NUTRITION EDUCATION AND FOOD SUPPLEMENTATION DURING PREGNANCY AND THEIR INFLUENCES ON BIRTH WEIGHT

A Thesis for the Degree of Master of Philosophy in Nutrition

BY
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DECLARATION

This is to certify that the thesis entitled "NUTRITION EDUCATION AND FOOD SUPPLEMENTATION DURING PREGNANCY AND THEIR INFLUENCES ON BIRTH WEIGHT" by Shimul Koli Hossain in partial fulfillment of the requirement for the award of Master of Philosophy in Nutrition has been completed under our supervision.

It is further certified that Shimul Koli Hossain has fulfilled all condition laid down in the Academic Ordinance with regard to M. Phil. course work and to the best of our knowledge, the thesis contains her original research.

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DECLARATION

I, hereby, humbly declare that the thesis entitled "NUTRITION EDUCATION AND FOOD SUPPLEMENTATION DURING PREGNANCY AND THEIR INFLUENCES ON BIRTH WEIGHT" based on works carried out by me. No part of it has been presented for attainment of higher degree in elsewhere.

The research work was carried out in i) Institute of Nutrition & Food Science (INFS), University of Dhaka ii) Rural community of Dhamrai Upazilla of Dhaka District iii) Rural community of Narshingdi Upazilla of Narshingdi District & iv) Rural community of Rupgonj Upazilla of Narayangonj District.

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Dedicated to

All Freedom Fighters of Bangladesh
for whom we got our Independence

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ACRONYMS

AIDS	Acquired Immunodeficiency Disease
ANC	Antenatal Care
ALRI	Acute Lower Respiratory Infections
BINP	Bangladesh Integrated Nutrition Program
BMI	Body Mass Index
BW	Birth Weight
CC	Chest Circumference
CHL	Crown Heel Length
CI	Confidence Interval
CNP	Community Nutrition Promoters
EFAs	Essential Fatty Acids
FSH	Follicle Stimulating Hormone
FS	Food Supplementation
FWA	Family Welfare Assistant
FWC	Family Welfare Centre
GnRH	Gonadotropin Releasing Hormone
HIV	Human Immunodeficiency Virus
hPL	Human Placental Lactogen
hCG	Human Chorionic gonadotropin
INFS	Institute of Nutrition & Food Science
IUGR	Intra Uterine Growth Retardation
LH	Leutenizing Hormone
LMP	Last Menstrual Period
LBW	Low Birth Weight
MDG	Millennium Development Goals
MNH	Maternal Neonatal Health

MUAC	Mid-Upper Arm Circumference
NCHS	National Centre for Health Statistics
NE	Nutrition Education
NNP	National Nutrition Program
OR	Odds Ratio
PI	Ponderal Index
RR	Relative Risk
SGA	Small for gestational Age
TMAR	Total Mean Adequacy Ratio
TSH	Thyroid Stimulating Hormone
UNICEF	United Nations Children's Fund
WHO	World Health Organization

ABSTRACT

A community based intervention study was conducted among three groups (Nutrition Education Group, Nutrition Education + Food Supplementation Group and Control Group) of 150 pregnant women with BMI<17 in three Upazillas with the aim to determine the effects of Nutrition Education and Nutrition Education along with Food Supplementation on them in terms of pregnancy weight gain and birth weight of babies. The study was conducted in Dhamrai Upazilla of Dhaka District (for Nutrition Education Group), Narsingdi Sadar Upazilla of Narsingdi District (for Nutrition Education + Food Supplementation Group) where a food supplementation program for women with BMI <17 of National Nutrition Program (NNP) is going on and in Rupgonj Upazilla of Narayangonj District (for Control Group). Pregnant women were selected with the inclusion criteria of being in the 5th month of pregnancy, having a BMI < 17, being free from systemic diseases like hypertension, diabetes, and kidney diseases and willing to participate in the study. The women who delivered before 37 weeks of pregnancy, gave birth of twin babies, aborted or had to be hospitalized for severe illness during pregnancy were excluded from the study.

Women in the Nutrition Education Group & Nutrition Education + Food Supplementation group were given Nutrition Education sessions every month based on selective topics till the deliveries of babies. In addition, women in the Nutrition Education + Food Supplementation Group were supplemented by 600 Kcal/woman/day for every day of the week except

for Friday in addition to their own home meals by the Community Nutrition Promoters (CNP) from the time of selection till delivery. Data was analyzed for 139 women (there were total dropouts of 11 women due to abortion, preterm birth & twin pregnancy) by using SPSS 12 version for Windows.

Finally after the dropouts, results were obtained from 55 pregnant women in the Nutrition Education Group, 40 women from the Nutrition Education + Food Supplementation Group and 44 women from the Control group. Most of the women (58.9%) were between 20 and 25 years of age; more than one-fourth (28.1%) were illiterate. About 59.0% did not have any kind of media at their homes. Mean monthly family income was Tk.3761.87±Tk.1922.46. Mean number of family members was 4.86±0.21. About one-fourth of the respondents (24.5%) were primi and most of the women (83.5 %) had two or less than two children.

Analysis of variance (ANOVA) suggests a statistically significant difference in total pregnancy weight gain across the three groups ($P<0.001$). Post hoc exploration of the association revealed higher weight gain in the Nutrition Education + Food Supplementation Group than in the other two groups ($P<0.01$). However, weight gain in the Nutrition Education Group is greater than Control Group but did not show statistically significant difference from the control ($P>0.05$). Mean birth weight was higher among Nutrition Education + Food Supplementation group than the Control & Nutrition Education group, but compared to the Control group, it was higher among Nutrition Education group. A significant linear relation is

found between birth weight of the baby and maternal weight gain (R=0.46; P<0.001). The study concludes that a small amount of food supplementation could help achieve the necessary weight gain during pregnancy.

The study recommends that food supplementation could increase the birth weight, which in turn can reduce the infant mortality and morbidity with decrease of foetal origin of adult diseases like high blood pressure, adult-onset diabetes, coronary heart disease, and stroke. Therefore government should expand Food Supplementation Programs on a larger scale for pregnant women with BMI <17 along with strong Nutrition Education components.

CHAPTER-I

1.1 Introduction

1.2 Justification of the Study

1.3 Background Information

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1.8 Limitations of the Study

1.1 INTRODUCTION

Low birth weight is a major predictor of neonatal and infant mortality[1] Birth weight is regarded as one simple measure of pregnancy outcome. It is a relative indicator of fetal well being and maturity. Recognizing the importance of birth weight measurement, 34th world assembly in 1981 recommended it is one of the twelve global indicators for monitoring the health of the community[2]. In both developed and developing countries, birth weight is probably the single most important factor that affects neonatal mortality and morbidity. Thus birth weight has largely been a subject of clinical and epidemiological importance and a target for public health intervention. The magnitude of the problem can be assessed by the fact that out of 120 million annual births in the world, an estimated 17 million infants are born every year with LBW, representing about 16% of all newborns in developing countries. Nearly 80% of all affected newborns with LBW at term are born in Asia mainly in south-central Asia, with Bangladesh having the highest incident rate in the world[3].

Problems of low birth weight (LBW) is more in developing countries[4], particularly in the Indian subcontinent, where LBW rates are 30-50%, which are among the highest in the world[5]. Half of all perinatal death in the world and one third of infant death are directly and indirectly related to low birth weight[6].

In Bangladesh percentage of low birth weight is 30 percent according to the evaluation of Bangladesh Integrated Nutrition Program[7] and another study

revealed that prevalence of LBW in Bangladesh (36%) is more than twice the 15% threshold that indicates a public-health problem[8].

Cause of low birth weight in Bangladesh is due to intrauterine growth retardation rather than prematurity. Several studies found association between maternal under nutrition with the poor pregnancy outcome and low birth weight[9-16]. Different interventional studies suggested that food supplementation to undernourished mother during pregnancy may lower the incidence of low birth weight[17-20].

Reports from developed and developing countries showed that poor maternal nutritional status is associated with perinatal mortality and low birth weight. Maternal under nutrition and poor pregnancy weight gain is positively associated with birth weight of babies[9-16, 21-28].

Pregnancy is a period of great physiological as well as psychological stress for the women. Women have to maintain their health at optimum level to prepare for delivery and lactation and also to provide good nutrition for the development of the foetus. Maternal nutrition during pregnancy reflects both the increased metabolic requirements of the mother and the ever-growing nutritional demands of the developing fetus. Pregnancy makes major metabolic demands on the mother. The newly pregnant mother enters a hyper metabolic and anabolic state as compared to her pre pregnancy condition. The normal pregnancy is characterized by a positive weight gain that reflects an increase in uterine, placental and mammary tissue, amniotic fluid and fat stores. Among the major challenges is the need for the mother to increase her

circulating blood volume so as to provide the necessary perfusion of the ever-growing placenta. The expansion of blood volume takes place primarily in the second trimester and early part of the third trimester and reaches its peak at 32 weeks gestation with an increase of 45% above the pre pregnancy volume[29]. Additionally, the mother must also supply both the essential macro and micronutrient demands of the developing fetus as well as meeting her own metabolic requirements. Modern recommendations as to the desired weight gain during pregnancy thus relate both to the pre conception weight and the pregnancy period itself. For those mothers defined as underweight (Body Mass Index BMI <19.8) the recommended weight gain is 12.5-18 kilograms. For those mothers with a preconception normal weight (BMI 19.8-26) the weight gain should be 11.5-16 kilograms while in obese women (BMI >26) the recommended weight gain should be 7-11.5 kilograms[30].

If the mother does not provide adequate macronutrient substrate during the first and second trimester there is uniform decrease in the number of cells and cell size leading to symmetric intrauterine growth retardation. Inadequate nutrition in the third trimester, especially in the last two months of the pregnancy, will lead to a non uniform decrease in cell size and only minimal decrease in cell numbers. This situation leads to the clinical entity called asymmetric intrauterine growth retardation.

The long term biologic price of being small for gestational age and growth retarded has been discussed by Barker[31] who has hypothesized that intrauterine events "set" the metabolic activity of the organism with long term consequences. In particular, the phenomenon of increased type II diabetes (adult onset) in infants born small for gestation age emphasizes the concept

that there are fetal and neonatal origins of adult disease. It is postulated that inadequate intrauterine nutrition leads not only to poor growth but also to a degree of down regulation of metabolic processes that in turn cannot tolerate the long term postnatal loads, especially of carbohydrates.

Adequate nutrition before and during pregnancy is very important for a long-term health. A woman who has been well nourished before conception begins her pregnancy with reserves of several nutrients so that the needs of the growing foetus can be met without affecting her health. Infants, who are well nourished in the womb, have an enhanced chance of entering life in good health. Mother's diet should produce adequate nutrients so that maternal stores do not get depleted and produce sufficient milk to nourish her child after birth. Abrams[32] studied weight gain by trimester in otherwise healthy non-obese women and noted that for each kilo of maternal weight gain in the 2nd trimester the fetus gained 33 grams above the mean, while a similar weight gain in the 3rd trimester resulted in only a 17 gram weight gain. These data emphasize the importance of weight gain in the second trimester and the need to allow the mother an unrestricted though balanced diet during this period. The importance of the preconception period is clear from the observation that there was a 600 gram decrease in birth weight when the mothers conceived in an undernourished state and continued to be undernourished throughout the pregnancy, as in Leningrad[33]

The reduction of underweight children is a key indicator of the first millennium development goal (MDGs) which aim to reduce poverty and hunger between 1990 and 2015.[34]

1.2 JUSTIFICATION OF THE STUDY

Low birth weight is generally associated with increased morbidity and mortality, impaired immune function, and poor cognitive development for neonates and infants. Infants born LBW are at risk to develop acute diarrhoea or to be hospitalized for diarrhoeal episodes at a rate almost two to four times greater than their normal birthweight counterparts.[35-38]

Infants who are LBW risk contracting pneumonia or acute lower respiratory infections (ALRI) at a rate almost twice that of infants with normal birthweight; and more than three times greater if their weight is less than 2000 g.[37, 39, 40] The risk of neonatal death for infants who are LBW weighing 2000-2499 g at birth is estimated to be four times higher than for infants weighing 2500-2999 g, and ten times higher than for infants weighing 3000-3499 g.[41] LBW infants during the post-neonatal period (>28 days of age) also have high mortality rates -and in some cases their risk may be greater than those for LBW infants during the neonatal period.[3, 42]

In Brazil, 67% of all infants dying during their first week of life are LBW infants; in Indonesia the rate is 40%; and in the Sudan the rate is 35%. Infant mortality (less than one year of age) due to LBW was slightly lower: 47% in Brazil and 19% in Indonesia.[43-45]

LBW accounted for 69% of the ALRI deaths in India, and it is estimated that in Bangladesh, almost half of the infant deaths from pneumonia or ALRI and

diarrhoea could be prevented if LBW were eliminated.[3, 46] Infant mortality rate in Bangladesh is 52/1000 live birth[47] and about one-third of the infant mortality shared with the neonatal mortality and majority of death caused by the direct and indirect effect of low birth weight.

If the mother is undernourished the baby is at an increased risk of being premature with low birth weight and development irregularities. Intrauterine nutrition is highly important for the growth of the central nervous system and kidneys of the foetus, which mature during the later part of pregnancy. In the first trimester the rate of growth of the foetus is slow and the mother is not able to take much food because of nausea and vomiting which are common during this period. It is during the next two trimesters that the foetus grows rapidly and therefore the nutritional needs for the formation of new tissues is increased. Therefore the diet of the pregnant women must provide the additional requirements. Maternal under nutrition and poor pregnancy weight gain is positive associated with birth weight of babies.[9-16]

In order to reduce the incidence of low birth weight, maternal nutritional status should be improved. It should be done prior to the beginning of a woman's reproductive life i.e. from the early adolescent period. If a country like Bangladesh is to continue a program aimed to improve the nutritional status of future mothers and to enroll the undernourished pregnant mothers in nutrition intervention program, the verification of the impact on birth weight is imperative for research in the long run. Since some small scale studies that have been carried out have given controversial results about the impact of

food supplementation on birth weight, it is necessary to carry out further studies with different study designs to explore the actual benefit of the program.

The aim of this study is to find out the effect of nutrition education and food supplementation on pregnancy weight gain of undernourished pregnant women (BMI <17) and to explore the effects of these interventions on the birth weight of babies. Another intention of the study is to compare and contrast the birth weight of babies and pregnancy weight gain of undernourished (BMI <17) pregnant women between the two intervention groups (nutrition education group vs. combination of nutrition education with food supplementation group) with the control group.

1.3 BACKGROUND INFORMATION

Pregnancy:

Involves the transport of the sperm and egg, fertilisation, development of the Zygote into a Blastocyst, implantation into endometrium, development of the placenta, development of the foetus, parturition or birth at the end of 9 months.

Egg transport:

Following ovulation (day 14 of the menstrual cycle), the egg remains fertile for 10 to 15h. It is transported down the fallopian tubes by ciliated epithelium and contraction of smooth muscle. It is a slow process and can take 4 days to reach the uterus.

Sperm transport:

Following release of several hundred million sperm into vagina, they move towards the uterus by their own propulsion, cilia of uterus and contraction of uterus, mucous, ejaculating force. The mortality is high (only a few 100 reach the uterus) due to long journey, large energy requirement and the vaginal environment being acidic. The sperm remain fertile on average for 48 hours.

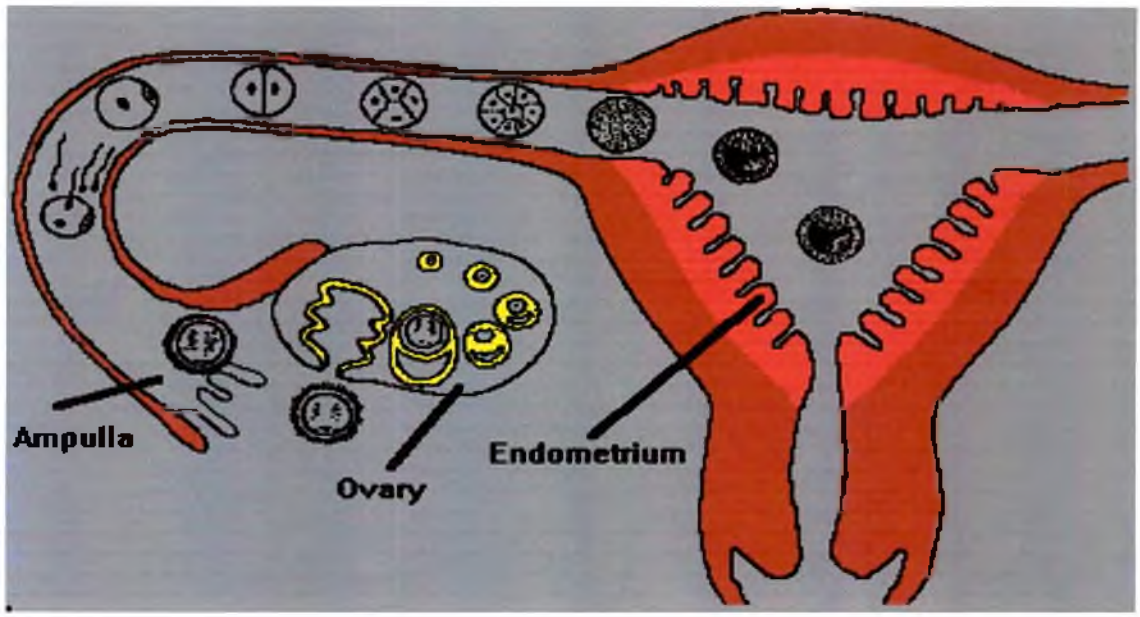
Sperm have to reside in female tract for several hours to i) sperms plasma membrane to become altered so that it will be capable of fusing with the egg, ii) convert the sperms tail into a more whiplike action from the wavelike beats.

Fertilization:

Fusion of egg and sperm: Many sperms bind with the sperm receptors in the Zona Pellucida, which triggers the sperm head to open and expose the acrosomal enzymes, which digest a pathway through the Zona pellucida. The first sperm to penetrate the zone then fuses with the eggs plasma membrane and contractile elements in the egg draw the sperm in. Additional sperm are prevented entry by the egg inactivating the sperm binding sites and hardening of the zona pellucida.

If fertilization doesn't occur then egg would be broken down uterine cells, but sometimes you can get dangerous ectopic pregnancies, in fallopian tubes usually.

The fertilized egg is called a zygote and during the next 3-4 days its cells undergo mitosis (cleavage), i.e. 2, 4, 8, 16 and 32 cells etc... When it reaches the uterus, it receives nutrients from the intrauterine fluid and continues cell division for another 3 days until it forms the BLASTOCYST (fluid filled hollow sphere). This consists of an outer layer of cells called the Trophoblast (which will surround the embryo and foetus and give it nutrition and secrete hormones i.e. form the placenta) an inner cell mass (The inner cell mass will give rise to embryo and foetus) and a central fluid filled cavity (which will give the amniotic cavity). Seven days after ovulation (i.e. day 21 of Menstrual cycle), implantation (burying of the blastocyst into endometrial layer) of the Blastocyst into endometrium begins, started by proteolytic enzymes from the trophoblast cells. The endometrium then increases its vascularisation, blood supply and nutrients.



The Placenta:

The Blastocyst then develops after a few weeks into the PLACENTA, in fact it is fuily developed 5 weeks after implantation. It consists of 3 parts, i) a foetal part supplied by the outermost layer of trophoblast cells (CHORION), ii) Maternal part is the endometrium below chorion, and iii) finger like projections (chorionic villi) which extend from the chorion into the endometrium, these villi are a rich network of capillaries which are linked to the foetal and maternal circulations via the umbilical arteries and veins and the umbilical cord.

Embryo and Foetal Development:

In the first 2-3 weeks, the embryonic membranes develop from the inner cell mass, namely the Chorion which encloses the embryo, Amnion sac which contains amniotic fluid, Yolk sac containing yolk and the Allantois (a small outgrowth from which the umbilical cord will link to the placenta). During the 3rd week a 3 layered embryo approx. 2mm long can be distinguished and this

undergoes GASTRULATION (cell migration and rearrangement) resulting in the differentiation into body organs (organogenesis). The 3 layers are the Ectoderm (from which the nervous system and skin develops), the Endoderm (from which the epithelial linings of the digestive, respiratory and urinary systems develop) and lastly the Mesoderm (everything else, bones, muscle, gonads, blood). By three and a half weeks a miniature heart is pumping blood. By 8 weeks the embryo is 22mm long and 1g in weight and all organ systems are recognizable. From weeks 9 to 40 it is regarded as a foetus and rapid growth of body structures occur whilst it is attached to the umbilical cord and floating in the Amniotic cavity in amniotic fluid. The cavity and fluid, buffers mechanical disturbances and temperature variations. There is exchange of materials between the maternal and foetal bloodstreams, and the maternal nutrition is crucial to the growth of the foetus. Also alcohol, smoking, drugs can be detrimental. Procedures such as ultrasound scanning can be used to monitor the foetus, whilst amniocentesis or chorionic villi sampling can be used to diagnose the gender or diseases (e.g. Downs Syndrome).

Hormonal changes during pregnancy:

Are produced by 3 tissues i) the trophoblast cells which surround the embryo – secrete Chorionic Gonadotropin. This is similar to LH, it maintains the corpus luteum and also causes it to secrete oestrogen and progesterone, its highest concentration is 60-80 days after last menstrual period and the lowest after 90 days and then remains constant for the next 6 months, detection of this in urine or plasma is a positive test for pregnancy.

ii) Corpus Luteum – secretes Oestrogen and Progesterone. This secretion is maintained for the initial 3 months by maintenance of the corpus luteum by the hormone Chorionic gonadotropin. The oestrogen stimulates growth of the uterine muscle. Progesterone inhibits uterine motility. Their concentrations increase throughout pregnancy, with the biggest increase after 3 months due to placenta.

iii) Placenta- secretes oestrogen and Progesterone, also Human chorionic Thyrotropin (effectively thyroid stimulating hormone –TSH), Human Placental Lactogen (hPL) and Inhibin. The placenta can make progesterone, but to make oestrogens needs Androgens (precursor of oestrogen) to be supplied from the fetal adrenal glands.

hPL is very similar to growth hormone and prolactin. It mobilises fats, stimulates growth of fetus, initiates breast development, and stabilizes plasma glucose. TSH stimulates metabolism. Inhibin inhibits the anterior pituitary so that less FSH is produced and thus prevents further follicle development. The high concentrations of Oestrogen and progesterone also inhibit GnRH, thus less FSH and LH and thus prevention of follicle development.

Effects of pregnancy on the Mother:

1. The mother's anterior pituitary enlarges and there is increased secretion of corticotrophin, thyrotrophin and somatotrophin, resulting in increased thyroxine (increased metabolism) and aldosterone (increases fluid retention) and cortisol (increases glucose mobilization).
2. Increase in size and vascularization of breasts and uterus

3. The uterus enlargement pushes into abdominal cavity and presses against diaphragm, may cause backaches and breathing difficulties
4. Increase in placenta size (fully formed by 16 weeks) and amniotic fluid volume. The placenta secretes Human chorionic Thyrotropin which increases the metabolism of the mother and also Human placental Lactogen which causes maturation of the breasts for lactation and growth of foetus due to mother using less glucose but more fatty acids, so that the glucose is available for the foetus.
5. Increased calcium concentration in mother due to parathyroid and vitamin D, to be used for foetus bone development.
6. Gut: nausea and morning sickness in first few months, decreased motility of digestive tract i.e. constipation, heartburn
7. Urinary system: more urine due to more foetal wastes and also uterus compressing bladder
8. Respiratory: increase in respiratory frequency, vital capacity and decrease in residual volume, dyspnoea in late stages of pregnancy
9. Cardiovascular: increased blood volume, due mainly to water. Increased blood pressure, heart rate and cardiac output by 20-40%. Varicose veins if uterus presses on pelvis.

Care During Pregnancy:

Antenatal care, the care a woman receives throughout her pregnancy, is important in helping to ensure that women and newborns survive pregnancy and childbirth. The traditional approach to antenatal care, which is based on European models developed in the early 1900s, assumes that more is better

in care for pregnant women. Frequent routine visits are the norm, and women are classified by risk category to determine their chances of complications and the level of care they need.

Objectives of ANC:

- Promote and maintain the physical, mental and social well-being of both the mother and baby by providing education on danger signals, nutrition, rest, sleep and personal hygiene PLUS the environment of the pregnancy and birth; Keeping normal "normal"
- Detect and manage complications, whether medical, surgical or obstetric: current problems, not predictions
- Develop birth preparedness plan: who attends, where, communication/transportation, birth attendant, who accompanies, necessary items (blanket/towels, clean plastic cover, clean razor blade, clean setting
- Develop complication readiness plan: where, who accompanies, who stays with children, who makes decisions if primary decision-maker not available, potential blood donor, finances, transportation, communication.
- Help prepare the mother to breastfeed successfully, experience normal puerperium, and take good care of the child physically, psychologically and socially

Following the World Health Organization's lead, the MNH Program takes the view that every pregnant woman is at risk for complications and that all

women should therefore receive the same basic care and monitoring for complications. The Program does not recommend relying on certain measures and risk indicators that are routine in traditional antenatal care (such as height, ankle edema and fetal position before 36 weeks), because they have not been proven to be effective in improving pregnancy outcomes.

.Counseling and Health Promotion

Focused antenatal care visits should include time for providers and women to talk about important issues related to nutrition and health during pregnancy, including the following:

- Danger signs of complications during pregnancy and labor: how to recognize them, what to do and where to get help
- Nutrition: the importance of good nutrition to the health of the mother and baby; how to get enough calories and essential nutrients for a healthy pregnancy; micronutrient supplements; importance of iron intake
- Risks of using tobacco, alcohol, medications and local drugs
- Rest and avoidance of heavy physical work
- Family planning: benefits of child spacing to mother and child; options for family planning services following the baby's birth
- Breastfeeding: health and practical benefits; exclusive breastfeeding; importance of immediate breastfeeding after birth
- HIV and other sexually transmitted diseases: the use of condoms for dual protection from pregnancy and disease; other measures for prevention; availability and benefits of testing; and

specific issues related to mother-to-child transmission and living with AIDS (after a positive test result)

Birth Preparedness and Complication Readiness

Focused antenatal care includes attention to a woman's preparations for childbirth, such as getting the support she will need from her provider, family and community, and making arrangements for her newborn. The skilled provider and the woman should plan for the following:

- A skilled provider to be at the birth
- The site for the birth and how to get there
- Items needed for the birth, whether it will be at home or in a healthcare facility
- Money to pay for the skilled attendant and any needed medications
- Support after the birth, including someone to accompany the woman during the birth and someone to take care of her family while she is away

In addition, since 15 percent of all pregnant women develop a life-threatening complication and most of these complications cannot be predicted, every woman and her family must be ready to respond to such a problem. Every woman should have a plan for the following:

- A person designated to make decisions on her behalf, in case she is unable to make them
- A way to communicate with a source of help (skilled attendant, facility, transportation)
- A source of emergency funds
- Emergency transportation
- Blood donors

Pregnancy & Nutrition:

Pregnancy is a period of great physiological as well as psychological stress for the women. Woman has to maintain her health at optimum level to prepare for delivery and lactation and also to provide good nutrition for the development of the foetus. Adequate nutrition before and during pregnancy is very important for a long-term health. A woman who has been well nourished before conception begins her pregnancy with reserves of several nutrients so that the needs of the growing foetus can be met without affecting her health. Infants, who are well nourished in the womb, have an enhanced chance of entering life in good health. Mother's diet should produce adequate nutrients so that maternal stores do not get depleted and produce sufficient milk to nourish her child after birth.

If the mother is undernourished the baby is at an increased risk of being premature with low birth weight and development irregularities. Intrauterine nutrition is highly important for the growth of the central nervous system and kidneys of the foetus, which mature during the later part of pregnancy.

In the first trimester the rate of growth of the foetus is slow and the mother is not able to take much food because of nausea and vomiting which are common during this period. It is during the next two trimesters that the foetus grows rapidly and therefore the nutritional needs for the formation of new tissues is increased. Therefore the diet of the pregnant women must provide the additional requirements. Apart from the increase in foetal tissue there is an increase in maternal tissues like mammary glands and tissues supporting the foetus like placenta.

Accretion of nutrients in a foetus takes place during last trimester of pregnancy. This has to be supplied by mother either from her diet or from her reserve. A term neonate will have adequate stores of iron, protein, vitamin C and other vitamins. If the diet is lacking in nutrients and there is no store of nutrients foetus will have intra uterine growth retardation.

A well balanced diet that is high in fibre, carbohydrates, proteins, vitamins, minerals and low in saturated fats will help a mother to stay fit and supply the foetus with all the essential nutrients for healthy development.

Impact of Maternal Nutrition Status during Pregnancy:

- **Maternal nutrition and maternal well being**
- **Maternal nutrition and pregnancy outcome**
- **Maternal nutrition and fetal growth**
- **Maternal nutrition and fetal development**
- **Maternal nutrition and adult diseases of the infant**

Nutrition and Maternal Well Being During Pregnancy

Pregnancy makes major metabolic demands on the mother. The newly pregnant mother enters a hyper metabolic and anabolic state as compared to her pre pregnancy condition. The normal pregnancy is characterized by a positive weight gain that reflects an increase in uterine, placental and mammary tissue, amniotic fluid and fat stores. Among the major challenges is the need for the mother to increase her circulating blood volume so as to provide the necessary perfusion of the ever-growing placenta. The expansion of blood volume takes place primarily in the second trimester and early part of the third trimester and reaches its peak at 32 weeks gestation with an increase of 45% above the pre pregnancy volume[29]. Additionally, the mother must also supply both the essential macro and micronutrient demands of the developing fetus as well as meeting her own metabolic requirements. Fetal growth is peaking at 32-34 weeks gestation. At times the macronutrient demands of the fetus exceed the capacity of the mother's intake. In those situations the mother must rely to a degree on the energy stores (primarily fat) that have been deposited in the second trimester.

The importance of the preconception period is clear from the Leningrad siege during World War II observation that there was a 600 gram decrease in birth weight when the mothers conceived in an undernourished state and continued to be undernourished throughout the pregnancy, as in Leningrad. When the malnutrition was limited to the first trimester there was an increased incidence in early spontaneous abortions. Inadequate nutrition limited to the second trimester had relatively little effect on maternal health or fetal growth provided that there was adequate nutrition in the third trimester. Third trimester

malnutrition however manifested a 10% reduction in average birth weight (less than 300 gram) and a 15% reduction in placental weight.[33]

Pregnancy Requirement:

Energy:

During pregnancy, extra calories are needed due to a woman's increased basal metabolic rate and higher energy demands. According to the Institute of Nutrition & Food Science (INFS) an extra 150 kcal is recommended in the first trimester and an extra 350 Kcal for the second & 3rd trimester.

Protein:

Protein requirements are increased during pregnancy due to growth for body tissues, including for the growing baby, the placenta, the increase in the mother's blood volume and the amniotic fluid. and maternal storage reserves for labor, delivery and lactation. Canadian recommendations state that an extra 5g/day during the first trimester, an extra 20g/day in the second trimester and an extra 24g/day in the third trimester are needed. A total of 2 to 3 servings a day is recommended (one serving of protein is 100 gm.). Dietary sources of protein include: lean meats, poultry, turkey, fish, low fat milk products, legumes, soy, eggs, seeds & nuts.

Other Essential Nutrients during Pregnancy

The other 3 nutrients that are essential to the health of a mother and her growing baby are *calcium*, *iron* and *folic acid*. These require special attention, because most women don't get enough through their normal diet.

Calcium

It is needed for proper fetal skeleton and tooth bud formation, as well as for maternal calcium metabolism. Dietary sources of calcium include: milk & milk products, fortified soymilk, canned sardines or salmon with bones, sesame seeds, almonds, soy beans, tofu, leafy greens and broccoli. Vitamin D helps body to absorb calcium therefore adequate amount of vitamin D also required during pregnancy. Vitamin D is found in milk and milk products, eggs and sunlight. Calcium is found primarily in milk products, although the vegetable, broccoli, and canned fish are also good sources.

Iron

There is a high iron demand during pregnancy, as extra iron is needed to make red blood cells that carry oxygen through mother's body and to the baby. If a pregnant does not have enough iron in her diet, her body will draw on its own iron stores to supply it to her baby. The result is feelings of tiredness and low iron stores called iron deficiency anemia.

Dietary sources of iron include: whole grain and iron enriched cereals, liver, red meats, and dried fruits, dried peas and beans, dark green vegetables, dried fruits and nuts. To increase iron absorption from plant based sources, eat them with foods rich in vitamin C such as strawberries, orange juice, peppers, cantaloupe, tomatoes, potatoes, cauliflower and kale. Also, coffee or tea consumed right before, during or after a meal can reduce the amount of iron your body absorbs from plant based foods and should be avoided at these times.

Folic Acid

Folic acid is essential for the process of cell division and the development of healthy tissues. Like iron, folic acid can be found in many foods, including leafy green vegetables, liver and eggs. Studies show that folic acid can help prevent certain birth defects of the brain and spine - called neural tube effects.

Studies also suggest that folic acid reduces the risk of spina bifida (open spine) and anencephaly (a lethal defect involving absence of a major portion of the brain and skull), and related birth defects by about 50%.

Studies reveal that this dosage of folic acid reduces recurrences by more than 70% in babies of women who have already had a child with a neural tube defect. Dietary sources of folic acid include: liver, cooked legumes (kidney beans, chick peas, and lentils), sunflower seeds, nuts, dark leafy greens, asparagus, broccoli, cooked spinach, oranges, cantaloupe and whole grains.

Essential Fatty Acids:

Pregnant women should consume adequate amounts of essential fatty acids (EFAs), linoleic acid and linolenic acid in their daily eating habits for proper fetal neural and visual development. Dietary sources of essential fats include: fish oils, flax seed, flaxseed oil, canola, soybeans and soy-based products (tofu, soy burgers), vegetables, nuts and seeds.

It is also important to avoid excess vitamin A during pregnancy because it may cause damage to the embryo. Foods containing large amounts of vitamin A include liver and should be eaten only on occasion.

A moderate salt intake is important for pregnant women. Fluids also are essential, and the recommended daily intake of six to eight glasses can be met by drinking water, juice or milk.

Pregnancy Weight Gain:

Gaining 10- 15 Kg on average during your pregnancy is normal.

• Fetes	3 kg
• Placenta, amniotic fluid and membranes	1.8 kg
• Maternal blood, tissue fluids, fat, etc	4.1 kg
• Uterus	0.9 kg
• Mammary glands	0.9 kg
• Total	11 kg

Low Birth Weight:

Low birthweight has been defined by the World Health Organization (World Health Organization, International statistical classification of diseases and related health problems, tenth revision, World Health Organization, Geneva, 1992.) as weight at birth of less than 2,500 grams (5.5 pounds). This practical cut-off for international comparison is based on epidemiological observations that infants weighing less than 2,500 g are approximately 20 times more likely to die than heavier babies.

A baby's low weight at birth is either the result of preterm birth (before 37 weeks of gestation) or of restricted foetal (intrauterine) growth.[48] Low birthweight is closely associated with foetal and neonatal mortality and

morbidity, inhibited growth and cognitive development, and chronic diseases later in life.[31] Many factors affect the duration of gestation and foetal growth, and thus, the birthweight. They relate to the infant, the mother, or the physical environment and play an important role in determining the birthweight and the future health of the infant.

More than 20 million infants worldwide, representing 15.5 per cent of all births, are born with low birthweight, 95.6 per cent of them in developing countries. The level of low birthweight in developing countries (16.5 per cent) is more than double the level in developed regions (7 per cent). Half of all low birthweight babies are born in South-central Asia, where more than a quarter (27 per cent) of all infants weighs less than 2,500 g at birth.

One of the major challenges in measuring the incidence of low birthweight is the fact that more than half of infants in the developing world are not weighed. In the past, most estimates of low birthweight for developing countries were based on data compiled from health facilities. However, these estimates are biased for most developing countries because the majority of newborns are not delivered in facilities, and those who are represent only a selected sample of all births.

What are the causes of LBW?

Premature birth – Infant born before term or less than 37 weeks gestation

Intra-uterine growth retardation – A condition where foetal growth has been constrained

A baby's low weight at birth is either the result of preterm birth (before 37 weeks of gestation) or due to restricted foetal (intrauterine) growth. Low birthweight is closely associated with foetal and neonatal mortality and morbidity, inhibited growth and cognitive development, and chronic diseases later in life.

Many factors affect the duration of gestation and foetal growth, and thus, the birthweight. They relate to the infant, the mother, or the physical environment and play an important role in determining the birthweight and the future health of the infant. Birthweight is affected to a great extent by the mother's own foetal growth and her diet from birth to pregnancy, and thus, her body composition at conception. Mothers in deprived socio-economic conditions frequently have low birthweight infants.

Many factors affect the duration of gestation and of foetal growth, and thus, the birthweight. They relate to the infant, the mother or the physical environment and play an important role in determining the infant's birthweight and future health.[49] For the same gestational age, girls weigh less than boys, firstborn infants are lighter than subsequent infants, and twins weigh less than singletons;

- Birthweight is affected to a great extent by the mother's own foetal growth and her diet from birth to pregnancy, and thus, her body composition at conception;

- Women of short stature, women living at high altitudes, and young women have smaller babies;

- Once pregnant, the mother's nutrition and diet, lifestyle (e.g., alcohol, tobacco or drug abuse) and other exposures (e.g., malaria, HIV or syphilis), or complications such as hypertension can affect foetal growth and development, as well as the duration of pregnancy;

- Mothers in deprived socio-economic conditions frequently have low birthweight infants. In those settings, the infant's low birthweight stems primarily from the mother's poor nutrition and health over a long period of time, including during pregnancy, the high prevalence of specific and non-specific infections, or from pregnancy complications underpinned by poverty. Physically demanding work during pregnancy also contributes to poor foetal growth.

- Maternal malnutrition - including vitamin A, iron, folic acid, zinc deficiencies.
- High maternal blood pressure.
- Multiple births.
- Teenage pregnancy.
- Inadequate rest and continued hard work during pregnancy.
- Stress, anxiety and other psychological factors .
- Smoking during pregnancy and exposure to second-hand smoke.

- Acute and chronic infection during pregnancy – such as malaria, bacterial vaginosis, etc.

CONSEQUENCES OF LOW BIRTH WEIGHT:

LBW infants are at risk of:

- A 40-fold greater chance of dying in the neonatal period.
- A 50 percent greater chance of serious development problems, e.g. learning disabilities and mental retardation.
- IQ Point decrease of 5-10 points.
- Long term disabilities, including visual and hearing impairments.
- Illnesses associated with cardiovascular disease and diabetes in later life.
- Premature death.

FOETAL ORIGIN OF ADULT DISEASES

Any stimulus or insult that occurs during the critical period of fetal development may cause a fetal response and adaptation that leads to long-term or permanent changes in the structure or function of the body, a process sometimes referred to as programming[50] Maternal nutrition may act as a forecast for the fetus of the nutritional environment it will encounter after birth. The fetus responds and adapts to that forecast using a number of strategies in order to maximize its chances of postnatal survival. The immediate response to under nutrition is catabolic consumption of substrates to provide energy[51] (If under nutrition is prolonged, the fetus changes its metabolic rate

and alters the production of hormones and the sensitivity of tissues to them. For example, a decrease in maternal food intake leads to fall in the concentrations of fetal insulin, the IGF-1 (insulin-like growth factor-1) and glucose, causing reduced transfer of amino acids and glucose across the placenta, ultimately reducing the rate of fetal growth[52] Metabolic programming is also thought to occur, for example the fetus prepares to store nutrients as fat in anticipation of poor postnatal nutrition[53] Cell differentiation is also thought to alter due to a rise in Cortisol concentrations[52]. Redistribution of fetal blood flow also occurs to protect key organs, especially the brain, at the expense of other tissues such as muscle, kidneys and the endocrine pancreas.[54] The decreased requirement for substrates and the lowering of metabolic rate lead to slowing of fetal growth and the birth of an infant with lower birth weight, who did not reach its full growth potential. The 'thrifty phenotype' hypothesis proposed by Hales and Barker in 1992 aims to provide an explanation for the link between the fetal intra-uterine environment and the susceptibility to chronic diseases in later life[55]. It proposes that if the malnourished fetus is born into an environment of poor postnatal nutrition and remains in such an environment throughout childhood and adulthood, the prenatal adaptations are beneficial and the long-term health is unaffected. However, problems occur if a malnourished fetus is born into an environment of adequate or over nutrition. Fetal adaptations permanently alter insulin and glucose metabolism, thus increasing susceptibility to Type 2 diabetes, obesity and the metabolic syndrome in adults. The 'thrifty phenotype' hypothesis is widely supported by studies in both human and animal models[56] Extending

the thrifty phenotype, Gluckman and Hanson[57] proposed the 'predictive adaptive response' hypothesis. It postulates that the developing fetus assesses the plane of nutrition it receives *in utero*, predicts the postnatal nutritional plane (low or high) that it will encounter and adapts to the predicted environment in a way that would give it the best chance of survival. If the diet in adulthood diverges from the predicted plane, disease manifests itself.

Figure. Described effects of altered fetal nutrition on growth and maturation of fetal organ systems and their links with adult disease.

Courtesy: The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2006; 46: 4–14

1.4 HYPOTHESIS

The Birth Weight of Newborn is Influenced by Nutrition Education and Combination of Nutrition Education and Food Supplementation among Malnourished Pregnant Women

1.5 OBJECTIVES OF THE STUDY

General Objective

To evaluate the effect of nutrition education & nutrition education combined with food supplementation on undernourished pregnant women in term of pregnancy weight gain and the birth weight of their babies

Specific Objectives

1. To measure the weight gain of undernourished (BMI <17) pregnant women throughout pregnancy starting from 5th month and the birth weight of their babies after were given nutrition Education

2. To measure the weight gain of undernourished (BMI <17) pregnant women throughout pregnancy starting from 5th month and the birth weight of their babies after they have been given a combination of nutrition education and food supplementation.

3. To measure the weight gain of undernourished (BMI <17) pregnant women throughout pregnancy starting from 5th month and the birth weight of their babies in the control group

4. To compare the pregnancy weight gain and birth weight of the babies in the three groups

5. To find whether nutrition education alone or nutrition education combined with food supplementation is more effective to increase total pregnancy weight gain of undernourished (BMI <17) pregnant women and birth weight of their babies. .

6. To recommend appropriate strategy for better birth weight of the newborn and weight gain of undernourished pregnant women through proper nutrition intervention by giving nutrition education and food supplementation to undernourished pregnant women to be undertaken in similar upazillas of Bangladesh.

1.6 KEY VARIABLES

1. Age
2. Religion
3. Education
4. Occupation
5. Access to Media
6. Monthly Family Income
7. Types of Family
8. Number of Family Members
9. Duration of Marriage
10. Number of pregnancy
11. Number of Children
12. Birth Weight of Last Child
13. Assumption of Birth Weight of Last Child
14. Pregnancy Loss
15. Type of Pregnancy Loss
16. had MR or not
17. Wantedness of current Pregnancy
18. Problem during Current Pregnancy
19. Place intent to deliver
20. Weight
21. Height
22. BMI
23. Anaemia

24. Jaundice

25. Oedema

26. No of Total Food Supplementation

27. Weight Gain during the 1st to 2nd visit

28. Weight Gain during the 2nd to 3rd visit

29. Weight Gain during the 3rd to 4th visit

30. Weight Gain during the 4th to 5th visit

31. Total Pregnancy Weight Gain

32. Hour passed after Delivery

33. Place of Delivery

34. Mode of Delivery

35. Person conducted Delivery

36. Sex of the Baby

37. Apgar Score

38. Congenital Anomalies

39. Birth Weight of the Baby

1.7 OPERATIONAL DEFINITIONS

Age of the Respondent: Self mentioned age of respondent

Religion: Religion that was observed by the respondent

Education Level of Respondent: 1-16 actual year of schooling studied by the respondent

Education Level of Respondent's Husband: 1-16 actual year of schooling studied by the respondent's husband

Occupation of Respondent: Occupation of the respondent that earns money or not

Occupation of Respondent's Husband: Occupation of the respondent's husband that earns money or not

Access to Media: Whether respondent have any access to media at home or not

Monthly Family Income: Income of the all earning family member that spend for maintenance of family.

Types of Family: Nuclear means family consisted of husband, wife & their children; Joint family means if two families i.e. if the respondent lives with father in laws or with mother in laws; extended family means if the respondent lives with father/father- in-law along with uncle/uncle-in-law.

Number of Family Members: Number of persons share same kitchen

Duration of Marriage: Duration of marriage in complete year from the time of marriage till the date of interview

Number of Pregnancy: Total number of pregnancy by the respondent experienced including current one

Number of Children: Number of living children of respondent

Birth Weight of Last Child: Birth weight of last child of respondent in kilogram

Assumption of Birth Weight of Last Child: Assumption of size of last child at birth by the respondent

Pregnancy Loss: Spontaneous loss of pregnancy i.e. abortion, intrauterine and neonatal death excluding of menstrual regulation

Type of Pregnancy Loss: abortion means spontaneous abortion, intrauterine death means if the fetus dies inside uterus before delivery and neonatal death means death of baby within 1 month of delivery.

had MR or not: Whether the respondent had gone through menstrual regulation

Wantedness of Current Pregnancy: Whether the current pregnancy was wanted to respondent or not

Problem during Current Pregnancy: Any pregnancy related health problem that was encounter by the respondent during first interview

Place intend to deliver: Place where the respondent was intending to deliver current pregnancy

Weight: Weight of the respondent in Kg measured by the researcher

Height: Height of the respondent in meter measured by the researcher

BMI: Calculated from height & weight by using formula weight in kg/height in meter^2

Anaemia: Clinically assessed by the researcher by observing lower conjunctiva

Jaundice: Clinically assessed by the researcher by observing color of the sclera, skin & lower surface of the tongue

Oedema: Clinically assessed by the researcher by pitting of the Tibial shin

Time between two visits: Number of days between two visits

No of total nutrition education session: Number of nutrition education session attended by the respondent that was provided by the researcher

No of Total Food Supplementation taken: Total number of day supplementation taken by the respondent

Problem during Visit: Any health problem that was encounter by the respondent during each visit

Weight Gain during the 1st to 2nd visit: Obtained by subtracting the weight of the respondent taken during 1st visit from weight measured in 2nd visit

Weight Gain during the 2nd to 3rd visit: Obtained by subtracting the weight of the respondent taken during 2nd visit from weight measured in 3rd visit

Weight Gain during the 3rd to 4th visit: Obtained by subtracting the weight of the respondent taken during 3rd visit from weight measured in 4th visit

Weight Gain during the 4th to 5th visit: Obtained by subtracting the weight taken during 4th visit from weight measured in 5th visit:

Total Pregnancy Weight Gain: Obtained by subtracting the weight of the respondent taken during 1st visit or enrolment from weight measured in 5th & last visit.

Week of Delivery: Number of weeks passed from 1st day of last menstruation to the time of delivery

Hour passed after Delivery: Hour passed from time of delivery till measurement of birth weight of baby

Place of Delivery: Places where the respondents delivered the babies either in homes or in hospitals which includes District Hospital, Upazilla Hospital, Maternal & Child Welfare Centre (MCWC) and Family Welfare Centre (FWC)

Mode of Delivery: Whether delivered by caesarean section or normal by vaginally

Person conducted Delivery

Sex of the Baby: Biological sex of the baby by observing external genitalia during postnatal visit

Apgar Score: Score given by the health personnel to the neonate at birth according to the Apgar Score during hospital delivery.

Crying after Delivery: Whether the baby cried or not after birth which was stated by the mother

Congenital Anomalies: Whether the baby had any visible congenital anomalies/ deformity or not which was examined by the data collector.

Birth Weight of the Baby: Weight of the baby without any clothes taken by the data collector with the help of Seca Baby Scale within 48 hours of delivery.

1.8 LIMITATIONS OF THE STUDY

- The study used the present food supplementation package of NNP which was 600 Kcal/pregnant woman/day for 5 days of week & the researcher had no option regarding this due to lack of fund.

- FWAs and CNPs (in case of NNP upazilla) who were previously being given adequate training on anthropometric measurements were engaged in taking birth weight. However, there might be very little differences in their observed birth weights. But in terms of comparison between three groups the effect was almost nullified.

- Though the researcher wanted to have equal number of respondents from each group, but the availability of pregnant women with BMI<17 determined the total number of respondents from each group i.e. NE, NE+FS & Control groups.

CHAPTER- II. LITERATURE REVIEW

2.1 Anthropometric Measurement & Birth Weight

2.2 Pregnancy Weight Gain & Birth Weight

2.3 Food Supplementation & Birth Weight

2.4 Nutrition Education & Birth Weight

2.5 Factors of Low Birth Weight & Infant Mortality

LITERATURE REVIEW

2.1 ANTHROPOMETRIC MEASUREMENT & BIRTHWEIGHT

Allan A. Johnson, Enid M. Knight, Cecile H. Edwards, Ura Jean Oyemade, O. Jackson Cole, Oeida E. Westney, Lennox S. Westney, Haziel Laryea and Sidney Jones[9] in their study **"Dietary Intakes, Anthropometric Measurements and Pregnancy Outcomes"** found that, underweight prior to pregnancy and low pregnancy weight gains were found among 12.9% and 44.4% of the subjects respectively. Dietary intakes were not significantly correlated with pregnancy outcomes. Maternal anthropometric measurements significantly correlated with pregnancy outcomes included delivery weight, pregnancy weight gain, weekly weight gain, pre pregnancy weight, height, pre pregnancy body mass index ($P < 0.05$). They conducted a prospective observational study on 322 urban African- American Women & concluded that anthropometric measurements were better nutritional predictors of pregnancy outcome than dietary intake.

Karim E, Mascie-Taylor CG[13] in their study **"The association between birthweight, sociodemographic variables and maternal anthropometry in an urban sample from Dhaka, Bangladesh."** was examined the relationship between birthweight, socio-demographic variables and maternal anthropometry in a sample from an inner urban area of Dhaka, Bangladesh.

About 21% of babies were of low birthweight (LBW) using the World Health Organization cut-off of < 2500 g. LBW was more common in younger (< 20 years) and older (> 30 years) mothers, the low-income group and those with little or no education. The mean birthweight of the higher-educated, higher-income group and male children were on average 290, 260 and 120 g, respectively, higher than uneducated, lower-income groups and female children. The best cut-offs for detecting LBW and normal-weight infants was maternal weight of 50 kg (odds ratio = 4.6), maternal arm circumference of 23 cm (odds ratio = 5.0) and body mass index of 20.5 (odds ratio = 6.5). The sensitivity and specificity were best for maternal weight (69% and 68%, respectively). Logistic regression analyses show that mothers' weight at term was the best single predictor of LBW (31%), while maternal weight along with age, educational level and income group correctly predicted just over 35% of LBW. Regression analyses also confirmed that mothers' weight at term was the best predictor of birthweight, with a correlation coefficient of 0.49.

2.2 PREGNANCY WEIGHT GAIN & BIRTH WEIGHT

Abrams et al [32] studied weight gain by trimester in otherwise healthy non-obese women and noted that for each kilo of maternal weight gain in the 2nd trimester the fetus gained 33 grams above the mean, while a similar weight gain in the 3rd trimester resulted in only a 17 gram weight gain.

Mable Everette[58] in his study **"Gestational Weight and Dietary Intake During Pregnancy: Perspectives of African American Women"** focused on the six participants (including three teenagers) who delivered low birth

weight and/or preterm babies and 13 participants aged ≤18 years (teenagers) who delivered normal weight babies. The aim was to study the reasons for low birth weight and infant mortality among African Americans in Los Angeles, California. Data were collected during the years 1992–1995. Data were analyzed utilizing qualitative methodology. Four of the participants who delivered low birth/weight preterm infants reported weight related concerns during pregnancy. These included: weight loss and lack of weight gain.

Nadine Nannan, Rosana Norman, Michael Hendricks, Muhammad A Dhansay, Debbie Bradshaw[59] in their study titled **"Estimating the burden of disease attributable to childhood and maternal undernutrition in South Africa in 2000"** found that 3.5% of the burden from LBW was attributable to maternal underweight status.

Rode L, Hegaard HK, Kjaergaard H, Møller LF, Tabor A, Ottesen B[60]. conducted a study titled **"Association between maternal weight gain and birth weight."** to investigate the association between maternal weight gain and birth weight less than 3,000 g and ≥ 4,000 g in underweight (body mass index less than 19.8 kg/m^2, normal weight (BMI 19.8-26.0 kg/m^2), overweight (BMI 26.1-29.0 kg/m^2), and obese (BMI greater than 29.0 kg/m^2) women, with emphasis on the use of the American Institute of Medicine (IOM) recommendations in Denmark. They analyzed data from 2,248 women with singleton, term pregnancies. The relationship between weight gain and risk of birth weight less than 3,000 g and ≥ 4,000 g was examined in the four BMI groups, and use of IOM recommendations was tested by logistic regression

analyses. They found an inverse relationship between maternal weight gain and the proportion of infants with a birth weight less than 3,000 g. Birth weight ≥ 4,000 g increased with an increasing weight gain in underweight and normal-weight women, but the association was less apparent in overweight and obese women.

Shapiro C, Sutija VG, Bush J[16] in Methodist Hospital, Brooklyn, New York, USA. conducted a study on **"Effect of maternal weight gain on infant birth weight."** to ascertain whether increased weight gain during pregnancy resulted in higher birth weight infants. A database was constructed from valid data of a sample of 159 healthy women between 19 to 37 years of age. The inclusion criteria were: maternal age of 19-37 years, term gestations (37-42 weeks), a baseline weight obtained at 0-15 week's gestation, and a final weight obtained within 2 weeks of delivery. They calculated weight gain by subtracting baseline weight from the final weight. The study finding was the women with lower first trimester BMI (< 25) had infants of lower birth weight than women of higher BMI (> 25). Women with lower gain (< 35 lbs) delivered smaller infants than women with higher gain (> 35 lbs). Women of higher BMI and higher gain delivered the largest infants ($F = 5.37$; $p = 0.0015$). Underweight women (BMI < 19) gained less weight than women of normal weight (BMI 19-25), who gained the most weight. Obese women (BMI > 29) gained the least weight ($F = 6.26$; $p = 0.0005$). The study results confirmed that excessive maternal weight gain in pregnancy (> 35 lbs), does result in higher birth weight infants.

2.3 FOOD SUPPLEMENTATION & BIRTH WEIGHT

Kramer MS, Kakuma R[61] found in their review of published reports, supplemented by additional information from the trialist titled **"Energy and protein intake in pregnancy"** that, in five trials (1134 women), nutritional advice to increase energy and protein intakes was successful in achieving increase energy & protein intake with pregnancy weight gain, but no consistent benefit was observed on pregnancy outcomes.

In 13 trials (4665 women), balanced energy/protein supplementation was associated with modest increases in maternal weight gain and in mean birthweight, and a substantial reduction in risk of small-for-gestational-age (SGA) birth. These effects did not appear greater in undernourished women. No significant effects were detected on preterm birth, but significantly reduced risks were observed for stillbirth and neonatal death.

E A Mitchell, E Robinson, P M Clark, D M O Becroft, N Glavish, N S Pattison, J E Pryor, J M D Thompson and C J Wild[62] conducted a Case-control study of 844 cases (SGA) and 870 controls titled **"Maternal nutritional risk factors for small for gestational age babies in a developed country: a case-control study"** and their study suggests that small variations in maternal diets within the normal range during pregnancy in developed countries are associated with differences in birth weight.

Lechtig A, Yarbrough C, Delgado H, Martorell R, Klein RE, Béhar M.[63] conducted the study **"Effect of Moderate Maternal Malnutrition on the Placenta"** to determined the influence of moderate maternal malnutrition on the weight and chemical characteristics of the placenta are discussed. In the first study, two groups of pregnant women of high and low socioeconomic status from Guatemala City were studied. The average placental weight in the low socioeconomic group was 15 per cent below that of the high socioeconomic group and there was a consistent association between the postpartum maternal weight and placental weight.

The hypothesis that the difference in placental weight observed between the two groups was primarily due to maternal nutritional status was tested in the second study by means of nutritional intervention in four rural villages in Guatemala. Two of the villages received a protein-calorie preparation while the other two received a calorie supplement. Placental weight was higher among women with high levels of supplemented calories during pregnancy, independently of the type of food supplement ingested. On the average, the groups with low caloric supplementation (smaller than 20,000 calories) had placental weight 11 per cent below those with high caloric supplementation (larger than or equal to 20,000 calories), in contrast to placental weight, the concentration of placental chemical components studied was not associated with caloric supplementation. It was concluded that moderate protein-calorie malnutrition during pregnancy leads to lower placental weight without significantly changing the concentration of the biochemical components studied. The reduction of placental weight may be the mechanism by which

maternal malnutrition is associated with high prevalence of low-birth-weight babies in these populations.

Kaseb F, Kimiagar M, Ghafarpoor M, Valaii N[64] in their study **"Effect of traditional food supplementation during pregnancy on maternal weight gain and birthweight"** explore the effects of supplementary traditional food on pregnant women in a clinical trial in Islamshahr, a suburban area 35 km southwest of Tehran. The study comprised 53 healthy mothers who were neither addicts nor on medication and were free from genetic disorders. The pregnant mothers' health was evaluated by their weight gain that of lactating mothers by breast milk adequacy, and that of newborns by their weight at birth. The experimental group received traditional food (rice-milk porridge, lentils, pottage, cheese, yogurt, eggs, and milk with bread), supplying an extra 400 kcal energy and 15 g protein from the fourth month of pregnancy until childbirth. All subjects were weighed monthly. To ascertain breast milk sufficiency, the duration of exclusive breastfeeding and the growth trend of infants were surveyed. The study showed the weight gain in the experimental and control groups to be 11.0 ± 2.9 and 8.5 ± 3 kg respectively; the difference was 29.4% and statistically significant ($p < 0.02$). The confounding variables (energy and protein intake, age, height, BMI, age at first pregnancy, parity, last pregnancy spacing, number of children, number of miscarriages, duration of residence in the area, family size, education, housing, occupation of the mother or her husband) did not reveal any significant differences. Maternal weight gain was higher in the experimental compared to the control group. Birth weights in experimental and control groups were 3.33 ± 0.4 and 3.08 ± 0.3 kg, respectively. This difference, which amounts to 8.1%, was statistically

significant ($p < 0.05$). While the two groups of newborns had equal breastfeeding duration, heights and weights of newborns were significantly higher in the experimental group. This was also confirmed when compared to the NCHS figures.

Piyush Gupta, Mily Ray, Tarun Dua, Gita Radhakrishnan, Rajeev Kumar, H. P. S. Sachdev.[10] was conducted a double-blind, randomized, placebo-controlled trial in a tertiary care hospital titled "**Multimicronutrient Supplementation for Undernourished Pregnant Women and the Birth Size of Their Offspring**" to evaluate the effect of multimicronutrient supplementation for undernourished pregnant women on the birth size of their offspring, incidence of low-birth-weight infants (<2500 g), and early neonatal morbidity.

Two hundred pregnant women (of 13 465 approached) with a body mass index of less than 18.5 and/or a hemoglobin level of 7 to 9 g/dL were enrolled at 24 to 32 weeks of gestation. One hundred forty-six neonates (73.0%) were available for analysis of birth size and 170 (85.0%) for analysis of morbidity in the 7 days after delivery.

The micronutrient supplementation group (n = 99) received a multi micronutrient supplement containing 29 vitamins and minerals once a day, from enrollment until delivery (median duration, 58 days; inter quartile range, 37-77 days; compliance, 87%). The comparison group (n = 101) received placebo for 52 (15-66) days, with 85% compliance. All subjects also received supplements of iron (given in the form of ferrous sulfate, containing 60 mg of elemental iron), 60 mg/d, and folic acid, 500 µg/d.

Infants in the micronutrient group were heavier by 98 g (95% CI, 16 to 213 g) and measured 0.80 cm (95% CI, 0.03-1.57 cm) longer and 0.20 cm (95% CI, 0.04-0.36 cm) larger in mid arm circumference compared with the placebo group. Incidence of low birth weight declined from 43.1% to 16.2% with multi micronutrient supplementation a (a 70% decrease; relative risk, 0.30; 95% CI, 0.13-0.71; *P*=.006), and that of early neonatal morbidity declined from 28.0% to 14.8% (a 58% decrease; relative risk, 0.42; 95% CI, 0.19-0.94; *P*=.04). They concluded that compared with iron and folic acid supplementation, the administration of multi micronutrients to undernourished pregnant women may reduce the incidence of low birth weight and early neonatal morbidity.

Ferland S, O'Brien HT[17] was conducted a study on **"Maternal Dietary Intake and Pregnancy Outcome"** to study the relationship between maternal diet and infant anthropometric measurements in 56 women, aged 28 ± 5.1 years, with singleton pregnancies. The overall quality of the diet (three 24-hour recalls), including supplementation, was evaluated at 34 ± 1.3 weeks using a total mean adequacy ratio (TMAR) of 12 nutrients. Specific interviewing techniques were used to minimize social desirability bias. Anthropometric measurements of both parents and maternal lifestyle practices were also obtained. Infant weight, crown-heel length and head circumference were measured 14.6 ± 4.4 days after birth. Stepwise multiple regression analysis revealed that maternal diet quality (TMAR) was significantly related to infant weight (r = .039, P = .036) and crown-heel length (r = .071, P = .007). Other significant predictors included gestational age,

maternal height, sex, smoking and physical activity. Maternal diet was positively associated with infant weight and crown-heel length.

Ortolano SE, Mahmud Z, Iqbal Kabir AF, Levinson FJ[18] in their study **"Effect of targeted food supplementation and services in the Bangladesh Integrated Nutrition Project on women and their pregnancy outcomes"** monitoring data from the Bangladesh Integrated Nutrition Project and new data collected for this purpose were analyzed to assess the effects of targeted project services, including supplementation of food, on malnourished pregnant women (women with a body mass index of ≤18.5 in early pregnancy). The data on 456 women--195 receiving food supplement and 261 not receiving supplement--were collected from 17 upazilla (sub-districts) in four districts of Bangladesh. The assessment found that, despite lower economic status, the women with low BMI receiving supplementation of food and intensified services were more likely to have adequate pregnancy-related weight gain than the more economically-advantaged women with higher BMI. Primi gravida receiving supplementation were also more likely to have adequate pregnancy-related weight gain than the better-off non-supplemented primi gravidae (85.7% vs. 51.9%, p = 0.044). The mean birth-weights of infants of the supplemented women with low BMI were comparable to those of the better-off, non-supplemented women.

Ahrari M, Houser RF, Yassin S, Mogheez M, Hussaini Y, Crump P, Darmstadt GL, Marsh D, Levinson FJ[20] conducted a study on **"A positive**

deviance-based antenatal nutrition project improves birth-weight in Upper Egypt". An antenatal project was pilot-tested in Al-Minia Governorate, Upper Egypt, during 2003-2004 in the target villages, women at-risk of delivering low-birth-weight infants were enrolled in weekly 'IMPRESS' (improved pregnancy through education and supplementation) sessions with counselling and supplemental food. In total, 519 women (344 target, 175 comparison) were enrolled in the third or fourth month of pregnancy and were followed through delivery. Birth-weights of the target mothers increased 2.2 times more than birth-weights of the comparison mothers over baseline (mean increase: 0.58 vs. 0.26 g respectively, $p<0.01$). Similarly, the decrease in prevalence of low birth-weight from baseline was greater in the target villages than in the comparison mothers (% of decrease: 26.9 vs. 11.9 respectively, $p<0.01$). The target at-risk women were far more likely than their counterparts to report eating more food (54.9% vs. 10.6%), more meat (57.1% vs. 4.2%), more vegetables (66.9% vs. 5.3%), increasing daytime rest (64.1% vs. 11.7%), and avoiding second-hand smoke (91.3% vs. 51.6%) during pregnancy. The cost per 100 g of improvement in birth-weight was US$ 3.98. The Government of Egypt and partners are scaling up the elements of the project.

The study titled **"Diet during Pregnancy in relation to Maternal Weight Gain and Birth Size"** conducted by **Lagiou P**, **Tamimi RM**, **Mucci LA**, **Adami HO**, **Hsieh CC**, **Trichopoulos D**[65] in University hospital in Boston, USA. : A total of 224 pregnant women coming for their first routine prenatal visit were followed through delivery. Pregnant women's dietary intake during

the second trimester was ascertained at the 27th week of pregnancy through a food frequency questionnaire. Intake of neither energy nor any of the energy-generating nutrients was significantly associated with birth size. In contrast, maternal weight gain by the end of the second trimester of pregnancy was significantly associated with energy intake. They concluded that, although maternal weight gain is strongly associated with birth size, the indicated nutritional associations with weight gain are not reflected in similar associations with birth-size parameters.

2.4 NUTRITION EDUCATION & BIRTH WEIGHT

Orstead C, Arrington D, Kamath SK, Olson R, Kohrs MB[66]. was conducted a retrospective study titled **"Efficacy of Prenatal Nutrition Counseling: Weight Gain, Infant Birth Weight, and Cost-effectiveness"** to evaluate the effect of intensive nutrition counseling on weight gain of pregnant women and birth weight of their infants at an outpatient clinic by comparing one group of 86 women who attended only a nutrition class with another group of 114 women who attended the class plus multiple counseling sessions on appropriate weight gain and nutrient intake. The women receiving the counseling on an average gained 2.5 kg more weight, had fewer low-birth-weight infants (4% vs. 13%), and had infants weighing 100 gm more at birth. That indicates that intensive nutrition counseling results in a superior outcome of pregnancy. When the cost of intensive neonatal care for six infants was compared with the cost of nutrition counseling, a benefit-to-cost ratio of 1:5 was found.

Sachdeva R, Mann SK[67] was conducted a study on **"Impact of Nutrition Education and Medical Supervision on Pregnancy Outcome."** The authors therefore investigated the effect of combined nutrition education, medical supervision, and nutrient supplementation on the anthropometry of rural pregnant women and their neonates. Sixty Punjabi women from low and lower-middle income groups were selected for the study from eight villages in Ludhiana district. There were thirty women in the experimental group and thirty controls. The average weights of women in the experimental and control groups during the first trimester were 48.4 kg and 46.5 kg, respectively. Women in the control group received iron and folate supplements as per government practice, while subjects in the experimental group received regular supplements of iron, folic acid, and calcium in the form of Folifer and Calcium Sandoz tablets from the second trimester onwards. Women in the experimental group also received a pamphlet on diet during pregnancy along with four individual and three group contacts during the second half of pregnancy.

Body height, weight, mid-upper arm circumference (MUA) and skin fold thickness of the subjects were recorded. Weight gained during pregnancy and post partum weights were also recorded and body mass index was calculated. In addition, crown heel length (CHL), birth weight (BW), skin fold thickness, MUA, head circumference (HC), Chest circumference (CC) and ponderal index (PI) of the neonates were recorded within eight hours of their birth. The gain in weight during pregnancy was 6.30 and 5.7 kg in E and C groups

respectively. The study revealed that BW, CHL, skin fold thickness and PI of the newborns were significantly ($p < 0.01$) higher in E group. The mean BW of newborns in E and C groups was 2700 g and 2300 g, respectively. Weight gained during pregnancy had significant ($p < 0.05$) correlation to MUA, BW and skin fold thickness of the newborn.

Kramer MS[68] was conducted a study titled **"Nutritional advice in pregnancy"** to assess the effects of advising pregnant women to increase their energy and protein intakes on those intakes, on gestational weight gain, and on the outcome of pregnancy. Data were extracted by the author from published reports, and supplemented by additional information from trialists contacted by the author. Four trials involving 1108 women were included and found that advice to increase energy and protein intakes seems to be successful in achieving those goals, but the increases are lower than those reported in trials of actual protein/energy supplementation. The study revealed that nutritional advice appears effective in increasing pregnant women's energy and protein intakes, but the implications for fetal, infant, or maternal health cannot be judged from the available trials. Given the rather modest health benefits demonstrated with actual protein/energy however, the provision of such advice is unlikely to be of major importance.

2.5 FACTORS OF LOW BIRTH WEIGHT & INFANT MORTALITY

Sohely Yasmin, David Osrin, Elizabeth Paul, & Anthony Costello.[69] conducted a study on **"Neonatal mortality of low-birth-weight infants in**

Bangladesh" where they prospectively follow up a cohort of neonates with low birth weight after delivery in a hospital in Dhaka, Bangladesh, and 776 were successfully followed up either at home or, in the event of early death, in hospital & found that low birth weight approximately doubles the Neonatal Mortality Rate.

A.K.M.A. Salam, F. Haseen, H.K.M. You and H. Torlesse[8] conducted a survey titled **"National Low Birth-weight Survey of Bangladesh, 2003-2004"** on 4,414 pregnant adolescent girls & women in 107 randomly selected rural and urban clusters in Bangladesh & followed up to delivery. The findings of their study were:

The mean birth-weight of infants was 2,632 (SD 433) g. The prevalence of LBW (<2,500 g) was 36%, and <1% of infants were born with very low birthweight (<1,500 g). At least 77% of the LBW infants were growth-retarded, confirming that intrauterine growth retardation is the major cause of LBW in Bangladesh. The prevalence of LBW was higher in rural areas (37%) than in urban areas (29%). Other risk factors for LBW included low socioeconomic status, low level of parental education, young (<20 years) or old (>35 years) maternal age, primigravidity, multigravidity, short stature, lack of antenatal check-ups, and iron supplementation during pregnancy, pre-term delivery, and lack of adequate rest during pregnancy.

Laura P Torres-Arreola, Patricia Constantino-Casas, Sergio Flores-Hernández, Juan Pablo Villa-Barragán and Enrique Rendón-Macías[70] in their study titled **"Socioeconomic factors and low birth weight in Mexico"**

found that low socioeconomic level was the most important risk factor for LBW and was independent of other factors, including those related to reproduction and nutrition, smoking, morbidity during pregnancy, accessibility to health services and prenatal care (OR 2.68; 95% CI 1.19, 6.03).

Hirve SS, Ganatra BR[71]. on their study "Determinants of low birth weight: a community based prospective cohort study" to identifying and quantifying determinants of low birth weight (LBW) by following a community based prospective cohort of pregnant women in 45 villages in Pune district of India. In the 1922 live births born to mothers without a chronic illness, in whom birth weight was available within 24 hours, the cumulative incidence of LBW (< 2500 g) was 29%. The unadjusted relative risks for LBW were significantly higher for lower socio-economic status (RR = 1.71), maternal age less than 20 years (RR = 1.27), primi parity (RR = 1.32), last pregnancy interval less than 6 months (RR = 1.48), non-pregnant weight less than 40 kg (RR = 1.3), height below 145 cm (RR = 1.51), hemoglobin less than 9 g/dl (RR = 1.53) and third trimester bleeding (RR = 1.87). Multivariate logistic regression analysis showed that the adjusted odds ratio for LBW decreased with increasing gestational duration, non-pregnant weight, parity and rising education level of the mother. Socio-economic status, non-pregnant weight, maternal height, and severe anemia in pregnancy had substantial attributable risk per cent for LBW (41.4%, 22.9%, 29.5% and 34.5%, respectively). The findings suggest that selectively targeted interventions such as improving maternal education and nutrition, specifically anemia, wider availability of contraception to delay the first pregnancy and to increase pregnancy intervals

may help in identifying and ensuring adequate care for those women at greatest risk of LBW.

G. M. Monawar Hosain, Nilesh Chatterjee, Afroza Begum and Subas Chandra Saha[72] in their study **"Factors Associated with Low Birthweight in Rural Bangladesh"** examined factors associated with low birthweight (LBW) in rural Bangladesh. They enrolled 350 women in early first trimester & followed for duration of pregnancy and data gathered on maternal factors such as social, demographic, anthropometric, biochemical measures and newborn's birth weight within 48 hours of birth. Almost a quarter of babies (24%) were born with LBW and mean birth weight was 2961 g. Study found associations between LBW and mother's age, parity, weight and hemoglobin level at booking, weight gain and health problems during pregnancy, tobacco consumption, and gestational age by bivariate analysis. But no such association was seen in their study for birth spacing, mother's height, economic status, educational level, body mass index, mid upper arm circumference and number of ANC visits. Multivariable analysis revealed gestational age, hemoglobin levels at first visit and weight gain during pregnancy as significant predictors of LBW in this rural setting.

Nahar N, Afroza S, Hossain M. was conducted a prospective study titled **"Incidence of low birth weight in three selected communities of Bangladesh"** in urban affluent, slum and rural communities of Bangladesh during Feb '94 to Feb '95. From each community, 250 pregnant mothers were recruited in the study and at the end total 660 live births were studied to determine the incidence and risk factors of low birth weight. Incidence of low

birth weight was highest in urban slum (36.8%) followed by rural area (20.9%) and lowest in urban affluent community (18.3%). The area of residence had a significant influence on birth weight suggesting that environmental stress had detrimental effect on birth weight. Age, weight and height of mothers were also risk factor for low birth weight of their babies. Mothers of less than 20 years and more than 35 years, weighing less than 40 kg and having height less than 140 cm had the higher risk of giving birth to low birth weight babies. Incidence of low birth weight was highest (73.2%) among the primi gravidae mothers and 36.8% among the mothers who had no antenatal check-up, but it was 15.9% among those who had check-up more than 7 times. The distribution of low birth weight babies was higher (48.2%) among the mothers who had never gone to school.

CHAPTER-III. METHODS & MATERIALS

Methods & Materials

3.1 Study Design:

Community based Intervention Study.

3.2 Place & Population:

Rupganj Upazilla (Nutrition Education Ger.) of Narayangonj District, Narshingdi sadar upazilla (Nutrition Education + Food Supplementation Gr) of Narsingdi District & Dhamrai upazilla (Control Gr) of Dhaka District. All undernourished (BMI<17) pregnant women of study/control areas were included in this research work.

3.3 Period of Study:

Data collection period was April 2008 to September 2008

3.4 Sample Size:

All undernourished (BMI <17) Pregnant Women with specific inclusion criteria who were available at the data collection. Total 139 (Nutrition Education Gr. 55, Nutrition Education + Food Supplementation Gr 40, Control 44) after drop out in all groups.

3.5 Inclusion Criteria:

- Pregnant women in 5th month of Pregnancy

- BMI < 17
- Free from systemic disease like hypertension, diabetes, kidney diseases etc
- Willing to participate in the study

3.6 Exclusion Criteria

- Those who delivered before 37 weeks of pregnancy
- Those who gave birth of twin babies
- Aborted cases
- Severe illness leading to hospitalization

3.7 Study Parameters:

- Socio-economic condition of the pregnant women
- Nutrition Education
- Food supplementation
- Anthropometric measurement of pregnant women
- Birth weight of the Newborn

3.8 Data Collection Tools

Preparation & Pre testing of Questionnaires & Checklist:

Standard questionnaire was developed in accordance with the study objectives to obtain relevant information regarding socio-demographic variables and other pregnancy related information like problem during current pregnancy & where they intend to deliver. A checklist was developed to

collect data on anthropometric measurement and pregnancy related problem like anaemia, jaundice etc. These tools were pre-tested in similar setting other than study areas.

3.9 Selection of Study Areas

For nutrition education Dhamrai upazilla of Dhaka District, for nutrition education & food supplementation a NNP upazilla which was Narsingdi Sadar upazilla of Narsingdi District were purposively selected & for control Rupgonj upazilla of Narayangonj District was purposively selected.

3.10 Selection of Pregnant Women for Nutrition Education

Pregnant women with BMI <17 were identified at the FWCs of Dhamrai upazilla and those who had filled inclusion criteria were enrolled in the study. The subsequent follow up visits were conducted at the satellite clinics in groups where data were collected after providing nutrition education sessions. Post natal visit for taking birth weight was made at their homes within 48 hrs of delivery.

Total 5 nutrition education sessions were given in Bangla using simple & easy language, one in each month. Each session was consisting of 5 topics and flipchart, posters and some models were used to conduct the sessions.

3.11 Nutrition Education Sessions

Session One: Primary Information about Food & Nutrition

Session Two: Nutrition, Care & Cleanliness during Pregnancy

Session Three: Food intake during Pregnancy & Foetal Development

Session Four: Food Misconceptions & Homestead Food Production

Session Five: Breast Feeding & Immunization

3.12 Selection of Pregnant Women for Food Supplementation

Narsingdi Sadar upazilla is a NNP intervention area. From their supplementation program those women who were at the 5th month of pregnancy entered into food supplementation program were first identified from the register and those who fulfilled inclusion criteria were included in the study. Women under study were interviewed & examined by the researcher to collect data according to the questionnaire & checklist and nutrition education were also given by the researcher. Only food supplementations were provided by the NGO workers working on behalf of NNP.

3.13 Food Supplementation

Women were provided with 6 packets of meal, each packet contained following ingredients:

20 gm crushed rice

10 gm crushed lentil

5 gm molasses

3 ml oil

this provides 153 Kcal

Woman under study was given 600 Kcal of supplementation every day of week except Friday from the enrolment in the study till delivery. Nutrition education sessions were conducted every month before follow up examination.

3.14 Selection of Pregnant Women for Control

Pregnant women with BMI < 17 were identified at the different FWCs of Rupgonj upazilla and those fulfilled inclusion criteria were enrolled in the study. Women were followed-up every month with out any intervention. Post natal visit was carried out to take birth weight at their homes.

3.15 Collection of Anthropometric Data

Weight of the pregnant women was taken by using bathroom scale & height with wooden height measuring scale. BMI was calculated from this measurement at first visit. Later on only weight was measured in every month & weight of the baby was taken within 48 hours of birth at home visit by using Seca baby scale.

CHAPTER-IV: RESULTS

PART-A: Socioeconomic Conditions of the Respondents

PART-B: Pregnancy Weight Gain of Respondents & Birth Weight of their Babies across the Three Groups

PART-C: Comparison of Pregnancy Weight Gain of Respondents & Birth Weight of Their Babies across Three Groups

RESULTS

Data was analyzed on 139 pregnant women - 55 in Nutrition Education group, 40 in Nutrition Education + Food Supplementation group and 44 in Control group. SPSS 12 version was used to analyze data. Variables were tested according to the study objectives. Results of the study were described in three sections.

PART- A: SOCIOECONOMIC CONDITIONS OF THE RESPONDENTS

Table 1a. Distribution of Respondents by Age Group (n = 139)

Age Group in Year	Frequency	Percentage
<20	21	15.1
20-25	82	58.9
26-30	24	17.3
31-35	7	5.1
> 35	5	3.6
Total	139	100.0

Mean 23.70 years, SD ± 4.62 years

This table shows that among 139 respondents, about three-fifth (58.9%) of respondents belong to the age group of 20-25 years. 15.1% respondents' age was below 20 years and only 3.6% respondents were above 35 years of age. Mean age of the respondents was 22.73 years with SD of ± 4.24 years.

Table 2a. Distribution of Respondents by Religion (n=139)

Religion	Frequency	Percentage
Islam	122	87.8
Hinduism	17	12.2
Total	139	100.0

Most of the respondents' religion (89%) was Islam and only few (12.2%) respondents' religion was Hinduism.

Table 3a. Distribution of Respondents by Education (n = 139)

Level of Education	Frequency	Percentage
Illiterate	39	28.1
Can only sign	47	33.8
Non Formal	9	6.5
Class 1-XI	44	31.6
Total	139	100.0

More than one-fourth of the respondents (28.1%) were illiterate, more than one-third (33.8%) can only sign, 6.5% had non-formal education and about one-third of the respondents (31.6%) had schooling from class I to class XI.

Table 4a. Distribution of Respondents by their Husbands' Education (n=139)

Level of Education	Frequency	Percentage
Illiterate	21	15.1
Can only sign	47	33.8
Non Formal	12	8.6
Class I-X	55	39.7
Class XI- Class XV	4	2.8
Total	139	100.0

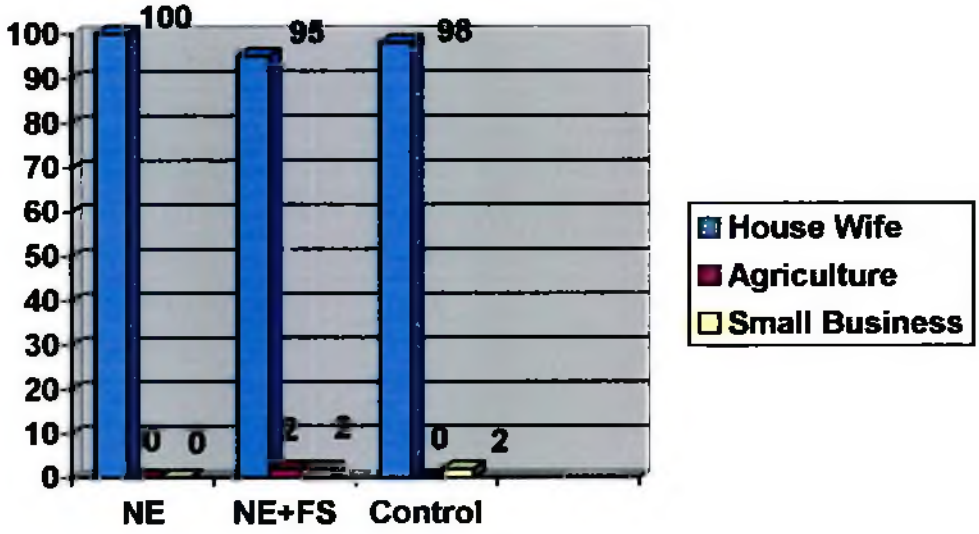
More than one-tenth of the respondents' husbands (15.1%) were illiterate, more than one-third of respondents' husbands (33.8%) can only sign, more than one-third of the respondents' husbands (39.7%) had schooling from class I to class X and only 2.8% of the respondents' husbands had schooling of Class X I- Class XV.

Table 5a. Distribution of Respondents by Exposure to Medias (Multiple Response n = 139)

Types of Media	Frequency	Percentage
None	82	59.0
Newspaper	2	1.4
Radio	4	2.8
TV	53	38.1
Magazine	0	0
Total	139	101.3

About three-fifth of the respondents (59.0%) did not have any access to the media at home. More than one-third (38.1%) of respondents had television & only 1.4% had newspapers at home.

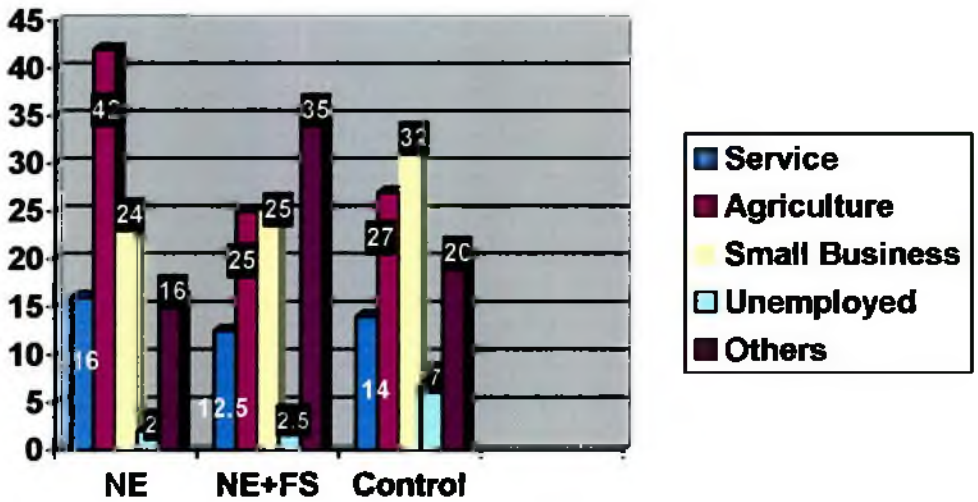
Fig 1a. Bar Diagram is showing the Occupation of Respondents



This bar diagram shows the occupation of the respondents. All the respondents in Nutrition Education (NE) group were housewives. Most of the

respondents (95% & 98% respectively) in Nutrition Education + Food Supplementation (NE+ FS) and in Control group were housewives. Only 2% of respondents in Nutrition Education + Food Supplementation (NE+ FS) group and Control group were involved in small business.

Fig 2a. Bar Diagram showing the Occupation of Respondents' Husbands



This bar diagram shows the occupations of the respondents' husbands. The occupation of 16% of the respondents' husbands in Nutrition Education group, 12.5% in Nutrition Education + Food Supplementation group and 14% in Control group was service. 42% of the respondents' husbands in Nutrition Education group, 25% in Nutrition Education + Food Supplementation group and 27% in Control group were involved in agriculture related works.

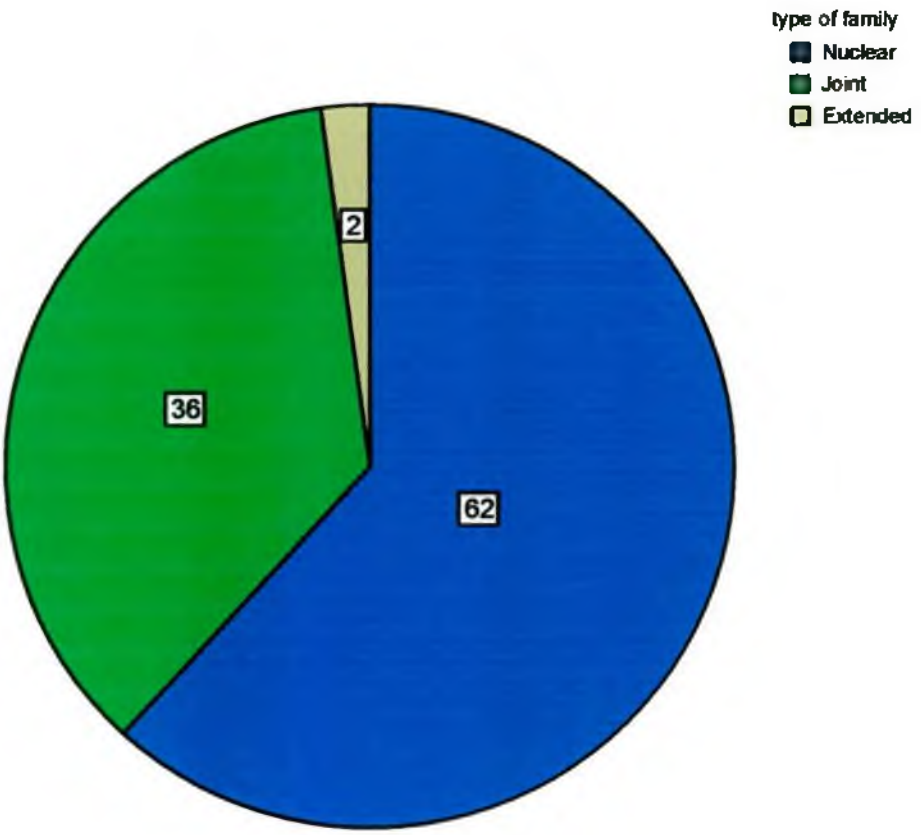
Table 6a. Distribution of Respondents by their Monthly Family Income (n=139)

Monthly Income In Taka	Frequency	Percentage
<3000	55	39.6
3000-7000	62	44.6
> 7000	22	15.8
Total	139	100.0

Mean TK. 3761.87, SD ± TK 1922.46

About half of the respondents (44.6%) had family incomes between TK. 3000 and TK. 7000, more than one-third of the respondents' family incomes were below TK. 3000 & the mean family income was TK. 3761.87 with SD of ± TK 1922.45.

Fig 3a. Pie Diagram Showing Types of Family Respondents were Living In



Out of the 139 respondents, 62% lived in nuclear families, 36% lived in joint families and only 2% lived extended families.

Table 7a. Distribution of Respondents by Number of Family Members

(n = 139)

No of Family Member	Frequency	Percentage
≤ 3	44	31.7
4-6	68	48.9
> 6	27	19.4
Total	139	100.0

Mean 4.86, SD ± 0.21

Table 7a shows that about half of the respondents (48.9.%) had 4 to 6 family members and near about one-third (31.7%) had less than 3 family members.

Table 8a. Distribution of Respondents by their Duration of Marriage (n=139)

Duration of Marriage in Year	Frequency	Percentage
<5	63	45.4
5-10	59	42.4
>10	17	12.2
Total	139	100.0

Out of the 139 respondents, about half of the respondents (45.5%) had been married for less than 5 years. More than two-fifth of the respondents (42.4%) had been married for 5 to 10 years and only 12.2 percent of the respondents had been married for more than 10 years.

Table 9a. Distribution of Respondents by the Number of Pregnancy (n = 139)

No of Pregnancy	Frequency	Percentage
1st pregnancy	34	24.5
2nd to 3rd pregnancy	82	59.0
4th to 5th pregnancy	14	10.1
6th to 8th pregnancy	9	6.5
Total	55	100.0

Mean 2.53, SD ± 1.48

About one-fourth of the respondents (24.5%) were in 1st pregnancy i.e. primi. About three-fifth of the respondents (59.0%) were in 2nd to 3rd pregnancy and more than one-tenth of the respondents (10.1%) were in 4th to 5th pregnancy and 6.5% of respondents were in 6th to 8th pregnancy .

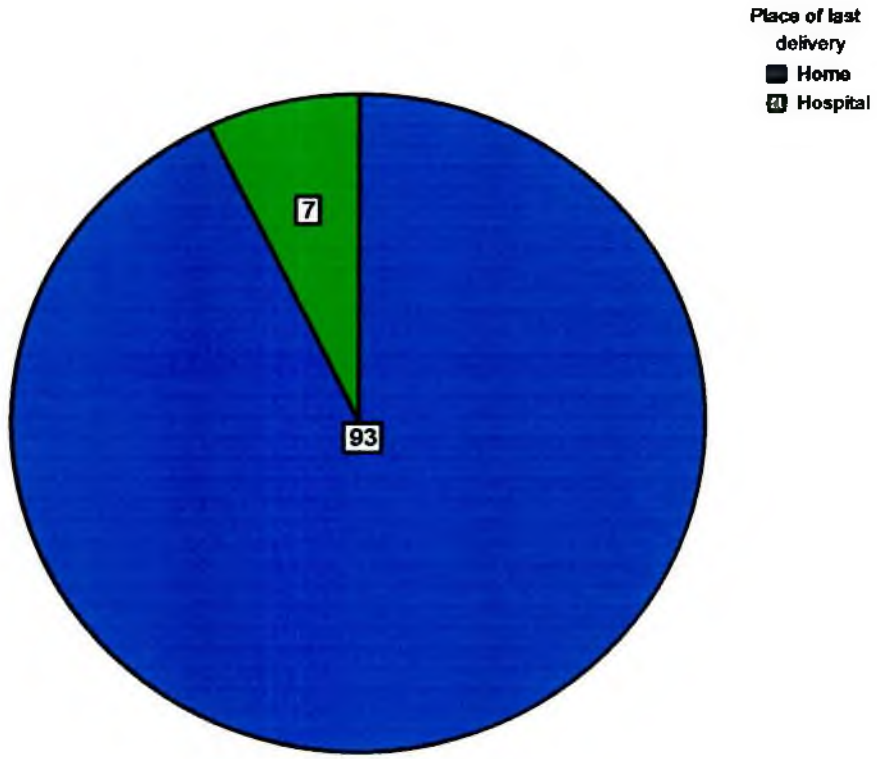
Table 10a. Distribution of Respondents by the Number of Children (n=97)

No of Children	Frequency	Percentage
≤2	81	83.5
>2	16	16.5
Total	97	100.0

Mean1. 28, SD ± 1.27

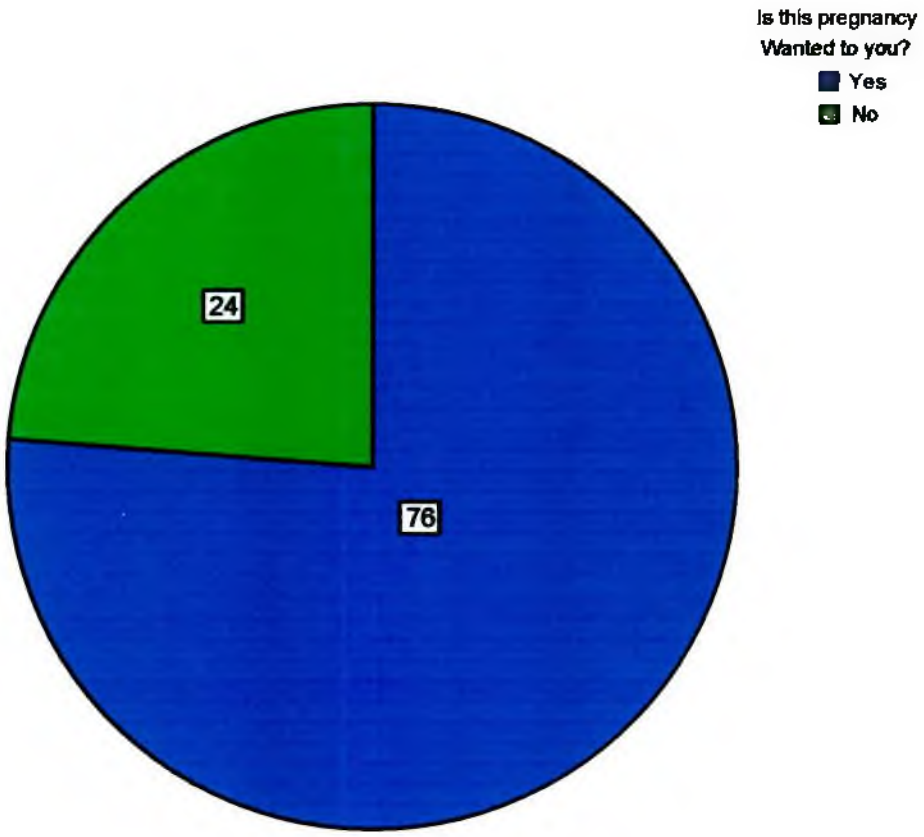
Out of 139 respondents, 42 did not have any living children. Out of 97 respondents, most of them (83.5%) had 1 to 2 children and 16.5% had more than 2 children.

Fig 4a. Pie diagram showing the place of Delivery of Last child



Out of 139 respondents, most (93%) delivered their last child at home and few (7%) delivered their last child at a hospital.

Fig 5a. Pie Diagram Showing the Percentage of Choice Involved in Becoming Pregnant amongst the respondents



Out of 139 respondents, most of the respondents (76%) said that the current pregnancy was wanted by them and rest of the respondents (24%) said that it was unwanted.

Out of 139 respondents, most of the respondents (76%) said that the current pregnancy was wanted by them and rest of the respondents (24%) said that it was unwanted.

Table 11a. Distribution of Respondents by the their Weight during 1st Visit

(n = 139)

Wt in Kg	Frequency	Percentage
30-34	16	11.5
35-39	101	72.7
>39	22	15.8
Total	139	100.0

Mean 37.29 Kg, SD ± 2.50

Most of the respondents' (72.7%) weight at first visit was between 35 to 29 kg and only 15.8 percent respondents' weight was above 39 kg.

Table 12a. Distribution of the Respondents by the their Height (n=139)

Height in Meter	Frequency	Percentage
< 1.5	36	25.9
≥ 1.5	103	74.1
Total	139	100.0

Mean 1.51 m, SD ± 0.04 m

Most of the respondents' (74.1%) heights were ≥ 1.5 meter.

Table 13a. Distribution of Respondents by Height and Birth Weight of their Babies (n=139)

Birth Weight in kg	Height of Respondents		Total	χ2 & P Value
	≤ 1.5 m	> 1.5 m		
≤ 2.5	40 (48.8)	42 (51.2)	57 (100.0)	1.95
> 2.5	21 (36.8)	36 (63.2)	82 (100.0)	P >0.05
Total	61 (43.9)	78 (56.1)	139 (100.0)	P= 0.16

Table 13 a shows that no statistical significant association was found between height of the mothers with birth weight of their babies.

PART - B: Pregnancy Weight Gain of Respondents & Birth Weight of their Babies across the Three Groups

B.1 Nutrition Education Group

Table 1b. Distribution of Respondents in Nutrition Education Group by Weight Gain in each Visit during Pregnancy

(n=55)

Weight Gain in kg during Pregnancy	from 1st visit till 2nd visit	from2nd visit till 3rd visit	from 3rd visit till 4th visit	from 4th visit till 5th visit
< 2	36 (65.5)	36 (65.5)	37 (67.3)	33 (60.0)
≥ 2	19 (34.5)	19 (34.5)	18 (32.7)	22 (40.0)
Total	55 (100.0)	55 (100.0)	55 (100.0)	55 (100.0)

Most of the respondents (82.0%) gained less than 2 kg of weight from 1st visit till 2nd visit.

More than half of the respondents (62.6%) gained less than 2 kg of weight from 2nd visit till 3rd visit and more than one-third of respondents (37.4%) gained 2 kg or more.

About half of the respondents (49.7%) gained less than 2 kg of weight between the time of the 3rd and the 4th visit and more than two-fifth of respondents (40.3%) gained weight 2 kg or more.

Sixty percent of the respondents (67.3%) gained less than 2 kg of weight between the time of the 4th and 5th visit and about two-fifth of the respondents (40%) gained weight 2 kg or more.

Table 2b. Distribution of Respondents in Nutrition Education Group by Total Pregnancy Weight Gain during Pregnancy

(n = 55)

Weight Gain in kg during Pregnancy	Frequency	Percentage
< 7	30	54.5
≥ 7	25	45.5
Total	55	100.0

Mean 6.68 kg, SD ± 0.77 kg

For more than half of the respondents (54.5%), the total weight gain during pregnancy was less than 7 kg. About forty six (45.5%) respondents had weight gain of 7 kg or more.

Table 3b. Distribution of Respondents in Nutrition Education Group by Birth Weight of their Babies

(n = 55)

Birth Weight in kg	Frequency	Percentage
≤ 2.5	25	45.5
> 2.5	30	54.5
Total	55	100.0

Mean 2.61 kg, SD ± 0.29 kg

More than half of the respondents (54.5%) delivered babies who weighed 2.5 kg or less and 45.5 percent of the respondents delivered babies who weighed above 2.5 kg.

Table 4b. Distribution of Respondents in Nutrition Education Group by Their Monthly Family Income & Total Weight Gain during Pregnancy

(n = 55)

Total Wt gain in kg during Pregnancy	Monthly Income in Taka			Total	χ2 & P Value
	< Tk. 3000	Tk. 3000 - 7000	> Tk. 7000		
< 7 Kg	18 (60.0%)	8 (26.7%)	4 (13.3%)	30 (100%)	3.648, P > 0.05 P = 0.161
≥ 7 Kg	20 (80.0%)	2 (8.0%)	3 (12.0%)	25 (100%)	
Total	38 (69.1%)	10 (18.2%)	7 (12.7%)	55 (100%)	

This table shows the distribution of respondents by their monthly family income and total pregnancy weight gain. Three-fifth of the respondents with monthly income less than TK. 7000 had total pregnancy weight gain less than 7 kg. More than one-tenth (12.0%) of the respondents with monthly income greater than TK. 7000 had total pregnancy weight gain 7 kg greater than 7 kg. No statistical significant relationship (P>0.05) was observed between monthly family income and total pregnancy weight gain of pregnant women.

Table 5b. Distribution of Respondents in Nutrition Education Group by Total Weight Gain during Pregnancy & Birth Weight of Babies

(n = 55)

Birth Weight in kg	Total Weight gain during pregnancy		Total	χ2 & P Value
	< 7 kg	≥ 7 kg		
≤ 2.5	17 (68.0%)	8 (32.0%)	25 (100%)	3.346 P > 0.05 (0.067)
> 2.5	13 (43.3%)	17 (56.7%)	30 (100%)	
Total	30 (54.5%)	25 (45.5%)	55 (100%)	

This table shows the distribution of respondents by total pregnancy weight gain and birth weight of the babies. About 68 percent of respondents with total pregnancy weight gain <7 kg delivered babies with birth weight 2.5 kg or less.

More than half of the respondents (56.7%) with total pregnancy weight gain ≥ 7 kg delivered babies with birth weight greater than 2.5 kg. This relationship was not statistically significant (P<0.05).

Table 6b. Distribution of Respondents in Nutrition Education Group by Their Monthly Family Income & Birth Weight of Their Babies (n=55)

Birth Weight in kg	Monthly Income in Taka			Total	χ2 & P Value
	< Tk. 3000	Tk. 3000-7000	> Tk. 7000		
≥ 2.5 Kg	13 (52.0%)	8 (32.2%)	4 (16.0%)	25 (100%)	7.398, P = 0.025* P > 0.05
> 2.5 Kg	25 (83.3%)	2 (6.7%)	3 (10.0%)	30 (100%)	
Total	38 (69.1%)	10 (18.2%)	7 (12.7%)	55 (100%)	

More than half of the respondents (52.0%) with monthly income less than TK. 3000 delivered babies with birth weight 2.5 kg or less. One-tenth (10.0%) of respondents with monthly income greater than TK. 7000 delivered babies with birth weight greater than 2.5 kg The difference in monthly income with birth weight was statistically significant.

B.2 Nutrition Education + Food Supplementation Group

Table 7b. Distribution of the Respondents in Nutrition Education + Food Supplementation Group by Weight Gain in Each Visit during Pregnancy

(n = 40)

Weight Gain in kg during Pregnancy	from 1st visit till 2nd visit	from2nd visit till 3rd visit	from 3rd visit till 4th visit	from 4th visit till 5th visit
< 2	34 (85.0)	23 (57.5)	22 (55.0)	15 (38.5)
≥ 2	6 (15.0)	17 (42.5)	18 (45.0)	24 (61.5)
Total	40 (100.0)	40 (100.0)	40 (100.0)	39 (100.0)

Most of the respondents (85.0%) gained less than 2 kg of weight between the time of the 1sl and the 2nd visit.

About three-fifth of the respondents (57.5%) gained less than 2 kg of weight between the time of the 2nd and the 3rd visit.

More than half of the respondents (55.0%) gained less than 2 kg of weight between the time of the 3rd and the 4th visit and about half of respondents (45.0%) gained 2 kg and above.

About two-fifth of the respondents (38.5%) gained less than 2 kg of weight between the time of the 4th and the 5th visit and more than three-fifth of the respondents (61.5%) gained 2 kg and above.

Table 8b. Distribution of the Respondents in Nutrition Education + Food Supplementation Group by the Total Weight Gain during Pregnancy (n = 40)

Weight Gain in Kg during Pregnancy	Frequency	Percentage
< 7	18	45.0
≥ 7	22	55.0
Total	40	100.0

Mean 7.37 kg, SD ± 1.18 kg

For more than half of the respondents (55.0%), the total weight gain during pregnancy was more than 7 kg. About forty five (45.0%) respondents had weight gain less than 7 kg.

Table 9b. Distribution of the Respondents in Nutrition Education + Food Supplementation Group by Birth Weight of Their Babies (n=40)

Birth Weight in kg	Frequency	Percentage
≤ 2.5	11	27.5
> 2.5	29	72.5
Total	40	100.0

Mean 2.68 kg, SD ± 0.24 kg

About three-fourth of the respondents (72.5%) delivered babies who weighed more than 2.5 kg and 27.5 percent of the respondents delivered babies who weighed 2.5 kg or less.

Table 10b. Distribution of Respondents in Nutrition Education + Food Supplementation Group by Their Monthly Family Income & Total Weight Gain during Pregnancy
(n=40)

Total Wt gain in kg during Pregnancy	Monthly Income in Taka			Total	χ2 & P Value
	< Tk. 3000	Tk. 3000-7000	> Tk. 7000		
< 7 kg	5 (27.8%)	8 (44.4%)	5 (27.8%)	18 (100%)	3.29, P > 0.193
≥ 7 kg	11 (50.0%)	9 (40.9%)	2 (9.1%)	22 (100%)	
Total	16 (40%)	17 (42.5%)	7 (17.5%)	40 (100%)	

This table shows the distribution of respondents by monthly family income and total pregnancy weight gain. More than one-fourth of respondents (27.8%) with monthly income less than TK. 3000 had total pregnancy weight gain less than 7 kg. About 9 percent (9.1%) of respondents with monthly income more than TK. 7000 had total pregnancy weight gain of 7 kg or greater than 7 kg. No statistical significant relationship (P>0.05) was observed between monthly family income and total pregnancy weight gain of pregnant women. .

Table 11b. Distribution of Respondents in Nutrition Education + Food Supplementation Group by Total Weight Gain during Pregnancy & Birth Weight of Babies
(n=40)

Birth Weight in kg	Total weight gain during pregnancy		Total	χ2 & P Value
	< 7 kg	≥ 7 kg		
≤ 2.5	9 (81.8%)	2 (18.2%)	11 (100%)	6.385 P < 0.05 *
> 2.5	9 (31.0%)	20 (69.0%)	29 (100%)	
Total	18 (45.0%)	22 (55.0%)	40 (100%)	

This table shows the distribution of respondents by total pregnancy weight gain and birth weight of the babies. About 82 percent of respondents with total

pregnancy weight gain <7 kg delivered babies with birth weight 2.5 kg or less and 69 percent of respondents with total pregnancy weight gain ≥ 7 kg delivered babies with the birth weight more than 2.5 kg. This relationship was statistically significant (P<0.05).

Table 12b. Distribution of Respondents in Education + Food Supplementation Group by Monthly Family Income & Birth Weight of their Babies
(n=40)

Birth Weight in kg	Monthly Income in Taka			Total	χ2 & P Value
	< Tk. 3000	Tk. 3000-7000	> Tk. 7000		
≥ 2.5 kg	4 (36.4%)	3 (27.3%)	4 (36.4%)	11 (100%)	4.40
> 2.5 kg	20 (69.0%)	6 (20.7%)	3 (10.3%)	29 (100%)	P = 0.11
Total	24 (60.0%)	9 (22.5%)	7 (17.5%)	40 (100%)	P > 0.05

More than one-third of the respondents (36.4%) with monthly income less than TK. 3000 delivered babies with birth weight of 2.5 kg or less than 2.5 kg. About ten (10.3%) percent of respondents with monthly income more than TK. 7000 delivered babies with birth weight greater than 2.5 kg. The difference in monthly income with birth weight was not statistically significant.

Table 15b. Distribution of Respondents in Control Group by the Birth Weight of their Babies
(n = 44)

Birth Weight in kg	Frequency	Percentage
≤ 2.5	21	47.7
> 2.5	23	52.3
Total	44	100.0

Mean 2.58 kg, SD ± 0.26 kg

More than half of the respondents (52.3%) delivered babies who weighed more than 2.5 kg and 47.7 percent of the respondents delivered babies who weighed 2.5 kg or less. Mean birth weight was 2.58 kg ± 0.26 kg.

Table 16b. Distribution of Respondents in Control Group by Their Monthly Family Income & Total Weight Gain during Pregnancy
(n = 44)

Total Wt gain in kg during Pregnancy	Monthly Income in Taka			Total	χ^2 & P Value
	< Tk. 3000	Tk. 3000-7000	> Tk. 7000		
< 7 kg	14 (51.9%)	7 (25.9%)	6 (22.2%)	27 (100%)	0.973 P >0.05 (0.615)
≥ 7 kg	9 (52.9%)	6 (35.3%)	2 (11.8%)	17 (100%)	
Total	23 (52.3%)	13 (29.5%)	8 (18.2%)	44 (100%)	

This table shows the distribution of respondents by monthly family income and total pregnancy weight gain. More than half of the respondents (51.9%) with monthly income less than TK. 3000 had total pregnancy weight gain less than 7 kg. About 12 percent (11.8%) of respondents with monthly income more than TK. 7000 had total pregnancy weight gain of 7 kg or greater than 7 kg. No statistical significant relationship (P>0.05) was observed between monthly family income and total pregnancy weight gain of pregnant women. .

Table 17b. Distribution of Respondents in Control Group by Total Weight Gain during Pregnancy & Birth Weight of Babies (n=44)

Birth Weight in kg	Total Weight Gain during Pregnancy		Total	χ2 & P Value
	< 7 kg	≥ 7 kg		
≤ 2.5	18 (85.7%)	3 (14.3%)	21 (100%)	10.05
> 2.5	9 (39.1%)	14 (60.9%)	23 (100%)	P < 0.05*
Total	27 (61.4%)	17 (38.6%)	44 (100%)	(0.002)

This table shows the distribution of respondents by total pregnancy weight gain and birth weight of the babies. Most of the respondents (85.7%) with total pregnancy weight gain <7 kg delivered babies with birth weight 2.5 kg or less. More than three-fifth of respondents (60.9%) with total pregnancy weight gain of 7 kg or more delivered babies with birth weight greater than 2.5 kg. This relationship was statistically significant (P<0.05).

Table 18b. Distribution of Respondents in Control Group by Monthly Family Income and Birth Weight of Their Babies (n=44)

Birth Weight in kg	Monthly Income in Taka			Total	χ2 & P Value
	< Tk. 3000	Tk. 3000-7000	> Tk. 7000		
≤ 2.5 kg	13 (61.9%)	4 (19.0%)	4 (19.0%)	21 (100%)	2.275
> 2.5 kg	10 (43.5%)	9 (39.1%)	4 (17.4%)	23 (100%)	P = 0.321
Total	23 (52.3%)	13 (29.5%)	8 (18.2%)	44 (100%)	P > 0.05

More than three-fifth of the respondents (61.9%) with monthly income less than TK. 3000 delivered babies with birth weight 2.5 kg or less than 2.5 kg. About one-fifth of the respondents (17.4%) with monthly income more than TK. 7000 delivered babies with birth weight greater than 2.5 kg. The difference in monthly income and birth weight was not statistically significant.

PART – C. COMPARISON ACROSS THE THREE GROUPS

Table 1c: Distribution of Respondents by Age Group

Age group	Group			
	Nutrition Education	Nutrition Education + Food Supplementation	Control	Total
< 20 yrs	11 (20.0)	3 (7.5)	7 (15.9)	21 (15.1)
20 - 24 yrs	24 (43.6)	18 (45.0)	28 (63.6)	70 (50.4)
25 - 29 yrs	17 (30.9)	10 (25.0)	5 (11.4)	32 (23.0)
≥30 yrs	3 (5.5)	9 (22.5)	4 (9.1)	16 (11.5)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=15.0 df =6 P=.020

This table shows the distribution of respondents by age group. Most of the pregnant women in the three groups belonged to the age group of 20-24 years. There was statistical significant (P<0.05) difference observed in age groups across the three groups.

Table 2c: Analysis of Variance (ANOVA) of Age across 3 Groups

Respondents Group	N	Mean age	SD	F Statistics	P value
Nutrition Education	55	22.7	4.24	4.34	0.015
Nutrition Education + Food supplementation	40	25.4	5.26		
Control	44	23.3	4.06		
Total	139	23.7	4.62		

ANOVA of age groups of respondents across the three groups was done and significant difference (P<0.05) in age groups across the three groups of women was found.

Table 3c: Distribution of Respondents by Level of Education of Respondent

Level of Education	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
Illiterate	13 (23.6)	12 (30.0)	23 (52.3)	48 (34.5)
Can sign only	7 (12.7)	20 (50.0)	20 (45.5)	47 (33.8)
Primary education	19 (34.5)	8 (20.0)	1 (2.3)	28 (20.1)
Above primary level	16 (29.1)	0 (0)	0 (0)	16 (11.5)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square = 55.3 df = 6 P<.001

Table 3c is showing the distribution of respondents by the level of their education. About one-fourth (23.6%) in the Nutrition Education group, about one-third (30.0%) in the Nutrition Education + Food Supplementation group and more than half (52.3%) of the respondents in the Control group were illiterate. There was statistically significant difference (P<0.05) observed in the levels of education among all three groups.

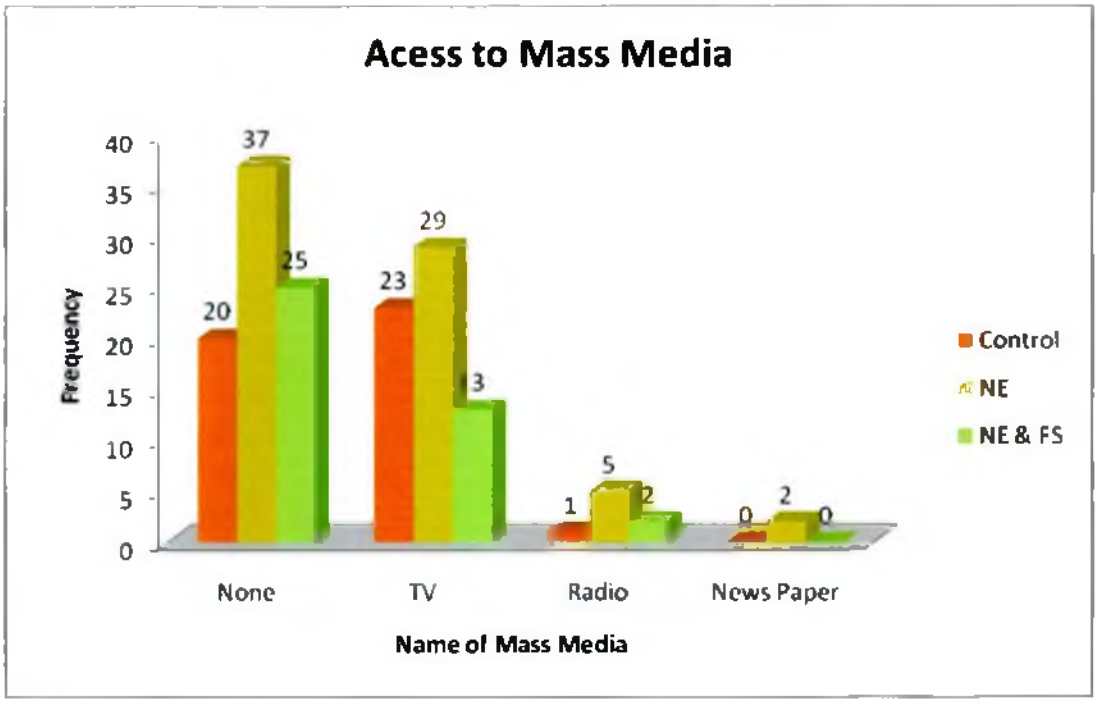
Table 4c: Distribution of Respondents by Level of Education of Husband

Level of Education	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
Illiterate	16 (29.1)	10 (25.0)	7 (15.9)	33 (23.7)
Can sign only	6 (10.9)	15 (37.5)	26 (59.1)	47 (33.8)
Primary education	21 (38.2)	11 (27.5)	9 (20.5)	41 (29.5)
Above primary level	12 (21.8)	4 (10.0)	2 (4.5)	18 (12.9)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=27.5 df = 6 P<.001

This table shows the distribution of respondents by the level of education of their husbands. About one-third (29.1) women's husbands in Nutrition Education group, one-fourth (25.0) women's husbands in Nutrition Education + Food Supplementation group and 15.9% women's husbands in Control group were illiterate. More than one-fifth of the respondents' (21.8%) husbands in Nutrition Education group, one-tenth of the respondents' husbands in Nutrition Education + Food Supplementation group and 4.5 % respondents' husbands in Control group had above primary level of education. Difference in education levels across the three groups was statistically significant.

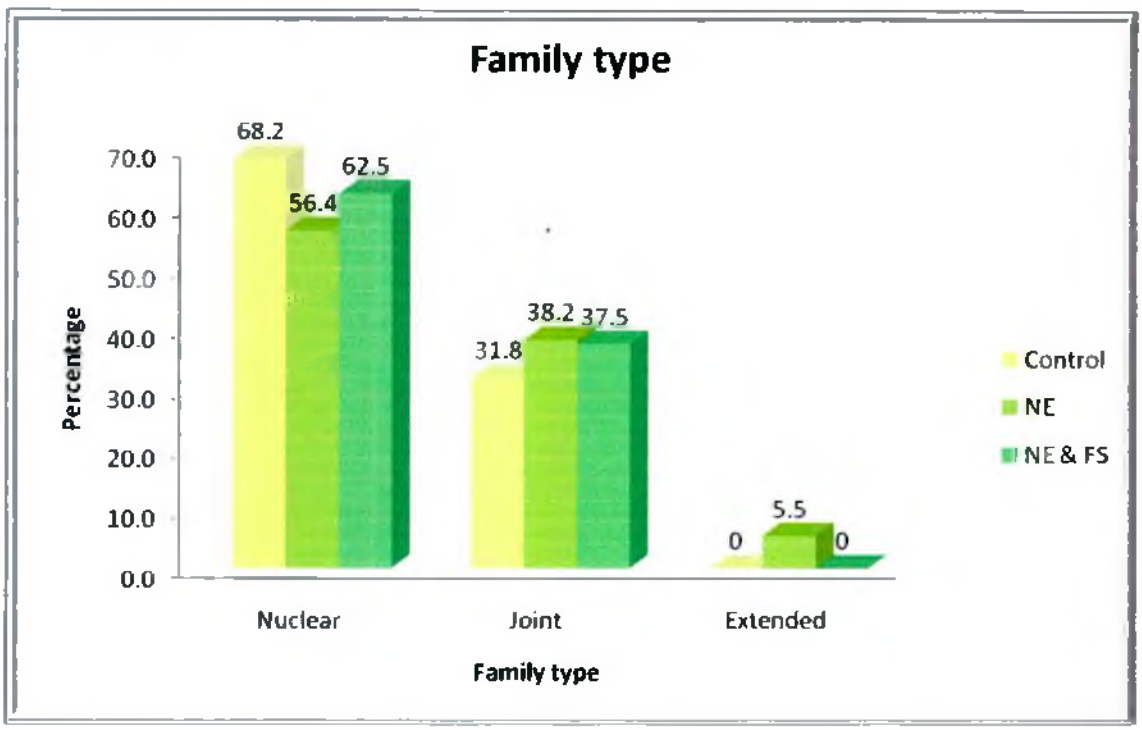
Figure 1c: Distribution of the Respondents by Exposure to Mass Media



This bar diagram shows the distribution of respondents by access to media at their home. More than one-third of the respondents in Nutrition Education

group, one-fourth of the respondents in Nutrition Education + Food Supplementation group and one-fifth of the respondents in Control group did not have any access to media at their homes. Only 2% of the respondents in the Nutrition Education group had access to newspapers at their homes, respondents from the other two groups did not have any access to newspapers at their home. One-fifth (20%) to more than one-fourth (29%) respondents in all three groups had access to television at their homes.

Figure 2c: Distribution of Respondents by Type of Family



This bar diagram shows the distribution of respondents by type of family. More than half of the respondents (56.4%) in Nutrition Education group, more than three fifth (62.5%) in Nutrition Education + Food Supplementation group and more than two-third (68.2%) of respondents in Control group lived in

nuclear families. About one-third to more than one-third (32% to 38%) of respondents in all three groups lived in joint families. Only a few in the Nutrition Education + Food Supplementation group lived in extended families.

Table 5c: Distribution of Respondents by Income Group across Three Groups

Income Group	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
< TK. 2500	18 (32.7)	11 (27.5)	12 (27.3)	41 (29.5)
TK. 2500-6000	29 (52.7)	22 (55.0)	24 (54.5)	75 (54.0)
> TK. 6000	8 (14.5)	7 (17.5)	8 (18.2)	23 (16.5)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=.57 df = 4, P=.96

Table 5d shows the distribution of respondents by income groups across the three groups. From this table it is revealed that no statistical significant difference (P>0.05) was observed in income groups across the three groups of pregnant women.

Table 6c: Analysis of Variance (ANOVA) of Monthly Income across Three Groups

Respondents Group	N	Mean Income	SD	F Statistics	P value
Nutrition Education	55	3716.4	1909.6	0.03	0.98
Nutrition Education + Food Supplementation	40	3787.5	1955.7		
Control	44	3795.5	1951.5		
Total	139	3761.9	1922.5		

ANOVA of monthly income across the three groups also did not find any statistical significant difference across the three groups.

Table 7c: Distribution of Respondents by Family Size

Family size	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
< 5 persons	33 (60.0)	15 (37.5)	25 (56.8)	73 (52.5)
5 - 6 persons	13 (23.6)	11 (27.5)	15 (34.1)	39 (28.1)
> 6 persons	9 (16.4)	14 (35.0)	4 (9.1)	27 (19.4)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=11.1, df =4, P=.025

Three-fifth of respondents (60.0%) in Nutrition Education group, about three-fifth of respondents (56.8%) in Control group and more than one-third of respondents in Nutrition Education + Food Supplementation had family size of less than 5 persons. About one-fourth to more than one-third of respondents (23.6% to 34.1%) in three groups had family members between 5 and 6 persons. The difference in family size observed across the three groups was statistically significant (P<0.05).

Table 8c: Distribution of Respondents by Sex of the Baby

Sex of the Baby	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
Boy	24 (43.6)	27 (67.5)	18 (40.9)	69 (49.6)
Girl	31 (56.4)	13 (32.5)	26 (59.1)	70 (50.4)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=7.2, df=2, P=.027

Above table shows the distribution of respondents by the sex of the baby across the three groups. Significant difference (P< 0.05) of sex of the babies was observed across the three groups of respondents.

Fig. 3c: Comparison of Weight Gain during Pregnancy from 1st Visit till 2nd Visit by Groups

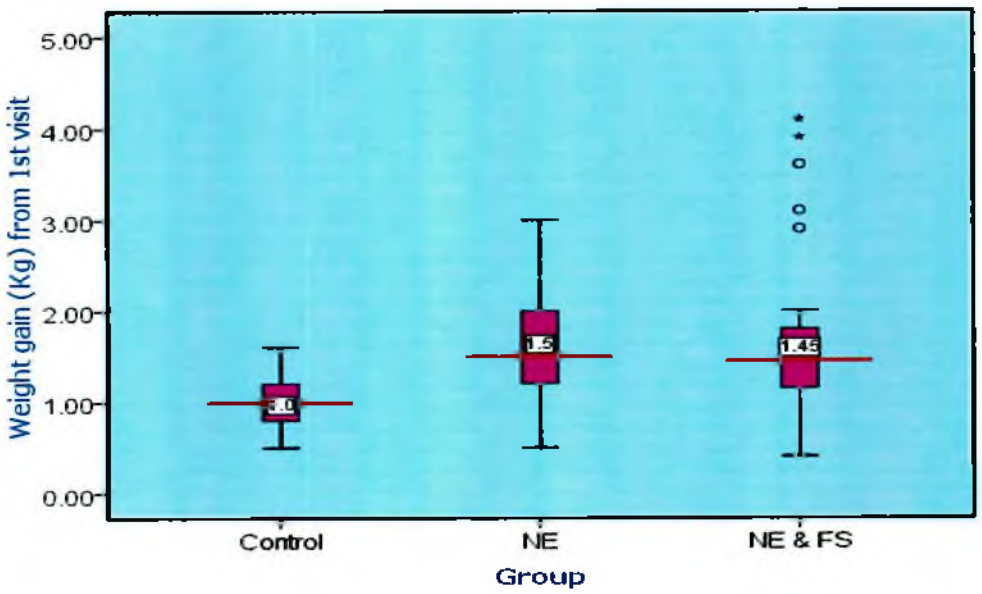


Fig 3c is showing the box plot which describes the weight gain of respondents from 1st visit till 2nd visit across the three groups. Median of weight gain of women from 1st visit till 2nd visit was higher in Nutrition Education + Food Supplementation group and the Nutrition Education group than in the Control group.

Fig. 4c: Comparison of Weight Gain during Pregnancy from 2nd Visit till 3rd Visit by Groups

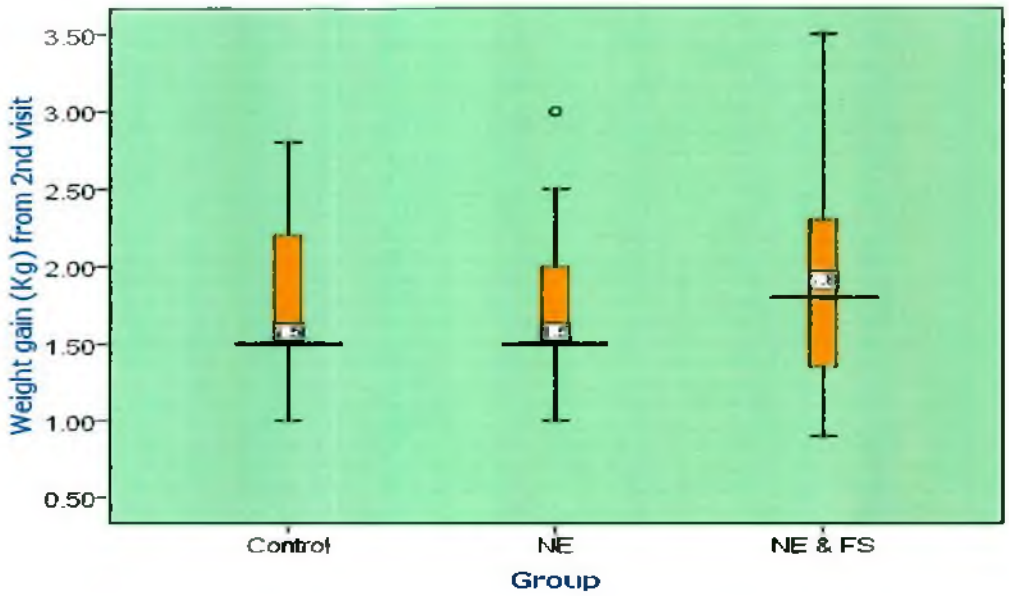


Fig 4c is showing the box plot which describes the weight gain of respondents from 2nd visit till 3rd visit across the three groups. Median of weight gain of women from 2nd visit till 3rd visit was higher in Nutrition Education + Food Supplementation group than the Nutrition Education group and the Control group.

Fig. 5c: Comparison of Weight Gain during Pregnancy from 3rd Visit till 4th Visit by Groups

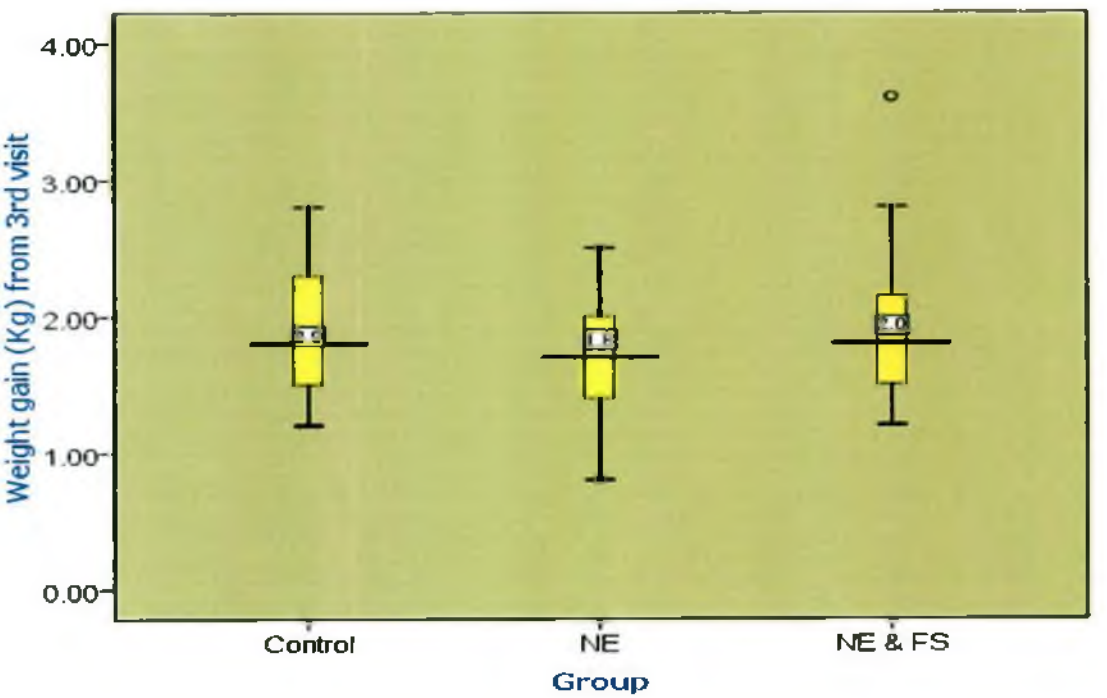


Fig 5c is showing the box plot which describes the weight gain of respondents from 3rd visit till 4th visit across the three groups. Median of weight gain of women from 3rd visit till 4th visit was higher in Nutrition Education + Food Supplementation group and control group than the women of Nutrition Education group.

Fig. 6c: Comparison of Weight Gain during Pregnancy from 4th Visit till 5th Visit by Groups

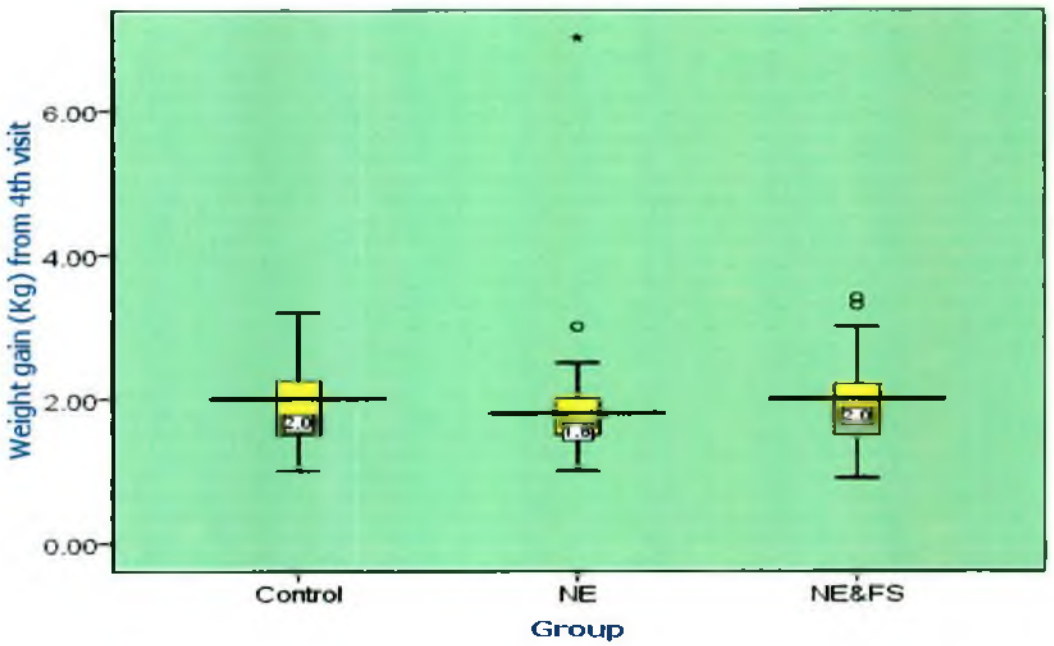


Fig 6c is showing the box plot which describes the weight gain of respondents from 3rd visit till 4th visit across the three groups. Median of weight gain of women from 3rd visit till 4th visit was higher in Nutrition Education + Food Supplementation group and Control group than the women of Nutrition Education group.

Table 9c: Distribution of Respondents by Total Weight Gain during Pregnancy

Total weight gain during Pregnancy	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
≥ 7 kg	30 (54.5)	18 (45.0)	27 (61.4)	75 (54.0)
< 7 kg	25 (45.5)	22 (55.0)	17 (38.6)	64 (46.0)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=2.27, df =2, P= 0.32

More than half of the respondents (54.5%) in Nutrition Education group, about half of the respondents (45.0%) in Nutrition Education + Food

Supplementation group and more than three-fifth of the respondents in Control group had total pregnancy weight gain 7 kg or more. About half of the respondents (45.5%) in Nutrition Education group, more than half of the respondents (55.0%) in Nutrition Education + Food Supplementation group and more than one-third of respondents (38.6%) in Control group had total pregnancy weight gain below 7 kg. This difference in total pregnancy weight gain across the three groups was not statistically significant (P> 0.05)

Table 10c: Analysis of Variance (ANOVA) of Mean of Total Weight Gain during Pregnancy across Three Groups

Respondents Group	N	Mean Wt Gain	SD	F Statistics	P value
Nutrition Education	55	6.68	0.77	9.53	< 0.01
Nutrition Education + Food Supplementation	40	7.37	1.18		
Control	44	6.55	0.80		
Total	139	6.55	0.80		

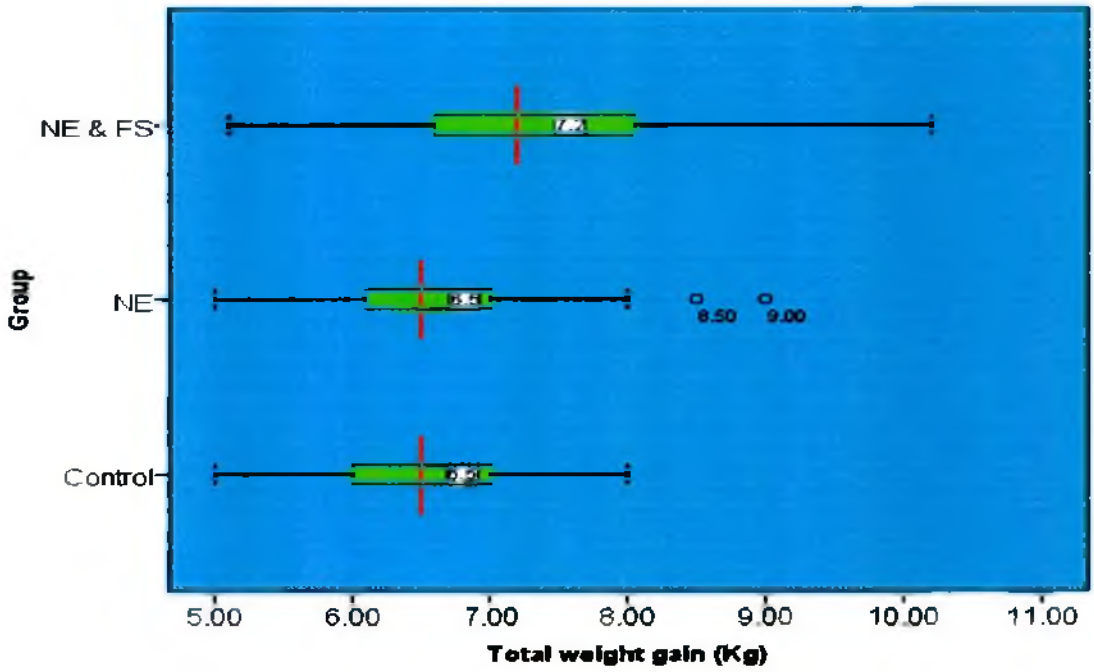
Analysis of variance of total pregnancy weight gain shows statistically significant differences across the three groups.

Table 11c: Post Hoc Comparison of Mean of Total Weight Gain during Pregnancy among Three Groups

Groups	Mean difference	SE	P value
Control Vs. Nutrition Education	0.13	0.19	0.86
Control Vs. Nutrition Education + Food Supplementation	0.82	0.20	<0.01
Nutrition Education Vs. Nutrition Education + Food Supplementation	0.69	0.19	<0.01

Post hoc exploration of total pregnancy weight gain across the three groups shows that the difference in total pregnancy weight gain across the three groups is due to Nutrition Education + Food Supplementation group.

Fig. 7c: Comparison of Median of Total Weight Gain during Pregnancy by Groups



This box plot supports the finding of the post hoc exploration of total pregnancy weight gain across the three groups. Median value of total pregnancy weight gain in Nutrition Education+ Food Supplementation group is higher than the other two groups.

Table 12c: Logistic Regression Analysis of Total Weight Gain Adjusted for Possible Confounders Considered

	B	S.E.	Wald	P Value	Odds Ratio	Lower 95% C.I.	Upper 95% C.I.
Group			2.80	0.25			
Group (Nutrition Education)	-0.06	0.69	0.01	0.93	0.94	0.24	3.63
Group Nutrition Education + Food Supplementation	0.93	0.66	1.97	0.16	2.54	0.69	9.35
Age group			1.81	0.61			
Age group (20 – 24 Yrs)	0.27	0.62	0.19	0.66	1.31	0.39	4.45
Age group (25-29 yrs)		0.88	0.18	0.67	1.45	0.26	8.08
Age group (>30 yrs)	-1.19	1.38	0.74	0.39	0.31	0.02	4.58
Income Level			4.79	0.09			
Income Level (2500 – 6000 Tk/mo)	0.23	0.50	0.21	0.64	1.26	0.47	3.35
Income Level (>6000 Tk/mo)	-1.44	0.79	3.38	0.07	0.24	0.05	1.10
Family Type			0.12	0.94			
Family type (Joint)	-0.24	0.85	0.08	0.78	0.79	0.15	4.15
Family type (Extended)	-0.56	1.81	0.10	0.76	0.57	0.02	19.72
Family size			1.51	0.47			
Family size(5-6 Person)	-0.27	0.85	0.10	0.75	0.76	0.14	4.03
Family size(> 6 person)	0.59	0.91	0.43	0.51	1.81	0.30	10.75
Order of Pregnancy			5.07	0.17			
Order of Pregnancy (2^{nd} -3^{rd})	-0.34	1.31	0.07	0.79	0.71	0.05	9.18
Order of Pregnancy (4^{th} - 5^{th})	-3.63	2.09	3.03	0.08	0.03	0.00	1.58
Order of Pregnancy (6^{th} & above)	-3.67	2.43	2.27	0.13	0.03	0.00	3.01
Pregnancy loss (Yes)	0.30	0.77	0.15	0.69	1.36	0.30	6.18
Anaemia			0.17	0.92			
Anaemia (Moderate)	-0.25	0.83	0.09	0.77	0.78	0.15	4.01
Anaemia (Severe)	-0.63	1.68	0.14	0.71	0.53	0.02	14.25
Jaundice (Present)	0.69	0.78	0.77	0.38	1.98	0.43	9.19
Constant	-2.20	1.97	1.24	0.26	0.11		

Nagelkerke R Square = .298
Hosmer and Lemeshow Chi-square = 6.254; P =0.619

The difference in total pregnancy weight gain across the three groups of women was found not to be statistically significant. Logistic regression

analysis of total pregnancy weight gain across the three groups was done after correcting possible confounding factors. No confounders found seemed to be significant.

Table 13c: Distribution of Respondents by Birth Weight

Birth Weight	Group			Total
	Nutrition Education	Nutrition Education + Food Supplementation	Control	
≤ 2.5 kg	30 (54.5)	29 (72.5)	23 (52.3)	82 (59.0)
> 2.5 kg	25 (45.5)	11 (27.5)	21 (47.7)	57 (41.0)
Total	55 (100)	40 (100)	44 (100)	139 (100)

Chi-Square=4.3, df=2, P= 0.12

Table 13c shows the distribution of respondents by birth weight across the three groups. More than half of the respondents (54.5%) in Nutrition Education group, about three-fourth in Nutrition Education + Food Supplementation group and more than half of the respondents (53.3%) in Control gave birth to babies with birth weight 2.5 kg or less than 2.5 kg. About half of the respondents (45.5% & 47.7% respectively) in Nutrition Education and Control groups and about one-third of respondents (27.5%) in Nutrition Education + Food Supplementation group gave birth to babies with birth weight greater than 2.5 kg.

Fig. 8c: Comparison of Median of Birth Weight of Babies across Groups

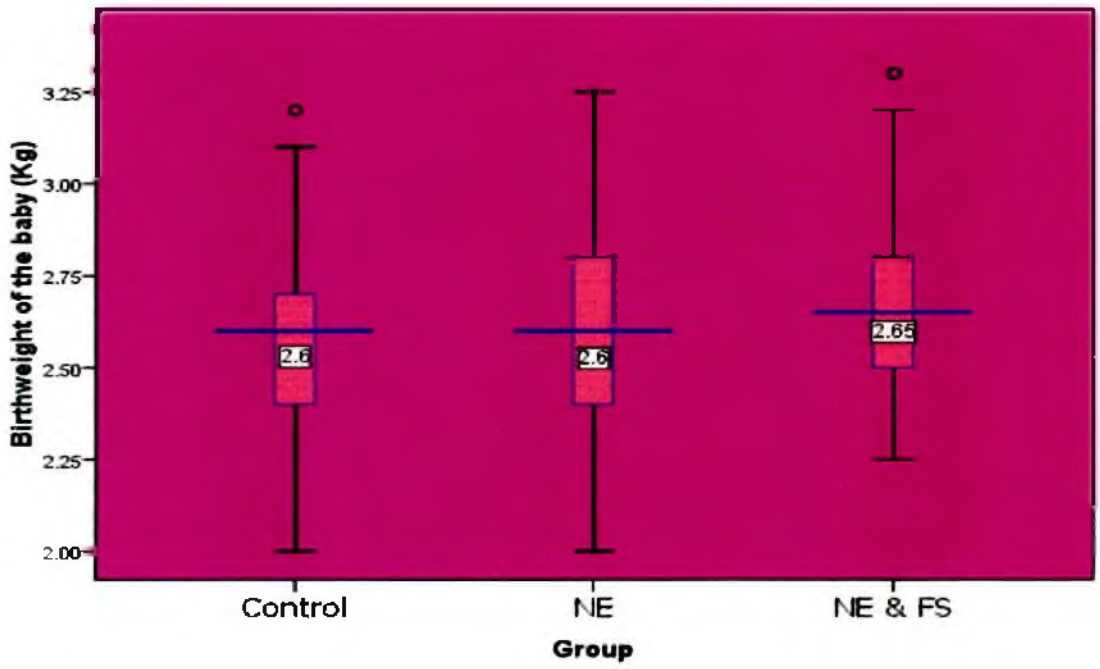


Fig 8c shows that the median value of birth weight of babies of women in the Nutrition Education + Food Supplementation group is greater than those of the other two groups.

Table 14c: Analysis of Variance (ANOVA) of Mean Birth Weight of babies across Three Groups

Respondents Group	N	Mean Birth wt	SD	F Statistics	P value
Nutrition Education	55	2.61	0.29	1.47	0.23
Nutrition Education + Food Supplementation	40	2.68	0.24		
Control	44	2.58	0.26		
Total	139	2.62	0.27		

Analysis of variance shows that no significant difference was observed in birthweight of babies across the three groups.

Table 15c: Logistic Regression Analysis of Birth Weight Adjusted for Possible Confounders Considered

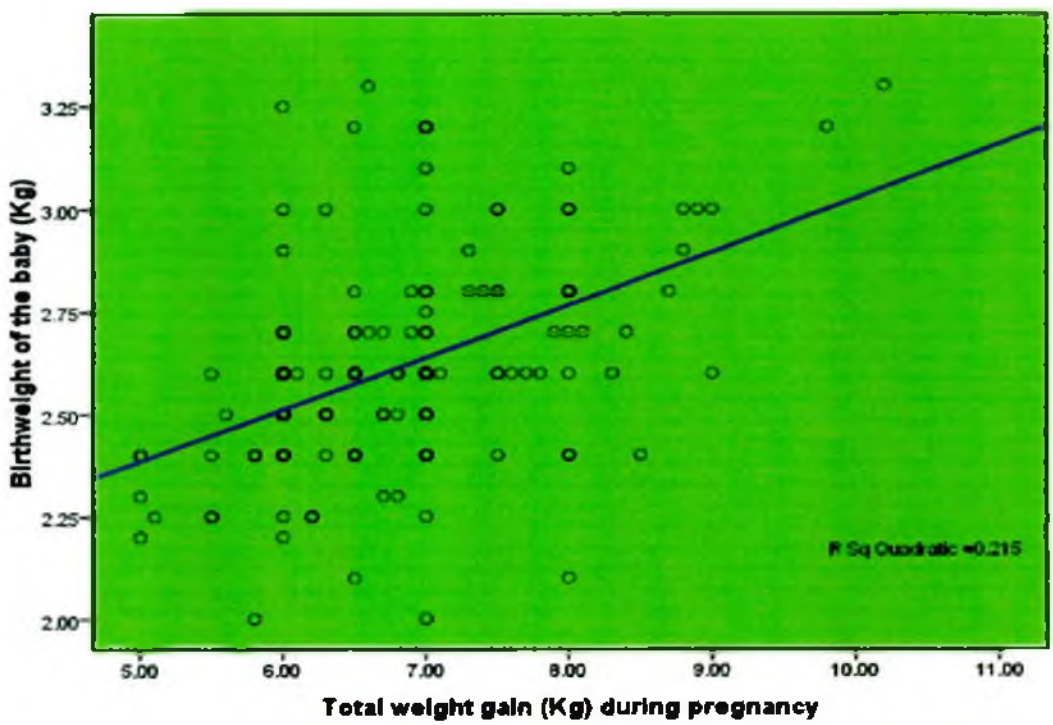
	B	S.E.	Wald	P Value	Odds Ratio	Lower 95%C.I	Upper 95% C.I
Group			4.41	0.11			
Group (Nutrition Education)	-0.42	0.65	0.42	0.52	0.65	0.18	-0.42
Group (Nutrition Education + Supplementation)	1.07	0.69	2.43	0.12	2.93	0.76	1.07
Age group			3.58	0.31			
Age group (20 - 24 Yrs)	1.12	0.63	3.12	0.08	3.07	0.89	1.12
Age group (25-29 yrs)	0.89	0.87	1.05	0.31	2.44	0.44	0.89
Age group (>30 yrs)	1.67	1.39	1.44	0.23	5.32	0.35	1.67
Income Level			0.42	0.81			
Income Level (2500 – 6000 Tk/mo)	0.14	0.51	0.07	0.79	1.15	0.43	0.14
Income Level (>6000 Tk/mo)	-0.31	0.73	0.18	0.67	0.73	0.17	-0.31
Family Type			4.76	0.09			
Family type (Joint)	-2.05	0.94	4.76	0.03	0.13	0.02	-2.05
Family type (Extended)	-23.04	22828	<.000	1.00	<.001	0	-23.04
Family size			1.93	0.38			
Family size(5-6 Person)	1.18	0.90	1.71	0.19	3.25	0.56	1.18
Family size(> 6 person)	1.25	1.01	1.53	0.22	3.47	0.48	1.25
Order of Pregnancy			1.34	0.72			
Order of Pregnancy (2^{nd} -3rd)	-1.32	1.26	1.10	0.29	0.27	0.02	-1.32
Order of Pregnancy (4^{th} – 5th)	-2.13	1.92	1.23	0.27	0.12	0.00	-2.13
Order of Pregnancy (6^{th} & above)	-2.26	2.26	1.00	0.32	0.10	0.00	-2.26
Pregnancy loss (Yes)	0.33	0.73	0.20	0.65	1.39	0.33	0.33
Anaemia			2.71	0.26			
Anaemia (Moderate)	1.48	0.90	2.71	0.10	4.40	0.76	1.48
Anaemia (Severe)	21.22	28394	<.000	0.99	<.000	0	21.22
Jaundice (Present)	0.47	0.81	0.33	0.56	1.59	0.33	0.47
Constant	-1.97	1.89	1.09	0.30	0.14		-1.97

Nagelkerke R Square = .312

Hosmer and Lemeshow Chi-square = 5.653; P =0.686

Logistic regression of birth weight of babies across the three groups was done after correcting possible confounding factors. It was found that the difference in birth weight was not statistically significant after controlling the possible confounding factors above.

Fig. 9c: Correlation between Total Pregnancy Weight Gain and Birth Weight of Babies



Correlations between Total Weight Gain and Birth Weight of the Baby	
Pearson Correlation coefficient (R)	P Value (1-tailed)
.463	<.001

Fig 9c is showing the scattered plot diagram which displays the linear correlation between total pregnancy weight gain and birth weight of the babies. It concludes that the birth weight will increase with the increase of total pregnancy weight gain.

CHAPTER-V:

5.1 Discussion

5.2 Conclusion

5.3 Recommandations

5.1 DISCUSSION

A community based intervention study was conducted among three groups (Nutrition Education Group, Nutrition Education + Food Supplementation Group and Control Group) of 150 pregnant women with BMI<17 and free from systemic diseases in three Upazillas with the aim to determine the effects of Nutrition Education and Nutrition Education along with Food Supplementation on them in terms of pregnancy weight gain and birth weight of babies. Women in the Nutrition Education Group & Nutrition Education + Food Supplementation group were given Nutrition Education sessions every month based on selective topics till the deliveries of babies till the deliveries of babies. Women in the Nutrition Education + Food Supplementation Group were supplemented by 600 Kcal/woman/day for every day of the week except for Friday in addition to their home meals by the Community Nutrition Promoters (CNP) from the time of selection till delivery.

Finally after the dropouts, results were obtained from 55 pregnant women in the Nutrition Education Group, 40 women from the Nutrition Education + Food Supplementation Group and 44 women from the Control group.

Mean age of the respondents was 23.70 ± 4.62 years, 28.1% were illiterate, 59.0% did not have any access to media at their homes, most of them (98%-100%) were housewives. Mean family income was Tk. 3761.87 ± Tk. 1922.46, most of them were lived in nuclear family, about one-fourth (24.55) were primi.

No significant relation was observed between BMI, Pre pregnancy weight of the mothers with the birth weight of their babies. This finding was not similar with the finding of Allan et al[9]. They conducted a prospective observational study on 322 urban African- American Women and found that maternal anthropometric measurements significantly correlated with pregnancy outcomes included delivery weight, pregnancy weight gain, weekly weight gain, pre pregnancy weight, height, pre pregnancy body mass index ($P < 0.05$). This dissimilarity may be due to as the BMI of all women was below 17 therefore weight and BMI of the pregnant women in this study was not that much varied. Present study finding is similar with the finding of Hosain G M M et al[72]. They did not found any statistical significant association between height and BMI of the mothers with the birth weight of their babies.

In this study, statistically significant association was found between birth weight and monthly family income of the respondents. Similar findings were observed by Karim et al.[13] They found that mean birth weight of higher income group is greater than the lower income group. Similar finding also observed by A.K.M.A. Salam et al[8], Laura P et al[70], Hirve SS et al[71] found that one of the risk factor of low birth weight was low socio-economic condition.

They also found that low birth weight was more common in younger (< 20 years) and older (> 30 years) mothers and those with little or no education. Their study revealed that male children were on average 290, 260 and 120 g, respectively, higher than uneducated, lower-income groups and female

children. These findings of their study were not similar with this study. Present study did not found any statistical relationship with age, education of the mothers with birth weight of their babies.

Present study revealed that pregnancy weight gain has linear correlation with the birth weight of babies (correlation coefficient of 0.45). Similar finding was observed by others[13, 16, 32, 58, 60].

Present study suggested that total pregnancy weight gain is greater ($P<0.01$) in women of Nutrition Education + Food Supplementation group than the other two groups (Nutrition Education & Control group). Ortolano et al[18] in their study "Effect of targeted food supplementation and services in the Bangladesh Integrated Nutrition Project on women and their pregnancy outcomes" found that, despite lower economic status, the women with low BMI receiving supplementation of food and intensified services were more likely to have adequate pregnancy-related weight gain than the more economically-advantaged women with higher BMI. Kramer MS and Kakuma R[61] in their review of published reports titled "Energy and protein intake in pregnancy" found that in 13 trials (4665 women), balanced energy/protein supplementation was associated with modest increases in maternal weight gain and in mean birthweight.

Ahrari M et al[20] found in their study that, the mothers who received food supplementation and counselling during pregnancy delivered babies with birth-weights 2.2 times greater than the babies whose mothers did not

received any food supplementation or counselling (mean increase: 0.58 vs. 0.26 g respectively, p<0.01).

However, in present study, weight gain in the Nutrition Education Group is greater than Control Group but did not show statistically significant difference from the control (P>0.05). This finding differ from Kramer MS and Kakuma R.[61] They found that, in five trials (1134 women), nutritional advice to increase energy and protein intakes was successful in achieving increase energy & protein intake with pregnancy weight gain. The present study finding also differs from the finding of Orstead C et al [66]. They found that the women receiving the counselling on an average gained 2.5 kg more weight, had fewer low-birth-weight infants (4% vs. 13%), and had infants weighing 100 gm more at birth.

Mean birth weight was greater among the babies delivered by the women of Nutrition Education + Food Supplementation group and Nutrition Education group than the babies of Control group of women. This difference was not statistically significant.

This finding is not similar with findings of E A Mitchell.[62] and Ferland[17]. They found that small variations in maternal diets within the normal range during pregnancy in developed countries are associated with differences in birth weight and maternal diet quality (TMAR) was significantly related to infant weight (r = .039, P = .036).

5.2 Conclusion

- Most of the respondents (58.95) were 20 to 25 years of age
- More than one-fourth of women (28.1%) were illiterate
- Almost all of them (98%-100%) were housewives, 59% did not have any kind of media at their homes
- Monthly family income was ~Tk.3700
- Mean family number was 5 to 6, about 55% to 65% of women were either primi or second gravida, and 55 % to 70% had only one child.
- Monthly mean weight gain was higher among Nutrition Education + Food Supplementation group, but no significant weight gain was observed among the Nutrition Education group than the Control group.
- Total weight gain of pregnancy was significantly higher among Nutrition Education + Food Supplementation group than the Control & Nutrition Education group, but compare to Control it was higher among Nutrition Education group.
- Analysis of variance (ANOVA) suggests a statistically significant difference in mean of total pregnancy weight gain across the three groups ($P<0.001$).

- Post hoc exploration of the association revealed higher total pregnancy weight gain in Nutrition Education + Food Supplementation group than other two groups ($P<0.01$).

- Mean of total weight gain in pregnancy in Nutrition Education group is greater than Control group but did not show statistically significant difference from the Control ($P>0.05$).

- Mean birth weight was higher among Nutrition Education + Food Supplementation group than the Control & Nutrition Education group, but compare to Control it was higher among Nutrition Education group.

- A significant linear relation is found between birth weight of the baby with maternal weight gain ($R=0.46$; $P<0.001$).

5.3 Recommandations

- Government should take Food Supplementation program on a larger scale as Food Supplementation could increase the birth weight & in turn could reduce the infant mortality and morbidity with decrease the foetal origin of adult diseases like high blood pressure, adult-onset diabetes, coronary heart disease, and stroke.

- More emphasis should be given to provide Nutrition Education to pregnant women during antenatal visits both in static & satellite clinics.

- Women should come forward to engage themselves in small business to help their husbands to ensure food security at household level.

- Health care providers should motivate women during antenatal visits either to deliver at hospitals or if at home, with the assistance of skilled birth attendants.

- Like highly nutritious biscuits given to selected school children, the government may also consider giving nutrient dense Food Supplementation to all pregnant women who posses BMI < 17.

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Annexures:

Questionnaire

Study Location Map

Nutrition Education Materials used in the study

Food Supplementation given to the pregnant women

Annexure 1a

গর্ভাবস্থায় পুষ্টি শিক্ষা এবং সম্পুরক খাদ্যগ্রহণ এবং শিশুর জন্ম ওজনের উপর তার প্রভাব

প্রশ্নমালা

উপরোক্ত শিরোনামে আমার গবেষণা কাজে অংশগ্রহণের জন্য আপনাকে অনুরোধ করছি এবং প্রসব না হওয়া পর্যন্ত প্রতিমাসে সম্পুরক খাদ্য ও/পুষ্টি শিক্ষা গ্রহণ করার জন্য ও আপনাকে শারিরীক পরীক্ষা করতে অনুমতি দেবার জন্য অনুরোধ করছি। প্রসব পরবর্তীতে নবজাতকের জন্ম ওজন গ্রহণ করবার জন্য অনুমতি প্রদানের অনুরোধ করছি। এতে আপনার বা শিশুর কোন অসুবিধা হবেনা এবং আপনার কাছ থেকে সংগ্রহকৃত উপাত্ত এবং আপনার সাক্ষাতকার শুধুমাত্র গবেষণার কাজে ব্যবহৃত হবে এবং গোপনীয় থাকবে।

বক্তব্য পড়ে শোনানো হলো

অনুমতি প্রদান করলাম (স্বাক্ষর)

(স্বাক্ষাতকার দানকারীর স্বাক্ষর/বৃদ্ধাঙ্গুলীর ছাপ)

প্রশ্নাবলী ঃ সনাক্তকরণ নং ঃ নিবন্ধকরণের তারিখ ঃ

নিউট্রেশন এডুকেশন গ্রুপ ১ শেষ মাসিক এর তারিখ:.....

সাপ্লিমেন্টারী গ্রুপ + নিউট্রেশন এডুকেশন গ্রুপ ২ ডেলিভারীর এর তারিখ:.....

কন্ট্রোল গ্রুপ - ৩

উপাত্ত সংগ্রহের স্থান .....

পরিচিতি

নাম ঃ .....

স্বামীর নাম ঃ .....

ঠিকানা ঃ

বাড়ীর নাম ..... গ্রাম ঃ .....

ইউনিয়ন .....জেলা ঃ .....

আর্থ-সামাজিক প্রশ্নাবলী

১। আপনার বয়স কত ? ..... বৎসর

২। আপনার ধর্ম কি ?

১) ইসলাম ২) হিন্দু ধর্ম ৩) খ্রিষ্টানধর্ম
৪) বৌদ্ধ ধর্ম ৯) অন্যান্য (উল্লেখ করুন) .....

৩। আপনি কতদূর লেখা পড়া করেছেন ?

১-১৬ (যত বৎসর পড়াশুনা করেছেন)
১৭ - অশিক্ষিত
১৮ - উপানুষ্ঠানিক শিক্ষা
১৯ - শুধুমাত্র স্বাক্ষর করতে পারেন

৪। আপনার স্বামী কতদূর লেখাপড়া করেছেন ?

১-১৬ (যত বৎসর পড়াশুনা করেছেন)
১৭ - অশিক্ষিত
১৮ - উপানুষ্ঠানিক শিক্ষা
১৯ - শুধুমাত্র স্বাক্ষর করতে পারেন

৫। আপনার পেশা কি ?

১) গৃহিনী ২) কৃষিকাজ ৩) ছোট ব্যবসা
৪) চাকুরী ৯) অন্যান্য (উল্লেখ করুন) .....

৬। আপনার স্বামীর পেশা কি ?

১) চাকুরী ২) কৃষিকাজ ৩) ছোট ব্যবসা
৪) বেকার ৯) অন্যান্য (উল্লেখ করুন) .....

৭। আপনার বাসায় কি কোন সংবাদ মাধ্যম আছে ? (একাধিক উত্তর হতে পারে)

১) নাই ২) খবরের কাগজ ৩) রেডিও
৪) টিভি ৪) সাময়িকী ৯) অন্যান্য (উল্লেখ করুন) .....

৮। আপনার পরিবারের মাসিক আয় কত ? ..... টাকা

৯। আপনি কি ধরণের পরিবারে বাস করেন ?

১) একক ২) যৌথ ৩) বর্ধিত

১০। আপনার পরিবারের সদস্য কতজন ..... জন

খ. বিবাহ ও গর্ভ সম্পর্কিত প্রশ্নাবলী

১১। কত বৎসর হলো আপনার বিবাহ হয়েছে? [ ] বৎসর

১২। এ পর্যন্ত মোট কতবার আপনি গর্ভবর্তী হয়েছেন ? [ ] বার

[ ] জন

১৩। আপনার কজন সন্তান আছে ?

[ ]

১৪। শেষ সন্তান টি কোথায় প্রসব করেছেন ?
১) বাসায় ২) হাসপাতালে

১৫। আপনি আপনার সবচেয়ে ছোট বাচ্চাটির জন্ম ওজন জানেন কি ? [ ]
১) হ্যাঁ ২) না

১৬। যদি জেনে থাকেন তাহলে ওর জন্ম ওজন কত ছিল ? [ ]

১৭। যদি জেনে না থাকেন তাহলে ও কেমন ছিল? [ ]
১) ছোট ২) গড় ওজনের ৩) সাধারণের চেয়ে বেশী ওজনের

১৮। আপনার কি কোন গর্ভ নষ্ট হয়েছে ? [ ]
১) হ্যাঁ ২) না

১৯। যদি হয়ে থাকে তাহলে সেটা কি প্রকৃতির ছিল ?

গর্ভপাত	মৃত শিশু প্রসব	নবজাতকের মৃত্যু

২০। আপনি কতবার এম আর করিয়েছেন ? (না করিয়ে থাকলে শূন্য বসান) [ ]

গ. বর্তমান গর্ভাবস্থা সম্পর্কে প্রশ্নাবলী

২১। এবার গর্ভবর্তী হওয়াটাটি আপনার আকাঙ্খিত ছিল ? [ ]
১) হ্যাঁ ২) না

২২। গর্ভকালীন সময়ে আপনার কি কোন শারীরিক অসুবিধা হচ্ছে ? [ ]
১) হ্যাঁ ২) না

২৩। যদি হয়ে থাকে তাহলে কি অসুবিধা হচ্ছে (একাধিক উত্তর হতে পারে √ চিহ্ন দিন) [ ]
১) বমি বমি ভাব ২) বমি ৩) ক্ষুধামন্দা
৪) নিদ্রাহীনতা ৫) অম্বল ৬) বুক ধরপড় করা
৭। মাথা ঘোরানো ৮) দূর্বল লাগা ৯) অন্যান্য (উল্লেখ করুন) .....

২৪। আপনি কোথায় বাচ্চা প্রসব করাবেন বলে ঠিক করেছেন ? [ ]
১) বাসা ২) হাসপাতাল

১ম সাক্ষাৎ ঃ

তারিখ ঃ .....

শারীরিক মাপ

১। ওজন ..... কেজি

২। উচ্চতা ..... মিটার

৩। বিএমআই ঃ কেজি/মি^{২}

পরীক্ষা

৪। রক্ত শূন্যতা ১) নাই ২) আছে (অল্প ও মাঝারী মাত্রায়) ৩) আছে (মারাত্মক) ☐

৫। জন্ডিস ১) আছে ২) নাই ☐

৬। পায়ে ফোলা ১) আছে ২) নাই ☐

২য় সাক্ষাৎ

তারিখ ঃ.....

৭। দুইটি সাক্ষাৎ এর মধ্যবর্তী সময় ..... দিন

৮। মোট পুষ্টি শিক্ষা গ্রহণের অধিবেশনের সংখ্যা ..... বার

৯। মোট সম্পূরক খাদ্য গ্রহণের দিন ..... দিন

১০। অসুবিধা ১) নাই ২) আছে ☐

১১। অসুবিধা থেকে থাকলে উল্লেখ করুন .....

শারীরিক মাপ

১২। ওজন ..... কেজি

১৩। ওজন বৃদ্ধি ..... কেজি

পরীক্ষা

১৪। রক্ত শূন্যতা ১) নাই ২) আছে (অল্প মাঝারী) ৩) আছে (মারাত্মক) ☐

১৫। জন্ডিস ১) নাই ২) আছে ☐

১৬। পা ফোলা ১) নাই ২) আছে ☐

৩য় সাক্ষাৎ

তারিখ ঃ.....

১৭। দুইটি সাক্ষাৎ এর মধ্যবর্তী সময় ..... দিন

১৮। মোট পুষ্টি শিক্ষা গ্রহণের অধিবেশনের সংখ্যা ..... বার

১৯। মোট সম্পূরক খাদ্যা গ্রহণের দিন ..... দিন

২০। অসুবিধা ১) নাই ২) আছে ☐

২১। অসুবিধা থেকে থাকলে উল্লেখ করুন .....

শারীরিক মাপ

২২। ওজন ..... কেজি

২৩। ওজন বৃদ্ধি ..... কেজি

পরীক্ষা

২৪। রক্ত শূন্যতা ১) নাই ২) আছে (অল্প মাত্রায়) ৩) আছে (মারাত্মক) ☐

২৫। জন্ডিস ১) নাই ২) আছে ☐

২৬। পা ফোলা ১) নাই ২) আছে ☐

৪র্থ সাক্ষাৎ

তারিখ ঃ.....

২৭। দুইটি সাক্ষাৎ এর মধ্যবর্তী সময় ..... দিন

২৮। মোট পুষ্টি শিক্ষা গ্রহণের অধিবেশনের সংখ্যা ..... বার

২৯। মোট সম্পূবক খাদ্যা গ্রহণের দিন ..... দিন

৩০। অসুবিধা ১) নাই ২) আছে ☐

৩১। অসুবিধা থেকে থাকলে উল্লেখ করুন .....

শারীরিক মাপ

৩২। ওজন ..... কেজি

৩৩। ওজন বৃদ্ধি ..... কেজি

পরীক্ষা

৩৪। রক্ত শূন্যতা ১) নাই ২) আছে (অল্প মাত্রায়) ৩) আছে (মারাত্মক) ☐

৩৫। জন্ডিস ১) নাই ২) আছে ☐

৩৬। পা ফোলা ১) নাই ২) আছে ☐

৫ম সাক্ষাৎ

তারিখ ঃ.....

৩৭। দুইটি সাক্ষাৎ এর মধ্যবর্তী সময় ..... দিন

৩৮। মোট পুষ্টি শিক্ষা গ্রহণের অধিবেশনের সংখ্যা ..... বার

৩৯। মোট সম্পূরক খাদ্য গ্রহণের দিন ..... দিন

৪০। অসুবিধা ১) নাই ২) আছে

৪১। অসুবিধা থেকে থাকলে উল্লেখ করুন .....

শারীরিক মাপ

৪২। ওজন ..... কেজি

৪৩। ওজন বৃদ্ধি ..... কেজি

৪৪। সর্ব মোট ওজন বৃদ্ধি ..... কেজি

পরীক্ষা

৪৫। রক্ত শূন্যতা ১) নাই ২) আছে (অল্প মাঝারী) ৩) আছে (মারাত্মক)

৪৬। জন্ডিস ১) নাই ২) আছে

৪৭। পা ফোলা ১) নাই ২) আছে

প্রসবের তথ্য

প্রসবের তারিখ ঃ .....

৪৮। কত সপ্তাহে প্রসব হলো ..... সপ্তাহ

৪৯। ডেলিভারীর পর কতঘন্টা পার হয়েছে ..... ঘন্টা

৫০। প্রসব এর স্থান ১) বাসা ২) হাসপাতাল

৫১। প্রসব এর ধরণ ১) স্বাভাবিক ২) সিজারিয়ান

৫২। ডেলিভারী কন্ডার্ট করেছে
১) ডাক্তার ২) এফডাব্লিউভি/মিডওয়াইফ/নার্স ৩) এসবিএ
৪) এফভাব্লিউ এ ৫) ট্রেনিং প্রাপ্ত টিবিএ ৬) আত্মীয়/দাই
৯) অন্যান্য (উল্লেখ করুন) .....

৫৩। বাচ্চার লিঙ্গ ১) ছেলে ২) মেয়ে

৫৪। আপগার স্কোর (হাসপাতালে ডেলিভারীর ক্ষেত্রে) .....

৫৫। জন্মের পর কেঁদেছে ১) সাথে সাথে ২) দেরীতে

৫৬। জন্মগত ত্রুটি ১) আছে ২) নাই

৫৭। যদি থেকে থাকে তাহলে কি উল্লেখ করতে হবে .....

নবজাতকের শারীরিক মাপ

৫৮। জন্ম ওজন..... কেজি

স্বাক্ষাতকার গ্রহণকারীর নাম

Annexure 1b

Nutrition education and food supplementation during pregnancy and their influences on birth weight

Questionnaires

I am seeking your consent for enrolment of your in the above mentioned study which will include participation in Nutrition Education Sessions in each month and taking Supplementation Food 6 days of a week according to National Nutrition Program (NNP) rule from the enrolment into the study till delivery of your baby. I am also seeking your permission to take birth weight of your baby during home visit. Your participation in the study will not hamper the health of you and your baby and all the information will be used only for study purpose and will keep in secret.

Above statement is uttered to take verbal/written consent.

Permission granted

.....

(Signature of Respondent)

Questionnaire for: ID No..... Date of Enrolment: .....

NE Gr.
NE+ FS Gr.
Control Gr.
Study Place:

Identity of the Respondent

Name of the Respondent: .....

Husband's Name: .....

Address:
Identification of the Household:: .....Village: .....

Union: .....District:.....

A. Socio-demographic Characteristics

1. What is your age?..... (in year) ☐

2. What is your religion? 1. Muslim 2. Hindu 3. Buddhist ☐
4. Christian 9. Others (Specify).....

3. What is your educational level? 1-16 (years of education) ☐
17- illiterate
18- non formal education
19-only can sign

4. What is your husband's educational level? 1-16 (years of education) ☐
17- illiterate
18- non formal education
19-only can sign

5. What is your occupation? 1. House wife 2. Govt. Service ☐
3. Private Service 4. Small Business
9. Others (Specify).....

6. What is your husband's occupation? 1. Unemployed 2. Govt. Service ☐
3. Private Service 4. Small Business 5. Farmer
9. Others (Specify).....

7. What kind of media do you have in your home? (in multiple responsesuse give √ mark) 1. None 2. Newspaper 3. Radio 4. TV ☐
5. Magazines 9. Others (Specify).....

8. What is your monthly family income? ..... ☐

9. What kind of family do you live in? 1. Nuclear 2. Joint 3. Extended ☐

10. How many members are in your family? .....person ☐

B. Marriage & Pregnancy Related Information

11. How long have you been married for? (in years) ☐

12. How many times have you been ever pregnant? ☐

13. How many children do you have? ☐

14. Where did you delivered your last child? 1. Hospital 2. Home ☐

15. Do you know the birthweight of your last child? 1. Yes 2. No ☐

16. If Yes, what was the birth weight? .....

17. If No, how did he/she look? 1. Small 2. Average 3. Big ☐

18. Did you have any pregnancy loss? 1. Yes 2. No ☐

19. If Yes, What was that?

(answer start from 0, 1, 2 etc.)

Abortion	Intra uterine death	Neonatal death

20. How many times did you have MR? ☐

C. Information related to current pregnancy

21. Is this pregnancy expected to you? 1. Yes 2. No ☐

22. Do you have any problem in this pregnancy? 1. Yes 2. No ☐

23. If Yes, then what problem do you have? ☐
(in multiple responses use give √ mark)

1. Nausea
2. Vomiting
3. Loss of appetite
4. Sleeplessness
5. Acidity
6. Palpitation
7. Vertigo
8. Weakness
9. Others

(Specify).....

24. Where do you want to deliver this baby? 1. Hospital 2. Home ☐

C 1. First Visit

Date:.....

Anthropometric Measurement

1. Weight:.....Kg
2. Height:.....meter
3. BMI:.....Kg/m^2

Examination

4. Anaemia 1. Absent 2. Present – (Mild to Moderate) 3. Present (Severe) ☐
5. Jaundice 1. Absent 2. Present ☐
6. Oedema 1. Absent 2. Present ☐

C 2. Second Visit Date:.....

7. Gap between two visit: .....days
8. Number of Nutrition education received: .....times
9. Total numbers of days supplementation taken: .....days
10. Problems Present: 1. Yes 2. No ☐
11. If Yes, specify:.....

Anthropometric Measurement

12. Weight:.....kg
13. Weight gain: .....kg

Examination

14. Anaemia 1. Absent 2. Present – (Mild to Moderate) 3. Present (Severe) ☐
15. Jaundice 1. Absent 2. Present ☐
16. Oedema 1. Absent 2. Present ☐

C 3. Tird Visit

Date:.....

17. Gap between two visit: .....days

18. Number of Nutrition education received: .....times

19. Total number of days supplementation taken: .....days

20. Problem 1. Yes 2. No

21. If Yes, specify:.....

Anthropometric Measurement

22. Weight:.....kg

23. Weight gain: .....kg

Examination

24. Anaemia 1. Absent 2. Present (Mild to Moderate) 3. Present (Severe)

25. Jaundice 1. Absent 2. Present

26. Oedema 1. Absent 2. Present

C 4. Fourth Visit

Date:.....

27. Gap between two visit: .....days

28. Number of Nutrition education received: .....times

29. Total number of days supplementation taken: ..... days

30. Problem 1. Yes 2. No

31. If Yes, specify:.....

Anthropometric Measurement

32. Weight: .....kg

33. Weight gain: .....kg

Examination

34. Anaemia 1. Absent 2. Present (Mild to Moderate) 3. Present (Severe)

35. Jaundice 1. Absent 2. Present

36. Oedema 1. Absent 2. Present

C. 5. Fifth & Last Visit

Date:.....

37. Gap between two visit: .....days

38. Number of Nutrition education received: .....times

39. Total number of days supplementation taken: .....days

40. Problem 1. Yes 2. No

41. If Yes, specify:.....

Anthropometric Measurement

42. Weight:.....kg

43. Weight gain: .....kg

44. Total Pregnancy Weight Gain: ..... kg

Examination

45. Anaemia 1. Absent 2. Present (Mild to Moderate) 3. Present (Severe) ☐

46. Jaundice 1. Absent 2. Present ☐

47. Oedema 1. Absent 2. Present ☐

Delivery Outcome

Date of Delivery:.....

48. Week of Delivery ..... week

49. Hour passed after Delivery: ..... hrs

50. Place of Delivery: 1. Hospital 2. Home

51. Mode of Delivery: 1. Normal 2. Caesarean

52. Delivery conducted by: 1. Doctors 2. FWV/ Midwife/ Nurse
3. SBA 4. FWA 5. TTBA
6. Relative/UTTBA 9. Others (specify).....

53. Sex of Baby: 1. Male 2. Female ☐

54. Apgar Score (in case of hospital delivery):.....

55. Cry after birth: 1. Immediate 2. Delayed ☐

56. Congenital Anomalies: 1. Absent 2. Present ☐

57. If present, specify: .....

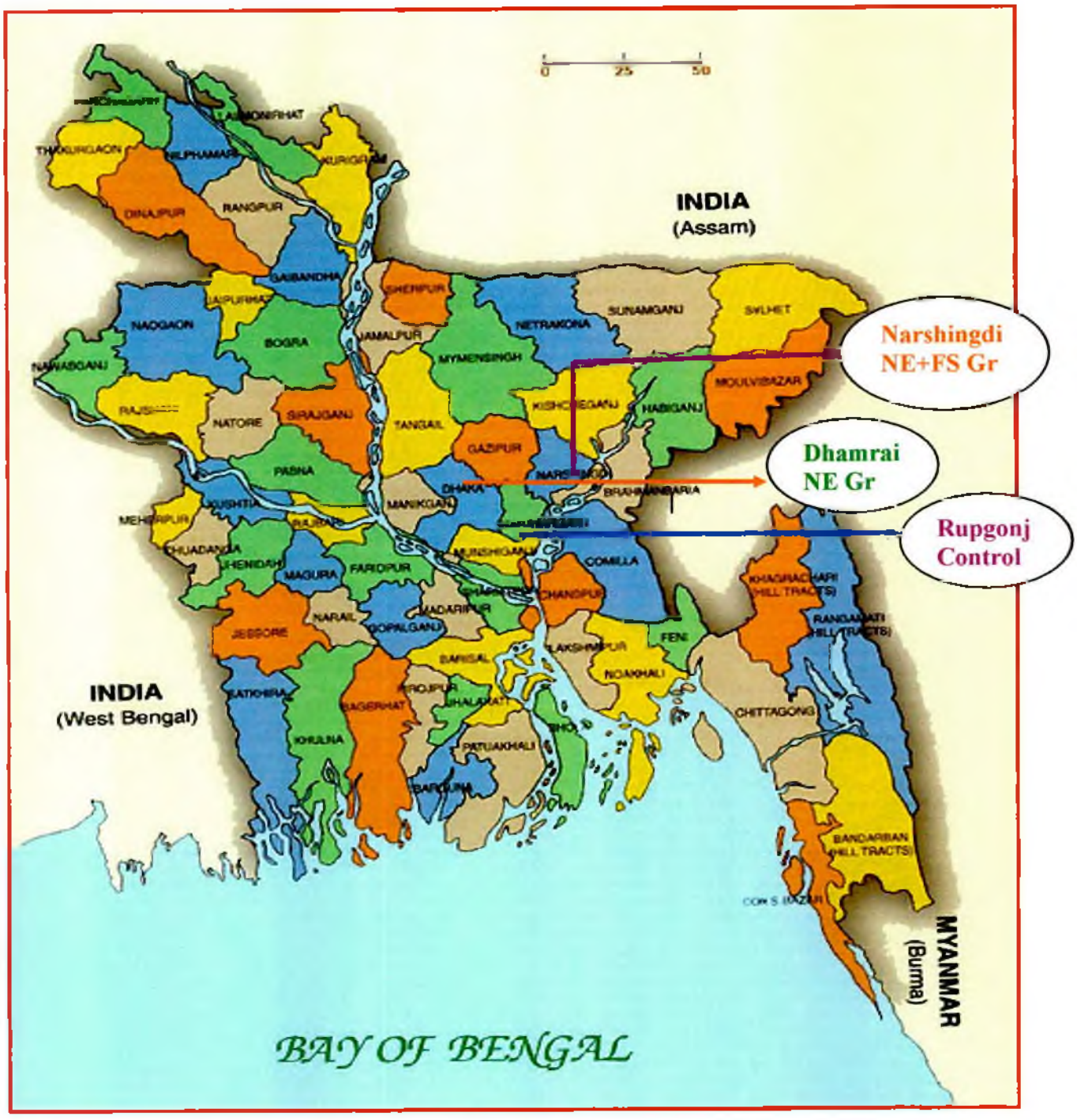
Anthropometric Measurement of Baby

58. Birth Weight: .....kg

Signature of the Interviewer

Annexure 2

Study Location Map



Nutrition Education Materials Used in the Study

গর্ভকালীন সময়ে পুষ্টি শিক্ষা

"গর্ভাবস্থায় পুষ্টি শিক্ষা এবং সম্পুরক খাদ্যগ্রহণ এবং শিশুর জন্ম ওজনের উপর তার প্রভাব"

গবেষণা কাজে ব্যবহৃত ফ্লিপচার্ট

শিমুল কলি হোসেন

অধিবেশন - ১

খাদ্য ও পুষ্টির প্রাথমিক ধারণা

খাদ্য কি?

ক্ষুধার জন্য আমরা যা খাই যা শরীরে পুষ্টি যোগায় তা-ই খাদ্য।

পুষ্টি কি?

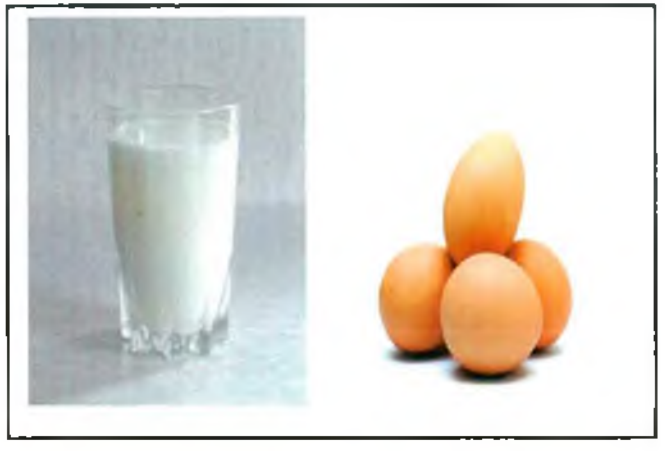
শরীরের ক্ষয় পুরণ ও শক্তি যোগানের পর শরীরের বৃদ্ধি ও মনের সুস্থতা হচ্ছে পুষ্টি। শরীরে পুষ্টি থাকলে মানুষ সুস্থ থাকে আর পুষ্টির অভাব হলে মানুষ ঘন ঘন অসুস্থ হয়। সব ধরণের খাবার পরিমাণ মত খেলে শরীরে পুষ্টি থাকে।

খাবার কত ধরণের?

১. শর্করা জাতীয় - ভাত, রুটি, মুড়ি, চিড়া ইত্যাদি



২. আমিষ জাতীয় - মাছ, মাংস, ডিম, দুধ, ডাল, সীমের বীচি, বাদাম ইত্যাদি



৩. স্নেহ জাতীয় - তেল, ঘি, মাখন, চর্বি, বাটার অয়েল ইত্যাদি

৪. ভিটামিন ও খনিজ লবণ জাতীয় - শাক, সব্জি, ফল ইত্যাদি

ফাজ অনুযায়ী খাদ্যকে ৩ ভাগে ভাগ করা যায়। যেমনঃ

১. শক্তিদায়ক খাদ্য - ভাত, রুটি, মুড়ি, চিড়া, আলু, তেল, ঘি, মাখন ইত্যাদি

২. গঠন বৃদ্ধিকারক খাদ্য - মাছ, মাংস, ডিম, দুধ, ডাল, সীমের বীচি, বাদাম ইত্যাদি

৩. রোগ প্রতিরোধকারী খাদ্য - শাক, সব্জি, ফল, ছোট মাছ, ইত্যাদি

কিছু দেশীয় ফলের নাম - আম, জাম, কাঠাল, পেপে, পেয়ারা, কলা, আমড়া, কামরাঙ্গা, তরমুজ, আতাফল, শরিফা, গাব, বড়ই, আমলকি, কমলা, বাঙ্গি, ফুটি, সফেদা, পানিফল, বেতফল, আনারস, লটকন ইত্যাদি

কিছু শাকের নাম - লাল শাক, পালং শাক , কচু শাক, ঢেকি শাক, পুই শাক, মুলা শাক, লাউ শাক, কলমি শাক, হেলে শাক, কলাই শাক, সরিষা শাক, ডাটা শাক ইত্যাদি

পরিমাণমত খাবার কি?

খাবার কতটুকুন খেতে হবে তা নির্ভর করে মানুষের বয়স, কাজের পরিমাণ, ওজন বা দেহের গঠন এবং শরীরের অবস্থার উপর। যেমনঃ ছোট বাচ্চাদের ও কিশোর-কিশোরীদের প্রাপ্তবয়স্কদের তুলনায় বেশী খেতে হয় কারণ প্রাপ্তবয়স্কদের তুলনায় তাদের শরীর দ্রুত বৃদ্ধি পায়। আবার যারা বেশী কাজ করে তাদের কম কাজ যারা করে তাদের তুলনায় বেশী খেতে হয়। যাদের স্বাস্থ্য ভাল বা মোটা তাদের তুলনায় রোগা বা চিকন স্বাস্থ্যের ব্যক্তিকে বেশী খেতে হয়। প্রাপ্তবয়স্কদের বৃদ্ধদের তুলনায় বেশী খেতে হয়। আবার যে কোন বয়সের লোকদেরই অসুখের পর একটু বেশী খেতে হয়। গর্ভবতী মা এবং যে সমস্ত মহিলারা সন্তানদের বুকের দুধ পান করান তাদেরও স্বাভাবিকের চেয়ে কিছু বেশী খেতে হয়।

সুষম খাবার কি?

আবার সব ধরণের খাবার মানুষকে খেতে হবে। যেমনঃ খাবারে শতকরা ৬০-৭০ ভাগ শর্করা জাতীয় খাবার, ১০-১৫ ভাগ স্নেহ জাতীয় খাবার এবং ২০-৩০ ভাগ আমিষ জাতীয় খাবার থাকা উচিৎ। তা ছাড়া ও প্রচুর পরিমাণে শাক সব্জি ও ফল খাওয়া উচিৎ। এ ধরণের মিশ্র খাবারকে সুষম খাবার বলে। সুষম খাবার খেলে যে কোন ধরণের পুষ্টির অভাব হয়না।

সুষম খাবার

অধিবেশন - ২
গর্ভকালীন সময়ে পুষ্টি, যত্ন ও পরিষ্কার-পরিচ্ছন্নতা

গর্ভাবস্থায় কেন বেশী খাদ্যের প্রয়োজন?

গর্ভাবস্থায় পরিমাণ মত অর্থাৎ স্বাভাবিকের চেয়ে কিছু বেশী সুষম খাদ্য খেলে মা ভাল থাকবে এবং গর্ভস্থ শিশু সুস্থ ও স্বাভাবিকভাবে জন্ম গ্রহণ করবে।

গর্ভাবস্থায় বেশী খাদ্যের প্রয়োজন কারণ-

১. ভ্রুণ ও গর্ভস্থ শিশুর বৃদ্ধির জন্য

২. মায়ের চাহিদা বৃদ্ধির জন্য

৩. প্রসবকালে বা ডেলিভারীর সময় যে ক্ষয় হয় তা পুরণের জন্য

কতটুকু বেশী খাদ্যের প্রয়োজন?

স্বাভাবিক খাবারের থেকে পাঁচ ভাগের এক ভাগ বেশী খেতে হবে। যেমনঃ অতিরিক্ত একটি রুটি বা অর্ধেক প্লেট ভাত এবং -

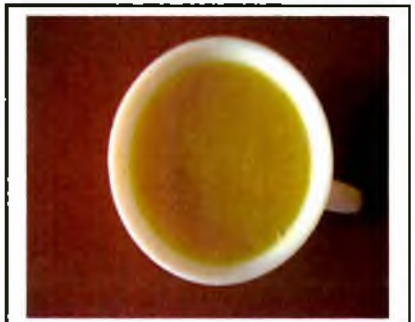
অতিরিক্ত একটি রুটি

অর্ধেক প্লেট ভাত

নিচের খাবারগুলো থেকে যে কোন দুটি

এক কাপ দুধ বা দই

এক কাপ সব্জি



এক কাপ ডাল

একটা ফল

এক টুকরা মাছ, মাংস বা একটা ডিম

গর্ভবতী মায়েদের যত্ন ও পরিষ্কার-পরিচ্ছন্নতার জন্য কি কি করতে হবে?

১. স্বাভাবিক খাবারের থেকে পাঁচ ভাগের এক ভাগ বেশী খেতে হবে।

২. সব ধরণের খাবার খেতে হবে।

৩. স্বাস্থ্যসম্মত পরিষ্কার খাবার খেতে হবে।

৪. ঢাকনা দিয়ে ঢাকা খাবার খাবে, বাসি বা পচা খাবার খাওয়া যাবেনা।

রাস্তায় বা বাইরের কেনা খাবার খাওয়া উচিৎ নয় কেননা এ থেকে জন্ডিস ও ডায়রিয়া হবার আশংকা থাকে।

রাত্রে পর্যাপ্ত সময় (৬-৮ ঘন্টা) ঘুমাতে হবে এবং দুপুরে খাবার পর কিছু সময় (১-২ ঘন্টা) বিশ্রাম নিতে হবে

গর্ভবতী মায়েদের যত্ন ও পরিষ্কার-পরিচ্ছন্নতার জন্য কি কি করতে হবে?

ভারী কাজ যেমনঃ পানি টানা, ধান ভানা, ভারী কিছু উঠানো ইত্যাদি করা যাবেনা

গর্ভবতী মা-কে পরিষ্কার-পরিচ্ছন্ন, দুশ্চিন্তা মুক্ত ও হাসিখুশি থাকতে হবে।

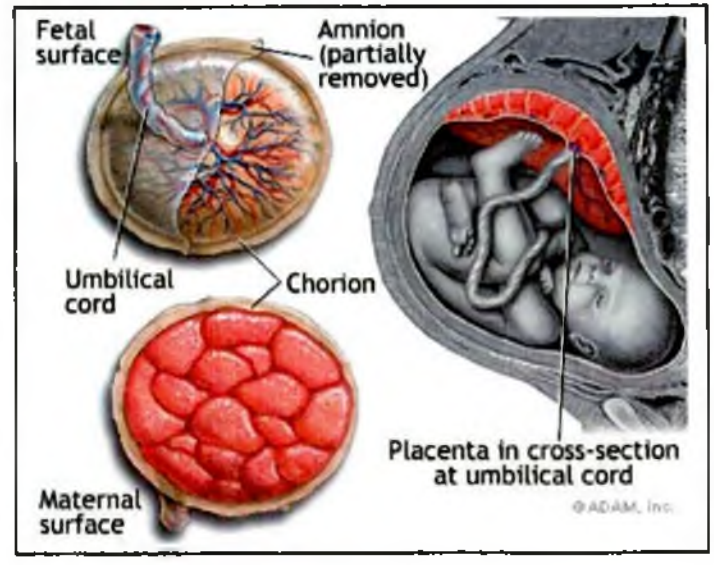
গর্ভকালীন সময়ে অন্তত পক্ষে তিনবার ডাক্তার বা স্বাস্থ্যকর্মীর কাছে চেক-আপ করতে যেতে হবে।

অধিবেশন - ৩
গর্ভাবস্থায় খাদ্য ও গর্ভস্থ ভ্রূণের বৃদ্ধি

গর্ভাবস্থায় কেন ওজন বৃদ্ধি পায়?

গর্ভাবস্থায় ওজন বৃদ্ধি পায় কারণ

১. নয় মাসে ধীরে ধীরে ভ্রূণ থেকে পরিণত শিশু জন্ম লাভ করে তাই শিশুর বৃদ্ধির সাথে সাথে মায়ের ওজন বৃদ্ধি পায়।



২. মায়ের অঙ্গ প্রত্যাঙ্গ যেমনঃ সন্তান ধারণের জন্য জরায়ুর আকার বৃদ্ধি পায় এবং শিশুকে দুধ পান করানোর জন্য স্তনের আকার বৃদ্ধি পায়।

৩. গর্ভাবস্থায় শরীরে কিছু চর্বি জমে যা স্বাভাবিক। সন্তান জন্মদান করার জন্য যে শক্তি দরকার হয় তা এই চর্বি থেকে আসে।

গর্ভাবস্থায় একজন মায়ের কতটুকু ওজন বৃদ্ধি পাওয়া উচিৎ?

গর্ভাবস্থায় একজন মায়ের প্রায় ৯-১২ কেজি ওজন বৃদ্ধি পাওয়া উচিৎ। গর্ভাবস্থায় নিয়মিত ওজন নেওয়া উচিৎ এবং আগের ওজনের সাথে তুলনা করে দেখা উচিৎ যে তার ওজন বাড়ছে কি না।

ওজন না বাড়লে ডাক্তারের পরামর্শ নেওয়া উচিৎ।

গর্ভাবস্থায় নিয়মিত ওজন নেওয়া উচিৎ এবং ওজন না বাড়লে ডাক্তারের পরামর্শ নেওয়া উচিৎ

প্রতিমাসে কি হারে ওজন বাড়া উচিৎ?

প্রথম তিন মাসে - ১-৩ কেজি

পরের ছয় মাসে - প্রতি সপ্তাহে আধা কেজি করে

মায়ের শরীরে পানি আসার কারণে অনেক সময় ওজন বাড়তে পারে। এমন হলে ডাক্তারের পরামর্শ নিতে হবে।

ওজন না বাড়লে আমরা কি বুঝব?

মায়ের ওজন না বাড়লে আমরা বুঝবো যে গর্ভস্থ শিশু ঠিক মত বাড়ছে না।

গর্ভস্থ শিশু না বাড়লে কি হয়?

গর্ভস্থ শিশু না বাড়লে -

১. কম ওজনের সন্তান জন্ম হবে।

২. শিশুর ওজন কম হলে মৃত্যুর সম্ভাবনা বেড়ে যায় এবং শিশু নিওমোনিয়া, ডায়রিয়া ও অন্যান্য রোগে বেশী ভোগে।

৩. জন্ম ওজন কম হলে পরবর্তীকালে তার ডায়াবেটিস ও হৃদরোগ হওয়ার ঝুকি বেড়ে যায়।

কম ওজনের সন্তান জন্ম হবে

ডায়রিয়া ও অন্যান্য রোগে বেশী ভোগে

পরবর্তীকালে হৃদরোগ হওয়ার ঝুঁকি বেড়ে যায়

অধিবেশন - ৪

খাদ্য সমন্ধে ভুল ধারণা দূরীকরণ ও বাড়ীতে খাদ্য উৎপাদন

আমাদের দেশে খাদ্য সমন্ধে অনেক ভুল ধারণা আছে, বিশেষ করে গর্ভবতী মায়েদের অনেক কিছু খেতে মানা করা হয় যা সঠিক নয়।

খাদ্য সম্পর্কিত কিছু ভুল ধারণা ও তার সমাধান

১. গর্ভবতী মায়েদের অনেক সময় কম খেতে দেওয়া হয় ও অনেক সময় ভিটামিন খেতে দেওয়া হয়না কেননা তারা মনে করেন যে এতে গর্ভস্থ শিশু বেশী বড় হয়ে যাবে এবং অপারেশনের মাধ্যমে ডেলিভারী করাতে হবে।

সমাধানঃ
আসলে এ ধারণা সম্পূর্ণই ভুল কেননা আগেই বলা হয়েছে গর্ভস্থ শিশুর স্বাভাবিক বৃদ্ধির জন্য মাকে কিছু অতিরিক্ত খাদ্য খেতে হবে ।

২. রাতের বেলা অনেক সময় ভাত খেতে দেওয়া হয়না কারণ মনে করা হয় যে ভাত খেলে শরীরে পানি আসে।

সমাধানঃ
ভাত ও রুটি দুটিই শর্করা জাতীয় খাদ্য তাই এ দুয়ের মধ্যে কোন পার্থক্য নেই।

৩. ডায়রিয়া হলে খাবারের পরিমাণ কমিয়ে উপাস করানো হয় যাতে ডায়রিয়া ভাল হয়ে যায়।

সমাধানঃ
ডায়রিয়া হলে শরীর থেকে প্রচুর পরিমান পানি ও খনিজ লবন বের হয়ে যায় তাই খাবারের পরিমাণ কমিয়ে উপাস করানো হলে রোগী পানি ও খনিজ লবনের অভাবে আরো অসুস্থ হবে এবং গর্ভস্থ শিশুর ক্ষতি হবে এমনকি রোগী মারাও যেতে পারে। তাই ডায়রিয়া হলে ওয়াল সেলাইনের পাশাপাশি স্বাভাবিক খাবার খাওয়াতে হবে।

৪. আমাদের দেশে গর্ভাবস্থায় কিছু কিছু খাবার খেতে মানা করা হয়। যেমনঃ বাইন মাছ খেলে শিশু পেটের ভেতর বেশী নোচড়ানুচরি করে, হাস খেলে গর্ভস্থ শিশুর হাসের মত লম্বা গলা হয়, আনারস খেলে শিশুর শরীরে আনারসের মত চোখ হয়, ডাব খেলে শিশুর চোখ গোলা হয়, ক্ষীরা খেলে শরীরে ফাটা ফাটা দাগ হয়, মৃগেল মাছ খেলে পরবর্তীকালে শিশুর মৃগী রোগ হয় ইত্যাদি।

সমাধানঃ
এ সমস্তই ভুল ধারণা। গর্ভাবস্থায় কোন খাবার খেতে মানা নেই। গর্ভস্থ শিশুর স্বাভাবিক বৃদ্ধির জন্য মাকে কিছু অতিরিক্ত খাদ্য খেতে দেওয়া উচিৎ।

অধিবেশন - ৫
শাল দুধ ও বুকের দুধ পান এবং টীকাসমূহ গ্রহণে উদ্বুদ্ধকরণ

শাল দুধ কি?

বাচ্চা জন্ম গ্রহণ করার পর মায়ের বুকের থেকে যে ঘন, হাল্কা হলুদ রংয়ের দুধ বের হয় সেটাই শাল দুধ।

শাল দুধ কি খাওয়াতে হয় না ফেলে দিতে হয়?

অনেক মায়েরা শাল দুধ ফেলে দেয় কারণ তারা মনে করে এই দুধ খেলে বাচ্চার পেটে অসুখ হবে। কিন্তু এটা তাদের ভুল ধারণা।

শাল দুধ হচ্ছে বাচ্চার প্রথম টীকা। অর্থাৎ শাল দুধ খেলে বাচ্চা বিভিন্ন রোগ বালাই থেকে মুক্ত থাকে।

শিশু জন্মের পর পরই তাকে মায়ের বুকের দুধ খেতে দিন

বুকের দুধ কিভাবে খাওয়াতে হয়?

শিশু জন্মের পর পরই তাকে মায়ের বুকের দুধ খেতে দিতে হয়। গর্ভফুল পড়ার আগে বাচ্চাকে দুধ খেতে দিলে তাড়াতাড়ি গর্ভফুল বের হয়ে যায়। এতে রক্তপাত কম হয় এবং জরায়ুটা সংকোচিত হয়। বাচ্চাকে জন্মের পর থেকে পূর্ণ ছয় মাস শুধুমাত্র বুকের দুধ খাওয়াতে হবে। এ সময় তাকে পানি খাওয়ানোরও প্রয়োজন নাই। ৬ মাসের পর থেকে শিশুকে বুকের দুধের পাশাপাশি অন্যান্য খাবার খাওয়ানো ধীরে ধীরে অভ্যাস করতে হয় এবং দুই বৎসর পর্যন্ত বুকের দুধ খাওয়াতে হয়।

ডায়ারিয়া হলে কি দুধ বন্ধ করে দিতে হবে?

না । জন্মের পর বাচ্চাকে বুকের দুধ খাওয়ালে বাচ্চারা ঘন ঘন অল্প অল্প করে পায়খানা করে।এটা ডায়ারিয়া না। তাছাড়াও ডায়ারিয়া হলেও বুকের দুধ বন্ধ করা উচিৎ নয়। ডায়ারিয়া হলে শিশুকে তার স্বাভাবিক খাবারের পাশাপাশি স্যালাইন খাওয়াতে হবে।

বুকের দুধের উপকারিতা কি কি?

- বুকের দুধ খাওয়ালে শিশুর অসুখ কম হয় এবং শিশু মৃত্যুও কম হয়। তাই ডাক্তারের জন্য খরচটা বেচে যায় ও শিশু সুস্থ থাকে।
- বুকের দুধ নিরাপদ, সহজে পাওয়া যায় এবং কিনতে হয়না। তাই বুকের দুধ খাওয়ালে টাকা পয়সা খরচ হয়না।
- বুকের দুধ খাওয়ালে শিশুরা বুদ্ধিমান হয় এবং শারিরীক গড়ন ভাল হয়।
- বুকের দুধ খাওয়ালে মা ও শিশুর মধ্যে বন্ধন দৃঢ় হয়।

সুস্থ মা ও সুস্থ শিশু

Women were provided with
6 packets of meal & one packet contain:

20 gm crushed rice
10 gm crushed lentil
5 gm molasses
3 ml oil
which provides 153 Kcal

Women under study were given 600 Kcal of supplementation every day of week except Friday from the enrolment to the study till delivery. Nutrition Education session was conducted every month before taking mothers' weight.

One Packet of meal