR)

As median price ratios of medicine within a country can provide insight into the local medicine pricing policies, comparison with medicine prices in other countries can give further information and is spcifically powerful in advocacy messages. Median Price Ratio (MPR) of medicines was calculated for observing how many times greater or lesser the price of local medicines in comparison to international reference unit prices. The formula for calculating MPR is given here.

$$\text{Median Price Ratio (MPR)} = \frac{\text{Median local unit price}}{\text{International reference unit price}}$$

The prices of medicines of year 2015 and 2019 were converted to United States Dollar (USD) using the exchange rate on 30.06.2015 ($1 USD = 77.78 Bangladeshi Taka) and 28.01.2019 ($1 USD= 83.46 BDT), respectively. The international prices of 2015 were taken as reference unit prices.

Table 3.11: Median Price Ratio (MPR) of surveyed essential antibiotics.

Medicines	**Strength**	**Dosages form**	**Median international reference unit price (USD)**	**Median local unit price (USD)**		**Median price ratio (MRP)**	
				2015	**2019**	**2015**	**2019**
Amoxicillin	250mg	Capsule	0.0227	0.0455	0.042	2.00	1.85
Ampicillin	250mg	Capsule	0.0163(S)	0.0417	0.039	2.56	2.39
Phenoxymethyl penicillin	250mg	Tablet	0.0388	0.0255	0.026	0.66	0.67
Benzathine Penicillin	12 lac units / vial	Injection	0.1809	0.321	0.29	1.77	1.6
Flucloxacillin	250mg	Capsule	0.0403	0.0709	0.066	1.76	1.64
Procaine Penicillin	4 lac Units / vial	Injection	0.2951	0.1806	0.119	0.61	0.40
Cephradine	250mg	Capsule		0.08383	0.079		
Cephalexin	250mg	Capsule	0.0475	0.08453	0.078	1.78	1.64
Benzyl Penicillin	5 lac Units / vial	Injection	0.1224	0.1451	0.105	1.18	0.86
Cloxacillin	500mg	Capsule	0.0566	0.0745	0.071	1.32	1.25
Amoxiclav	250mg	Tablet	0.1476 (S)	0.2130	0.239	1.44	1.62
Erythromycin	250mg	Tablet	0.045	0.0610	0.058	1.35	1.28

Chloramphenicol	250mg	Capsule	0.09	0.0321	0.03	0.36	0.33
Doxycycline	100mg	Capsule	0.0192	0.0261	0.025	1.36	1.30
Co-Trimoxazole	800mg+ 160mg	Tablet	0.0314	0.0259	0.024	0.82	0.76
Metronidazole	400mg	Tablet	0.0157	0.0145	0.0136	0.92	0.83
Tetracycline	250mg	Capsule	0.0222	0.0141	0.016	0.63	0.67
Nalidixic Acid	500mg	Tablet	0.0435	0.0626	0.048	1.44	1.1

Supplier's price was taken.

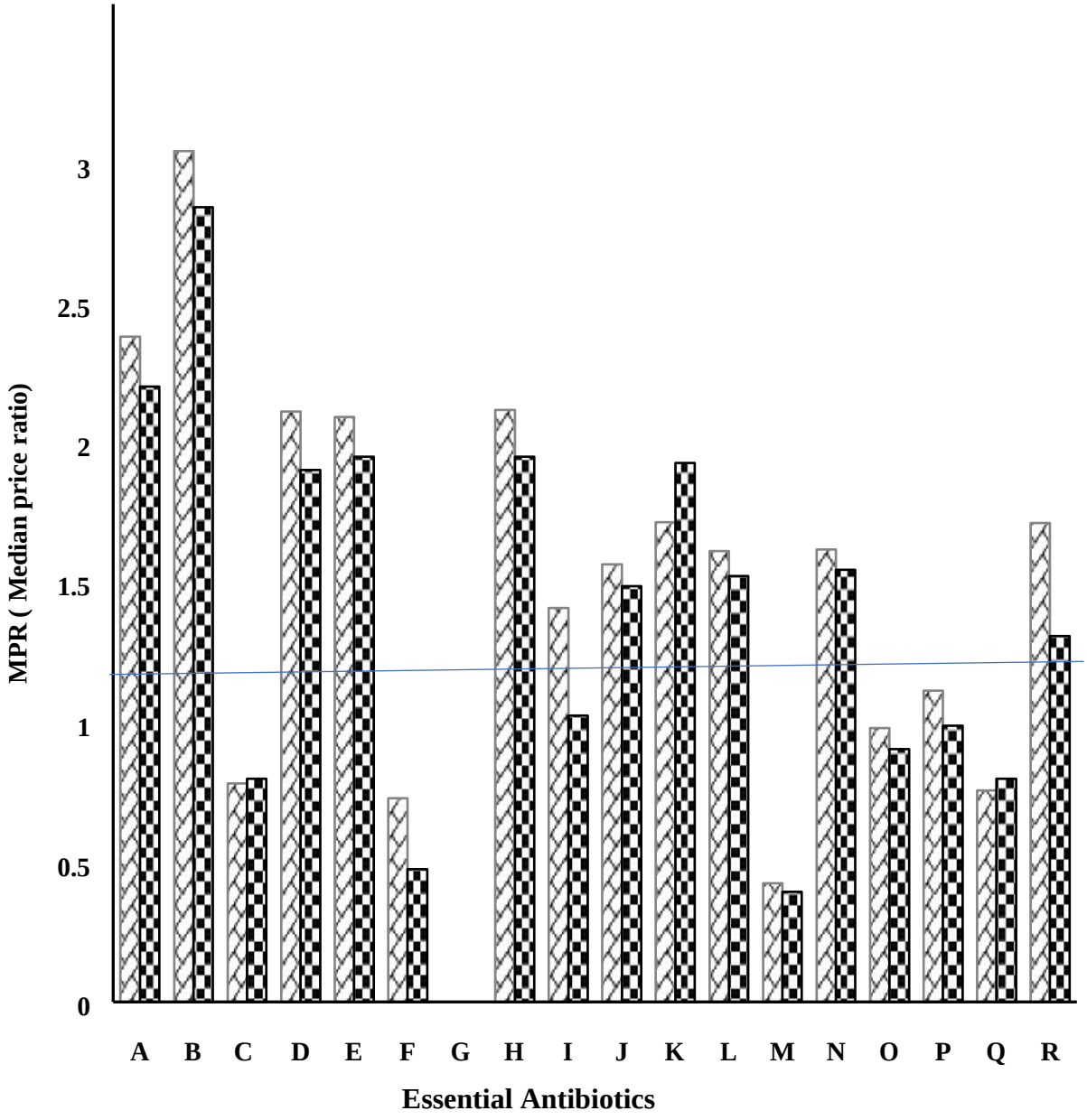

Figure 3.38: Median Price Ratio (MPR) of selected essential antibiotics.

Here, ▨ = Year 2015 & ▩ = Year 2019.

A = Amoxycillin, B = Ampicillin, C = Phenoxymethyl Penicillin, D = Benzathine Penicillin, E = Flucloxacillin, F = Procaine Penicillin, G = Cephradine, H = Cephalexin, I = Benzyl Penicillin, J = Cloxacillin, K = Amoxiclav, L = Erythromycin, M = Chloramphenicol, N = Doxycycline, O =

Co-Trimoxazole, P = Metronidazole, Q = Tetracycline & R = Nalidixic Acid.

From Figure 3.38, it was observed that the Median Price Ratio of Amoxicillin was 2 and 1.85 in 2015 and 2019, respectively; that of Ampicillin was 2.56 and 2.39 in 2015 and 2019, respectively; that of Phenoxymethyl Penicillin was 0.66 and 0.67 in 2015 and 2019, respectively; that of Benzathine Penicillin was 1.77 and 1.6 in 2015 and 2019, respectively; that of Flucloxacillin was 1.76 and 1.64 in 2015 and 2019, respectively; that of Procaine Penicillin was 0.61 and 0.4 in 2015 and 2019, respectively; that of Cephradine was not found; that of Cephalexin was 1.78 and 1.64 in 2015 and 2019, respectively; that of Benzyl Penicillin was 1.2 and 0.86 in 2015 and 2019, respectively; that of Cloxacillin was 1.32 and 1.25 in 2015 and 2019, respectively; that of Amoxiclav was 1.44 and 1.62 in 2015 and 2019, respectively; that of Erythromycin was 1.36 and 1.28 in 2015 and 2019, respectively; that of Chloramphenicol was 0.36 and 0.33 in 2015 and 2019, respectively; that of Doxycycline was 1.36 and 1.3 in 2015 and 2019, respectively; that of Co-Trimoxazole was 0.82 and 0.76 in 2015 and 2019, respectively; that of Metronidazole was 0.93 and 0.83 in 2015 and 2019, respectively; that of Tetracycline was 0.64 and 0.67 in 2015 and 2019, respectively; that of Nalidixic Acid was 1.44 and 1.1 in 2015 and 2019, respectively.

Availability of Medicines

Manufacturers of each medicine were counted for assessing medicine availability. This gave the national availability of the medicines. Availability of medicines at regional level was determined by collecting data from different retail pharmacies. It is important to point out that the availability expressed in the results refers to all eighteen surveyed medicines. The medicines found at the time of data collection were termed as available.

Table 3.12: Availability and Market growth of essential antibiotics.

Medicines	**Dosages Form**	**No. of manufacturers in different year**				
		2001	**2003**	**2006**	**2015**	**2019**
Amoxicillin	Capsule/Dry Syrup /Injection	10	75	70	45	69

Ampicillin	Capsule/Dry Syrup /Injection	10	11	9	6	6
Phenoxymethyl	Tablet/Syrup	10	15	17	10	16
Penicillin						
Benzathine penicillin	Injection	7	4	5	2	6
Flucloxacillin	Capsule/Syrup/Injection	10	46	57	49	70
Procaine penicillin	Injection	4	2	3	3	4
Cephradine	Capsule/Syrup/Injection	10	54	58	57	79
Cefalexin	Capsule/Tablet/Syrup	11	39	30	8	20
Benzyl penicillin	Injection	3	3	2	1	4
Cloxacillin	Capsule/Syrup/Injection	10	30	26	14	16
Amoxiclav	Tablet/Capsules/ Dry Syrup/Injection	8	4	4	8	14
Erythromycin	Tablet/Oral Suspension /Injection	10	27	40	40	50
Chloramphenicol	Eye/Ear Drops/Ointment	4	5	4	21	25
Doxycycline	Capsule	10	47	46	25	40
Co-trimoxazole	Tablet/Suspension	9	69	60	33	32
Metronidazole	Tablet/Oral Liquid/Injection	11	77	70	44	80

Tetracycline	Capsule/Injection	10	37	34	14	26
Nalidixic acid	Tablet/Syrup	10	12	11	4	9

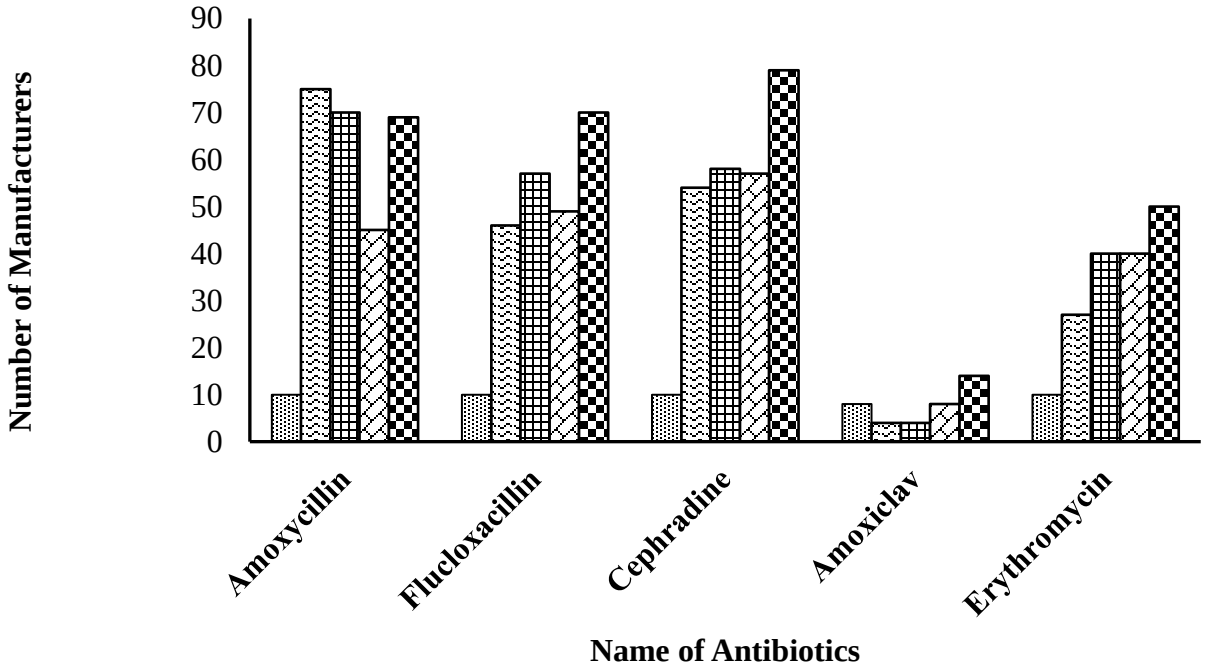

Figure 3.39.1: Manufacturers' number of selected essential antibiotics across years.

Here, ▨ =Year 2001, ▨ = Year 2003, ▨ = Year 2006, ▨ = Year 2015 & ▨ = Year 2019.

From Figure 3.39.1, it was seen that the number of manufacturers of Amoxicillin was 10 in 2001, 75 in 2003, 70 in 2006, 45 in 2015 and 69 in 2019; that of Flucloxacillin was 10 in 2001, 46 in 2003, 57 in 2006, 49 in 2015 and 70 in 2019; that of Cephradine was 10 in 2001, 54 in 2003, 58 in 2006, 57 in 2015 and 79 in 2019; that of Amoxiclav was 8 in 2001, 4 in 2003, 4 in 2006, 8 in 2015 and 14 in 2019; that of Erythromycin was 10 in 2001, 27 in 2003, 40 in 2006, 40 in 2015 and 50 in 2019, respectively.

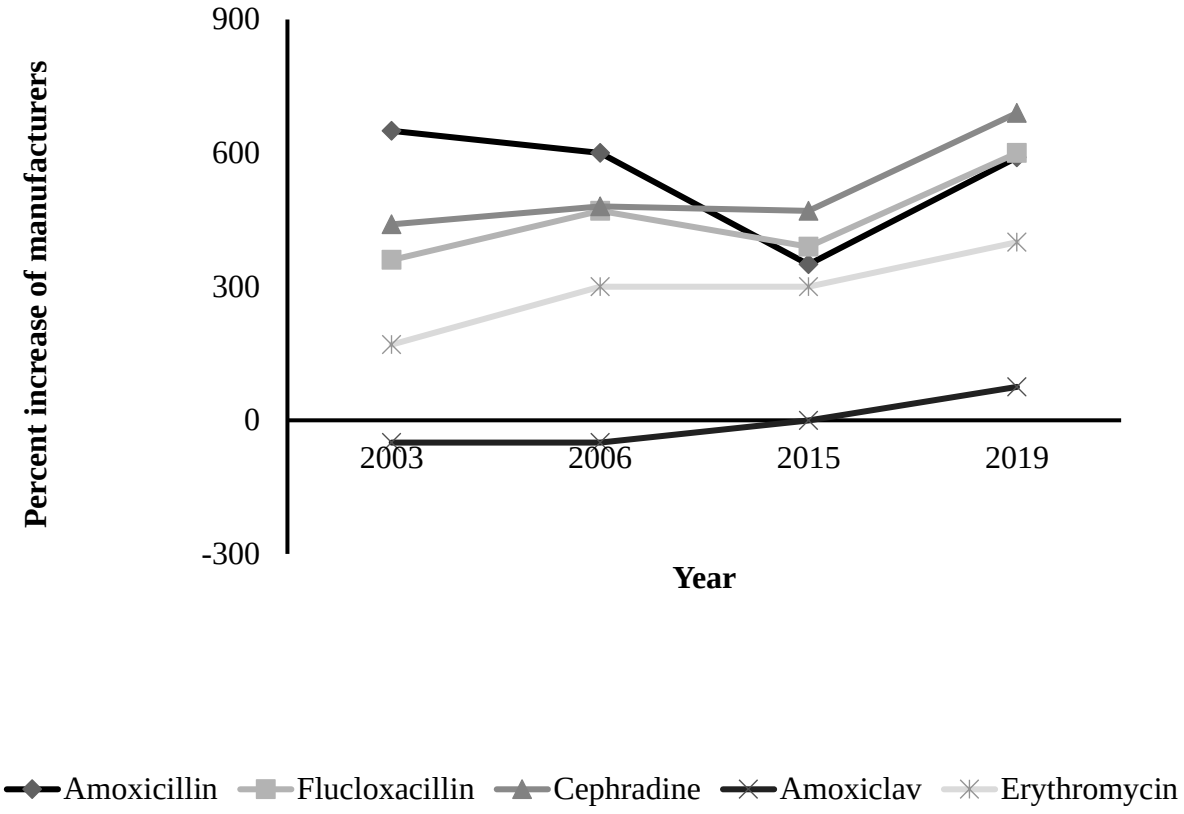

Figure 3.39.2: Percent increase of manufacturers across years.

From Figure 3.39.2, it was observed that the number of manufacturers of Amoxicillin increased 650% from 2001 to 2003, 600% from 2001 to 2006, 350% from 2001 to 2015 and 590% from 2001 to 2019; that of Flucloxacillin increased 360% from 2001 to 2003, 470% from 2001 to 2006, 390% from 2001 to 2015 and 600% from 2001 to 2019; that of Cephradine increased 440% from 2001 to 2003, 480% from 2001 to 2006, 470% from 2001 to 2015 and 690% from 2001 to 2019; that of Amoxiclav decreased 50% from 2001 to 2003, 50% from 2001 to 2006, increased 0% from 2001 to 2015 and 75% from 2001 to 2019; that of Erythromycin increased 170% from 2001 to 2003, 300% from 2001 to 2006, 300% from 2001 to 2015 and 400% from 2001 to 2019, respectively.

We inspected a total of 25 retail pharmacies to gather information about the described

medicines. When one outlet had the medicine of any dose and dosage form on the time of data collection referred to availability of a medicine. Data were collected from different types of retail pharmacies - large, small; medicine shop, model pharmacy; medicine stores located near both the government and non-government hospitals. The retail shops were located in different regions of the Dhaka Metropolitan City. Among the inspected retail shops, the essential antibiotics were poorly available in general medicine stores as compared to the Model pharmacies. Therefore, availability was higher in Model pharmacies than General medicine stores.

Table 3.13: Availability of generic equivalent medicines in retail pharmacies.

Medicine	Dosages Form	Availability in percentage (%)	
		Model Pharmacy (n=10)	**General medicine store (n=15)**
Amoxicillin	Capsule/Dry Syrup /Injection	100%	93.33%
Ampicillin	Capsule/Dry Syrup /Injection	70%	26.66%
Phenoxymethyl Penicillin	Tablet/Syrup	90%	53.33%
Benzythine penicillin	Injection	80%	33.33%
Flucloxacillin	Capsule/Syrup/Injection	100%	86.66%
Procaine penicillin	Injection	20%	0%
Cephradine	Capsule/Syrup/Injection	100%	80%
Cephalexin	Capsule/Tablet/Syrup	60%	6.66%
Benzyl penicillin	Injection	30%	6.66%
Cloxacillin	Capsule/Syrup/Injection	90%	26.66%
Amoxiclav (Amoxicillin + Clavulanic acid)	Tablet/Capsules/ Dry Syrup/Injection	100%	86.66%
Erythromycin	Tablet/Oral Suspension /Injection	100%	66.66%
Chloramphenicol	Eye/Ear Drops/Ointment	70%	40%

Doxycycline	Capsule	90%	66.66%
Co-trimoxazole (Amoxicillin + Clavulanic acid)	Tablet/Suspension	100%	46.66%
Metronidazole	Tablet/Oral Liquid/Injection	100%	86.66%
Tetracycline	Capsule/Injection	100%	46.66%
Nalidixic acid	Tablet/Syrup	50%	33.33%

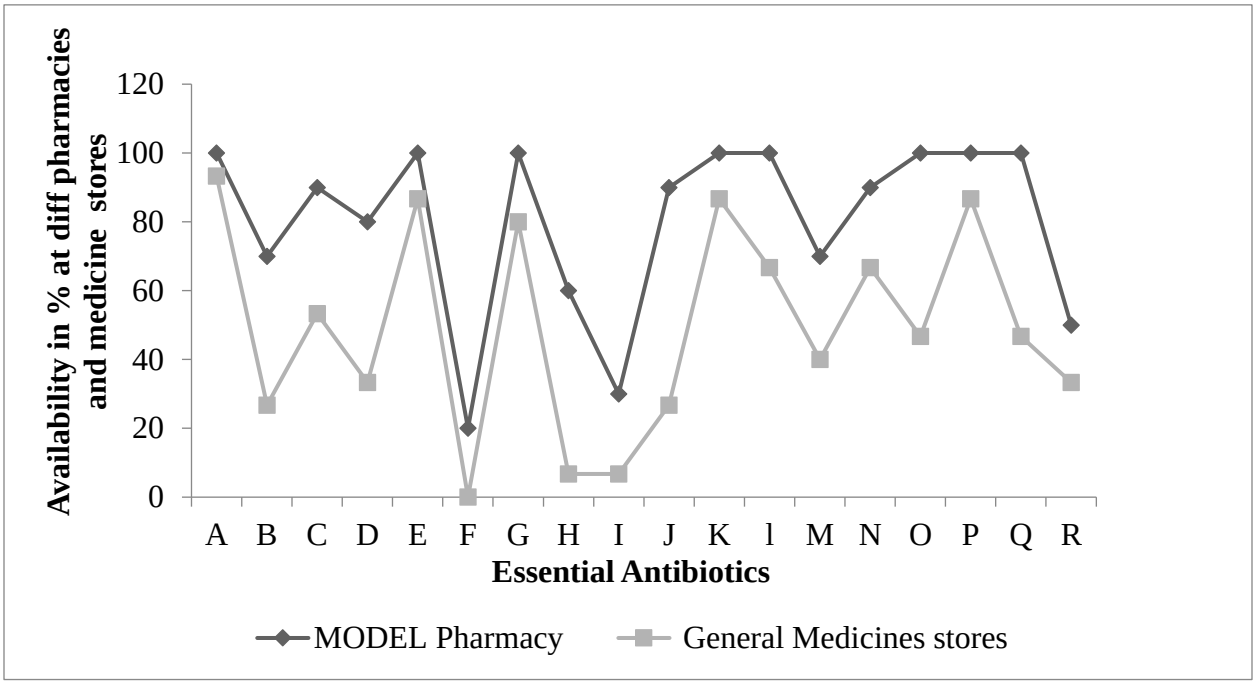

Figure 3.40: Availability of selected essential antibiotics at Dhaka Metropolitan city in Bangladesh.

A = Amoxicillin, **B** = Ampicillin, **C** = Phenoxymethyl Penicillin, **D** = Benzathine Penicillin, **E** = Flucloxacillin, **F** = Procaine Penicillin, **G** = Cephradine, **H** = Cephalexin, **I** = Benzyl Penicillin, **J** = Cloxacillin, **K** = Amoxiclav, **L** = Erythromycin, **M** = Chloramphenicol, **N** = Doxycycline, **O** = Co-Trimoxazole, **P** = Metronidazole, **Q** = Tetracycline & **R** = Nalidixic Acid.

From Figure 3.40, it was observed that the availability of Amoxicillin was 100% and

93.3% in Model pharmacies and General medicine stores respectively; that of Ampicillin was 70% and 26% in Model pharmacies and General medicine stores, respectively; that of Phenoxymethyl Penicillin was 90% and 53% in Model pharmacies and General medicine stores, respectively; that of Benzathine Penicillin was 80% and 33.3% in Model pharmacies and General medicine stores, respectively; that of Flucloxacillin was 100% and 86% in Model pharmacies and General medicine stores, respectively; that of Procaine Penicillin was 20% and 0% in Model pharmacies and General medicine stores, respectively; that of Cephradine was 100% and 80% in Model pharmacies and General medicine stores, respectively ; that of Cephalexin was 60% and 7% in Model pharmacies and General medicine stores, respectively; that of Benzyl Penicillin was 30% and 7% in Model pharmacies and General medicine stores, respectively; that of Cloxacillin was 90% and 26% in Model pharmacies and General medicine stores, respectively; that of Amoxiclav was 100% and 86% in Model pharmacies and General medicine stores, respectively; that of Erythromycin was 100% and 66% in Model pharmacies and General medicine stores, respectively; that of Chloramphenicol was 70% and 40% in Model pharmacies and General medicine stores, respectively; that of Doxycycline was 90% and 66% in Model pharmacies and General medicine stores, respectively; that of Co-Trimoxazole was 100% and 46% in Model pharmacies and General medicine stores, respectively; that of Metronidazole was 100% and 86% in Model pharmacies and General medicine stores, respectively; that of Tetracycline was 100% and 46% in Model pharmacies and General medicine stores, respectively; that of Nalidixic Acid was 50% and 33.3% in Model pharmacies and General medicine stores, respectively.

Affordability of Medicine

Medicine affordability was determined by calculating the expenses of standard treatment to complete a full course (shown in Table 3.14). The prices of medicines of 2019 were considered. The government of Bangladesh, on September 13, 2018, announced Tk. 8000 as the minimum salary for the Garment worker. The lowest monthly wage of unskilled people was considered as BDT 8000. The economic condition of Bangladesh is also improving. The per capita national income is also increasing every year. Therefore, the medicines are becoming more affordable as well. The following Table indicates some idea about health and economic status of Bangladesh.

Table 3.14: Prices per regimens of treatment with different essential antibiotics.

Medicine	**Strength**	**Course of treatment**	**No. of units per treatment**	**Median price per tab/vial**	**Price per course of treatment**	**Number of days' wages**
Amoxicillin	Cap 250mg	6 Cap/day, 7 days	42	3.51	147.42	0.553
Ampicillin	Cap 250mg	6 Cap/day,7 days	42	3.25	136.5	0.512
Phenoxymethyl-penicillin	Tab 250mg	8 tab/day, 7 days	56	2.2	123.2	0.462
Benzathine penicillin	Inj12 lac unit/vial	2 Inj/week,3 weeks	6	24.21	145.26	0.545
Flucloxacillin	Cap 250mg	6 Cap/day, 7 days	42	5.52	231.84	0.87
Procaine penicillin	Inj4 lac unit/vial	2vial/day, 10 days	20	10	200	0.75
Cephradine	Cap 250mg	8 Cap/day, 7 days	56	6.65	372.4	1.4
Cephalexin	Cap 250mg	8 Cap/day, 7 days	56	6.5	364	1.36
Benzyl penicillin	Inj 5lac unit/vial	4 vial/day, 5 days	20	8.765	175.3	0.66
Cloxacillin	Cap 500mg	4 cap/day, 7 days	28	5.92	165.76	0.6216
Amoxiclav (Amoxicillin + Clavulanic acid)	Tab 250mg+125 mg	6 tab/day, 7 days	42	20	840	3.15
Erythromycin	Tab 250mg	8 tab/day, 7 days	56	4.825	270.2	1.01

Chloramphenicol	Cap 250mg	8 Cap/days,5 days	40	2.5	100	0.4
Doxycycline	Cap 100mg	2 Cap/day,7 days	14	2.06	28.84	0.11
Co-trimoxazole (Trimethoprim + Sulfamethoxazole)	Tab 800mg+160 mg	2 Cap/day,7 days	14	2.005	28.07	0.105
Metronidazole	Tab 400mg	4 cap/day, 7 days	28	1.14	31.92	0.12
Tetracycline	Cap 250mg	8 Cap/day, 7 days	56	1.3	72.8	0.273
Nalidixic acid	Tab 500mg	8 Cap/day, 7 days	56	4.03	225.68	0.8463

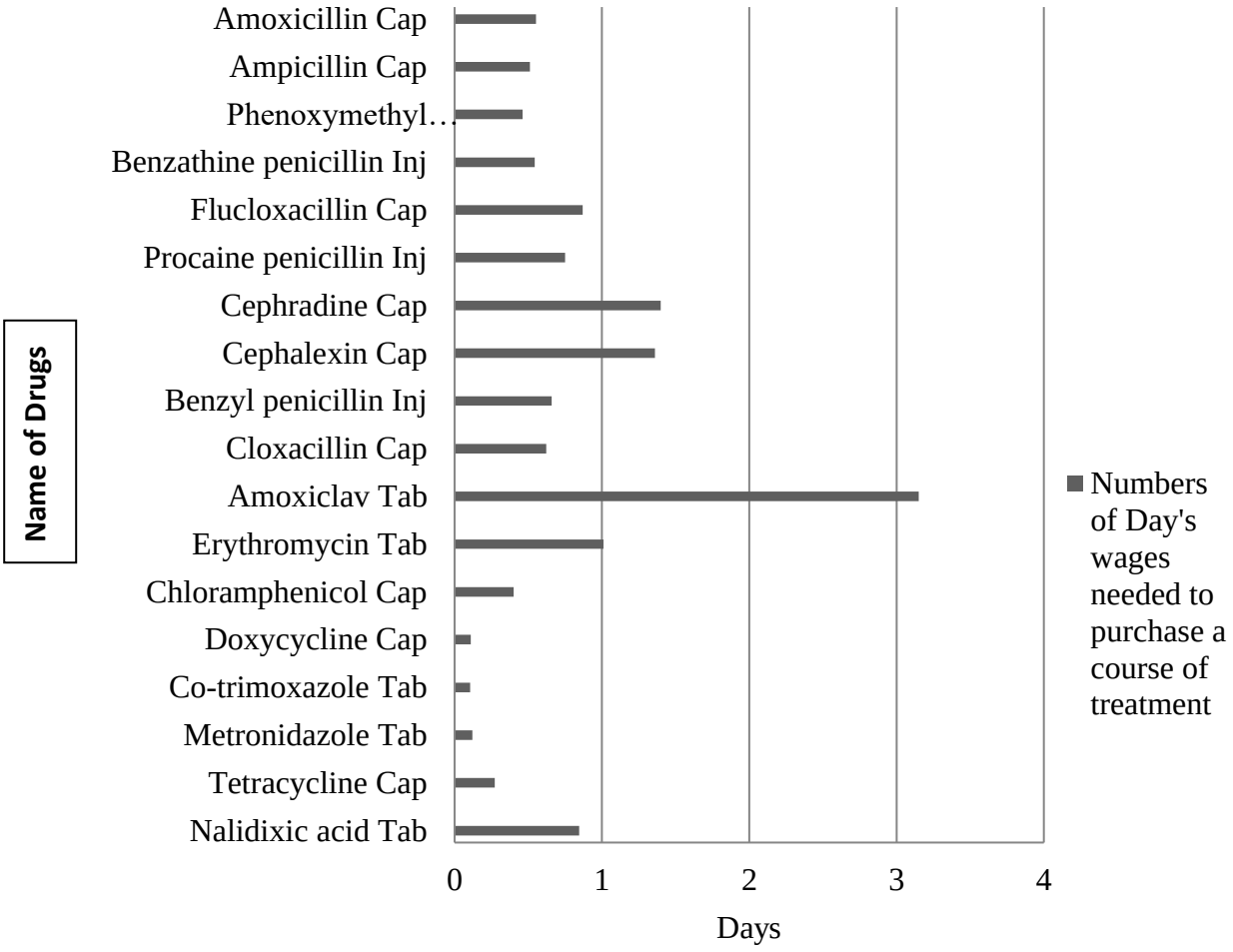

Figure 3.41: Affordability of essential antibiotics in Bangladesh.

The number of day's salaries necessary for buying a course of treatment (shown in Table 3.14) was estimated from the daily wages of the lowest-paid unskilled laborer (266.67 BDT).

The essential medicines were less available in general medicine stores as compared to the Model pharmacies in surveyed pharmacies. A moderate increase in price had been shown by a comparative study on price variation across years. The median prices of surveyed medicines were taken and a gross comparison was done that indicated % increase or decrease in price. In the

studied programs, the median price ratios of surveyed medicines varied from 0.36 – 2.56 and 0.33-2.39 in Year 2015 and 2019, respectively. While noting the WHO target that consumers should pay no more than four times the IRPs, it was observed that medicine prices were lower in the Bangladesh compared to IRPs. A medicine price survey in Bahrain, undertaken in 2013, using the WHO / HAI methodology, showed that patients were paying 34.78 and13.85 times IRPs for Obstetrics (OBs) and Lowest-price Generic (LPG), respectively22. Patients were paying 13.05 and 4.12 times IRPs for OB and LPG, respectively in 2011 at Tatarstan Province in Russia. In 2010 in a high-income Caribbean country, patients were paying 61.44 and17.33 times IRPs for OB and LPG, respectively[40]. The studied program generated the idea that the essential antibiotics were affordable in Bangladesh.

Chapter 4
Conclusion and Recommendations

Chapter 4

Conclusion and Recommendations

4.1 Conclusion

Healthy population can contribute to the economy in a better way. So, investment in health has a long-term positive impact to the economy of a country. Although government is the giant organization, it also has limitations because it looks for development and sustainability of the all sectors of the country. A sound mind is in a sound body. If better health service can be provided to the people of Bangladesh, the population will turn in to healthy work force who will be able to contribute to the economy in an excellent way. It can be inferred that the idea of ensuring health for all is not a very difficult task. The major plus point has been the positive gesture of all the related stakeholders of health and medication. Contribution and cooperation of all- politicians, GOs, NGOs, civil society etc. to the NHP and NDP can make them fullest and confident to ensure health for all in Bangladesh.

4.2 Recommendations

1. **Updating and dissemination of policy**: Both NHP and NDP should be live document and they should be changed as per the requirements of the market. The policy is supposed to be well informed to general mass to establish their rights and responsibilities in implementing it. Government and private machineries such hospital help desk, government TV channels, private TV channels, print and electronic media etc. may play a vital role in this regard.

2. **Duty and responsibility of public servants**: Public servants can play a pivotal role in formulation and implementation of NHP. They can have the duties and responsibilities through governance, coordination, financing and budgeting, monitoring and evaluation, impact assessment and policy feedback, hospital and community pharmacy, formulating rules and

regulations, facilitating rural areas, proper execution of existing legal framework and waste management etc.

3. **Provision during emergency and disaster**: Emergency and disaster situation like zika virus, nipah virus related disease, Dengue, Chikungunya- this type of disease, non-communicable disease, epidemic disease control should be properly addressed in NHP. Time to time revision of policy, involving civil society; involving public representative hand in hand with public servants can be practical in this respect.

4. **Doctor's fee and health insurance**: Fees of private practicing doctors should be made rational and all citizens of Bangladesh should be under coverage of health insurance. Indications and instructions regarding the issues should be in NHP.

5. **Hospital pharmacy**: The hospital pharmacy should be opened in every hospital even in the primary level hospitals and the policy should ensure that a qualified A grade pharmacist present in the hospital pharmacy.

6. **Coverage of health service**: presently there are not adequate number of hospitals, number of beds, number of doctors, other health personnel. The number of these should be increased immediately to cover ensuring service to all people. If the whole country can be covered with quality health service, people will not be interested to travel foreign countries for treatment purpose.

7. **Cooperation from the politicians and bureaucrats**: Full cooperation is sought from politicians and civil servants to ensure better formulation and implementation of NHP.

8. **Social acceptance, coordination and contributions of parties**: The mindset of general people is yet to be convinced to accept the good works of the NGOs in the country regarding public health care. The activities of the NGOs should properly be coordinated at different levels of the Government. NGOs are supposed to cooperate in this regard. NGOs are playing remarkable roles in the service to people throughout the country and it should be made public.

9. **Awareness building of people**: To date people are not well aware of ADRM, RUD, Essential Medicines. People should be well aware of the issues for the sake of their good health. They might be informed through seminar, symposiums, different print and electronic media etc.

10. **Manufacturing essential medicines**: There should clear cut guidelines for manufacturing essentials medicines by the pharmaceutical companies. There is a tendency of the companies to manufacture only the much profitable items. This tendency should be stopped and essential medicines manufacturing might be made a compliance to continue in manufacturing. DGDA can play the key role in this regard.

11. **Pricing of medicines**: Pricing of medicines are supposed to be revised from time to time and monitored continuously as per the NDP 2016. But yet differentiation is being observed. Strictness in pricing and monitoring will do benefit to the people of all concerned.

12. **Publication of OTC (Over the Counter) drugs' list**: List of OTC drugs are supposed to be displayed by the Government. DGDA is recommended to publish the OTC drugs' list. Any change in the list should be informed immediately to all concerned including mass people.

13. **Boasting the export of medicines widely**: Now Bangladesh is exporting medicines to 113 countries including developed countries in the world. The purview of export of medicines may be expanded by easing the export formalities for the exporters. Government may also give subsidies to the exporters. Through proper initiatives and endeavor by the Government and related stakeholders, pharmaceutical industry may grow and develop as the garment industry in home and abroad.

14. **Pharmacists in the compounding and dispensing**: Pharmacists are the experts on drugs and medicines regarding rational use of drugs, drug- drug interaction, drug- food interaction, contraindications of drugs and medicines etc. They are supposed to be better in

compounding and dispensing of drugs. So, pharmacists are soughed to be involved in compounding and dispensing of drugs and medicines.

15. **Pharmacists in community and hospital pharmacy**: The provision of community and hospital pharmacy is there in NDP 2016 and the authority of implementation is given to DGDA. DGDA should play active role in recruitment pharmacists in government hospitals and community pharmacies. In the private level, community pharmacy is getting popularity by the appointment of pharmacists. So, right man should be in the right place in the government machineries.

16. **Information and awareness about NDP and NHP for mass people**: Yet mass people are not well informed and aware about National Health and Drug Policies. Initiatives and endeavors should be taken to make people about their rights and responsibilities regarding the two policies.

17. **Updating the syllabus**: The syllabus of B. Pharm and M. Pharm can be modified and updated by adding more topics of drug policy and making the syllabus more realistic. Importance should be given on "Essential Drug Program". In the university level Adverse Drug Reaction Mechanism (ADRM) as well as Rational Use of Drug (RUD) should be taught more elaborately. Some seminars can be held to spread the concept of ADRM, RUD, Sustainable Development Goals (SDGs) as well as Rational Use of Antibiotics among the general mass.

18. Essential medicines are being manufactured by a limited number of companies. Price regulation is needed in this respect. Establishing a price regulation mechanism for essential medicines might be a way forward towards providing better service to people.

19. Medicine price monitoring should be done periodically. Prices must be monitored regularly and information should be made widely available to more precisely control price and availability trends.

20. There are several medicines which are manufactured by only a few companies. For this reason, the prices of those medicines are prevailing higher in comparison to international reference prices. The government should compel all companies for manufacturing essential medicines.

21. A database should be maintained for the prices of medicines of previous years so that one can easily compare the price increases or decreases among years. The database should be made available for mass people.

Chapter 5
Limitations of the Study

Chapter 5

Limitations of the study

The study was carried out engaging all resources with sincerity, honesty and the archived knowledge on the research methodology. In spite of all efforts, the following limitations might affect to some extent of the degree of accuracy and generalization of the results of the study. The main limitations of the study were-

1. Time constraints, which might have affected the quality of data;

2. Author's personal judgement and opinion might have affected the process of discussion and recommendations;

3. Above all, the sample size taken was small to complete the study within the stipulated period of time which might not be a good representative sample of the population.

Chapter 6
References

Chapter 6

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Chapter 7
List of Publications

Chapter 7

List of Publications

1. **Md. Aknur Rahman**, Sauda Sumaya Dina, Md. Monirul Islam, Jakir Ahmed Chowdhury, Shaila Kabir, Abu Asad Choudhury and Md. Shah Amran. 2019. *The Study of Availability, Affordability and Price Variation of Essential Antibiotics in Bangladesh Biomedical & Pharmacology Journal, Oriental Scientific Publishing Company*. Vol. 12(4), p. 1811-1826.

2. **Md. Aknur Rahman[1]**, Md. Riaz Hossain[2], Md. Aslam Hossain[1] and Md. Shah Amran[1]. 2021. *A Study on the National Drug Policies of Bangladesh to Ensure Health for All 2021*. Dhaka Univ. J. Pharm. Sci. 20(1): 00-00, 2021 (June) **DOI:** https://doi.org/10.3329/dujps.v19i2.50856**. Accepted on 20 February 2021, to be published ASAP.**

3. **Md. Aknur Rahman**, Md. Monirul Islam, Zahirul Islam, Tahmina Sharif Nila, Amena Alam Shanta, Md. Rafat Tahsin, Tanzia Islam Tithi, Md. Shah Amran. 2019. *Primary Health Care in Netrokona Sadar Upazila - A Case Study on Extended Program on Immunization.* American Journal of Health Research. Vol. 8, No. 1, pp. 1-5. doi: 10.11648/j.ajhr.20200801.11. Received: September 23, 2019; Accepted: October 24, 2019; Published: January 31, 2020.

Appendices

Appendix I: Questionnaire

Appendix II: The Study of Availability, Affordability and Price Variation of Essential Antibiotics in Bangladesh

Appendix III: A Study on the National Drug Policies of Bangladesh to Ensure Health for All

Appendix IV: Primary Health Care in Netrokona Sadar Upazila - A Case Study on Extended Program on Immunization

Appendices

Appendix I

Questionnaire

Different types of questionnaires were constructed by the author. These are given below.

Title: Study on Health and Drug Policies of Bangladesh to ensure Health for All

Policy Related People- National Drug Policy (NDP)

A) Respondent's Identity: Please tick √ on your choice

1.Name :

2.Gender : ☐ Male ☐ Female

3.Education : ☐ Under Graduate ☐ Graduate ☐ Post Graduate ☐ Ph D

4.Designation & Institution :

5. Area/ Division ☐ Dhaka Metro City ☐ Dhaka Division ☐ Rajshahi Division ☐ Khulna Division

B) Questionnaire: Please tick √ on your choice (as necessary)

1. Are you acquainted with the National Drug Policy (NDP)?

   ☐Yes ☐ No

2. If yes, what are your suggestions regarding its appropriateness, the way it is now?

   a.

   b.

   c.

3. If no, do you think you should have been acquainted?

   ☐ Yes ☐ No

4. What role can a public servant play to promote NDP? {**Please tick √ on your choice/**

choices}

(1)	Governance	
(2)	Coordination	
(3)	Financing and budgeting	
(4)	Drug Trafficking	
(5)	Waste Management	
(6)	Data Capturing Reporting	
(7)	Impact Assessment & Policy Feed Back	
(8)	Hospital & Community pharmacy	
(9)	Pricing	
(10)	Storage & Distribution	
(11)	Research & Development	
(12)	Protection of Drug Abuse	
(13)	Rational Use of Drug	
(14)	Facilitating Reaching the Hard to Reach Area	
(15)	Formulating Rules/ Regulations	
(16)	Quality Assurance	
(17)	Global Trade (Import/ Export)	
(18)	Proper Execution of existing Legal Framework	
(19)		
(20)		
(21)		

5. What are the areas not appropriately covered in NDP?

   a.

   b.

   c.

6. How can those areas be improved?

   a.

   b.

   c.

7. Whether procurement Acts/ Rules are followed in procuring drugs/ medicines using public funds?

   ☐ Yes ☐ No

8. Whether your organization has personnel who are trained on public procurement management?

   ☐ Yes ☐ No

9. Whether the packages are included in procurement plan and approved before going for procurement?

☐ Yes ☐ No

10. In case of drugs/ medicine purchasing, do your organization follow national or international quality standards?

☐ Yes ☐ No

11. Does your organization go for post procurement audit?

☐ Yes ☐ No

12. In your opinion, is Adverse Drug Reaction an important issue?

☐ Yes ☐ No

13. If yes why?

a.

b.

c.

14. Do you think that Rational Usage of Drugs is an important issue today?

☐ Yes ☐ No

15. If yes, why?

a.

b.

c.

16. Sustainable Development Goals (SDGs) contain some specific goals regarding use of drugs to improve the public health. Do you think that it is important to incorporate the SDGs in our current drug policy?

☐ Yes ☐ No

17. Overall opinion about NDP:

Title: Study on Health and Drug Policies of Bangladesh to ensure Health for All

Policy Related People- National Health Policy (NHP)

B) Respondent's Identity: Please tick (√) on your choice

1. Name :

2. Gender : ☐ Male ☐ Female

3. Education : ☐ Under Graduate ☐ Graduate ☐ Post Graduate ☐ Ph D

4. Designation & Institution :

5. Area/ Division ☐ Dhaka Metro City ☐ Dhaka Division ☐ Rajshahi Division ☐ Khulna Division

B) Questionnaire: Please tick (√) on your choice (as necessary)

1. Are you acquainted with the National Health Policy (NHP)?

☐Yes ☐ No

2. If yes, what are your suggestions regarding its appropriateness, the way it is now??

a.

b.

c.

3. If no, do you think you should have been acquainted with the NHP?

☐Yes ☐ No

4. What role can a public servant play to promote NHP? {**Please tick (√) on your choice/ choices**}

(1)	Governance	
(2)	Coordination	
(3)	Financing and budgeting	
(4)	Monitoring & Evaluation of health related issues	
(5)	Transboundary/ cross border disease control	
(6)	Data Capturing Reporting	
(7)	Impact Assessment & Policy Feed Back	
(8)	Hospital & Community pharmacy	
(9)	Facilitating Reaching the Hard to Reach Area	
(10)	Formulating Rules/ Regulations	

(11)	Global Trade (Import/ Export	
(12)	Proper Execution of existing Legal Framework	
(13)	Waste Management	
(14)		
(15)		
(16)		

5. What are the areas not appropriately covered in NHP?

   a.

   b.

   c.

6. How can those areas be improved?

   a.

   b.

   c.

7. Whether procurement Acts/ Rules are followed in procuring medical equipment/ drugs/ medicines using public funds?

   ☐ Yes ☐ No

8. Whether your organization has personnel who are trained on public procurement management?

   ☐ Yes ☐ No

9. Whether the packages are included in procurement plan and approved before going for procurement?

   ☐ Yes ☐ No

10. In case of medical equipment/ drugs/ medicine purchasing, do your organization follow national or international quality standards?

   ☐ Yes ☐ No

11. Does your organization go for post procurement audit?

   ☐ Yes ☐ No

13. Overall opinion about NHP:

Title: Study on Health and Drug Policies of Bangladesh to ensure Health for All

Service Provider- National Health Policy (NHP)

A) Respondent's Identity: Please tick (√) on your choice

1. Name :

2. Gender : ☐ Male ☐ Female

3. Education : ☐ Under Graduate ☐ Graduate Post Graduate Ph D

4. Designation & Institution :

5. Area/ Division ☐ Dhaka Metro City ☐ Dhaka Division Rajshahi Division Khulna Division

B) Questionnaire: Please tick (√) on your choice (as necessary)

1. Are you acquainted with the National Health Policy (NHP)?

☐Yes ☐ No

2. If yes, what are your suggestions regarding its appropriateness, the way it is now?

a.

b.

c.

3. If no, do you think you should have been acquainted with the NHP?

☐Yes ☐ No

4. What role can a public servant play to promote NHP? {**Please tick (√) on your choice/ choices**}

(1)	Governance	
(2)	Coordination	
(3)	Financing and budgeting	
(4)	. Monitoring & Evaluation of health related issues	
(5)	Transboundary/ cross border disease control	
(6)	Data Capturing Reporting	
(7)	Impact Assessment & Policy Feed Back	
(8)	Hospital & Community pharmacy	
(9)	Facilitating Reaching the Hard to Reach Area	

(10)	Formulating Rules/ Regulations	
(11)	Global Trade (Import/ Export)	
(12)	Proper Execution of existing Legal Frame	
(13)	Waste Management	
(14)		
(15)		
(16)		

5. What are the areas grossly neglected in NHP?

   a.

   b.

   c.

6. In implementation of NHP, do you face any problem?

   ☐ Yes ☐ No

7. If yes, what are the problems?

   a.

   b.

   c.

8. Do you get full cooperation from the top management in implementation of NHP?

   ☐ Yes ☐ No

9. If no, what are the areas of non-cooperation?

   a.

   b.

   c.

10. What are the areas, you think, need to be improved in implementing the NHP?

    a.

    b.

    c.

11. Overall comments:

<u>সেবা গ্রহীতার জন্যঃ</u> জাতীয় স্বাস্থ্যনীতি

<u>(১) ব্যক্তিগত তথ্যঃ</u> টিক (√) দিন

নামঃ

লিংগঃ ≥পুরুষ ≥মহিলা

ঠিকানাঃ

বয়স (বছর): ≥ ২০-২৪, ≥ ২৫-৩০, ≥ ৩১-৩৫, ≥ ৩৬-৪০, ≥ ৪১-৫০, ≥ ৫১-বেশি

শিক্ষাগত যোগ্যতাঃ ≥এস.এস.সি ≥এইচ.এস.সি ≥স্নাতক ≥মাস্টার্স ও তদুর্দ্ধ ≥ অন্যান্য

পদবী ও প্রতিষ্ঠানঃ

বাসস্থান এলাকাঃ ≥শহর ≥ সিটি কর্পোরেশন ≥ পৌরসভা

≥শহরতলী ≥ গ্রাম

<u>(২) প্রশ্ন গুচ্ছঃ</u> টিক (√) দিন

১। আপনি কি জাতীয় স্বাস্থ্যনীতি সম্পর্কে জানেন?

≥হ্যাঁ ≥ না

২। যদি হ্যাঁ হয় তাহলে কোথা থেকে জেনেছেন? টিক (√) দিন

(১)	স্বাস্থ্য মন্ত্রানালয়	
(২)	স্বাস্থ্য অধিদপ্তর	
(৩)	পরিবার পরিকল্পনা অধিদপ্তর	
(৪)	ঔষধ প্রশাসন অধিদপ্তর	
(৫)	হাসপাতাল	
(৬)	ক্লিনিক	
(৭)	শিক্ষা প্রতিষ্ঠান	
(৮)	বন্ধু-বান্ধব	
(৯)	আত্মীয়স্বজন	
(১০)	প্রচার মাধ্যম	
(১১)		

(১২)		
(১৩)		

৩। কি কারণে স্বাস্থ্যনীতি সম্পর্কে জানার আগ্রহ বোধ করলেন?

৫। আপনি কি মনে করেন আমাদের স্বাস্থ্যনীতি পুর্নাঙ্গ ও স্বয়ং সম্পন্ন?

≥ হ্যাঁ ≥ না

৬। না হলে কি কি অসংগতি আছে?

৭। ভাল স্বাস্থ্যনীতির জন্য কি কি বিষয়ে অন্তর্ভূক্ত হওয়া প্রয়োজন বলে আপনি মনে করেন?

৮। স্বাস্থ্য নীতি সম্পর্কে আপনার সার্বিক মতামত কি?

৯। জাতীয় স্বাস্থ্য নীতিতে সরকারি কমকর্তাদের কি কি করণীয় বলে মনে করেন?

Appendix II

Biomedical & Pharmacology Journal, December 2019. Vol. 12(4), p. 1811-1826

The Study of Availability, Affordability and Price Variation of Essential Antibiotics in Bangladesh

Md. Aknur Rahman[1], Sauda Sumaya Dina[2], Md. Monirul Islam[3], Jakir Ahmed Chowdhury[4], Shaila Kabir[1], Abu Asad Choudhury[1] and Md. Shah Amran[1]*

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The increased prices and low availability of medicines are main obstacles to health care system in developing countries like Bangladesh. The main goal of this work is to gather and assessing the data on availability, affordability and price variations of essential antibiotics in Bangladesh. The data will help to improve the availability and affordability of essential antibiotics for the mass peoples. The present work was done using standard methodology described in guideline, "Price measurement, availability and affordability and price components of medicines. A total of eighteen essential antibiotics were surveyed and their prices and availability were determined. Prices from 2003 to 2019 were collected from different sources to make a comparative study of the price variations over the years. The overall prices of essential antibiotics are not much higher than international reference prices. The rate of increase of price from previous years is not so alarming. The numbers of manufacturing companies were collected from the Bangladesh National Formulary (BDNF) of different Volumes to compare the increasing number of manufacturers. Essential antibiotics affordability was determined by comparing the total cost of treatment of a particular disease to the monthly salary of the lowest paid unskilled laborer. There are several essential antibiotics for which the numbers of manufacturing companies are increasing in very high rate. This type of survey may be expanded to the national level for the data of different regions of Bangladesh.

Keywords: Affordability, Availability, Essential Antibiotics, Median Price Ratio, Median Price and Price variations.

The insufficiency of access to essential antibiotics remains a great public health problem all over the world. World Health Organization (WHO) defines the essential medicines as "those medicines which meet the global health needs of the majority of the population of a particular territory". The WHO updates its Model Essential Medicines List every 2 years in a transparent way. Although access to essential medicines has improved since the introduction of the essential medicines concept in

1977, one-third of the world's population is still not treated with the required medicines that are needed for their treatment. In low- and middle-income countries (LMICs), as many as ninety percent of the population pay out-of-pocket for their drugs. The USA has also made a shift to high-deductible insurance strategy during within the last decades1.

In 2001, a resolution (WHA 54.11) endorsed by the Member States of the World Health Assembly called for a standardized procedure to monitor medicines prices to help boost the access. In response, the World Health Organization/Health Action International (WHO/HAI) Project on Medicine Prices and Availability was established. The primary purpose of this project was to develop a standardized method to calculate medicines' prices, availability, affordability and price components in a reproducible method so as to allow international comparisons against the time. In 2003, after testing in 9 countries, the standard WHO/HAI methodology was released, with a second edition published in 2008[2].

Poor medicine availability, increased prices and low affordability are major obstacles to medicine access for common people in developing countries of the world. In many developed countries, for example, the USA, there are growing concerns about decreased medicine access for reasons including high medicine prices and co-payments/deductibles, uninsured populations, inadequate transparency in medicine price components, and health agencies' low capability to bargain procurement prices [1].

For the evaluation of the studied medicines' consumer prices, WHO/HAI methodology uses international reference prices (IRPs) as an external standard. To evaluate prices, a median price ratio (MPR) is measured by comparing the median consumer price of a supplied medicine with the particular IRP. International reference prices used in this work were taken from the 2015 Management Sciences for Health (MSH) International Drug Price Indicator Guide.

The MSH reference prices were published in 1986 for the first time. The MSH reference prices are procurement prices obtained from both sellers and purchasers and collected from government agencies, pharmaceutical suppliers and international development organizations. The MSH prices are widely accepted as proper reference standards 3. These MSH procurement prices report the real prices obtained by non-profit suppliers and government tenders, the robust nature of this data ensures international comparability [4].

Government of any country should procure medicines from the reliable sources as compared to the IRPs patient prices from the private sector to reduce the excessive cost of the medicines occurring from the additional costs in markups, tariffs, taxes and other costs. Because of these additional costs, the WHO has set a target of 4 times the IRP for patient prices in the private sectors. Medicine availability and prices are recognized as an important components of access to medicines by WHO, For this reason the WHO five years strategic plan 2008-2013 defines the global and national targets for generic essential medicines, targeting 80% availability in all sectors and median consumer prices to be no more than four times the IRP. In studied works, the Median price ratios of studied medicines in Bangladesh varied from 0.36-2.56 and 0.33-2.36 in year 2015 and 2019, respectively.

Medicines included in this survey are used all over the world. The medicines are used to treat common conditions and appear on most treatment guidelines. Many of the surveyed medicines were studied in the 2009 study of medicine availability and prices in 36 developing and middle-income countries [3].

In our work, we examined the availability of essential antibiotics across Model pharmacies and general retail stores. Prices were obtained from BDNF-2, BDNF-3, BDNF-4 and DGDA website of year 2003, 2006, 2015 and 2019, respectively, and essential antibiotics prices of 2015 according to BDNF 4 and 2019 according to DGDA website were then compared with the MSH IRPs. The current survey was performed using standard methodology stated in guideline Price measurement, availability and affordability and price components of medicines [2].

The WHO/HAI Project on Medicine Prices and Availability was founded in 2001 – (i) to develop a effective methodology for accumulating and analyzing medicine price, availability, affordability and medicine price component data in different health-care sectors and regions in a country; (ii) to publish survey data on open access website to enhance price transparency; and (iii)

to recommend for proper national policies and monitor their consequences.

The specific objectives of our study were – (i) to measure prices of Essential antibiotics for treating prevalent conditions in Bangladesh, (ii) to assess the affordability of standard treatment regimens utilizing these medicines, (iii) to compare the prices of drugs found in the country with international reference prices and (iv) to compare the prices of essential antibiotics of different years with statistical significance testing.

National drug policy 2016

Bangladesh Government has approved 3rd national drug policy of the country in its Cabinet Meeting that was held on 19 December 2016. To propose a draft of this policy, a drug policy formulation committee and sub-committee were constituted in 2011[5]. The sub-committee has analyzed meticulously the problems and prospects of the country's pharmaceutical sector, discussed with many professional experts and leaders of this sector, gathered opinion from all stakeholders and incorporated important suggestions from the public. Thus this drug policy has turned to be both pro-industry and pro-people.

Essential drug list (EDL)

To protect public health effectively and to deal with emergency need of the majority of the people, separate EDL for Allopathic, Ayurvedic, Unani and Homeopathic-Biochemic systems of medicines have been prepared. The quantity of drugs in the Essential Drug List (Allopathic) is 285 (versus 150 in the drug policy of 1982 with 56 in the Supplementary List), the number of medicines in the Essential Drug List (Ayurvedic) is 100, the quantity of drugs in the Essential Drug List (Unani) is 223 and the quantity of drugs in the Essential Drug List (Homeopathic) is 370.

All the drugs included in this list must be available throughout the country so that people even from remote corners can get an easy access to these drugs. After every 2 years, all these lists will be updated from time to time. Regular updating and inclusion of more drugs in this list will help us to get patent waiver of drugs on public health issue beyond 2033.

Regulatory system

The Directorate General of Drug Administration (DGDA), Ministry of Health

Table 1. List of essential antibiotics surveyed

S No.	Beta Lactam antibiotics	Dosage form taken to check Availability	Dosage form taken to check Affordability and price
1	Amoxicillin	Capsule/Dry Syrup /Injection	Capsule 250mg
2	Ampicillin	Capsule/Dry Syrup /Injection	Capsule 250mg
3	Phenoxymethyl Penicillin	Tablet/Syrup	Tablet 250mg
4	Benzathine Penicillin	Injection	Injection 12 lac unit/vial
5	Flucloxacillin	Capsule/Syrup/Injection	Capsule 250mg
6	Procaine Penicillin	Injection	Injection 4 lac unit/vial
7	Cephradine	Capsule/Syrup/Injection	Capsule 250mg
8	Cephalexin	Capsule/Tablet/Syrup	Cap 250mg
9	Benzyl Penicillin	Injection	Injection 5 lac unit/vial
10	Cloxacillin	Capsule/Syrup/Injection	Capsule 500mg
11	Amoxiclav(Amoxicillin + Clavulanic acid)	Tablet/Capsules/Dry Syrup/Injection	Tablet (250mg + 125mg)
	Other antibacterials		
12	Erythromycin	Tablet/Oral Suspension /Injection	Tablet 250mg
13	Chloramphenicol	Cap/Eye/Ear Drops/Ointment	Capsule 250mg
14	Doxycycline	Capsule	Capsule 100mg
15	Co-Trimoxazole (Trimethoprim + Sulfamethoxazole)	Tablet/Suspension	Tablet (800mg + 160mg)
16	Metronidazole	Tablet/Oral Liquid/Injection	Tablet 400mg
17	Tetracycline HCl	Capsule/Injection	Capsule 250mg
18	Nalidixic Acid	Tablet/Syrup	Tablet 500mg

and Family Welfare, is the National Regulatory Authority for drugs in Bangladesh. The DGDA oversees and implements all Drug laws in the country and guides all activities related to import, purchase of raw and packaging materials, manufacture and import of finished drugs, export, sales and price fixation, etc. Currently there are 28,734 brands of medicine products and a total of 269 drug manufacturing companies [6].

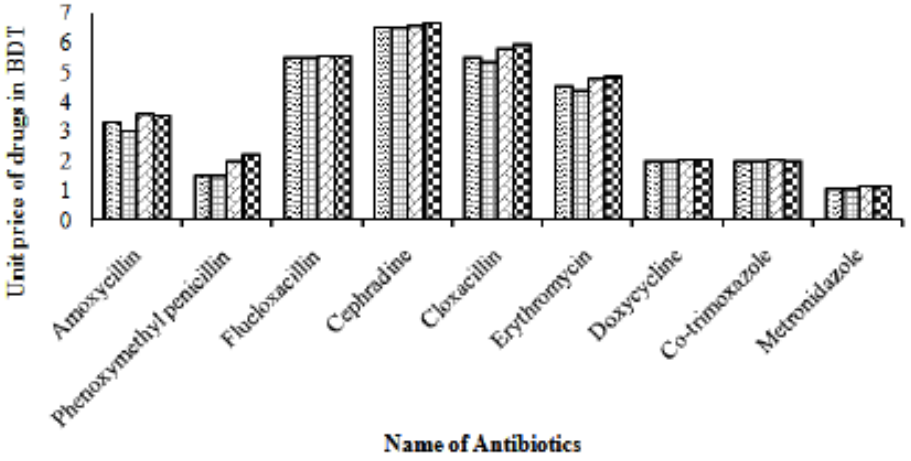


Fig. 1. Prices of some selected Essential Antibiotics of different years. Here, =Year 2003, = Year 2006, = Year 2015 & = Year 2019.

Table 2. Median unit price of medicines in different years

Medicines	Strength	Dosage form	Price in 2003	Price in 2006	Price in 2015	Price in 2019
Amoxicillin	250mg	Capsule	3.29	3.02	3.54	3.51
Ampicillin	250mg	Capsule	2.51	2.5	3.25	3.25
Benzathine Penicillin	12 lac units/vial	Injection	23.56	23.12	24.98	24.21
Flucloxacillin	250mg	Capsule	5.5	5.5	5.52	5.52
Procaine Penicillin	4 lac units/vial	Injection	6.81	7.6	14.05	10
Cephradine	250mg	Capsule	6.5	6.5	6.525	6.65
Cephalexin	250mg	Capsule	6.285	6.5	6.575	6.5
Benzyl Penicillin	5 lac units/vial	Injection	6.365	6.36	11.29	8.76
Cloxacillin	500mg	Capsule	5.5	5.355	5.8	5.92
Amoxiclav (Amoxicillin + Clavulanic acid)	250mg+ 125mg	Tablet	20.22	16.25	16.57	20
Erythromycin	250mg	Tablet	4.5	4.35	4.75	4.82
Chloramphenicol	250mg	Capsule	2.5	2.35	2.5	2.5
Doxycycline	100mg	Capsule	2	2	2.03	2.06
Co-Trimoxazole (Trimethoprim + Sulfamethoxazole)	800mg + 160mg	Tablet	2	2	2.02	2.01
Metronidazole	400mg	Tablet	1.01	1.01	1.13	1.14
Tetracycline	250mg	Capsule	1.01	1	1.1	1.3
Nalidixic Acid	500mg	Tablet	3.85	3.87	4.87	4.03

Table 3. Statistical hypothesis testing

Paired t- test	Year 2003 vs Year 2006	Year 2003 vs Year 2015	Year 2003 vs Year 2019	Year 2006 vs Year 2015	Year 2006 vs Year 2019	Year 2015 vs Year 2019
p-value	Can't reject Null; p value= 0.325> α=0.05	Can't reject Null; P value=0.168> α=.05	Might reject Null; p-value =0.02< α=0.05	Might reject null; pvalue =0.032< α=0.05	Might reject Null; p value=0.007< α=0.05	Can't reject null p value=0.510> α=0.05
Result	Price difference not statistically significant	Price difference not statistically significant	Significant Price difference exist	Significant Price difference exist	Significant Price difference exist	Price difference not statistically significant

Methodology

With the help of the WHO/HAI methodology, we analyzed the availability, affordability and prices of 18 essential antibiotics. Availability of 18 essential medicines was obtained from 25 private pharmacies (Model pharmacies and general medicine stores). The medicine shops were located in different regions of the Dhaka Metropolitan City.

The prices of 18 essential medicines were also examined. The prices of drug were compared with international reference prices (IRPs). A comparative study on variation of prices across years was also done. A comparative statistical analysis among prices of different years was done by using SPSS statistic software. The local unit prices were collected from Bangladesh National Formulary which is the directory for all drugs produced locally and marketed in Bangladesh 7. International reference prices were utilized to compare national prices with the international standard.

The WHO/HAI methodology also evaluates the affordability of medicines, expressed as the number of day's salary needed by the lowest paid unskilled government laborer to buy a full-course of treatment. To estimate what drug prices mean in terms of affordability for mass people, some normal treatment costs were measured and compared with the salary of the lowest-paid unskilled laborer, which was 8000 Bangladeshi Taka per month8. All prices were converted to United States Dollar (USD) using the exchange rate on 30.06.2015 ($1 USD = 77.83 Bangladeshi Taka)9. The international prices of 2015 were used as reference unit prices.

Survey medicines

A total of 18 essential antibiotics were selected from the Essential drug list of Allopathic drugs published by Directorate General of Drug Administration. All essential antibiotics were dose and dosage-form specific. The surveyed essential antibiotics were shown in Table 1. All surveyed essential antibiotics are generally used and have an available IRP.

Price component

Prices were obtained from BDNF-2, BDNF-3, BDNF-4 and DGDA of year 2003, 2006, 2015 and 2019, respectively. Essential antibiotics prices of 2015 according to BDNF 4

were then compared with the MSH 2015 IRPs. The drug prices were compared with international reference prices (IRPs). A comparative study on prices variation across years was also done. To ease international comparisons, medicine-specific median price ratios (MPR) were estimated when prices were available from at least four facilities. The MPR refers to the ratio of a medicine's local median unit price as compared to the 2015 MSH international median unit reference price.

Availability of essential antibiotics

The availability of essential antibiotics was expressed in two ways. One was the national availability of medicines which was calculated by counting the number of manufacturer in the country. The manufacturer numbers were collected from Bangladesh National Formulary7, 10, 11, 12. Medicine availability was collected for different years as in 2001, 2003, 2006, 2015 and 2019. The data for the year of 2019 were collected from DGDA website.

Our study investigated the availability of essential antibiotics across Model pharmacies and general retail stores. The availability of medicine in retail medicine shops was expressed as percentage to the number of sites on day of data collection. Only those medicines were considered available which were present at the time of data collection. Availability of 18 essential medicines were obtained from 25 private pharmacies (Model pharmacies and general medicine stores) and a comparison of mean percentage availability between 10 Model pharmacies and 15 General medicine stores were also studied using WHO/HAI methodology.

Affordability of essential antibiotics

The affordability of medicine was estimated as the number of days' wages that the lowest paid unskilled laborer would have to give for a standard treatment. As the government hospitals provide essential antibiotics to the patients free of cost, only the private sector medicine price was considered. The most common disease conditions were taken as standard for treatment approaches.

RESULTS AND DISCUSSION

The data for each medicine were collected from different sites and national formularies. Then the data were utilized in the program of MS Excel Workbook, given by the WHO/HAI. To avoid errors, data were checked and re-entered

Table 4. Price variation of essential antibiotics given in percentage across years

Medicine	Strength	Dosage form	Standard Price Year 2003	Price increased Or decreased in Percentage Year 2006	Year 2015	Year 2019
Amoxycillin	250mg	Capsule	3.295	-8.34%(3.02)	7.43% (3.54)	6.52%(3.51)
Ampicillin	250mg	Capsule	2.515	-0.6%(2.5)	29.2%(3.25)	29.2%(3.25)
Phenoxymethyl penicillin	250mg	Tablet	1.47	0%(1.47)	35%(1.985)	49.6%(2.2)
Benzathine Penicillin	12 lac units/vial	Injection	23.56	-1.8%(23.12)	6%(24.98)	2.7%(24.21)
Flucloxacillin	250mg	Capsule	5.5	0%(5.5)	0.36%(5.52)	0.36%(5.52)
Procaine Penicillin	4 lac units/vial	Injection	6.815	11.5%(7.6)	106%(14.05)	46.7%(10)
Cephradine	250mg	Capsule	6.5	0%(6.5)	0.38%(6.525)	2.3%(6.65)
Cephalexin	250mg	Capsule	6.285	3.4%(6.5)	4.6%(6.575)	3.4%(6.5)
Benzyl Penicillin	5 lac units/vial	Injection	6.365	0%(6.365)	77%(11.29)	37.7%(8.765)
Cloxacillin	500mg	Capsule	5.5	-2.6%(5.355)	5.4%(5.8)	7.6%(5.92)
Amoxiclav	250mg	Tablet	20.22	-19.6%(16.2)	-18%(16.57)	-1%(20)
Erythromycin	250mg	Tablet	4.5	-3.3%(4.35)	5.5%(4.75)	7.2%(4.825)
Chloramphenicol	250mg	Capsule	2.5	-6%(2.35)	0%(2.5)	0%(2.5)
Doxycycline	100mg	Capsule	2	0%(2)	1.5%(2.03)	3%(2.06)
Co-Trimoxazole	800mg + 160mg	Tablet	2	0%(2)	1%(2.02)	0.25%(2.01)
Metronidazole	400mg	Tablet	1.01	0%(1.01)	11.8%(1.13)	12.8%(1.14)
Tetracycline	250mg	Capsule	1.01	-0.9%(1)	8.9%(1.1)	28.7%(1.3)
Nalidixic Acid	500mg	Tablet	3.855	0.39%(3.87)	26%(4.87)	4.5%(4.03)

into the program. For a comparative study, prices of medicines of different years were collected. The drug unit price collected from the facility survey were entered into the MS Excel-based Workbook, followed by automated and manual error-checking, and built-in automated analysis feature of the workbook. A comparative statistical

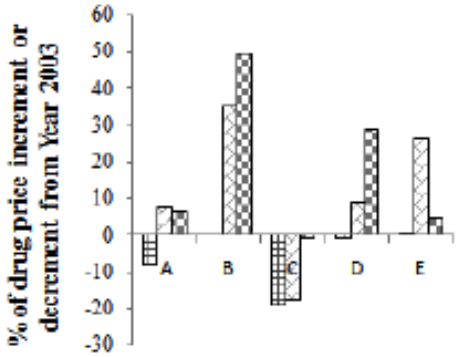


Fig 2a. In column chartPrice variation in percentage of selected antibiotics across years taking Year 2003 (BDNF-2) drug price as standard

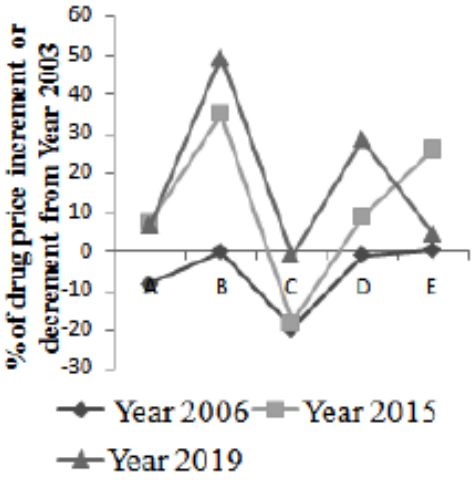


Fig 2b. In line chart Price variation in percentage of selected antibiotics across years taking Year 2003 (BDNF-2) drug price as standard

Here, = Year 2006, = Year 2015 & = Year 2019.
A=Amoxicillin Cap 250 mgB=Phenoxymethyl PenicillinTab 250mgC=AmoxiclavTab 250 mgD=Tetracycline Cap 250 mgE=Nalidixic Acid Tab 500 mg.

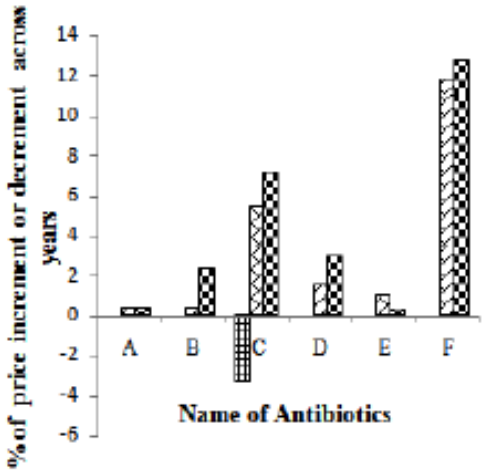


Fig. 3a. Price variation of selected antibiotics across yearsfrom year 2003. Drug price of year 2003 was taken as standard

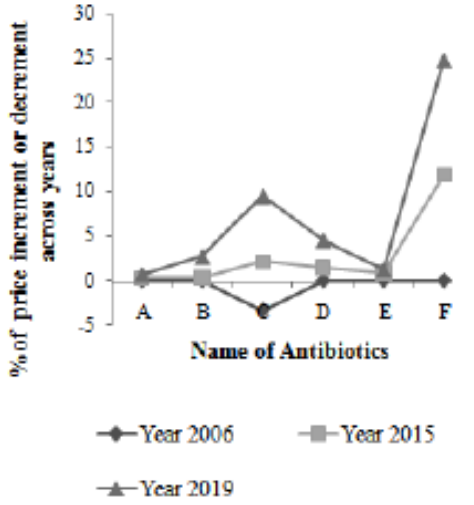


Fig. 3b. Price variation of selected antibiotics across yearsfrom year 2003. Drug price of year 2003 was taken as standard

Here, = Year 2006, = Year 2015 & = Year 2019.
A= Flucloxacillin capsule 250mg B = cephradine capsule 250mg C= Erythromycin Tablet 250mg D= Doxycycline Capsule 250mg E= Co-trimoxazole tablet 800mg + 160mg F= Metronidazole Tablet 400mg.

analysis among prices of different years was done by using SPSS statistical software.

Price of medicines

The prices of selected medicines (Shown in Table 1) of different years (2003, 2006, 2015 and 2019) were collected and listed (Shown in Table 2).The medicine unit prices gathered from the facility survey were placed into the MS Excel-based Workbook. A comparative statistical analysis among prices of different years was done by using SPSS statistical software (Shown in Table 3). There are some medicines of which prices changed dramatically. Sometimes prices increased and sometime remained almost the same.

Figure 1 showed that the Median unit price of Amoxicillin Capsule (250 mg) was Tk. 3.29 in 2003, 3.02 in 2006, 3.54 in 2015 and 3.51in 2019, respectively; that of Phenoxymethyl Penicillin Tablet (250 mg) was Tk. 1.47 in 2003, 1.46 in 2006, 1.98 in 2015 and 2.2 in 2019, respectively; that of Flucloxacillin Capsule (250 mg) was Tk. 5.5 in 2003, 5.5 in 2006, 5.52 in 2015 and 5.52 in 2019, respectively; that of Cephradine Capsule (250 mg) was Tk. 6.5 in 2003, 6.5 in 2006, 6.52 in 2015 and 6.65 in 2019, respectively; that of Cloxacillin Capsule (500 mg) was Tk. 5.5 in 2003, 5.35 in 2006, 5.8 in 2015 and 5.92 in 2019, respectively; that of Erythromycin Tablet (250 mg) Tk. 4.5 in 2003, 4.35 in 2006, 4.75 in 2015 and 4.82 in 2019, respectively; that of Doxycycline Capsule (100 mg) was Tk. 2.00 in 2003, 2.00 in 2006, 2.03 in 2015 and 2.06 in 2019, respectively; that of Co-trimoxazole Tablet (800mg+160 mg) was Tk. 2.00 in 2003, 2 in 2006, 2.02 in 2015 and 2.00 in 2019, respectively; that of Metronidazole Tablet (400 mg) Tk. 1.01 in 2003, 1.01 in 2006, 1.13 in 2015 and 1.14 in 2019, respectively.Comparison between year 2003 and 2006

Medicines prices from year 2003 to 2006 were not changed much. Median prices of maximum medicine decreased in 2006 compared to year 2003. This difference of prices between year

Table 5. Median Price Ratio(MPR) of surveyed essential antibiotics

Medicines	Strength	Dosages form	Median international reference unit price (USD)	Median local unit price (USD)		Median price ratio (MRP)	
				2015	2019	2015	2019
Amoxicillin	250mg	Capsule	0.0227	0.0455	0.042	2.00	1.85
Ampicillin	250mg	Capsule	0.0163(S)	0.0417	0.039	2.56	2.39
Phenoxymethyl penicillin	250mg	Tablet	0.0388	0.0255	0.026	0.66	0.67
Benzathine Penicillin	12 lac units/vial	Injection	0.1809	0.321	0.29	1.77	1.6
Flucloxacillin	250mg	Capsule	0.0403	0.0709	0.066	1.76	1.64
Procaine Penicillin	4 lac units/vial	Injection	0.2951	0.1806	0.119	0.61	0.40
Cephradine	250mg	Capsule		0.08383	0.079		
Cephalexin	250mg	Capsule	0.0475	0.08453	0.078	1.78	1.64
Benzyl Penicillin	5 lac units/vial	Injection	0.1224	0.1451	0.105	1.18	0.86
Cloxacillin	500mg	Capsule	0.0566	0.0745	0.071	1.32	1.25
Amoxiclav(Amoxicillin + Clavulanic acid)	250mg + 125mg	Tablet	0.1476 (S)	0.2130	0.239	1.44	1.62
Erythromycin	250mg	Tablet	0.045	0.0610	0.058	1.35	1.28
Chloramphenicol	250mg	Capsule	0.09	0.0321	0.03	0.36	0.33
Doxycycline	100mg	Capsule	0.0192	0.0261	0.025	1.36	1.30
Co-Trimoxazole (Trimethoprim + Sulfamethoxazole)	800mg + 160mg	Tablet	0.0314	0.0259	0.024	0.82	0.76
Metronidazole	400mg	Tablet	0.0157	0.0145	0.0136	0.92	0.83
Tetracycline	250mg	Capsule	0.0222	0.0141	0.016	0.63	0.67
Nalidixic Acid	500mg	Tablet	0.0435	0.0626	0.048	1.44	1.1

•S= Supplier price [As Buyer price not found]

2003 and year 2006 was not statistically significant (p value = 0.325).

Comparison between year 2003 and 2015

Median prices of maximum medicine increased in 2015 moderately compared to year 2003. This difference of prices between year 2003 and year 2015 was not statistically significant (p value = 0.168).

Comparison between year 2003 and 2019

Median prices of selected medicines increased in 2019 much compared to year 2003. This difference of prices between year 2003 and year 2019 was statistically significant (p value = 0.020).

Comparison between year 2006 and 2015

Median prices of selected medicines increased in 2015 much compared to year 2006. This difference of prices between year 2003 and year 2015 was statistically significant (p value = 0.032).

Comparison between year 2006 and 2019

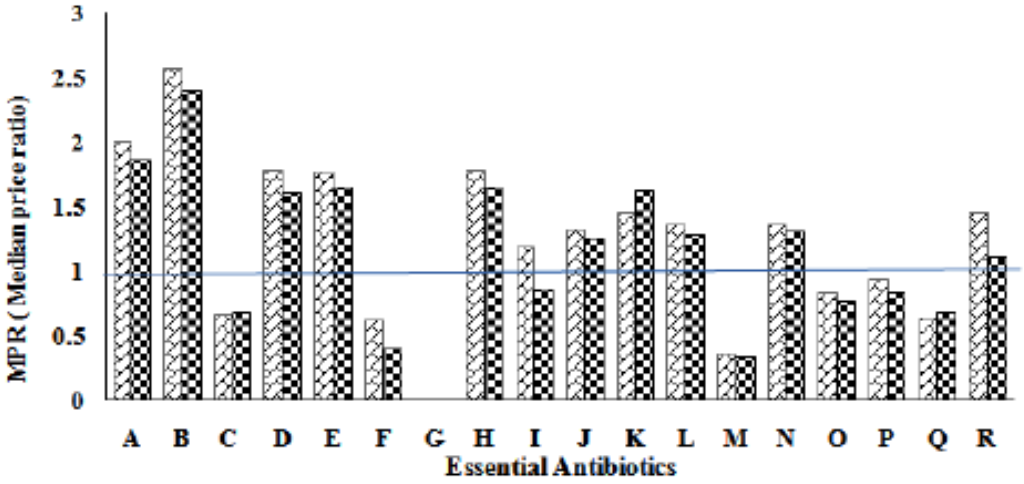
Median prices of selected medicines increased in 2019 greatly compared to year 2006. This difference of prices between year 2003 and year 2019 was statistically significant (p value = 0.007).

Comparison between year 2015 and 2019

Median prices of selected medicines increased in 2019 greatly compared to year 2015. This difference of prices between year 2015 and year 2019 was not statistically significant (p value = 0.510).

Figure 2a showed that the Median unit price of Amoxicillin Capsule (250 mg) decreased 8.34% from 2003 to 2006, increased 7.43% from 2003 to 2015, and 6.52% from 2001 to 2019; that of Phenoxymethyl Penicillin Tab (250 mg) increased 0% from 2003 to 2006, 35% from 2003 to 2015 and 49.6% from 2003 to 2019; that of Amoxiclav Tablet (250 mg) decreased 19.6% from 2003 to 2006, 18% from 2003 to 2015 and 1% from 2001 to 2019; that of Tetracycline Capsule (250 mg) decreased 0.9% from 2003 to 2006, 8.9% from 2003 to 2015and 28.7% from 2003 to 2019; that of Nalidixic Acid Tablet (500 mg) increased 0.389% from 2003 to 2006, 26% from 2003 to 2015 and 4.5% from 2003 to 2019, respectively.

A plot was drawn using selected antibiotics showed a great deviation in price over years (Figure 3(a), 3(b)).



Here = Year 2015 & = Year 2019.

A=AmoxycillinB=Ampicillin C=Phenoxymethyl Penicillin D=Benzathine Penicillin E= FlucloxacillinF= Procaine Penicillin G=CephradineH=Cephalexin I=Benzyl Penicillin J= CloxacillinK=AmoxiclavL=Erythromycin M= Chloramphenicol N=Doxycycline O=Co-TrimoxazoleP= Metronidazole Q=Tetracycline R=Nalidixic Acid.

Fig. 4. Median Price Ratio (MPR) of selected essential antibiotics

Figure 3a showed that the Median unit price of Flucloxacillin Capsule 250 mg increased 0% from 2003 to 2006, increased 0.36% from 2003 to 2015 and 0.36% from 2001 to 2019; that of Cephradine Capsule 250 mg increased 0 % from 2003 to 2006, 0.38% from 2003 to 2015 and 2.3% from 2003 to 2019 ; that of Erythromycin Tablet 250 mg decreased 3.3% from 2003 to 2006, 5.5% from 2003 to 2015 and 7.2% from 2001 to 2019; that of Doxycycline Capsule 250 mg increased 0% from 2003 to 2006, 1.5% from 2003 to 2015 and 3% from 2003 to 2019; that of Co-trimoxazole Tablet 800 mg+160 mg increased 0% from 2003 to 2006, 1% from 2003 to 2015 and 0.25% from 2003 to 2019; that of Metronidazole Tablet 400 mg increased 0% from 2003 to 2006, 11.8% from 2003 to 2015 and 12.8% from 2003 to 2019, respectively.

Median Price Ratio (MPR)

Median Price Ratio (MPR) of medicines was calculated to observe how many times greater or lesser the price of local medicines to international reference unit prices. The formula for calculating MPR is given below –

Median Price Ratio (MPR) =(Median local unit price)/(Internationalreferenceunitprice)

The medicine prices of year 2015 and 2019 were converted to US Dollar using the exchange rate on 30.06.2015 ($1 USD = 77.83 Bangladeshi Taka) and 28.01.2019 ($1 USD= 83.4643 BDT), respectively. The international prices of 2015 were used as reference unit prices.

Figure 4 showed that the Median Price Ratio (MPR) of Amoxicillin was 2.00 and 1.85 in 2015 and 2019, respectively; that of Ampicillin was 2.56 and 2.39 in 2015 and 2019, respectively; that of Phenoxymethyl Penicillin was 0.66 and 0.67 in 2015 and 2019, respectively; that of Benzathine Penicillin was 1.77 and 1.6 in 2015 and 2019, respectively; that of Flucloxacillin was 1.76 and 1.64 in 2015 and 2019, respectively; that of Procaine Penicillin was 0.61 and 0.4 in 2015 and 2019, respectively; that of Cephradine was not found; that of Cephalexin was 1.78 and 1.64 in 2015 and 2019, respectively; that of Benzyl Penicillin was 1.2 and 0.86 in 2015 and 2019,

Table 6. Availability and Market growth of essential antibiotics

Medicines	Dosages Form	No. of manufacturers in different year				
		2001	2003	2006	2015	2019
Amoxicillin	Capsule/Dry Syrup /Injection	10	75	70	45	69
Ampicillin	Capsule/Dry Syrup /Injection	10	11	9	6	6
PhenoxymethylPenicillin	Tablet/Syrup	10	15	17	10	16
Benzathine penicillin	Injection	7	4	5	2	6
Flucloxacillin	Capsule/Syrup/Injection	10	46	57	49	70
Procaine penicillin	Injection	4	2	3	3	4
Cephradine	Capsule/Syrup/Injection	10	54	58	57	79
Cefalexin	Capsule/Tablet/Syrup	11	39	30	8	20
Benzyl penicillin	Injection	3	3	2	1	4
Cloxacillin	Capsule/Syrup/Injection	10	30	26	14	16
Amoxiclav (Amoxicillin + Clavulanic acid)	Tablet/Capsules/ Dry Syrup/Injection	8	4	4	8	14
Erythromycin	Tablet/Oral Suspension /Injection	10	27	40	40	50
Chloramphenicol	Eye/Ear Drops/Ointment	4	5	4	21	25
Doxycycline	Capsule	10	47	46	25	40
Co-trimoxazole (Trimethoprim + Sulfamethoxazole)	Tablet/Suspension	9	69	60	33	32
Metronidazole	Tablet/Oral Liquid/Injection	11	77	70	44	80
Tetracycline	Capsule/Injection	10	37	34	14	26
Nalidixic acid	Tablet/Syrup	10	12	11	4	9

respectively; that of Cloxacillin was 1.32 and 1.25 in 2015 and 2019, respectively; that of Amoxiclav was 1.44 and 1.62 in 2015 and 2019, respectively; that of Erythromycin was 1.36 and 1.28 in 2015 and 2019, respectively; that of Chloramphenicol was 0.36 and 0.33 in 2015 and 2019, respectively; that of Doxycycline was 1.36 and 1.3 in 2015 and 2019, respectively; that of Co-Trimoxazole was 0.82 and 0.76 in 2015 and 2019, respectively; that of Metronidazole was 0.93 and 0.83 in 2015 and 2019, respectively; that of Tetracycline was 0.64 and 0.67 in 2015 and 2019, respectively; that of Nalidixic Acid was 1.44 and 1.1 in 2015 and 2019, respectively.

Availability of medicines

For assessing medicine availability, manufacturers of each medicine were counted. This gave the national availability of the medicines. By collecting data from different retail pharmacies, availability of medicines at regional level was determined. It is important to mention that the availability given in the results refers to all eighteen examined essential antibiotics. Only that antibiotics were seen at the time of data collection were termed as available.

Figure 5a showed that the number of manufacturers of Amoxicillin was 10 in 2001, 75 in 2003, 70 in 2006, 45 in 2015 and 69 in 2019; that of Flucloxacillin was 10 in 2001, 46 in 2003, 57 in 2006, 49 in 2015 and 70 in 2019; that of Cephradine was 10 in 2001, 54 in 2003, 58 in 2006, 57 in 2015 and 79 in 2019; that of Amoxiclav was 8 in 2001, 4 in 2003, 4 in 2006, 8 in 2015 and 14 in 2019; that of Erythromycin was 10 in 2001, 27 in 2003, 40 in 2006, 40 in 2015 and 50 in 2019, respectively.Here, =Year 2001, =Year 2003, = Year 2006, = Year 2015 & = Year 2019.

Figure 5b showed that the number of manufacturers of Amoxicillin increased 650% from 2001 to 2003, 600% from 2001 to 2006, 350% from 2001 to 2015 and 590% from 2001 to 2019; that of Flucloxacillin increased 360% from 2001 to 2003, 470% from 2001 to 2006, 390% from 2001 to 2015 and 600% from 2001 to 2019; that of Cephradine increased 440% from 2001 to 2003, 480% from 2001 to 2006, 470% from 2001 to 2015 and 690% from 2001 to 2019; that of Amoxiclav decreased 50% from 2001 to 2003, 50% from 2001 to 2006,

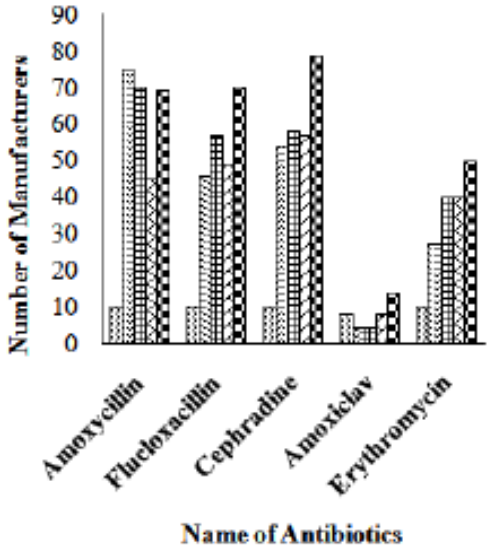


Fig. 5a. Manufacturers number of selected essential antibiotics across years

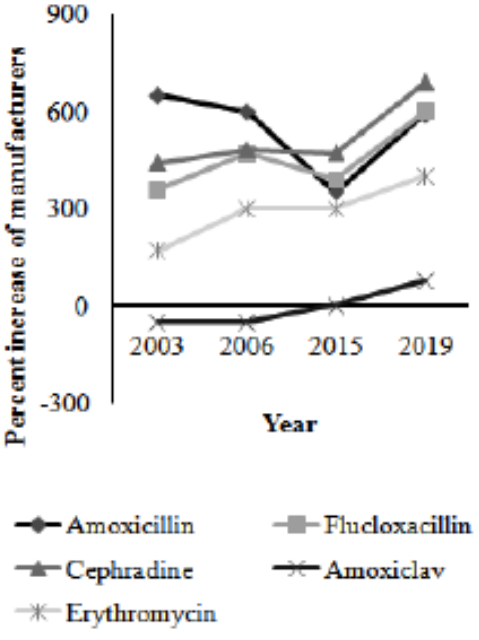


Fig. 5b. Percent increase of manufacturers across years

Here, =Year 2001, =Year 2003, = Year 2006, = Year 2015 & = Year 2019.

increased 0% from 2001 to 2015 and 75% from 2001 to 2019; that of Erythromycin increased 170% from 2001 to 2003, 300% from 2001 to 2006, 300% from 2001 to 2015 and 400% from 2001 to 2019, respectively.

A total of 25 retail pharmacies were

Table 7. Availability of generic equivalent medicines in retail pharmacies.

Medicine	Dosages Form	Availability in percentage(%) Model Pharmacy (n=10)	General medicine store(n=15)
Amoxicillin	Capsule/Dry Syrup /Injection	100%	93.33%
Ampicillin	Capsule/Dry Syrup /Injection	70%	26.66%
PhenoxymethylPenicillin	Tablet/Syrup	90%	53.33%
Benzythine penicillin	Injection	80%	33.33%
Flucloxacillin	Capsule/Syrup/Injection	100%	86.66%
Procaine penicillin	Injection	20%	0%
Cephradine	Capsule/Syrup/Injection	100%	80%
Cephalexin	Capsule/Tablet/Syrup	60%	6.66%
Benzyl penicillin	Injection	30%	6.66%
Cloxacillin	Capsule/Syrup/Injection	90%	26.66%
Amoxiclav(Amoxicillin + Clavulanic acid)	Tablet/Capsules/ Dry Syrup/Injection	100%	86.66%
Erythromycin	Tablet/Oral Suspension /Injection	100%	66.66%
Chloramphenicol	Eye/Ear Drops/Ointment	70%	40%
Doxycycline	Capsule	90%	66.66%
Co-trimoxazole (Amoxicillin + Clavulanic acid)	Tablet/Suspension	100%	46.66%
Metronidazole	Tablet/Oral Liquid/Injection	100%	86.66%
Tetracycline	Capsule/Injection	100%	46.66%
Nalidixic acid	Tablet/Syrup	50%	33.33%

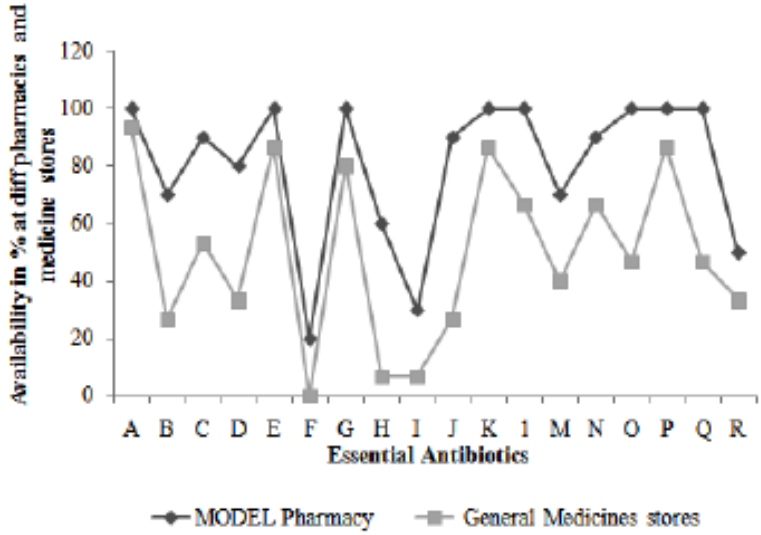


Fig. 6. Availability of selected essential antibiotics at Dhaka Metropolitan city in Bangladesh.
A=Amoxicillin B=Ampicillin C=Phenoxymethyl Penicillin D=Benzathine Penicillin E= FlucloxacillinF= Procaine Penicillin G=CephradineH=Cephalexin I=Benzyl Penicillin J=CloxacillinK=AmoxiclavL=Erythromycin M= Chloramphenicol N=Doxycycline O=Co-TrimoxazoleP= Metronidazole Q=Tetracycline R=Nalidixic Acid

inspected to gather information about the described medicines. Availability of a medicine was ensured when one outlet had the medicine of any dose and dosage form on the time of data collection. However, data were collected from different types of retail pharmacies- large, small; medicine shop, model pharmacy; medicine stores located near the both government and non-government hospitals. The retail shops were located in different regions of the Dhaka Metropolitan City. In inspected retail shops, the essential antibiotics were poorly available in general medicine stores as compared to the Model pharmacies. So availability is higher in Model pharmacies than General medicine stores.

Figure 6 showed that the availability of Amoxicillin was 100% and 93.3% in Model pharmacies and General medicine stores respectively; that of Ampicillin was 70% and 26% in Model pharmacies and General medicine stores respectively; that of Phenoxymethyl Penicillin was 90% and 53% in Model pharmacies and General medicine stores respectively; that of Benzathine Penicillin was 80% and 33.3% in Model pharmacies and General medicine stores respectively; that of Flucloxacillin was 100% and 86% in Model pharmacies and General medicine stores respectively; that of Procaine Penicillin was 20% and 0% in Model pharmacies and General medicine stores respectively; that of Cephradine was 100% and 80% in Model pharmacies and General medicine stores, respectively ; that of Cephalexin was 60% and 7% in Model pharmacies and General medicine stores, respectively; that of Benzyl Penicillin was 30% and 7% in Model pharmacies and General medicine stores, respectively; that of Cloxacillin was 90% and 26% in Model pharmacies and General medicine stores, respectively; that of Amoxiclav was 100% and 86% in Model pharmacies and General medicine stores, respectively; that of Erythromycin was 100% and 66% in Model pharmacies and General medicine stores respectively; that of Chloramphenicol was 70% and 40% in Model pharmacies and General medicine stores, respectively; that of Doxycycline was 90% and 66% in Model pharmacies and General medicine stores, respectively; that

Table 8. Prices per regimens of treatment with different essential antibiotics

Medicine	Strength	Course of treatment	No. of units per treatment	Median price pertab/ vial	Price per course of treatment	Number of days' wages
Amoxicillin	Cap 250mg	6 Cap/day, 7 days	42	3.51	147.42	0.553
Ampicillin	Cap 250mg	6 Cap/day,7 days	42	3.25	136.5	0.512
Phenoxymethyl-penicillin	Tab 250mg	8 tab/day, 7 days	56	2.2	123.2	0.462
Benzathine penicillin	Inj12 lac unit/vial	2 Inj/week,3 weeks	6	24.21	145.26	0.545
Flucloxacillin	Cap 250mg	6 Cap/day, 7 days	42	5.52	231.84	0.87
Procaine penicillin	Inj4 lac unit/vial	2vial/day, 10 days	20	10	200	0.75
Cephradine	Cap 250mg	8 Cap/day, 7 days	56	6.65	372.4	1.4
Cephalexin	Cap 250mg	8 Cap/day, 7 days	56	6.5	364	1.36
Benzyl penicillin	Inj 5lac unit/vial	4 vial/day, 5 days	20	8.765	175.3	0.66
Cloxacillin	Cap 500mg	4 cap/day, 7 days	28	5.92	165.76	0.6216
Amoxiclav (Amoxicillin + Clavulanic acid)	Tab 250mg+125mg	6 tab/day, 7 days	42	20	840	3.15
Erythromycin	Tab 250mg	8 tab/day, 7 days	56	4.825	270.2	1.01
Chloramphenicol	Cap 250mg	8 Cap/days,5 days	40	2.5	100	0.4
Doxycycline	Cap 100mg	2 Cap/day,7 days	14	2.06	28.84	0.11
Co-trimoxazole (Trimethoprim + Sulfamethoxazole)	Tab 800mg+160mg	2 Cap/day,7 days	14	2.005	28.07	0.105
Metronidazole	Tab 400mg	4 cap/day, 7 days	28	1.14	31.92	0.12
Tetracycline	Cap 250mg	8 Cap/day, 7 days	56	1.3	72.8	0.273
Nalidixic acid	Tab 500mg	8 Cap/day, 7 days	56	4.03	225.68	0.8463

of Co-Trimoxazole was 100% and 46% in Model pharmacies and General medicine stores respectively; that of Metronidazole was 100% and 86% in Model pharmacies and General medicine stores, respectively; that of Tetracycline was 100% and 46% in Model pharmacies and General medicine stores, respectively; that of Nalidixic Acid was 50% and 33.3% in Model pharmacies and General medicine stores, respectively.

Affordability of medicine

Medicine affordability was estimated by calculating the expenses of standard treatment to complete a full course (Shown in Table 7). The prices of medicines of 2019 were considered. The government of Bangladesh, on September 13, 2018 announced Tk. 8000 BDT as the minimum salary for Garment worker. The lowest monthly wage of unskilled people was considered as 8000 BDT . The economic condition of Bangladesh is also growing healthy. The per capita national income is also increasing every year. So the medicines are also becoming more affordable. The following table gives some idea about health and economic status of Bangladesh.

The number of day's salaries necessary to buy a course of treatment (shown in Table 8) was estimated from the daily wages of the lowest-paid unskilled laborer (266.67 BDT).

DISCUSSION

In visited retail shops, the essential antibiotics were less available in general medicine stores as compared to the Model pharmacies. A comparative study on prices variation across years had shown a moderate increase in price. The median prices of surveyed antibiotics were obtained and a gross comparison was done that indicated % increase or decrease in price. In the study, the median price ratios of surveyed antibiotics ranged from 0.36-2.56 and 0.33-2.39 in Year 2015 and 2019, respectively. While observing the WHO target that patients should pay no more than four times the IRPs, we found that medicine prices were lower in the Bangladesh compared to IRPs. A medicine price survey in Bahrain during 2013 utilizing the WHO/HAI method, exhibited that patients were paying 34.78 and 13.85 times IRPs for innovator brands and lowest paid generics, respectively 1. Patients were paying 13.05 and 4.12 times IRPs for innovator brands and lowest paid generics, respectively during 2011 at Tatarstan

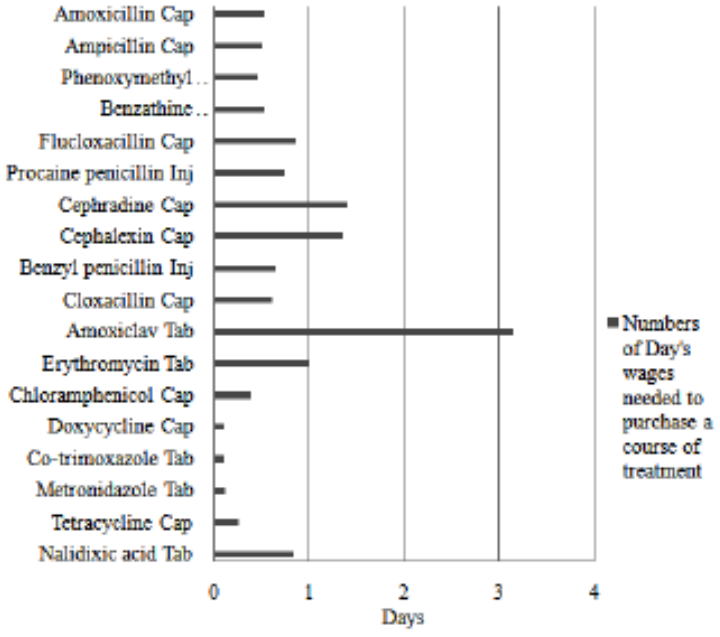


Fig. 7. Affordability of essential antibiotics in Bangladesh

Province of Russia. While patients were paying 61.44 and 17.33 times IRPs for innovator brands and lowest paid generics, respectively13, in a Caribbean country in 2010. Our findings gave the idea that the essential antibiotics were affordable in Bangladesh.

CONCLUSIONS

Medicine prices are not much higher than international reference prices. In comparison to the WHO target, medicine prices were considerably lower in the Bangladesh. We also observed a wide variation in terms of the MPR results for different antibiotics in our work. The prices for medicines included were near to WHO's target. The essential antibiotics were affordable. These data exhibit that the antibiotics targeted by the study have a high variation in prices. The reason for this variation may be due to fewer generics on the market and therefore they have a widespread availability in the first level health facilities, which may result in decreased prices relative to the international reference. Some treatments are affordable for families on a low income. This is especially true for essential medicine used in the treatment of different diseases. The numbers of manufacturers for several medicines have increased in a very rapid speed. Mostly used antibiotics manufacturers are increasing from the last consecutive years.

Based on the findings of the study, it is inferred that – (i) Investigating the availability of medicines in government hospitals and examining models that are able to provide good prices and availability at their hospital, (ii) Establishing a price regulation mechanism for essential medicines, (iii) Medicine price monitoring should be performed at regular interval. To more precisely control price and availability trends, prices must be monitored regularly and have the results made widely available, (iv) There are several medicines which are manufactured by only a few companies. As a result, the prices of those medicines remain very high in comparison to international reference prices. The government should be aware that essential medicines are manufactured by almost all company, (v) There should be a database for the prices of medicines of previous years so that one can easily compare the price changes among years. This database should be available for mass people.

ACKNOWLEDGEMENT

We express our gratitude to the authority of Directorate General of Drug Administration (DGDA).

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Appendix III

A Study on the National Drug Policies of Bangladesh to Ensure Health for All

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ABSTRACT: Bangladesh approved the proposal for a National Drug Policy on May 29, 1982. We know that such drug policies are developed gradually over a period of time and may contain a lot of comprehensive documents. But in Bangladesh, the expert committee worked out the policy, based on 16 standards within 15 days. This vital document, almost unchanged, was made a law on 12 June 1982. A few years later, it can be observed that despite opposition from many concerns, the output of essential drugs has increased from about 30 to about 80 percent, prices have in almost all cases gone down considerably, the domestic industry has grown rapidly, the quality of its production has increased dramatically, and people's awareness about quality medicines has been steadily growing. The World Health Organization (WHO) has stressed the need of a formulated drug policy in every country of the world in 1986. Bangladesh responded very early to this respect. Subsequently, two more national drug policies were promulgated in 2005 and 2016 respectively. Experience over the decades has shown that the said policies could not fulfill the declared objective of ensuring health for all. Our aim is to describe some of the lacunae for which total implementation of drug policy is still struggling. To find the root causes, a total of five hundred volunteers were surveyed by supplying a questionnaire on drug policy. It was observed that most of the participants opined that the incumbent government needs to be more stringent to implement the drug policy into reality by utilizing the public servants and public sectors, especially health personnel to ensure health for all.

Key words: National drug policy, Health of people, WHO, Questionnaire.

INTRODUCTION

The World Health Organization (WHO) defines National Drug Policy (NDP) as "a comprehensive framework in which each component plays an important role in achieving one or more of the general objectives of the policy (access, quality and rational use)".[1] WHO recommends that all countries of the world formulate comprehensive NDP and implement it. A policy is not static and will usually develop over time. A National Drug Policy is a commitment to a goal and a guide for action. National drug policy expresses and prioritizes the medium to long-term goals set by the government for the pharmaceutical sector, and identifies the main strategies for attaining quality in pharmaceutical sector. The NDP deals with both public and private segments of pharmaceutical issues and comprises all the notable thespians of this medicine-producing arena.[2] Essential Medicine (EM) was defined in 1977 as "medicines that are of utmost importance, and are basic, indispensable and necessary for the health needs of the population".[3]

The Government of Bangladesh is committed to provide effective health care service for the people of the country as per the constitution of the People's Republic of Bangladesh Articles 15 (a), 15(d), and 18(1). Good quality drugs are pre-requisite along with the skilled physicians and standard medical devices and supplies for promoting improved health

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care service. The pharmaceutical industry of Bangladesh is one of the fastest growing sectors. Once where almost 80% demand of drugs was imported, currently more than 98% of medicines are being produced in the country.

NDP of 1982 is an epoch-making event in the history of Bangladesh. Before 1982, there was no NDP in Bangladesh.[4] The medicine market in Bangladesh was filled with unnecessary, harmful, and unsafe medicines before NDP 1982 and multinational companies were controlling the pharmaceutical markets of Bangladesh.[5,6] Only 14 countries, including Bangladesh, had NDP in 1982.[7,8] The second National Drug Policy was formulated in 2005 and the third one was published in 2016.[9,10] A struggle and endeavor has been done in the formulation of NDP 2016 to make the policy much more effective and pro-people.

The major objectives of the study were - (i) to check consciousness of related people about National Drug Policy, (ii) to improve the policy by taking some valuable suggestions from the respondents of the survey, (iii) to find out the drawbacks that are in the policy and come out with the strategies to deal with them and (iv) to find out the area of non-cooperation to implement the policy in the ground.

MATERIALS AND METHODS

Both primary and secondary data were used to conduct the study. The survey (primary) was done to identify the consciousness and thinking of the respondents. The respondents of this study were teachers, students and researchers. Some universities were randomly selected for this purpose. All of the respondents were related to drug sector. Secondary sources of data were from articles, books, webs etc.

Data collection. Required information about the study was attained by supplying questionnaire. Respondents' perceptions and suggestions were also taken to fulfill specific purpose of the research. A total of 500 respondents were surveyed (Table 1). They were students, teachers, researchers etc. Primary data was collected using the knowledge of the people about NDP in the country.

Table 1. List of Universities surveyed.

Name of Institutions	Number of respondents
University of Dhaka	55
University of Asia Pacific	61
State University of Bangladesh	138
Northern University of Bangladesh	56
World University of Bangladesh	42
Khulna University	148
Total	500

The respondents were asked some questions about National Drug Policy (NDP) as well as the safe use of antibiotics and Rational Use of Drug (RUD).

RESULTS AND DISCUSSION

For a comparative study, data from 500 respondents were collected followed by supplying questionnaire to the respondents. Then the data were entered into the program of MS Excel Work book. The questionnaire, responses and analysis are presented below.

Question 1. Are you acquainted with National Drug Policy (NDP)?

In this question, 460 of the respondents out of 500 answered 'yes' and rest 40 answered 'no' (Figure 1).

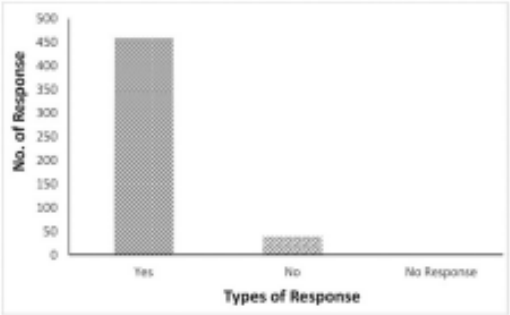

Figure 1. Responses to the question 1.

The above figure showed that 92% of the respondents were acquainted with drug policy and 8% were not acquainted. It means that most of the respondents are acquainted with the NDP. But 100 % of the population related to pharmaceutical sciences should know about the NDP. Drug policy is a

complete life cycle of a drug. It controls every step of drug like production, distribution, advertisement, sell etc. Appropriate knowledge of drug is incomplete without knowing the National Drug Policy of someone's own country.

Question 2. If yes, what are your suggestions regarding its appropriateness the way it is now?

Some suggestions regarding its appropriateness the way it is now were given by the respondents. The suggestions of the respondents were - (i) Regulatory authority should take some steps and should be much stricter regarding the issue, (ii) Stakeholders should come forward to ensure the appropriateness of the policy, (iii) Some respondents have suggested to make some strict law about it, (iv) There should be some research work regarding this policy, (v) Drug policy should be updated with time, (vi) This policy should spread among the normal people to increase awareness, (vii) Some people suggested to make it more specified, and (viii) Some people suggested to modify it. The results (responses of 460 respondents) could also be viewed in the following figure.

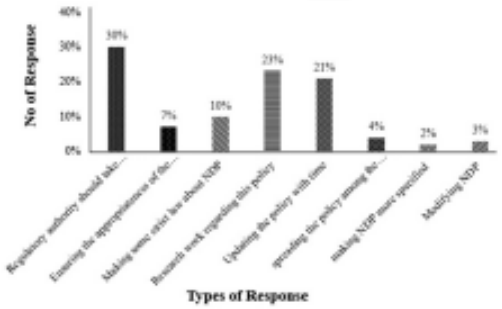

Figure 2. Suggestions regarding NDP's appropriateness the way it is now.

From Figure 2, it was evident that 30% (138) of the respondents suggested the regulatory authority to take some step and be much stricter regarding the NDP. 23% (106) respondents stressed upon the research work regarding the policy. 21% (97) respondents suggested to update the policy in time. The percentages for responses regarding making some strict law about NDP, ensuring the appropriateness of the policy, spreading the policy among the common people to increase awareness, modifying NDP and making NDP more specified were 10% (46), 7% (32), 4% (18), 3% (14) and 2% (9), respectively. The results shown in the figure were taken from the suggestions given by the respondents in this respect.

Question 3. If no, do you think you should have been acquainted?

It was observed that 9 answered 'yes', 7 answered 'no' and 24 had 'no response'. Here, maximum respondents had no responses, which was unexpected. The reasons behind it need to be explored. The result is shown in Figure 3.

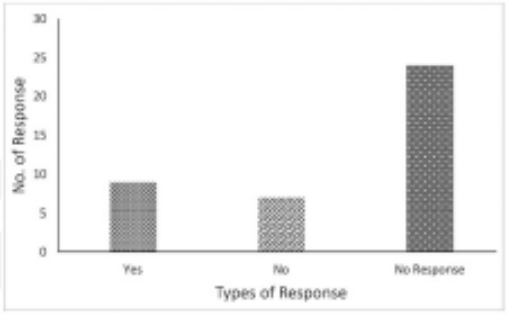

Figure 3. Responses to the question 3.

In the question, whether the unacquainted respondents want to know about drug policy, it was observed that 22.5% of the respondents answered yes, 17.5% answered no and the rest 60% had no response. It showed that maximum respondents had no interest to be acquainted with NDP. But related people should know in detailed about the NDP. Acquaintance means familiarity with or knowing something. The result shows the respondents who have no knowledge (acquaintance) about the drug policy, of them, maximum have no interest to know the drug policy although some feel of no need to know the drug policy. The authority concerned, for example DGDA, should play vital role to make people interest to know about drug policy.

Question 4. Do you think the present syllabus (syllabus of B. Pharm and M. Pharm) related to drug policy issue is comprehensive?

In the fourth question, about the present syllabus, 212 respondents out of 500 replied 'yes', 280 replied

'no' and 8 had 'no response'. The responses are shown in Figure 4.

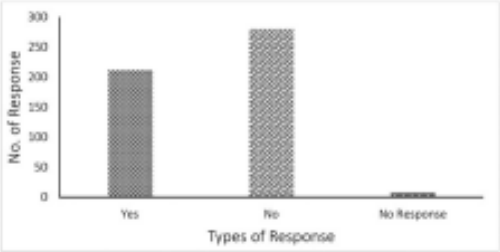

Figure 4. Responses to the question 4.

It was evident that 42% of the respondents answered 'yes', 56% replied 'no' and 2% had no response. Most of the answers were against the present syllabus regarding the "National Drug Policy". In order to have a good population of pharmaceutical knowledge, only traditional knowledge about drug and medicine is not enough. Knowledge of drug policy is also essential as 'drug policy' plays a vital role in all the drug related aspects. From the study, it was inferred that the present syllabus related to drug policy should be revisited, updated and transformed as per the market need.

Question 5. If no, what are your suggestions to improve the present syllabus?

In the 5th question, some respondents suggested some important points to improve the present syllabus of B.Pharm and M.Pharm. Those were - (i) More topics regarding drug policy should be added, (ii) Should teach us more elaborately, (iii) Irrelevant topics should be discarded, (iv) Topics should not be repeated, (v) Topics regarding drug policy should be added from first year and (vi) Syllabus should be updated with time. The suggestions regarding the improvement of present syllabus were in keeping with the context.

Question 6. In your opinion, is Adverse Drug Reaction Monitoring (ADRM) an important issue?

In the question on ADRM, 490 of the respondents replied 'yes', 2 replied 'no' and 8 had no response. Responses can be found in Figure 5.

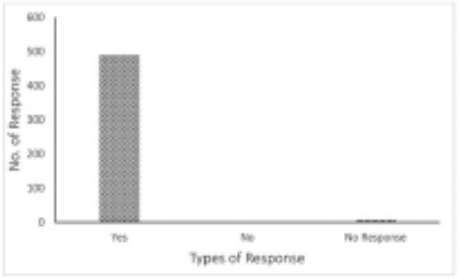

Figure 5. Responses to the question 6.

It was observed that 98% of the respondent agreed with the issue of ADRM. On the other hand, 2% of the respondents didn't agree with this issue. This indicated that ADRM was given importance by all concerned because it is very much related to maintaining good health of people.

Question 7. Do you think that Rational Use of Drug (RUD) is an important issue today?

490 out of 500 respondents answered 'yes', 4 answered 'no' and 6 had no response. The responses are shown in Figure 6.

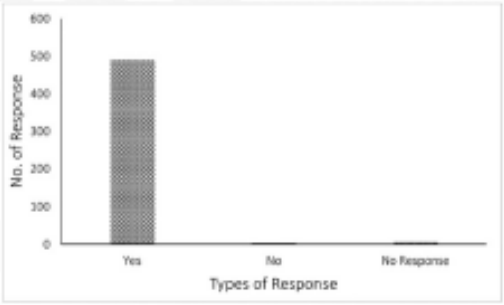

Figure 6. Responses to the question 7.

From the figure, it was seen that 98% of the respondents said that RUD was an important issue. Only 1% respondent replied 'no' and 1% didn't respond to the question. It means that better treatment can be ensured by practicing RUD. So, the importance of RUD can clearly be understood by the relevant people. But the bitter truth is that RUD is not maintained properly in our country. So, according to the respondents' opinion, more care should be given about the right quality, right quantity, right time, right dosage form, right application of drug and at right price. Because, overuse, polypharmacy and incorrect

use of drugs are the most common problems of drug use today; RUD should be given priority.

Question 8. It is widely known that abuse of antibiotics is very common all over the country. Do you think RUD can prevent abuse of antibiotics?

It was evident that 495 out of 500 respondents opined in favor of practice of RUD to prevent abuse of antibiotics, 2 respondents answered 'no' and 3 had no response. The responses could also be viewed in Figure 7.

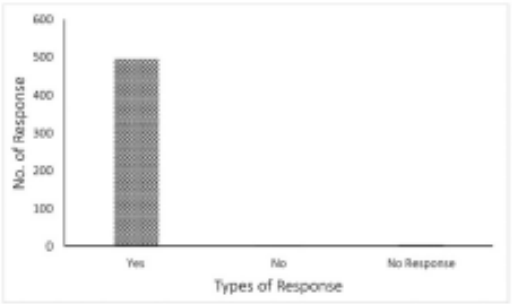

Figure 7. Responses to the question 8.

It was observed that 99% of the respondents thought that RUD can prevent the abuse of antibiotics. Less than 1% replied 'no' regarding the question. The result indicated that right use of drug practice can prevent abuse of antibiotics. So, training and awareness building endeavors regarding RUD might be fruitful to combat abuse of antibiotics in the country. Rational Use of Drugs is ensured when patients receive medications at the appropriate needs, in right doses, at the right time, and at the right cost. Overuse, polypharmacy and incorrect use of drugs are the most common problems of drug use today. In case of antibiotics, they happen every now and then and so, RUD regarding antibiotics has been emphasized in the study. A lot of factors, such as, budget, life style, awareness, knowledge etc. can contribute to the proper use of antibiotics besides RUD.

Question 9. Sustainable Development Goals (SDGs) contain some specific goals regarding use of drugs to improve public health. Do you think that it is important to incorporate SDGs in our current drug policy?

It was seen that 441 respondents out of 500 endorsed incorporation of SDGs in the current drug policy, 13 answered 'no' and 46 did not respond (Figure 8).

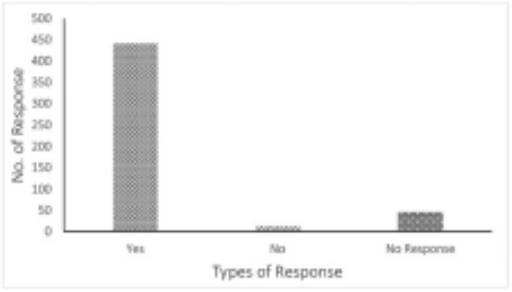

Figure 8. Responses to the question 9.

In the query of incorporation of SDGs into the drug policy, 88% said 'yes' and 3% said 'no' where 9% of the respondents didn't respond to the question. So, maximum felt the importance of incorporation of SDGs in the drug policy to keep pace with the global market.

Question 10. Do you have any idea about essential drug program in Bangladesh?

In response to the question regarding idea of essential drug program, 372 out of 500 respondents said 'yes', 110 answered 'no' and 18 did not respond (Figure 9).

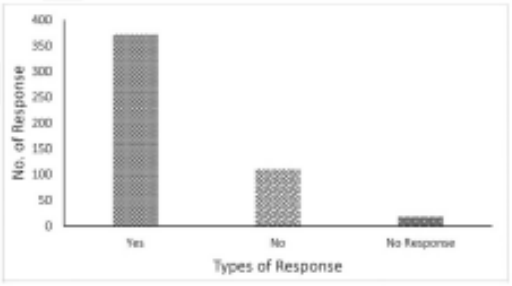

Figure 9. Responses to the question 10.

It was observed that 74% of the respondents answered 'yes', 22% answered 'no' and 4% did not respond. It was observed that maximum respondents had the idea about essential drug program.

Question 11. How many drugs are included as essential drugs in NDP 2016?

Well, it was a little bit tricky question as the right answer of the question along with wrong answers were given as options. The right answer was 285. Only 26 respondents were able to give the right answer among 500 respondents (Figure 10). 442 participants gave wrong answer and 32 did not respond.

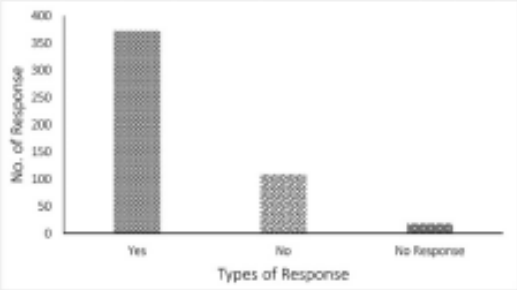

Figure 10. Responses to question 11.

It was seen that the percentage of right answerers was only 5% where percentage of wrong answerers was 85% and10% gave no response. Everyone related to drug and medicine should know the essential drug list. So, it was an important point to study why this information of essential drug list was not known to all concerned. It is to be mentioned that anybody can find the said essential drug list in the drug policy.

Question 12. Do you think that the fund allocated in the national budget for research and education on drug is sufficient?

It was displayed in the figure 11 that 445 out of 500 respondents said 'no', 40 said 'yes' and 5 did not respond.

Majority (91%) of the respondents opined that the budget that was allocated for the research purpose was not sufficient. 8% opined that the budget was sufficient and 1% had no response. The result of the study indicates that the present budget allocated to research and education on drug is not sufficient. So, budget on this issue should be revisited and commensurate with the actual need. More budget allocations on research and education on drug can contribute to create the healthy workforce who can give better service to the nation and ultimately participate in the national economy to a great extent. If this protection measure is taken proactively, it will positively trigger the national health in consequence.

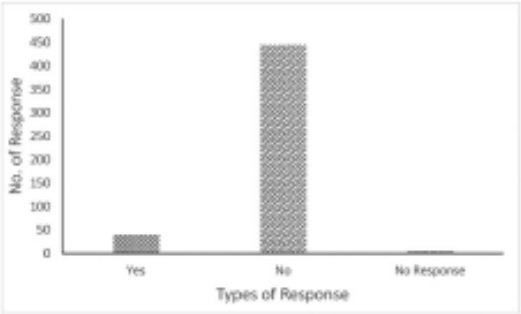

Figure 11. Responses to the question 12.

Question 13. If no, give your comment.

Some comments regarding this question are given below - (i) Budget should be increased, (ii) Regulatory committee should be formed regarding this issue, (iii) Investigation should be done why and where to increase the budget.

The study was conducted among the students, teachers and researchers of different universities offering pharmacy education. It has enabled us to realize the understanding and thinking of different respondents about NDP, ADRM, essential drug, sustainable development goals as well as Rational Use of Drugs. From different figures, it was observed that number of positive answers were good. In case of question of ADRM, RUD and safe use of antibiotics, most of the respondents gave positive answers. Maximum respondents (99%) opined that right use of drug practice can prevent abuse of antibiotics. Awareness and training were sought in this respect.

In the investigation, it was found that some of the respondents did not know about SDGs as well as essential drug program. The percentage were 9% and 22% respectively. Surprisingly, it was found that only 26 (5%) respondents out of 500 knew the exact number of essential drugs in Bangladesh. A study by AK Mohiuddin in 2018 observed that although the NDP gives clear guideline to production and distribution of essential drugs with incentives, still

80% of under privileged people doesn't have sustainable access.[11]

Regarding the question of improvement of the drug policy, most of the respondents suggested to make regulatory authority to strictly role/implement the drug policy. Drug policy is usually formulated by the health policy makers and planners, not by the regulatory authority. Drug policy is implemented by regulatory authorities. The goal is to transform the policy into reality. So, it should be spread over widely into the mass population. Also, NDP 2016 clearly spelled out that DGDA has to be strengthened through appropriate expansion of existing human resources and infrastructural facilities to serve as an effective National Regulatory Authority (NRA). The National Regulatory Authority has to be, at least, recognized by WHO and to be a member of PIC/S (The Pharmaceutical Inspection Convention/The Pharmaceutical Inspection Scheme).[12]

Again, almost 91% of the respondents said that budget allocated for research and education was not quite enough and they further suggested to increase the budget as well as to make a committee to look after the matter. According to DGDA, Drug Control Committee (DCC), Standing Committee for Imports of Raw Materials and Finished Drugs, Pricing Committee and a number of other relevant Committees, which comprise of experts of different fields, are there to advice the Licensing Authority and recommend about the matters related to drugs and medicines.[13] But as per the study, it needs some endeavor/improvement in implementation of the policy.

CONCLUSION

Based on the survey on students, teachers and researchers of different universities, it can be inferred that the idea of transforming national drug policy into reality is not so much difficult. It's just a matter of time. The major plus point has been the positive outlook of all the respondents of relevant areas. A good knowledge about the national drug policy as well as other drug related information is already in place. It should only be nourished and continued. However, there are some major drawbacks as noticed, like-continuous monitoring of regulatory committee, lack of strict rules and regulation, lack of dissemination of information to the general mass, lack of adherence etc. If these drawbacks are managed, people would be much more benefitted through implementation of the National Drug Policies.

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Appendix IV

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Primary Health Care in Netrokona Sadar Upazila - A Case Study on Extended Program on Immunization

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Abstract: Health related surveys are important as well as critical tool to measure a community's health status, health behavior, and risk factors concerned with health issues. These surveys also help to evaluate the quality of health care level received by the people. By conducting health surveys from time to time, the patterns and beliefs about health and treatment strategies can be identified. The national policy makers can use those survey data to better understand main health problems in the country and correct issues that are obstacles for human and economic development. The Expanded Program on Immunization (EPI) is a World Health Organization (WHO) program that aims to make all the essential vaccines available to all children regardless of nation, region, and socio-economic status. To make the program fruitful, all the United Nations' member states, the national governments make their policies for vaccination programs using the guidelines of EPI. Bangladesh is a south Asian country with a condensed population having different national problems. Ensuring primary health care to each and every individual is a challenging task for the government. The current study was aimed to observe the situation of primary health care system in an upazilla of the district Netrokona. The EPI was considered as a parameter of primary health care system. The data gathered from the study may be used by the government to fix the associated problems and to improve the health care system.

Keywords: Health Care Provider, Immunization, Primary Health Care, Upazilla Health Complex, WHO

1. Introduction

Health is the source of all happiness. Bangladesh is a lower middle income country in the world. It has about 160 millions of population struggling to stay in only 1,47,570 square kilometers. There are a number of challenges like ensuring health for all, natural disasters, unemployment etc. to face towards its way of development. Among them health is a pivotal issue to provide to all spheres of population. According to World Health Organization, "Health is the physical, social and mental wellbeing and not merely absence of any disease". Health is the basic need of people in Bangladesh. Medical care to Bangladeshi citizens is one of the basic necessities. Improvement of nutritional status and public health status is a Constitutional commitment of the Government of Bangladesh [1]. The progress of a nation depends on the condition of health of the population of the country. Basic health is crucial to serve people of Bangladesh. So, Primary Health Care (PHC) is an important arena to study and the focus would be on the Expanded Program on Immunization (EPI).

Although Bangladesh is progressing tremendously

recently, ensuring health for all is still a big challenge. From the government side along with other health services community clinics are playing important role. Non-Government Organizations (NGOs) are also contributing to this service to a great extent. Government and NGOs are striving to reach to the grass root levels to ensure health for the people of Bangladesh. How primary health care can be strengthened by engaging all players especially NGOs in providing health services is the center point of this study. The present study thus focuses on the Expanded Program on Immunization (EPI).

Health services based on primary health services have been expanding gradually in Bangladesh to improve the health status of the people, especially the maternal health in rural areas where more than 85 percent of the people are living and are underserved and underprivileged groups [2]. The study focused on the degree of people's getting the public health services from different agents as well as government of Bangladesh. It suggested that the people's getting the health services is not satisfactory. Salahuddin *et al.*, (1988) stated that Bangladesh, being a poor country with scarce resources, cannot afford to provide sophisticated medical care to the entire population [3]. Emphasis is therefore given to primary health care covering the unnerved and undeserved population with the minimum cost in the shortest time. Mahmud (2004) explored people's perceptions and reality regarding participation in freshly opened areas inside the Bangladesh public health healthcare delivery system [4]. The noble findings suggest that the effectiveness and ability of community teams to operate as spaces for participation and supply the means for developing capabilities to participate is limited, being constrained by poverty, social inequality and dependency relationships, invisibility, low self-esteem and absence of political clout.

The Government of Bangladesh is spending a remarkable amount of money to provide free primary health care services to the people through various efforts. Present scenario of providing primary health care services and the prospective areas of improvement are important arena to be looked into. The specific objectives of this study were as follows:

i. To find the area of cooperation of Government Organization (GO) and NGO in the arena of Public Health Care (PHC) focusing EPI.
ii. To find the weaknesses in providing the primary health care services.

2. Methods

Methodology plays an important role in performing this kind of research. So, the research followed specific methods to collect data and information by interviewing, personal observation and informal discussion.

Both primary and secondary sources of data were used throughout the study. Questionnaire, interview and discussion were the instruments to collect the primary data. The author selected a non-government organization, BRAC (Bangladesh Rural Advancement Committee), as the service provider regarding primary health care focusing EPI. Upazila health complex was consulted in providing the same. Program Head, Health, Nutrition and Population of BRAC head office was also consulted. Due to time and resource constraints, 20 service recipients, 5 service providers (NGO) and 5 service providers (GO) were randomly interviewed. Both qualitative and quantitative data were collected. Various books, journals and internet open access sources were used to collect the required information. Field visit was used to collect the valuable information. The steps used to conduct the study are shown in Figure 1.

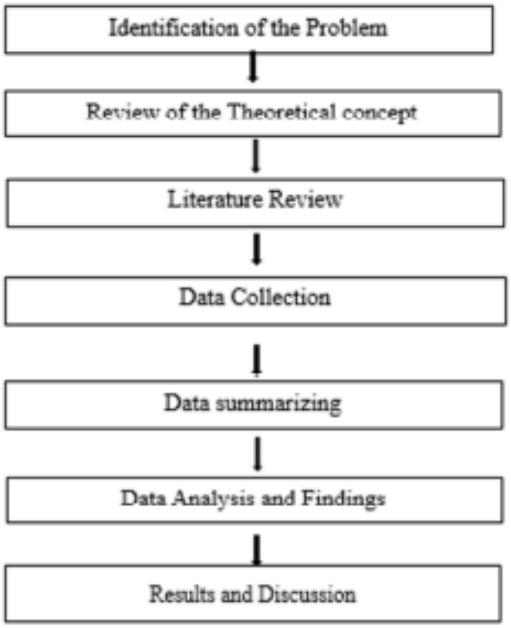

Figure 1. *Flow chart used for data collection, compilation and presentation.*

3. Results and Discussion

3.1. Public Health Care in Bangladesh

Primary Health Care (PHC) refers to "essential health care" that is supported by scientifically sound and socially acceptable strategies and technologies that create universal health care accessible to any or all people and families in a community. It is through their full participation and at a value that the community and also the country will afford to keep up at each stage of their development within the spirit of "self-reliance and self-determination" [5]. In other words, PHC is an approach to health beyond the traditional health care system that focuses on health equity-producing social policy [6]. PHC includes all areas that play a role in health, such as access to health services, environment and lifestyle [7]. Thus, primary healthcare and public health measures, taken together, may be considered as the cornerstones of

universal health systems [8].

Bangladesh government is striving to ensure basic health at the grass root level. As part of the initiative, the following data can be visualized. There are 467 government hospitals at the upazila level and below, which altogether have 18,791 hospital beds. At the union level, there are 31 hospitals with 490 beds and 1,362 health facilities for outpatient services only. So, at the union level, there are 1,393 health facilities. At the ward level, there are 12,584 community clinics in operation till date [9].

3.2. EPI in Netrokona Sadar Upazila

Primary health care includes very basic health care services like EPI, ORS, sanitation and family planning services, comprehensive reproductive health care, reduction of mortality and morbidity of mother and children etc. Of the so many, EPI was selected to measure the status of PHC. EPI is the instrument to prevent the following diseases of the mothers and children. Table 1 indicated the diseases which can be prevented by different vaccines under EPI [10].

Table 1. Diseases to be prevented by EPI.

Sl no.	Name of disease	Name of vaccine
1	Children tuberculosis	BCG
2	Diphtheria	Pentavalent
3	Hoping cough	Pentavalent
4	Tetanus	Pentavalent
5	Hepatitis B virus	Pentavalent
6	Hib V	Pentavalent
6	Polio	Oral polio vaccine
7	Hum	Measles Rubella

Netrokona sadar upazila was selected to study the impact of EPI of the government, because it is one of the most remote areas of Bangladesh.

A brief description of the population status of the area is given in the Table 2.

Table 2. Population status of Netrokona sadar upazila.

Item	Male	Female	Total
Total population	1,45,225	1,31,538	2,76,763
Children (0-59 month)	23,719	20,380	44,099
Adolescent (1 year reg.)		5,860	5,860
Female (15-49 years)		62,730	62,730
Pregnant women (1 year reg.)		7,666	7,666
Others			1,56,408

EPI related information of Netrokona Sadar upazila was searched and the scenario was given in the Table 3 [11].

Table 3. Information regarding EPI centers and related personnel from the government.

SL no.	Item	Number
1	EPI center	288
2	Health inspector	3
3	Assistant health inspector	12
4	Health assistant	45

One health assistant and one family planning worker are dedicated to ensure immunization of each immunization center of the respective ward of the union. There are 288 EPI centres in Netrokona Sadar Upazilla. 3 health inspector, 12 assistant health inspector and 45 health assistant engaged to ensure immunization of the centers. Every month immunization program is implemented by the efforts of the personnel and other resources dedicated for the purpose. Government as well as NGO, Bangladesh Rural Advancement Committee (BRAC) is working to make the program a success. Every health nurse of BRAC visits 15 household every day and he/ she finds out/ identifies the immunization requiring child, adolescent and pregnant mother. He/ she informs them about the immunization center and the date of immunization fixed by the office. If required, the incumbents are carried to the immunization center for ensuring their vaccination. For an instance, data of immunization in Netrokona sadar upazila is given in Table 4 [11].

Table 4. Monthly immunization report (children 0-11 month), December 2017.

Item	BCG	Pentavalent (1+2+3)	PCV (1+2+3)	OPV (1+2+3)	IPD	MR vaccine (1 dose)	Total
Total number of vaccine taken	503	1,616	1,586	1,616	459	511	6,291

Table 4 showed different types of vaccines for different diseases and also the number of vaccines given. The total number of vaccines given to 288 EPI centres is 6,291 for the month of December, 2017.

3.3. The Case study of EPI at Netrokona Sadar Upazilla

As a case study one of the immunization centres of Netrokona Sadar Upazilla was selected and 20 vaccine takers were interviewed through a pre-prepared questionnaire. The immunization center was the house of Nurul Islam Master, Village: Rajendrapur, Block: Kha-1, Ward no. 1, Union: Challisha, Thana: Netrokona Sadar. The respondents were asked how they were informed about the EPI. The status of the observation is given in Table 5.

Table 5. Sources of EPI information.

Sources of EPI information	Health inspector/ health assistant	Family welfare assistant	BRAC health nurse	Others
Number	2	4	11	2
Percentage (%)	10.5	21.0	57.9	10.5

Table 5 showed that 1 respondent did not respond to the issue. From the responses, it is evident that health inspector/

health assistant, family welfare assistant, BRAC health nurse and others gave the information to the vaccine takers were 10.5%, 21.0%, 57.9% and 10.5%, respectively. It is evident from the data that contribution of GO and NGO (BRAC) in giving the information of EPI was complementary and supplementary.

When asked the service provider of NGO (BRAC) said about success of the EPI, the respondents' comments were summarized in Table 6:

Table 6. *Comments of service providers about success of EPI.*

Item	Very good	Good	Satisfactory	Moderate	Not good
Number	5	0	0	0	0
Percentage (%)	100	0	0	0	0

It was observed from Table 6 that among the very good, good, satisfactory, moderate and not good, the very good comment was 100%. From the data it is observed that EPI is a successful endeavor of primary health care service in Bangladesh.

When asked the service provider of government side about success of the EPI, the respondents' (5) comments were summarized in Table 7.

Table 7. *Comments of service providers about success of EPI.*

Item	Very good	Good	satisfactory	Moderate	Not good
Number	5	0	0	0	0
Percentage (%)	100	0	0	0	0

It was observed from Table 7 that among the very good, good, satisfactory, moderate and not good, the very good comment was 100%. From the data it was observed that EPI is a successful event of primary health care service.

From the above two tables 6 and 7, both NGO and GO it may be commented about 100% success of EPI. One of the authors (MAR) personally visited the awareness and mobilsation briefing session of BRAC at Village: Rajendrapur, Block: Kha-1, Ward no. 1, Union: Challisha, Thana: Netrokona Sadar near to the EPI center of the house of Nurul Islam Master. A BRAC health worker was briefing the mother and adolescent and persuaded and mobilized them to go to the EPI center to take vaccines. A picture of the BRAC's effort is given Figure 2.

Figure 2. *Briefing session for mobilization program of BRAC.*

The author MAR visited the EPI center and saw that GO and NGO (BRAC) were working together to make the immunization program a success. In the EPI center, one health worker and one family welfare assistant from UHFPO were immunizing the mother, children and adolescent. And side by side, one health nurse was mobilizing the vaccines takers to the Centre. A symbol of cooperation and coordination between care provider and patient in the field level is given in the Figure 3.

Figure 3. *Immunization at the EPI Center.*

As per the information from the Deputy Commissioner's (DC) office of Netrokona district, there remain 63 NGOs in Netrokona. They meet in coordination meeting monthly in DC office and discussed various issues of collaboration and problems as well. Coordination meeting of NGOs is also held in Upazila level. Especially EPI and other health issues are discussed in the meetings of civil surgeon and UHFP office. This is how collaboration is being practiced between GO and NGOs at the local level.

One of the authors (MAR) met with Dr. Mohammad Ariful Alam, Program Head, Health, Nutrition and Population of head office of BRAC and discussed relevant issues regarding EPI. He commented that EPI is one of the successful sector of primary health care of Bangladesh. He added that government does the hard part and BRAC does the soft part of EPI as for example mobilization. Through excellent cooperation and coordination between GO and NGO, EPI became a grand success. But he claimed that government does not recognize the contribution of NGOs in this arena.

The author also meet with UHFPO of Netrokona Sadar upazila. UHFPO commented that BRAC is supporting the mobilization for EPI, but sometimes proper cooperation is not noticed as expected.

From the information and data included in the study, it is evident that diseases like children tuberculosis, diphtheria,

whooping cough, tetanus, hepatitis B virus, Hib V, polio and measles can be prevented by vaccines through EPI as part of the endeavors/ efforts of primary health care services of the government. In the journey of primary health care services through EPI, collaboration of GO and NGO works effectively to a great extent. Government ensures the hard part of the EPI like procurement and supply of vaccines, pushing or injecting vaccines etc. Along with government, NGO works for the soft part like awareness and mobilization of the incumbents/ clients. The study found that through collaboration and cooperation between GO and NGO, EPI becomes a successful program of the government. The study also finds some areas of development/ improvement. The areas identified might be more coordination, endorsement of contributions of the players in the smooth running of the EPI.

4. Conclusion

Healthy population can contribute to the economy in a better way. So, investment in health has a long term positive impact to the economy at large. Although government is the giant organization, it has also limitations because it looks for development and sustainability of the all sectors of the country. NGOs can play the complementary and supplementary role to government in ensuring optimum service to the public. EPI of primary health care service is a successful version of GO and NGO collaboration in Bangladesh. Coordination and collaboration between GO and NGOs could be applied to all other areas of service to public for overall development and sustainability of the country. The following points should also be taken into consideration:

i. Social acceptance: The mindset of general people is yet to be convinced to accept the good works of the NGOs in the country.
ii. Coordination at all levels: The study found some lack of full coordination especially in the implementation level. This issue should be well addressed.
iii. Transparency and accountability: Transparency and accountability of the NGOs should be revisited and revised in all levels for the betterment of the country.
iv. Role of NGOs and making public: NGOs are playing roles in the service to people in the country and it should be made public.
v. Contributions of parties: Contributions of both parties-GO and NGOs should be recognized and rewarded.
vi. Partners of Government: NGOs may be treated as complementary/ supplementary to Government initiatives.

Limitations

Enough time was not allocated to go in detail of study. Data collection was limited to Netrokona Sadar Upazila only. Secondary sources of data were used to enrich the primary data.

Conflict of Interest

The authors declare no conflict of interest.

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