

**ASSESSMENT OF NUTRITIONAL AND HEALTH STATUS OF
PREGNANT WOMEN IN SURJER HASHI CLINIC AND MARIE
STOPES CLINIC OF DINAJPUR SADAR UPAZILA**

A THESIS

BY

TABASSUM RAHMAN

Registration No. 1605574

Session: 2016-2017

Thesis Semester: July-December, 2017

**MASTER OF SCIENCE (M.S.)
IN
FOOD SCIENCE AND NUTRITION**



**DEPARTMENT OF FOOD SCIENCE AND NUTRITION
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY
UNIVERSITY, DINAJPUR**

JUNE, 2018

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**Submitted to the Department of Food Science and Nutrition
Hajee Mohammad Danesh Science and Technology University, Dinajpur
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**DEPARTMENT OF FOOD SCIENCE AND NUTRITION
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY
UNIVERSITY, DINAJPUR**

JUNE, 2018

**DEDICATED
TO MY
BELOVED PARENTS**

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The Author

ABSTRACT

This study was designed to assess the nutritional and health status of 122 pregnant women of Dinajpur district. The study mainly covered ‘Surjer Hashi Clinic’ and ‘Marie Stopes Clinic’ of Dinajpur Sadar Upazila. A pre-tested general assessment questionnaire, validated food frequency questionnaire and anthropometric measurements were used to collect data from the pregnant women. Both qualitative and quantitative data were collected by interviewing and from their record file. Nutritional status was determined using Body Mass Index (BMI), and hemoglobin levels. Nutrient intake data were compared with Recommended Dietary Allowance (RDA) for pregnancy. In this study, age of the respondents were in the range of 18-35 years and most of the respondents were housewives. The study showed that 32.8% and 22.1 % respondents had completed Primary School Certificate (PSC) and Junior School Certificate (JSC) level of education. 23.8% respondents had studied up to secondary level and 11.5% had studied up to higher secondary level. Among the respondents 4.9% and 2.5% had completed graduation and higher level of education. 2.5% had no formal education. It was observed that there exists highly significant association between monthly household food expenditure and category of Body Mass Index (BMI). More than half of the respondent’s energy intake were below RDA value and a few percentage of the respondent’s energy intake were higher than RDA value. From the respondents 8.2% were under weight and 36.1% respondents were overweight. From the respondents the percentages of severe, moderate and mild anemia were 2.5%, 33.6%, 62.3%. 1.6% respondents had normal level of hemoglobin. However, the result also showed that most of the respondents had hypotension and less percentage had hypertension. 34.4% respondents had diabetes and 65.6% respondents had no diabetic symptoms. The study concluded that underweight, overweight and low nutrient intake were main contributing factors for nutritional problems in the study sample.

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LIST OF ABBREVIATIONS

ANC	: Antenatal Care
BBS	: Bangladesh Bureau of Statistics
BDHS	: Bangladesh Demographic and Health Survey
BMI	: Body Mass Index
BMMS	: Bangladesh Maternal Mortality and Health Care Survey
CI	: Confidence Interval
DALYs	: Disability-Adjusted Life Years
EOC	: Emergency Obstetric Care
Hb	: Hemoglobin
HPNSDP	: Health, Population and Nutrition Sector Development Program
ICDDR	: International Centre for Diarrhoeal Disease Research, Bangladesh
IUD	: Intrauterine Device
ICMR	: Indian Council of Medical Research
LARC	: Long-Acting Reversible Contraceptive
MDG	: Millennium Development Goal
MMR	: Maternal Mortality Ratio
MOHFW	: Ministry of Health and Family Welfare
MNCH	: National Institute of Population Research and Training
PM	: Permanent Methods
PNC	: Postnatal Care
RDA	: Recommended Dietary Allowances
SAR	: South Asian Region
BSVS	: Bangladesh Sample Vital Statistics
TFR	: Total Fertility Rate
UNICEF	: United Nations International Children's Emergency Fund
WFP	: World Food Programme
WHO	: World Health Organization



CHAPTER I

INTRODUCTION

CHAPTER I

INTRODUCTION

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 related with pregnancy. During this period the fetus is nourished directly by the mother through placenta. Nutritional status of the expectant mother is one of the most important factors affecting pregnancy outcomes (Ramakrishnan, 2004).

Every year, 200 million women become pregnant worldwide. Though most pregnancies of healthy mothers end with the birth of a live baby, on many occasions childbirth is a time of complications and even death (Khanum *et al.*, 2000). Each year globally more than half a million women die from pregnancy related complications (Ronsmans and Graham 2006), four million neonates die (Lawn *et al.* 2005), and 10 million children die under the age of five (WHO, 2003). Maternal death and disability are the important cause of healthy life years lost for women of reproductive age in developing countries, accounting for over 28 million disability-adjusted life years (DALYs) lost and at least 18% of the burden of disease in these women (World Bank, 1993). Bangladesh still records a high maternal mortality ratio, with 320 deaths per 100,000 births. This means that about 12,000 women die from pregnancy or childbirth related complication every year - more than 30 every day. In Bangladesh, the levels of maternal, neonatal and child mortality and morbidity are unsatisfactorily high compared to other developing countries, with continuing socioeconomic differentials. At present, about 12,000 maternal, 120,000 neonatal and 244,000 under-5 child deaths take place each year (NIPORT, Mitra Associates and Macro International Inc. 2007; UNICEF 2007).

The government of Bangladesh is dedicated to achieving the target for Millennium Development Goal (MDG) 4 and MDG 5. The BMMS 2010, indicated a substantial reduction in the maternal mortality ratio (MMR), an annual rate of decrease of 5.6 percent. The MMR fell from 322 deaths per 100,000 live births (or between 253 and 391 at 95 percent confidence interval [CI]) in 1998-2001 to 194 deaths per 100,000 live births (149 to 238 at 95 percent CI) in 2007-2010, showing a degree of success in the health sector. Moreover, Bangladesh has set targets to achieve the goal of the Health, Population and Nutrition Sector Development Program (HPNSDP) to reduce MMR to

less than 143 deaths per 100,000 live births and to reduce the under-five mortality rate from 146 deaths per 1,000 live births in 1990 to 48 deaths per 1,000 live births by 2016.

Malnutrition occur when dietary energy or nutrient intake are insufficient, excessive or simply imbalanced. Due to variety of malnutrition in developing countries comprises the entire range of problems that can occur .Women, specially at their pregnancy or lactating state, are often more vulnerable than men to malnutrition because of their different physiological requirements, having lower metabolic rates and less muscle on average than men. Bangladesh faces many nutritional problems. Maternal nutritional problems remain as one of the public health problems in Bangladesh (Hossain *et al.*, 2013)

Nutrition in pregnancy should be well-maintained because healthy diet in pregnancy should ensure proper fetal growth, good maternal health and lactation. A study on dietary intake of expectant mother revealed that proper dietary balance of mother's diet is necessary to ensure adequate energy and nutrient intake for satisfactory growth of the fetus without depleting maternal stores and damaging mother's own tissues to maintain her pregnancy (Mridula *et al.*, 2003). Adequate nutrition intake during pregnancy has huge potential for promoting the nutritional status of the mother and her child. Malnutrition resulting from inadequate dietary intake is related to growth failure and development of protein-energy malnutrition, especially during the gestation (Abu-Saad and Fraser, 2010). It was known that poor growth results not only from a deficiency of protein and energy but also from inadequate intake of micronutrients that are necessary during pregnancy. Pregnant women need additional protein for initial removal of pregnancy related tissue and to maintain new tissue (Abu-Saad and Fraser, 2010). Malnutrition passes from one generation to the next because malnourished mothers give birth to malnourished infants.

Bangladesh is also a poor performer with respect to skilled attendance at birth and essential obstetric care (NIPORT *et al.*, 2003). These high mortality rates are supported by the fact that 85 per cent of women give birth at home, most with unskilled attendants or relatives assisting. Whatever government health facilities are available at many levels, these are not properly utilized. Dinajpur district is a district in the Rangpur division of northern Bangladesh. Dinajpur is the largest district among all sixteen northern districts of Bangladesh. Total population of Dinajpur district is approximately 2,990,128. According to Local Health Bulletin 2016 for Dinajpur Sadar, no of maternal death in

Dinajpur district is 48 at upazila health complex. The low status of women, poor quality and low uptake of services are some of the reasons for this situation. However, this study, was aimed at considering the nutritional and health status of pregnant women and research continue to emerge.

Objectives:

The objectives of this study were to determine the nutritional and health status of the pregnant women in rural areas of Dinajpur district. The study had the following specific objectives:

1. To assess the socio-demographic features of respondents.
2. To record the food and nutrient intake of the respondents and compare the same with the available recommended dietary allowances (RDA).
3. To examine nutritional and health status of respondents.



CHAPTER II

REVIEW OF LITERATURE

CHAPTER II

LITERATURE REVIEW

This chapter contains the present and past nutritional and health status of pregnant women in Bangladesh and other countries.

2.1 Maternal health

Maternal health has been defined as safe motherhood, hardly defined to mean ensuring that all women receive the care they need to be safe and healthy through pregnancy and childbirth (Family Care International, 2000).

2.2 Process indicators in Maternal Health

Collecting information and data on maternal mortality ratios and rates is difficult and costly. In addition, the indicators often do not register change over a short period of time, nor do they provide clear indications as to what actions should be developed to improve the situation. In response to these difficulties, a series of process indicators have been developed. These include:

- Percentage of women who attended antenatal care
- Percentage of women who deliver in an institution
- Percentage of women who have a skilled attendant at birth
- Caesarian section rate

Source: WHO, 2012.

2.3 Maternal health in SAR

The usage of maternal health services, namely ANC and skilled birth attendance, has increased in South Asian Region (SAR). To achieve MDG 5 inequity in access to maternal health services remains a major barrier. Wide differences in service use remain in SAR, especially across wealth quintiles and by residence. ANC is an opportunity to reach pregnant women with vital mediations and information. In South Asia, 71 percent of women receive ANC, which comprises at least one visit to a doctor, nurse, or midwife during pregnancy. But, only 35 percent of women make a minimum of four ANC visits, as recommended by the World Health Organization (UNICEF, 2009). ANC reportage is

highest in Sri Lanka 99.4 percent, Maldives 99.1 percent, and Bhutan 97.3 percent. Afghanistan has the lowest ANC rate at 63.4 percent. South Asian women in the richest quintile are almost twice as likely as women in the poorest quintile to have at least one ANC visit with a trained provider: 95 percent versus 50 percent (UNICEF, 2009).

Skilled birth attendance in South Asia is lagging behind all other regions. Skilled birth attendance increased from 36.2 percent in 2000 to 49.8 percent in 2010. Skilled birth attendance is maximum in Sri Lanka (98.6 percent) and the Maldives (94.8 percent) and lowest in Bangladesh (31.7 percent)

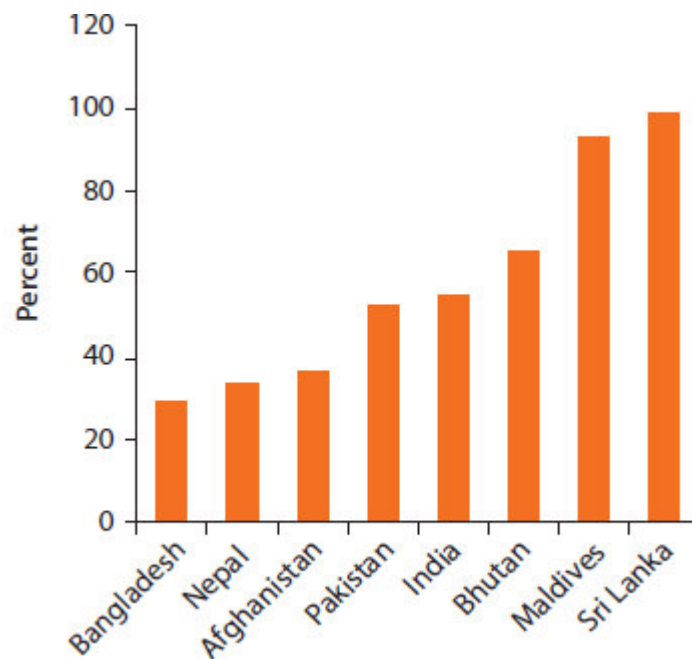


Figure 2.1: Skilled Birth Attendance in SAR

Source: World Bank, 2014a.

2.4 Maternal mortality

WHO defines a maternal death as “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the period and the site of the pregnancy, from any cause related to or motivated by the pregnancy or its management but not from accidental or incidental causes” (WHO, 1992 cited in Freedman *et al.*, 2005).

Maternal mortality refers to deaths due to complication from pregnancy or childbirth.

Goals for reducing maternal mortality are often expressed in terms of a reduction in the maternal mortality ratio (MMR). The maternal mortality ratio is the number of maternal deaths per 100, 000 live births and measures the risk of a woman dying once she is already pregnant (Penn-Kekana and Blaauw, 2002).

2.5 Status of maternal mortality in globally

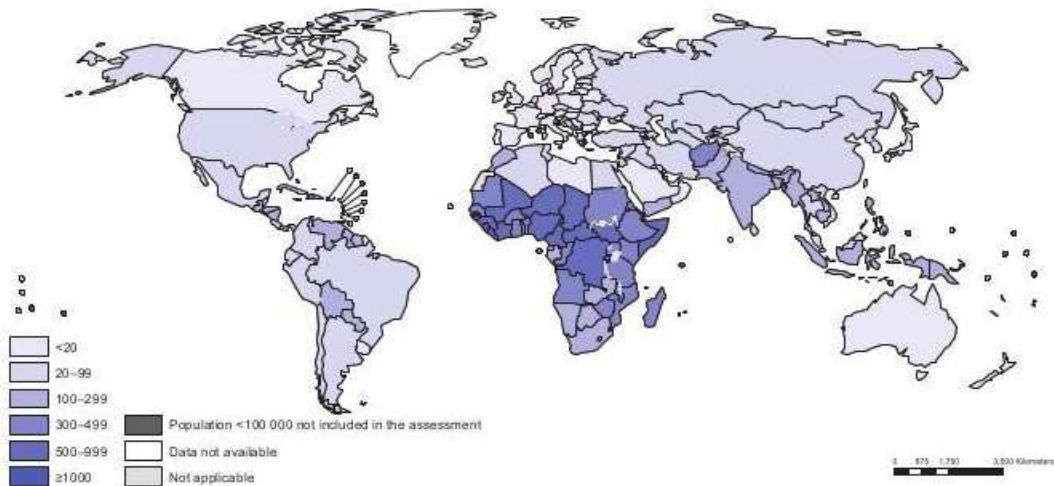


Figure 2.2: Global maternal mortality ratio (WHO, 2013)

2.6 Status of maternal mortality in SAR

The maternal mortality ratio (MMR) has long been accepted as one of the key indicators of population health and development. However, in the last few decades, there have been concentrated efforts and actions towards improving maternal health and reducing maternal mortality. For accurate and reliable estimates of maternal mortality this continued interest has been paralleled by a strong mandate. Improvement toward achieving the MDGs is due to successful policies and strategies related to safe motherhood, neonatal health, nutrition, and gender. Largely, South Asian Region (SAR) has made excellent progress toward achieving MDG 5A of reducing the MMR by three-quarters between 1990 and 2015. The MMR declined from 550 deaths per 100,000 live births in 1990 to 190 in 2013 (Kuruvilla *et al.*, 2014).

South Asia has made the world’s sharpest decline in maternal mortality since 1990. Between 1990 and 2013, reduction of maternal mortality rate in South Asia is 65 percent whereas other regions also reduced their maternal mortality rates: 56 percent in East Asia and the Pacific; 54 percent in Europe and Central Asia; 51 percent in the Middle East and North Africa; 49 percent in Sub-Saharan Africa; and 40 percent in Latin America

and the Caribbean. However, 24 percent of global maternal deaths in 2013 still happened in SAR.

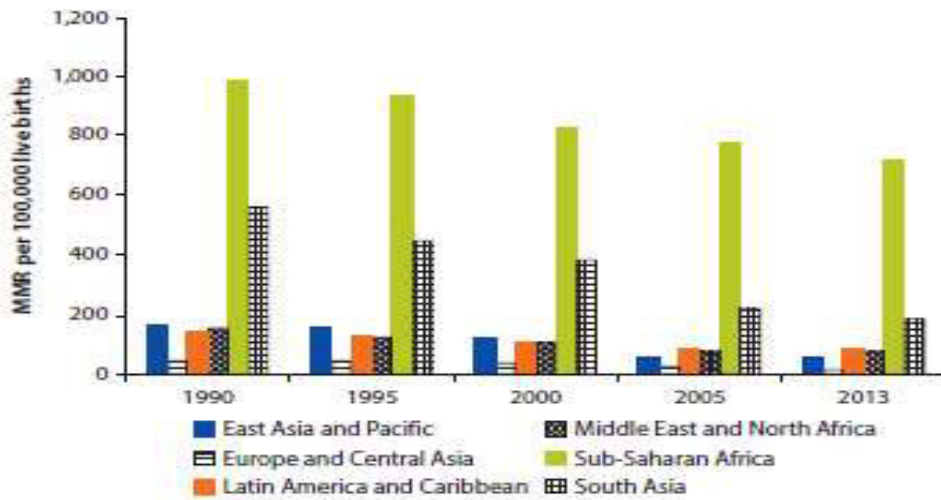


Figure 2.3: Regional Maternal Mortality Ratios, 1990–2013

Source: WHO *et al.*, 2014.

The regional MMR reduction rate differs extensively by country. Most SAR countries had an MMR reduction rate above 65 percent between 1990 and 2013. Three countries—Bhutan, Maldives, and Nepal—are among the 19 countries worldwide that have reduced maternal deaths by 75 percent or more by 2013, thus achieving MDG 5 much earlier than the target year of 2015.

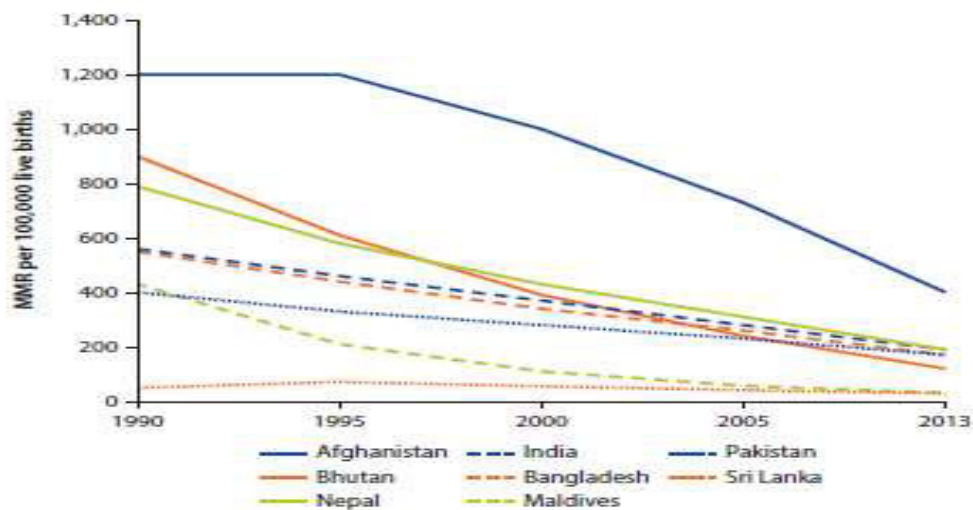


Figure 2.4: MMR Trends among SAR Countries

The regional MMR reduction rate varies widely by country. The countries with the greatest part of the decline in the number of maternal deaths in the region are India (74.1 percent), Bangladesh (12.0 percent), Pakistan (7.6 percent), and Nepal (3.3 percent). Population size and achievements in MMR reduction, these countries contributed the most to the decline of maternal mortality in South Asia. Within India, the states of Uttar Pradesh/ Uttarakhand, Bihar/Jharkhand, and Rajasthan had more than 50 percent of the total decline in India's maternal deaths.

Table 2.1: Trends in the Number of Maternal Deaths among SAR Countries, 1990–2013

Country	1990	1995	2000	2005	2013	Decline in MMR from 1990–2013	Decline in MMR from 1990–2013	Rank by Greatest Decline
Afghanistan	7,900	10,000	11,000	8,100	4,200	(3,700)	2.8%	5
Bangladesh	21,000	16,000	12,000	8,800	5,200	(15,800)	12.0%	2
Bhutan	180	110	61	35	17	(163)	0.1%	6
India	14,8000	123,000	97,000	73,000	50,000	(98,000)	74.1%	1
Maldives	38	16	7	4	2	(36)	0.0%	8
Nepal	5,400	4,200	3,300	2,200	1,100	(4,300)	3.3%	4
Pakistan	18,000	15,000	13,000	10,000	7,900	(10,100)	7.6%	3
Sri Lanka	180	240	190	150	110	(70)	0.1%	7
Total	200,698	168,566	136,558	102,289	68,529	(132,169)	100%	

Source: WHO *et al.*, 2014; World Development Indicators 2014, the World Bank.

2.7 Causes of maternal death

- Pregnancies with abortive outcome
- Hypertensive disorders
- Obstetric hemorrhage
- Pregnancy-related infection
- Other obstetric complications
- Unanticipated complications of management
- Non-obstetric complications
- Unknown or undetermined
- Coincidental causes

Source: WHO 2012.

Most maternal deaths do not have a well-defined cause. However, using the available data, nearly 73 percent of all maternal deaths between 2003 and 2009 were attributable to direct obstetric causes; deaths due to indirect causes accounted for 27.5 percent (95

percent CI, 19.7-37.5) of all deaths. The major causes of maternal mortality, in descending order, are as follows (Say *et al.*, 2014):

- Hemorrhage, 27.1 percent ; more than two thirds (72.6 percent) of deaths from hemorrhage were classified as postpartum hemorrhage
- Hypertension, 14.0 percent
- Sepsis, 10.7 percent
- Abortive outcomes, 7.9 percent
- Embolism and other direct causes, 12.8 percent.

The following three causes of deaths (abortive outcomes, obstructed labor and indirect causes) as are of significant programmatic interest but are particularly difficult to capture.

2.8 Demographic and socioeconomic profile in Bangladesh

Poverty:

Bangladesh is one of the most densely populated country with a land mass of 147,570 sq. km and a population of more than 140 million, 70% of whom live in rural areas (BDHS, 2004). According to BBS, the latest survey results, the poverty rate in rural areas was 26.4 percent, while urban poverty was 18.9 percent. The poverty rate in the 2010 survey was 31.5 percent (BBS, 2010).

Education:

Education is one of the major socioeconomic inspirations on a person's behaviors and attitudes. In general, the greater a person's educational attainment, the more knowledgeable he or she is about the use of health services, family planning, and the health care of children. Education enhances the ability of an individual to achieve desired demographic and health goals. There has been an increase in the proportions of men and women who have completed secondary or higher education since 2011. For men, the proportion has increased from 15 percent to 17 percent, and for women it has increased from 10 percent to 12 percent in 2014 (BDHS, 2014).

Literacy Rate:

The literacy rate for population aged 7 years and over increased from 50 percent in 2004 to 71 percent in 2016, amounting to an increase of about 42 percent in 13 years. The increase in female literacy compared to male literacy was more noticeable. The adult literacy rate for population aged 15 years and over increased by 40 percent over the period 2004–2016 from 51.6 percent in 2004 to 72.3 percent in 2016. The increase in female literacy was much higher (52%) than that of the increase among the males (31%) during 2004–2016 (BSVS, 2016).

Child-Woman Ratio:

There has been a consistent fall in the child-woman ratios in the sample vital registration area. Since 2004, the ratio has shown a decline of about 33 percent, from 476 in 2004 per 1000 women to 320 per one thousand women in 2016. The comparable decline as recorded in the census enumeration was over 24 percent, from 519 per 1000 women in 2001 to 392 per 1000 women in 2011 (BSVS, 2016).

Total Fertility Rate:

Total fertility rate (TFR) is a summary measure of fertility obtained by summing the age specific fertility rates for each single year or each age group (usually of five year age groups) of women in the child-bearing age. The overall TFR for the SVRS area was computed to be 2.1 per woman. The corresponding estimate for the BDHS of both 2011 and 2014 is 2.3. As expected, the TFR for rural women in SVRS is higher (2.38) than among their urban counterparts (1.68). This result is consistent with the BDHS, 2014 (2.4 as against 2.0) (BSVS, 2016).

2.9 Maternal health in Bangladesh

While improving, in terms of national averages, maternal health status for many Bangladeshi women remains poor. Around 50% of Bangladeshi women were found to be commonly malnourished with a BMI less than 18.5. Over 43% of pregnant women were iodine deficient and more than 2.7% developed night blindness during pregnancy (BDHS, 2001).

The mean BMI has increased from 20.2 in 2004 to 22.3 in 2014. Therefore, the proportion of women with a BMI below 18.5 has decreased, from 34 percent in 2004 to 19 percent in 2014 (BDHS, 2014).

World Food Programme (WFP, 2012) in Bangladesh indicated that micronutrient deficiencies particularly iron deficiency anemia and iodine deficiency is extensive and multiple deficiencies are common. Iron deficiency anemia among pregnant woman is a serious nutritional challenge; with one in two pregnant women is anemia. Pregnant women in Bangladesh suffer most from under nutrition and underweight (WFP, 2012).

Adequate micronutrient intake by women has important benefits for both the women and their children. Breastfeeding children benefit from the micronutrient supplementation that mothers receive, especially vitamin A. In Bangladesh, micronutrient deficiency among women is a common public health problem. Vitamin A supplementation has increased remarkably in the past decade, from 15 percent in 2004, 21 percent in 2007, and 29 percent in 2011 to 46 percent in 2014 (BDHS, 2014).

2.10 Maternal mortality in Bangladesh

The MMR declined from 6.48 per 1000 live births in 1986 to 3.15 in 2001, a more than 51 per cent decline in 15 years. The vital registration system initiated in 2002 records a slightly higher rate (3.93) compared to the previous years. This ratio falls consistently to 1.78 in 2016.

The maternal mortality ratio (MMR) in Bangladesh has declined from nearly 574 per 100,000 live births in 1990 to between 320 and 400 in 2004 (NIPORT 2001; BDHS 2004).

Between BMMS 2001 and BMMS 2010, MMR declined significantly: from 322 to 194 maternal deaths per 100,000 live births. The MMR in Bangladesh declined between 2001 and 2010 but has now slowed down. The MMR estimate from the BMMS 2016 is 196 maternal deaths per 100,000 live births, almost identical to the estimate of BMMS 2010.

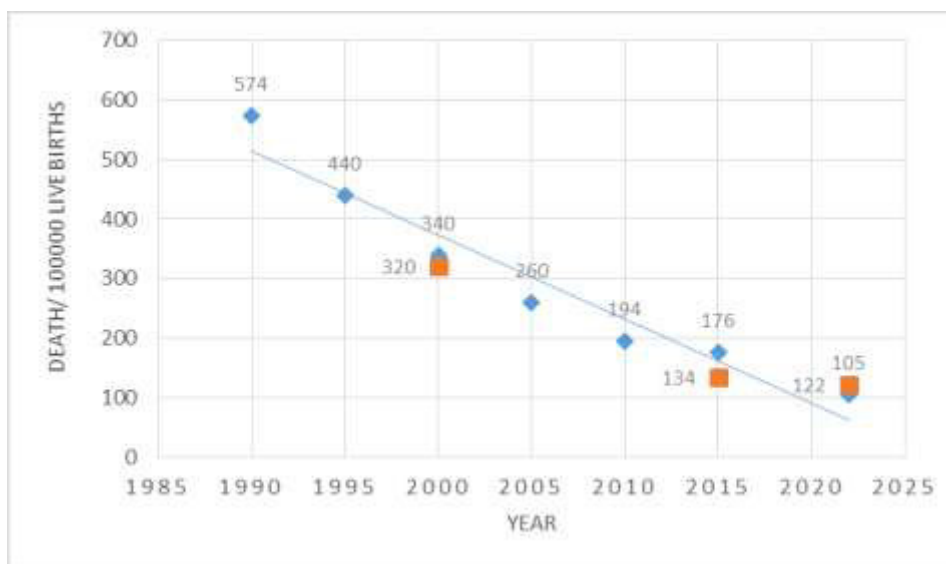


Figure 2.5: Maternal mortality in Bangladesh

Source: Bangladesh Maternal Mortality and Health Care Survey 2016

2.11 Causes of maternal death in Bangladesh

Maternal death is caused by direct, indirect and other related factors. The major direct causes of maternal deaths in Bangladesh are haemorrhage, eclampsia, unsafe abortion, obstructed labour, postpartum sepsis, and violence and injuries (Fauveau 1994, NIPORT *et al.* 2003, MOHFW 2003). Almost one-fourth of the total maternal death in rural Bangladesh is due to unsafe abortion and related complications (Alauddin 1986; MOHFW 2003). In a recent survey, BMMS 2010 and BMMS 2016 found that account 55 percent of maternal deaths are caused by two major but preventable causes namely hemorrhage (31 percent) and eclampsia (24 percent). Additional causes include abortion (7 percent), obstructed labour (3 percent) and other direct causes (7 percent), indirect causes (20 percent). One-fifth of the maternal deaths have indirect causes. The risk of dying from these causes remain unchanged between BMMS 2010 and BMMS 2016.

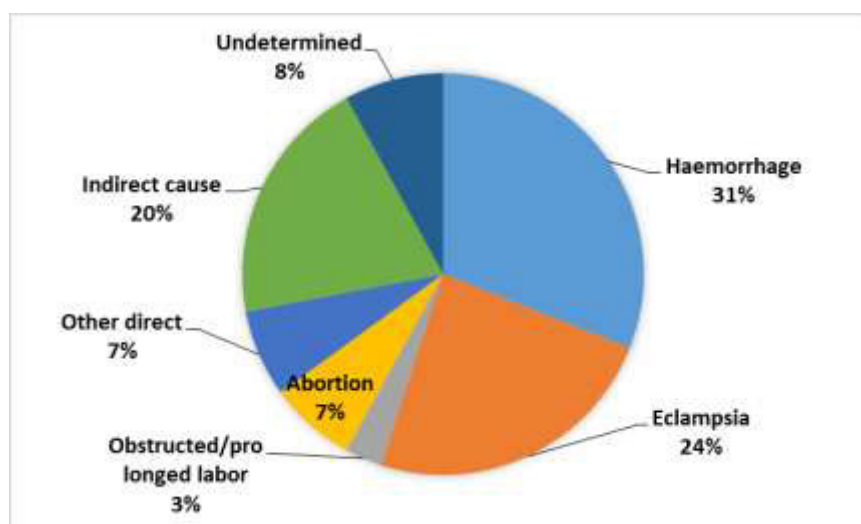


Figure 2.6: Causes of maternal death in Bangladesh

Source: Bangladesh Maternal Mortality and Health Care Survey 2016

Different studies recognized a number of indirect causes of maternal death in Bangladesh, such as anaemia, malaria, tuberculosis, etc. The risk factors for maternal mortality include women's low status in society, poor quality of maternity care services, lack of trained health professionals, lack of EOC services, low uptake of services by women, infrastructure and administrative difficulties (Haque *et al.* 1997; Streatfield *et al.* 2003). Sometimes distance of the health service facility from home and lack of transportation facilities in rural area act as difficulties to seeking care (NIPORT *et al.*, 2003). Early childbearing is another important risk factor for maternal death. MMR is much higher among females aged 15-19 years (7.3% 1,000 live births) compared to those in the low-risk age group of 20-34 years (4.3 per 1,000 live births) (WHO, 2004). Almost, half of women marry under the age of 18 and 58% become mother of first child under the age of 20 (BDHS 2004).

For all age groups, the MMR was comparable between BMMS 2010 and BMMS 2016, except in the youngest age group (15–19 years), where it was higher in 2016 and the risk of maternal death is high among first-time mothers (215 per 100,000 live births). In a recent survey, the percentage of women receiving the complete continuum of maternity care (antenatal care, delivery care, and postnatal care from medically trained providers) has increased significantly from five percent in 2001, to 19 percent in 2010, and to 43 percent in 2016. Delivery by trained providers increased from 27 percent in BMMS 2010 to 50 percent in BMMS 2016; the increase was predominantly caused by the rise in

facility deliveries from 23 percent to 47 percent. Private health facilities account for 29 percent of all deliveries, while 14 percent and four percent of births now occur at government and NGO facilities, respectively. In 2010, the private and public health facilities accounted for similar percentages of deliveries, with 11 percent at private and 10 percent at public facilities. In 2016, deliveries at private facilities were more than two times higher than deliveries at public sector health facilities (29 percent versus 14 percent). Only 46 percent of upazila and higher-level public facilities, and 20 percent of private hospitals, had at least one staff member who had ever received training on emergency obstetric care. Only 15 percent of higher-level public facilities, and seven percent of private hospitals, had a staff member trained in the past 24 months (BMMS 2016).

2.12 Service utilization in Bangladesh

To improve the health status of mothers, ante-natal, delivery and postnatal care from skilled providers is important. This section specifies the state of service utilization by mothers during ante-natal, delivery and post-natal periods.

Ante-natal care:

Ante-natal care is a type of preventive health care. Ante-natal care is the care one get from health professionals during pregnancy. It's sometimes called maternity care. Antenatal care coverage for births in the past surveys has increased substantially from 58 percent in 2004 to 78 percent in 2014. During the same period, ANC from a medically trained provider increased from 51 percent to 64 percent. Between 2011 and 2014, ANC from any provider increased by 10 percentage points, from 68 percent to 78 percent. The sharp increase in ANC in the three years between BDHS 2011 and BDHS, 2014 is mostly due to an increase in ANC from medically trained providers, mainly qualified doctors, whose role in ANC increased from 43 percent in 2011 to 58 percent in 2014 (BDHS, 2014).

Delivery care:

Proper medical attention and hygienic conditions during delivery can reduce the risk of complications and infections that can cause death or serious illness for the mother or the newborn. Hence, it is important to increase the proportion of births delivered in a safe, clean environment and under the supervision of health professionals. The proportion of

births delivered at health facilities has continued to increase from 12 percent in 2004 to 17 percent in 2007, 29 percent in 2011, and 37 percent in 2014. The increase since 2007 is mostly due to a sharp increase in delivery at private facilities (from 8 percent in 2007 to 15 percent in 2011 and to 22 percent in 2014), and to a less significant increase in deliveries in public facilities (from 8 percent in 2007 to 12 percent in 2011 and to 13 percent in 2014) (BDHS, 2014). Delivery by trained providers increased from 27 percent in BMMS 2010 to 50 percent in BMMS 2016; the increase was predominantly caused by the rise in facility deliveries from 23 percent to 47 percent (BMMS 2016).

Post-natal care:

Postnatal care is a crucial component of safe motherhood and neonatal health. Postnatal checkups provide an opportunity to assess and treat delivery complications and to counsel mothers on how to care for themselves and their newborn infant. Occurrence of a postnatal checkup from a medically trained provider within two days of delivery has increased from 20 percent of mothers in 2007 to 27 percent in 2011 and 36 percent in 2014. 39 percent of mothers in Bangladesh received postnatal care from a medically trained provider within 42 days after delivery. 61 percent of mothers and 64 percent of children did not receive a postnatal checkup from a medically trained provider (BDHS, 2014). Postnatal care coverage has been increasing sharply; PNC by a medically trained provider has increased from 11 percent in 2001, to 23 percent in 2010, and to 48 percent in 2016. Only six percent of women who delivered at home received PNC from a medically trained provider (BMMS 2016).

Family planning services:

Sixty-two percent of married women in Bangladesh use some method of contraception, and 54 percent use a modern method. Economic status does not appear to influence contraception use among couples.

Contraceptive use, while still increasing, is doing so at a slower pace. Between 2004 and 2014, use increased by 4 percentage points, from 58 to 62 percent. In contrast, use increased 13 percentage points from 1994 to 2004, rising from 45 percent to 58 percent. Currently, the four most popular modern methods used by married women are the pill (27 percent), injectable (12 percent), the male condom (6 percent), and female sterilization (5 percent). Only 8 percent of currently married couples use a long-acting

reversible contraceptive (LARC) or permanent methods (PM), such as an IUD, implant, or sterilization. In the last 10 years use of LARC-PM increased by less than 1 percentage point (BDHS, 2014). The use of modern methods is the highest for the younger women starting with a rate of 59.4 percent for those who are aged 15–19. This increases to 68.0 percent when they are 30-34 years of age. The rate then sharply falls as age advances and reaches to 34.5 percent when the women reach to the end of their reproductive life span. The use of modern methods of contraceptives in urban area exceeds the use in rural area by 5.5 percentage points (61.4% vs 55.9%) (BSVS, 2016).

Hossain *et al.* (2013) conducted a study on nutritional Status of pregnant women in selected rural and urban area of Bangladesh. In the study it was found that , measurement of body weight gain in different stages of pregnancy period was calculated as 20% and 14% severely malnourished, 54% and 30% moderately malnourished, 21% and 43% well nourished and 5% and 13% over malnourished ; hemoglobin (Hb) level was 16% and 19% severely anemic, 38% and 54% moderately anemic, 24% and 42% mildly anemic and 6% and 11% non-anemic; educational levels were 8% and 15% illiterate, 17% and 44% primary, 29% and 25% secondary, 10% and 39% under graduate and 2% and 11% post graduation of rural and urban pregnant women respectively. Monthly expenditure \leq Tk.3000 to Tk.4000 food for rural and urban pregnant women were found and considered as important causes for nutritional status during pregnancy period. Beside these, early marriage, frequent birth, illiteracy, poverty, misconceptions, and lack of nutritional knowledge were follow up in this study period.

Monoarul *et al.* (2014) conducted a study on awareness of pregnant women regarding pregnancy and safe delivery in selected rural area. This community based cross sectional descriptive study was carried out at Ullapara Upazila, Sirajgonj District among 120 pregnant women in a rural community. The results showed that majority of the respondents (65 %) were between 20-34 years of age group. Most of the respondents were housewives (85%). Majority (65%) of the respondents received antenatal care, and among them only 5% respondents received complete antenatal care and 25% received postnatal care. Majority (75%) of the respondents had not received postnatal care (PNC). Majority (85 %) of the respondent planning their delivery in the home and 15% respondent planning their delivery in the delivery center. About 50% of the respondents got information regarding pregnancy and delivery care through health workers. Besides 35% of respondents got information through doctor.

Nuruzzaman *et al.* (2015) conducted a study on reproductive characteristics and nutritional status of coastal women. The findings showed that average age of the respondents was 26.5 years. Almost 60% of them were Muslims and 44% were illiterate. The average monthly family income and family size was Tk-6968.18 and 5.8 respectively. More than half (56%) of the respondents had history of regular use of contraceptives and oral pill was the most common type of contraceptive. Average number of children was 2.95. More than half of them (54%) had history of home delivery. More than one-third (34%) of them were under nourished. Majority of them got early marriage (70%) but early marriage was not significantly associated with their nutritional status.

Nguyen PH *et al.* (2017) conducted a survey on the nutrition and health risks faced by pregnant adolescents: Insights from a cross sectional study in Bangladesh. It was found from the results that a total of 2,000 recently delivered women with infants <6 months of age was carried out in 20 sub-districts in Bangladesh where MNCH program is being implemented. The coverage of antenatal care and nutrition services was similar for adolescent and adult mothers. Compared to adult mothers, adolescent mothers had significantly fewer ownership of assets and lower decision making power. Adolescent mothers weighed significantly less than adult women (45.8 vs 47.1 kg, $p = 0.001$), and their BMI was significantly lower (19.7 vs 21.3, $p = 0.001$).

U. K. Prodhan *et al.* (2017) conducted a study on assessment on nutritional status of pregnant women and their new born baby in the hospitalized care system. The results showed that 16% illiterate pregnant women were not any nutritional knowledge and delivered their first child before 20 years where, about 89% surgical delivery was needed and 21% of newborn did not get colostrum after birth. Although 78% newborn mothers were practiced exclusive breast feeding whereas, 22% mothers were given formula milk to their newborn babies. About 23.40% of the pregnant women checked their health status regularly but 76.6% women abstain from checkup that play great impact on mother and upcoming child. Moreover, about 55.50% pregnant women were taken medicine during pregnancy including 83% of the pregnant women were taken iron tablet whereas, 44.50% women were not taken medicine during pregnancy. About 83% of the newborn were weighted 2500 gm and above, whereas the rest of the newborn were weighted from 1500-2500gm. Besides, majority of the respondents were satisfied with

hospitalized service and a small number of respondents claimed and unsatisfied with medical and health facilities of the hospital.

Ahmed T *et al.* (2012) lead a study on nutrition of children and women in Bangladesh: Trends and directions for the future. In the study it was found that child and maternal malnutrition has been reduced in Bangladesh, the prevalence of underweight (weight-for-age z-score <-2) among children aged less than five years is still high (41%). Nearly one-third of women are undernourished with BMI of <18.5 kg/m². The prevalence of anaemia among young infants, adolescent girls, and pregnant women is still at unacceptable levels. Given the low annual rate of reduction in child under nutrition of 1.27 percentage points per year, it is unlikely that Bangladesh would be able to achieve the United Nations' Millennium Development Goal to address under nutrition. The Government, development partners, non-government organizations, and the academia have to work in concert to improve the coverage of basic and effective nutrition interventions, including exclusive breastfeeding, appropriate complementary feeding, supplementation of micronutrients to children, adolescent girls, pregnant and lactating women.

Sahoo and Panda (2006) constructed a study on nutritional status of pregnant women of some villages in Balasore district, Orissa. The findings showed that a pre-tested structured interview schedule was used for the collection of general information among 105 pregnant women from 20 different villages of Balasore district. 24 hour recall method of diet survey was applied for the collection of dietary information. Hemoglobin level was collected from doctor's report for observing the anaemic condition. It was found that the mean iron, calcium, carotene and folic acid was much lower than the RDA volumes. Percent incidence of common nutritional deficiencies among the pregnant women was much higher in the third trimester than the 1st and 2nd trimester. In spite of better education and high-income, nutrition intake was lower than RDA in case of many sample women. Based upon the analysis, the study finally emphasizes the need for popularizing cultivation of low cost nutrition greens and vegetables in each household and imparting nutrition education to the village women.

Gao *et al.* (2013) conducted a survey on dietary intake and food habits of pregnant women residing in urban and rural areas of deyang city, sichuan province, China. In the study it was found that, a total of 203 pregnant women in the third trimester, aged 19–42

years. On the basis of self-reported height and pre-pregnancy weight, 68.7% of the women had a pre-pregnancy body mass index (BMI) within the normal range ($18.5 \leq \text{BMI} < 25$), 26.3% were found to be underweight with a BMI < 18.5 (20.8% in urban vs. 35.6% in rural areas), while only 5.1% were overweight with a BMI ≥ 30 . In view of acceptable macronutrient distribution ranges (AMDRs) the women's overall dietary energy originated excessively from fat (39%), was low in carbohydrates (49.6%), and reached the lower limits for protein (12.1%). Compared to rural areas, women living in urban areas had significantly higher reference nutrient intake (RNI) fulfillment levels for energy (106.1% vs. 93.4%), fat (146.6% vs. 119.7%), protein (86.9% vs. 71.6%), vitamin A (94.3% vs. 65.2%), Zn (70.9% vs. 61.8%), Fe (56.3% vs. 48%), Ca (55.1% vs. 41%) and riboflavin (74.7% vs. 60%). The likelihood of pregnant women following traditional food recommendations, such as avoiding rabbit meat, beef and lamb, was higher in rural (80%) than in urban (65.1%) areas. In conclusion, culturally sensitive nutrition education sessions are necessary for both urban and rural women.

Adikari *et al.* (2016) conducted a study on assessment of nutritional status of pregnant women in a rural area in Sri Lanka. The results showed that, a total of 133 pregnant women in their second trimester was recruited from Maternal and Child Health clinics. A pre-tested general assessment questionnaire, validated food frequency questionnaire and anthropometric measurements were used to collect information. Nutritional status was determined using Body Mass Index (BMI), weight-gain and hemoglobin levels. Nutrient intake data were compared with Recommended Dietary Allowance (RDA) for pregnancy. The mean age of the study sample was 26.86 ± 4.16 years. According to the pre-pregnancy BMI at the first visit to the clinic, 15, 44.4, 35.3 and 5.3 were underweight, normal, overweight and obese, respectively. Their mean weight gain during the second trimester was 2.71 ± 2.23 kg that was below the recommended weight gain (4.84 kg). Out of the total, 24.57% had anaemia ($< 11 \text{ g/dL}$). Mean daily intake of energy was 2472 kcal and percentages of energy from carbohydrate, protein and fat were 61.5, 12.2 and 26.3, respectively. Although mean daily dietary intake of protein (74.19 ± 13.64 g) was above the RDA of 59 g/day, mean intakes of Ca; 844.9 mg, Fe; 16.5 mg, and folate; 420.9 mg were below the RDA.



CHAPTER III

MATERIALS AND METHODS

CHAPTER III

MATERIALS AND METHODS

3.1 Study design

The investigation was a cross sectional observational study. A cross sectional study (also known as cross sectional analysis, prevalence study, transverse study) is a type of observational study that analyzes data from a population, or a representative subset, at a specific point of time-that is a cross sectional data.

The survey was conducted in Dinajpur district of Bangladesh. It mainly covered ‘Surjer Hashi Clinic’ and ‘Marie Stopes Clinic’ of Dinajpur Sadar Upazila.

3.2 Map of survey area



Figure 3.1: Map of survey area

3.3 Study population

The survey focused on the group of community-based married women of reproductive age (15-49 years).

3.4 Development of questionnaire

A questionnaire was developed containing both closed and open ended questions to obtain relevant information on anthropometric, socio-economic, women's diet diversity score and different health status. The questionnaire was divided into five sections:

- 1) Demographic information
- 2) Anthropometry
- 3) Socio-economic information
- 4) Diet diversity score
- 5) Health status

All questions were designed, pre-tested, modified and resettled to obtain and record information easily. Any modification necessary were then made and a final pre coded, pre-tested questionnaire was drawn up.

3.5 Sample size

A total of 122 pregnant women aged 15-49 years were selected purposively.

3.6 Data collection

A pre-tested questionnaire was administrated to the pregnant women by asking questions .Both qualitative and quantitative data were collected by interviewing and measurement from their record file. The record files were collected from 'Surjer Hashi Clinic' and 'Marie Stopes Clinic'.



Figure 3.2: Data collection

3.7 Anthropometric data

The anthropometric data were collected based on a standard methods. The following anthropometric data were collected:

Age:

Age of the subjects under study was determined by asking them and sometimes from their clinical record files.

Weight:

The subjects were weighed wearing minimal cloths and bare footed. Weight measurements were obtained using a digital weighing machine and recorded to the nearest 0.1 kg.

Height:

Height of the subjects under study were measured with a portable height machine board without shoes and the average was calculated and recorded to the nearest 0.1 cm.

Body Mass Index (BMI):

For the study population (15-49 years) BMI was used to determine their nutritional status. BMI is calculated by dividing weight in kilograms by the square of height in meters. Classification of nutritional status by BMI was done according to the WHO 1995 classification and Asian BMI classification

$$\text{BMI} = \text{Weight (kg)} / \text{Height (meter square)}$$

Table 3.1: Nutritional status based on the WHO and Asian criteria values

Nutritional status	WHO cut-off	Asian cut-off
Underweight	<18.5	<18.5
Normal	18.5- 24.9	18.5-22.9
Overweight	25- 29.9	23- 24.9
Pre-obese	-	25- 29.9
Obese	≥ 30	≥ 30
Obese Type 1	30-40	30-40
Obese Type 2	40.1-50	40.1-50
Obese Type 3	>50	>50

3.8 Classification of hemoglobin

World Health Organization (WHO) guidelines were followed to measure anaemia status. According to WHO guideline anaemia status is classified as following:

- Severe anaemic- <7.0 g/dl
- Mild anaemic- 7.0-9.9 g/dl
- Moderate anaemic- 10-12 g/dl
- Normal level- >12 g/dl

3.9 Dietary information

A diet diversity score was made. Different types of food was included in score card for weekly consumption. The score card covers cereals, dark green leafy vegetables, vitamin A rich fruits and vegetables, milk and milk products, eggs, iron rich foods, meats and

fish. The dietary information was collected by asking the respondents according to the score card.

3.10 Health status

Different health status of respondents were determined by asking them frequent questions. Other important data were collected from their record files provided by their local 'Surjer Hashi clinic' and 'Marie Stopes clinic' if necessary.

3.11 Variables selection and measurement

Dependent variable:

BMI was the dependent variable in this study. World Health Organization (WHO) guidelines were followed to measure BMI. The category of BMI was underweight, overweight, normal and obese.

Covariates:

Socioeconomic, diet diversity and different health status were categorized in the following way:

1. Pregnancy period of respondent
2. Educational qualification of respondents and spouse
3. Occupation of respondents and spouse
4. Monthly household income
5. Monthly household food expenditure
6. Weekly dietary intake
7. Category of BMI
8. Category of hemoglobin
9. Category of Blood pressure
10. Diagnosis of gestational diabetes
11. Haemorrhage

3.12 Data analysis

For socio-economic, demographic, health and food preferences data analysis, general statistical software SPSS16 was used. For chi-square test cross table was used. The

overall software used for data entry, data analysis, graphical representation and writing report were SPSS16.0, MS WORD, etc.

Tabular analysis:

1. For finding the frequency distribution of several variables simple table was formed
2. Demonstrating the relationship or association between two categorical variables bivariate tables was formed.

Chi-square (X^2) -test:

To test the significance of the association between two categorical variables.

Linear regression:

Linear regression is the most basic and commonly used predictive analysis. Regression estimates are used to describe data and to explain the relationship between one dependent variable and one or more independent variables. The simplest form with one dependent and one independent variable is defined by the formula, $y = a + b \times x$ here $y =$ dependent variable and $x =$ independent variable.

Simple and multiple linear regression:

In linear regression it is summarised as equation $y = \beta_0 + \beta x + \epsilon$ where y is the dependent variable, x is the independent variable and ϵ is the residuals (errors) of the regression. β_0 is the constant or the intercept, i.e. y value when $x = 0$; and β is the coefficient of x . Residuals are the difference between predicted y (using the equation) and observed y at given x . If the model is good, the total difference should be low, meaning that the model predicts observed values very well.

If there is only one independent variable, we call the model as simple linear regression. When we have two or more independent variables, we call it multiple linear regression. For multiple linear regression with two independents, the equation is

$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2$ where x_1 and x_2 are the two different variables.



CHAPTER IV

RESULTS AND DISCUSSIONS

CHAPTER IV

RESULTS AND DISCUSSION

This chapter contains the results obtained by using different statistical tools and their discussions. This chapter also showed the nutritional and health status of pregnant women according to socio-demographic characteristics and food intake pattern of pregnant women per week.

4.1 Univariate analysis

Table 4.1: Frequency distribution of socio demographic status

Characteristics of the study subjects (n=122)			
Variables	Categories	Frequency	Percent (%)
Pregnancy period of respondent	1 st Trimester	31	25.4
	2 nd Trimester	43	35.2
	3 rd Trimester	48	39.3
Age	Youth	4	3.3
	Young adults	118	96.7
Educational qualification of respondent	PSC	40	32.8
	JSC	27	22.1
	SSC	29	23.8
	HSC	14	11.5
	Honors	6	4.9
	MBA	3	2.5
	No formal education	3	2.5
Respondent occupation	House wife	106	86.9
	Service holder	4	3.3
	Student	12	9.8
Physical activity level	Sedentary	104	85.2
	Moderate	18	14.8
Husband's educational qualification	PSC	25	20.5
	JSC	38	31.1
	SSC	24	19.7
	HSC	13	10.7
	Honors	7	5.7
	MS	6	4.9
	No formal education	9	7.4
Husband's occupation	Farmer	25	20.5
	Day labour	38	31.1
	Auto rider	25	20.5
	Service holder	23	18.9
	Business man	11	9.0
Monthly household income(TK)	5000-10000	77	63.1
	10000-20000	37	30.3
	>20000	8	6.6
Monthly household food expenditure(TK)	2000-3000	60	49.2
	3500-5000	49	40.2
	>5000	13	10.7

4.1.1 Frequency distribution of socio demographic status

Pregnancy period of respondent:

From the frequency distribution Table, respondents were categorized into three position during pregnancy time. Among the respondents 25.4% were in first trimester position, 35.2% were in second trimester, 39.3% were in third trimester.

Age:

From the Table 4.1, it was observed that respondents were categorized into two groups. Among the respondent 3.3% were youth and 96.7% were young adults.

Educational qualification of respondent:

From Table 4.1, it showed that 32.8% and 22.1 % respondents had completed PSC and JSC level of education. 23.8% respondents had studied up to secondary level and 11.5% had studied up to higher secondary level. Among the respondents 4.9% and 2.5% had completed graduation and higher level of education. 2.5% had no formal education.

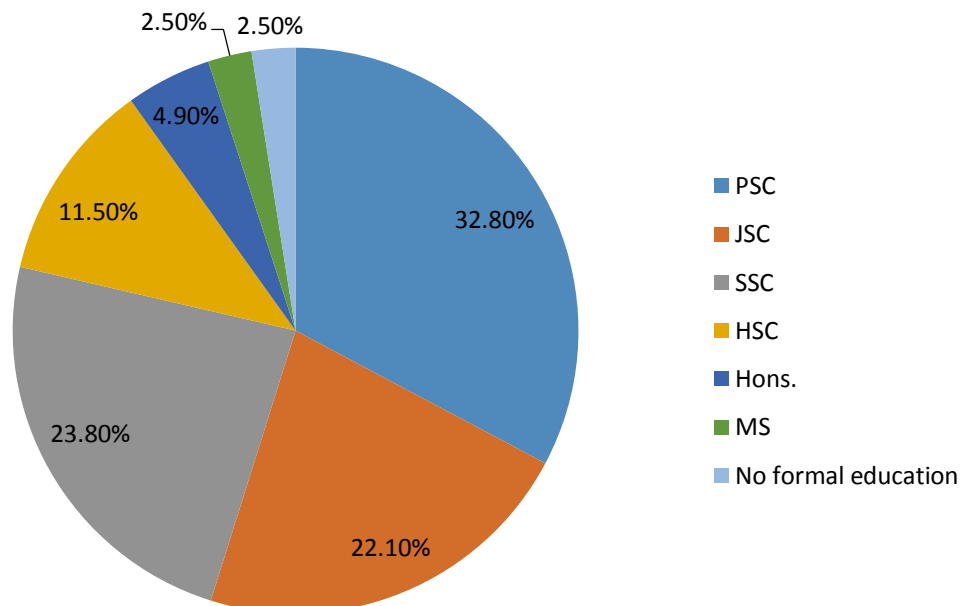


Figure 4.1: Educational qualification of respondents

Respondent occupation:

It was observed from the frequency Table 4.1, that respondent occupation was categorized into three groups. Among respondent 86.9% were housewives, 3.3% were service holder and 9.8% were student.

Physical activity level (PAL):

Table 4.1 represented that respondents were categorized into two types according to activity level of work. Among the respondent 85.2% was sedentary worker and 14.8% was moderate worker.

Husband's educational qualification:

From the Table 4.1 it was observed that, 20.5% and 31.1% had completed PSC and JSC level of education. Among the respondents 19.7% had studied up to secondary level and 10.7% had completed higher secondary level of education. 5.7 % and 4.9% had completed graduation and higher level of education. From the Table, 7.4% respondents had no formal education.

Husband's occupation:

It was observed from the frequency distribution Table 4.1 that respondent husband's occupation was categorized into farmer, day labor, auto rider, service holder and business. Among them 20.5% was farmer. Most of them were day labor 31.1%, 20.5% and 18.9% were auto rider and service holder respectively. The rest 9.0% was business man.

Monthly household income:

Table 4.1 represented that monthly household income was categorized into three groups. Those were 5000-10000tk which was 63.1%, 10000-20000tk which was 30.3%, >20000tk which was 6.6%.

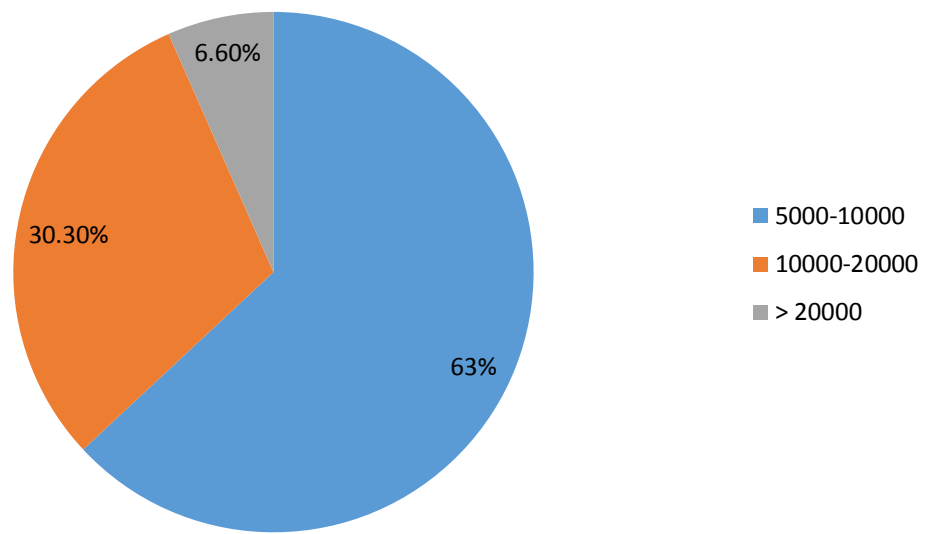


Figure 4.2: Monthly household income (Tk)

Monthly household food expenditure:

From the Table 4.1, who expenses 2000-3000 Tk for food was covered 49.2%, 3500-5000tk, which was 40.2%. Finally more than 5000tk for food was covered 10.7%.

Table 4.2: Frequency distribution of weekly dietary intake

Characteristics of the study subjects (n=122)			
Variables	Categories	Frequency	Percent (%)
Rice	Daily	108	88.5
	3-6 days in a week	14	11.5
Wheat flour	Daily	76	62.3
	2-3 days in a week	20	16.4
	4-6 days in a week	26	21.3
Vegetables	Daily	73	59.8
	3 days in a week	48	39.3
	5 days in a week	1	0.8
Vitamin A rich fruits	1 day	63	51.6
	2 days in a week	31	25.4
	4 days in a week	6	4.9
	Never	22	18.0
Other fruits	Daily	73	59.8
	3 days in a week	48	39.3
	5 days in a week	1	0.8
Iron rich food	Daily	81	66.4
	2 days in a week	40	32.8
	5 days in a week	1	0.8
Fish	1 day	51	41.8
	2 days in a week	46	37.7
	5 days in a week	22	18.0
	Never	3	2.5
Fleshy Meat	1 day	48	39.9
	2 days in a week	47	38.5
	4 days in a week	14	11.5
	Never	13	10.7
Milk and milk products	1 day	58	47.5
	3 days in a week	40	32.8
	5 days in a week	5	4.1
	Daily	2	1.6
	Never	17	13.9
Eggs	Daily	23	18.9
	3 days in a week	46	37.7
	5 days in a week	44	36.1
	Never	9	7.4
Tea or coffee	Yes	41	33.6
	No	81	66.4

4.1.2 Frequency distribution of weekly dietary intake

Rice:

From the frequency distribution Table 4.2, it was observed that the main staple food rice was categorized into two groups. Those were daily consumption and 3-6 days in a week. The percentage of daily consumption of rice was 88.5%. A few number of respondent consume rice 3-6 days in a week and the percentage was 11.5%.

Wheat flour:

According to Table 4.2, wheat flour consumption was categorized into three groups. Those were daily consumption, 2-3 days in a week and 4-6 days in a week. The percentage of respondent consumption was 62.3%, 16.4% and 21.3% respectively.

Vegetables:

Table 4.2 showed that vegetables consumption was categorized into three groups. Those were daily consumption, 3 days and 5 days in a week. Daily consumption of respondent was 59.8%.The rest amount was 39.3% and .8%.

Vitamin A rich fruits:

From the Table 4.2, it was observed that Vitamin A rich fruits (mainly ripe mango, ripe papaya, banana and apple) consumption was categorized into four groups. Those were one day, two days, four days and never in a week. The resultant amount was 51.6%, 25.4%, 4.9% and 18.0%.

Other fruits:

According to Table 4.2, other fruits were categorized into daily, three days and five days in a week. The percentage of consumption was 59.8%, 39.3% and 0.8% respectively.

Iron rich food:

According to Table 4.2, consumption of iron rich food (mainly legumes, nuts, dried beans) was categorized into three groups. Those were daily, two days in a week and five days in a week. The resultant amount was 66.4%, 32.8%, 0.8%.

Fish:

From the frequency distribution Table 4.2, consumption of fish was categorized into four groups. Those were one day, two days, five days and never in a week. The percentage of respondent consumption was 41.8%, 37.7%, 18.0% and 2.5% respectively.

Meat:

It was observed from the Table 4.2, consumption of meat was categorized into four groups. Those were one day, two days, four days and never in a week. The respondent who consumed fleshy meat, the resultant amount was 39.9%, 38.5%, 11.5%, and 10.7% respectively.

Milk and milk products:

From the Table 4.2 this data were categorized into five groups. Those were one day, three days, five days, daily and never in a week .The percentage of respondent consumption of milk and milk products were 47.5%, 32.8%, 4.1%, 1.6% and 13.9%.

Egg:

It was observed from the Table 4.2, that egg consumption was categorized into four groups. Those were daily, three days, five days and never in a week. The resultant amount of consumption was 18.9%, 37.7%, 36.1%, 7.4% respectively.

Tea or coffee:

Table 4.2 showed that from the total respondents, 33.6% respondents consumed tea or coffee and the yield 66.4% respondents did not consume caffeine.

Table 4.3: Mean \pm Standard deviation (SD) of average nutrient intake by pregnant women as (Srilakshmi, 2005) recommended in comparison with RDA:

Nutrients	RDA	Actual intake (Mean \pm SD)
Protein(g)	65	46.1533 \pm 4.15979
Energy(Kcal)	2525	2016.9 \pm 95.52543

4.1.3: Mean and Standard deviation (SD) of average nutrient intake by pregnant women in comparison with RDA

Protein (g): During pregnancy, protein rich diet promotes optimum fetal growth. RDA for protein for pregnant women is 65 gm/day. According to Table 4.3 the mean protein intake was lower (46.1533 gm) as compared to RDA.

Energy (Kcal): As per RDA, the energy consumption should have been 2525 kcal/day. The Table 4.3 showed that average energy consumption of pregnant women was considerably lower (2016.9kcal) as compared to RDA.

Table 4.4: Frequency distribution of protein and energy consumption with category of RDA

Variables	Categories	Frequency	Percent (%)
Protein(g)	Above RDA	43	35.2
	Below RDA	79	64.8
Energy(Kcal)	Above RDA	26	21.3
	Below RDA	96	78.7

4.1.4: Frequency distribution of protein and energy consumption with category of RDA

Protein (g): The Table 4.4 showed that the percentages of the respondents with above RDA and below RDA were 35.2% and 64.8%.

Energy (kcal): According to Table 4.4 it was observed that 21.3% respondents were in above RDA and 78.7% respondents were in below RDA.

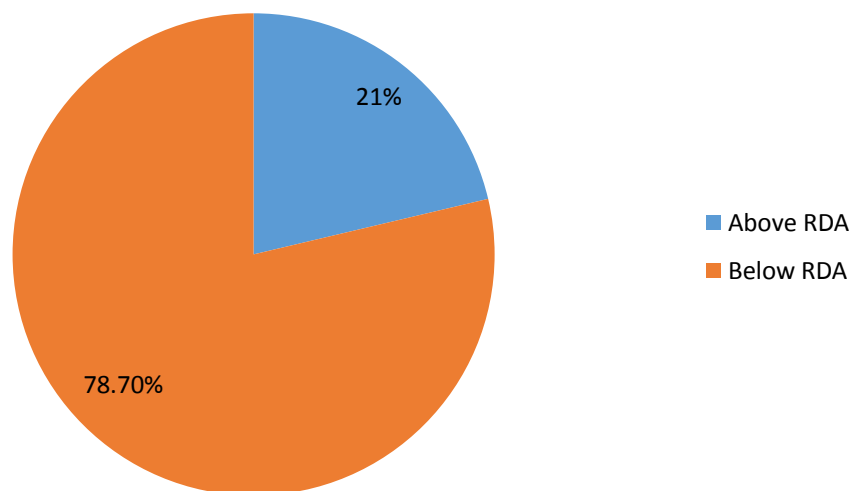


Figure 4.3: Category of energy consumption of respondents

Table 4.5: Frequency distribution of health status

Characteristics of the study subjects (n=122)			
Variables	Categories	Frequency	Percent (%)
Category of BMI	Under weight	10	8.2
	Normal	64	52.5
	Over weight	44	36.1
	Obese	4	3.3
Category of Hemoglobin	Severe	3	2.5
	Moderate	41	33.6
	Mild	76	62.3
	Normal	2	1.6
Exercise	Yes	67	54.9
	No	55	45.1
Frequent headache	Yes	75	61.5
	No	47	38.5
Visual problems	Yes	49	40.2
	No	73	59.8
Thyroid Problems	Yes	5	4.1
	No	117	95.9
Digestion problem	Yes	45	36.9
	No	77	63.1
Nausea and vomiting	Yes	71	58.2
	No	49	40.2
Blood Pressure	High	18	14.8
	Low	86	70.5
	Normal	18	14.8
Diabetes	Yes	42	34.4
	No	80	65.6
Pre-eclampsia	Yes	5	4.1
	No	117	95.9
Sepsis	Yes	15	12.3
	No	107	87.7
Cardiovascular disease	Yes	2	1.6
	No	120	98.4
Haemorrhage	Yes	4	3.3
	No	118	96.7
Depression	Yes	31	25.4
	No	91	74.6
Hemorrhoids	Yes	53	43.4
	No	69	56.6

4.1.5 Frequency distribution of health status

Category of BMI:

From the frequency distribution Table 4.5, it was observed that category of BMI was categorized into four groups. Those were under weight, normal, overweight, obese and their percentages were 8.2%, 52.5%, 36.1%, and 3.3% respectively.

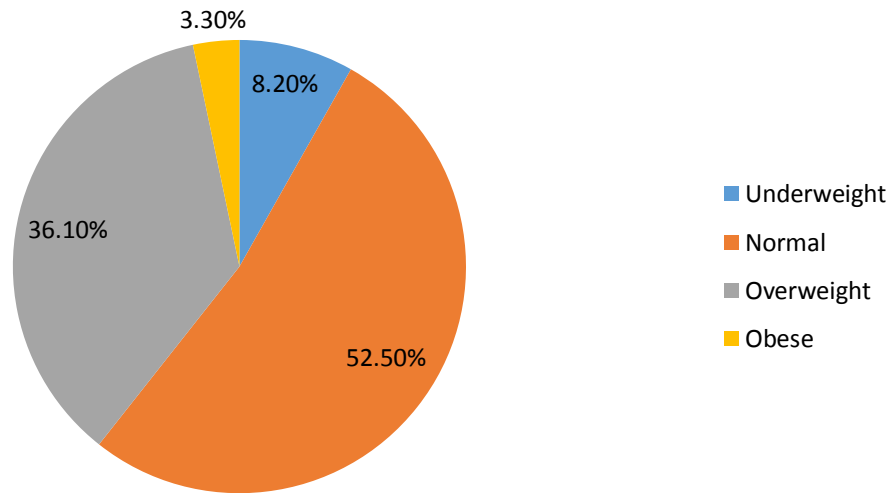


Figure 4.4: Category of BMI of respondents

Category of Hemoglobin:

From the Table 4.5, it was found that hemoglobin level was categorized into four groups. From the respondents the percentages of severe, moderate and mild anemia were 2.5%, 33.6%, 62.3%. 1.6% respondents had normal level of hemoglobin.

Exercise:

It was observed from the Table 4.5 that 54.9% respondents were active in exercise. 45.1% respondents did not take any kind of exercise.

Frequent headache:

According to Table 4.5, 61.5% respondents had frequent headache and 38.5% respondents had no headache.

Visual problem:

From the Table 4.5 it was observed that around the respondent who had vision problems it was 40.2% and 59.8% respondents had no vision problem.

Thyroid problem:

According to Table 4.5 it was observed that 4.1% respondent had thyroid problem. 95.9% respondents had no thyroid problem.

Digestion problem:

Table 4.5 showed that 36.9% respondent had digestion problem and 63.1% respondent never met any digestion problem.

Nausea and vomiting:

It was observed from Table 4.5 that 58.2% respondents had nausea and vomiting. The rest 40.2% respondent had no nausea and vomiting.

Blood pressure:

According to Table 4.5 it was observed that Blood pressure was categorized into three groups. Those were high, low, normal. 14.8% respondents had hypertension, 70.5% had hypotension, only 14.8% respondents had normal level of blood pressure.

Diabetes:

Table 4.5 showed that 34.4% respondents had diabetes and 65.6% respondents had no diabetic symptoms.

Pre-eclampsia:

From the frequency distribution Table 4.5, only 4.1% respondent who had pre-eclampsia. 95.9% respondent had no symptoms of pre-eclampsia.

Sepsis:

According to Table 4.5, 12.3% respondents had many infection which refers sepsis. There was no indication for sepsis 87.7% of the respondents.

Cardiovascular disease:

From the Table 4.5, only 1.6% respondents had cardiovascular problem. 98.4% of the respondents had no complication of cardiovascular disease.

Haemorrhage:

It was observed from the Table 4.5 that the respondents who had haemorrhage it was 3.3%. 96.7% respondents did not indicate this complication.

Depression:

From the frequency distribution Table 4.5, 25.4% respondents had mood disorder which refers depression. The respondents who had no depression, it was 74.6%.

Hemorrhoids:

According to Table 4.5, it was observed that 43.4% respondents had hemorrhoids . 56.6% respondents did not indicate this problem.

4.2 Bivariate Analysis

Bivariate analysis means the analysis of bivariate data. It is used to find out the relationship between two sets of values.

Chi-square test is a method of bivariate analysis which is used to know the association among several covariates with the response variable. In this section, the obtained results are illustrated by using this chi-square method. Simple linear regression estimates the relationship between one dependent variable and one or more independent variables.

Table 4.6: Results of Nutritional status of pregnant women for socio-demographic status

Variables	Categories	Category of BMI				P values
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	
Monthly household income(Tk)	5000-10000	10.4	62.3	24.7	2.6	0.014
	10000-20000	5.4	43.2	48.6	2.7	
	>20000	0.0	12.5	75.0	12.5	
Monthly household food expenditure(Tk)	2000-3000	16.7	53.3	30	0.0	0.002
	3500-5000	0.0	57.1	38.8	4.1	
	> 5000	0.0	30.8	53.8	15.4	

4. 2.1: Results of Nutritional status of pregnant women by socio-demographic status

Monthly household income (Tk):

From Table 4.6 it was observed the respondents were 10.4% underweight, 62.3% normal, 24.7% overweight and 2.6% obese whose monthly household income was 5000-10000 tk. Again, it was observed that whose monthly household income was between 10000-20000 Tk among them 5.4% was underweight, 43.2% normal weight, 48.6% overweight and 2.7% was obese respondents. The respondents whose monthly household income was > 20000 Tk 12.5% found to be normal, 75.0% overweight and 12.5% was obese. From the resultant P- value (.014), it was observed that there exists highly significant association between monthly household income and category of BMI.

Monthly household food expenditure (Tk):

According to Table 4.6 it was observed that there exists a strong association between monthly household food expenditure and category of BMI. It was observed that 16.7% underweight respondents, 53.3% normal weight and 30% of overweight respondents who expenses 2000-3000 Tk in monthly household food expenditure. On the other hand, who expenses 3500-5000 Tk in monthly household food expenditure, the respondents were 22.2% normal, 55.6% overweight and 22.2% obese. It was also observed that 30.8% of normal respondents, 53.8% of overweight and 15.4% of obese respondents that covers > 5000tk in monthly household food expenditure. From the resultant P- value (.002), it was also observed that there exists highly significant association between monthly household food expenditure and category of BMI.

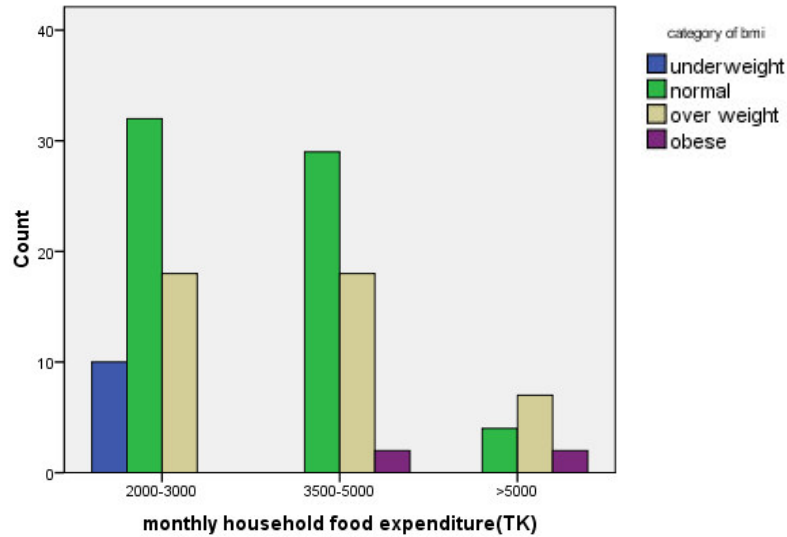


Figure 4.5: Category of BMI and monthly household food expenditure

Table 4.7: Results of Nutritional status of pregnant women for weekly dietary intake

		Category of BMI				
Variables	Categories	Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	P values
Category of Protein	Above RDA	2.3	7.0	81.4	9.3	0.002
	Below RDA	11.4	78.5	10.1	0.0	
Category of energy	Above RDA	4.9	26.8	58.5	9.8	0.006
	Below RDA	9.9	66.7	23.5	0.0	

4.2.2 Results of Nutritional status of pregnant women for weekly dietary intake

Category of Protein:

According to Table 4.7 it was observed that underweight, normal, overweight, obese and the percentage of respondents in above RDA were 2.3%, 7.0%, 81.4%, and 9.3%. It was also found that in below RDA and the percentage of respondents were 11.4% for underweight, in normal weight 78.5% and 10.1% for obese respondent. From the P-value (0.002), it can be said that there exists highly significant association between protein intake and category of BMI.

Category of energy:

It was found that underweight, normal, overweight, obese and the percentage of respondents in above RDA were 4.9%, 26.8%, 58.5%, and 9.8%. On the other hand, in below RDA and the percentage of respondents were 9.9% for underweight, in normal weight 66.7% and 23.5% for obese respondent. From the P- value (0.006), it can be said that there exists highly significant association between energy consumption and category of BMI.

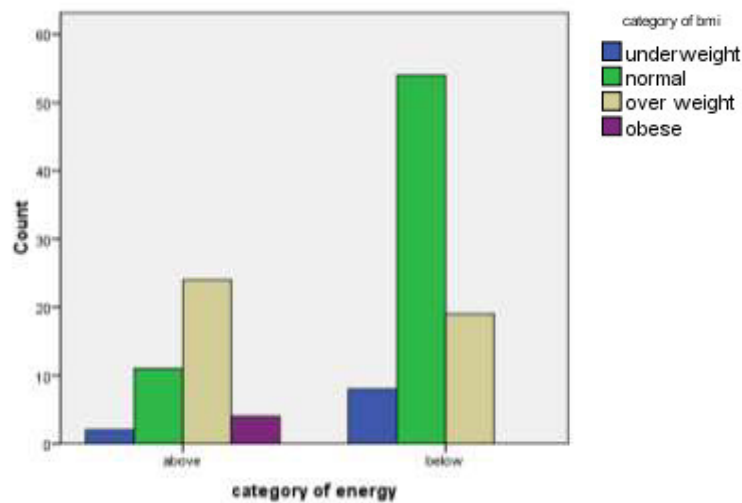


Figure 4.6: Category of BMI and category of energy

Table 4.8: Results of Nutritional status of pregnant women for health status

Variables	Categories	Category of BMI				P values
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	
Blood Pressure	High	0.0	22.2	55.6	22.2	0.016
	Low	11.5	57.5	31.0	0.0	
	Normal	.0	58.8	41.2	0.0	
Diabetes	Yes	7.1	31.0	52.4	9.5	0.002
	No	8.8	63.8	27.5	0.0	

4.2.3: Results of Nutritional status of pregnant women for health status

Blood pressure:

It was observed from the Table 4.8 that there exists a strong association between blood pressure and Category of BMI. High blood pressure was found in 22.2% normal weight, 55.6% overweight and 22.2% obese respondents. It was found that, among the respondents who had low blood pressure were 11.5% underweight, 57.5% normal, and 31.0% overweight. On the other hand 58.8% normal weight and 41.2% overweight respondents had normal blood pressure. Again from the p-value (0.016), it was also observed that there exists highly significant association between blood pressure and category of BMI.

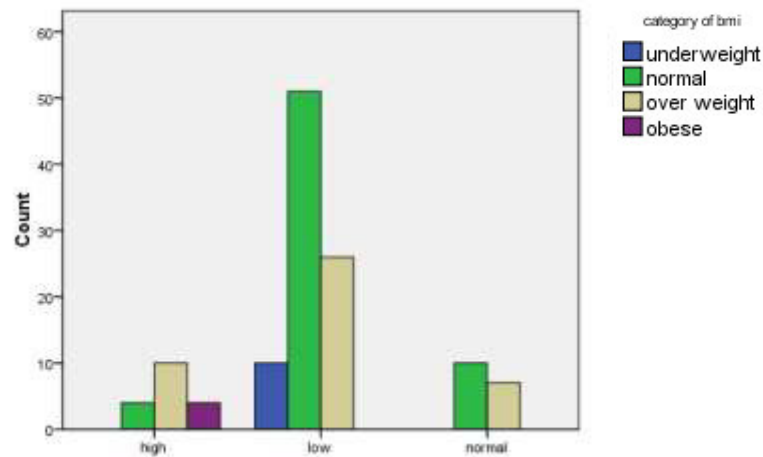


Figure 4.7: Category of BMI and Blood pressure

Diabetes:

From the Table 4.8, it was observed that 7.1% underweight respondents, 31.0% normal respondents, 52.4% overweight respondents and 9.5% obese respondents had diabetes. It was found that there exists a strong association between diabetes and category of BMI. It was observed that 8.8% of underweight respondents, 63.8% of normal respondents, and 27.5% of overweight respondents had no diabetes. Again from the p-value (0.002), it was also observed that there exists highly significant association between diabetes and category of BMI.

Table 4.9: Results of linear regression analysis of significant studied variables for nutritional status of pregnant women:

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-16.454	5.916		-2.781	.006
	energy in Kcal (per day)	.020	.003	.528	6.817	.000

a. Dependent Variable: BMI

Coefficients Table is the main table for linear regression. Regression equation of BMI on energy is estimated as, $BMI = -16.454 + .020 \times \text{energy}$. Energy in kcal (per day) is significantly associated with BMI. Positive coefficient value indicates that the association is positive. When energy consumption increases 1kcal then BMI will increase .020. So it can be said that the higher the energy consumption, the higher BMI.

4.3 Discussion

4.3.1 Socio-demographic features of the respondent

Although the concepts of mother's health and nutritional status have become a major concern, this study was carried out to identify the maternal health and nutritional status. Younger mother experiences complexity during pregnancy compared to adult mothers. This may happen due to immature physical condition. Low educational attainment is one of the potential risk factors connected with poor nutritional status in pregnancy. When considering the education level, more than half of the respondents have completed PSC and JSC level of education. However, this study also revealed that only 23.8% women completed their education up to the secondary level, and around 18.9% completed their studies up to higher secondary level or above. Among the pregnant women 2.5% have no formal education. Hossain *et al.* (2013) conducted a study on nutritional Status of pregnant women in selected rural and urban area of Bangladesh. He found that in his study, educational levels were 8% and 15% illiterate, 17% and 44% primary, 29% and 25% secondary, 10% and 39% under graduate and 2% and 11% post graduation of rural and urban pregnant women respectively.

The education level is important to acquire the knowledge about nutritional requirements and to have adequate nutrients during pregnancy. Most of the pregnant women is sedentary worker and only 14.8% is moderate worker. Nutritional knowledge improves the house-hold food consumption and food security level of the families. Most of the people belongs to lower income. The percentage of top income was few. Food consumption and other expenditure of families depends on income.

4.3.2 Dietary intake of the respondent

A healthy and diverse diet is important at all times in life, but particularly so during pregnancy. The maternal diet must provide sufficient energy and nutrients to meet the mother's usual requirements as well as the needs of the growing fetus, and facilitate the mother to lay down stores of nutrients required for fetal development as well as for lactation. Carbohydrate, protein and fat requirements as a percentage of total energy requirements were recommended as 55 to 75% of total energy from carbohydrate, 10 to 15% energy from protein and 15 to 30 % energy from fat (FAO, 2007 and fat from FAO, 2008). It has been observed from daily dietary nutrients intake of the respondent that only intake of energy, protein met with the RDA values. However, mean of daily energy intake is 2016.9 (kcal/day). Only 21.3% respondents are higher than RDA value and 78.7% are below RDA value of energy. Now the mean of protein intake from diet is 46.15 g. The percentage of protein intake is above RDA 35.2% and below 64.8% respectively. Mostly, Protein intake is below RDA because low consumption of meat, fish and milk. The women who chooses vegetarian diet leads high risk of protein deficiency. So it is necessary to intake adequate amount of protein. . It is an important concern during pregnancy because it crosses the placenta to the baby, whose metabolism is still maturing and cannot fully process it. Caffeine is a powerful central nervous system stimulant. It increases the body's heart rate and metabolism, which in turn can stress the fetus. Excessive consumption of caffeine may be an increased risk of miscarriage (ACOG, 2005).

Their vitamin A consumption is also lower. The reason for the low consumption of vitamin A may be due to low intake of green leafy vegetables and animal based foods that are high in vitamin A. Overall the dietary nutrients intake is low.

4.3.3 Health status of the respondent

Maternal health status at the time of conception is an important determining factor of fetal growth and development, during pregnancy. It has been observed from the respondents 8.2% are under weight. 52.5% respondents have normal weight. The percentage of overweight and obese respondents are 36.1 and 3.3% respectively. Hossain *et al.* (2013) conducted a study and he found that, 14% severely malnourished, 54% and 30% moderately malnourished, 21% and 43% well nourished and 5% and 13% over malnourished.

The reason for the overweight and obesity is fat deposition during pregnancy and thus leading higher weight. The study reveals that 2.5% are severe anemic, 33.6% are moderate anemic, 62.3% are mild anemic. Only 1.6% respondents have normal level of hemoglobin. Hossain *et al.* (2013) conducted a study and he found that in his study, hemoglobin (Hb) level was 16% and 19% severely anemic, 38% and 54% moderately anemic, 24% and 42% mildly anemic and 6% and 11% non-anemic. There are many good reasons to exercise during pregnancy. Exercise during pregnancy helps to reduce some of the common complaints of pregnancy including, backaches, constipation, and bloating and swelling. According to the American College of Obstetrics and Gynecology's guidelines unless there is a medical or pregnancy complication, pregnant women can and should try to exercise moderately for at least 30 minutes on most, if not all days of the week. It has been observed that 54.9% respondents are active in exercise. 45.1% respondents did not take any kind of exercise. Nausea and vomiting is common during pregnancy and it is often called morning sickness. Morning sickness is not limited to the morning. Morning sickness may be more severe with first-time pregnancies or multi-fetal pregnancies. It usually beginning between the 4th and 7th weeks after the last period and ending for most women by the 20th week (Quinla & Hill, 2003). The percentage of nausea and vomiting is 58.2% respondent. However, the result also shows that most of the respondents have hypotension and only 14.8% have hypertension. Gestational diabetes is the term used for diabetes diagnosed during pregnancy. It is due to excessive weight during pregnancy. Women who are diagnosed with gestational diabetes during pregnancy are more likely to develop diabetes later in life. It is present in 34.4% respondents and more than half of the respondents 65.6% have no gestational diabetes.

Pregnancy-induced hypertension is referred to as preeclampsia. Preeclampsia is characterized by elevated blood pressure (> 140 mm Hg systolic or 90 mm Hg diastolic) and significant proteinuria usually developing after the twentieth week of pregnancy. Source: (USDA, 2009). This is present in 4.1% respondent and the rest 95.9% respondents have no symptoms of pre-eclampsia.

Haemorrhage means excessive bleeding in pregnancy. It is the major causes of maternal death (BMMS, 2016). The study reveals that only 3.3% faces this complication and 96.7% respondents did not indicate this complication.

4.3.4 Relationship of Nutritional status of pregnant women with some covariates

The present study shows that there is a positive relationship between monthly household income and category of body mass index ($P= 0.014$). Mainly expenditure depends on income. If income is higher than expenditure must be higher. In the present study it is also found that there is also a strong relationship between monthly household food expenditure and category of body mass index ($P= 0.002$). It has been observed from the table that percentage of normal is higher in low income group, and the same time underweight are also equally high in this group. In the top income group, percentage of overweight is higher.

In the present study it is also found that there is also a strong relationship between category of energy and category of body mass index ($P=.006$). Comparison of mean energy consumption by respondents and given value by RDA show differences across all age groups. Most of the respondent shows below RDA value. So it can be said that energy consumption is lower during pregnancy.

Blood pressure is associated with weight. The present study shows that there is a positive relationship between blood pressure and category of body mass index ($p= 0.016$). It has been observed from the study that overweight and obese respondent have high blood pressure. Then normal and underweight respondent have low blood pressure.

The study shows that there is a positive association between diabetes and category of body mass index ($P=0.002$). The women who are overweight are at greater risk of developing pregnancy complications and problems associated with labor and delivery. Though gestational diabetes is very common during pregnancy, but it has been observed that overweight and obese respondent shows the maximum percentage of diabetes.



CHAPTER V

SUMMARY AND CONCLUSION

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Reproductive health and nutritional status of pregnant women of this study was not satisfactory and need more attention. Socio-demographic difference was common in variation of nutritional status of women. Malnutrition, under-weight were more common nutritional problems in the study. Due to malnutrition different types of life threatening complications may arise for pregnant women. There is no magic pill that can reduce or increase the nutritional status of the pregnant women. Hence some measurements should be taken to improve reproductive health and nutritional status of women.

Recommendations

It is necessary to increase awareness about dietary intake, maternal nutrition and maternal health during pregnancy, some of the recommendations from this study findings are:

- Increase awareness about malnutrition of pregnant women
- Improve health facilities at health care center
- Educational level of the rural women should be improved
- Early marriage should be discouraged
- Improve alertness about regular check up of their health
- Promoting women's knowledge about their bodies, sexuality, reproductive systems, complications during pregnancy and care of children
- Facilitating Emergency obstetric care (EOC)
- Improve delivery care
- Lowering the cost for primary health and medical services
- Trained persons should be posted on health care center



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APPENDIX

Appendix: Questionnaire & schedule

“Study on Assessment of Nutritional and Health Status of Pregnant Women in Surjer Hashi Clinic and Marie Stopes Clinic of Dinajpur Sadar Upazila”

Signature of respondent.....

Date.....

Section 1: Identification of Respondent

Name:
Division:
District:
Upazila/ Ward:
Name of household head:
Relationship to household head:
Pregnancy period of respondent:

Section 2: Background information

Religion	Educational qualification	Age	Weight (kg)	Height (cm)	Age of Husband (years)	Education of husband

Section 3: Socio- demographic information

Questions	Responses
What is your occupation?	
What is your husband's occupation?	
How much cultivable land does your household own?	
Any extra work that contributes to household income?	
Monthly household income	1) (5000 – 10,000) TK 2) (10,000 – 20000) TK 3) >20000 TK
Monthly household expenditures	1) (3000 – 6000) TK 2) (8000 – 12000) TK
Monthly household food expenditures	1) (2000 – 3000) TK 2) 3500-5000 TK 3) >5000 TK

Section 4: Women's food consumption in a week

Question	Food group	Examples	Yes/ No
1.	Cereals and any white roots and tubers	Rice, wheat, corn / maize, millet or other grains (e.g. ruti, noodles, biscuits, vermicelli, khichuri etc)	
2.	Dark green leafy vegetables	Locally available vitamin A rich leaves such as data shak, spinach, pui shak	
3	Vitamin A rich vegetables and tubers	Pumpkin, carrot, squash	
4	Vitamin A rich fruits	Ripe mango, ripe papaya, banana and apple	
5.	Other fruits or vegetables	Tomato, onion	
6.	Flesh meats	Beef, chicken, goat etc	
7.	Fish and sea food	Fresh or dried fish or shellfish	
8.	Eggs	Eggs from chicken and duck	
9.	Iron rich foods	Legumes, nuts, dried beans	
10.	Milk and milk products	Milk, cheese, yoghurt or other milk products	
11.	Tea and Coffee	Caffeine from tea, coffee and soft or hard drinks	

Section 5: Health Status

Questionnaire	Yes/ No
How is your general health? (Good/ Poor)	
Weight (kg)	
Do you exercise for at least 30 minutes on a day?	
Have you been under a physician's care before?	
No. of times you have been pregnant (Including present)	
Any problem before pregnancy and duration of problem?	
Do you have any serious injuries or operations?	
Frequent headache or migraine	
Visual problems	
Hearing problem	
Sinusitis problems	
Frequent sore throats, Tonsillitis	
Thyroid	
Nausea / vomiting	
Do you have digestion problem?	
Hemorrhoids	
High blood pressure/ low blood pressure	
Diabetes(Before/ After)	
Do you have cardiovascular disease?	
Do you have eclampsia?	
Kidney infection	
Irregular periods	
Haemorrhage	
Sepsis	
Low blood/ Anemia	
Vitamin A deficiency	
Depression	