CHAPTER-1

INTRODUCTION

1.1 Background of the study

Pregnancy is an anabolic process and a woman's normal nutritional requirement increases during pregnancy to meet the needs of the growing fetus and the maternal tissues associated with pregnancy. Since the nutritional status of the expectant mother is one of the most important determinants affecting pregnancy outcomes (Ramakrishnan, 2004), good maternal nutrition is important for the health and reproductive performance of women and the health, survival, and development of their children (Mora and Nestel, 2000).

Maternal factors are associated with intrauterine growth which together with infant nutrition has further impacts on reduced capacity in adult life, including reduced stature, lower physical work capacity, impaired cognitive function and educational attainment and also there is an increased risk of low birth weight in the next generation. There is evidence regarding improved dietary quality for the mother increases fetal growth (Savy *et al*., 2005). It is therefore important for the diet to be varied so as to provide the required nutrients and avert maternal malnutrition which deteriorates the health of the mother and may lead to mortality.

Available scientific evidence suggests that dietary diversity scores can be a measure of micronutrient diet adequacy of women (Hoddinott and Yohannes, 2002). Dietary diversity is defined as the number of different foods or groups of food consumed over a period of time, most often in a day or in a week (Ruel, 2003)

Inadequate intakes of specific nutrients in pregnancy have been reported to be a leading cause of poor maternal nutrition status resulting in a myriad of poor maternal and infant outcomes (Black *et al*., 2008). Poor nutrient intake therefore affects the maternal health and the health of the infant.

Maternal under nutrition ranges from 10 to 19 percent in most countries across the world. A serious maternal undernutrition problem is evident in most countries in sub-Saharan Africa, South-central and Southeastern Asia, and in Yemen, where more than 20 percent of women are malnourished (Black et al., 2008). Nutritional and

hormonal factors in pregnancy influence not only the immediate fetal outcome but also morbidity and mortality in later life (Duggan, 2003).

Lack of diversity has been identified by other studies to be a particularly severe problem among poor populations in the developing world, whose diets are predominantly starchy staples and the consumption of animal products, seasonal fruits and vegetables is generally absent or Minimal (Becquey *et al.*, 2009; Arimond and Ruel, 2004). Those most likely to suffer from deficiencies include infants and young children, adolescent girls and women of reproductive age (WRA) (Arimond *et al*., 2010, Becquey *et al*., 2009). These vulnerable populations have been found to switch to cheaper foods that will give a feeling of fullness in their stomachs without regard to how nutritious the foods are (Brinkman *et al*., 2009). In developed countries, there are a number of studies linking dietary diversity to nutrient intake, particularly among adults (Arimond and Ruel, 2004). A pregnant woman requires a varied diet to meet her nutritional requirements and thus improve her nutritional status. It is considered that inadequate intake of calories and nutrients, combined with a heavy workload, impacts adversely on the health of the mother, the developing fetus and the newborn.

Consumption of a variety of foods from various food groups has been found to be beneficial for human health (Mpontshane *et al*., 2008). Dietary diversity has been shown to be an aspect of dietary quality and therefore has been accepted to give an indication of general nutritional adequacy (Becquey *et al*., 2009; FAO, 2007). Dietary variety and nutritional adequacy with regard to the key vitamins and minerals, distribution of food within the household has been found to affect nutritional status of individuals. In addition, preparation of food and feeding practices has effects on nutrition and in turn the health of an individual. It is therefore important for each individual to meet his/her needs for different nutrients through a healthy, varied and balanced diet (Savy *et al*., 2005).

1.2 Problem Statement

For a healthy pregnancy outcome, studies have shown that it is important for the nutritional status of a woman before and during pregnancy to be good (Black *et al*., 2008). A non- diversified diet can have negative consequences on individuals' health, well-being and development, mainly by reducing physical capacities and resistance to infection. In addition, cognitive development, reproductive and even social capacities may also be impaired (Savy *et al*., 2005). Diets during pregnancy have been shown to have an effect on the overall nutritional status of the woman due to the increased nutritional requirements.

Studies have indicated that the nutrition of women has consequences for all the other age cohorts directly and/or indirectly. Typically, most of the women in parts of South Asia including Bangladesh enter pregnancy with a poor nutrition status. It has been found that most of the time, the women may enter pregnancy with iron deficiency anemia and may have other micronutrient deficiencies which adversely affect her health and that of the fetus. One of the Sustainable Development Goals (SDG) is to improve maternal health and thus reduce maternal mortality by three-quarters (Kenya National Bureau of Statistics & ICF Macro, 2010**)**, and SDG also aims at reducing infant mortality.

The goal of reducing maternal and infant mortality may not be achieved considering that maternal nutritional status contributes a great deal to both. In addition, there is limited information with regard to dietary diversity and its association with maternal nutritional status at Rohingya Camp, Kutupalong, Ukhiya, Cox's Bazar which is a hilly and arid area and prone to frequent disasters and these make the area vulnerable to food insecurity. Therefore, this study is aimed at determining dietary diversity, the nutritional status and factors influencing pregnant women so as to increase knowledge in the area and thus improve the practice.

1.3 Purpose of the study

Malnutrition among Pregnant and Lactating women is a critical problem because its effects are long lasting and go beyond herself and child. It has both short- and long-term consequences. For instance, malnourished as compared to non-malnourished Pregnant and Lactating women their child are physically, emotionally and intellectually less productive and suffer more from chronic illnesses and disabilities.

Malnutrition among Pregnant and Lactating women and their children depends on complex interactions of various factors reflecting socio-demographic, environmental, reproductive, institutional, cultural, political and regional factors.

There are several competing determinants for nutrition and health of children. Among all, gender is centrally focused in health-nutrition corollary. Denial, discrimination and disempowerment in terms of gender can have multiplier effects on the future of children and is a central hub of the health-related SDGs. Investing in nutrition especially in girl children is already proven to have huge benefit-cost ratio as depicted in the World Bank and other studies. Since women and female children are focal point in SDG 4 and 5 and an indispensible part of other SDGs. It is essential to explore the sex and gender differentials in terms of low birth weight, protein energy malnutrition, underweight, stunting, nutritional dwarfing and emaciating conditions.

The purpose of the study was to assess the nutritional status and dietary diversification of pregnant women and the factors affecting them at Rohingya Camp, Kutupalong,Ukhiya, Cox's Bazar.

1.4 Objectives of the study

- **i)** Assessing the nutritional status of pregnant women living at Rohingya camp, Kutupalong, Ukhiya, Cox's Bazar.
- **ii)** Establishing the association between demographic factors (marital status, age level and education level) and dietary diversification of pregnant women.

1.5 Significance

The findings of the study may be used by Ministry of Health and other organizations working in the promotion of maternal health to implement programs aimed at improving dietary diversity among pregnant women as a way to improve maternal nutritional status in the refugee context and other areas with similar circumstances.

The study has also contributed to knowledge on dietary diversity and factors related to it.

1.6 Delimitations

The study was carried out among pregnant women attending the survey at Rohingya Camp, Kutupalong, Ukhiya, and Cox's Bazar. And thus the research findings can only be applied to area with similar characteristics.

1.7 Limitation

The study was purposive sampling type and thus data collected does not show variation in anthropometric, demographic and dietary practices by seasons of the year. Also there is the shortage of some instrument that could be used to assess the nutritional status properly. Besides, language of Rohingya people acted as an impediment to deal with them properly.

1.8 Assumptions of the Study

The study made the assumption that all pregnant women that attended the survey did so willingly and that they gave correct and true information as much as possible.

CHAPTER-2

Review of Literature

The nutritional status of a woman has been found to be very important and critical as it determines and allows for a healthy pregnancy outcome (Khoushabi and Saraswathi, 2010; Black *et al.,* 2008). Maternal intake of carbohydrates and protein, fatty acids and micronutrients such as zinc, iron, magnesium, calcium, riboflavin and vitamin C have important effects on growth of the foetus and perinatal outcomes (Baer *et al.*, 2005). For maternal stores not to get depleted, the mother's diet should provide adequate nutrients (Khoushabi and Saraswathi, 2010). However, developing countries such as Bangladesh, Mayanmar, China, Sudan, and Nigeria and in developed countries like the USA, have reported inadequacy of macronutrient and micronutrient intake among pregnant women (Sukchan *et al*., 2010). The study sought to give information on the nutrient adequacy of pregnant women's diets with their anthropometric and demographic measurement.

2.1 Assessment of Anthropometric Measurement:

A pregnant woman's nutritional status has important implications for her health as well as the health of her children. It has been established that sufficient nutrition before and during pregnancy has the potential for the promotion of a long term health of the mother and her child (Khoushabi and Saraswathi, 2010). Maternal nutritional factors account for approximately 5 percent of intrauterine growth retardation in developing countries and the weight of an infant has been found to be dependent on the mother's health and nutrition during pregnancy (Muthayya, 2009).

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

lean bodies' mass and fat mass. Moreover, it does not provide information on body composition (Barlow 2007).

2.2 Assessment of Dietary Diversity:

Dietary diversity is defined as the consumption of an adequate variety of food groups and it has been accepted as an aspect of dietary quality and can indicate nutritional adequacy (Becquey *et al*., 2009 ; Mpontshane *et al*., 2008; FAO, 2007). It postulates that increasing the variety of foods and food groups in the diet helps ensure adequate intake of essential nutrients and promotes good health (Becquey *et al.*, 2009).

A number of studies have been able to link dietary diversity to the intake of nutrients specifically among adults in the developing countries like Kenya (Thorne-Lyman *et al.*, 2009; Arimond and Ruel, 2004). Another study done among women in Malaysia affirmed that after adjusting for other variables, diet diversity score has remained a significant protective factor against health risks where women with a higher DDS were more likely to have <3 health risks (Mohamadpour *et al.*, 2012). However, as there is limited information on dietary diversity among pregnant women, this study aimed to determine the dietary diversity and its relation to nutritional status.

Consumption of a large variety of foods is an internationally accepted recommendation for a healthy diet which has greatly been associated with positive health outcomes such as reduction in the incidence of cancer or mortality (Drescher *et al.*, 2007). Low dietary diversity has been associated with specific nutrient deficiencies and with stunting, an important health indicator, independently of socioeconomic status (Mpontshane *et al*., 2008).

A diversified diet has been associated with a number of improved outcomes in areas such as birth weight, child anthropometric status and improved haemoglobin concentrations. A more diversified diet has been highly correlated with such factors as caloric and protein adequacy, percentage of protein from animals' sources which are considered as high quality protein, and household income (FSAU, 2006). In addition, it has been found that the consumption of a varied diet leads to a reduced risk of

developing a deficiency or excess of any one nutrient and is therefore associated to the dietary nutrient quality (Esmaillzadeh *et al*., 2006).

2.3 Assessment of Demographic Measurement:

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

2.4 Consequences of Poor Anthropometric, Dietary and Demographic Diversity on Maternal Nutrition:

Lack of access to adequate and diversified diet has been identified as one of the severe problems among poor populations especially in countries where resources are limited and the results varies from nutrition problems (Ekesa *et al.,* 2011). It has been found out that chronic energy deficiency, inadequate energy intake and micronutrient deficiencies are the leading nutritional problems that affect women of reproductive age. Moreover, other studies have shown that when energy and protein deficiency occurs in the mother it is associated with intrauterine growth retardation (Fall, 2009).

Micronutrient malnutrition has remained a problem of public health concern in most developing countries, partly due to the consumption of monotonous, cereal-based diets that lack diversified (Kennedy *et al*., 2007). Low amount of micronutrient intake has been found to be a problem even in countries undergoing transition in terms of development and has been a dominant problem in many of the poorest regions across the world (Arimond and Ruel, 2004). However, it is noted that in many parts of South Asian regions, including Mayanmar, Bangladesh the scenario is that most of the women conceive baby with a relatively poor nutritional status suffering from under nutrition and many will be affected by a micronutrient deficiency or may develop a deficiency during pregnancy.

2.5 Factors Affecting Individual Anthropometric, Demographic and Dietary Diversity

2.5.1 Socio-economic Factors and their Effect

Dietary diversity has been strongly associated with socioeconomic status (SES) of a household (Arimond and Ruel, 2004). A study found that a higher socioeconomic status was associated with higher dietary diversity and better micronutrient adequacy (Ponce *et al.,* 2006). Other studies have shown that families which have greater incomes and resources tend to have more diverse diets as food access is determined by income and the prices of foods (Brinkman *et al*., 2009; Ponce *et al.*, 2006; Arimond and Ruel, 2004). Studies have been done and it has been demonstrated that high food prices are a challenge to accessing a diverse diet as they contribute to the erosion of the coping capacities of many households and countries across the developing world.

2.5.2 Maternal Factors and their Effect

Maternal factors (age, marital status, education level) have been shown to influence the dietary diversity. A low education level and unemployment are associated with an unhealthier diet. In addition, dietary patterns have been shown to vary according to demographic profiles, including gender, marital status. Less education, specifically, regardless of other factors, is directly associated with poorer food choices due to lack of the necessary knowledge and also lack of the resources. As a result of the low education particularly among women who are charged with the responsibility of food choice and preparation, there is less dietary diversity (Mazur *et al.*, 2003). The study focused on maternal factors mentioned above and how they affect dietary diversity.

2.6 Summary of Literature Review

Maternal under nutrition, including chronic energy and micronutrient deficiencies, is prevalent in many regions, especially in South-Central Asia, where in some countries more than 10 percent of women aged 15–49 years are shorter than 145 cm (Black *et al.,* 2008). Women who suffer from chronic energy deficiency have an increased risk of obstructed labour as a result of a contracted pelvis which is more common when malnutrition is prevalent. There is an increased risk of mortality especially in communities in which under nutrition in childhood is common and it accounts for eight percent of maternal deaths worldwide (Neilson *et al.,* 2003). There is also an increased risk of giving birth to low birth weight babies which is a well- known risk factor for neonatal and infant mortality, increased morbidity, impaired mental development, and the risk of chronic adult disease.

In summary, the importance of anthropometric, demographic and dietary diversity cannot be overlooked considering the fact that it significantly influences both the nutritional status of the mother and the fetal outcome. Though the importance of dietary diversity is an indicator of nutrient adequacy has been shown, there is limited knowledge especially on its association with the nutrition status of pregnant women. The study therefore determined the dietary diversity, factors affecting it, and the nutritional status of pregnant women at Rohingya Camp, Kutupalong, Ukhiya, Cox's Bazar.

CHAPTER-3

RESEARCH METHODOLOGY

3.1 Research Design

The study was considered as cross sectional study and the kind of sample is purposive sampling. This methodology was chosen to show the anthropometric, demographic, dietary diversity status, factors affecting dietary diversity and also the nutritional status of the pregnant women at a point in time.

3.2 Study Variables

The dependent variables were maternal nutritional status and dietary diversity. Independent variables include education level, and marital status and BMI level.

Conceptual Framework/Variables

a. Dependent variables

- Nutritional status
- Dietary diversity.

b. Independent variables

Socio-demographic Variables

- Age
- Educational level

3.3 Location of the Study

Kutupalong (Camp 2E) is one of the prominent camps among Rohingya camps. It lies between longitudes 92.162764 to the latitude 21.215185 to. It is situated in the West zone of Kutupalong and borders Modhurchara to the south and Ukhiya to the north.

3.4 Target Population

The study targeted pregnant women attending the survey at Rohingya Camp, Kutupalong, Ukhiya , Cox's Bazar.

3.5 Inclusion criteria:

Pregnant women with willingness to participate in the study and who are the dwellers at Kutupalong Rohingya camp. Pregnant women are getting WSB (Wheat Soy Blend) cereal and many other daily food commodities (Rice, Oil and pulse) funded by World Food programmme and many other local and international non-government organizations (NGOs).

3.6 Exclusion criteria:

Pregnant women with chronic diseases such as hypertension, diabetes, Tuberculosis and HIV/AIDS; those enrolled in intervention programs as this intervention would have an impact on the nutritional status and dietary diversity and thus bias the results of the study.

3.7 Sample size determination

The sample size for this study is determined by following formula:

n= —— (Adikari *et al.*, 2016**)**

Where,

n= desired sample size.

z=Value of standard normal distribution as given level of significance (confidence level), usually considered 1.96 at 95% Confidence Interval

p= Prevalence of under nutrition among Pregnant Women (according to UNHCR 2017 the Prevalence of under nutrition among Pregnant Women in Kutupalong Rohinga camp (Makeshift, Ukhiya Coxs Bazar) 31% (0.31).

q= 1-p=1-0.31=0.69

E=Allowable error in the study 5% (0.05)

By using this equation,

Sample size (n) = $[(1.96)^2 x 0.031 x\ 0.69]/ (0.05)^2$ = 328.7=329

3.8 Sampling Techniques

Kutupalong is one of the semi-arid and hilly camps among the Rohingya camps which experiences frequent disaster and therefore is prone to food insecurity.

Kutupalong camp was purposively chosen because diversity among different factors influencing pregnant women nutritional status is higher than any other camps. From the total population of pregnant woman, the sample was collected until the target data (39%) was achieved. Data was collected so carefully to avoid biasness.

3.9 Selection and Training of Research Assistants:

One research assistant has been recruited to assist in the study. There was also an assistant, chosen from the camp experienced in data collection. He got trained on the objectives of the research and data collection procedures. Information of Pregnant women was collected through the questionnaire, by reading through question to ensure familiarization and clarity of the responses.

3.10 Research Instruments and Equipment

For anthropometric measurement, a weighing machine and a height measuring tape were used. After finding the data of weight and height then they were put into the BMI index formula. Here BMI means Body Mass Index; it is the ratio of weight in kg to the height in meter. It is the easiest and less affordable method to find out the nutritional status according to the weight and height of the subject.

Depending on the objectives of a study, dietary diversity can be measured by using several methods such as a household or individual dietary diversity questionnaire in which dietary diversity score is used (FAO, 2007). Dietary diversity scores are created by adding either the number of individual food items that have been consumed over a reference period or the various food groups. Individual Dietary Diversity Score (IDDS) uses 16 food groups which include. Cereals; Vitamin A rich vegetables and tubers; White roots and tubers; Dark green leafy vegetables; Other vegetables; Vitamin A rich fruit; Other fruits; Organ meat; Flesh meat; Eggs; Fish; Pulses/Legumes, nuts and seeds; Milk and milk products; Oils and fats; Sweets and sugar and condiments and spices. The IDDS aims to capture nutrient adequacy and studies have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy (Foote *et al.,* 2004).

Promotion of diverse diets is one of several approaches to improving micronutrient nutrition for Women Reproductive Age; additional diet quality indicators would be needed in settings where other strategies, including fortification, bio fortification and/or supplementation, are used. Furthermore, diet quality is multidimensional. In addition to micronutrient adequacy, high-quality diets are characterized by balance

intake of protein, carbohydrates and fat (Institute of Medicine, 2005) and moderation in consumption of certain foods – those low in nutrient density and those associated with increased risks for chronic disease (George *et al*., 2014).

For demographic and dietary measurement an individual dietary diversity questionnaire (Appendix VI) recommended by FAO (FAO, 2007) was adopted and modified to collect data on dietary diversity, socio demographic and other factors influencing dietary diversity and nutritional status. The questionnaire was divided into 5 sections: socio-demographic information, 24 hour recall, dietary diversity, socioeconomic characteristics and cultural beliefs used to determine the nutritional status of the pregnant women. The socio-demographic data required were: - age, marital status and level of education.

Using the 14 food groups, dietary diversity categories were formulated namely; low dietary diversity category (≤3 food groups); medium diversity category (4 to 5 food groups) and high diversity category (≥6 food groups) (FAO. 2006).The respondent's dietary diversity score were then categorized based on their position on the categories. Additionally, dietary diversity score variable was dichotomized as category 0 for those not meeting the minimum dietary diversity and category 1 for those meeting the minimum diversity. Consumption of four or more food groups of the fourteen food groups were reckoned as Minimum Dietary Diversity.

The selected women were firstly asked for their last 24-hour dietary recall, then followed up to their houses to confirm with household measurements. The 24 hour dietary recall was used as it minimizes recall bias and it conforms to recall time period used in many other studies (Kennedy *et al*., 2007, Savy *et al*., 2005, Arimond and Ruel, 2004). The 24 hr. dietary recall involved asking the respondents to recall all the drinks and food eaten in the previous day in chronological order starting with the food eaten in the morning through the day up to the time the respondents went to sleep. Probing was done to ensure no foods or drinks were omitted.

3.11 Pre-Testing of Instruments

3.11.1 Reliability

The questionnaires were pre-tested to check on the length, content, question wording and language. This allowed modifications on the questionnaires by correcting mistakes and inclusion of foods that may have been missed out or elimination of

foods that may not be applicable in the camp context level. Ambiguous questions were corrected to ensure clarity and to elicit the required information therefore enhancing reliability. The order of questions was changed to start with the more general ones so as to put the respondent at ease**.**

3.11.2 Validity

To ensure validity, the questionnaire was tested and validated by peers and other technical persons so as to ensure that the questions elicited the required answer.

3.12 Data Collection Procedures and Techniques

Data were collected on a daily basis during the five working days i.e. Sunday to Thursday. The respondents were interviewed in a private room. Anthropometry measurements such as BMI index is calculated by weighing machine for weight and height measuring measurement for height by using a height scale.

Two focused group discussions were held with purposively selected groups of women at the end of the study period. The discussions were held in a private room with just the participants, research assistant and observer present. Participants were assured that information shared during these discussions was confidential and thus they were encouraged to give their answers with utmost freedom. The two groups that participated in the focused group discussions consisted of 10 and 12 women respectively and the discussions took 50 and 60 minutes respectively. Any question that had been raised during the discussion answered in the most possible comprehensive ways.

3.13 Data Analysis and Presentation

Completed questionnaires were checked on a daily basis for accuracy and completeness in recoding of responses. Editing and coding was done before data entry. Data were entered and analyzed using SPSS version 16, while dietary intake data from 24-hour recall was entered. For dietary diversity, from the list of 16 food groups which include Cereals; Vitamin A rich vegetables and tubers; White roots and tubers; Dark green leafy vegetables; Other vegetables; Vitamin A rich fruits; Other fruits; Organ meat; Flesh meat; Eggs; Fish; Pulses/Legumes, nuts and seeds; Milk and milk products; Oils and fats; Sweets and sugar and condiments and spices were used as recommended by FAO. However, for analysis purposes, two food groups, sweets and condiments were excluded and thus 14 food groups out of the 16 were used

(FAO, 2007). The two food groups were excluded as recommended as they are usually consumed in very small amounts.

Table 3.1 Categories of food groups (FAO, 2008)

Sl.no	Food groups	Points
1	Cereals	1
2	Oils and fats	1
3	Milk and milk products	1
4	Dark green leafy vegetables	1
5	Other vegetables	1
6	Legumes, nuts and seeds	1
7	Other fruits	1
8	Flesh meats	1
9	White tubers and roots	1
Sl.no	**Food groups**	**Points**
10	Vitamin A rich fruits	1
11	Fish	1
12	Eggs	1
13	Organ meat (iron rich)	1
14	Vitamin A rich vegetables and fruit	1
	Total Points	14

Data generated from 24 hour dietary recalls were then transferred to SPSS for analysis with other variables. Responses from Focused Group Discussions were arranged in general categories identified in the discussion guideline then coded. Common themes were identified, inferences made from each theme and conclusions drawn was then triangulated with the data from the questionnaire.

3.14 Ethical and Logistical Considerations

Permission and approval to carry out the research was sought from Chattogram Veterinary and Animal Sciences University. The questionnaires were administered to the respondents upon obtaining an informed written or thumb print consent (Appendix II). Before consent was obtained, the researcher and the research assistant explained the purpose of the study and respondents were assured of confidentiality of the information they provided. To ensure privacy, names and other means of identity were not used during the data collection. It ensures that all information obtained was kept in strict confidence and was only for purpose of the study.

CHAPTER-4

RESULTS

In this chapter, the study findings according to the objectives like Demographic and anthropometric characteristics, dietary diversity and dietary intake of the Respondents. Findings have been presented in bar charts, pie charts, and tables.

4.1 Anthropometric characteristics of the respondents

The height and weight of the respondents were put into the BMI formula ((BMI = weight in kg/ (height in meters) 2). Maternal height was measured with the height scale to the nearest 0.1 cm. The Seca digital adult scale was used to weigh participants to the nearest 0.05 kg. Result was then categorized according to the range. From the chart we can say that maximum of the respondents was normal in health, that is almost 62% (n=204). One third is underweight that is 37 %(n=121) and one person is overweight that is 1 %(n=4).

Table 4.1: BMI categorization

BMI Score	Nutritional status
≤ 18	Underweight
18.5-24.9	Normal
≥ 25	Overweight

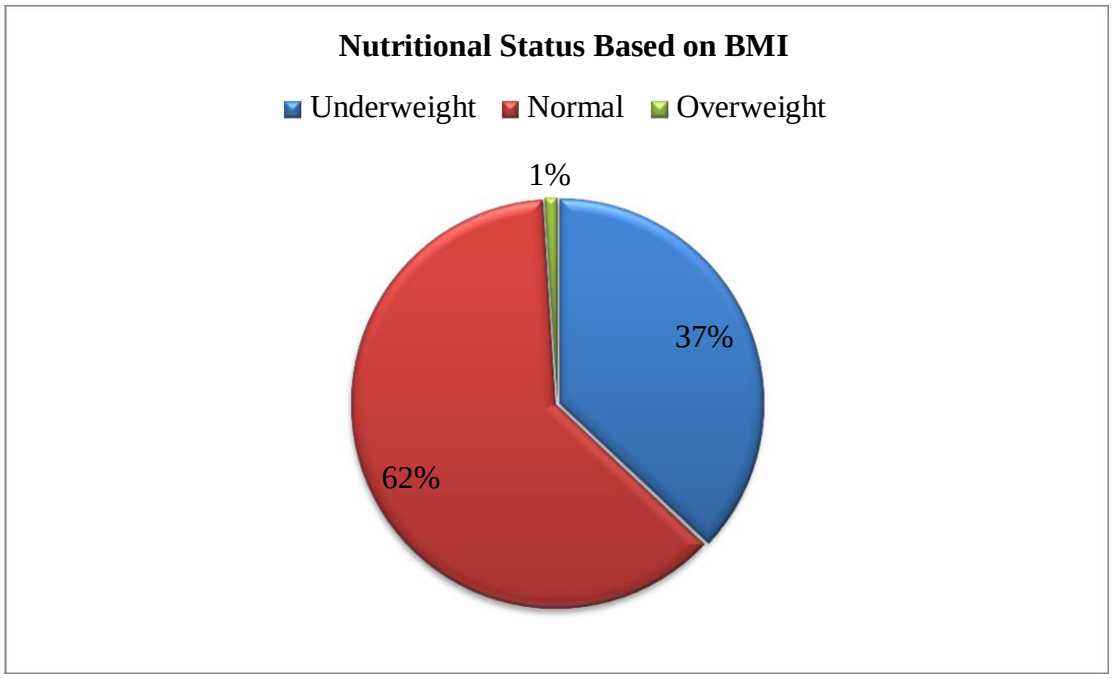

Figure 4.1: Nutritional Status Based on BMI

4.2. Demographic Characteristics of Respondents

4.2.1. Age Groups of the Respondents

Age was collected in terms of completed years. The most of the pregnant women in the study were found in the category of 20-34 years of age is 167 (51%). And this category includes 167 pregnant women. Secondly, 86 (26%) of pregnant women were included in the group of ≤ 19 years of age. Lastly, 76(23%) pregnant women were found in the age group ≥ 35 years of age.

Table 4.2: Demographic characteristics of the respondents

Age in years	Frequency(n)	Percentage
≤ 19	86	26
20-34	167	51
≥ 35	76	23
Total	329	100

4.2.2. Marital Status of the Respondents

Majority of the respondents were married (69%, n=227).We have also found that separated and divorced were (14%, n=46) and (17%, n=56) respectively.

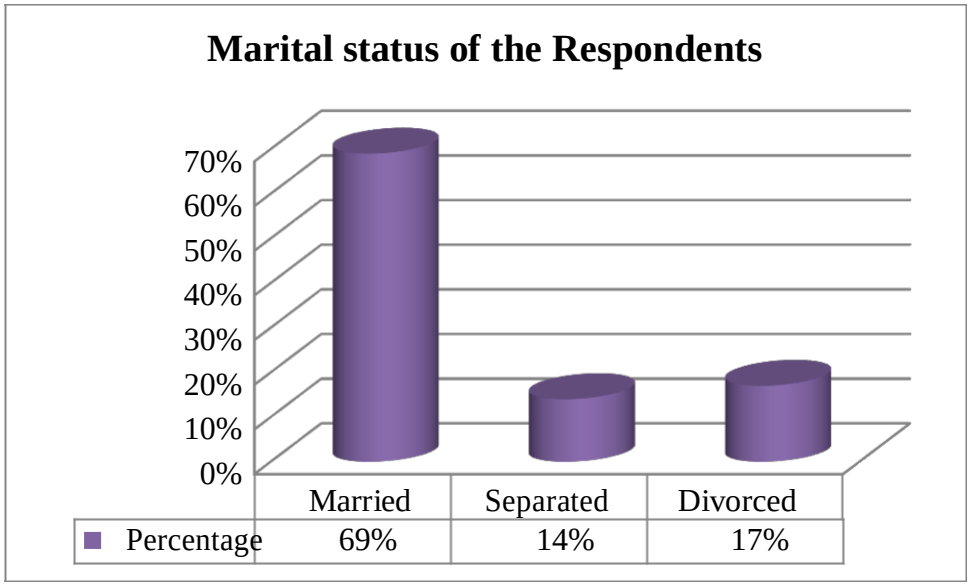

Figure 4.2: Marital status of the Respondents

4.2.3. Level of Education of the Respondents

The respondents were asked the level of education acquired as it may affect their economic status, the food choices and the food security status. Majority of the

pregnant women had no formal education (75%, n=248), and the total percentage of primary education was (17 %, n=57), and about (8%, n= 24) had acquired some secondary education.

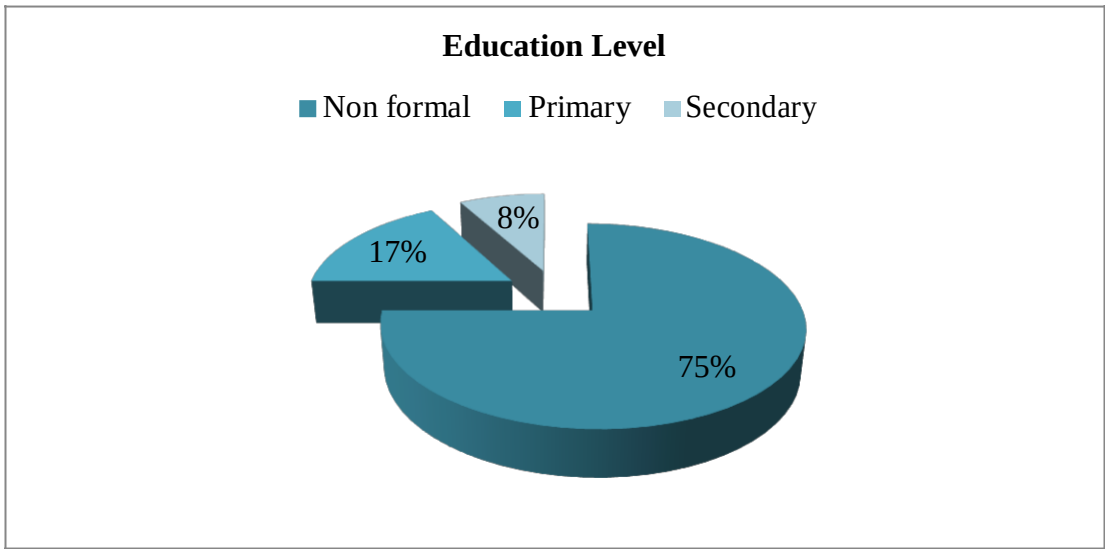

Figure 4.3: Education Level of Respondents

4.3. Dietary Diversity and Dietary Intake of the Respondents

4.3.1. Consumption of Foods Based on Food Groups

A total of 95 percent of the study population had consumed cereals in the previous 24 hours which is predominant. The main cereal consumed was WSB (wheat soy blend) in the form of halwa or suji. Generally, Vegetables form an integral part of the main meal for majority of the population generally. Over 91% (n=299) consumed dark green leafy vegetables and 75% (n=247) consuming other vegetables. Fats and oils consumption was reported by 86% (n=283) of the population. White tubers and roots were consumed by 65% (n=215) (Table 4.2).

Table 4.3: Consumption of the respondents by food groups

Food group	Frequency(n)	Percentage (%)
Cereals	313	95
Oils and fats	283	86
Milk and milk products	125	38
Dark green leafy vegetables	299	91
Other vegetables	247	75
Legumes, nuts and seeds	240	73
Other fruits	128	39
Flesh meats	108	33
White tubers and roots	215	65
Vitamin A rich fruits	95	29
Fish	206	62
Eggs	230	70
Organ meat (iron rich)	24	7
Vitamin A rich vegetables and fruit	27	8

4.3.2. Individual Dietary Diversity Score based on 24-hour recall

The mean DDS was 6.16 and this generally implies that the pregnant women had a medium dietary diversity. Significant differences were noted in the DDS based on marital status with those separated having a lower DDS of 5.85 compared to the married and the divorced who had a DDS of 6.88 and 5.75 respectively (Figure 4.4)

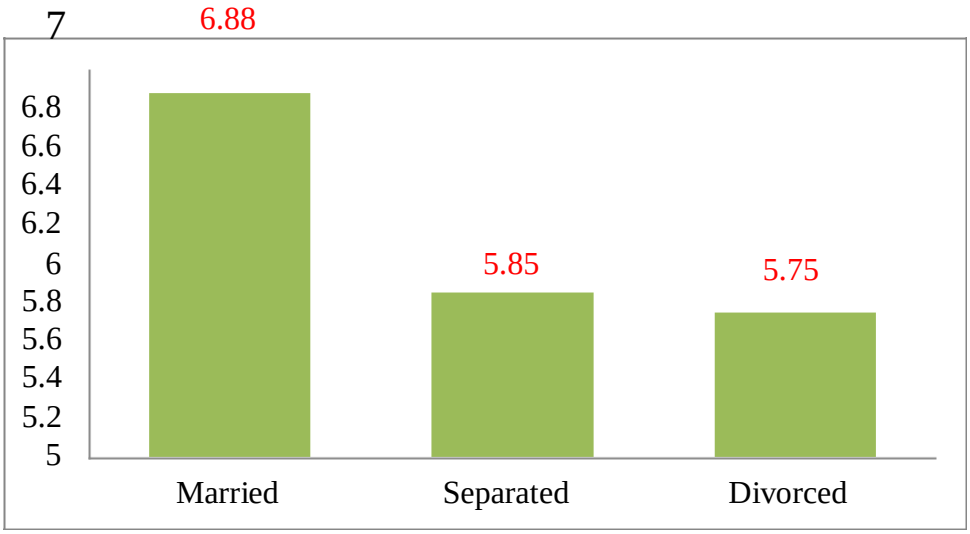

Figure 4.4: Individual Dietary Diversity Score based on 24 hour recall

4.4 Factors Associated with Dietary Diversity

In the present study, multivariable analyses revealed education level (p = 0.035), age level (p = 0.082), marital status (p =0.029), Nutritional status (p = 0.021), among the pregnant women as the factors that were significantly associated with the minimum dietary diversity.

The study observed that those who were married (AOR 3.02(1.95, 5.65)) had greater odds of achieving the minimum dietary diversity as compared to those who were divorced. This study also showed that age variables had no association with dietary diversity. (Table 4.4)

Table 4.4:Factors Associated with Dietary Diversity

Variables Minimum Dietary Diversity	N (%)	AOR (95% CI)	P value
Age level (years)			
≤ 19	86(26)	1.79 (0.95,3.78)	
20-34	167(51)	2.89 (1.06,5.39)	0.082
≥ 35	76(23)	1.67(0.50,3.10)	
Education Level			
Non Formal	248(75)	2.29(1.78,6.88)	
Primary	57(17)	1.52(1.21,3.21)	0.035
Secondary	24(8)	0.74(0.21,1.12)	
Marital Status			
Married	227(69)	3.02(1.95,5.65)	
Separated	46(14)	1.07(1.15,3.88)	0.029
Divorced	56(17)	1	
Nutritional Status (BMI)			
≤ 18	121(37)	3.09(1.45,3.90)	
18.5-24.9	204(62)	5.10(1.09,2.10)	0.021
≥ 25	4(1)	1	

CHAPTER-5

DISCUSSION

Anthropometric characteristics

Anthropometric indicators may reflect past events, predict future events or indicate the current nutritional status. Anthropometric point of view, pregnancy is unique in two respects: the observation period is relatively short and anthropometric indices change rapidly (Taleb *et al*., 2011). Anthropometry, however, cannot provide the complete picture of the nutrition and food situation needed for problem solving and program planning. Anthropometry can provide an estimate of the prevalence of under nutrition, but evaluations of food security, food distribution, nutrient content, morbidity and mortality, and other elements are needed to understand the causal factors resulting in under nutrition (Young *et al*., 1995). Nonetheless, anthropometric measurements are relatively easy to obtain in the field and anthropometric surveys can often be carried out in displaced populations, even during the acute phase of a humanitarian emergency.

Compared to WHO standards, in this study, 62% of the women interviewed were of normal weight, 37 % were under weight and 1% was overweight. Higher percentage of pregnant women in normal nutritional status in the study area may be due to regular attendance at nutrition Centers, receiving antenatal care during pregnancy, participation in nutritional education programs which were conducted at camp level, available food supply through general food distribution programs and regular consumption of supplements. Changes in BMI reflect the physiological changes of body size during pregnancy. The Prevalence of overweight found in other studies in Algeria (Bellahreche and Ouargli, 2007) seemed more than our results. A higher number of normal, and underweight women, had gained less than recommended level of weight, as compared to overweight and obese pregnant women. These results are comparable to other studies done in Pakistan (Munim and Maher, 2012).

Demographic characteristics

In regard to the association between dietary diversity and the age level of the respondents did not find any statistically significant association. Similar findings were

also documented by Ali *et al.* in Pakistan (Ali *et al.*, 2014). In the camp level all age levels of pregnant have the same access to available foods funded by different Organizations. Age has been found to be a risk factor for pregnancy where mothers are considered too young if they are below 19 years and too old if they are 35 years and above. However, in this study 26 % of the pregnant women were at the age below 19 years whereas a study done to identify the nutritional status of pregnant women in a rural area in the North-Western Province in Sri Lanka found only 3% of pregnant women in this age category (Adikari *et al.*, 2016).This difference may be due to the lack of awareness on early marriage prevalent among Rohingya community. It has been noted that the risk of infant mortality is much greater for children born to mothers who are too young or too old and that mothers that are too young, may experience difficult pregnancies and deliveries because of their physical immaturity. The findings of the study compare well with the findings in the Kenya Demographic and Health Survey, 2008-09 which found that nine percent were at high risk (Kenya National Bureau of Statistics and ICF Macro, 2010).

Low educational attainment is one of the potential risk factors associated with poor nutritional status in pregnancy. When considering the educational level, more than half of the pregnant women (75%) had no formal education and only (8%) had secondary education. The low levels of education observed may be due to the early marriages for the girls, low literacy levels in the camp and also the fact that girl child education until recent times has not been given much importance in this community. However, a study done in the Northern Province revealed that only (34.4%) of pregnant women completed their secondary education or above (Sivakaneshan and Senarath, 2009). The education level is important to acquire the knowledge about nutritional requirements and to have adequate nutrients during pregnancy. It improves the house-hold food consumption and food security level of the families. Regression analyses revealed association between dietary diversity and the level of education. In the camp context those women with higher education (secondary) had greater odds of attaining minimum dietary diversity. This might be so because women with secondary education might have acquired essential information on appropriate feeding practices. Similar observations on the impact of education on dietary diversity were also made in study done in South Africa (Taruvinga *et al.*, 2013). Besides, In the camp there are

myriad of Temporary learning Centers (TLC) which helped the pregnant women without formal education ensuring minimum dietary diversity.

Associations between dietary diversity and marital status have been reported in other studies (Taruvinga *et al*., 2013; Clausen *et al.,* 2005). In this study we found that 69% of the pregnant women were married and they had the highest level of mean DDS (6.88), 17% of the pregnant women were divorced having DDS (5.75) and 14% of the pregnant women having DDS (5.85).This study also showed that pregnant women who were living with their husbands could collect more foods for their family than those two groups (Divorced, Separated) of pregnant women. Thus the married couples had higher DDS.

In the present study, a mean DDS of 6.16 was reported. The finding of this study compares with that done in Pakistan among pregnant women, where a mean DDS of 6.17 was recorded (Ali *et al.,* 2014). Similarly, in another study carried out in South Africa among women, a mean DDS of 6.70 was observed (Acham *et al.,* 2012).

Dietary Diversity and Dietary intake

The consumption of cereals (95%) was the highest for its easy access in the form WSB (wheat soy blend). Vegetables form an integral part of the main meal for majority of the population generally. Over 91% consumed dark green leafy vegetables and 75%consuming other vegetables. Fats and oils consumption was reported by 86% of the population. White tubers and roots were consumed by 65%. It is a clear indication for health care providers to emphasize more on a diet that is balanced, and diverse, both in quantity, as well as quality, for an improvement in the nutritional status of the mother, as well as her newborn.

Interestingly, many studies in developing countries have documented that diet in these countries is predominantly cereal based (Kennedy *et al*.,2007; Ekesa *et al.,*2011). The finding of this study adds evidence to this argument since almost all participants (95%) of this study reported having consumed food items from the cereal based products.

CHAPTER-6

CONCLUSIONS

The nutritional status, demographic and dietary measurement indicated the diversity among the pregnant women was good as majority had high and medium dietary diversity based on the FAO categorization. The BMI data indicated that one- third are malnourished while the rest have a good nutrition status. However, based on dietary intake, the nutrient requirements for both the macronutrients and the micronutrients for pregnant women were not being met. Requirements for energy, carbohydrates, protein; and micronutrients of interest- iron and Vitamin C were below the RDAs for majority of the women.

The mean dietary diversity of pregnant women was high, although a good proportion had medium dietary diversity having poor dietary diversity. The dietary diversity of the women needs to be improved in order to ensure dietary quality and reduce consequences of poor dietary diversity. The low dietary intake by the pregnant women future generations are threatened given that the pregnant women could be giving birth to low birth weight infants.

The low consumption of iron rich foods such eggs, flesh meats and organ meats which also have highly bio available iron is of concern as the foods were readily available in the community. The pregnant women are therefore at high risk of anemia which can be prevented.

The finding has explicitly showed the critical role of education, nutritional status, and marital status in the attainment of the minimum dietary diversity and ultimately improved nutrient intake among pregnant women. In light of this finding, there is need to support existing and come up with new policies targeting these variables especially among the poor and vulnerable populations. Focus should therefore be on introduction of viable interventions and programs that would support these variables. Such interventions would play a significant role in enhancing dietary diversity particularly among pregnant women who have increased nutrients needs.

CHAPTER-7

RECOMMENDATION

Recommendations for Policy

Promotion of dietary diversity and modification of diets through practical demonstrations in the camps are considered conducive with an aim to improve the dietary diversity and thus the dietary quality of the pregnant women. There is need for more screening for malnutrition in pregnancy as part of the nutrition services . Mothers who receive services in the health facilities may be screened for timely identification as malnourished.

Recommendations for Practice

There is need to build awareness in the camp and especially among the women of reproductive age on the problem of high prevalence malnutrition. The high rates of malnutrition may be reduced by diversification of diets through diet modifications. There is need to promote behavioral changes among pregnant women with regard to intake of certain foods such as eggs and other protein foods which are nutritious but are not eaten for fear of birth complications through increase in knowledge about healthy foods in pregnancy. This can be done through promotion of community nutrition education and awareness programs.

Recommendations for Further Research

There is a scope for further investigation into the major causes of malnutrition so as to know the proportion of each cause and thus put mechanism in place to address the causes. More studies are required to be carried out to compare the nutritional status and dietary diversity status of pregnant women in other camps in order to construct locally standardized methodologies of assessing the same. The researcher recommends a study to be conducted on the dietary diversity and nutritional status of HIV infected pregnant women. A comparative study between anemia amongst HIV-positive and healthy pregnant women in the camp can also be carried out.

CHAPTER-8

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CHAPTER-9

APPENDICES

APPENDIX I: INDIVIDIVUAL QUESTIONNAIRE FOR PREGNANT WOMEN

INDIVIDUAL QUESTIONNAIRE FOR PREGNANT WOMEN

Personal Information

Name: ……. Husband's name……

Religion……. Age…….

Address …….

Name of block/camp	Questionnaire ID no	Date of Interview (dd/mm/yy)	Name of Interviewer

SECTION 1: ANHROPOMETRIC INFORMATION

Name	Weight	Height	BMI

SECTION 2: DEMOGRAPHIC INFORMATION

	1.1 Age of Interviewee	1.2 Marital status 1=Married 2=Divorced 3=Separated	1.3 Level of education 1=No formal education 2= Primary 3= Secondary

SECTION 3: DIETARY DIVERSITY

Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.

3.1 Last 24 hr

Serial No	Food group	Examples	1=Yes 0=No
1	Cereals	Bread, biscuits, cookies or any other foods made from millet, sorghum, maize, spaghetti, pasta, rice, wheat, ugali, porridge or pastes or other locally available grains	
2	White tubers and Roots	Pumpkin, carrots, yellow fleshed sweet potatoes	
3	Vitamin A rich vegetables and Tubers	White potatoes, white yams, cassava, green bananas	
4	Dark green leafy vegetables	Sukuma wiki, spinach, cabbages, cassava leaves, pumpkin leaves, cowpeas leaves, indigenous green vegetables	
5	Other vegetables	Tomato, onion, eggplant, green pepper	
6	Vitamin A rich fruits	Ripe mangoes, paw paw	
7	Other fruits	Passion fruit, banana, mkwaju, oranges, Avocado	
8	Organ meat (iron rich)	Liver, kidney, heart or other organ meats	
9	Flesh meats	Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, doves or other birds	

10	Eggs	Eggs	
11	Fish	Nile perch, tilapia, omena, fresh or dried fish,	
12	Legumes, nuts and seeds	Beans, green grams, cowpeas, dried peas, lentils, groundnuts, simsim	
13	Milk and milk products	Milk, cheese, yogurt, mala or other milk products	
14	Oils and fats	Oil, fats or butter added to food or used for cooking	
15	Sweets	Sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies	
16	Spices, condiments, Beverages	Spices (black pepper, salt), coffee, tea, alcoholic beverages, Roiko, curry powder	

SECTION 4: FOCUSED GROUP DISCUSION INTERVIEW GUIDE

1. Which are the most commonly consumed foods in this area?

2. What are the main factors which determine the choice of food you eat?

3. Are there any special foods for pregnant women? If yes, which ones are they?

4. When are the above foods consumed? During pregnancy/immediately after delivery?

5. Are there any foods that are prohibited during pregnancy?

6. What are the sources of information on various foods to be eaten? Reasons (Multiple responses are acceptable) (1=animals gave birth, 2=bought, 3=given, 4=death because of drought, 5=death because diseases, 6=sold, 7=raid, 8= Dowry; 9=other (specify)

7. Do you believe that pregnant women consume adequately diverse diets in this community?

Brief Biography

Khodadad Maruf passed the Secondary School Certificate Examination in 2009 and then Higher Secondary Certificate Examination in 2011. He obtained his B.Sc. (Hons.)in Food Science & Technology in 2015 from Chattogram Veterinary and Animal Sciences University (CVASU), Bangladesh. Now, he is a candidate for the degree of MS in Department of Applied Food Science and Nutrition under Food Science & Technology Faculty; CVASU. He has immense interest to work with nutrition.