Infant and Young Child Feeding Practices, Household Food Security and Nutritional Status of Under-five Children in Moheshkhali Island, Cox'sbazar

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Roll No: 0219/10

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A thesis submitted in the partial fulfillment of the requirements for the degree of Masters of Science (MS) in Applied Human Nutrition and Dietetics

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December, 2020

I dedicate this thesis to my beloved parents and teachers.

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List of Abbreviations

MUAC	: Mid Upper Arms Circumference
WAZ	: Weight for Age Z-score
HAZ	: Height for Age Z-score
WHZ	: Weight for Height Z-score
BMI	: Body Mass Index
WHO	: World Health Organization
et al.	: *et al*lies = and other
IYCF	: Infant and Young Child Feeding
SD	: Standard Deviation
GAM	: Global Acute Malnutrition
MAM	: Moderate Acute Malnutrition
SAM	: Severe Acute Malnutrition
cm	: Centimeter
Kg	: Kilogram
MoH	: Ministry of Health
NGO	: Non-Governmental Organization
ACF	: Action Contre La Faim

Abstracts

This study was conducted among people of Moheshkhali Island, which is situated at south-eastern part of Bangladesh. A cross-sectional study was conducted on a hundred and seventy mother-child pairs between 4th October to 28th November,2021. Anthropometrical measurements of under five children and mothers were taken and form ready in native language (Bangla) were accustomed to collect the information. Information of maternal IYCF information and practices were conjointly collected. Data were entered into SPSS (version sixteen) software system for analysis. Emergency Nutrition Assessment (ENA) for good 2007 software system was accustomed convert organic process knowledge into Z-scores. The prevalence of stunting (Height-for-age) among the children was high. The finding of this study revealed that the prevalence of wasting in children was 6.5%, 54.1% were stunted, 31.2% were underweight; among the women, 22.4% were overweight and 70.1% were illiterate. 65.3% of mother knew the appropriate time for initiation of colostrum after birth. This study also revealed that only 24.7% of mothers practiced exclusive breast feeding. Overall maternal IYCF knowledge and practices, nutritional status of under-five children among the studied population were not at a satisfactory level. Despite of significant differentiation among the 31.5% underweight children, 32.7% mother had poor practice and 20% mothers had good practice on IYCF. The result of this study showed a significant difference (p=0.031) between the malnourished children based on their MUAC status according to their maternal BMI. The prevalence rate of malnutrition among kids aged 6-59 months was high, indicating that the nutrition scenario in study space is extremely important issue. Therefore, particular attention ought to tend on intervention of deficiency disease (malnutrition).

Keywords: IYCF, Malnutrition, MUAC, Z-Score, Height

Chapter I: Introduction

Malnutrition is known as the main cause of morbidity and mortality in children, especially in under-five. Worldwide more than half of childhood deaths are happened due to malnutrition. In 2016, the United Nations International Children's Emergency Fund - estimated that globally, 22.9% of children suffer from stunting and 7.7% from wasting. To ensure the better nutritional status of infant after birth maternal nutrition is a very important issue. Optimal infant and young child feeding is crucial for children's survival and health. It has been recently confirmed by The Lancet series that more than 800,000 infant deaths could be prevented with optimal feeding including breastfeeding. Inappropriate infant and young child feeding (IYCF) practices, such as early cessation of breastfeeding, non-exclusive breastfeeding and inappropriate complementary feeding, contribute significantly to child malnutrition and death, mostly in poorer countries. Although breastfeeding initiation is almost common in Bangladesh, almost 70% of mothers do not exclusively breastfed for the recommended first 6 months of life for various environmental, cultural and economic reasons. According to (Bidlack,2013) the nutritional status of the children is a reflection of their overall health. Malnutrition refers to getting too little or too much of certain nutrients which can lead to serious health issues including stunted growth (Emanuella *et al*., 2018), eye problem (Motbainor and Taye, 2019), diabetes (Vinicius *et al*., 2011) and heart disease (Osmond and Barker, 2000). Malnutrition is marked by a deficiency of energy, essential proteins, fats, vitamins and minerals in a diet (Kemmer *et al*., 2003; Luxemburger *et al*., 2003; Abudayya *et al*., 2007). Currently, 195 million under-5 children are affected by malnutrition and 90% of them live in sub-Saharan Africa and South Asia. Out of 195 million, at least 20 million children suffer from severe acute malnutrition and 175 million are undernourished (Albelti *et al*., 2006).The 2020 SMART survey indicates a serious level of wasting prevalence by WHZ and/or oedema among children aged 6-59 months in Moheshkhali Upazila (GAM: 11.0 %; 7.5 - 16.0 95% CI; SAM: 1.3 %; 0.5 - 3.4 95% CI). The underweight prevalence found to be serious at 29.8% [24.2 - 36.0] while stunting prevalence found Very High at 35.3% [29.5 - 41.6]. The study also revealed that pregnant and lactating women (with infant< 6 months child) were found to be more malnourished per low MUAC (<210 mm) classification as reported 2.6% [0.0-6.2] in Moheshkhali Upazila (ACF, 2020). This thesis will help to

observe the current nutritional status of under five children living at Moheshkhali along with the IYCF practices by mothers and caregivers.

1.1 Rationale of the study

Our Country has improved few indicators regarding health and nutrition but still there is a large volume of people living without basic knowledge of health and nutrition and the result is yet, we don't have reached the safer percentage of malnutrition rate in Bangladesh.Very few available research have been done regarding health and nutrition issues of the people living at host community of Bangladesh and among these people, children are the most vulnerable group. The aim of this study is to find out the real scenario of nutritional status of U-5 children living at Moheshkhali Upazilla and to involve the policy makers, Govt. and Non- govt. organizations for finding the ways to improve the nutritional status of the under-5 children of Moheshkhali Upazilla.

1.2 Aim

To identify the overall determinants alliance with child malnutrition of the people living in the selected areas of Moheshkhali Island at CoxsBazar.

1.3 Specific objectives

- To assess the maternal Infant and Young Child Feeding knowledge and practices in Moheshkhali Island
- To determine the nutritional status of under-five children according to their maternal Infant and Young Child Feeding knowledge and practices
- To determine the nutritional status of under-five children according to their maternal nutritional status

Chapter II: Review of Literature

This thesis tries to present some literature related to the research previously conducted in our country as well as in other countries of the world. Therefore, the main aim of this research is to analyze the nutritional status of under-5 year children living at Moheshkhali Upazilla.

The rate of malnutrition is higher in South Asia compared to other region of the world including Africa. Underweight and Stunting rate was recorded as 46 and 41 percent in South Asia respectively. At Sub-Saharan Africa acute malnutrition has been a persistent problem for young children. Majority of these children can't reach the normal international standard height for their age; that is, they are "stunted" In contrast, the percentage of children stunted in Southeast Asia dropped from 52 percent to 42 percent between 1990 and 2006. The number of undernourished (low weight for age)people of all ages in sub-Saharan Africa increased from about 90 million in 1970 to 225 million in 2008, and was projected to add another 100 million by 2015, even before the current world food price hikes**.** Despite of effective health interventions every year over ten million U-5 children die worldwide from preventable and treatable illness. Half of these deaths are happened due to malnutrition. The resistance to infection is poor to malnourished children; therefore, they are more likely to die from common childhood ailments such as diarrheal diseases and respiratory infections. In addition, malnourished children that survive are likely to suffer from frequent illness, which adversely affects their nutritional status and locks them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability. Malnutrition is a serious health problem, in developing countries (Kebede, 2013).

A population based cross-sectional study was conducted in Brazil, and about 4,258 non-pregnant women and their children < 60 months who participated in the 2006 Brazilian Demographic Health Survey. It was compared the distributions of two nutritional indexes of children, height-for-age (HAZ) and body mass index-for age (BAZ) z-scores, by categories of maternal height, body mass index (BMI), and waist circumference (WC) and also examined the associations of maternal anthropometry with the prevalence of child stunting (HAZ < - 2) and overweight/obesity (BAZ > 2). HAZ was positively associated with maternal height and WC in a linear fashion. After adjustment, for sociodemographic characteristics, children whose mothers' height was >145 cm had 1.2 lower HAZ than children whose mothers were >= 160 cm tall. After further adjustment for maternal height

and maternal BMI, children of mothers with a waist circumference >= 88 cm had 0.3 higher HAZ than those of mothers with WC< 80 cm. BAZ was positively associated with maternal BMI and WC (Felisbino *et al*.,2014).

A total of 400 children (2-5 years) were randomly selected from four purposively selected nursery and primary schools in the four communities of obowo Local Government Area. The results showed that 7.8% of children were overweight (8.6%male and 7.2% female), 1.3% were wasted (2.9% male), 6.4% were stunted (5.6% male and 7.0%female), there was significant relationship between anthropometric indices and gender. 77.5% mothers/caregivers had reported that they had knowledge of nutrition education, 45% had knowledge of nutritional status, 50% view childhood obesity as normal growth and sign of wealth and happiness, 37% got nutrition information from hospital and 73.8% take their child to hospital when sick, there was a significant relationship between knowledge of nutrition education of mother/caregivers and the nutritional status of children. The major underlying causes of nutritional problems include poor maternal and child care practices, lack of awareness ,and nutritional education and background of the parents, family food insecurity, poor access to good quality health and sanitation services. Most important of these factors is the education background and nutritional knowledge of the mothers. Poor nutrition is also caused due to non-exclusive breast feeding, the early introduction of food other than breastfeeding and inadequate amount of complementary foods, starting at about six months (Oly and Ihedioha, 2018).

2.1 Malnutrition

Malnutrition may be a condition that results from intake a diet within which one or additional nutrients are either not enough or an excessive amount of such the diet causes health issues (UNICEF, 2010). It should involve calories, protein, vitamins or minerals (UNICEF, 2010). Not enough nutrients are known as under-nutrition or hungriness whereas an excessive amount of is named over nutrition (Young, 2012). Malnutrition is often used to specifically refer to under-nutrition where an individual is not getting enough calories, protein, or micronutrients (Manoj and Ashutosh, 2011; Young, 2012). Undernourishment is most often due to not enough high-quality food being available to eat (WHO, 2014). High food prices and poverty are the main reasons of that problem

(UNICEF, 2010; WHO, 2014). Number of infectious diseases, e.g., gastroenteritis, pneumonia, malaria, and measles are happened due to lack of breastfeeding (WHO, 2014).

2.2 Types of malnutrition

Protein-energy malnutrition and dietary deficiencies are known as the two main types of malnutrition (Manoj and Ashutosh, 2011). Protein-energy malnutrition has two severe forms: marasmus (a lack of protein and calories) and kwashiorkor (a lack of just protein) (Young, 2012). Common micronutrient deficiencies include: a lack of iron, iodine, and vitamin A (Young, 2012). Malnutrition can also be divided into two different types, SAM and MAM. SAM refers to children with severe acute malnutrition and MAM refers to moderate acute malnutrition (Sathish *et al.*, 2014). However, the term malnutrition is commonly used to refer to undernutrition only (Nikolaos, 2011).

2.3 Driving factors of malnutrition

Poverty and high food prices, imbalanced dietary practices and lack of agricultural productivity are known as major causes of malnutrition. Clinical malnutrition, such as cachexia, is also a major burden in developed countries. Various scales of analysis also have to be considered in order to determine the sociopolitical causes of malnutrition. For example, the population of a community that's among poor governments, is also in danger if the world lacks health-related services, however on a smaller scale bound households or people is also at a fair higher risk because of variations in financial gain levels, access to land or levels of education (Fotso and Kuate, 2006). UNICEF conceptual framework of causes of malnutrition (UNICEF, 1997) is given below.

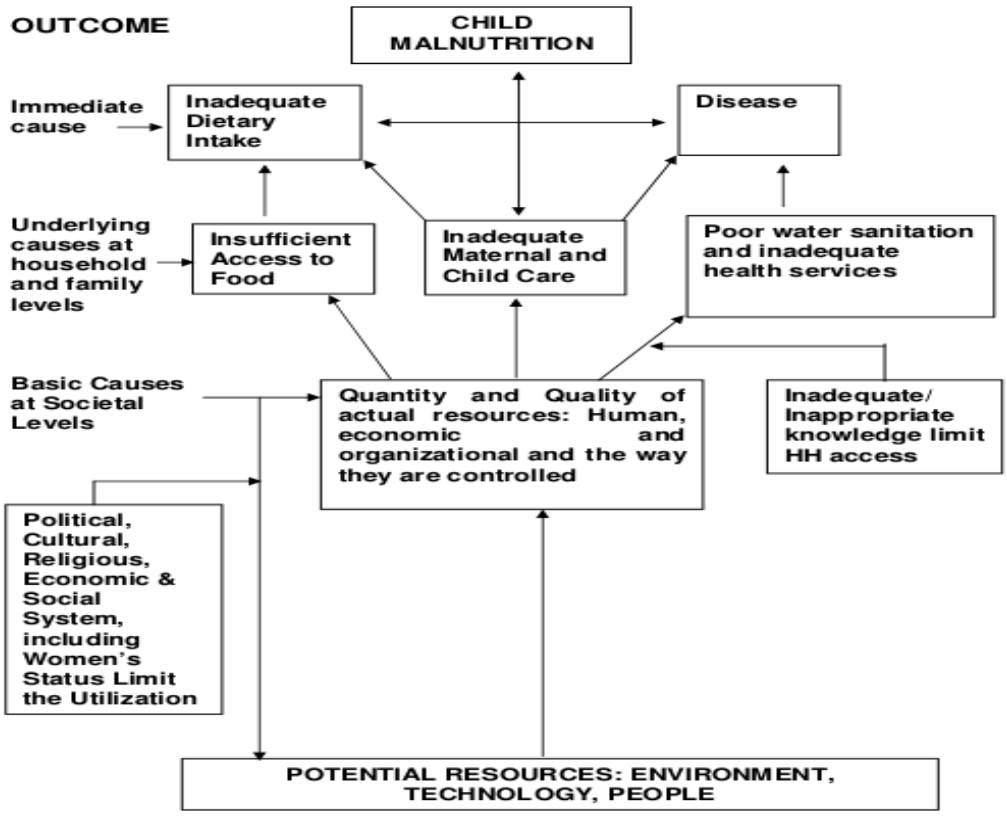

Figure 2.1: UNICEF conceptual framework of causes of malnutrition

2.4 Breastfeeding

Lack of breastfeeding is another cause of malnutrition. As of 2016 is estimated that about 823,000 deaths of children less than five years old could be prevented globally per year through more widespread breastfeeding (Victora *et al.*, 2016). Breast milk feeding provides an important source of micronutrients, clinically proven to booster the immune system of children and provide long-term defenses against non-communicable and allergic diseases (Lessen and Kavanagh, 2015).

2.5 Measurement parameters

2.5.1 Assessment of Anthropometric Measurement

A pregnant woman's nutritional status has important implications for her health as well as the health of her children. It has been established that sufficient nutrition before and during pregnancy has the potential for the promotion of a long term health of the mother and her child (Khoushabi and Saraswathi, 2010). Maternal nutritional factors account for approximately 5 percent of intrauterine growth retardation in developing countries and the

weight of an infant has been found to be dependent on the mother's health and nutrition during pregnancy (Muthayya, 2009).

Assessment of Anthropometric measurement can be defined as the combination of measuring height and weight of subject as an indicator of nutritional status. This is calculated on the basis of BMI index (Esmaillzadeh *et al.*, 2006). WHO in 1995 have recommended anthropometric measurements such as weight, height, circumferences (e.g. head and waist), and skinfold thickness to be expressed in percentiles or z-scores. Anthropometric measurements can detect the two forms of malnutrition (under and over nutrition). Body mass index (BMI) or Quetelet index, is obtained from weight and height measurements and is used to assess body size, and to determine whether an individual's weight is appropriate for his or her height. However, the BMI indicator has the limitation of not making a distinction between lean bodies' mass and fat mass. Moreover, it does not provide information on body composition (Barlow, 2007).

2.5.2 Assessment of Demographic Measurement

Demographic measurement is the combination of several factors such as their age, educational status, and marital status. Age was collected in terms of completed years. Though the definition of women of reproductive age includes women in the age category of 15-49 years, data was collected of women aged 19-49 years and therefore analysis was restricted to this category (Ivers and Cullen, 2011). The respondents were asked the level of education acquired as it may affect their economic status, the food choices and the food security status (Kenya National Bureau of Statistics and ICF Macro, 2010).

2.5.3 Z- Score

Z-score is the number of standard deviations from the mean a data point. Technically it's a measure of how many standard deviations below or above the population mean a raw score is. A z-score is also known as a standard score and it can be placed on a normal distribution curve. Z-scores range from -3 standard deviations (which would fall to the far left of the normal distribution curve) up to +3 standard deviations (which would fall to the far right of the normal distribution curve). In order to use a Z-score, need to know the mean μ and also the population standard deviation σ. Z-score is the most appropriate description of malnutrition, health and nutrition centers have been in practice reluctant to adopt its use for individual assessment (WHO, 1995).

2.6 Similar studies conducted elsewhere

A study conducted in Bangladesh about factors causing malnutrition among under five children (Rayhan and Khan, 2000). Socio-economic, environmental and health related factors at nutritional status of U-5 children living in our country were investigated at this study. Among under-five children 10.5 percent were found as acutely malnourished, 45 percent were found as chronic malnourished and 48 percent were found as suffering from under-weight problem. Previous birth interval, size at birth, mothers body mass index at birth and parents are found as the main contributing factors of malnutrition. Another study conducted in Ethiopia about risk factors for Severe Acute Malnutrition (SAM) in children under the age of five (Amsalu and Tigabu, 2008). The research revealed the association of severe acute malnutrition with inappropriate child feeding practices.

Chapter III: Materials and Methods

3.1 Study Location

Moheshkhali is the Upazilla situated at the south-eastern part of Bangladesh. The specific location of this study was Dhalghata Union, Matarbari Union and Kutubjhom Union of Moheshkhali. For a number of reasons, these areas have garnered national and international attention. One of the biggest mega project of Bangladesh govt. is going on at Matarbari, Sonadia which is one of the attractive tourist zone situated at Kutubjhom. In addition, these areas are one of the most natural disaster prone areas in Bangladesh. Geographically, these areas are marked as most remote and hard to reach areas, where govt. facilities are limited and humanitarian organizations also work with great difficulties. For these reasons, there is a large scope to work on the health and nutritional status, dietary habit and other indicators which are relate to malnutrition of the people living at these areas.

3.2 Study Design

A cross-sectional study was conducted in Moheshkhali Upazilla, CoxsBazar, Bangladesh, from 4th October to 28th November,2021.

3.3 Study Population

The source population were all children aged 6-59 months (paired with their mother) in Moheshkhali Upazilla during the specified study period. The study population were all randomly selected 6-59 months old children (paired with their mother) who lived in Moheshkhali Upazilla during the specified study period. All children aged 6-59 months and their mothers with complete information and a signed consent were eligible for inclusion into the study. A total of 170 mother-child pairs participated in the study. Anthropometric indicators (weight, height, length, and mid upper arm circumference) of 170 mother-child pairs participated in the study were measured and maternal characteristics data with infant and young child feeding (IYCF) knowledge and practices were recorded as independent variables.

3.4 Inclusion criteria:

Children aged 6-59 months who lived in Matarbari, Dhalghata and Kutubjhom unions of Moheshkhali Upailla, Cox's Bazar, Bangladesh were included in the study.

3.5 Exclusion criteria:

The study participants who were seriously ill (Fever, Vomiting, Diarrhoea, Dehydration, Anemia, High respiration rate) during the time of survey were not included in the study.

3.6 Study parameter

The anthropometry, IYCF Knowledge and practices by mothers, household food security and demographic informations of the people living at Moheshkhali were studied.

3.7 Ethical issue

Ethical guidelines of the Declaration of Helsinki IV, 2001 were followed for the study. At first communicated with the nutrition and health partners i.e. INGO/NGOs who worked in Moheshkhali Upazilla, were responsible to take care of them and then take consent to take interview from the peoples of areas. Written consent of each respondent was taken before interview. The questionnaire was designed considering the privacy of the subject. The respondent's personal information was kept confidential.

3.8 Data collection tool

A structured questionnaire (Appendix I) was used for collection of anthropometric, demographic, IYCF and household food security related data. Child Height Board and Weight scale were used for the measurement of child height (Appendix II, III) and weight. Mid Upper Arm Circumference (MUAC) tape was used for the measurement of MUAC (Appendix IV) (WHO, 2006). The Z-score was calculated using standard charts (Appendix V) (WHO, 2006).

3.9 Data collection

The primary data were collected in a face to face interview. The secondary data related to MUAC and Z-score were calculated from WHO Standard Charts (WHO, 2006). The questionnaire was pretested in zones outside the sampling area and re-examined on the premise of feedback (Tinson *et al*., 2008). After the pilot test, the questionnaire was validated with the real situation to ensure reliability of the study.

3.10 Sample Size and Sampling technique

The sample size was determined by using a single proportional formula assuming the prevalence rate of malnutrition to be 50% in the survey area, 95% confidence interval (CI), 8% margin of error (d) and 13% non-response rate was added to the total calculated sample size (Kadam and Bhalerao, 2010).

Calculation of sample size for infinite population:- **Sample size (N) = $Z^2 \times p\ (1\text{-}p)/d^2$** ,Where z= confidence interval at 95% (standard value of 1.96) ; P= estimated prevalence of malnutrition (50%); d= margin of error (8%)

Now, $N=1.96^2 \times 0.5 \times (1-0.5)/ (0.08)^2 = 150.06 \approx 150$

Thus calculated sample size was adjusted for non-response. Considering non-response rate as 13%, the adjusted final sample size was $169.5 \approx 170$.

A simple random sampling was used to select the study participants. When there was more than one child under-five years of age of a mother, lottery method was used to randomly select the child who participate in the study.

3.11 Study Variables

Infant and young child feeding knowledge and practices of mother (consume colostrum, breast feeding, exclusive breast feeding, complementary feeding, continued breast feeding.

Independent variables include: socio-demographic variables (age of child and mother, child's and mother's sex, maternal education, age of the mother during marriage and number of child under five years). Maternal characteristics (number of children under five years, age during marriage, mother education) were also independent variables in this study. For the socioeconomic indicators, mother was considered for the interview and IYCF information was received by interviewing the mothers only.

ENA for SMART 2007 software was used to convert the anthropometric measures; weight, height/length and age values into Z-scores of the indices; Height-for-Age (HAZ), Weight-for-Height (WHZ) and Weight-for-Age (WAZ) taking sex into consideration using WHO 2006 standards. A low height-for-age, below -2SD of the reference population, indicates stunting while below -3SD indicates severe stunting. A low weight-for-height, below -2SD of the reference population, indicates wasting, while below −3SD

indicates severe wasting. A child with a weight-for-age z-score below -2SD of the reference population is underweight while a child below or -3SD is severely underweight.

3.12 Measurements

A well-structured questionnaire was used to collect data by a face-to-face interview from the mothers of the children. Birth dates of child and mother were obtained from the EPI card or verbal responses from mother. Anthropometric data were collected through measurement of length/height and weight of all children and mother. For the socioeconomic indicators, mother was considered for the interview and IYCF information was received by interviewing the mothers only.

All anthropometric measurements were done by well-trained person. Weight was measured using an electronic weighing scale. The child was either naked or with minimum/lightly/clothing and no shoes. Calibration before weighing every child was done to ensure it was at zero. For children more than 2 years, they stood erect on an electronic balance with their heads straight facing forward. The result was read to the nearest 0.1 kg. In case of children aged <2 years, the mother was first weighed alone and then mother and child weighed together. Weight of mother was subtracted from weight of mother and child to get child's weight. Body length of children age up to 24 months was measured without shoes. The length was read to the nearest 0.1 cm. The children were measured lying down horizontally on the L-shaped height board graded in centimetres with their faces looking upward and with the help of an assistant. The height of children >24 months was measured with the children standing erect with their feet flat on the height board without shoes. Then, height was read to the nearest 0.1 cm. To determine the presence of edema, normal thumb pressure was applied to an area for few seconds then released and checked for pitting; however, we had no case of edema in this study. Maternal weight was measured using an electronic weighing scale and height (barefoot) was measured using non-extensible measuring tape and recorded to the nearest 0.5 cm. MUAC was measured on the left arm, in the midpoint between the elbow and the shoulder. It was measured using the three-colored tape (WHO,2006).

Data were collected using structured questionnaire via face to face interview from the mothers of children and anthropometric measurements. The questionnaire was initially prepared in English after reviewing literature by Investigators and then translated into Bangla, then retranslated to English to check the equivalence. Six health workers were

hired who had previous working experience in relevant activities. Proper training was provided to data collectors. Pre-test was done on 5% of sample size in non-selected mother-child pairs and some modifications were made accordingly. Data was collected under the supervision of the investigator. Incomplete questionnaires were completed by making second visits. Weighing scales were calibrated with known weight object regularly. The scales indicator was checked against zero reading after weighing every child and mother.

3.13 Data verification

The data set was first checked, scrutinized, cleaned and entered into MS excel file in computer from categorical to the numerical codes. The data was edited to check if there was any discrepancy (blank, double entry, wrong entry). After summarizing the collected data for each of the suggested indicators to answer the question on the objectives of the study, the analysis was preceded according to the plan.

3.14 Analysis

Statistical analyses were done using SPSS 16.0 statistical software. The data were exported to SPSS after the data were first coded and then entered in the computer using ENA for SMART 2007 Software. Descriptive statistics like frequencies or proportions were first done and presented by tables. Then bivariate analysis was done for the three outcome variables: stunting, underweight and wasting separately. Statistical association was declared significant if p-value was less than 0.05

MUAC measurement I

MUAC measurement II

Weight measurement I

Weight measurement II

Length measurement

Figure 3.1: Anthropometric Measurement

Chapter IV: Results

Variables of Child	Percentage (n)
Gender	
Boy	**52.4 (89)**
Girl	**47.6 (81)**
Age Groups (months)	
6-11	**9.4 (16)**
12-23	**28.2 (48)**
24-35	**29.4 (50)**
36-47	**18.2 (31)**
48-59	**14.7 (25)**

Table-4.1: General information of the studied 6-59 months children

Table-4.1 shows that, among the total 170 studied 6 to 59 months children, 52.4% children were boys and 47.6% children were girls. The children of age 6-59 months were categorized according to World Health Organization standard in five groups which showed that 29.4% children were in age group of 24-35 months, followed by age groups of 12-23 months (28.2%), 36-47 months (18.2%), 48-59 months (14.7%) and 6-11 months (9.4%).

Variables of the Mothers	Percentage (n)
Educational status	
Illiterate	**70.1 (119)**
Primary	**25.2 (43)**
Secondary	**4.7 (8)**
Age (years)	
<20	**4.7 (8)**
20-30	**86.5 (147)**
>30	**8.8 (15)**
Marriage age (years)	
<18	**42.4 (72)**
18 to 21	**55.3 (94)**
>21	**2.4 (4)**
Number of under five children	
One	**24.1 (41)**
Two	**47.6 (81)**
Three	**28.2 (48)**

Table-4.2: Percent distribution of general characteristics in studied mothers

Table-4.2 shows that, 70.1% of the mothers were illiterate. 25.2% of mothers had primary level education while only 4.7% mothers had secondary level education. This table also shows that maximum mothers (86.5%) were between the age group of 20 to 30 years, 8.8% mothers were more than 30 years old and only 4.7% mothers were below 20 years old. Majority mothers (55.3%) got married between the ages of 18 to 21 years and 42.4% got married before 18 years of age. 24.1% mothers had only one under five children while 47.6% and 28.2% mothers had two and three under five children respectively.

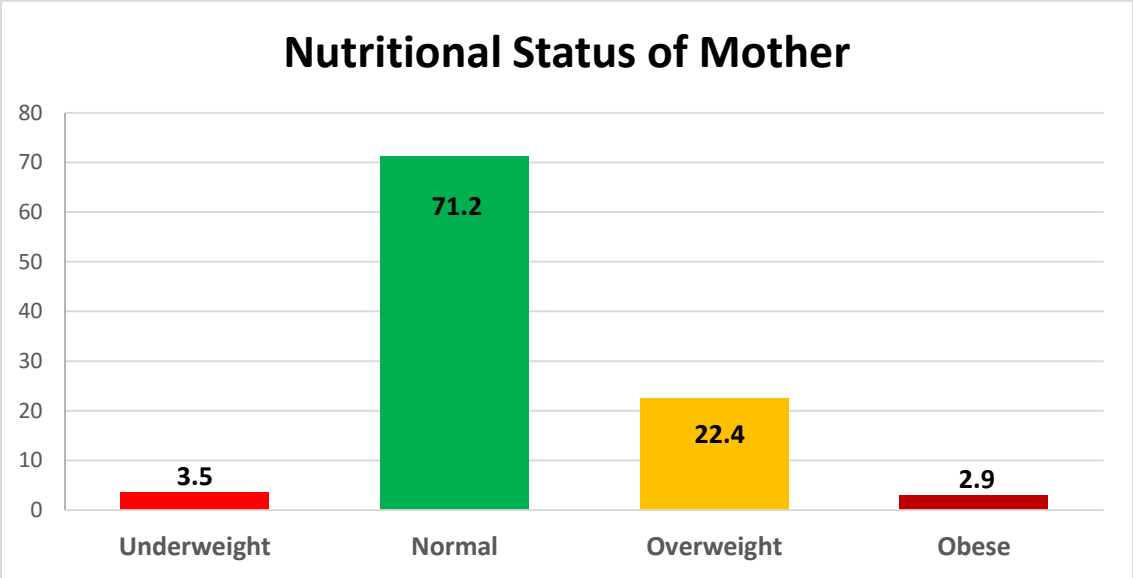

Figure-4.1: Maternal nutritional status based on Body Mass Index (BMI)

According to Body Mass Index (BMI), 71.2% of mothers were found to be normal (18.5-22.9 kg/m^2). 3.5% of mothers were underweight (<18.5 kg/m^2) while 22.4% were overweight (23.0 to 27.49 kg/m^2) and 2.9% of mothers were obese (≥27.5 kg/m^2).

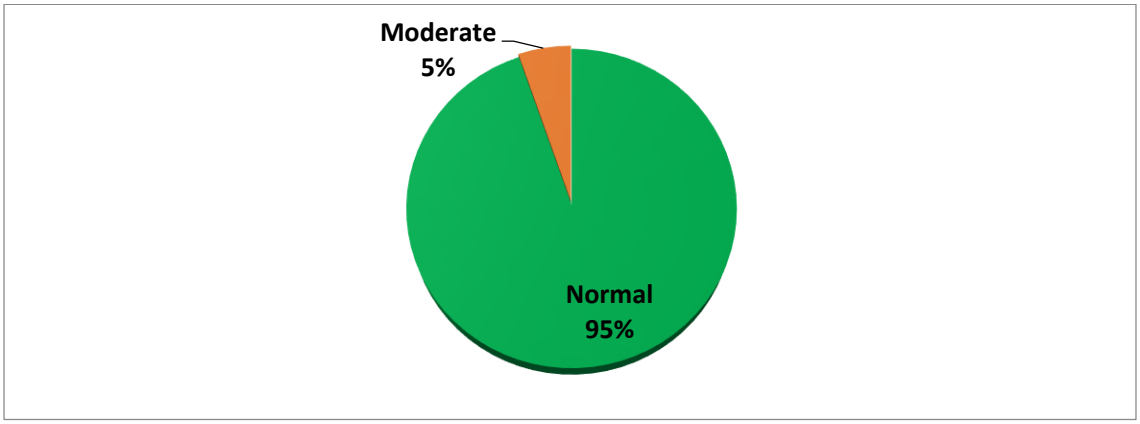

Figure-4.2: Maternal nutritional status based on MUAC

The above figure depicts the maternal nutritional status based on MUAC. 95% mothers was found to be normal (≥220 mm) based on Mid Upper Arm Circumference (MUAC) value. About 5% were found moderately malnourished (≥185 to <220 mm). None of the mother was found severely malnourished by their MUAC status.

Table-4.3: Percent distribution of mothers based on knowledge on Infant and Young Child Feeding (IYCF)

IYCF Knowledge Variables	Percentage (n)
Colostrum feeding	
Yes	**97.1 (165)**
No	**2.9 (5)**
Time for initiation of colostrum	
Within 1st hour	**65.3 (111)**
1 to 3 hours	**26.5 (45)**
>3 hours	**2.4 (4)**
Do not know	**5.9 (10)**
Duration of exclusive breast feeding	
<6 months	**91.2 (155)**
6 months	**4.1 (7)**
>6 months	**0.6 (1)**
Do not know	**4.1 (7)**
Time for initiation of complementary feeding	
<6 months	**8.2 (14)**
6 months	**73.5 (125)**
>6 months	**17.6 (30)**
Do not know	**0.6 (1)**
Duration of breast feeding continuation	
<12 months	**5.9 (10)**
12 to 18 months	**12.9 (22)**
>18 months	**81.2 (138)**

Table-4.3 shows that, about all of the respondents (97.1%) had knowledge about colostrum. 65.3% of mother knew the appropriate time for initiation of colostrum after birth. About 91 % mothers knew about the duration of exclusive breast feeding. 73.5% of mothers knew the appropriate time of introduction of complementary foods. 81.2% of mothers knew the proper duration for breast feeding continuation.

Table-4.4: Percent distribution of mothers based on the Infant and Young Child Feeding (IYCF) practices

IYCF Practice Variables	Percentage (n)
Colostrum feeding after birth	
Yes	**93.5 (159)**
No	**6.5 (11)**
Time for initiation of colostrum (n=159)	
Within 1st hour	**44.7 (71)**
1 to 3 hour	**52.8 (84)**
>3 hour	**2.5 (4)**
Exclusive breast feeding for 6 months	
Yes	**75.3 (128)**
No	**24.7 (42)**
Initiation of complementary feeding at proper time	
Yes	**65.9 (112)**
No	**34.1 (58)**
Breast feeding continuation up to 2 years	
Yes	**82.9 (141)**
No	**17.1 (29)**

Table-4.4 presents that, 93.5% of mothers fed colostrum to their baby while 6.5% did not feed colostrum to their baby. Colostrum was initiated within the first hour of birth by 44.7% of mothers. Among others, 52.8% of them started colostrum between 1 to 3 hours of birth and 2.5% more than 3 hours of birth. Only 24.7% of mothers practiced exclusive breast feeding while 75.3% of mothers gave other food to their baby. About 65.9% of mothers introduced complementary food to their baby timely (at 181 days) and 34.1% mothers initiated complementary feeding properly. 82.9% mothers continued breast feeding up to 2 years to their baby while 17.1% did not continue up to 2 years.

Nutritional Status of 6 to 59 Months Old Children

Prevalence of malnutrition among the children was measured by weight-for-age (underweight), weight-for-height (wasting) and height-for-age (stunting) z-scores. Children who fall below -2 SD were considered as undernourished. Those with Z score value of ≤-2SD to >-3SD were considered as moderately malnourished and those with Z

scores value of ≤-3SD were considered as severely malnourished. Global Acute Malnutrition (GAM) was considered for the Z score of <-2SD.

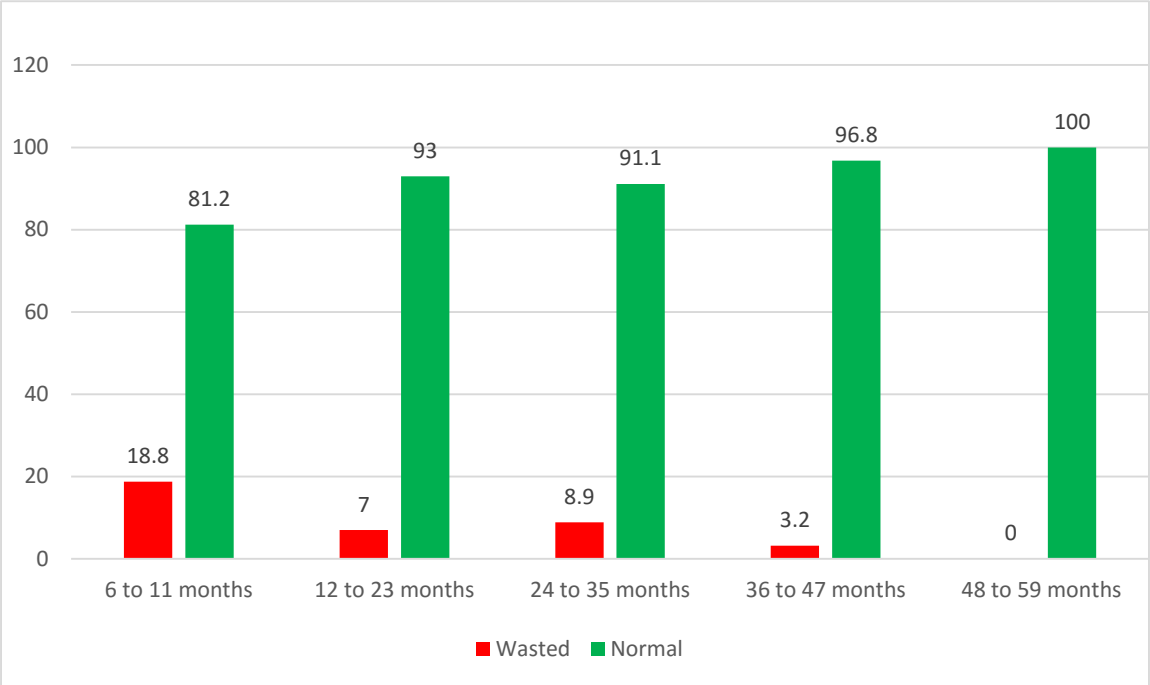

Figure-4.3: Prevalence of wasting among 6-59 month aged children

The figure-4.3 shows the prevalence of wasting among the studied children by age. Prevalence of wasting was highest in children aged 6-11 months (18.8%) followed by 24-35 months (8.9%), 12-23 months (7.0%) and 36-47 months (3.2%). 93.1% of the children were normal.

Table-4.5: Prevalence of underweight measured by Weight for Age Z (WAZ) score and by sex of the children

Types of underweight	Percentage		
	Boys n = 89	**Girls** n = 81	**All** n = 170
Underweight (<-2 WAZ)	37.1	24.7	31.2
Moderately underweight (<-2 WAZ ≥-3)	23.6	21.0	22.4
Severely underweight (<-3 WAZ)	13.5	3.7	8.8
Normal (≥ -2 WAZ)	62.9	75.3	68.8

Table-4.5 shows the percentage of the children by their Weight for Age Z score and sex. According to the above table, Global Acute Malnutrition rate (GAM) (< -2 WAZ-score**)** was 31.2%. Boys were more underweight than girls (37.1% vs. 24.7%). 8.8% children were severely underweight and 22.4% children moderately underweight. Though the prevalence of moderate underweight was about to each other between boys and girls, the severe underweight was significantly higher (13.5% vs. 3.7%) among boys than girls.

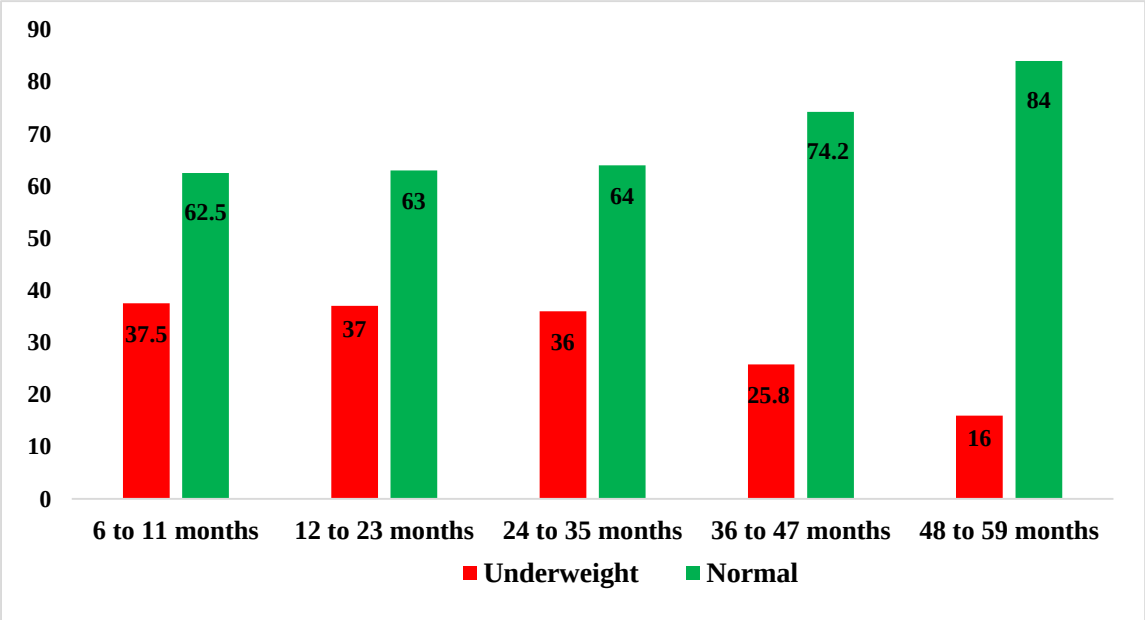

Figure-4.4: Prevalence of underweight among 6-59 months children based on Weight for Age Z-score (WAZ) by their age categories

Figure-4.4 shows the prevalence of underweight among the studied children by age. Prevalence of underweight was the highest in children aged 6-11 months (37.5%) followed by 12-23 months (37.0%) and 24-35 months (36.0%), 36-47 months (25.8%). Children aged 48-59 months had the lowest levels of underweight (16.0%). 68.5% of the children were found to be normal.

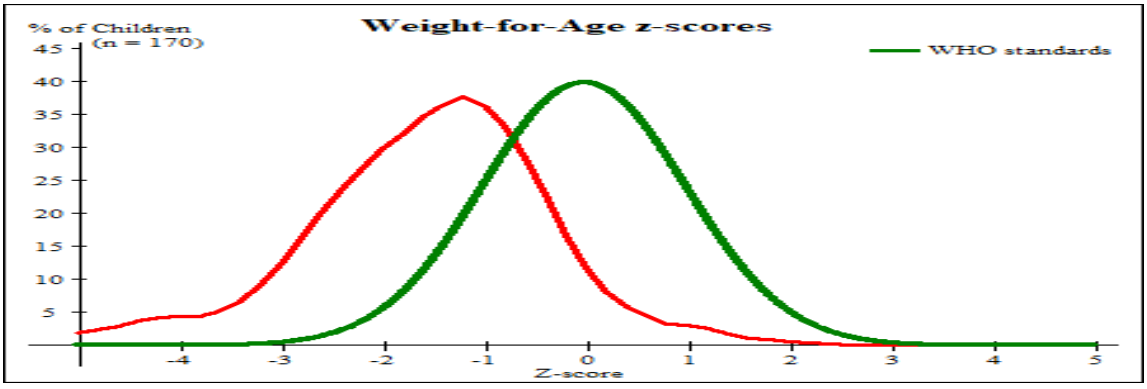

Figure-4.5: Distribution of studied children with Weight-for-Age Z-score

The WAZ curve compared with WHO standards for combined sex was shown in figure 4.5. The curve has moved to the left which is a negative skewing (negatively skewed) with respect to the WHO curve.

Table-4.6: Percent distribution of stunting among 6-59 months children by sex

Types of Stunting	Percentage		
	Boys n = 89	**Girls** n = 81	**All** n = 170
Stunting (<-2 HAZ)	51.7	56.8	54.1
Moderate stunting (<-2 HAZ ≥-3)	24.7	30.9	27.6
Severe stunting (<-3 HAZ)	27.0	25.9	26.5
Normal (≥ -2 HAZ)	48.3	43.2	45.9

The table-4.6 shows that, 54.1 % of the children were stunted of which 26.5 % children were severely stunted and 27.6 % children were moderately stunted. The prevalence of stunting was higher in girls (56.8 %) than in boys (51.7 %).

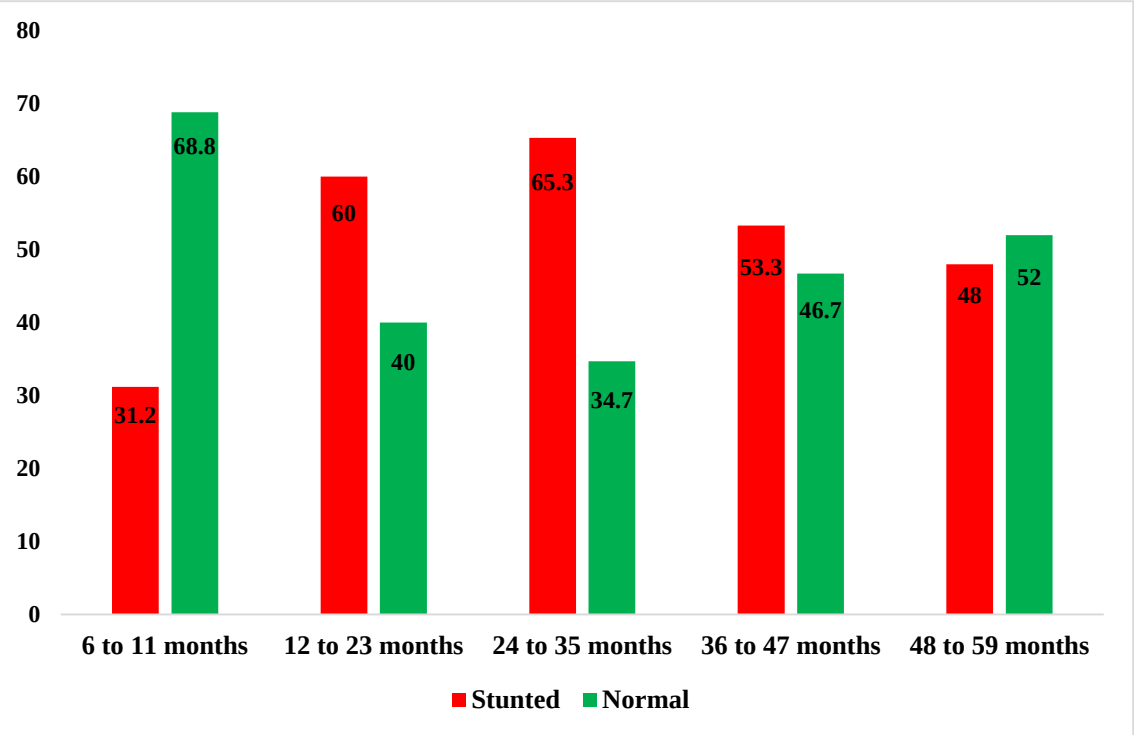

Figure-4.6: Percent distribution of stunting among 6-59 months children by age

Figure-4.6 shows that, the prevalence of stunting (by age categories) among the studied children. The lowest stunting rates were among the studied children 6-11 months old (31.2%). Children aged 24-35 months had the highest level of stunting (65.3%).

Figure-4.7: Distribution of children with Height-for-Age Z-score

The HAZ curve compared with WHO standards for combined sex is shown in figure. The curve has moved to the left which is a negative skewing (negatively skewed) with respect to the WHO curve.

Table-4.7: Prevalence of acute malnutrition based on Mid Upper Arm Circumference (MUAC) of the children.

Types of Malnutrition	Percentage		
	Boys n = 89	Girls n = 81	All n = 170
Global malnutrition (MUAC < 125 mm)	10.1	4.9	7.6
Moderate malnutrition (115 mm ≤ MUAC >125 mm)	9.0	1.2	5.3
Severe malnutrition (MUAC < 115 mm)	1.1	3.7	2.4
Normal (MUAC ≥ 125 mm)	89.9	95.1	92.4

Table-4.7 describes that, 7.6% of children were found global acute malnourished (MUAC < 125 mm). 2.4% of children were severely malnourished (MUAC < 115 mm) and 5.3% children were moderately malnourished (115 mm ≤ MUAC >125 mm) and rest of the 92.4% were found as normal.

Table-4.8: Percent distribution of nutritional status of children according to the maternal IYCF knowledge

Nutritional Status of Children		Maternal IYCF knowledge			
		Poor (0-4) (%) N	**Good (5) (%) N**	**Total**	**P-value (χ^2)**
WAZ	**Underweight (WAZ < -2.0 SD)**	**30.9 (34)**	**32.8 (19)**	**31.5 (53)**	**0.806 (0.060)**
	Normal (WAZ ≥ -2.0 SD)	**69.1 (76)**	**67.2 (39)**	**68.5 (115)**	
WHZ	**Wasted (WHZ < -2.0 SD)**	**7.5 (8)**	**5.7 (3)**	**6.9 (11)**	**0.659 (0.195)**
	Normal (WHZ ≥ -2.0 SD)	**92.5 (98)**	**94.3 (50)**	**93.1 (148)**	
HAZ	**Stunted (HAZ < -2.0 SD)**	**54.6 (59)**	**57.9 (33)**	**55.8 (92)**	**0.688 (0.161)**
	Normal (HAZ ≥ -2.0 SD)	**45.4 (49)**	**42.1 (24)**	**44.2 (73)**	
MUAC	**Malnourished (MUAC < 125 mm)**	**7.1 (8)**	**8.6 (5)**	**7.6 (13)**	**0.731 (0.118)**
	Normal (MUAC ≥ 125 mm)	92.9 (104)	91.4 (53)	92.4 (157)	

Table-4.8 presents the nutritional status of the studied children by the IYCF knowledge of their mother. It shows that 31.5% children were underweight. Among the underweight children, 30.9% mothers had poor knowledge (correctly answered 0 to 4 questions among 5 questions about IYCF) and 32.8% mother had good knowledge (correctly answered all of 5 questions about IYCF) on IYCF. The stunted and wasted children were 55.8% and 6.9% respectively but it shows no significant differences based on the maternal IYCF knowledge. This table shows no significant improvement of the nutritional status of the children by various indicators based on the IYCF knowledge of their mother.

Table-4.9: Percent distribution of nutritional status of children according to the maternal IYCF practices

Nutritional Status of Children		Maternal IYCF practices			
		Poor (0-4) (%) N	Good (5) (%) N	Total	P-value (χ^2)
WAZ	Underweight (WAZ < -2.0 SD)	32.7 (50)	20.0 (3)	31.5 (53)	0.313 (1.017)
	Normal (WAZ ≥ -2.0 SD)	67.3 (103)	80 (12)	68.5 (115)	
WHZ	Wasted (WHZ < -2.0 SD)	6.2 (9)	15.4 (2)	6.9 (11)	0.209 (1.576)
	Normal (WHZ ≥ -2.0 SD)	93.8 (137)	84.6 (11)	93.1 (148)	
HAZ	Stunted (HAZ < -2.0 SD)	55.3 (83)	60 (9)	55.8 (92)	0.729 (0.120)
	Normal (HAZ ≥ -2.0 SD)	44.7 (67)	40 (6)	44.2 (73)	
MUAC	Malnourished (MUAC < 125 mm)	7.7 (12)	6.7 (1)	7.6 (13)	0.881 (0.022)
	Normal (MUAC ≥ 125 mm)	92.3 (143)	93.3 (14)	92.4 (157)	

Table- 4.9 describes the nutritional status of the studied children by the IYCF practices of their mother. It shows that 31.5% children were underweight. Among the underweight children, 32.7% mother had poor practice properly practiced 0 to 4 rules among 5 rules accordingly IYCF) and 20% mothers had good practice (properly practiced all of 5 rules accordingly) on IYCF. It also indicates that 6.9% children were wasted. Among the wasted children, 6.2% mothers had poor IYCF practiced and 15.4% mothers had good IYCF practiced. It also found that 7.6% children were malnourished (MUAC < 125 mm) where poor IYCF practiced mothers were 7.7% and good IYCF practiced mothers were 6.7%. This study found no significant differences of the nutritional status of the children between the mothers with poor and good IYCF practices.

Table-4.10: Mean and standard deviation of child characteristics based on maternal IYCF knowledge

Child Characteristics	Maternal IYCF knowledge		
	Poor (0-4) (Mean ± SD)	Good (5) (Mean ± SD)	P-value
Age (months)	28.63 ± 13.33	26.37 ± 13.38	0.300
MUAC (cm)	14.15 ± 1.21	14.11 ± 1.45	0.844
WAZ	-1.52 ± 1.15	-1.61 ± 1.13	0.611
HAZ	-1.98 ± 1.69	-2.33 ± 1.57	0.188
WHZ	-0.59 ± 0.99	-0.43 ± 1.20	0.374
BMIZ	-0.37 ± 1.08	-0.17 ± 1.31	0.293

The table 4.10 shows the mean and standard deviation of child characteristics according to their maternal knowledge on IYCF. It was found that the mean age in months of the child was 28.63 among the child`s mothers who had poor knowledge on IYCF (correctly answered 0 to 4 questions among 5 questions about IYCF) and 26.37 among the child`s mothers who had good knowledge on IYCF (correctly answered all of 5 questions about IYCF). The mean MUAC of the children with poor maternal IYCF knowledge was 14.15 cm and mean MUAC of the children with good maternal IYCF knowledge was 14.11 cm. It also found that the mean WAZ (underweight) of the children was -1.52 and -1.61 among the child`s mothers who had poor and good knowledge respectively. No significant differences were found in mean and standard deviation of the nutritional status of the children by various indicators based on the IYCF knowledge of their mother.

Table-4.11: Mean and standard deviation of child characteristics according to maternal IYCF practices

Child Characteristics	Maternal IYCF practices		
	Poor (0-4) (Mean ± SD)	Good (5) (Mean ± SD)	P-value
Age (months)	27.49 ± 13.25	31.67 ± 14.20	0.248
MUAC (cm)	14.10 ± 1.30	14.55 ± 1.25	0.196

WAZ	**-1.54 ± 1.17**	**-1.60 ± 0.92**	**0.865**
HAZ	**-2.09 ± 1.69**	**-2.25 ± 1.20**	**0.719**
WHZ	**-0.53 ± 1.19**	**-0.56 ± 1.19**	**0.916**
BMIZ	**-0.30 ± 1.16**	**-0.26 ± 1.25**	**0.909**

The table-4.11 represents that, the mean and standard deviation of child characteristics according to their maternal IYCF practices. It was found that the mean WAZ (underweight) of the child was -1.54 among the child`s mothers who practiced poor IYCF rules (properly practiced 0 to 4 rules among 5 rules accordingly IYCF) and -1.60 among the child`s mothers who practiced good IYCF rules (properly practiced all of 5 rules accordingly IYCF). The mean HAZ (stunted) of the children with poor IYCF practiced mothers was -2.09 and mean HAZ (stunted) of the children with good IYCF practiced mothers was -2.25. It also found that the mean WHZ (wasted) of the children was -0.53 and -0.56 WHZ (wasted) among the child`s mothers who practiced poor and good IYCF rules respectively. This table showed no significant differences of child characteristics between the mothers with poor and good IYCF practices.

Findings regarding the status of household food shows that 19.0% of households were food secure as per the HFIAS but the status of moderate and severe food insecurity was 34.1% and 46.9% respectively among the households that participated in this study.

Table-4.12: Pearson correlation (r) of the child's anthropometric variables with maternal anthropometric status

Child characteristics	**Maternal BMI**		**Maternal MUAC**	
	r	**P**	**r**	**P**
Weight for Age Z score	**0.131**	**0.089**	**0.098**	**0.204**
Height for Age Z score	**0.043**	**0.578**	**-0.015**	**0.845**
Weight for Height Z score	**0.141**	**0.066**	**0.158***	**0.040**
BMI for Age Z score	**0.137**	**0.075**	**0.157***	**0.040**
MUAC	**0.205****	**0.007**	**0.226****	**0.003**

**. Correlation is significant at the 0.05 level
*. Correlation is significant at the 0.01 level

Table-4.12 represents the Pearson correlation (r) of the child's anthropometric variables with maternal anthropometric status. It shows that MUAC of the studied children was found significantly correlated with the maternal BMI ($r = 0.205$; $p = 0.007$). Weight for Height Z score (WHZ), BMI for Age Z score (BMIZ) and MUAC of the children were significantly correlated with the maternal MUAC status.

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Chapter V: Discussion

There aren't any revealed data on the statistics regarding the individuals of Moheshkhali Upazilla in terms of their socioeconomic standing, IYCF practices, food security, health and nutritional status of under-five children. This area is under the Chittagong division of Bangladesh which is situated in the south eastern hill region. To compare the findings, available survey data were used that represent the status of overall Chittagong division as well as the eastern hill survey region (FSNSP) of Bangladesh.

The studied children consisted of 52.4% children were boys and 47.6% children were girls. The children of age 6-59 months were categorized according to World Health Organization standard in five groups which showed that 29.4% children were in age group of 24-35 months, followed by age groups of 12-23 months (28.2%), 36-47 months (18.2%), 48-59 months (14.7%) and 6-11 months (9.4%) (Table-4.1). The result of this study revealed that 70.1% mothers were illiterate. And also 42% mothers got married before 18 years of age (Table-4.2). The findings of this study described that 47.6% and 28.2% mothers had two and three children under five years of age respectively (Table-4.2). It may be due to ignorance of family planning among the people, high level of illiterate, women do not intend to use a contraceptive method. Studies conducted over the last few years in world indicated that multiple anthropometric factors can affect child nutrition. Mother's level of education (Demissie and Worku, 2013), inadequate purchase power and access issues (Jesmin *et al*., 2011), low health literacy (Shibulal, 2013) and misconceptions regarding proper nutrition (Asgary *et al*., 2015) affect child nutrition. In the study areas, most of the living women are less educated and their knowledge of nutrition is very poor which is associated with malnutrition of their children on the present study. According to,(Teng and Zaliah, 2011; WFP and UNHCR, 2013) Poor growth rate of children has been associated with low education level of caregiver, big household size and large number of children (WFP and UNHCR, 2012), parity and age of the children (Engebretsen *et al*., 2008). The parents with low level of education cannot ensure proper care of their children which probably leads to the malnutrition of their children (Teng and Zaliah, 2011; WFP and UNHCR, 2013). In this study, 71.2% of mothers were found to be normal (BMI 18.5-22.9 kg/m^2). 3.5% of mothers were underweight (<18.5 kg/m^2) while 22.4% mothers were overweight (23.0 to 27.49 kg/m^2) and 2.9% of mothers were obese (≥27.5 kg/m^2) (Figure-01).

It was reported that, breastfeeding play crucial role on nutrition of children, if the children were not breastfed in time and frequency then it increases the risk of malnutrition because both are important in breastfeeding (CARE, 2010). According to (WHO, 2002), the risk of malnutrition among children may be reduced through the best IYCF (Infant and Young Child Feeding) practices, i.e., breastfeeding and complementary feeding.

The study presented that colostrum was initiated within the first hour of birth by 44.7% of mothers. Only 24.7% of mothers practiced exclusive breast feeding to their baby. Complementary foods to babies were initiated at right time (181 days) by 65.9% mothers. Breast feeding was continued by 82.9% mothers till two years of age of the baby (Table-4.4). The reason for the failing/lack of active IYCF and child caring practices could also be simply because of lacking of mothers` health education or while not understanding the importance of IYCF. According to Olwedo *et al.*,2013, 49% of the children received timely complementary feeding; however 39% of the children received complementary feeds before the age of 6 months and 13% after 6 months. Colostrum was initiated within the first hour of birth by 44.7% of mothers (Table-4.4). The results of Kelati *et al.*,2011, revealed that breastfeeding practice was initiated immediately after birth for 66.8% children. Only 24.7% of mothers practiced exclusive breast feeding to their baby.

This study revealed that, there was a strong relationship between mother age and MUAC. When mothers were in middle age, then child MUAC score was good because when parents are adult and physically strong then they can take care of their children, so we may assume that, the age of mother is one kind of driving factors of malnutrition (Shibulal, 2013). Our study showed very good association of parity and family size with child MUAC. When parity and family size increased then child MUAC decreased and malnutrition increased. From this study it is appeared that, parity and family size is one of the root causes of malnutrition (Fotso and Kuate, 2006). On the other hand, when family size and parity increase then Z-score decrease with increased rate of malnutrition (Fotso and Kuate, 2006). This study showed that 31.2% of the children were underweight (8.8% severe and 22.4% moderate) (Table-4.6). Underweight reflects both chronic and acute malnutrition but does not distinguish between the two. It could result from a brief period of food deprivation or disease. Low weight-for-age index identifies the condition of being underweight, for a specific age. The result of this study showed that underweight (31.2%) was nearly similar to that of 33.7% found in a study in Burmese refugee camp and 33.7% found in Mai-Aini Eritrean refugees' camp, Northern Ethiopia, Kelati *et al*.2011. The

negative skewness of the WAZ curve of this studied children compared to the WHO growth distribution curve indicates that most of the children had a WAZ-scores <−2SD (Figure-4.6). The median was lower than that of the WHO standards indicating a high prevalence of underweight in the studied children. The prevalence of underweight (31%) was high among the under-five children. The study described that, regular basis enough foods present at household with variety had positive effect on the health and nutrition status of the children. Similar results were reported elsewhere (Richmond and Kotelchuck, 1984; Smith and Hadded, 2000).

Chapter VI: Conclusion

Conclusively, the results of this study indicate that Infant and Young Child Feeding (IYCF) Practices, Household Food Security and Nutritional Status of Under-five Children in Moheshkhali, Cox's Bazar, Bangladesh. Stunting, wasting and underweight rate was found 54.1%, 6.5% and 31.2% respectively at the under five children of studied area at Mohshkhali.26.5% of them were severely stunted, 2.9% were found to be severely wasted and severely underweight rate were 8.8%. The study shows that wasting and underweight was higher in boys than girls while in case of stunting, the prevalence was found higher in boys than girls. According to the findings of this study the rate of stunting in under-five children is high. Long term health and developmental impact may occurred at children due to acute malnutrition.Increased risk of stunted growth, impaired cognitive development and a greater chance of developing non-communicable diseases in adulthood are marked as the result of long term impacts of acute malnutrition. The result of this study showed a significant difference ($p=0.031$) between the malnourished children based on their MUAC status according to their maternal BMI. This showed that the prevalence of malnourished children (based on MUAC) was higher among the children whose mothers had normal BMI than the children whose mothers had overweight BMI (12.2% versus 3.4%). From the findings of this study, 22.4% mothers were overweight and 2.9% mothers were obese, this results highlight the need to focus more attention on non-communicable diseases among the women. Healthy children may be ensured through a healthy mother. Children of mothers had a lower risk of being stunted, wasted and underweight compared to children of undernourished mother.31.5% children were found underweight at this study. 32.7% mother had poor practice and 20% mothers had best practice on IYCF, among the identified underweight children. The result of this study found that 24.7% of mothers practiced exclusive breast feeding to their baby and 65.9% of mothers introduced complementary food to their baby timely (at 181 days) . Inappropriate infant and young child feeding practices, such as non-exclusive breastfeeding and inappropriate complementary feeding, contribute significantly to child malnutrition and death. Overall maternal IYCF knowledge and practices, nutritional status of under-five children among the studied population were not at a satisfactory level. Maternal nutrition is also important for ensuring good nutritional status of the infant after birth as well as safeguarding women's health. These findings are of great importance as they identify potential actions that can be used to improve the nutritional status of children and their mothers. This study

point out the need of making a comprehensive, integrated and multi-sectorial plan for addressing the problem of malnutrition in long term. Joint effort by governmental and non-governmental organizations should be increased to reduce the rate of malnutrition among under five children. To reduce the child malnutrition effective and efficient and program should be designed and started. The rate of malnutrition in this area needs to be viewed as not just a health issue but as a serious protection and access to basic rights failure. This bring out that, it is very important to invest on the prevention of malnutrition rather only to focus in the treatment.

Chapter VII: Future Directions

7.1 Limitations

The main limitations of this study

- Dietary assessments were not included in this study.
- Due to COVID-19 situation & fear of COVID throughout the area the sample size was not much larger.
- The MUAC is one of the best parameters of identifying nutrition status, but it is specific to small age, i.e., for 6 to 59 months' child MUAC range is the same. The Z-score can be calculated as weight-for-height, weight-for-age and height-for-age but we used only weight-for-height Z-score

7.2 Recommendations

- There is need for further study to establish the reasons why stunting is more prevalent than wasting and underweight in the current study.
- National, international organizations and other stakeholders should sensitize the public on the issue of overweight which was from this study.
- To encourage breastfeeding and appropriate starting of Complementary foods promotion of appropriate IYCF practices should be prioritized.
- Mothers need more nutritional education on complementary feeding and should be guided on how to introduce complementary foods to their children.
- Govt. health facilities and NGOs work at this area should focus on GMP program to monitor the height and weight of the Under-five children's regularly.

7.3 Future directions

- Association of stunting and dietary habits of the people living at this area may be assessed.
- Investigation on the relation of blood glucose, haemoglobin, sodium, zinc, iron and malnutrition might be a fruitful research.

- Proportion of salt intake through food and salt percentage present at drinking water at this area may be investigated which may keep impact nutritional status of the people.

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Appendix I: Questionnaire

Infant and Young Child Feeding (IYCF) Practices, Household Food Security and Nutritional Status of Under-five Children in Moheshkhali Island, Cox'sbazar.

MS Thesis Work for Academic Purpose

Consent of the Respondent

Our department (Department of Applied Human Nutrition & Dietetics) is going to conduct an academic research. Our goal is to collect information from the caregiver (young & older Woman) with a broad objective to understand the IYCF practices, household food security & nutritional status of under-5 children living at Moheshkhali Island of cox's Bazar, Bangladesh. We will want to know detailed information about your daily activities on the previous day. All information will be used for research purpose only and must be kept confidential.

You have every right to keep away or to quit at any time if you want. In the circumstances, do you give your consent to collect information from you?

Yes **No**

[Take the interview after having obtained the consent]

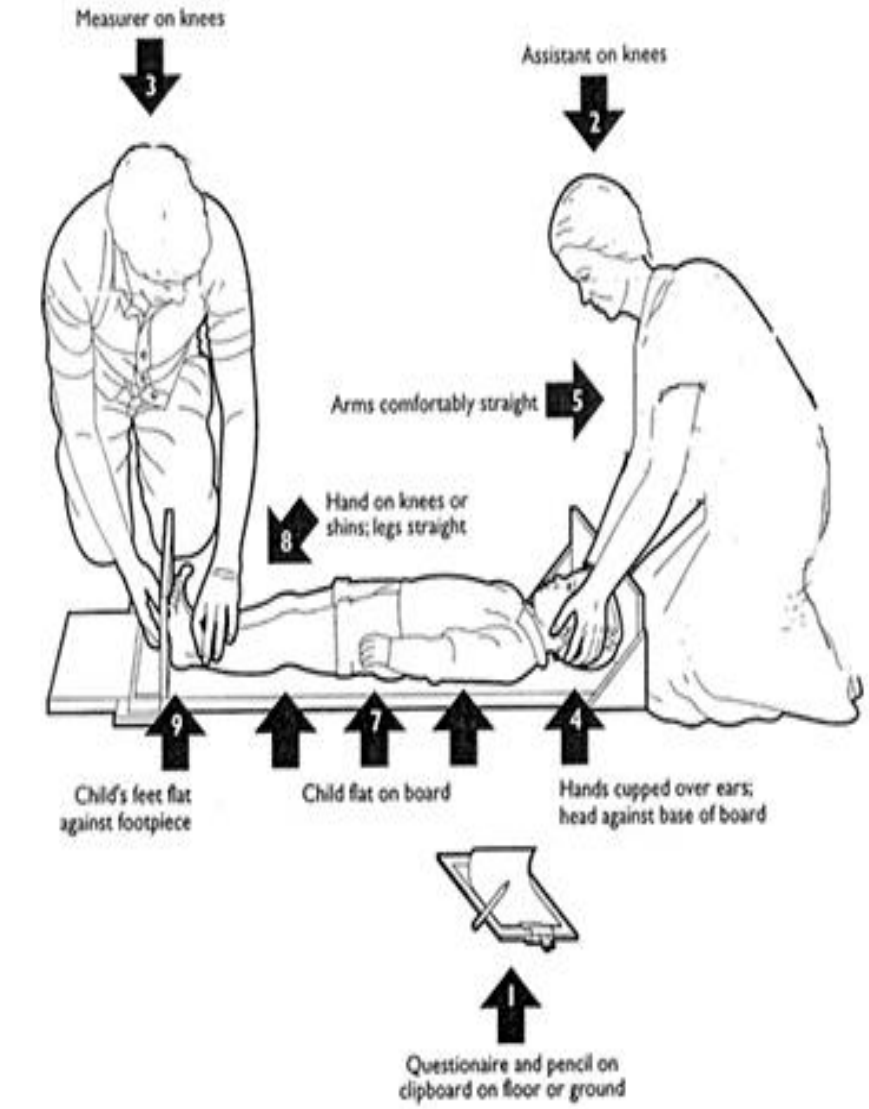
Date:					I/D:	
Address:						
Name of the Recipient (Mother/Caregiver):					Religion:	
Father's Name:						
Child Name:					Child Sex: M/ F	
Demographic Questions:						
1. Mother's Age:						
2. Child's Age:						
3. How many years living in this area:						
4. Number of total Children Under-5:						
	Surroundings Condition Economic information:					
	1. Last educational status: (Mark properly).					
	Academic level					
	No academic background	Madrasa	Primary	Secondary	Higher Secondary	Others
Child						
Mother						
2. What's the main earning source of your family?						
3. Who is the main earner of your family?					Father/Mother/Both/None	
Marital Information:						
1. What is your marital status?					Married/ Non married/ Divorced / Widow	
2. Are you pregnant?					Yes / No	
3. Age during Marriage-						
Mothers knowledge on Infant and Young Child Feeding (IYCF) Practices:						
1. Is your child do breastfeed?					Yes / No	
2. When is the appropriate time for initiation of breastfeeding?					Within 1st hour/ 1-3 hours/ >3 hours/ Don't Know	
3. How many months should be continued for breast feeding?					<12 months / 12-18 months / >18 months	
4. What is the appropriate duration of EBF?					<6 months/ 6 months/ >6 months / Don't Know	

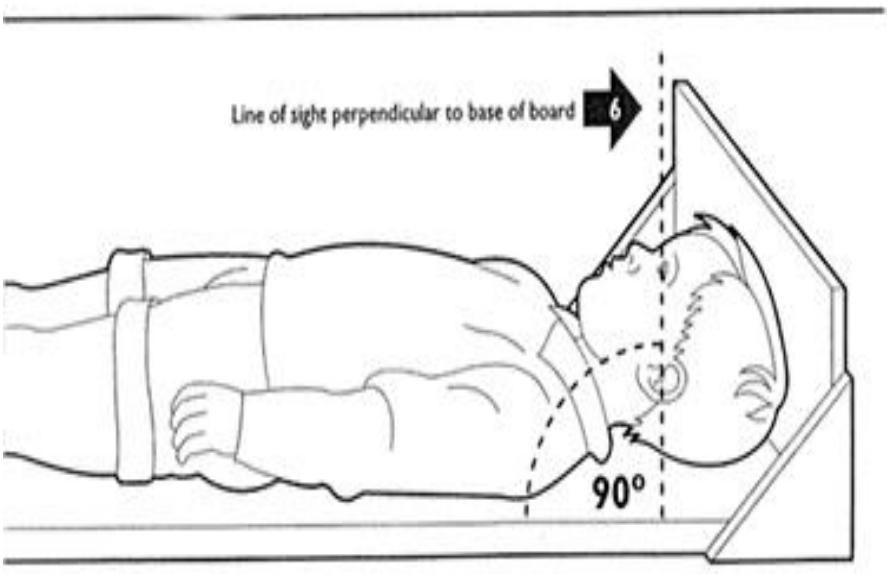
5. Did you give anything to your baby within 6 months of age except breast feeding?	Yes / No
6. Whether colostrum should be given to the newborn?	Yes / No
7. Did you give colostrum to your baby after birth?	Yes / No
8. When did you give colostrum to your baby after birth?	Within 1st hour/ 1-3 hours/ >3 hours/ Don't Know
9. What is the age when complementary feeding should be started?	<6 months/ 6 months/ >6 months / Don't Know
10. Did you introduce complementary food to your baby timely (after 180 days)?	Yes / No
11. Did you give formula milk or animal milk to your baby within 2 years of age?	Yes / No
Child Anthropometric Measurement Information:	
1. Child MUAC?	
2. Child Height?	
3. Child Weight?	
4. Child Z-score?	
Mother's Anthropometric Measurement Information:	
1. Mother MUAC?	
2. Mother Height?	
3. Mother Weight?	
4. Mother Z-score?	

_____

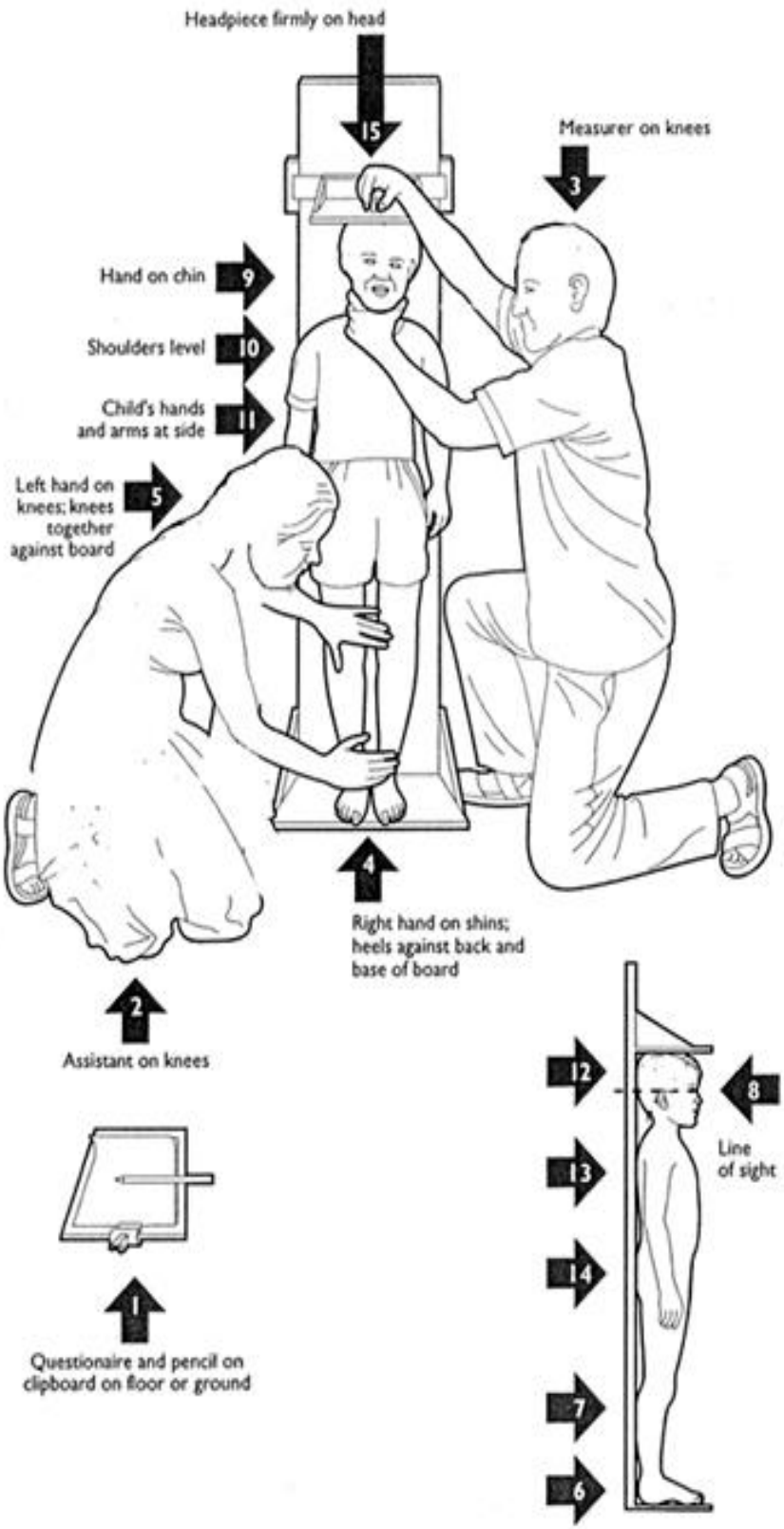
(Signature/Thumb)

Appendix II: Measurement of Length

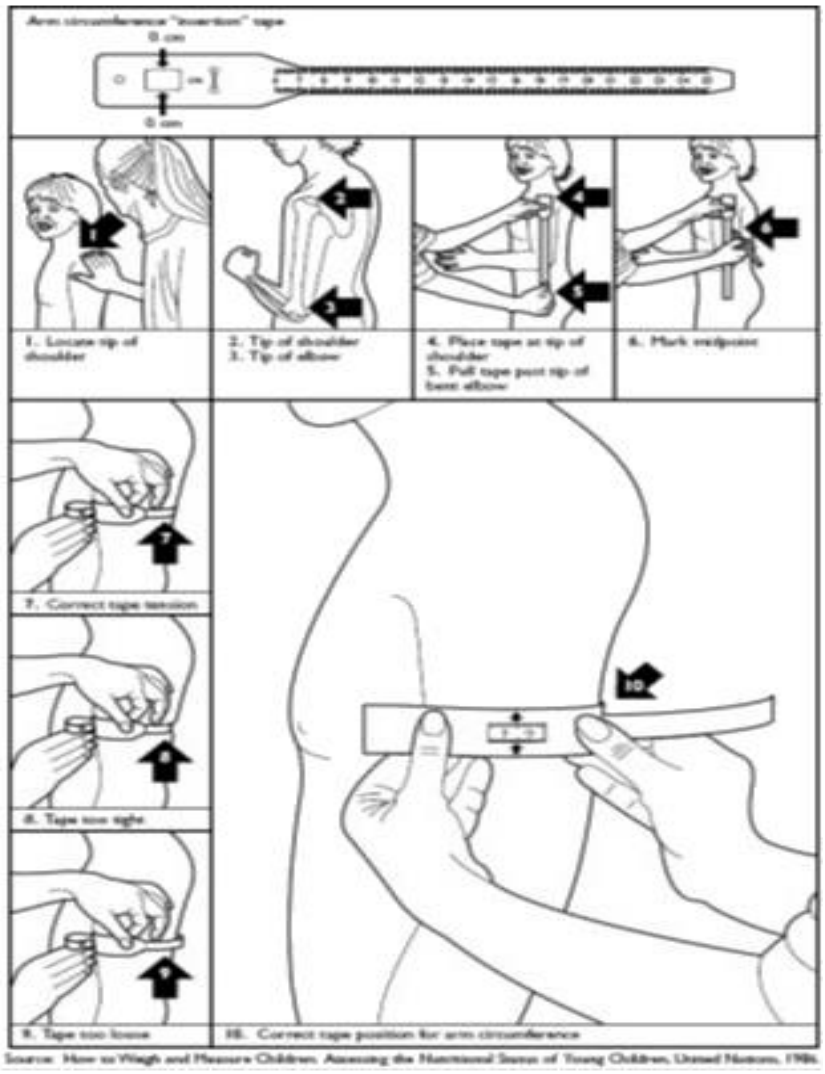


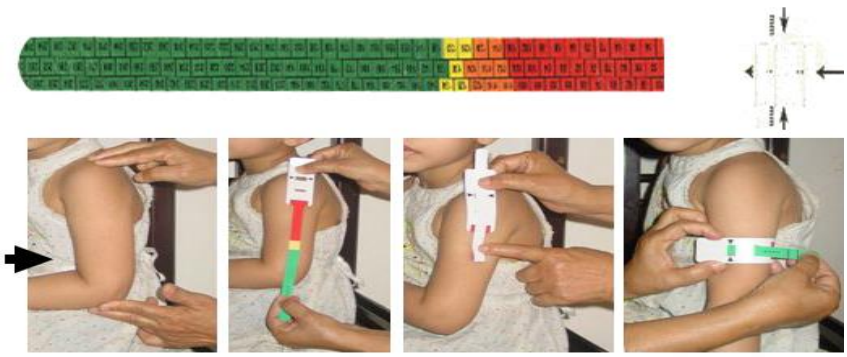


Appendix III: Measurement of Height



Appendix IV: Measurement of MUAC





- 6 mo – 5 yrs
- < 12.5 cm acute malnutrition

Anthropometric indicators Measurement guide FANTA, 2003

Appendix V: Z-score

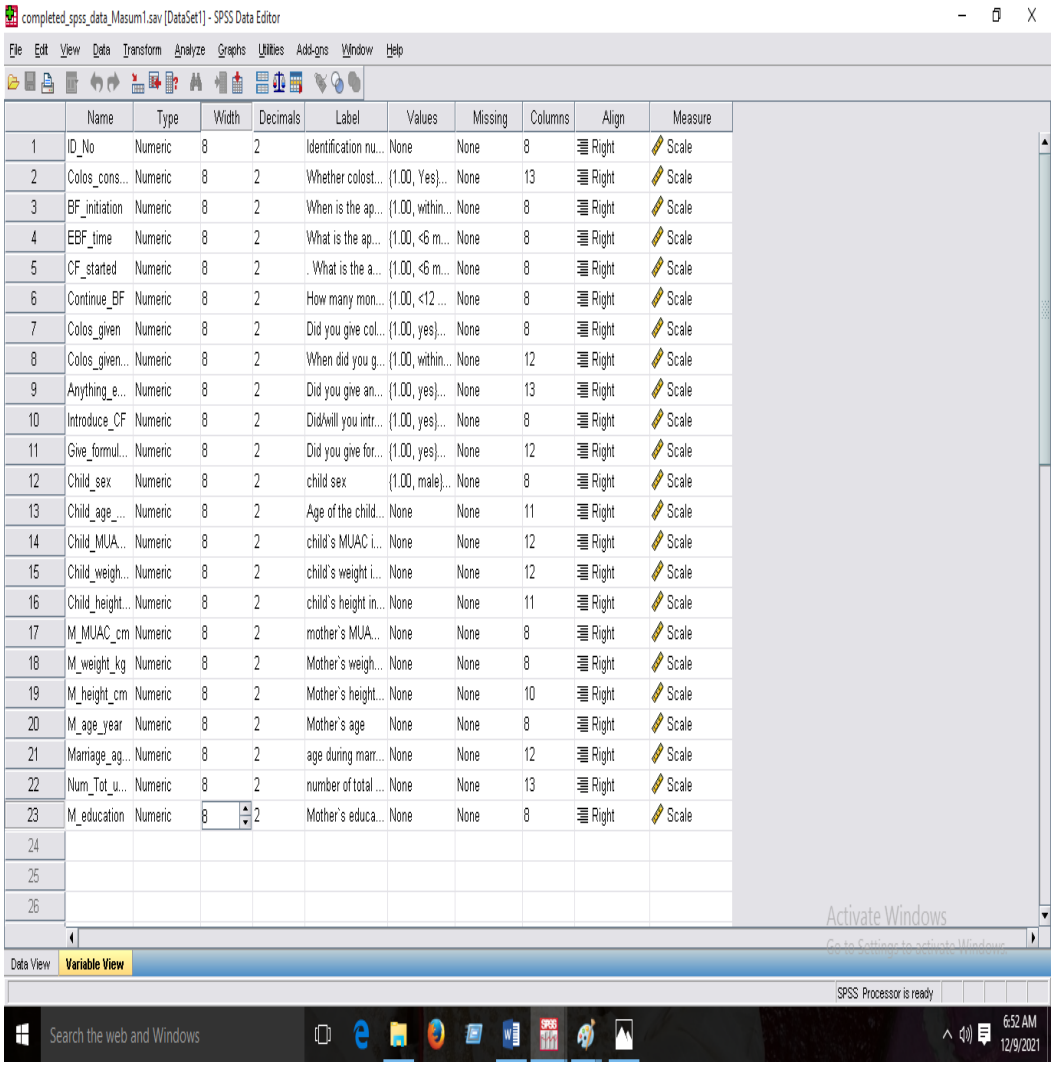
Weight-for-Length Reference Card (below 87 cm)

Boys' weight (kg)					Length	Girls' weight (kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Médian	(cm)	Médian	-1 SD	-2 SD	-3 SD	-4 SD
1.7	1.9	2.0	2.2	2.4	45	2.5	2.3	2.1	1.9	1.7
1.8	2.0	2.2	2.4	2.6	46	2.6	2.4	2.2	2.0	1.9
2.0	2.1	2.3	2.5	2.8	47	2.8	2.6	2.4	2.2	2.0
2.1	2.3	2.5	2.7	2.9	48	3.0	2.7	2.5	2.3	2.1
2.2	2.4	2.6	2.9	3.1	49	3.2	2.9	2.6	2.4	2.2
2.4	2.6	2.8	3.0	3.3	50	3.4	3.1	2.8	2.6	2.4
2.5	2.7	3.0	3.2	3.5	51	3.6	3.3	3.0	2.8	2.5
2.7	2.9	3.2	3.5	3.8	52	3.8	3.5	3.2	2.9	2.7
2.9	3.1	3.4	3.7	4.0	53	4.0	3.7	3.4	3.1	2.8
3.1	3.3	3.6	3.9	4.3	54	4.3	3.9	3.6	3.3	3.0
3.3	3.6	3.8	4.2	4.5	55	4.5	4.2	3.8	3.5	3.2
3.5	3.8	4.1	4.4	4.8	56	4.8	4.4	4.0	3.7	3.4
3.7	4.0	4.3	4.7	5.1	57	5.1	4.6	4.3	3.9	3.6
3.9	4.3	4.6	5.0	5.4	58	5.4	4.9	4.5	4.1	3.8
4.1	4.5	4.8	5.3	5.7	59	5.6	5.1	4.7	4.3	3.9
4.3	4.7	5.1	5.5	6.0	60	5.9	5.4	4.9	4.5	4.1
4.5	4.9	5.3	5.8	6.3	61	6.1	5.6	5.1	4.7	4.3
4.7	5.1	5.6	6.0	6.5	62	6.4	5.8	5.3	4.9	4.5
4.9	5.3	5.8	6.2	6.8	63	6.6	6.0	5.5	5.1	4.7
5.1	5.5	6.0	6.5	7.0	64	6.9	6.3	5.7	5.3	4.8
5.3	5.7	6.2	6.7	7.3	65	7.1	6.5	5.9	5.5	5.0
5.5	5.9	6.4	6.9	7.5	66	7.3	6.7	6.1	5.6	5.1
5.6	6.1	6.6	7.1	7.7	67	7.5	6.9	6.3	5.8	5.3
5.8	6.3	6.8	7.3	8.0	68	7.7	7.1	6.5	6.0	5.5
6.0	6.5	7.0	7.6	8.2	69	8.0	7.3	6.7	6.1	5.6
6.1	6.6	7.2	7.8	8.4	70	8.2	7.5	6.9	6.3	5.8
6.3	6.8	7.4	8.0	8.6	71	8.4	7.7	7.0	6.5	5.9
6.4	7.0	7.6	8.2	8.9	72	8.6	7.8	7.2	6.6	6.0
6.6	7.2	7.7	8.4	9.1	73	8.8	8.0	7.4	6.8	6.2
6.7	7.3	7.9	8.6	9.3	74	9.0	8.2	7.5	6.9	6.3
6.9	7.5	8.1	8.8	9.5	75	9.1	8.4	7.7	7.1	6.5
7.0	7.6	8.3	8.9	9.7	76	9.3	8.5	7.8	7.2	6.6
7.2	7.8	8.4	9.1	9.9	77	9.5	8.7	8.0	7.4	6.7
7.3	7.9	8.6	9.3	10.1	78	9.7	8.9	8.2	7.5	6.9
7.4	8.1	8.7	9.5	10.3	79	9.9	9.1	8.3	7.7	7.0
7.6	8.2	8.9	9.6	10.4	80	10.1	9.2	8.5	7.8	7.1
7.7	8.4	9.1	9.8	10.6	81	10.3	9.4	8.7	8.0	7.3
7.9	8.5	9.2	10.0	10.8	82	10.5	9.6	8.8	8.1	7.5
8.0	8.7	9.4	10.2	11.0	83	10.7	9.8	9.0	8.3	7.6
8.2	8.9	9.6	10.4	11.3	84	11.0	10.1	9.2	8.5	7.8
8.4	9.1	9.8	10.6	11.5	85	11.2	10.3	9.4	8.7	8.0
8.6	9.3	10.0	10.8	11.7	86	11.5	10.5	9.7	8.9	8.1

Veight-for-Height Reference Card (87 cm and above)

Boys' weight (kg)					Height	Girls' weight (kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Médian	(cm)	Médian	-1 SD	-2 SD	-3 SD	-4 SD
8.9	9.6	10.4	11.2	12.2	87	11.9	10.9	10.0	9.2	8.4
9.1	9.8	10.6	11.5	12.4	88	12.1	11.1	10.2	9.4	8.6
9.3	10.0	10.8	11.7	12.6	89	12.4	11.4	10.4	9.6	8.8
9.4	10.2	11.0	11.9	12.9	90	12.6	11.6	10.6	9.8	9.0
9.6	10.4	11.2	12.1	13.1	91	12.9	11.8	10.9	10.0	9.1
9.8	10.6	11.4	12.3	13.4	92	13.1	12.0	11.1	10.2	9.3
9.9	10.8	11.6	12.6	13.6	93	13.4	12.3	11.3	10.4	9.5
10.1	11.0	11.8	12.8	13.8	94	13.6	12.5	11.5	10.6	9.7
10.3	11.1	12.0	13.0	14.1	95	13.9	12.7	11.7	10.8	9.8
10.4	11.3	12.2	13.2	14.3	96	14.1	12.9	11.9	10.9	10.0
10.6	11.5	12.4	13.4	14.6	97	14.4	13.2	12.1	11.1	10.2
10.8	11.7	12.6	13.7	14.8	98	14.7	13.4	12.3	11.3	10.4
11.0	11.9	12.9	13.9	15.1	99	14.9	13.7	12.5	11.5	10.5
11.2	12.1	13.1	14.2	15.4	100	15.2	13.9	12.8	11.7	10.7
11.3	12.3	13.3	14.4	15.6	101	15.5	14.2	13.0	12.0	10.9
11.5	12.5	13.6	14.7	15.9	102	15.8	14.5	13.3	12.2	11.1
11.7	12.8	13.8	14.9	16.2	103	16.1	14.7	13.5	12.4	11.3
11.9	13.0	14.0	15.2	16.5	104	16.4	15.0	13.8	12.6	11.5
12.1	13.2	14.3	15.5	16.8	105	16.8	15.3	14.0	12.9	11.8
12.3	13.4	14.5	15.8	17.2	106	17.1	15.6	14.3	13.1	12.0
12.5	13.7	14.8	16.1	17.5	107	17.5	15.9	14.6	13.4	12.2
12.7	13.9	15.1	16.4	17.8	108	17.8	16.3	14.9	13.7	12.4
12.9	14.1	15.3	16.7	18.2	109	18.2	16.6	15.2	13.9	12.7
13.2	14.4	15.6	17.0	18.5	110	18.6	17.0	15.5	14.2	12.9
13.4	14.6	15.9	17.3	18.9	111	19.0	17.3	15.8	14.5	13.2
13.6	14.9	16.2	17.6	19.2	112	19.4	17.7	16.2	14.8	13.5
13.8	15.2	16.5	18.0	19.6	113	19.8	18.0	16.5	15.1	13.7
14.1	15.4	16.8	18.3	20.0	114	20.2	18.4	16.8	15.4	14.0
14.3	15.7	17.1	18.6	20.4	115	20.7	18.8	17.2	15.7	14.3
14.6	16.0	17.4	19.0	20.8	116	21.1	19.2	17.5	16.0	14.5
14.8	16.2	17.7	19.3	21.2	117	21.5	19.6	17.8	16.3	14.8
15.0	16.5	18.0	19.7	21.6	118	22.0	19.9	18.2	16.6	15.1
15.3	16.8	18.3	20.0	22.0	119	22.4	20.3	18.5	16.9	15.4
15.5	17.1	18.6	20.4	22.4	120	22.8	20.7	18.9	17.3	15.6

Appendix VI: Variables View at SPSS



M. Abdullah Al Masum has been awarded the B.Sc. (Hons) in Food Science and Technology (FST) degree from the Faculty of Food Science and Technology, Chattogram Veterinary and Animal Sciences University, Khulshi, Chattogram-4225, Bangladesh in 2018. He passed his Higher Secondary Certificate Examination in 2013 with GPA 5.00 from Chattagram Biggan College and Secondary School Certificate Examination in 2011 with GPA 5.00 from Shilkhali High School. Mr. Masum is currently a MS student in Applied Human Nutrition and Dietetics under the Department of Applied Food Science and Nutrition at Chattogram Veterinary and Animal Sciences University. He has been awarded the National Science and Technology Fellowship from the University Grants Commission, Bangladesh. He is the son of Zahir Uddin Ahamed and Ayesha Begum in Pekua upazila under Cox'sBazar District.