ASSESSMENT OF NUTRITIONAL STATUS AND PREVALENCE OF WASTING, STUNTING AND UNDERWEIGHT OF FORCIBLY DISPLACED ROHINGYA CHILDREN 6-59 MONTHS OF AGE LIVING MAKESHIFT CAMP, COX'S BAZAR, BANGLADESH: A CROSS-SECTIONAL STUDY

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Registration No: 835

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A thesis submitted in the partial fulfillment of the requirements for the degree of Masters of Science in Applied Human Nutrition & Dietetics

Department of Applied Food Science and Nutrition
Faculty of Food Science and Technology
Chattogram Veterinary and Animal Sciences University Chattogram-4225, Bangladesh
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Authorization

I now declare myself to be the sole author of this thesis. This thesis is presented in partial completion of the requirements for the degree of Master of Science (MS) in Applied Human Nutrition and Dietetics at Chattogram Veterinary and Animal Sciences University's Department of Applied Food Science and Nutrition, Faculty of Food Science & Technology. I also permitted the Chattogram Veterinary and Animal Sciences University (CVASU) to distribute this thesis to other institutions or people for scholarly investigation. Further, it authorized the CVASU to duplicate the thesis by photocopying or other means, in whole or in part, at the request of other institutions or people for academic research. I, the author, vouch for the authenticity of all the works included in this report. Unless otherwise cited or credited, the work is solely my own. All information gathered from books, national and international publications, websites, and other sources has been appropriately cited. Consequently, I am solely accountable for collecting, compiling, maintaining, and disseminating all data gathered in this report.

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This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects, and that all revisions required by the thesis examination committee have been made

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List of Abbreviation

FDMN	Forcefully Displaced Myanmar Nationals
RRRC	Refugee Relief and Repatriation Commission
CiC	Camp in Charge
HH	House Hold
MUAC	Mid Upper Arm Circumference
SAM	Severe Acute Malnutrition
MAM	Moderate Acute Malnutrition
GAM	Global Acute Malnutrition
HWZ	Height-for-Weight-Z score
HAZ	Height-for-Age-Z score
WAZ	Weight-for-Age Z Score
SD	Standard Deviation
IMCI	Integrated Management of Childhood Illness
WASH	Water Sanitation and Hygiene
IYCF	Infant and Young Child Feeding
IYCF-E	Infant and Young Child Feeding in Emergencies
UNHCR	United Nations High Commissioner for Refugees
WFP	World food Programme
UNICEF	United Nations International Children's Emergency Fund
ACF/AAH	Action Contre La Faim / Action Against Hunger
WHO	World Health Organization
SCI	Save the Children International
FAO	Food and Agricultural Organization

IMO	The International Organization for Migration
GoB	Government of Bangladesh
cm	Centimetre
Kg	Kilogram

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ABSTRACT

Nutritional scenario is fragile state of forcibly displaced Rohingya children who live in makeshift camps in Bangladesh. A cross-sectional study was conducted to assess the nutritional status and determine the risk group and identifying underlying cause of malnutrition for children who live in makeshift camps in Ukhiya under Cox'sBazar district, Bangladesh. A total of 431 children under five years (6-59 months) comprising, 202 were male and 229 were female from Camp 4, which is a makeshift camp. A pre-prepared questionnaire was used to assess the nutritional status and evaluate the association between various factors and nutritional status. The children were measured for MUAC, Height, and weight and determined the Weight for Height Z-score(WAZ), Height for age Z-score(HAZ), and Weight for Age Z-score(WAZ). Parents of the children were interviewed for the socio-demographic, water sanitation and hygiene, and health-seeking behaviour information. The result found that 15.3% of children were wasted where 4.6% were severely wasted, and 10.7% were moderately wasted. Again 32% of children were stunted, where 8.1% were severely stunted, and 23.9% were moderately stunted. Moreover, 29.9% of children were underweight, where 6.7%were severely underweight, and 23.2% were moderately underweight. This study also found that the prevalence of malnutrition among boys (18.9% wasted, 34.1% stunted,33.3% underweight) is higher than among girls (12.3% wasted, 30.2%, stunted, 26.7% underweight) and the prevalence of malnutrition among the group 6-23 months is higher (16% wasted, 35.1% stunted, 30.9% underweight) than the girls (13.8% wasted, 25.5% stunted, 27.7% underweight). Age of the respondent child is positively associated ($p<0.05$) with both acute malnutrition and chronic malnutrition. The children with proper access to water sanitation hygiene were better in nutritional status than those with a facility average, again the children who has and a medical complication (IMCI danger sign last two weeks recall) was found positively associated ($p<0.05$) with acute malnutrition. Therefore nutrition-specific interventions need to increase to reduce malnutrition, and appropriate WASH facilities need to boost the nutritional status of Forcibly Displaced Rohingya children.

Keywords: FDMN, Malnutrition, Wasting, Stunting, Underweight, Z-score

CHAPTER 1
INTRODUCTION

1.1 Background

The foundation of a child's survival and growth is proper nutrition. Children that receive adequate nutrition have higher capacities for development, education and community involvement. According to the "Convention on the Rights of the Child," each & every infant and child in the world has the right to ample nourishment, ensuring well-balanced meals every day. Early childhood development requires optimal nutrition to promote healthy growth, organ development and performance, a robust immune system, and neurological and cognitive progress (UNICEF and WHO, 2020). Stunting, wasting, and overweight are the three most telltale signs of malnutrition in children under five, affecting at least one in three of them. Stunting is characterized as a short stature in relation to a child's age. The persistent drop in linear growth observed in the first five years of life may induce significant irreparable physical and neurocognitive impairment associated with stunted growth, posing a substantial hazard to human development (Akombi et al., 2017). A potentially lethal condition known as wasting is brought on by a lack of nutrients and/or illness. Those who have wasting, that is characterized by something like a transient, fast drop in nutritional status, have compromised immune systems, which raises their likelihood of death owing to a higher prevalence and severity of common infections, particularly when severe (Chowdhury et al., 2020). Although undernutrition is the most readily identified form of malnutrition, the face of malnutrition in all its manifestations is rapidly changing, with childhood overweight becoming a global epidemic. Overweight is a result of an increasing number of children growing up in obesity-promoting circumstances with more access to processed foods and an increasingly sedentary lifestyle (Tasnim , 2018). Globally in 2020, Stunting affects 144 million children under the age of five, wasting affects 47 million, and obesity affects 38 million (UNICEF, 2020). Around the world, undernutrition is to blame for nearly 50% of all child fatalities (Asim and Nawaz, 2018).

Even though there are many different ways that malnutrition can present, the prevention strategy is essentially the same: Sufficient maternal nutrition prior, throughout, and then after pregnancy and lactation; optimal nursing during the initial

two years of life; nutrient-dense, diversified, and safe foods for young children. providing access to basic health, water, hygiene and sanitation services, as well as possibilities for safe physical exercise (World Health Organization, 2020). However, due to poverty, a lack of information about nutrition, inadequate child feeding techniques, an insufficient level of care from caregivers, and infections, adequate nutrition is not fulfilled in many areas of developing countries. Children in poor countries today endure significant rates of morbidity and mortality as a result of increased malnutrition (Ijarotimi, 2013). Although the proportion of malnourished children has decreased globally over the past 30 years in percentage terms, the sheer number of malnourished children has continued to rise (Ghosh, 2020).

Eliminating all forms of malnutrition is one of the Sustainable Development Goals (SDG) 2030 agenda's objectives. The SDGs aim to abolish all forms of hunger and malnutrition by 2030, assuring that everybody, especially children, has year-round access to sufficient food (Katila et al., 2019). Realizing the need for accelerated global actions to alleviate the burden of malnutrition, six Global Nutrition Targets were established by World Health Assembly in 2012, to achieve them by 2025. Three of the targets were to lower the percentage of children under the age of five who really are stunted by 40 % and to reduce and maintain childhood wasting below 5 percent. ensure there is no increase in childhood obesity (Global Nutrition Report, 2020). The world is currently falling short of the goals set for global nutrition. In 2025, there would be 128 million stunted children under the age of five, which is higher than the target of 100 million. The percentage of children under the age of five who are overweight is rising in various parts of the world and to reach the goal of 5% by 2025, the present rates of wasting (7.8%) must be reduced by about 40% (World Health Organization, 2018).

The WHO has defined malnutrition as the largest threat to public health worldwide, particularly in developing nations. The nutritional status of under five children is the most significant indication of the global public health status of a country (Sultana et al., 2019). In low- and middle-income countries (LMICs) like Bangladesh, where resources are scarce, malnutrition is a persistent problem, particularly among children under the age of five. According to the 2019 Multiple Indicator Cluster Survey (MICS), 24.67 % of Bangladeshi children are stunted, 9.75 % are obese, 20.57 % are underweight, and 6.80 percent are overweight. (Hossain et al., 2020). Children's

nutritional status suffers in humanitarian situations such as the Rohingya crisis in Bangladesh due to poor diets, insufficient services, inappropriate practices, and a lack of a supporting atmosphere.

1.2 Problem statement

In August 2017, a vast influx of Rohingya refugees from Myanmar sought safety in Bangladesh has created the fastest-growing refugee crisis in the world (Ainul et al., 2018). Based on the 2015-16 Myanmar Demographic and Health Survey, 38% of children under the age of five in Rakhine State suffered from stunting, and 14% from wasting. This was the lowest nutritional status of any state in Myanmar (Leidman et al., 2020). In Bangladesh, the nutritional status of Rohingya displaced children under five years bremains a serious health concern despite improved efforts to offer adequate treatment (Hasib et al., 2020). According to UHCR SNS Survey the prevalence of wasting in Rohingya refugee camp is 13.7% (Standardized Expanded Nutrition Survey, 2019).

1.3 Objectives

The objectives of this study were:

i. To analyze the nutritional health and status of 6-59 month-age of forcibly displaced Rohingya children of camp 4.
ii. To determine the risk group of malnutrition by age and sex.
iii. To assess the underlying cause of malnutrition of 6-59 months-age displaced Rohingya children of camp 4.

CHAPTER 2
REVIEW OF LITERATURE

2.1 Background

Cox's Bazar is one of the sixty-four districts of Bangladesh located in the Chittagong Division's southeast. It is bordered to the north by Chittagong District, to the east by Bandarban Area and Myanmar, and to the west by the Gulf of Bengal. Its name is derived from Cox's Bazar. Myanmar (formerly Burma) is a sovereign state and Southeast Asia's second-largest region by land area. Rakhine, located over the Naf River from Cox's Bazar, is home to the vast majority of Rohingya in Myanmar. Rakhine is one of the poorest states in Myanmar. In Rakhine State, education, medical services, and adequate nourishment are in short supply. In addition, the immunization rate is lowest in the country and an insufficient number of educated professionals per capita (Widespread and Systematic, 2018). In August 2017, a widespread and systematic offensive erupted across northern Rakhine state (Widespread and Systematic, 2018). There was a tremendous outbreak of violence in Rakayan state in 2017, and the violence fluctuated throughout the following year before erupting in August 2017 (Widespread and Systematic, 2018). As a result of the violence, more than 700,000 Rohingya fled to Bangladesh, where they now reside in the largest refugee camp in the world (Refugees, 2021.). These influxes, in addition to the Rohingya people who reached in Bangladesh all through earlier waves of dispute, have led to an overall population of 944,682 as of October, with 818,625 currently living in cooperative locations (camps), 115,331 residing in cooperative sites with the surrounding area, and 10,726 living diffusely in local communities, according to UNHCR 2019 data (Population Statistics, 2019). From August 2017, the Bangladeshi government has referred to the Rohingya as Myanmar Forcibly Displaced People (RISSM, 2017.).

Unfortunately, the nutritional status of disabled Rohingya children is worse. This study's objective is to give a summary of prior research undertaken in Bangladesh. Consequently, the study seeks to assess the nutritional quality and health behavior of young camp-dwelling children in Bangladesh.

2.2 Malnutrition:

Malnutrition relates to food intake shortages or excess, an imbalance of key nutrients, or poor nutrient utilising (Malnutrition, 2023). It is an acute or chronic nutrition condition that is characterized by altered body composition and impaired function due to undernutrition (Soeters et al., 2017). A subacute or chronic nutritional state in which different degrees of excess or undernutrition and inflammatory processes have led to abnormalities in body composition and decreased function (Soeters et al., 2008). WHO declared it as "the cellular imbalance between the availability of nutrients and energy and the body's demand for them to accelerate economic growth, preservation, and particular functions" (Malnutrition, 2023)

This study focused on under nutrition and, more particularly, protein energy malnutrition (PEM). Insufficient food supply due to economical, political, and sometimes environmental concerns such as natural catastrophes is the leading cause of PEM among children in underdeveloped countries (Grover & Ee, 2009)..

2.3 Driving factor of Malnutrition:

The conceptual model highlights the complexity of the numerous interrelated factors that can affect nutritional status at various levels, including immediate, underlying, and fundamental, emphasising that it is not merely a food, health, or care issue (Semba et al., 2007). This allows needs assessments beyond a population's food requirements and promotes a greater understanding of the variables that influence nutrition status. Focusing on the identified vulnerable groups, the conceptual model can be used as a checklist to identify and prioritise the population's short- and long-term needs and service gaps (Panagides et al., 2019). This is based on the premise that care, food security, appropriate health services, and a healthy home environment are required to prevent diseases and malnutrition in a community. If these are not available, they must be made available. This will ensure that the available resources are utilised efficiently (Black et al., 2008).

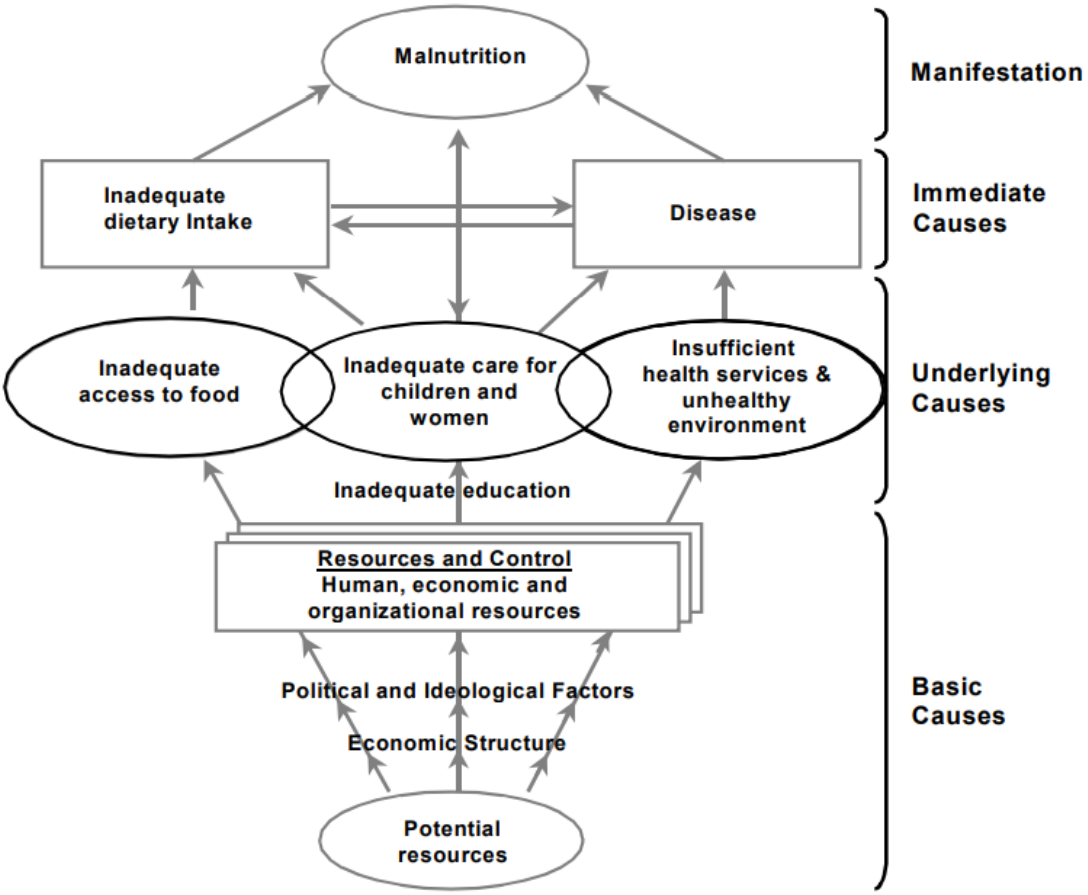

Figure 2.3.1 UNICEF conceptual framework of malnutrition (UNICEF, 1997).

2.4 Forms of Malnutrition:

It is generally accepted that the health effect of undernuttirion and overnutrition/obesity manifest in a variety of ways (Scrinis, 2020). Undernutrition, micronutrient deficiencies (also known as hidden hunger), and overnutrition/obesity/overweight are now the three major prevalent forms of malnutrition (FAO/WHO, 2018; WHO, 2019; FAO/WHO, 2019). (Abdulahi et al., 2017). Undernutrition and overnutrition/obesity are two common classifications of malnutrition (Chatterjee et al., 2022).

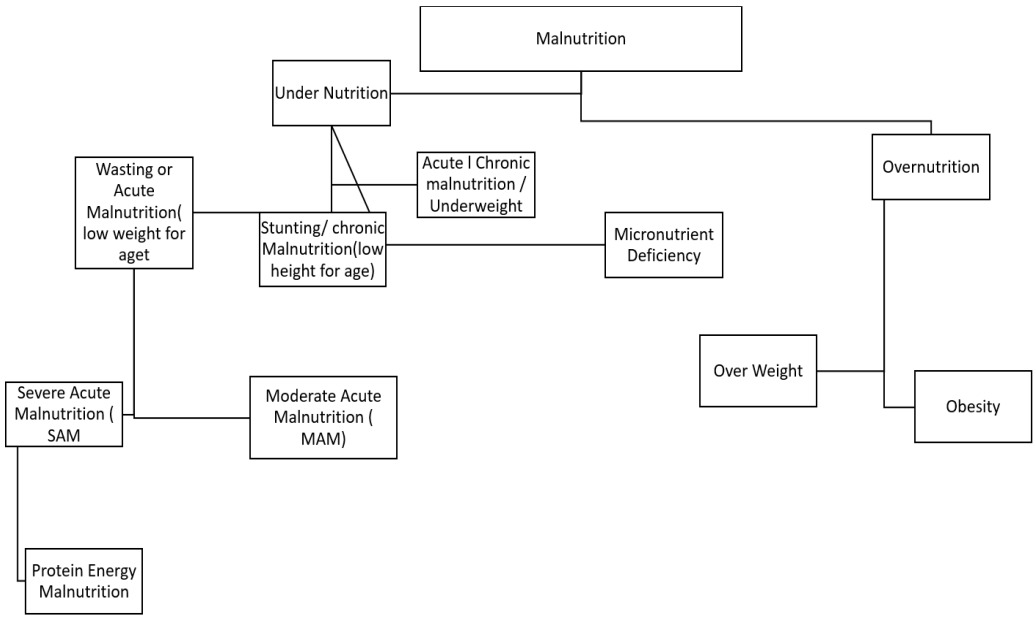

Figure 2.4.1 Classification of nutritional disorder.

2.5 Under Nutrition:

Undernutrition is inadequate energy and nutrient intake to meet a person's needs for good health(Maleta, 2006) . In the majority of published works, undernutrition defined is synonymous with malnutrition. In its strictest definition, malnutrition relates to the both undernutrition and overnutrition. To combat this, descriptive terms like kwashiorkor & marasmus have been developed. While protein-energy malnutrition cannot exist without particular nutritional deficiencies, impartial terminology such as undernutrition is utilized because it encompasses both protein-energy malnutrition and micronutrient deficiencies. (Black et al., 2008). Undernutrition comprises wasting, stunting, and deficiencies of micronutrient (vitamin and minerals) as one version of the condition called as malnutrition, whereas obesity or overconsumption of specific nutrients represents another kind (Black et al., 2008). Acute malnutrition (wasting, thinness, and bilateral pitting oedema), chronic malnutrition (stunting), underweight (a combination of stunting and wasting), and micronutrient deficiencies are the most prevalent forms of undernutrition, which can occur individually or in combination (e.g. deficiencies in vitamin A, iodine, iron, and zinc). In following modules, acute malnutrition, stunting, and being underweight are covered in further detail (Guide to Anthropometry: A Practical Tool for Program Planners, Managers, and Implementers, 2018).

2.5.1 Acute Malnutrition / Wasting:

Acute malnutrition is caused by an inadequate amount of food, severe and/or repetitive illnesses (such as waterborne diseases and pneumonia), or a combination of these, resulting in a child who loses weight rapidly, does not gain enough weight comparative to his or her growth in height, and/or exhibits bilateral pitting. edema Children suffering acute malnutrition seem to be more prone to infection-related death (Black et al., 2013) and, depending on the degree of their condition, require treatment. Wasting, weight-for-height (WHZ) 2 of the World Health Organization's (WHO) child growth criteria, constitutes a severe hazard to infant survival and development because it raises the risk of death (Fernandez et al., 2002). Child wasting can have negative and often irreversible impacts, such as poor cognition and learning, reduced lean body mass, short grownup stature, productivity loss and decreased wages (Aguayo et al., 2017). Typically, nutrition researchers have concentrated on one or the other form of malnutrition. In the 2008 and 2013 Lancet series on maternal and child under nutrition, wasting and stunting are presented as independent issues contributing separately to mortality and disease burden, and interventions were assessed based on their effectiveness in addressing one or the other issue individually (Grantham et al., 2007).

2.5.2 Chronic Malnutrition / Stunting:

Stunting is a phenomenon in which linear growth failure is a feature of many clinical diseases associated with increased morbidity and mortality, reduced neurological and cognitive function, and an increased chance of developing chronic illness in childhood (Onis & Branca, 2016). Stunting is a sign of chronic undernutrition that happens when a child fails to reach his or her full developmental potential as a result of cumulative effects of inadequate nutritional intake, frequent disease, or both (Weise, 2017). Hence, the child is shorter than would be expected for a child of their age and gender who is in good health. Infectious disorders such as diarrhea, pneumonia, and measles are more prevalent in children with growth retardation (Black et al., 2013). According to estimations by the World Bank, a 1% decrease in adult height due to childhood stunting is related with a 1.4% decline in economic output. As adults, stunted children are predicted to earn 20% less than their non-stunted counterparts (Grantham et al., 2007).

2.5.3 Underweight:

Underweight is an index of body mass which falls below the usual range for an adult or child who is physically healthy. It's also characterized as wasting, muscle atrophy, thinness, stunting, etc., and its causes include a lack of appropriate nutrients in the body (Uzogara, 2016). It is caused by insufficient dietary intake and recurring infectious infections (Abdulahi et al., 2017). A low WFA with a z-score less than -2SD below the median (WHO standards). This kind of malnutrition combines stunting and wasting characteristics. This metric is frequently employed for growth monitoring and promotion (Weise, 2017).

2.6 Z Score:

Z-scores represent the distance and direction in which a person's measure differs from the reference population's median value. Z-scores beyond the usual range suggest a dietary deficit (Allgeier et al., 2017). If a z-score is outside of the normal range, its distance from the median reflects the severity of the nutritional issue; nevertheless, the further it differs from the median, the more severe the issue. When a large proportion of a population's members have z-scores from outside "normal" range, there is a nutrition issue at the population level. In addition to identifying the current nutritional status of a child, z-scores can be used to track their growth over time. (Altman, 2013) The reference lines on growth charts are referred to as z-score lines and are derived from standard deviation (SD) scores, also known as z-scores. Z-scores are used to quantify the distance of a given measurement from the mean (or average). A weight-for-height z-score of -2.33, for example, indicates that a child's weight is 2.33 standard deviations (SDs) below the anticipated median weight of children of the same height. Because the child's weight-to-height ratio is below average, they are regarded to be "wasted." A positive z-score indicates that the weight of the child lies to the right of the median, indicating that the child is heavier than average. z-scores are calculated differently for ordinarily and non-normally distributed observations in the reference population. (Allgeier et al., 2017).

2.6.1 Normally distributed measurements:

Understanding a z-score is facilitated by the notion of a normal distribution. As depicted below, most values in a typical distribution cluster are around the median.(Guide to Anthropometry: A Practical Tool for Program Planners, Managers, and Implementers, 2018).

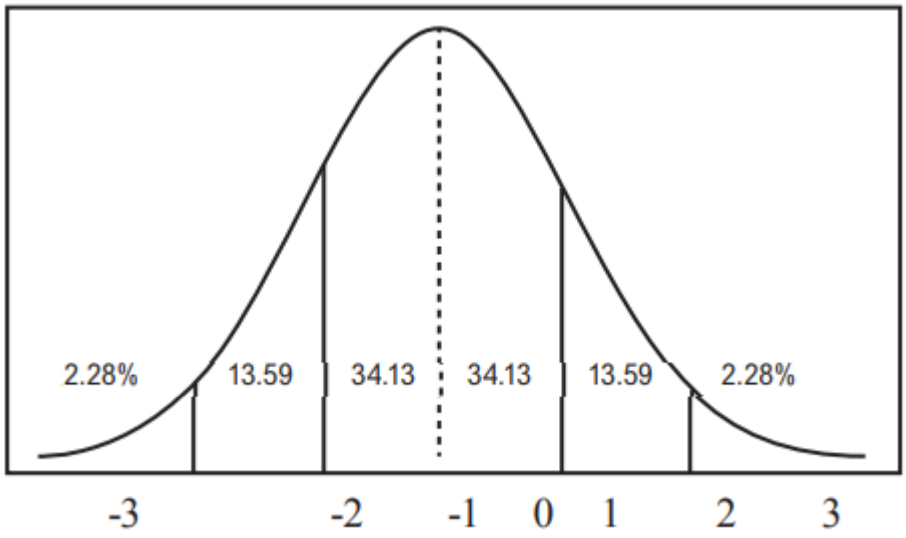

Figure 2.6.1 Normal bell-shaped curve cut into z-score

2.6.2 Non-normally distributed:

Measurements In contrast to the height distribution, the weight distribution graph resembles a "deformed" bell, with the right side being longer than the left and being characterized as right-skewed.(World Health Organization, 2017).

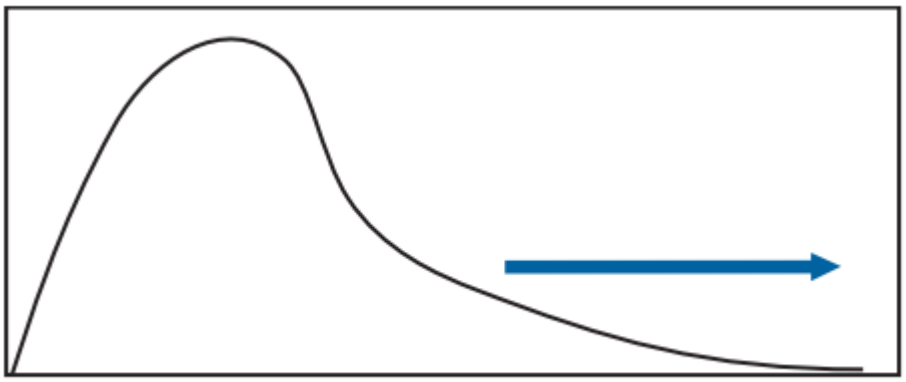

Figure 2.6.2 Non-normally distributed of Z score.

2.7 Integrated Management of Childhood illness:

The World Health Organization (WHO) and the United Nations International Children's Fund (UNICEF) established the Integrated Management of Childhood Illness (IMCI) in 1992 as an integrated strategy to improving child health (World Health Organization, 2017). IMCI is a set of integrated (combined) recommendations, as opposed to separate guidelines for each child ailment (Khatun et al., 2021). Its

primary objective is to decrease mortality and morbidity due to the leading causes of pediatric disease (Liu et al., 2012). According to the World Health Organization (WHO), UNICF IMCI detects general danger indications that may demand hospitalization of the child and focuses its evaluation on the existence of cough and trouble breathing, diarrhea, fever, measles, ear infection, and malnourished hypothermia. (Exploratory Conference to Examine Novel Evidence for Integrated Management of Childhood Illness (IMCI) Hazard Indicators, n.d.) hyperthermia Chronic infection is one of the primary reasons for malnutrition in children under five.

2.8 Water Sanitation and Hygiene (WASH):

WASH is crucial for enhancing nutritional outcomes (Undernutrition and Water, Sanitation and Hygiene, 2013). According to the World Health Organization (WHO), fifty percent of undernutrition is attributed to diseases caused by unsafe water, poor sanitation, or inadequate hygiene (Prüss & WHO, 2008). Due to poor WASH, diarrhea is the leading cause of death among children, accounting for 8% of all deaths among children under the age of five worldwide (Nina, 2021). Access to improved water, sanitation, and hygiene (WASH) might prevent 58% of yearly diarrheal deaths among children under the age of five worldwide, according to recent estimates (Chase & Ngure, 2016). The deterioration of a child's health, which contributes indirectly to malnutrition, is a result of contaminated water, poor sanitation, and hygiene (Chase & Ngure, 2016). Diarrhea affects children exposed to filthy water and living situations; it is particularly common in middle-income and low-income countries. A recent review of the effect of combined water, sanitation, and hand washing programs on anthropometry in children under the age of five indicated only small gains in linear growth and insignificant effects on underweight or wasting. Observational study findings suggest a connection between diarrhea and other infectious disorders and cognitive deficits (Otsuka et al., 2019).

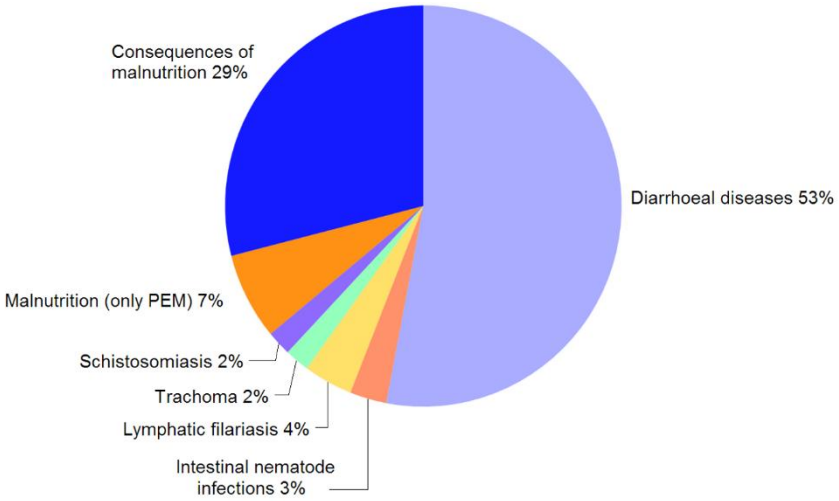

Figure 2.8.1 Breaks down the preventable WASH-associated disease burden(Bartram & Cairncross, 2010).

2.9 Food Insecurity and Malnutrition:

Food insecurity remains one of the leading causes of malnutrition in low- and middle-income nations (Tydeman et al., 2018). It is either a lack of safe and nutritious food or the inability to get food in socially appropriate ways. Its four hierarchical dimensions are accessibility, usability, availability, and stability (Gross et al., 2000). The majority of research quantified food insecurity using modified versions of the Department of Agriculture's Household Food Security Survey Module. There have been reports of 18–91% prevalence and severity of food insecurity, based on the measurement instrument and population under study (Militao et al., 2022).

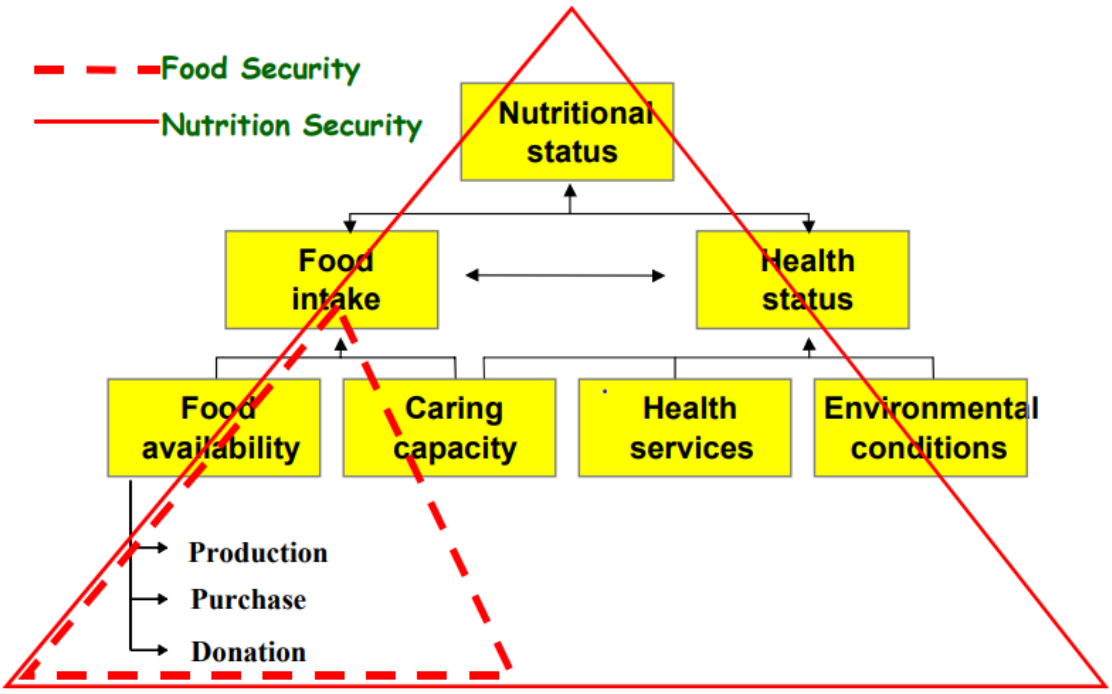

Figure 2.9.1 Conceptual foundation of the household nutritional status (Gross et al., 2000).

2.10 Nutritional Status of Forcible displaced Myanmar Nation:

Rohingyas were not granted full citizenship until 1982, despite the fact that the Rohingya population had lived in Burma since 1780. (Wijnroks et al., 1993). They lacked education, health care, work, and freedom of movement, among other things. Rohingya youngsters already exceeded the World Health Organization's Emergency Thresholds for malnutrition. Unfortunately, because to the long travel to Bangladesh and the conditions in the camps, the nutritional quality of Rohingya children has substantially deteriorated (UNICEF, 2009). Poor nutrition is the major source of infectious diseases and ultimately increases the economic burden on the nation.

CHAPTER 3
MATERIALS AND METHODOLOGY

3.1 Study area:

The research was conducted at camp 4, a makeshift camp in the Cox's Bazar district's Ukhiya Upazila. The GPS coordinates of Camp 4 (21.2082° N, 92.1440° E), located in the southeast of Ukhia Upazila, were chosen for the study.

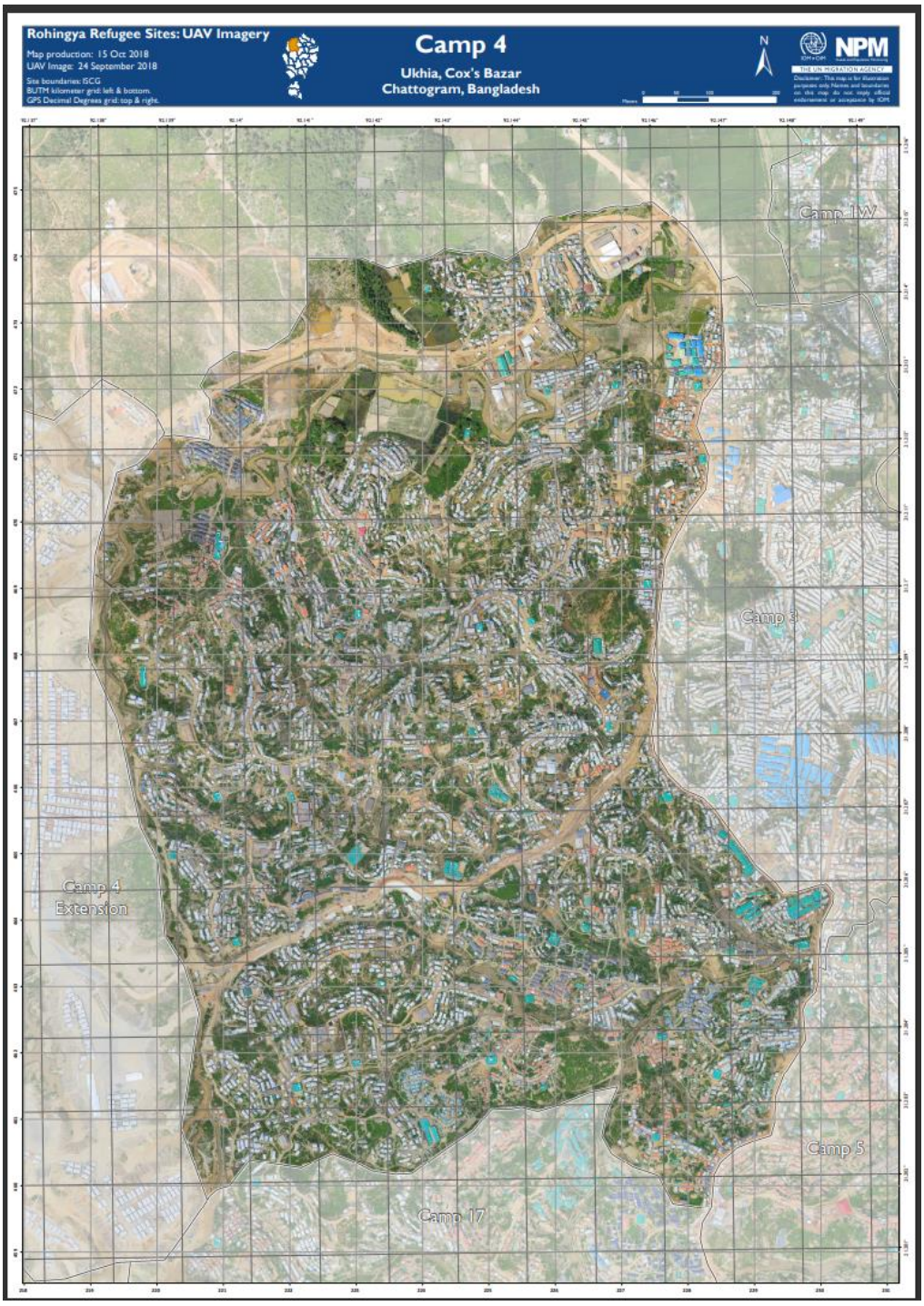

Figure 3.1.1 Map of the study area

3.2 Study Design:

From February to June 2022, a community-based cross-sectional descriptive survey was conducted among 431 randomly selected children aged 6 to 59 months residing in camp 4. A structured questionnaire administered by an interviewer was used to collect data. A systematic sampling method was used to collect the data. Interviews with the selected mothers were conducted via door-to-door visits. Except for Camp 4, all 33 camps have children as their reference population. Children residing in Camp 4 constitute the source population.

3.3 Sampling frame:

A sample frame of 500 house hold was constructed by following predetermined criteria.

- The house hold must be belonging to FDMN
- The family is willingly interested to participate the interview
- Must have at least one child 0-59 month.
- Parents or caregiver must be present in the family.

3.4 Sample size calculation and study population:

According to UHCR SNS Survey the prevalence of malnutrition in Rohingya refugee camp is 13.7% (Standardized Expanded Nutrition Survey, 2019). the sample size for the study was determined by using following formula (Bhalerao & Kadam, 2010).

$n=(\frac{z}{m})^2 \times p\ (1-p)$

Where,

n= required sample size(?)

z= confidence interval (95%)

p= prevalence of malnutrition of Rohingya under five children (13.7%)

m= margin of error. (3.25%)

Therefore,

$N= (\frac{1.96}{.0325})^2 \times .137(1-.137)$

$= 430.008 \approx 431$

The interview is conducted by going door-to-door from the camp's entrance to its conclusion until the desired sample size is reached. To collect the required household information, a structured questionnaire containing both open-ended and closed-ended questions was designed. Simple random sampling was used for surveys in the designated research camp.

3.5 Simple Random Sampling:

A list of all targeted households living within the perimeter of the specified research camp was used to choose households at random. With UNHCR's registration data, lists of registered refugees were compiled. The number of families was established so that one team could accomplish the task in one day.

Table 3.5.1 House hold calculated for survey

Calculation of HH coverage/day		
Event	Time to dedicate	Total time remaining
Time frame of per day field work	8:00 am until 4:00 pm = 480 min	480 min
Travel time	75 min X 2 trip = 150 min	480-150=330 min
breaks of 15 min + 45 min lunch break and prayer time	15 min + 45 min = 60 min	330-60= 270 min
Discussion with block leader and selection of 1st HH	10 min	270-10=260 min
Travel time between households	5 min	
Time allocated for household's interview	40 min	Including travel time between HHs.
The total number of HH's to be covered per day.	260/40≈6.5 HH≈ 7 HH interviewers=7 HH per day	In camp4 and

[All 6-59-month-old children in selected households were eligible for anthropometric measurements.]

3.5.1 Selection of Individuals in Survey:

All 6-59 month age children in chosen households who consented to anthropometric measurements. Attempts were made to re-visit houses in order to measure children who had been absent during the interview.

In some instances, anthropometric data of children of eligibility age were not collected:

- If a child was away from the household during the visit, a family member was unable to locate him or her, and the kid was not found after returning.
- If having disability or physical deformity that would compromise the accuracy of an anthropometric measurement.

In this context, there were usually no concerns with weighing the 6-59 month-age children without clothing. For privacy considerations, children who shown hesitation were measured in a separate room.

During the survey, children diagnosed with acute malnutrition based on weight for height using a field weight-for-height z-score table, MUAC below 125 mm, and/or the presence of edema were referred to the nearest nutrition program center if they were not already enrolled with the consultant or responsible site supervisor.

3.6 Study parameter / Collected Variables:

3.6.1 Anthropometry

- For children aged 6 to 59 months, age was entered as a birthday date (day/month/year) only when the information was confirmed by supporting paperwork such as vaccination or birth registration cards. Ages were calculated using a local calendar of events and documented in months in the absence of supporting data. The nutrition survey was restricted to infants and toddlers aged 0 to 59 months. The complete local event calendars for January through June are included in Annex 4.
- Children aged 6 to 59 months were weighed using an electronic SECA scale with a mother/child weighing feature to the nearest 0.1 kg. Children who could stand still without difficulty were independently weighed. Youngsters who were unable to stand without assistance were weighed using the 2-in-1 technique. To ensure accuracy, all youngsters were again measured and

weighed without clothing. Two team members simultaneously measured each child's height and weight.

- The height and length of children aged 6 to 59 months were measured in centimeters to the closest 0.1 centimeter. For measuring barefoot and bareheaded youngsters, typical UNICEF height boards were used. Children younger than 2 years of age were measured while lying down, while those older than 2 years of age were measured while standing (height). Two team members concurrently took the measurements of each child.
- MUAC was measured to the closest millimeter in children aged 6 to 59 months. The left arms of all subjects were assessed using standard MUAC tapes. Two team members concurrently took the measurements of each child.
- The existence of bilateral pitting oedema in children aged 6 to 59 months was recorded as "yes" or "no." Every kid was evaluated for oedema by applying three seconds of constant thumb pressure to the tops of both feet.

3.6.2 IMCI Danger sign:

- Diarrhea was examined in children aged 6–59 months using a two-week recall. The passing of three or more loose or liquid stools per day was characterized as diarrhea.
- Cough (with fever) in children aged 6 to 59 months was examined using a two-week recall. Fever and cough (associated by rapid or difficult breathing) were defined. This signal was utilized in lieu of probable ARI or pneumonia.
- Using a two-week recall, children aged 6 to 59 months were evaluated for fever (without cough and rash), defined as fever without respiratory symptoms (cough). This measure was employed as a surrogate for suspicions of malaria.
- Wellness Seeking Parents of children aged 6 to 59 months that experienced diarrhoea, cough, or fever during the two-week reference period were questioned as to whether they had sought medical assistance for their child.

3.7 Others variable:

Socioeconomic, demographic, hygienic, and water and sanitation factors The nutrition and health practices of FDMN households were investigated.

3.8 Questionnaire, Training:

3.8.1 Questionnaire:

The questionnaire for the survey was developed by collecting and compiling information from Google Scholar-published journals. Alongside me was a team carrying hard copies of the questionnaire. Annex 1 contains the complete survey questionnaire, children

3.8.2 Training of research assistant:

For assistance and improved study facilitation, a female and a male research assistant with prior work experience in the Rohingya camp, particularly on nutrition projects were recruited for the study. The research assistants were also fluent in the local language and familiar with Chittagonian, which enabled them to efficiently explain the questions to the interviewees and comprehend their responses. Prior to the pre-test, they were trained intensively for five days on the purpose and objective of the study, data collection tools, anthropometric measurements, ethical issues, and what to expect from each question. I led the program alongside a Nutrition Specialist who is currently engaged as a nutrition consultant for a large firm. The team members were educated on the objectives , methodology, household selection, consent gathering, anthropometric measurements, and questionnaire content during the training. To ensure the quality and correctness of the measures, all children were measured twice.

3.9 Data collection procedure:

I was responsible for gathering the primary data. Each caregiver was interviewed face-to-face in the comfort of their own home in order to ensure that they were able to respond freely to the questionnaire questions. All anthropometric measurements were taken in their own residence. On average, it took between 35 and 45 minutes to conduct an interview. Participants were encouraged to respond freely because they were assured that any information revealed during the interview would remain confidential. Collecting data on pregnant women involved reviewing questionnaire questions multiple times to ensure familiarity and clarity of responses.

3.10 Data Collection tools:

A structured questionnaire (Annex 1) was used to collect socio-demographic variables, socio-economic variables, anthropometric measurements and other factors.

- Socio-demographic variables include age, family size, and gender.

• Socio-economic variables include the caregiver's education, relationship with the caregiver, and nutritional status.

• Anthropometric variables included oedema, mid-upper arm circumference (MUAC), height, and weight.

• Health condition, including diarrhoea, an IMCI warning sign.

For the measurement of child height and weight, a child height board and a weight scale were used (WHO,2006). For the measurement of MUAC, a standard MUAC tape (printed by UNICEF) and a standard MUAC tape (printed by WHO) were used (WHO,2006). Using the Z sore standard chart and ENA software, the standard deviation was determined.

3.11 Mid Upper circumference (MUAC) Measurement:

MUAC is used to assess wasting and has to be performed at critical contact points for all sensitive groups. The measurement correlates strongly with muscle mass and, thus, the body's nutritional reserves. It correlates strongly with mortality risk. Since there are no standardized measurements for newborns younger than 6 months, the 6 month age limit must be utilized for arm circumference. Age-appropriate MUAC tapes (for children under the age of five) were employed to measure MUAC during the study.

3.11.1 Measurement MUAC:

(Guide to Anthropometry: A Practical Tool for Program Planners, Managers, and Implementers, 2018)

- bilateral pitting edema excluded.
- The left upper arm was used to acquire the MUAC (or the less active arm).
- Placed the left (or less active) arm's acromion and olecranon. In order to find the correct measurement point, the patient's elbow is bent to 90 degrees (Picture Annex3).
- Marked the midway of the upper arm with a pen after locating it. Instead of the MUAC tape, it was recommended to use a string to determine the midpoint.
- The arm of the infant must then be relaxed and let to fall alongside the body.
- Wrapped the MUAC tape around the child's arm, feed the tape's end through the first and third apertures, and then feed the tape's end through the first and

second openings so that the entire tape is in touch with the child's skin. It should be neither very tight nor loose.

- With the simple three-color coded tape (red, yellow, and green), read the color through the window with the arrows pointing inwards. Using the numbered measuring tapes, record the actual measurement in cm using the actual measurement. With an accuracy of 0.1 centimeter, MUAC can be measured (cm).

Table 3.11.1 Mid-Upper Arm Circumference(World Health Organization, 2017):

Based on WHO standards, the table below provides internationally acceptable MUAC cutoffs for children aged 6 to 59 months. There are not enough data to suggest a MUAC limit for infants less than six months.

Age Group	Nutritional Status (identifies wasting/acute malnutrition)	
	SAM	MAM
6-59 month	115 mm	≥115 mm to < 125 mm

3.12 Measurement of body Weight:

Using an electronic scale for "tared weighing" to weigh a newborn. Resetting the scale to zero while the individual being weighed is still on it is referred to as "tared weighing." Described the tared weighing technique to the mother, emphasizing that she must remain on the scale until her infant is weighed while in her arms. It ensured that the scale was set on a solid, flat, and level surface. Ensure that a solar-powered scale has sufficient light to function. The sensitivity of battery-powered scales to direct sunlight and dampness necessitates their appropriate protection.(World Health Organization, 2017).

- A single press of the start button activated a battery-powered scale. Confirmed that the mother's footwear had been removed.
- Asked mother to stand with her feet slightly apart in the center of the scale.

- Even when her weight is displayed, remind the mother to remain on the scale until the baby has been weighed in her arms.
- Zero outed the scale when the mother is standing on the scale and her weight is displayed. This can be done by pressing the two-in-one button (for battery-powered scales). When the scale displays a mother and kid with the number 0.0, it is not calibrated.
- Give the child to the mother with care and request that she maintained stillness.
- On the screen, the child weight will be presented. Record the weight. Verify that the numbers are being read in the proper order.
- Child older than 2 years and able to stand, the parent was permitted to take the child alone.

3.13 Measurement of body Height:

To increase accuracy and precision when measuring length and height, the task was allocated to two individuals. Children less than 2 years old were measured lying down. According to WHO guidelines, children measuring at least 87 cm tall are measured standing, while those measuring less than 87 cm are measured lying down. If children at least 2 years old or 87 cm tall were measured lying down, 0.7 cm was subtracted. For children under 2 years of age or less than 87 cm are measured standing up, add 0.7 centimeters and convert to length.

For children less than 2 years of age or shorter than 87 inches, measure length When measuring length, the height board is placed on the ground or a stable, flat surface such as a table. The child's shoes were removed. The child was placed on his or her back in the center of the height board, with shoulders, hips, and feet touching the surface. The feet were at a 90-degree angle, the knees were completely straight, and the arms were at the sides. The assistant positions the child's head on the board while simultaneously grasping its sides. The measurer presses the sliding board against the child's feet and measures to the nearest 0.1 centimeter while keeping the child's ankles or knees down. The assistant confirms the measurement, after which the measurer records it on the survey form.

For children 2 years and older or with a height of at least 87 cm, measure height. When measuring a child's height, the shoes are removed. The height board is put

upright on the ground, vertically supported by a solid surface, such as a wall. The youngster is placed on the height board with arms at his/her sides, standing upright in the middle of the board. The helper presses firmly on the child's ankles and knees while the measurer holds the child's head straight. The child's head, shoulders, buttocks, and heels must touch the board, and his/her feet must be close together. The measurer positions the sliding board and measures to the nearest 0.1 centimeter. The assistant repeats the measurement for verification and then notes it on the anthropometric form or health card once the measurer has announced it (World Health Organization, 2017).

3.14 Measurement of Bilateral Pitting Edema:

Bilateral pitting edema is a medical complication of a particular subtype of severe acute malnutrition known as nutritional edema, edematous malnutrition, SAM with edema, or kwashiorkor. It is an abnormal condition of body where accumulation of fluid in physiological tissues that, in its mildest form, causes swelling in both feet and, in its most severe form, in both feet, legs, hands, arms, and face. It is identified by a skin recession that persists after applying pressure to both feet for three seconds. Even moderate bilateral pitting edema is symptomatic of SAM or some other serious condition. For further diagnosis and treatment, individuals with this condition were referred to the local health and nutrition center (world Health Organization, 2013).

Table 3.14.1 Classification of Bilateral Pitting Edema

Statement	Edema Grade	Nutritional Condition
Absent bilateral pitting edema	Absent (0)	Does not have edematous malnutrition
Existing in both feet and ankles	Mild (+)	SAM
Found in both feet and ankles, as well as the lower legs, hands, or lower arms.	Moderate (++)	SAM
Generalized, including both feet, legs, hands, arms, and face	Severe (+++)	SAM

3.15 Z score Determination:

There are three methods for calculating the z-score: Weight for Height (WHZ), Weight for Age (WAZ), and Height for Age (HAZ) (World Health Organization, 2006). At first, the child's weight was measured in kilograms using an SECA scale, and the child's height was measured in centimeters using a height board. After gathering data for Height and Weight, the information was entered into ENA software. Z Score was determined manually using the WHO-recommended reference card and automatically using ENA.

Table 3.15.1 WHO Child Growth Standards Classification:

ANTHROPOMETRIC INDICATOR AND CONDITION	AGE		Z-SCORE						
	0–23 months	24–60 months	< -3	≥ -3 to < -2	≥ -2 to < -1	≥-1 to ≤ +1	> +1 to ≤ +2	> +2 to ≤+3	> +3
Length-for-age Stunting	✔		Severe stunting	Moderate stunting	Normal				Extreme tallness is not usually a nutrition issue. May indicate endocrine disorder.
Height-for-age Stunting		✔							
Weight-for-age Underweight	✔	✔	Severe underweight	Moderate underweight	Normal		Do not use weight-for-age to determine overweight. Weight-for-length/height (0–60 months) and BMI-for-age (all ages) are better for assessing overweight in children.		
Weight-for-length Wasting, overweight/obesity	✔		Severe wasting/ severe acute malnutrition (SAM)	Moderate wasting/ moderate acute malnutrition (MAM)	Normal		Possible risk of overweight	Overweight	Obesity
Weight-for-height Wasting, overweight/obesity		✔							
BMI-for-age* Wasting, overweight/obesity	✔	✔	Severe wasting/SAM	Moderate wasting/MAM	Normal		Possible risk of overweight	Overweight	Obesity
Head-circumference-for-age Small head circumference	✔	✔	Very small head circumference (severe microcephaly)	Small head circumference (microcephaly)	Normal			Large head circumference (macrocephaly) Not related to nutritional status.	

3.16 Measurement of Nutritional Status:

In this report Nutritional status of the participants was measured by calculating GAM rate. Stunting, wasting, underweight all of parameter were analyzed on the basis of WHO threshold of prevalence of malnutrition. MUAC was assess to compare with wasting as rapid assessment analyzing tools.

3.17 Data verification:

The data set was initially validated, sanitized, and entered into an MS Excel spreadsheet from category to numeric coding. The data was revised to identify any discrepancies (blank, double entry, wrong entry). After summarizing the acquired

data for each of the proposed indicators to answer the question regarding the study's objectives, the analysis proceeded as planned.

3.18 Statically evaluation:

The data were initially recorded in Excel before being exported to SPSS for analysis. Z score value was calculated by ENA software. IBM's version 25 of Statistical Package for Social Science (SPSS) was used to analyze the data. Two analyses were conducted. Chi-square test, descriptive statistics. The data was organized and summarized using descriptive statistics to determine the frequency distribution of various variables and categories. The Chi-square test was performed to determine the existence of a relationship between two categorical variables. Here employed a 95% confidence interval, and a p-value 0.05 was deemed the threshold for establishing a positive link between two categorical variables. The strength of relationship between the various risk factors and the study outcomes was reported using crude and adjusted odds ratios, and statistical significance was assumed when alpha was less than or equal to 0.05 For the significance test, the adjusted odds ratio (AOR) was used to evaluate the strength of the connections at 95% confidence intervals.

3.19 Ethical Issue:

This research was conducted in conformity with the ethical principles outlined in the Helsinki declaration1964. The Refugee Relief and Repatriation Commissioner's Office (RRRC) granted ethical permission, followed by the Camp-in-Charge (CIC) and. After describing the goal of the study to each participant, written agreement was obtained.

After the aims of the survey were properly described and prior to the collection of data, all participants were requested to verbally consent before any data were taken. The households were permitted to decline participation in the survey. Participation was completely optional. Always, children were measured with an elderly relative or parent present. All data were kept confidential throughout and following the review.

CHAPTER 4
RESULT

This chapter presents and explains the study's conclusions as determined by data analysis. A complete sample of 431 respondents was appropriately evaluated and presented in accordance with the study's objectives. The results are presented using bar charts, graphs, and tables.

4.1 Socio-demographic information of the parents

Table4.1 shows the socioeconomic and demographic factors of responders. Total 431 children of 6-59 month were involved in this study. From the total sample population, male 46.9 % and female53.1 %.

68.2% of child were < 2 years (6-23 month) and 31.8 were >2 years < 5 years (24-59 month) years old. In consideration of water sanitation hygiene facility 94.7% family were using the common latrine constructed by different NGOs, 3.4% having well facility and 2.1% didn't have well water sanitation and hygiene facility. The average household size in the survey area was 5.8% individuals. The ratio of male to female children aged 6 to 59 months presented in Table 4.1 below shows that the number of respondent parentage. Among all the 431 participant 202 were male which percentage of total sample is 46.9 and 229 were female which percentage was 53.6 from total sample. The number of children 6-23 month were 294 from where 140 were male (63.9% of total male participant) and 154 were female (67.2% of total female). Respondent children of 24-59 month were 137 where 62 were male (30% of the total male respondent) and 75 were female (32.8 of total female respondent).

Table 4.1.1 Distribution of Age and Sex among Children 6-59 months:

Age Group	Male		Female		Total	
	n	%	n	%	N	%
6-23 month	140	63.9	154	67.2	294	68.2
24-59 month	62	30.7	75	32.8	137	31.8
Total	202	46.9	229	53.6	431	100%

4.2 Prevalence thresholds for wasting, overweight and stunting in children under 5 years:

Revised thresholds, presented in the table 4.2.1, were set in 2018 as part of the WHO-UNICEF publication. These revised thresholds were utilized to create prevalence-based maps for this publication. The cutoffs were established in proportion to the standard deviations (SD) of the WHO Child Growth Standards. The worldwide definition of "normal" (two standard deviations from the WHO median) establishes the first threshold, which consists of 2.3% of the area under the normalized distribution. This "extremely low" multiplier level (rounded to 2.5%) serves as the foundation for establishing future thresholds. (Altman, 2013)

Table 4.2.1 Interpretation of the severity of Malnutrition:

Indicator	Prevalence Thresholds level; [%]				
	Very High	High	Medium	Low	Very low
Wasting [WHZ]	≥15	10-15	5-<10	2.5-<5	<2.5
Stunting [HAZ]	≥30	20-<30	10-<-20	2.5-<10	<2.5
	Critical		Serious	Poor	Acceptable
Underweight [WAZ]	≥30		20-<30	10-<20	<10

WHO/UNICEF Classification of the severity of Malnutrition among Children.

4.3 Prevalence of malnutrition on the basis of MUAC:

The frequency of GAM per MUAC among children 6-59 months was 15.8%, MAM per MUAC was 11.4%, and SAM per MUAC was 4.6%, as shown in Table 4.3.1. according to the 2018 WHO/UNICEF rating, which falls under the "Very HIGH" public health threshold level.

Table 4.3.1 Prevalence of malnutrition on the basis of MUAC:

Children 6-59 months		Prevalence	
	N	n	%
Global Acute Malnutrition	431	68	15.8%
Moderate Acute Malnutrition		49	11.4%
Severe Acute Malnutrition		19	4.4%

According to Table 4.3.2, the prevalence of acute malnutrition was higher in boys than in girls for GAM (20.3% vs. 11.8%), for MAM (15.0% vs. 7.8%), and for SAM (5% vs. 4.4%).

Table 4.3.2 Prevalence of malnutrition by MUAC on the basis of Sex group:

Sex	Normal (MUAC>12 .5cm)		SAM (MUAC ≤11.5cm)		MAM (MUAC ≥11.5cm ≤12.5cm)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate	
	n	%	n	%	n	%	N	%	N	%
Male	161	79.7	10	5	31	15.3	202	100	41	20.3
Female	202	88.2	9	3.9	18	7.9	229	100	27	11.8
Total	363	84.2	19	4.4	49	11.5	431	100	68	15.8

While comparing the prevalence of acute malnutrition between children 6-23 months and children 24-59 months, children 24-59 months had a significantly greater prevalence of GAM (16.6% vs. 16%), but children 6-23 months had a higher prevalence of MAM (11.7 vs. 11.2) and SAM (4.8 vs. 3.8%).

Table 4.3.3 Prevalence of malnutrition by MUAC on the basis of Age Group:

Age Group	Normal (MUAC>12.5cm)		SAM (MUAC ≤11.5cm)		MAM (MUAC ≥11.5cm ≤12.5cm)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate	
	n	%	n	%	n	n	N	%	n	%
6-23 month	247	84	14	4.8	33	11.2	294	100	47	16
24-59 month	116	84.7	5	3.6	16	11.7	137	100	21	16.6
Total	363	84.2	19	4.4	68	68	431	100	68	15.8

4.4 Prevalence and association of acute malnutrition by WHZ among Children 6-59 months:

The percentage of acute malnutrition was established by WHZ based on an evaluation of 431 children (6-59 months). Only one incidence of Oedema with grade one was identified in Camp4. According to the new WHO/UNICEF categorization for Wasting for 2018, the prevalence of GAM per WHZ among children aged 6–59 months was 15.3%, which exceeds the "Very HIGH" public health criterion.

Table 4.4.1 Prevalence of malnutrition on the basis of WHZ (Wasting):

Children 6-59 months		Prevalence	
	N	n	%
Global Acute Malnutrition	431	66	15.3
Moderate Acute Malnutrition		46	10.7
Severe Acute Malnutrition		20	4.6

4.4.1 Association between respondent sex and acute malnutrition

As shown in Table 4.4.2, the prevalence of acute malnutrition was higher among boys than among girls for GAM (18.9% vs 12.3%), MAM (13.9% vs 7.4%), and SAM (5% vs 4.4%) but the association (p=0.119; p>0.05) of sex and acute malnutrition was not so statistically significant.

Table 4.4.1.1 Association of acute malnutrition and sex of the respondent

Sex	Normal (Z score ≥-2SD)		SAM (Z score <-3SD)		MAM (Z score <-2SD to ≥-3 SD)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate		p-value
	N	%	n	%	n	%	N	%	n	%	
Male	164	81.2	10	5	28	13.9	202	100	38	18.9	0.119
Female	201	87.8	10	4.4	18	7.9	229	100	28	12.3	
Total (6-59 month)	365	84.7	20	4.6	46	10.7	431	100	66	15.3	

4.4.2 Association between respondent age and acute malnutrition:

Comparing the prevalence of acute malnutrition between children 6-23 months and 24-59 months, in table 4.4.2.1 the children 6-23 months showed a significantly higher prevalence of GAM (16% vs. 13.8%), MAM (10.9% vs. 10.2%), and SAM (5.1% vs. 3.5%) and there has a positive association (p=0.005; p<0.05) between age of the respondent to acute malnutrition.

Table 4.4.2.1 Association of acute malnutrition and the age of respondent:

Age Group	Normal (Z score ≥-2SD)		SAM (Z score <-3SD)		MAM (Z score <-2SD to ≥-3 SD)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate		p-value
	n	%	n	%	n	%	N	%	N	%	
6-23 month	247	84	15	5.1	32	10.9	294	100	47	16	0.005
24-59 month	118	86.1	5	3.6	14	10.2	137	100	19	13.8	
Total	365	84.7	20	4.6	46	10.7	431	100	66	15.3	

4.5 Association and prevalence of acute chronic malnutrition (stunting) by HAZ among the children 6-59 months:

The prevalence of global chronic malnutrition or stunting per HAZ among children 6-59 months was 32%, as shown in Table 4.5.1 below, which according to the new WHO/UNICEF classification for stunting in 2018 is rated "Very High".

Table 4.5.1 Prevalence of malnutrition on the basis of HAZ Score (Stunting):

Children 6-59 months		Prevalence	
	N	n	%
Global Chronic Malnutrition	431	138	32
Moderate Chronic Malnutrition		103	23.9
Severe Chronic Malnutrition		35	8.1

4.5.1 Association between respondent sex and chronic malnutrition:

As shown in Table 4.5.1.1, the prevalence of chronic malnutrition is greater among boys than among girls for global (34.1% vs. 30.2%), moderate (25.7% vs. 22.3%), and severe stunting (8.4% vs. 7.4%) and the observe value (p=0.328; p>0.05) of sex and chronic malnutrition was not so statistically significant.

Table 4.5.1.1 Association of chronic malnutrition and sex of the respondent:

Sex	Normal (Z score ≥-2SD)		SAM (Z score <-3SD)		MAM (Z score <-2SD to ≥-3 SD)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate		p-value
	n	%	n	%	n	%	N	%	N	%	
Male	133	65.8	17	8.4	52	25.7	202	100	69	34.1	0.328
Female	160	69.9	18	7.9	51	22.3	229	100	69	30.2	
Total (6-59 month)	293	68	35	8.1	103	23.9	431	100	138	32.0	

4.5.2 Association between chronic malnutrition and age of the respondent:

While comparing to children aged 24-59 months, children aged 6-23 months exhibited a greater prevalence of global (35.1% vs. 25.5%), moderate (26.9% vs. 17.5%), and severe chronic malnutrition (8.2% vs. 8%) malnutrition and there has a positive association (p=0.011; p<0.05) between age of the respondent to chronic malnutrition. Stunting was shown to be more prevalent in children aged 6 to 23 months

Table 4.5.2.1 Association of chronic malnutrition and age of the respondent:

Age Group	Normal (Z score ≥-	SAM (Z score	MAM (Z score <-	Total	GAM (prevalence of SAM+	p-value

	2SD)		<-3SD)		2SD to ≥-3 SD)				prevalence of MAM) rate		
	n	%	n	%	n	%	N	%	N	%	
6-23 month	191	65	24	8.2	79	26.9	294	100	103	35.1	
24-59 month	102	74.5	11	8	24	17.5	137	100	35	25.5	0.011
Total	293	68	35	8.1	103	23.9	431	100	138	32.0	

4.6 Prevalence and association of underweight among children 6-59 months by WAZ:

As shown in Table 4.6.1 below, the prevalence of underweight per weight for height score among children 6-59 months was 29.9% where 6.7% were sever underweight and 23.2% were moderate underweight which is very high.

Table 4.6.1 Prevalence of malnutrition on the basis of WAZ (Underweight):

Children 6-59 months		Prevalence	
	N	n	%
Global Underweight	431	129	29.9
Moderate underweight		100	23.2
Severe Underweight.		29	6.7

4.6.1 Association between respondent sex and underweight:

Underweight per WAZ among children 6-59 months is broken down by gender in Table 4.6.1.1. Globally, boys had a larger frequency of underweight (33.3% vs. 26.7%), moderate underweight (27.7% vs. 10.2%), but girls' was a higher prevalence of severe stunting (7.4% vs. 5.5%) but the association ($p>0.05$) was not statistically significant.

Table 4.6.1.1 Association of underweight and sex of the respondent:

Sex	Normal (Z score ≥-2SD)		SAM (Z score <-3SD)		MAM (Z score <-2SD to ≥-3 SD)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate		p-value
	n	%	n	%	n	%	N	%	N	%	
Male	134	66.3	12	5.9	56	27.7	202	100	68	33.3	0.26
Female	168	73.4	17	7.4	44	19.2	229	100	61	26.7	
Total (6-59 month)	302	70.1	29	6.7	100	23.2	431	100	129	29.9	

4.6.2 Association of underweight and age of the respondent:

Children 6-23 months exhibited a greater prevalence of global (30.9% vs. 27.7%), moderate (23.8% vs. 21.9%), and severe chronic malnutrition (7.1% vs. 5.5%) as compared to children 24-59 months there has a positive association (p<.005) among this two age group. Children 6-23 month of age have higher in prevalence of underweight than the children 24-59 month of age.

Table 4.6.2 Association of underweight and age of the respondent:

Age Group	Normal (Z score ≥-2SD)		SAM (Z score <-3SD)		MAM (Z score <-2SD to ≥-3 SD)		Total		GAM (prevalence of SAM+ prevalence of MAM) rate		p-value
	n	%	n	%	n	%	N	%	N	%	

6-23 month	203	69.0	21	7.1	70	23.8	294	100	91	30.9	0.000
24-59 month	99	72.3	8	5.8	30	21.9	137	100	38	27.7	
Total	302	70.1	29	6.7	100	23.2	431	100	129	29.9	

4.7 Association of diarrhea, acute respiratory infection, fever in and WASH facility of the respondent:

Considering a two-week recall period from 431 sample child found malnourished 11.8% who was suffered only in diarrhea, 5.3 % who was suffered only fever and 10.4% who was suffered from acute respiratory infection, 12.5 % who was found suffered both diarrhea in last two week, 4.6 % was found suffered from both fever and acute respiratory difficulties. Form the number of respondent there was a strong positive association ($p=0.013$; $p<0.05$) with IMCI danger sign and malnutrition.

Table 4.7.1 Association of IMCI danger sign WASH facility with malnutrition.

Indicator	Parameter	number	percentage	p- value
IMCI danger sign	Diarrhoea	51	11.8	0.013
	Fever	23	5.3	
	ARI	45	10.4	
	Diarrhoea & fever	54	12.5	
	Fever and ARI	20	4.6	
WASH facility	Well	14	3.2	0.355
	Common	342	79.3	
	No	9	2.1	

CHAPTER 5
DISCUSSION

In this study, the nutritional condition of children aged 6-59 months of camp 4 at Ukhia upazila, Cox's Bazar, Bangladesh is examined. It had been four years since wholesale deracination in the Rakhine state of Myanmar, and malnutrition was prevalent among the Rohingya displaced population in Cox's Bazar district's tent communities. In October and November 2017, Bangladesh remained above global emergency criteria (World Health Organization, 2018) This study was conducted to evaluate and determine the malnutritional status of children under the age of five (6-59 months) based on anthropometric parameters (MUAC, Height, weight and WHZ, HAZ, WAZ), socio-economic, demographic, hygiene, sanitation, and other factors that contribute to malnutrition.

5.1 Acute Malnutrition per weight for height Z score (Wasting):

This study found that , the prevalence of Global Acute Malnutrition or GAM by WHZ among children aged 6–59 months was 15.3%, or "Very High" according to the UNICEF/WHO criteria. Where SAM incidence was 4.6%, while MAM prevalence was 10.7%. Based on data disaggregated by gender, GAM rates have been persistently higher among males than among girls (18.9% vs. 12.0%). Where SAM prevalence was (5% vs. 4.4%), MAM prevalence was (13.9% vs. 7.9 GAM rates by WHZ were consistently higher in younger children aged 6-23 months than in older children aged 24-59 months; there were significant variations in GAM rates between children aged 6-23 months and 24-59 months (p=0.005). 10% of the population in the setting of Bangladesh is affected by wasting (Das et al., 2022). According to a recent study, the prevalence of child wasting is approximately 8%, and only about 1% of children are severely wasted (Hossain et al., 2022). In Myanmar, the prevalence of under-five child wasting was 7.7% among boys and 6.4% among girls (Blankenship et al., 2020), 21.5% in Sri Lanka (Senarath , 2015), and 17.1% in southern India (World Health Organization, 2015). (Murarkar et al., 2020a). Hence, the prevalence of wastefulness among the Rohingya is more than in Bangladesh, Nepal, and Myanmar, but lower than in southern India.

5.2 Chronic Malnutrition per Height for Age Z score (Stunting):

This study found that the prevalence of Global Chronic Malnutrition or GAM by HAZ among children aged 6–59 months was 32%, which Very High(Onis et al., 2019) according to the UNICEF/WHO criteria . The SAM prevalence was 8.1%, while MAM prevalence was 23.9%. GAM rates via WHZ for males have been consistently higher than for girls (GAM 34.1% vs. 23.3%). Where SAM prevalence was (8.4% vs. 7.9%), MAM prevalence was (27.7% vs. 22.3%). GAM rates by WHZ were consistently higher in younger children aged 6-23 months than in older children aged 24-59 months; significant differences in GAM rates were seen between children aged 6-23 and 24-59 months (35.1% vs. 25.5%, p=0.11). only a few Current research suggests that the prevalence of moderate and severe levels of stunting among children under the age of five in Bangladesh was 25% and 12%, respectively (Sultana et al., 2019), with a substantially greater incidence in rural regions (38.1%) than in urban areas (31.2%) (Akram et al., 2018). The prevalence of stunting and severe stunting was 26.3% and 10.2% among 0–23-month-old babies and 40.6% and 15.9% among 0–59-month-old children in Nepal (Tiwari et al., 2014). The prevalence of childhood stunting in Myanmar was 28 %, according to Hong (2021). In Nepal, 49 % of children under the age of five were stunted, whereas in India, 45.9 % of children under the age of five were stunted (Murarkar et al., 2020b). Comparatively, the prevalence of FDMN is higher in Mayanmer Nation, but it is lower in Nepal, India Moharastra, and Bangladesh.

5.3 Malnutrition per Weight for Age Z Score (Underweight):

This study found that the prevalence of Global Under nutrition or GAM by WAZ among children aged 6–59 months was 29.9%, which is very high according to the UNICEF/WHO criteria. The frequency of SAM was 6.7%, while MAM prevalence was 23.2%. GAM rates by WHZ have been consistently higher among boys (33.3% vs. 26.6%) based on data disaggregated by gender. Where SAM is more prevalent in females than in males (7.4 vs. 5.9%), MAM is more prevalent (27.7% vs. 19.2%). GAM rates by WHZ were consistently higher in younger children aged 6-23 months than in older children aged 24-59 months; there were significant variations in GAM rates between children aged 6-23 months and 24-59 months (p=0.000). Where SAM prevalence was greater (7.9 vs. 5.8%), MAM prevalence was greater (23.8% vs. 21.1%). 11% of children in Bangladesh were severely underweight, and 28% were

moderately underweight, according to a recent research.(Alom et al., 2012). Another survey revealed that 33% of the population is underweight(Das & Gulshan, 2017). In Myanmar, 18.3% of children under the age of five are reported to be underweight(Khaing et al., 2019) . In India, 52.9% of children under the age of five were underweight, 7% of children were extremely malnourished, and the incidence of underweight among children under the age of one was 62.4% and 44.0% among boys(Stalin et al., 2013) . In Nepal, 37% of children under the age of five were underweight, with children older than 24 months being more likely to be underweight than children younger than 24 months(Adhikari et al., 2017) and Srilanka it was 35.6% (Galgamuwa et al., 2017).In comparison to other nations, the prevalence of underweight among FDMN is lower in the south Asian nation. However, the proportion of underweight children under the age of 2 in the United States is higher than in Nepal.

5.4 Association of water sanitation and hygiene with malnutrition:

Worldwide, every fifth child has stunted growth, one in thirteen is wasted, and every seventh child is underweight. There are 297,000 deaths from diarrhea each year among children under five that can be attributed to WASH. South Asia and Sub-Saharan Africa account for around 90% of these cases (Mshida et al., 2018; Waage et al., 2010). It is believed that by improving WASH conditions and procedures, up to 45% of child deaths worldwide attributed to malnutrition might be avoided. (Mshida et al., 2018; Curtis & Cairncross, 2003). A recent study in Nepal discovered that 51.1% of children had intestinal parasite infections, 52.2% had diarrhea, 63.9% exhibited clinical symptoms of nutritional inadequacies, and 55.5% of children were undernourished. (Shrestha and others, 2020) In India, about 62 million kids (48%) from all income levels have stunted growth. In this study the number of respondent who are suffered diarrhore, fever, acute respirotary infection found a positive association ($p<0.05$) between IMCI infection and malnutrition.

CHAPTER 6
CONCLUSIONS

In this study the malnutritional assessment of under five children among the FDMN living in refugee camp in Cox's Bazar Bangladesh revealed a high prevalence of malnutrition. The study found that among the children in research camp 15.3%, stunted 32.0%, and underweight 29.9%, a lack of access to nutritious food. The survey revealed that acute malnutrition among children at Camp4 in Ukhia, Cox's Bazar remains below the "High/Serious" level of 10% to 16%. Also prevalent are severe malnutrition and stunting. According to the updated public health criterion for stunting in 2018, there is a "Very High" level of stunting among 6-59-month-old children in the survey region (30%). Significantly greater rates of stunting were observed among children age 6 to 23 months compared to those aged 24 to 59 months. The majority of migrants live in overcrowded, unclean conditions, with little access to clean water and sanitation services, which increases the likelihood of sickness. In addition, many refugees lack access to sufficient food and medical care, resulting in widespread malnutrition and a high infant mortality rate. According to the World Food Programme, more than half of all Rohingya refugees in Bangladesh are at risk of starvation, and nearly one in five children under the age of five suffers from severe malnutrition. Due to the stress they endured, the crisis also resulted in severe mental health issues. Additionally, efforts must be made to address the core causes of malnutrition, such as poverty and relocation. The Rohingya refugee crisis has caused a serious malnutrition problem in the population. A high prevalence of undernutrition and micronutrient deficiencies has resulted from the combination of displacement, restricted access to resources, and poor living conditions. This has damaged the mental and emotional health of Rohingya refugees in addition to their physical health. Improving the Rohingya refugee camp's living conditions with supported access and enough nourishment necessitates efficient coordination between several sectors, such as health, nutrition, protection, site administration, site development, and WASH. On the basis of additional research in this subject and a nation-wide policy aimed at enhancing their standard treatment and management, we continue to exist.

CHAPTER 7
RECOMMENDATION AND FUTURE PERSPECTIVE

7.1 Recommendation:

- To reduce the prevalence of malnutrition among children under the age of five in the research sites, the community health extension activity should be supplemented with nutritional health educators. Cox's bazaar humanitarian situation intersectoral coordination group. Response can engage with the nutrition sector, and health sector and other stakeholders in order to better coordinate the provision of services for children. This can be achieved through food assistance programs, such as providing supplemental food for children or pregnant and lactating women, as well as through community gardens and agricultural projects that foster self-sufficiency.
- Special focus on children under two years because of this age people found more likely to be malnourished.
- Access to clean water and sanitation facilities can aid in preventing the spread of disease and enhancing overall health. This may include training for caregivers on how to make nutritional meals, as well as instruction on the necessity of exclusive breastfeeding for infants.
- Encourage exclusive breastfeeding for infants: Exclusive nursing for the first six months can significantly improve a child's nutritional condition and health.
- Address underlying socioeconomic issues Malnutrition is frequently a sign of underlying socioeconomic difficulties such as poverty, lack of education, and restricted access to healthcare. By addressing these underlying difficulties, the community's well-being can be enhanced.
- Collaborate with local organizations and community leaders: Collaborating with local organizations and community leaders can help to ensure that interventions are relevant and sustainable for the local context, as well as improve community buy-in.
- Promote a multi-sectoral approach: Involve relevant stakeholders and other ministries, including as agriculture, water and sanitation, and the education ministry, as well as the community, in the planning and execution of appropriate nutrition program to support under five children in Rohingya camps.

- Door-to-door complaint and feedback mechanisms should be strengthened in order to obtain information on the health and nutritional status of children.
- This study covered only one refugee camps out of 33 camps and a limited sample size. It is proposed that future research should involve a larger camp area for stronger validation of findings.

7.2 Limitation:

The study's sample size is adequate, but the lack of coverage of a wider area may restrict the generalizability of its findings to the Rohingya community in the remaining camps. It was a cross-sectional study that examined only a single instance of nutritional status. Such information as the exact age of the children may be biased. The anthropometric measurements misrepresent the real health of the children. Self-reporting of a variable may introduce a degree of informational bias. Nonetheless, a reliable sampling procedure and sample size that is statistically justifiable could confirm the study's conclusions.

7.3 Future perspective

Children's nutritional status could not be precisely assessed due to the limited scope of the researcher's investigation. Furthermore, the following future research topic ideas may be considered:

- A broader focus on expanding the proposed intervention to new locations, and maybe with a high sample size, must be done.
- The relationship between the reproductive health of Rohingya parents and its impacts on their children might be investigated.
- Micronutrient deficiency and its association.
- Broad association between water, sanitation, and hygiene and malnutrition status.

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Annex 1: Pre-structured questionnaires

Questionnaire

Assessment of nutritional status and prevalence of wasting, stunting and underweight of forcibly displaced Rohingya children 6-59 months of age living makeshift camp, cox's bazar, Bangladesh: a cross-sectional study.

Participant Consent Form

I'm **Md. Abidul Islam**, a graduate student at Chattogram Veterinary & Animal Sciences University studying applied food science & nutrition at the faculty of food science & technology. I'm carrying out a quantitative study on

Assessment of nutritional status and prevalence of wasting and stunting and underweight of children 6-59 month of age among FDMN (Forcibly Displaced Myanmar Nationals) living in Ukhiya makeshift camp, Cox's bazar, Bangladesh. The goals of this study are to evaluate nutritional status of displaced Myanmar children and find out the underlying causes of malnutrition by analysis of dietary practices, and nutritional status. An interview with you as part of the study will last between 20 and 30 minutes. Participants in this trial run little to no risk. In order to maintain confidentiality, I will try to avoid using your real name in the study itself. You have the option to exit the study whenever you choose, and you can also ask that any information gathered about you won't be used in the research. You acknowledge that you have read and comprehended the information above and that you are interested in taking part in this study by signing the form below.

Consent of the participator:	
a. Yes	b. NO

Section 1: General information:

Name of the child:		
Sex:		
Father's name:		
Mother's Name:		
FCN:		
Block:		
Camp:		
No. of Family member		
Father's occupation		
Mother's occupation		
Age category (in month)		
	6-8m	
	9-11m	
	12-23m	
	24-59m	
Age confirmation:	Data card	
	Vaccine card	
Any Disabilities:	Yes	
	No	
If yes which types of dis abilities? (according to	Have any difficulties in seeing?	

Washington questionnaires) :	Have any difficulties in hearing?	
	Have any difficulties in walking / climbing?	
	Have any difficulties in Remembering / concentrating	
	Have any difficulties in Speaking	

Section 2: Anthropometric assessment:

Oedema	
MUAC	
Height (in cm above 2 years)	
Length (in cm child Under 2 years)	
Weight (in kg)	
WFH or WFL Z score	
AFH/L Z score	
AFW Z score	
Visible sign of wasting	
IMCI danger Sign:	
Recent history of Diarrhoea	

Section 3: Types of Nutrition service received from NGOs

Does s\he Admitted any INFs (Integrated Nutrition facility) ?	Yes	
	No	
If yes than in which component?	OTP	
	TSFP	
	BSFP	

Section 4: IYCF Practice for (for 6-24m age child)

Does mother breast feed her child?	Yes	
	No	
If yes then how may time?	By day	
	By Night	
Does mother have any difficulties with breast feed?		
Is the child used pacifier?		
Does child older than 6 months received any food other than breast milk?		

Section 5: Complementary feeding information

What did mother feed her child yesterday?					
Complementary food	Is child getting anything else to eat?	What	Frequency	How much	Texture
Solid food/ Semi solid food	Staples (porridge, rice, ruti)				
	Legumes (dal, beans)				
	Vegetable				

	Fruits				
	Animal (meat/fish/egg)				
	Dairy product				
Liquid	Other milk				
	Any juice / other liquid				

Section 6: Hygiene practice

Does the caregiver wash hand with clean safe water, and soap before?		
	Preferring food	
	Before feeding	
	Before eating	
Does the care giver wash the child hand with clean water and soap before s\he eat?	Yes	
	No	
Environmental hygiene		
Source of drinking water		
Facility of sanitary latrine		

ANNEX 2: Event calendar

Month	2016		2017		2018		2019	
January (Poush-Magh)	January Winter session,	45	January Winter session, English New Year's Day	33	January Winter session, English New Year's Day	21	January Winter session, English New Year's Day	9
February (Magh-Falgun)	February End of Winter Mother Language Day	44	February End of Winter Mother Language Day	32	February End of Winter Mother Language Day	20	February End of Winter Mother Language Day	8
March (Falgun-Chaitra)	March Hervesting time work brick field,	43	March Hervesting time work brick field, Birth day of Bangabandu Independence Day	31	March Hervesting time work brick field, Birth day of Bangabandu Independence Day	19	March Hervesting time work brick field, Birth day of Bangabandu Independence Day	7
April (ChaitraBaishakh)	April Harvesting time, Bangla New year day (PohelaBoishak).	42	April Harvesting time, Bangla New year day (Pohela Boishak).	30	April Harvesting time, Bangla New year day (PohelaBoishak)	18	April Harvesting time, Bangla New year day (PohelaBoishak) Shab-e-Barat	6
May (Baishakh-	May Summer, Buddho	41	May Summer, Buddho	29	May Summer, Buddho	17	May Summer, Buddho	5

Jaishtha)	purnima		purnima Shab-e-Barat		purnima Shab-e-Barat		purnima Cyclone Foni	
June (Jaishtha-Ashar)	June Start of long rainy session, Shab-e-Barat	40	June Shobe-e Qadar & Jummatul bida/ Eid-ul Fitr	28	June Shobe-e Qadar & Jummatul bida/ Eid-ul Fitr	16	June Shobe-e Qadar & Jummatul bida/ Eid-ul Fitr	4
July (Ashar-Shrabon)	July Eid-ul fitor, Rainy session	39	July Rainy session	27	July Rainy session 2nd Nutrition Action Week, 14-19 July.	15	July Rainy session	3
August (Shrabon- Bhadro)	August Rainy Session, Janmashtami	38	August Rainy Session, Janmashtami (2nd Recent Conflict in Myanmar)	26	August Rainy Session, Eid Ul Azha	14	August Rainy Session, Eid Ul Azha	2
September (Bhadro-Ashwin)	Septembe r End of the long rainy session/ Eid-ul Azha,	37	Septemb er Eid Ul Adha, Durgapuja (Dasha mi) End of the long rainy session	25	September Moharram Ashura, Janmashtami End of the long rainy session	13	September Moharram Ashura, Janmashtami End of the long rainy session	1

October (Ashwin-Kartik)	October Durga Puja, (Bijaya Dashami) Moharram Ashura (1st recent Conflict in Myanmar)	36	October Durga Puja, (Bijaya Dashami) Moharram Ashura	24	October Durga Puja, (Bijaya Dashami)	12	October Durga Puja, (Bijaya Dashami)	0
November (KartikAgrahayan)	November Harvesting time, Start working in salt field,	35	November Harvesting time, Start working in salt field, 1st Nutrition Action Week, 17-22 Nov.	23	November Harvesting time, Start working in salt field, Eid-Emiladunnobi.	11		
December (Agrahayon-Poush)	December Christmas, Starting Winter, Eid-E-miladunnobi,	34	December Christmas, Starting Winter, Eid-E-miladunnobi,	22	December Christmas, Starting Winter, 30 December National Parliament Election	10		

ANNEX 3: Population sheet

Annex I

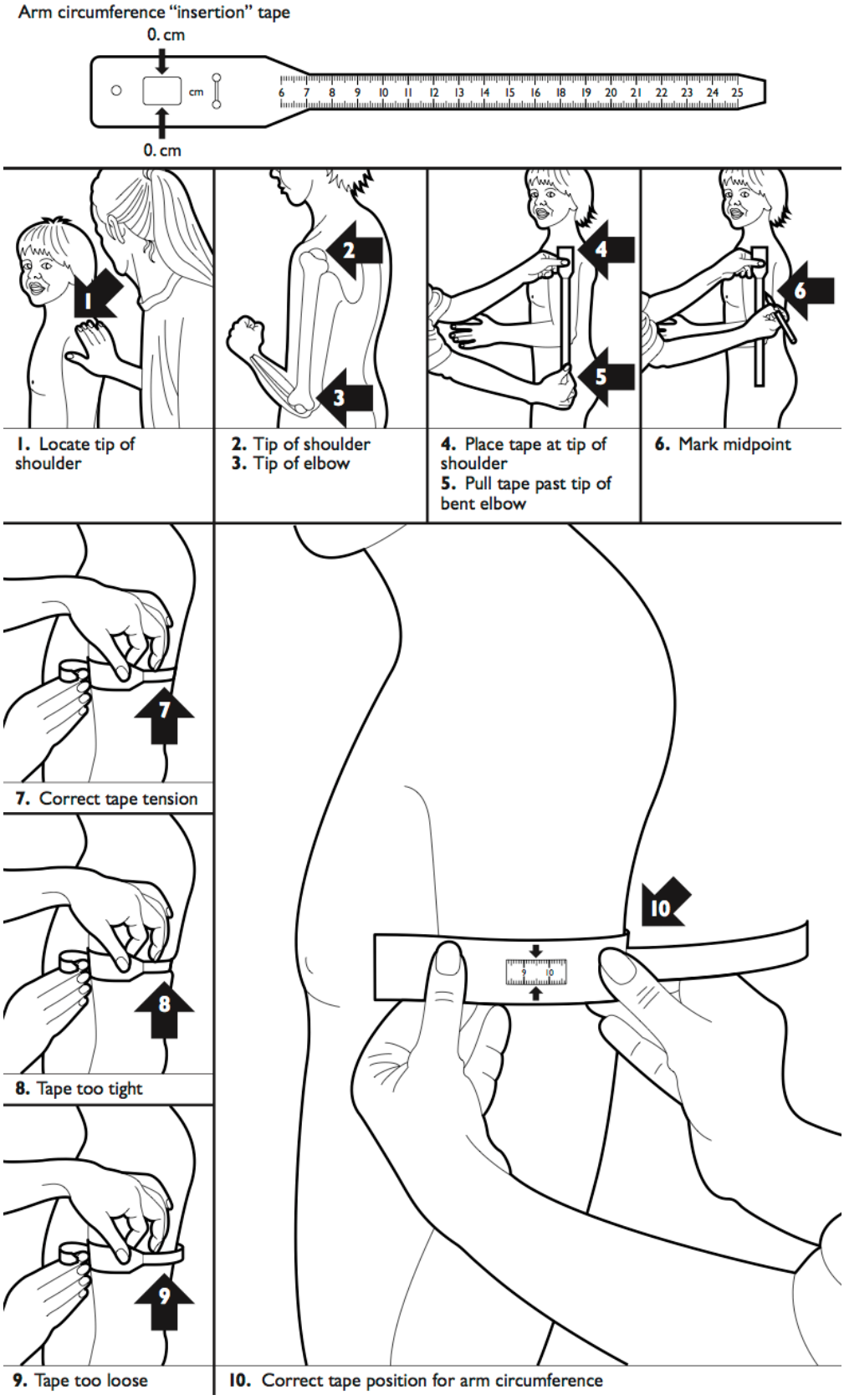
Age and gender breakdown by camp

Camp	Total Families	Total Individuals	below 1 year Infant		between 1-4 year Children		between 5-11 year Children		between 12-17 year Children		between 18-59 year Adult		60+ Elderly	
			Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Camp 1E	8,634	39,917	438	419	2,475	2,609	4,314	4,476	2,665	2,872	9,752	8,337	671	889
Camp 1W	8,328	39,045	277	314	2,236	2,328	4,504	4,593	2,686	2,814	9,617	8,077	730	869
Camp 2E	6,105	26,922	284	295	1,919	2,000	3,191	3,180	1,719	1,956	6,616	4,901	396	465
Camp 2W	5,481	24,754	243	270	1,614	1,780	2,867	2,925	1,629	1,772	6,075	4,686	378	515
Camp 3	8,113	37,256	387	345	2,480	2,523	4,191	4,356	2,384	2,654	9,108	7,454	637	737
Camp 4	7,334	32,576	278	283	2,312	2,473	3,478	3,761	2,076	2,267	8,137	6,462	482	567
Camp 4 Ext	1,964	8,710	121	139	726	747	917	963	477	553	2,106	1,665	121	175
Camp 5	5,671	26,433	319	380	2,236	2,256	2,755	2,867	1,550	1,791	6,297	5,026	428	528
Camp 6	4,998	24,383	294	311	1,956	1,826	2,698	2,899	1,493	1,620	5,665	4,724	378	519
Camp 7	8,313	38,535	314	355	2,869	2,955	4,256	4,402	2,380	2,599	9,380	7,566	621	838
Camp 8E	6,329	30,623	201	214	2,038	2,143	3,220	3,411	2,024	2,162	7,674	6,349	481	706
Camp 8W	6,670	32,077	272	289	2,257	2,353	3,655	3,667	2,039	2,290	7,757	6,363	485	650
Camp 9	7,195	33,892	183	216	2,416	2,428	3,643	3,712	2,259	2,425	8,332	6,906	590	782
Camp 10	6,417	30,844	202	204	2,168	2,207	3,369	3,541	1,993	2,216	7,667	6,165	496	616
Camp 11 Camp 17	6,243 3,992	31,351 18,299	350 279	347 312	1,943 1,371	1,969 1,494	3,597 1,967	3,657 2,023	2,097 1,119	2,315 1,219	7,540 4,432	6,383 3,483	483 248	670 352
Camp 18	6,226	28,851	226	218	2,136	2,316	3,216	3,282	1,850	1,966	7,079	5,629	383	550
Camp 19	5,133	25,076	232	245	1,567	1,667	2,807	2,962	1,715	1,904	6,156	4,930	400	491
Camp 20	1,615	7,323	129	122	569	569	753	829	466	472	1,778	1,426	83	127
Camp 20 Ext	2,242	10,084	139	155	841	863	1,071	1,097	584	628	2,432	1,963	140	171
Camp 22	4,347	22,302	211	255	1,344	1,394	2,569	2,725	1,622	1,720	5,233	4,434	336	459
Camp 23	717	3,108	4	7	181	204	405	407	258	247	761	542	51	41
Camp 24	5,870	27,155	163	184	1,757	1,833	3,119	3,186	2,000	2,131	6,840	5,048	401	493
Camp 25	1,580	7,866	85	91	449	482	949	932	589	627	1,927	1,459	135	141
Camp 26	9,028	41,617	299	332	2,746	2,817	4,877	5,015	2,916	3,115	10,478	7,613	635	774
Camp 27	3,328	16,028	162	222	1,000	1,068	1,868	1,893	1,105	1,196	3,942	3,021	242	309
Bhasan Char*	1,394	6,063	2	4	476	514	820	791	338	386	1,426	1,177	48	81
Kutupalong RC**	3,129	17,202	117	109	757	821	1,522	1,680	1,500	1,516	4,739	3,958	231	252
Nayapara RC**	4,263	22,833	142	153	1,082	1,102	2,016	2,085	1,973	2,027	6,572	4,917	390	374
Total	191,141	907,766	8,266	8,844	61,188	63,619	100,017	103,674	60,614	66,042	222,921	179,687	14,522	18,372

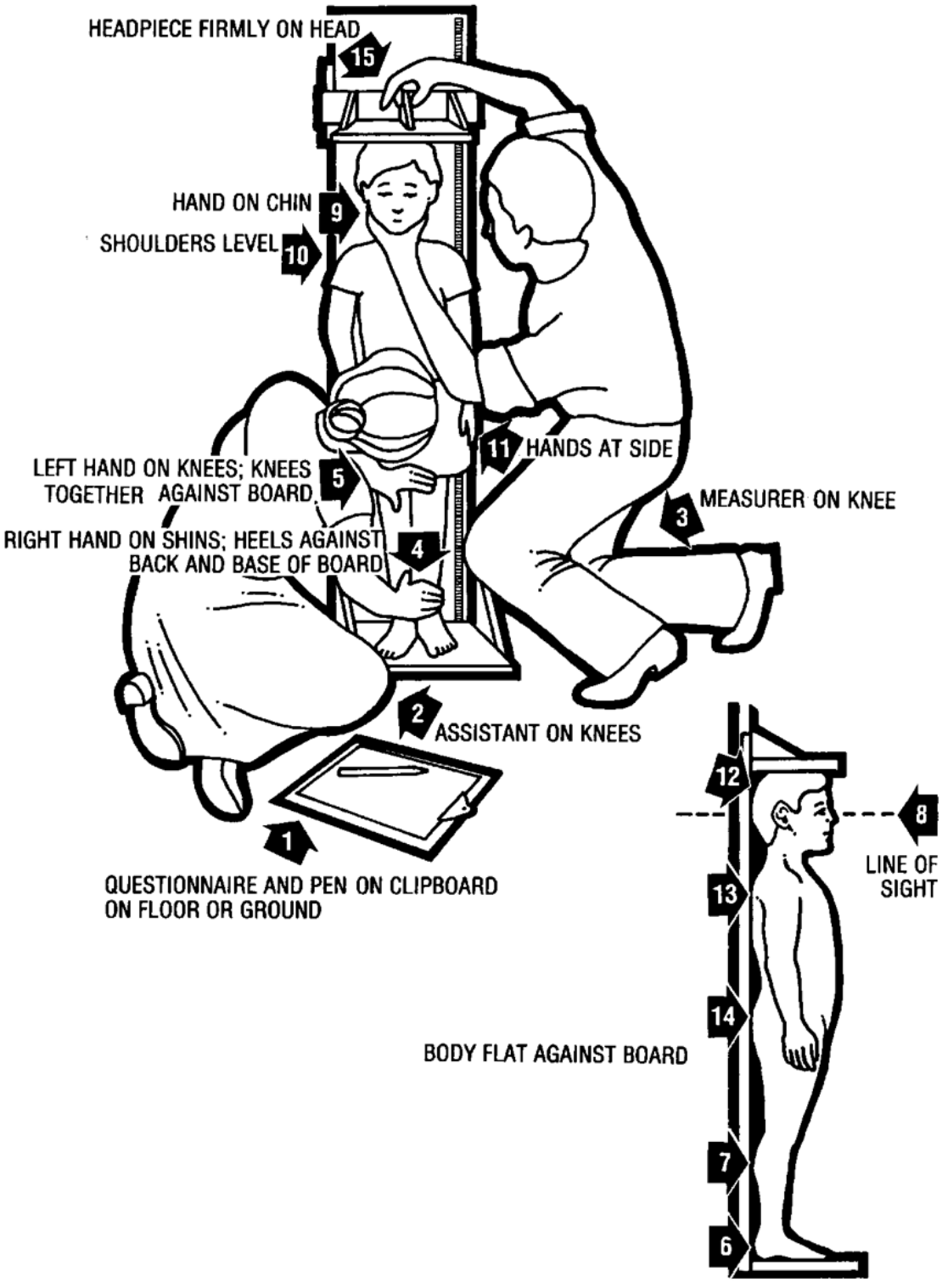
*Bhasan Char relocations data is being updated in joint GoB-UNHCR proGres database. As of 31-Oct, a total of 6,063 refugees have been updated with address as 'Bhasan Char'.
Nearly 19,000 have been relocated to Bhasan Char in total as confirmed by the office of the Refugee Relief and Repatriation Commissioner (RRRC), as of 6 April.
**Kutupalong RC includes 15,076 registered refugees of 2,616 families and Nayapara RC includes 21,072 registered refugees of 3,684 families.

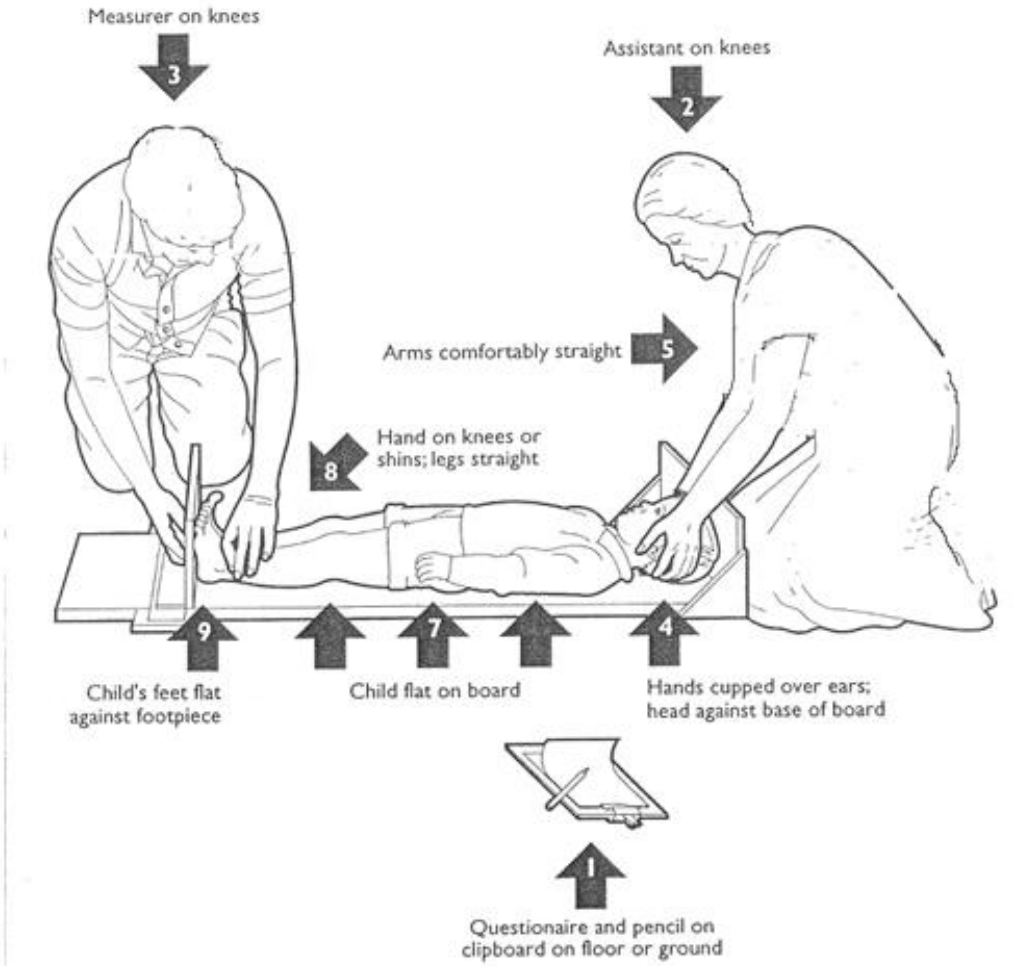
Creation date: 31 Oct, 2021 Sources: UNHCR

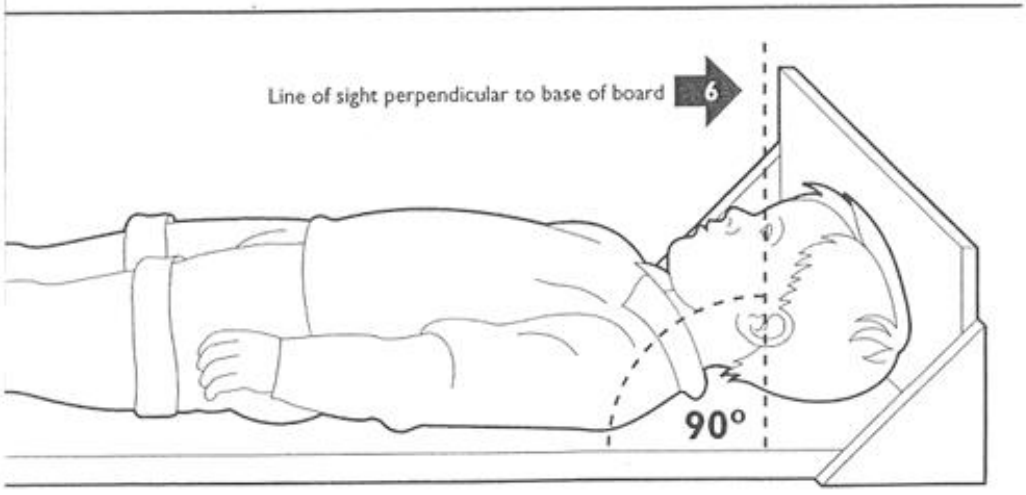
ANNEX 4: Measurement of mid-upper arm circumference (MUAC)



ANNEX 5: Measurement of body height




Measurer on knees
3
Assistant on knees
2
Arms comfortably straight
5
Hand on knees or shins; legs straight
8
9
7
4
Child's feet flat against footpiece
Child flat on board
Hands cupped over ears; head against base of board
1
Questionaire and pencil on clipboard on floor or ground


Line of sight perpendicular to base of board
6
90°

ANNEX 6: Measurement of bod weight.

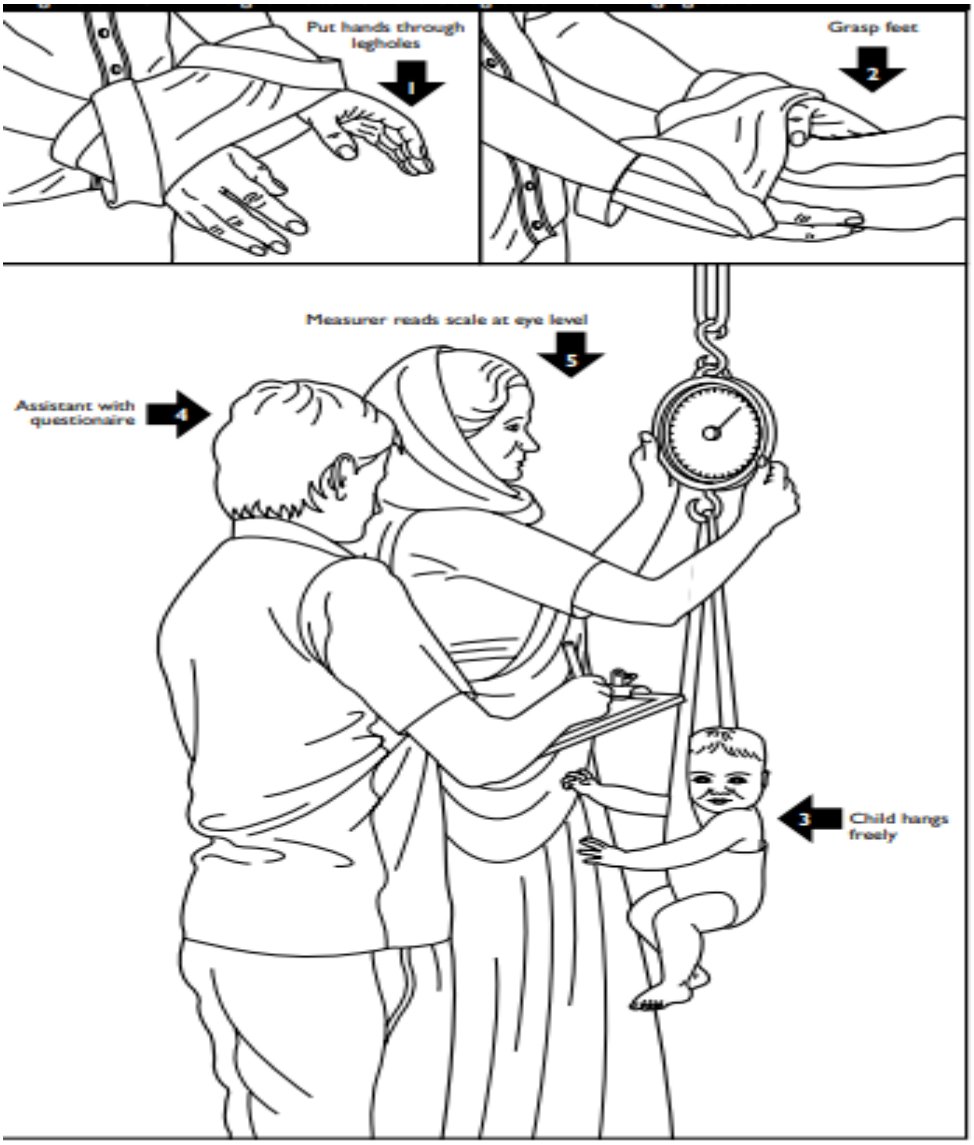
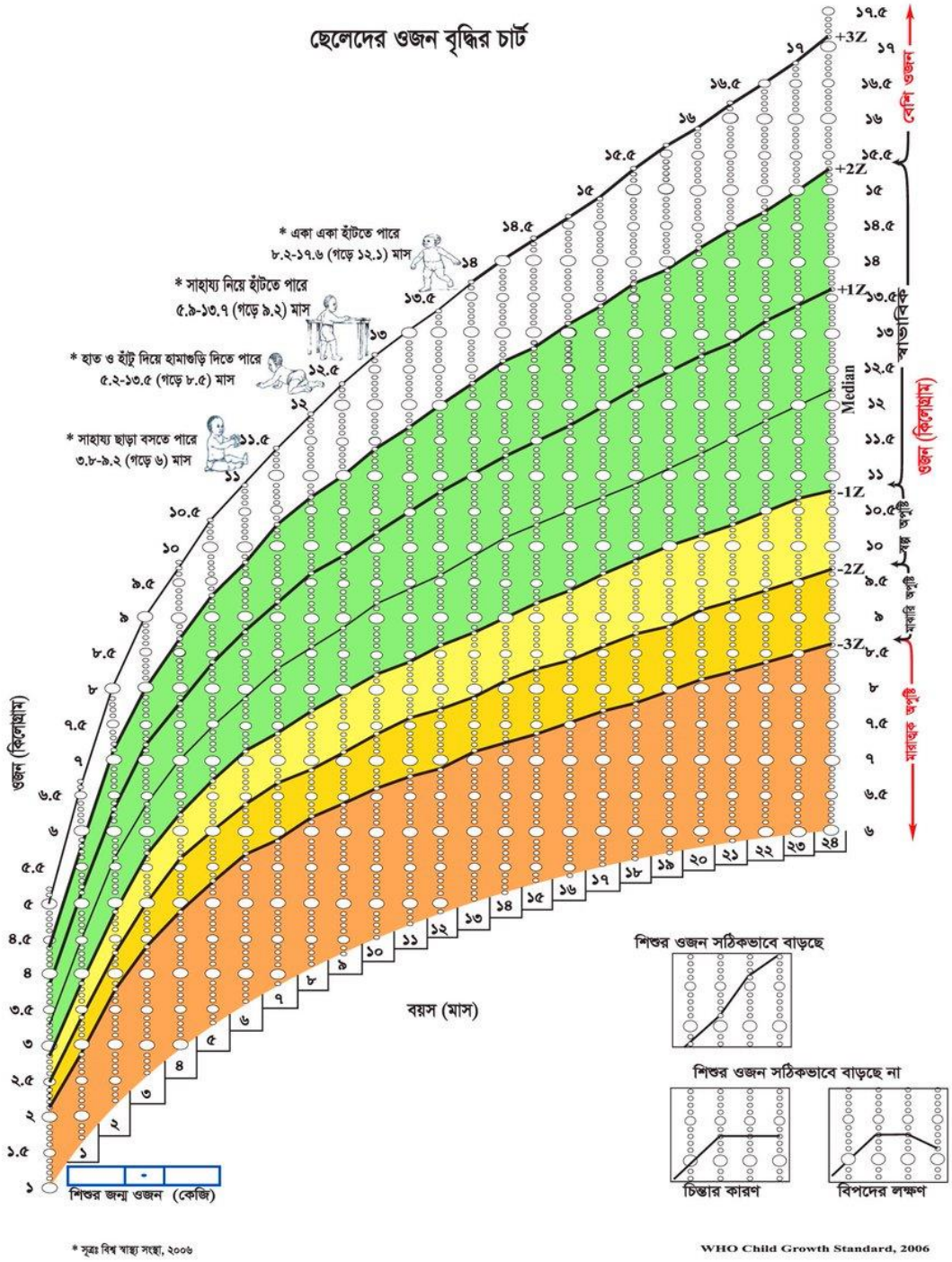
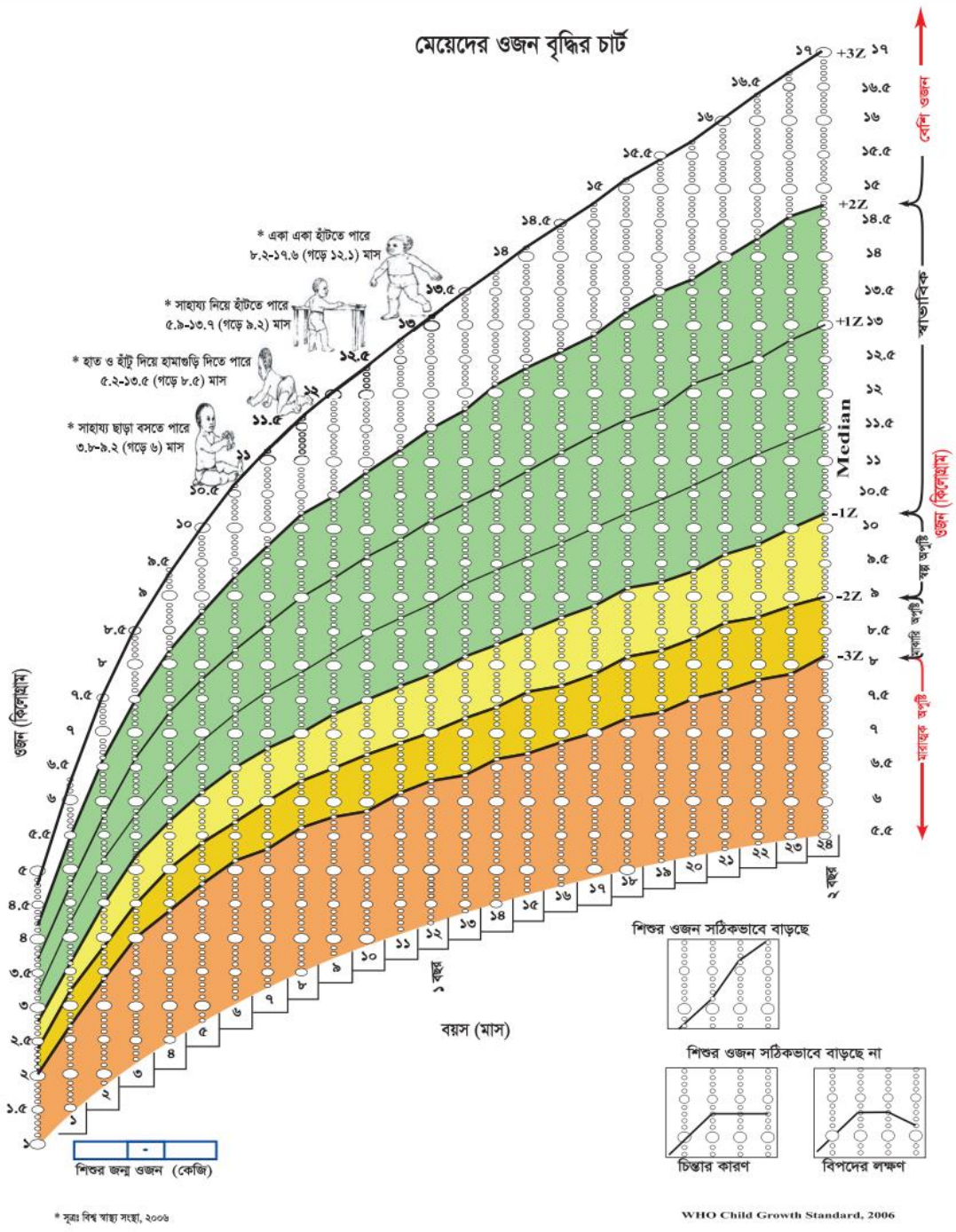


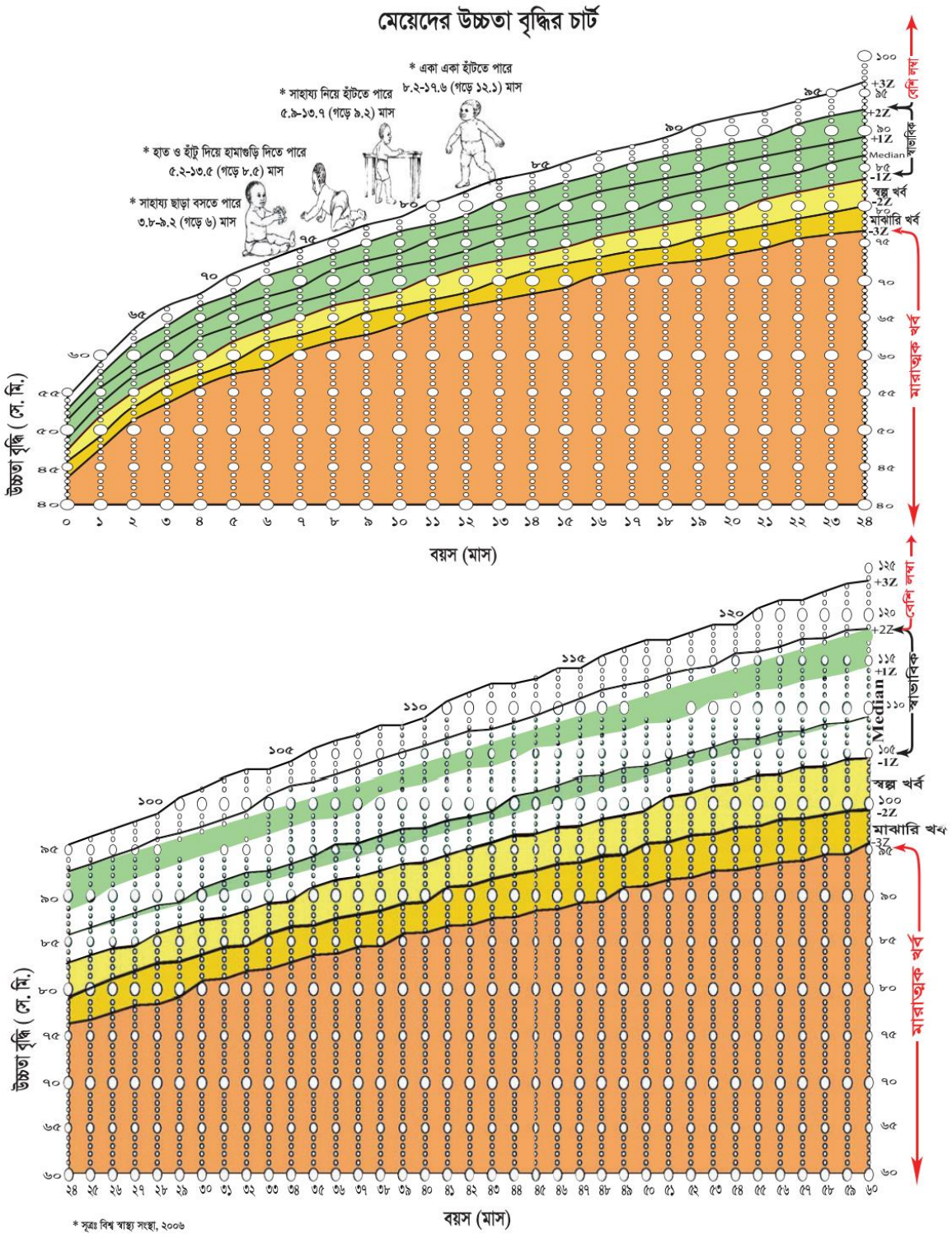
Figure: Measurement of body weight in salter scale

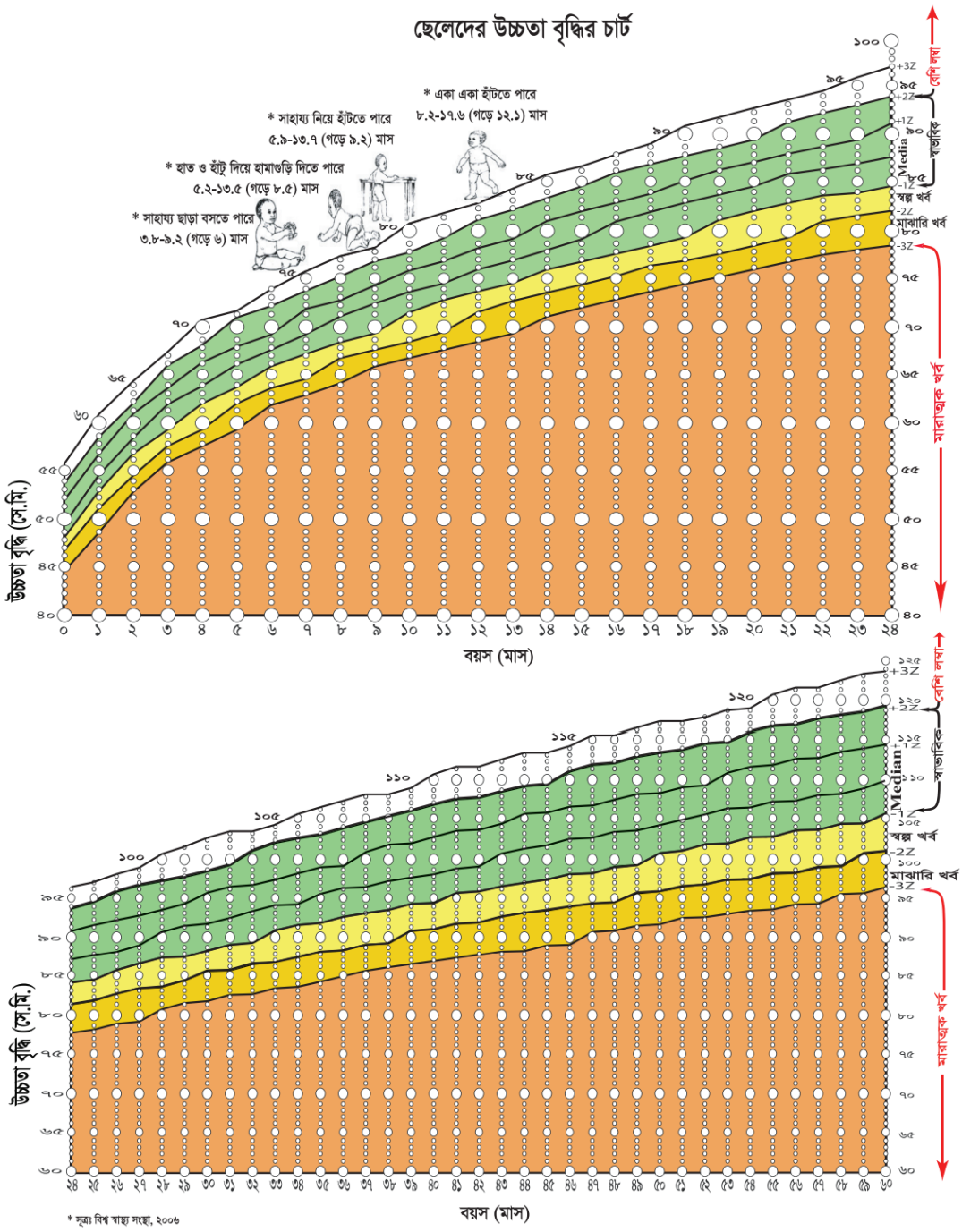
Figure: weight measurement in electric scale manually.

ANNEX 7: Weight gain reference card.




মেয়েদের ওজন বৃদ্ধির চার্ট
* একা একা হাঁটতে পারে
৮.২-১৭.৬ (গড়ে ১২.১) মাস
* সাহায্য নিয়ে হাঁটতে পারে
৫.৯-১৩.৭ (গড়ে ৯.২) মাস
* হাত ও হাঁটু দিয়ে হামাগুড়ি দিতে পারে
৫.২-১৩.৫ (গড়ে ৮.৫) মাস
* সাহায্য ছাড়া বসতে পারে
৩.৮-৯.২ (গড়ে ৬) মাস
+3Z
+2Z
+1Z
Median
-1Z
-2Z
-3Z
বেশি ওজন
স্বাভাবিক
ওজন (কিলোগ্রাম)
স্বল্প অপুষ্টি
মারাত্মক অপুষ্টি
ওজন (কিলোগ্রাম)
বয়স (মাস)
১ বছর
২ বছর
শিশুর জন্ম ওজন (কেজি)
শিশুর ওজন সঠিকভাবে বাড়ছে
শিশুর ওজন সঠিকভাবে বাড়ছে না
চিন্তার কারণ
বিপদের লক্ষণ
* সূত্রঃ বিশ্ব স্বাস্থ্য সংস্থা, ২০০৬
WHO Child Growth Standard, 2006


মেয়েদের উচ্চতা বৃদ্ধির চার্ট
* একা একা হাঁটতে পারে
৮.২-১৭.৬ (গড়ে ১২.১) মাস
* সাহায্য নিয়ে হাঁটতে পারে
৫.৯-১৩.৭ (গড়ে ৯.২) মাস
* হাত ও হাঁটু দিয়ে হামাগুড়ি দিতে পারে
৫.২-১৩.৫ (গড়ে ৮.৫) মাস
* সাহায্য ছাড়া বসতে পারে
৩.৮-৯.২ (গড়ে ৬) মাস
উচ্চতা বৃদ্ধি (সে. মি.)
বয়স (মাস)
বেশি লম্বা
স্বাভাবিক
স্বল্প খর্ব
মাঝারি খর্ব
মারাত্মক খর্ব
Median
+3Z
+2Z
+1Z
-1Z
-2Z
-3Z
* সূত্রঃ বিশ্ব স্বাস্থ্য সংস্থা, ২০০৬


ছেলেদের উচ্চতা বৃদ্ধির চার্ট
* একা একা হাঁটতে পারে
৮.২-১৭.৬ (গড়ে ১২.১) মাস
* সাহায্য নিয়ে হাঁটতে পারে
৫.৯-১৩.৭ (গড়ে ৯.২) মাস
* হাত ও হাঁটু দিয়ে হামাগুড়ি দিতে পারে
৫.২-১৩.৫ (গড়ে ৮.৫) মাস
* সাহায্য ছাড়া বসতে পারে
৩.৮-৯.২ (গড়ে ৬) মাস
উচ্চতা বৃদ্ধি (সে.মি.)
বয়স (মাস)
বেশি লম্বা
স্বাভাবিক
স্বল্প খর্ব
মাঝারি খর্ব
মারাত্মক খর্ব
Median
+3Z
+2Z
+1Z
-1Z
-2Z
-3Z
* সূত্রঃ বিশ্ব স্বাস্থ্য সংস্থা, ২০০৬

ANNEX 7: Weight for Height/length Look-up Table

Weight for Height/Length Look-Up Table

Weight-for-Length Look-up Table, Children 0-23 Months (Birth to 2 years), WHO 2006 Child Growth Standards

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

[a] Length is measured for children under 2 years or less than 87 cm height. For children 2 years or older or 87 cm height or greater, height is measured. Recumbent length is, on average, 0.7 cm greater than standing height; although the difference is of no importance to individual children, a correction may be made by subtracting 0.7 cm from all lengths above 86.9 cm if standing height cannot be measured.

Weight for Height/Length Look-Up Table

Weight-for-Height Look-up Table, Children 24-59 Months, WHO 2006 Child Growth Standards

Boys' weight (kg)				Height [a]	Girls' weight (kg)			
-3 SD	-2 SD	-1 SD	Median	(cm)	Median	-1 SD	-2 SD	-3 SD
9.5	10.2	11.1	12.0	**87**	11.7	10.7	9.9	9.1
9.7	10.5	11.3	12.2	**88**	12.0	11.0	10.1	9.3
9.9	10.7	11.5	12.5	**89**	12.2	11.2	10.3	9.5
10.1	10.9	11.8	12.7	**90**	12.5	11.4	10.5	9.7
10.3	11.1	12.0	13.0	**91**	12.7	11.7	10.7	9.9
10.5	11.3	12.2	13.2	**92**	13.0	11.9	10.9	10.1
10.7	11.5	12.4	13.4	**93**	13.2	12.1	11.1	10.2
10.8	11.7	12.6	13.7	**94**	13.5	12.3	11.3	10.4
11.0	11.9	12.8	13.9	**95**	13.7	12.6	11.5	10.6
11.2	12.1	13.1	14.1	**96**	14.0	12.8	11.7	10.8
11.4	12.3	13.3	14.4	**97**	14.2	13.0	12.0	11.0
11.6	12.5	13.5	14.6	**98**	14.5	13.3	12.2	11.2
11.8	12.7	13.7	14.9	**99**	14.8	13.5	12.4	11.4
12.0	12.9	14.0	15.2	**100**	15.0	13.7	12.6	11.6
12.2	13.2	14.2	15.4	**101**	15.3	14.0	12.8	11.8
12.4	13.4	14.5	15.7	**102**	15.6	14.3	13.1	12.0
12.6	13.6	14.8	16.0	**103**	15.9	14.5	13.3	12.3
12.8	13.9	15.0	16.3	**104**	16.2	14.8	13.6	12.5
13.0	14.1	15.3	16.6	**105**	16.5	15.1	13.8	12.7
13.3	14.4	15.6	16.9	**106**	16.9	15.4	14.1	13.0
13.5	14.6	15.9	17.3	**107**	17.2	15.7	14.4	13.2
13.7	14.9	16.2	17.6	**108**	17.6	16.0	14.7	13.5
14.0	15.1	16.5	17.9	**109**	18.0	16.4	15.0	13.7
14.2	15.4	16.8	18.3	**110**	18.3	16.7	15.3	14.0

[a] Length is measured for children under 2 years or less than 87 cm height. For children 2 years or older or 87 cm height or more, height is measured. Recumbent length is, on average, 0.7 cm greater than standing height; although the difference is of no importance to individual children, a correction may be made by subtracting 0.7 cm from all lengths greater than 86.9 cm if standing height cannot be measured.

ANNEX 8: Anthropometric measurement photo gallery

Figure: Measurement of MUAC

Figure: Measurement of body Weight.




Figure: Measurement of body height


Figure: Interview were taken from caregiver of displaced Myanmer children.

Figure: A boy of displaced child with visible sign of wasting (PEM).

BRIEF BIOGRAPHY

This is **Md. Abidul Islam**, Son of late. Md. Nurul Islam and Morzina Akter. He had passed the Secondary School Certificate Examination in 2011 and then Higher Secondary Certificate Examination in 2013 under Chittagong board. He obtained his B.Sc(hon's) degree in Food Science and Technology from Faculty of Food Science and Technology, Chattogram Veterinary and Animal Sciences University, Khulshi, Chattogram. Now, He is a candidate for MS in Applied Human Nutrition and Dietetics under the Department of Applied Food Science and Nutrition, Faculty of Food Science and Technology, CVASU. He is keen to do further research in the Applied Nutrition and Clinical Nutrition sector and contributes his knowledge in improving the nutritional status of the people throughout the world.