

Knowledge Regarding Nutrition in Childhood among the Mothers in Selected Communities of Mymensingh District, Bangladesh

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Abstract: Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system and neurological and cognitive development. Child malnutrition impacts cognitive function and contributes to poverty through impeding individuals' ability to lead productive lives. In addition, it is estimated that more than one-third of under-five deaths are attributable to under nutrition. Maternal health status, habits, and environment during and even before pregnancy profoundly impact the health and well-being of a child. Thus, achieving optimal child health is dependent upon optimizing the health and well-being of a child's mother. The purpose of this research is to identify the present situation of maternal anthropometry, socioeconomic status and nutritional status of under five children in selected area of Mymensingh district. Structured questionnaire was used for this descriptive cross-sectional study and sampling technique was random non-probable sampling. Collected 300 data was analyzed by SPSS and Microsoft Excel Software. This research found that according to Water low classification greater part of the children was stunted (54%). Only 17.7% of the children were found here to be normal. 16% of the children were both stunted and wasted, 12.3% children were wasted and also found that about two third of the mothers were normal BMI whereas only 11.67% were underweight. On the other hand, 22% and 2.33% mothers were found overweight and obese respectively. According to SES Score large number of mothers was found in lower class (61%). In remaining 29% belongs to lower middle class, 9.67% was from middle class. Only 0.33% mother belongs to upper middle class. None of the mother was in upper class. This study found a highly significant association between maternal anthropometric status and total family income. Here Chi-Square value is 39.63 and P-Value is 0.001. The study also found significant association between maternal anthropometric status and birth weight of the children (Chi-Square value is 19.072 and P-Value is 0.025). Innovative interventions of reaching health care, immunization, health and nutrition education to the people need to be evolved on priority.

Keywords: Nutrition, Mothers, Mymensingh District.

INTRODUCTION

Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period. While motherhood is often a positive and fulfilling experience, for too many women it is associated with suffering, ill-health and even death. The major direct causes of maternal morbidity and mortality include hemorrhage, infection, high blood pressure, unsafe abortion, and obstructed labor (WHO-2000)¹. Maternal mortality data is said to be an important indicator of overall health system quality because pregnant women survive in sanitary, safe, well-staffed and stocked facilities. If new mothers are thriving, it indicates that the health care system is doing its job. If not, problems likely exist (Country Comparison: Maternal Mortality Rate in The CIS World Factbook, 2010)².

Children's health encompasses the physical, mental, emotional and social wellbeing of children from infancy through adolescence (Pasquariello and Patrick, 1999)³. According to the World Health Organization, malnutrition is the biggest contributor to child mortality, present in half of all cases. Six million children die of hunger every year ("U.N. chief: Hunger kills 17,000 kids daily", 2009)⁴.

Socioeconomic status is commonly conceptualized as the social standing or class of an individual or group. It is often measured as a combination of education, income and occupation. Examinations of socioeconomic status often reveal inequities in access to resources, plus issues related to privilege, power and control (American Psychological Association)⁵. Socioeconomic status is typically broken into three categories (high SES, middle SES, and low SES) to describe the three areas a family or an individual may fall into. When placing a family or individual into one of these categories, any or all of the three variables (income, education, and occupation) can be assessed⁶.

Families with higher and expendable income can accumulate wealth and focus on meeting immediate needs while being able to consume and enjoy luxuries and weather crises (Boushey et al, 2005)⁷. Education also plays a role in income. Median earnings increase with each level of education. As conveyed in the chart, the highest degrees, professional and doctoral degrees, make the highest weekly earnings while those without a high school diploma earn less. Higher levels of education are associated with better economic and psychological outcomes i.e.: more income, more

control, and greater social support and networking (American Psychological Association, 2007)⁸. Occupation is the most difficult factor to measure because so many exist, and there are so many competing scales. Many scales rank occupations based on the level of skill involved, from unskilled to skilled manual labor to professional, or use a combined measure using the education level needed and income involved.

In sum, the majority of researchers agree that income, education and occupation together best represent SES, while some others feel that changes in family structure should also be considered. With the definition of SES more clearly defined, it is now important to discuss the effects of SES on students' cognitive abilities and academic success. Several researchers have found that SES affects students' abilities (Milne and Plourde, 2006)⁹.

Access to quality of health care varies by socioeconomic status. Among adults, 40 percent of those who have not graduated from high school are uninsured, compared with only 10 percent of college graduates; more than 60 percent of the uninsured are in low-income families (A.C Monheit and Vistnes, 2000)¹⁰.

The term 'nutritional anthropometry' first appeared in "Body Measurement and Human Nutrition" and has been defined by Jelliffe (1966)¹¹ as: "measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition." Anthropometric measurements are widely used in the assessment of nutritional status, particularly when a chronic imbalance between intakes of protein and energy occurs. Such disturbances modify the patterns of physical growth and the relative proportions of body tissues such as fat, muscle and total body water¹².

Anthropometric measurements are of two types: Growth measurements and body composition measurements. Body composition measurements can be further subdivided into the measurements of body fat and the measurements of fat free mass.

Maternal health status, habits, and environment during and even before pregnancy profoundly impact the health and well-being of a child. Thus, achieving optimal child health is dependent upon optimizing the health and well-being of a child's mother. Child health is foundational to adult health and well-being. When children's health is nurtured and supported and there is an absence of physical and mental abuse, or other intentional childhood

trauma; and there exists opportunities to gain habits that support good health during childhood, the stage is set for a healthy adulthood less likely to include chronic health problems such as overweight/obesity, poor oral health, diabetes and other chronic physical and mental health problems. The last few decades have brought significant improvements in child health in Bangladesh. The mortality rate in children under-five declined from 152 deaths per 1,000 live births to 94 deaths per 1,000 live births, but these rates are still high, and have remained constant for several years. Pneumonia, diarrhea, measles, malaria, malnutrition, injuries and the high number of neonatal deaths, and poor care-seeking behavior, all contribute to the high levels of child mortality. Malnutrition is the major cause of disease burden in developing countries and is a principal factor inhibiting further rapid declines in child mortality. Approximately 70% of world's malnourished children live in Asia, resulting in the region having the highest concentration of childhood malnutrition. Prevalence of stunting and underweight are high in South Asia where one in every two preschool children is stunted. In fact, Bangladesh has the highest prevalence of child underweight of all countries in the world except North Korea, and only seven countries have a higher prevalence of child stunting than that of Bangladesh.¹³ Family income, mother's education, sex and birth order of children are the important determinant of malnutrition.¹⁴ Poor breastfeeding habits—only 37% of children are exclusively breastfed for first 6 months of life—encourage wasting. Discrimination against women leaves mothers unable to make decisions in their own households regarding the food and health of themselves and their children. In the face of rising food prices, insufficient nutritious food and illness continue to set the stage for malnutrition. Malnutrition is commonest in the poorest communities and in households of low educational status. Floods and other natural disasters severely compromise food security in rural areas¹⁵. Rural mothers in Bangladesh lack adequate knowledge about malnutrition risk factors. Forty-one percent of children under five are underweight and 43 percent are stunted due to malnutrition. The lack of awareness among rural mothers in our country is alarming. Few are conscious about the proper diet of an infant but many were ignorant about the aggravating effect malnutrition had on other childhood diseases¹⁶. This research will explore the knowledge of mothers in a selected section of the population. Likely it will encourage other

researchers to continue forward and explore the total scenario of knowledge of mothers on malnutrition, who can act as a pivot to control it. Health policy making may take further steps to create health education awareness in this regard to be felt among the mothers. The study has been conducted in the selected areas of Mymensingh City to identify present situation of maternal and child health.

JUSTIFICATION

Malnutrition is the major cause of disease burden in developing countries and is a principal factor inhibiting further rapid declines in child mortality. Prevalence of stunting and underweight are high in South Asia where one in every two preschool children is stunted. In fact, Bangladesh has the highest prevalence of child underweight of all countries in the world except North Korea, and only seven countries have a higher prevalence of child stunting than that of Bangladesh¹⁷.

Family income, mother's education, sex and birth order of children are the important determinant of malnutrition¹⁸. Discrimination against women leaves mothers unable to make decisions in their own households regarding the food and health of themselves and their children. In the face of rising food prices, insufficient nutritious food and illness continue to set the stage for malnutrition. Malnutrition is commonest in the poorest communities and in households of low educational status. Floods and other natural disasters severely compromise food security in rural areas¹⁹.

An increased understanding of the association of child malnutrition with maternal knowledge is coming from the international comparisons of malnutrition prevalence among children and prevention, particularly those from the national and the International Study of prevention of malnutrition by lifestyle modification interventions. From the current study and other studies of malnutrition prevention among under five children, it is possible to draw some tentative conclusions as to the association of maternal education with child malnutrition worldwide.

OPERATIONAL DEFINITIONS

Malnutrition: Malnutrition is a serious condition that happens when your diet does not contain the right amount of nutrients. It means "poor nutrition" and can refer to: undernutrition – not getting enough nutrients. overnutrition – getting more nutrients than needed.

Undernutrition: Undernutrition denotes insufficient intake of energy and nutrients to meet an individual's needs to maintain good health. In most literature, undernutrition is used synonymously with malnutrition. In the strictest sense, malnutrition denotes both undernutrition and overnutrition.

Obesity: Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese. Carrying excess weight can lead to musculoskeletal disorders including osteoarthritis.

HDL: HDL cholesterol is the well-behaved "good cholesterol." This friendly scavenger cruises the bloodstream. As it does, it removes harmful bad cholesterol from where it doesn't belong. High HDL levels reduce the risk for heart disease -- but low levels increase the risk.

LDL: LDL stands for low-density lipoproteins. It is called the "bad" cholesterol because a high LDL level leads to a buildup of cholesterol in the arteries.

Atherothrombosis: the formation of a blood clot within an artery as a result of atherosclerosis.

Hypercholesterolemia: Hypercholesterolemia is a condition characterized by very high levels of cholesterol in the blood. Cholesterol is a waxy, fat-like substance that is produced in the body and obtained from foods that come from animals (particularly egg yolks, meat, poultry, fish, and dairy products). The body needs this substance to build cell membranes, make certain hormones, and produce compounds that aid in fat digestion. Too much cholesterol, however, increases a person's risk of developing heart disease.

Peripheral vascular disease: Peripheral vascular disease, also called PVD, refers to any disease or disorder of the circulatory system outside of the brain and heart. The term can include any disorder that affects any blood vessels. It is, though, often used as a synonym for peripheral artery disease.

Cerebrovascular disease: Cerebrovascular disease includes a range of conditions that affect the flow of blood through the brain. This alteration of blood flow can sometimes impair the brain's functions on either a temporary or permanent basis. When such an event occurs suddenly, it's referred to as a cerebrovascular accident (CVA).

Thromboangiitis: Thromboangiitis obliterans is a rare disease in which blood vessels of the hands

and feet become blocked. Thromboangiitis obliterans (Buerger disease) is caused by small blood vessels that become inflamed and swollen. The blood vessels then narrow or get blocked by blood clots (thrombosis).

Endarterectomy: Carotid endarterectomy is a procedure to treat carotid artery disease. This disease occurs when fatty, waxy deposits build up in one of the carotid arteries. The carotid arteries are blood vessels located on each side of the neck (carotid arteries).

This buildup of plaque (atherosclerosis) may restrict blood flow to the brain. Removing plaque causing the narrowing in the artery can improve blood flow in the carotid artery and reduce the risk of stroke.

Respondent: Respondents means those persons who had been questioned to answer for this current study the association of malnutrition with maternal education.

Knowledge: Here, in this current study knowledge signifies about the lifestyles and associated with malnutrition.

Research Question

What is the level of knowledge regarding childhood malnutrition among the mothers in selected communities of Mymensingh city, Bangladesh?

LITERATURE REVIEW

Under-five children form a bulk number of demographic forces. They are the future of the nation. Nearly 177 million babies are malnourished around the world. Malnutrition is responsible for nearly 45% of deaths in under five children. Mothers can play vital role to save these babies. A study was conducted to assess knowledge of mothers about malnutrition of under-five children in a selected slum of Mymensingh city. That was cross sectional study. Three hundred mothers were purposively selected to take face to face interview. Pre-tested structured questionnaire was used to collect data. Level of knowledge was determined by pre-defined score. Mean age of respondents was 19.55 ± 3.0 years. Most of the respondents were under secondary school certificate level education. Nearly half of the respondents were housewife. Mean monthly family income of respondents was 156.84 ± 29.53 USD. Majority of the respondents (76 %) had knowledge on weaning food. The study revealed that about half of the study subjects had

knowledge on preparation of khichuri (mixed food). About half of the respondents stated that diarrhea was the consequence of malnutrition. Conclusion: Overall knowledge on malnutrition among mothers needs to be improved. Mass media should be widely used to increase the level of knowledge of mothers on malnutrition²⁰.

A study in Ghana reported that malnutrition is a common cause of morbidity and mortality in children. The aim of that study was to compare the nutritional status of children under 5 years of teenage and adult mothers in Tamale Metropolis, Ghana. A case-control study involving 300 (150 cases, 150 controls) mother-child pairs was carried out. A questionnaire was used to collect data on socio-demographic characteristics of mothers and children and anthropometry was used to assess the nutritional status of children. Anthropometric z-scores derived based on WHO Child Growth Standards were used to determine stunting, wasting and underweight statuses of children. Logistic regression analysis was used to compare the nutritional status of children of teenage and adult mothers. Children of teenage mothers, compared to those of adult mothers, were 8 times more likely to be stunted [Adjusted Odds Ratio (AOR) = 7.56; 95% confidence interval (CI) 4.20–13.63], 3 times more likely to be wasted (AOR = 2.90; 95% CI 1.04–8.04), and 13 times more likely to be underweight (AOR = 12.78; 95% CI 4.69–34.81) after adjusting for potential confounders. The risk of child malnutrition increases with young maternal age; interventions should be targeted at teenage mothers and their children to reduce the risk of malnutrition²¹.

Adequate nutrition is one of the essential determinants of the health of children, and the right to adequate food is one of the fundamental human rights enshrined in many international agreements. Malnutrition is the most common nutritional disorder in developing countries²²⁻²³. Globally, 22.9% of children under 5 years are stunted and 7.7% are wasted²⁴. In Northern Region of Ghana, 33.1%, 6.3% and 20.0% of children under five are stunted, wasted and underweight respectively²⁵. Malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction and physical capacity²⁶⁻²⁷. About half of all deaths in children under five (about 3 million deaths) worldwide are caused by malnutrition²⁸. About 11% of all births worldwide are to girls aged 15–19 years old and the vast majority of these (95%) occur in low and middle-income countries where child marriage is

widespread²⁹. In Ghana, 11.3% of females aged 15–19 years have had a birth, while 2.9% were pregnant at the time of interview³⁰. Young maternal age at childbirth (< 20 years) is associated with increased risk of intrauterine growth restriction³¹, low birth weight, preterm birth³², infant mortality³³⁻³⁴ and poor child growth³⁵. For example, in low and middle-income countries, babies born to mothers under 20 years of age have a 50% higher risk of being stillborn or dying in the first few weeks versus those born to mothers aged 20–29 years³⁶. It is suggested that these associations result from interactions of biological, behavioural, and social factors. The nutritional needs of pregnant teenagers may compete with those of the developing foetus³⁷ because they are still growing resulting in increased nutritional demands compared to adult pregnant women. Teenage mothers may breastfeed for a shorter duration than older mothers³⁸, be behaviourally immature and therefore less sensitive to the needs of their infants, and may easily get annoyed and use less emotionally positive communication compared to adult mothers. In addition, younger mothers tend to have less education, and to be of lower socio-economic status and so have a higher chance of experiencing psychological stress resulting from limited resources³⁹ and parenting. Despite the high prevalence of teenage childbearing in Ghana, data are scanty on the effects of low maternal age on growth indicators of Ghanaian children. The aim of this study was to assess the effect of low maternal age on child growth indicators by comparing the nutritional status of children under five of teenage and adult mothers in Tamale Metropolis, Ghana.

Another prospective randomized trial was carried out to test the efficacy of a specific intervention for reducing the extent of their malnutrition and to change behaviour of mothers relating to child-feeding practices, care-giving, and health-seeking practices under the Bangladesh Integrated Nutrition Project (BINP). The study was conducted in rural Bangladesh among 282 moderately-malnourished (weight-for-age between 61% and 75% of median of the National Center for Health Statistics standard) children aged 6-24 months. Mothers of the first intervention group received intensive nutrition education (INE group) twice a week for three months. The second intervention group received the same nutrition education, and their children received additional supplementary feeding (INE+SF group). The

comparison group received nutrition education from the community nutrition promoters twice a month according to the standard routine service of BINP. The children were observed for a further six months. After three months of interventions, a significantly higher proportion of children in the INE and INE+SF groups improved (37% and 47% respectively) from moderate to mild or normal nutrition compared to the comparison group (18%) ($p<0.001$). At the end of six months of observation, the nutritional status of children in the intervention groups improved further from moderate to mild or normal nutrition compared to the comparison group (59% and 86% vs 30%, $p<0.0001$). As the intensive nutrition education and supplementation given were highly effective, more children improved from moderate malnutrition to mild or normal nutritional status despite a higher incidence of morbidity. The frequency of child feeding and homebased complementary feeding improved significantly ($p<0.001$) in both the intervention groups after three months of interventions and six months of observation.

Body-weight gain was positively associated with age, length-for-age, weight-for-length, frequency of feeding of khichuri, egg, and potato ($p<0.05$). Ability of mothers to identify malnutrition improved from 15% to 99% in the INE group and from 15% to 100% in the INE+SF group, but reduced from 24% to 21% in the comparison group. Use of separate feed pots, frequency of feeding, and cooking of additional complementary feeds improved significantly in the INE and INE+SF groups compared to the comparison group after three months of interventions and six months of observation. It can be concluded from the findings of the study that intensive nutrition education significantly improves the status of moderately-malnourished children with or without supplementary feeding⁴⁰.

Malnutrition is a problem not only in rural area but also among the urban poor. Also, the urban poor are a neglected segment of population in terms of basic services and amenities. Nutrition in children is affected by various determinants including mother's level of knowledge, attitudes and practices. Hence, A study was conducted in an urban slum setting to understand the extent and determinants of malnutrition in children below five years of age. The study objectives were to understand the knowledge, attitude and practices of mothers with respect to nutrition of them under five children and to measure the extent of

malnutrition in the sample population of under five children. That was a cross sectional study and data was collected on a sample of 300 children under five years and their mothers selected through cluster sampling technique in Turbel stores urban slum community of Navi Mumbai. Using a semi-structured interview schedule, Knowledge, Attitude and Practice (KAP) on nutrition among mothers of these children were assessed and anthropometric measurements were taken. The study used the World

Health Organization (WHO) guidelines for measuring malnutrition. Data was entered and analyzed using SPSS, version 20. z score analysis for malnutrition assessment was done using the appropriate WHO software. The knowledge levels of mothers regarding breast-feeding were mixed. Majority (88%) of the mothers were aware that only breast-feeding is required post-delivery, and duration of breast-feeding could be more than six months. there was a gap in knowledge about breast-feeding practice during infant illness. Only 9% of mothers had the correct knowledge to increase breast feeding if the infant was ill and 20% felt breast feeding should be decreased during illness of child. Mothers had very poor knowledge about nutritious food. The attitude score was created using the Likert scale with a minimum score of 16 and maximum score of 64. The mean attitude score was 54.29 with a standard deviation of 5.24. In terms of breast-feeding practices, 74 (24.6%) mothers did not initiate breast-feeding within one hour of birth, and only 21 (7%) mothers increased breast feed frequency during illness of child. Conclusion: The study found gaps in knowledge about breast-feeding practices among mothers and very poor practices related to adequate nutrition for children. Stunting was seen in more than 50 % of children. However, the mothers had a very positive overall attitude about

improving nutrition of their children and were willing to learn about it. This provides an opportunity for a targeted intervention among the mothers of these children in the community⁴¹.

An attempt was made to explore the predictors of child chronic malnutrition using the data of nationwide Bangladesh Demographic and Health Survey, 2004. The malnutrition status was measured according to the anthropometric indices and the analysis was carried out considering the groups of causes according to the UNICEF modified conceptual framework (basic, underlying, immediate and temporal). Logistic regression models were developed to identify the basic, underlying, immediate and temporal predictors according to the framework, and finally a combined model was developed using the significant predictors from the preceding four models. The prevalence of child chronic malnutrition was found high (43%) in Bangladesh with 16.4% severely stunted. The findings indicate that child age, region, birth order and birth interval, mother's education, wealth status, number of sleeping room, family size and cooking place were the basic predictors. Food insecurity status, maternal care and receiving colostrums were identified as underlying predictors; child feeding practices, receiving vitamin-A capsule by mother, acute respiratory infection (ARI) and incidence of diarrhoea were immediate predictors; mother's body mass index (BMI) and age at birth were temporal predictors. Final model indicates that chronic malnutrition was widely prevalent among the children belonging to Barisal division, ages 12-23 months, lower birth interval, households having large size, less sleeping room, poor wealth index, internal cooking place and mothers who were illiterate, thin, and insufficient maternal care recipients⁴².

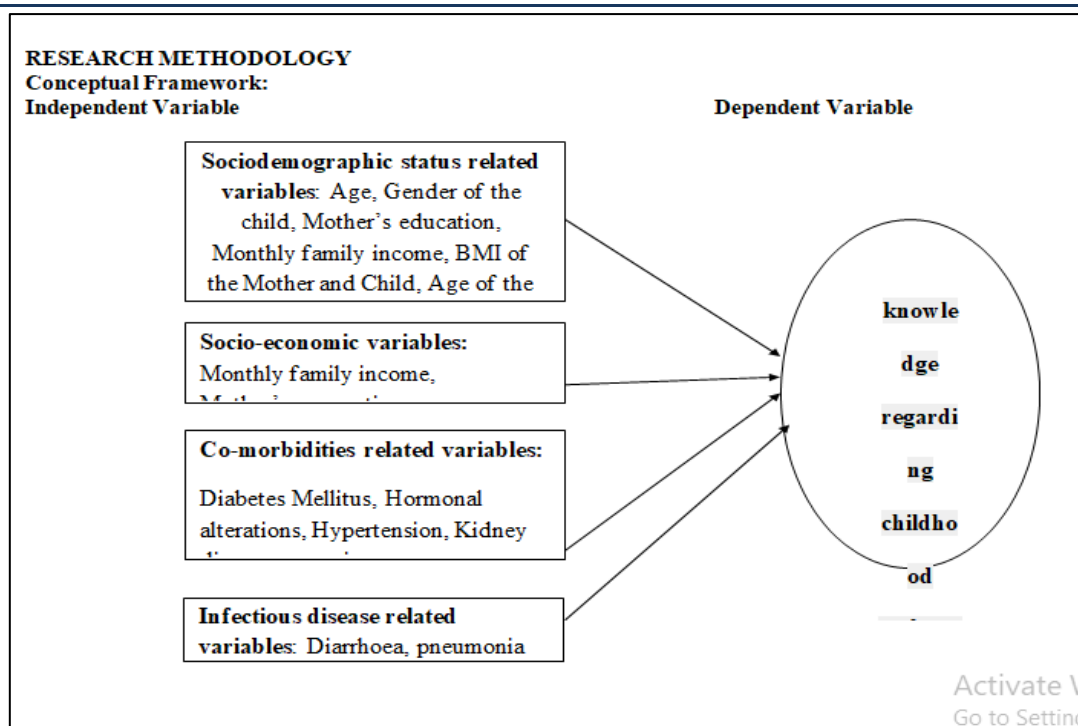


Figure.1 Age of the participated mother in the study. Distribution of Maternal Anthropometry:

Study Objectives

General Objective:

To assess level of knowledge regarding childhood malnutrition among the mothers in selected communities of Mymensingh city, Bangladesh

Specific Objectives:

- To describe the Socio-demographic characteristics of the respondents.
- To assess the anthropometric measurement related factors of the respondent.
- To assess level of knowledge regarding childhood malnutrition among the mothers.
- To identify the socio-economic factors of the respondent.

Study design:

It was a descriptive type of cross-sectional study following a quantitative design.

Study Population:

The study population was the entire mothers who have under 5 children in Mymensingh city.

Sample population:

Those people were present at the time of data collection.

Study site:

Mymensingh District is a district in Mymensingh Division, Bangladesh, and is bordered on the north by Meghalaya, a state of India and the Garo Hills, on the south by Gazipur District, on the east by the districts of Netrokona and Kishoreganj, and on the

west by the districts of Sherpur, Jamalpur and Tangail.

Study Area:

The study was conducted in different areas in Mymensingh district.

Study Period:

The study was conducted during the period from January 2024 to April 2024.

Sample Size:

The sampling size was determined by the following formula. The sample size for that proposed study was calculated by the following formula-

$$n =$$

Where,

$$z^2 pq d^2$$

n = required sample size

z = standard normal deviation with 95% CI which is set as 1.96

p = Prevalence of the undernutrition (among under five children) in India which is 33%⁴³ = 0.33

q = 1-p So, q=1-0.33 = 0.67

d = Acceptable error = 0.05

Required sample size,

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

=339.75 ≈ 340

Due to inadequate time, source, and financial limitation researcher collected 300 samples (Mothers of 170 male and 130 female children) with the consent of the guide.

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria:

- Those mothers who gave consent was included in the study.
- Only mothers who have children under five years of age.

Exclusion criteria:

- Respondents who refuse to provide informed consent
- Respondent with major psychiatric problem

Sampling technique:

Non-randomized Purposive sampling technique was applied.

Data collection tools:

A Semi-structured, pre-tested and modified

questionnaire was used to collect the data

Data collection technique:

All the data were collected by face-to-face interview.

Data management and analysis:

Statistical Package for Social Science (SPSS) version 16.0 (Chicago) a computer program was used to entry and analyzes the collected data. Proportion was presented by frequency and cross tabulation analysis. The association was finding out by using Pearson's chi-square (χ^2) test.

Limitation of the study:

As the sample collected purposively, so it may differ from the actual parameter of the population. There is a question about the reliability of the answer of the respondent. He might conceal the fact. It also affects the result. Time was too short to conduct such a study. There is also a fund crisis to conduct such a study.

Time line of study:

Activities	Months	January 2024				February 2024				March 2024				April 2024			
		1 st	2 ⁿ	3 ^r	4 ^t	1 st	2 ⁿ	3 ^r	4 ^t	1 st	2 ⁿ	3 ^r	4 ^t	1 st	2 ⁿ	3 ^r	4 ^t
Proposal writing																	
Literature review																	
Proposal defense																	
Pretest of questionnaire																	
Data collection																	
Data entry																	
Data analysis																	
Report writing																	
Draft submission /Thesis defense																	
Final report submission																	

RESULTS

The descriptive type of cross-sectional study was conducted to assess the risk factors associated with the nutritional status of under five children in selected areas in Mymensingh district, Bangladesh with a sample size of 300. A pre tested modified interviewer administrated semi structured questionnaires was used to collect the information. All the data were entered and analyzed by using

Statistical packages for social science (SPSS) software version 16.0 (Chicago). The salient features of this study are presented in the following sections:

Maternal Anthropometry and Healthcare Facilities:

Distribution of Participated Mother's Age:

In the study participated mother's age limit was

sixteen years to forty-five years. The mothers were categorized into four age groups.

In this study, 300 mothers were assessed in the selected areas of Mymensingh city where 22.3% mothers were found in the age of less or equal 20

years, 37% mothers were found in the age between 21-25 years, 29.7% mothers were found in the age of 26-30 years and 11% mothers were found in the age of above 30 years (Figure -1).

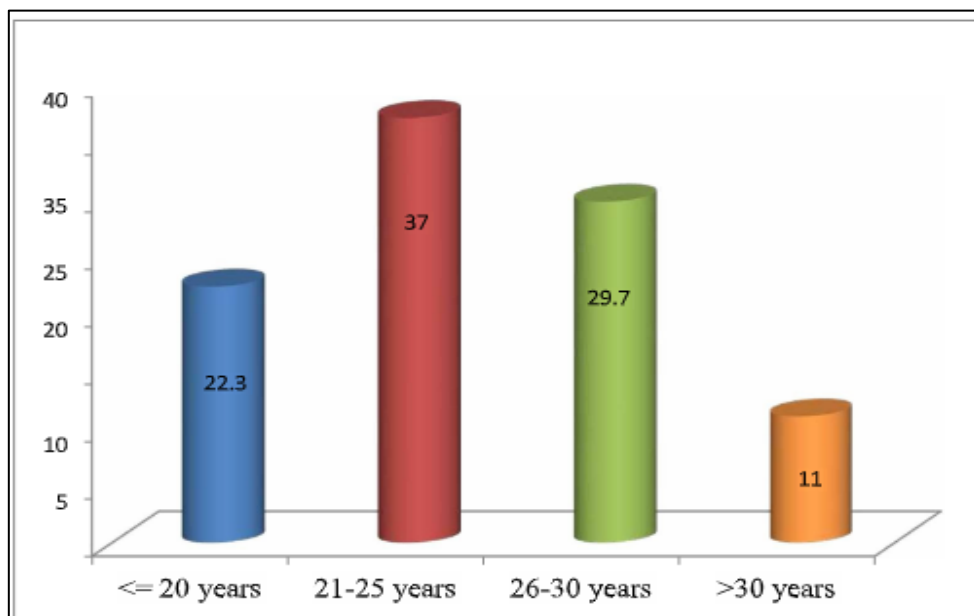


Figure.2 Age of the participated mother in the study. Distribution of Maternal Anthropometry: Maternal Anthropometric status was determined by the indicator called Body Mass Index (BMI). BMI is based on a Weight to Height ratio that is considered a good index of body fat and protein stores. According to BMI of mother after child birth were classified into four groups.

Figure-2 shows the anthropometric indicators of the maternal nutrition. It was found that about two third of the mothers were normal BMI whereas

only 11.67% were underweight. On the other hand, 22 and 2.33% mothers were found overweight and obese respectively.

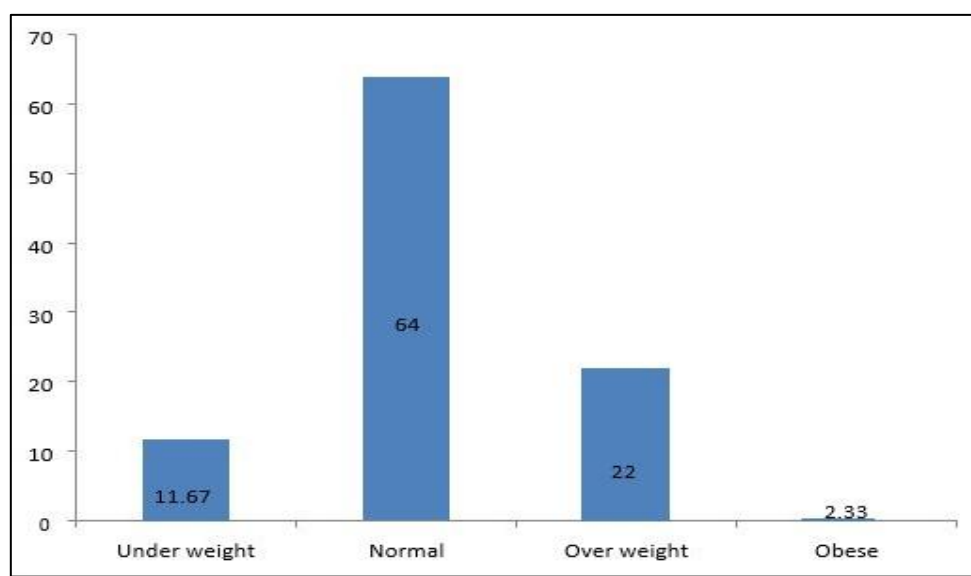


Figure.3 Maternal Anthropometric Status Distribution of Maternal Vaccination Status:

In Bangladesh, females are started to vaccinate at the age of sixteen and they receive five doses of TT (Tetanus Toxoids) vaccine and one dose of MR

(Measles Rubella) vaccine. Those who missed TT vaccine are given three doses of TT during pregnancy. In case of MR vaccine, it is restricted

during pregnancy.

Table: 1 Vaccination status of mother

Vaccination received	Frequency (n)	Percent (%)
Yes	284	94.7
No	16	5.3
Total	300	100

Table:1 illustrated the vaccination status of the mothers and shown almost all mothers (94.7%) were taken vaccine during pregnancy.

Distributions of Diseases and Complications of the Participated Mothers:

Most of the participated mothers were free from

diseases or complications. Some of the mothers were suffering from various diseases and complications such as constipation, hypertension, kidney disease, diabetes mellitus and other diseases like fever, cough etc.

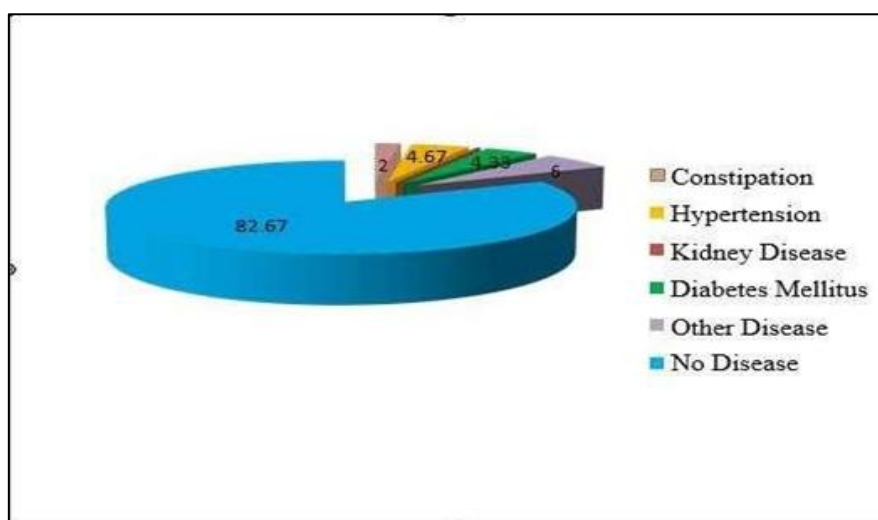


Figure. 4 Disease or Complications of mother.

Figure-3 shows the pattern of disease or complications of the selected mother and it was indicated that 82.7% have not any disease or complications. 4.7%, 4.3%, 2% and 0.3% have hypertension, diabetes mellitus, constipation and kidney disease respectively. Again, 6% of the mothers have other diseases such as fever,

common cold and sore throat etc.

Distribution of Maternal Hemoglobin Status:

Anemia means that the blood does not contain enough hemoglobin. Anemia is detected by measuring blood hemoglobin level. For the adult healthy non- pregnant women hemoglobin level is 12g/100ml blood.

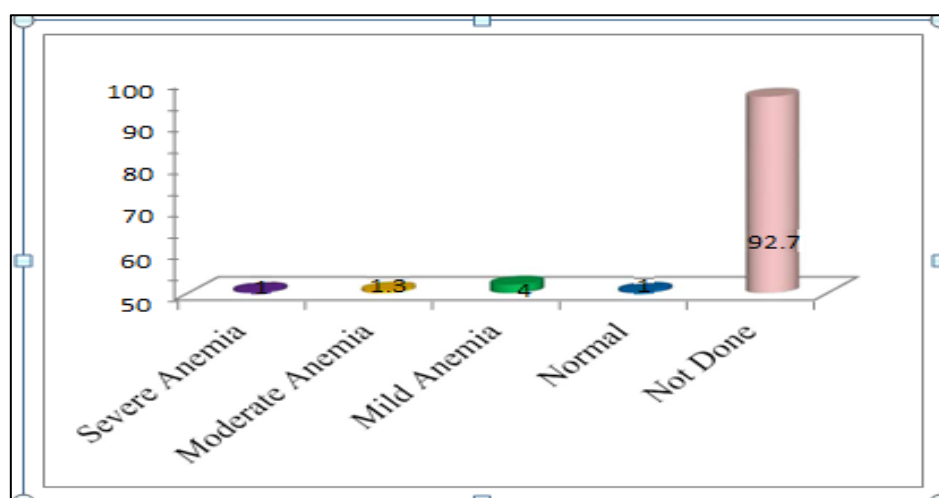


Figure.5 Maternal hemoglobin status.

The figure-4 revealed that 1% mother has normal hemoglobin status and 1%, 1.3%, 4% were found severely anemic, moderately anemic and mildly anemic respectively. On the other hand, this study found that most of mother was not concern about anemia that is why 92.7% mothers do not have done any hemoglobin test at all.

Distribution of Maternal Socio-Economic Status:

Socioeconomic status (SES) is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education, and occupation.

Table: 2 Socio-Economic Status of Mother

Occupation	Frequency (n)	Percent (%)
Part time Worker	20	6.7
Full time Worker	10	3.3
Business Entrepreneur	1	0.3
House Wife	269	89.7
Education		
Less than SSC	143	47.7
SSC	110	36.7
HSC	15	5
Graduate or Higher	32	10.7
Income		
Having Monetary Income	30	10
No Monetary Income	270	90

Distribution of Maternal Socioeconomic Class:

Socioeconomic class is an important source of health inequity, as there is a very robust positive correlation between socioeconomic class and health. This correlation suggests that it is not only

the poor who tend to be sick when everyone else is healthy, but that there is a continual gradient, from the top to the bottom of the socio-economic ladder, relating status to health.

Table: 3 Socioeconomic Classes of Participated Mothers

SEC	Score	Frequency (n)	Percent (%)
Upper Class	15	0	0
Upper middle Class	12 – 15	1	0.33
Middle Class	9 – 12	29	9.67
Lower Middle Class	6 - 9	87	29.0
Lower Class	Less than 6	183	61.0
Total		300	100

In this study 89.7% of the mother was housewife, 6.7% was part time worker, 3.3% was full time worker and only 0.3% was business woman. Their educational qualification was 47.7% less than SSC, 36.7% SSC, 10.7% graduate or higher and 5% HSC. The table also shows that 90% of the mother having no income and only 10% of the mother having income. (Table:2). Table:3 shows the maternal Socioeconomic Class according to SES

Score. Large number of mothers was found in lower class (61%). In remaining 29% belongs to lower middle class, 9.67% was from middle class.

Only 0.33% mother belongs to upper middle class. None of the mother was in upper class.

NUTRITIONAL AND HEALTH STATUS OF THE CHILDREN:

Distribution of Participated Children's Age Group

300 children were classified into five different age groups. The age groups are zero to twelve months, thirteen to twenty-four months, twenty-five to thirty-six months, thirty- seven to forty-eight months and forty-nine to sixty months.

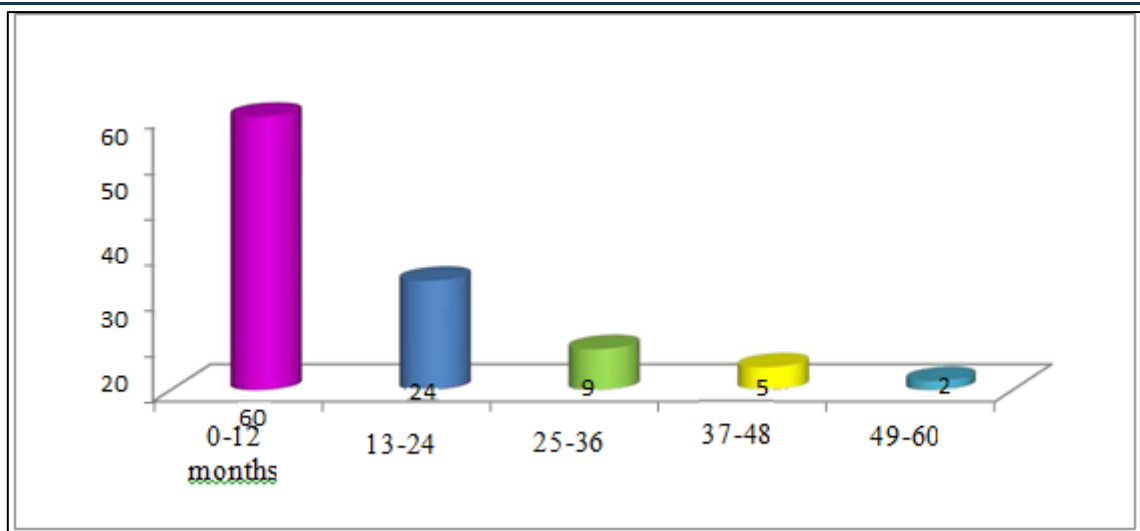


Figure.6: Age groups of the children

Figure-5 shows that the study found most of the participated children's age was 0-12 months (60%); 24%, 9%, 5% and 2% children's age was 13-24 months, 25-36 months, 37-48 months and 49-60 months respectively.

Gender Distribution of Participated Children

Among the participated 300 children, number of male children was 170 and female children were 130.

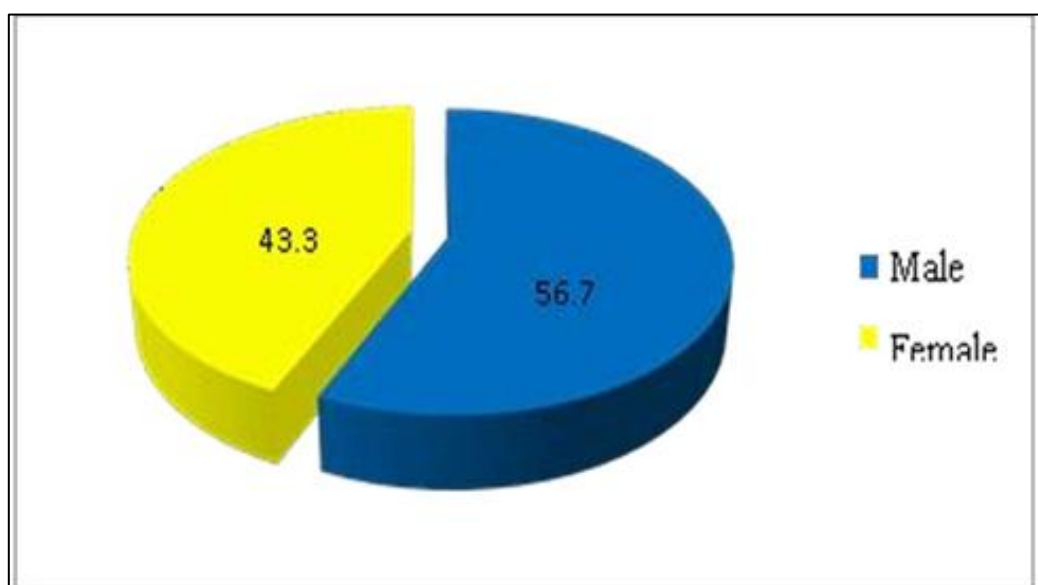


Fig.7 Sex of the participated under 5 children

Figure-6 indicates that in this study 300 children were classified by their sex; 56.7% children were male and 43.3% were female.

Distribution of Birth Weight of Children

Birth weight is the body weight of a baby at its birth. There have been numerous studies that have attempted, with varying degrees of success, to show links between birth weight and later- life conditions, including diabetes, obesity, tobacco smoking and intelligence.

A baby born small or large for gestational age

(either of the two extremes) is thought to have an increased risk of obesity in later life, but it was also shown that this relationship is fully explained by maternal weight.

Babies that have a low birth weight are thought to have an increased risk of developing type 2 diabetes in later life. Some studies have shown a direct link between an increased birth weight and an increased intelligence quotient. Increased birth weight is also linked to greater risk of developing autism.

Table:4 Birth weight of the participated children

Birth Weight	Frequency (n)	Percent (%)
Very Low Birth Weight	4	1.3
Low Birth Weight	78	26.0
Normal	217	72.3
Over Weight	1	0.03
Total	300	100

The table indicates that in this study, most of the children had normal birth weight (72.3%) and 1.3%, 26.0%, and 0.03% had very low birth weight, low birth weight and overweight respectively.

Distribution of Nutritional Status of Children

Nutritional status was determined by anthropometric measurement performing standard methods (NCHS), Gomez Classification and Water Low classification. In 1956, Gómez and Galvan studied factors associated with death in a group of malnourished children in a hospital in Mexico

City, Mexico and defined categories of malnutrition: first, second, and third degree. The degrees were based on weight below a specified percentage of median weight for age. The risk of death increases with increasing degree of malnutrition. An adaptation of Gomez's original classification is still used today. In this study to determine the nutritional status of the participated under five children percent of expected Weight for Age, Height for Age, Weight for Height and Water Low Classification was used. Similar result can be found if using Z-Score.

Table: 5 Nutritional Status of Children

Weight for Age	Frequency (n)	Percent (%)
Third Degree Malnutrition	17	5.7
Second Degree Malnutrition	67	22.3
First Degree Malnutrition	98	32.7
Well Nourished	100	33.3
Over Nourished	18	6.0
Height for Age		
Severe Malnourished	39	13.0
Moderate Malnourished	76	25.3
Mild Malnourished	95	31.7
Well Nourished	80	26.7
Over Nourished	10	3.3
Weight for Height		
Severe Malnourished	11	3.7
Moderate Malnourished	32	10.7
Mild Malnourished	42	14
Well Nourished	158	52.7
Over Nourished	57	19.0
Water low Classification		

Normal	53	17.7
Stunting	162	54.0
Stunting and Wasting	48	16.0
Wasting	37	12.3

Overall nutritional status of 300 participated children has shown in this table:5. According to Weight for Age parameter 33.3% children were found to have normal. Rest of them 32.7%, 22.3%, 5.7% and 6% were found first degree malnourished, second degree malnourished, third degree malnourished and over nourished respectively. On the other hand, 80% children have

found normal height for age at the reference of WHO standard. In accordance of Weight for Height parameter 52.7% children have found normal and remaining of them 14%, 10.7%, 3.7% children were mild malnourished, moderate malnourished and severe malnourished respectively. 19% children have found over nourished also. This table also indicates the

nutritional status of 300 children using indicator of Waterlow classification. It shows that greater part of the children was stunted (54%). Only 17.7% of the children were found here to be normal. 16% of the children were both stunted and wasted, 12.3% children were wasted.

Distribution of Prevalence of Infectious Diseases among the children:

Malnutrition is the primary cause of immunodeficiency worldwide, with infants,

children, adolescents, and the elderly most affected. There is a strong relationship between malnutrition and infection and infant mortality, because poor nutrition leaves children underweight, weakened, and vulnerable to infections, primarily because of epithelial integrity and inflammation. Malnutrition can make a person more susceptible to infection, and infection also contributes to malnutrition, which causes a vicious cycle.

Table: 6 Prevalence of Infectious Diseases among the children

Name of the Diseases	Frequency (n)	Percent (%)
Diarrhea		
Once	48	16.0
Twice	31	10.3
Thrice	12	4.0
Above	30	10.0
None	179	59.7
Pneumonia		
1 st time	37	12.3
2 nd time	4	1.3
3 rd time	1	0.3
Above	1	0.3
None	257	85.7

This table:6 illustrates that 59.7% children do not have diarrhea and 40.3% children have diarrhea, among them 16% have diarrhea for once and 10.3% have twice, 4% have thrice and 10% have above from birth to during the study period. In case of pneumonia 14.3% was infected and 85.7% was free from pneumonia. Among the infected children first time infection rate was highest (12.3%). The figure 4.5.5 shows that 93% children were not infected by other diseases except diarrhea and pneumonia. Only 7% children were infected by various diseases such as measles, common cold, fever and cough etc.

Distribution of Vaccination Status of Children

At present, routinely get vaccines that protect them from more than a dozen diseases such as measles, polio, and tetanus. Most of these diseases are now at their lowest levels in history. Children must get at least some vaccines before they may attend school. Vaccines help make baby immune to serious diseases without getting sick first. Without a vaccine, baby must actually get a disease in order to become immune to the germ that causes it. Vaccines work best when they are given at certain ages. For example, children don't receive measles vaccine until they are at least one year old. If it is given earlier it might not work as well.

Table:7 Vaccination status of the participated children

Receiving Vaccines	Frequency (n)	Percent (%)
Yes	289	96.3
No	11	3.7
Total	300	100

The table:7 Shows that among the 300 children 96.3% children were vaccinated or continuing

vaccination process and only 3.7% was not vaccinated.

Association and Correlation among different parameters

Table: 8 Associations between Maternal Anthropometric Status and Total Family Income

Maternal Anthropometric Status	Total Family Income (BDT)						Total	χ^2 -value	P-Value
	<5000	>5000 to <10000	>10000 to <15000	>15000 to <20000	>20000 to <25000	>25000			
Under Weight	5	16	6	6	0	2	35		
Normal	13	83	27	23	8	38	192		
Over Weight	2	12	6	20	4	22	66	39.63	0.001
Obese	0	1	1	1	1	3	7		
Total	20	112	40	50	13	65	300		

This study found a highly significant association between maternal anthropometric status and total family income. Here Chi-Square value is 39.63 and P-Value is 0.001 (Table:8). The study found

significant association between maternal anthropometric status and birth weight of the children (Table:9).

Table: 9 Association between maternal anthropometric status and birth weight of the children

Birth Weight of the children	Maternal Anthropometric Status				Total	χ^2 -Value	P-Value
	Under Weight	Normal	Over Weight	Obese			
Very Low Birth Weight	0	3	0	1	4		
Low Birth Weight	13	43	19	3	78		
Normal	22	146	46	3	217	19.072	0.025
Over Weight	0	0	1	0	1		
Total	35	192	66	7	300		

Table: 10 Association between maternal age and nutritional status (WFA) of the children

Maternal Age (Years)	Nutritional Status (Weight for Age)					Total	χ^2 -Value	P-Value
≤ 20	7	19	24	15	2	67		
21- 25	5	26	29	46	5	111		
26-30	4	14	38	26	7	89	21.671	0.041
≥ 30	1	8	7	13	4	33		
Total	17	67	98	100	18	300		

The table:10 illustrates that there was a significant association between maternal age and nutritional

status (WFA) of the children, here P-value is <0.05.

Table:11 Correlation between birth weight of the children and nutritional status (Weight for Age)

		Birth weight	Nutritional Status by Weight for
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			Age
Birth weight	Pearson Correlation	1	0.163**
	Sig. (2-tailed)		0.005
	N	300	300
Nutritional Status by Weight for Age	Pearson Correlation	0.163**	1
	Sig. (2-tailed)	0.005	
	N	300	300
**. Correlation is significant at the 0.01 level (2-tailed).			

This study found positive highly significant correlation between birth weight and nutritional

status (WFA) of participated children (Table:11).

Table: 12 Correlation between total family income and nutritional status (WFA and HFA) of the children

		Total family income	Nutritional Status By Weight for Age	Nutritional Status By Height for Age
Total family income	Pearson Correlation	1	0.164**	0.123*
	Sig. (2-tailed)		0.004	0.034
	N	300	300	300
Nutritional Status By Weight for Age	Pearson Correlation	0.164**	1	0.380**
	Sig. (2-tailed)	0.004		0.000
	N	300	300	300
Nutritional Status By Height for Age	Pearson Correlation	0.123*	0.380**	1
	Sig. (2-tailed)	0.034	0.000	
	N	300	300	300
**. Correlation is significant at the 0.01 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

The study found positive highly significant correlation between total family income and weight for age of the children. In addition, total family income was significantly correlated with height for age of the children too and weight for age and height for age was also correlated in this study (Table:12).

DISCUSSION

Maternal health status, habits, and environment during and even before pregnancy profoundly impact the health and well-being of a child. Thus, achieving optimal child health is dependent upon optimizing the health and well-being of a child's mother. Child health is foundational to adult health and well-being. When children's health is nurtured and supported and there is an absence of physical and mental abuse, or other intentional childhood trauma; and there exists opportunities to gain habits that support good health during childhood, the stage is set for a healthy adulthood less likely to include chronic health problems such as overweight/obesity, poor oral health, diabetes and other chronic physical and mental health problems.

The last few decades have brought significant improvements in child health in Bangladesh. The mortality rate in children under-five declined from 152 deaths per 1,000 live births to 94 deaths per 1,000 live births, but these rates are still high, and have remained constant for several years. Pneumonia, diarrhea, measles, malaria, malnutrition, injuries and the high number of neonatal deaths, and poor care-seeking behavior, all contribute to the high levels of child mortality. Because of this reason the study has been conducted in the selected areas of Mymensingh City to identify present situation of maternal and child health.

A descriptive cross-sectional study was carried out among the 300 mothers-under 5 children pairs selected randomly from different parts of the Mymensingh City. In this study, 300 mothers were assessed in the selected areas of Mymensingh city where 22.3% mothers were found in the age of less or equal 20 years, 37% mothers were found in the age between 21-25 years, 29.7% mothers were found in the age of 26-30 years and 11% mothers were found in the age of above 30 years. In the

study, among the 300 mothers 64% were found normal BMI. On the other hand, 22% mothers were found overweight, 2.33% were obese and 11.67% were underweight according to their BMI (Figure 2). The table:4 illustrated that among 300 mothers 284 (94.7%) was vaccinated during pregnancy and only 16 (5.3%) mother was not vaccinated.

The study found that among the 300 mothers 82.7% had not any disease or complications. 4.67%, 4.33%, 2% and 0.33% have Hypertension, Diabetes Mellitus, Constipation and Kidney Disease respectively. 6% of the mothers have other diseases such as Fever, Common Cold and Sore throat etc. The figure (4) revealed that 1% mother has normal hemoglobin status and 1%, 1.3%, 4% were found severely anemic, moderately anemic and mildly anemic respectively. On the other hand, this study found that most of mother was not concern about anemia that is why 92.7% mothers do not have done any hemoglobin test at all⁴⁴.

In this study, 89.7% of the mother was housewife, 6.7% was part time worker, 3.3% was full time worker and only 0.3% was business woman. Their educational qualification was 47.7% less than SSC, 36.7% SSC, 10.7% graduate or higher and 5% HSC. The table also shows that 90% of the mother having no income and only 10% of the mother having income (Table:2). Table 3 showed the maternal Socioeconomic Class according to SES Score. Large number of mothers was found in lower class (61%). In remaining 29% belongs to lower middle class, 9.67% was from middle class. Only 0.33% mother belongs to upper middle class. None of the mother was in upper class⁴⁵. Most of the mother in this study was housewife (89.7%) and their education level was SSC (36.7%) and less than SSC (47.7%) which are the two main reasons to lower the SES Score of them. The level of Maternal Education, Monthly Income and Occupation were used for measuring SES Score. The study found that most of the children's age was 0-12 months 60%; 24%, 9%, 5% and 2% children's age was 13-24 months, 25-36 months, 37-48 months and 49-60 months respectively (Figure 5). In this study 300 children were classified by their sex; 56.7% children were male and 43.3% were female (Figure 6).

In this study, most of the children had normal birth weight (72.3%) and 1.3%, 26.0%, and 0.03% had very low birth weight, low birth weight and overweight respectively (Table 4).

Overall nutritional status of 300 participated children has shown in the table 5. According to Weight for Age parameter 33.3% children were found to have normal. Rest of them 32.7%, 22.3%, 5.7% and 6% were found first degree malnourished, second degree malnourished, third degree malnourished and over nourished respectively. On the other hand, 80% children have found normal height for age at the reference of WHO standard. In accordance of Weight for Height parameter 52.7% children have found normal and remaining of them 14%, 10.7%, 3.7% children were mild malnourished, moderate malnourished and severe malnourished respectively. 19% children have found over nourished also. Table 5 also indicates the nutritional status of 300 children using indicator of Waterlow classification²³. In this study, greater part of the children was stunted (54%). Only 17.7% of the children were found here to be normal. 16% of the children were both stunted and wasted, 12.3% children were wasted. On the other hand, according to Bangladesh Demographic and Health Survey (BDHS) 2011²⁴, 41% of the children under5 are considered to be stunted, while 15% are severely stunted. 16% of children are considered wasted and 4% are severely wasted. The reason behind 54% of stunted under five children might be genetic, demographic, low birth weight, poor complementary feeding, prevalence of infectious disease and poor hygiene practices etc.

The table 6 illustrated that 59.7% children do not have diarrhea and 40.3% children have diarrhea, among them 16% have diarrhea for once and 10.3% have twice, 4% have thrice and 10% have above from birth to during the study period. In case of pneumonia 14.3% was infected and 85.7% was free from pneumonia. Among the infected children first time infection rate was highest (12.3%). The figure 6 shows that 93% children were not infected by other diseases except diarrhea and pneumonia. Only 7% children were infected by various diseases such as measles, common cold, fever and cough etc²⁵.

Among the 300 children 96.3% children were vaccinated or continuing vaccination process and only 3.7% was not vaccinated (Table 7). This study found a highly significant association between maternal anthropometric status and total family income. Here Chi-Square value is 39.63 and P-Value is 0.001 (Table 8). The study found significant association between maternal anthropometric status and birth weight of the children (Table 9). The table 10 illustrated that

there was a significant association between maternal age and nutritional status (WFA) of the children⁴⁶, here P-value is <0.05. The study found positive highly significant correlation between total family income and weight for age of the children. In addition, total family income was significantly correlated with height for age of the children too and weight for age and height for age was also correlated in this study (Table 12).

CONCLUSION AND RECOMMENDATIONS

Conclusion:

Maintenance of good nutritional status for an individual means to meet the nutrient needed through proper diet by selecting right kind of appropriate available foods and beverages. Food fads faulty food habit, superstitions, ignorance, lack of proper knowledge and many other factors are predominantly responsible for the nutritional disorders among the people of Bangladesh. In case of child malnutrition, poor breastfeeding practice, inappropriate complementary feeding and improper hygiene are the multifactorial cause in the country. Disease prevalence due to infections is an important cause of morbidity and mortality in infants and young children in most developing countries including Bangladesh. The nutrition situation of Bangladesh has not improved satisfactory as an educational environment, social environment and need more attention and a community-based strategy for the improvement of maternal nutritional status. Malnutrition, underweight, wasting and stunting are more common nutritional problem in Bangladesh. An individual human can easily overcome these problems without excess money wasting by acquiring nutritional knowledge, nutritional value of food and dietary habits. This research found that according to Water low classification greater part of the children was stunted (54%). Only 17.7% of the children were found here to be normal. 16% of the children were both stunted and wasted, 12.3% children were wasted and also found that about two third of the mothers were normal BMI whereas only 11.67% were underweight. On the other hand, 22% and 2.33% mothers were found overweight and obese respectively. In this study, there was significant association between maternal anthropometric status and total family income (P-value 0.001); maternal anthropometric status and birth weight of the children (P-value 0.025); maternal age and weight for age of the children (P-value 0.041); It also found positive correlation between birth weight and weight for age of the

children; total family income and nutritional status of the participated children. This study was a cross sectional study but its incorporated variables are constantly changeable so it should be longitudinal study and is necessary to uphold new information. In this study sample size was too small to compare with the population of sixteen crore of Bangladesh. The study was conducted with 300 mothers and paired children only and the sample were collected from some specific areas of Mymensingh City not all over the country. This is the reason of these information do not represent the overall situation of Bangladesh. Finally, it can be concluded that the nutritional status of under five children does not reach the expected level in many aspects. Further studies with larger populations are needed in the field to cross-validate the results. The nutritional status of the vulnerable groups is the outcome of complex and interrelated set of factors. Many of these factors relate to health care, hygiene, sanitation, safe drinking water, public health measures etc. Needless to say, if the non-food factors are not taken care of, the supplementary food given to children through ICDS will have no impact. It would be just like a "leaky pot" where food provided through mouth finds the way out through various infections. Innovative interventions of reaching health care, immunization, health and nutrition education to the people need to be evolved on priority.

Recommendations:

Deforming of children and women in areas with high anemia levels need to be implemented. For future, the following steps should be taken:

- Capacity building of field personnel, training institutions and professional organizations related to maternal and child health care in the country deserve due attention.
- Strengthening inter-sectoral coordination and creating synergy regarding maternal and child healthcare service should be taken.
- Establishing nutrition monitoring, mapping and surveillance system properly for mother and child.
- Ensuring and promoting proper and optimal infant and young child feeding practices.
- Addressing micronutrient malnutrition due to deficiencies of vitamin A, iron, folic acid and iodine through intensified programs.
- Creating nutritional awareness at different levels utilizing all available channels of communication.
- In addition to poverty alleviation, action must be addressed to the underlying factors of-

- Household food security,
- Food safety and hygiene,
- Gender discrimination,
- Women's education,
- Housing,
- Adequate healthcare practice,
- Supply of portable pure water
- And sanitation.

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