Investigating the food habits and beliefs of pregnant women living in rural Bangladesh

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To my Oma, whose courage and strength has always been such an inspiration to me and represents the resilience of women worldwide. I miss you and love you; rest in peace.

ABSTRACT

The maternal diet plays a vital role in foetal growth and development, which continues to influence the infant's health status throughout their life and future generations. In developing countries such as Bangladesh, the maternal diet is limited and malnutrition rates are high, most often due to underlying economic, cultural, political and environmental factors that determine complex human behaviours, including food consumption practices.

The aim of this study was to use a mixed method approach to investigate food consumption practices during pregnancy and to explore the role of traditional eating habits and taboos in the maternal diet in rural Bangladesh.

Individual interviews were conducted with pregnant women (n=43) from nine villages in Pirganj upazila to collect demographic and individual dietary diversity data. Eight focus groups were conducted, which commenced with the compilation of a harvest calendar ('ten seed method') followed by a semi-structured discussion about food habits and beliefs whilst pregnant. Additionally, six women completed a photographic participant observation to enrich research findings.

The women's ages ranged between 15-42 years, with 25 belonging to Ethnic Minority (Adivasi) groups and 18 being Bengali. The mean dietary diversity score was 5.9 and the mean food variety score was 7.2, indicating poor diversity. Adivasi women consistently had lower dietary diversity scores and lower socio-economic status than Bengali women. Cultivated crops were rice, jackfruit and mango, with rice being the main crop, harvested twice a year, and consumed daily by all women. Women's social status, cultural customs and high poverty levels prevent them from achieving a diet that includes a varied diet during pregnancy. Most women consume fish 1-2 times a week and meat once every 2-3 months. Taboos regarding pregnancy were variable between groups. Examples include: food preparation during an eclipse causing ear/mouth deformities in their babies; a small pregnancy belly being desirable to prevent difficult childbirth; avoiding pineapple and green papaya because it can cause miscarriage.

Eating habits and taboos are engrained into the Bangladeshi culture and poor practices often result in pregnant women's insufficient consumption of a varied diet. The findings highlight the importance of understanding the relationship between underlying factors of malnutrition when planning sustainable improvements to health and wellbeing. These research findings were successfully incorporated into the Optimal Nutrition During Pregnancy project, which is currently being implemented in the Pirganj community.

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CONTRIBUTORS TO THE STUDY

Name	Position	Contribution
Moniek Kindred	Researcher	Determined the study concept and design, completed the literature review and ethics application, designed data collection resources, collected, analysed and interpreted research findings and prepared thesis manuscript.
Rozanne Kruger	Supervisor	Supervised design and conduct of research, reviewed ethics application and manuscript and provided analysis support.
Cathryn Conlon	Supervisor	Supervised design and conduct of research, reviewed ethics application and manuscript and provided analysis support.
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TABLE OF CONTENTS

LIST IF FIGURES

LIST OF TABLES

ABBREVIATIONS

ADP – Area Development Program

BBS - Bangladesh Bureau of Statistics

BDHS - Bangladesh Demographic and Health Survey

BMI – Body Mass Index

BRAC – Bangladesh Rural Advancement Committee

DALYs - Disability-Adjusted Life Years

FANTA - Food and Nutrition Technical Assistance

FAO – Food and Agriculture Organisation

FG – Focus Group

FVS – Food Variety Score

IDDQ – Individual Dietary Diversity Questionnaire

IDDS – Individual Dietary Diversity Score

IQ – Intelligence Quotient

LBW – Low Birth Weight

MICS - Multiple Indicator Cluster Survey

NGO – Non-Government Organisation

NIPORT - National Institute of Population Research and Training

ONDP – Optimal Nutrition During Pregnancy

PPM – Parts Per Million

RDI - Recommended daily intake

RAE - Retinol A equivalents

SPSS - Statistical Product and Service Solutions

TBA – Traditional Birth Attendant

UNICEF – United Nations International Children's Emergency Fund

WHO – World Health Organisation

WDDS – Women's Dietary Diversity Score

BENGALI TRANSLATIONS AND TERMANOLOGY

Adivasis – People belonging to an Ethnic Minority group in Bangladesh.

Aloo –Potato

Ayurbedic medicine – Local medicine based on herbs roots and metals which originated in India

Baht – Rice

Baja – Woman who cannot conceive a baby

Bashi foods – Foods cooked on previous day

Batul foods – Foods which are taboo to eat after delivery (e.g. hilsha fish, beef, shrimp fish and mutton)

Bhorta – Mash

Caffi - Cabbage

Chanachur - Bhuja/bombay mix

Curd – Yoghurt

Dahl – Lentil

Dudh – Milk

Dudhbaht – Rice cooked in milk

Ekadashi – Hindu fasting period

Fhata – Genetic skin disease similar to itchytosis

Gourd – A plant of the 'Cucurbitaceae' family which includes cucumbers, pumpkins and melons.

Gur – Molasses

Guti guti – When baby is born with bumpy skin, similar to a rash

Hapani - Pneumonia

Jhar Fuk - Splashing blessed water over the face

Jujube – Indian Baroi fruit

Khir – Boiled milk and sugar product

Khoi – Dry fried paddy (unprocessed rice)

Kobiraj – Drinking blessed water

Manoth – The act of making a sacrifice and offering a prayer at a place of worship to be able to conceive a baby

Muri – Puffed rice

Nahla - Dribbling

Nasta – Snack

Payesh – Luxurious dessert commonly made from rice, cardamom, raisins, gur and milk

Piazu - Deep fried lentil mixture

Upavas – Hindu fasting period

Ramadan – The ninth month of the Muslim calendar when Muslims observe a month of fasting during daylight hours

Rice fry – Dry fried rice

Roja – Muslim fasting period

Roti – Bread

Shaad – Ceremony when women are provided with food during the seven month of pregnancy

Shaak – Green leafy vegetables

Sim – Green bean

Singara - Bangladeshi samosa

Tel Pitha - Fried sweet bread, similar to doughnuts

Tor kari – Vegetable curry (sometimes with the addition of egg, fish or meat)

LIST OF APPENDICES

CHAPTER ONE: INTRODUCTION

There is more to do for the mother who watches her children go to bed hungry – a scandal played out a billion times each and every night. There is more to do for the young girl weighed down with wood or water when instead she should be in school - Ban Ki-moon (Secretary-General of the United Nations, 2007-present).

1.1 Introduction

Maternal malnutrition is due to multiple underlying ecological factors, including the social, cultural and economic environment, which influence women's food consumption practices (Bronfenbrenner, 1979). In developing countries, pregnant women are often faced with a lower social status, additional restrictions and lack access to nutritious food to provide for their increased requirements (Shannon, Mahmud, Asfia, & Ali, 2008). During pregnancy, the women's diet must provide adequate energy and nutrients to meet not only the mother's daily nutritional needs, but maintain her maternal stores, whist meeting the nutritional needs of the growing foetus (Mukhopadhyay & Sarkar, 2009; Williamson, 2006).

The impact of maternal malnutrition on the foetus is most severe due to the critical growth and development periods during the first and third trimesters of pregnancy (Muthayya, 2009; Robinson, Sinclair, & McEvoy, 1999; Walker et al., 2007). Maternal underweight during pregnancy leads to growth restriction of the foetus while in the womb, and is the leading cause of giving birth to a low birth weight (LBW) (defined as being born weighing less than 2500 grams) baby, who is prone to disease and premature death (Imdad, Sadiqb, & Bhutta, 2011; Kramer, 1987). LBW accounts for 50 percent of stunting (low height-for-age), impairs cognitive development and is one of the most influential factors affecting neonatal and postnatal mortality and morbidity (Fowles & Gabrielson, 2005; Kramer, 1987; McCormick, 1985; Williamson, 2006). Babies born weighing 3100 to 3600 grams are associated with optimum foetal outcomes in terms of growth and development (Kramer, 1987), and are linked with

reduced complications during pregnancy and labour (Williamson, 2006; World Health Organisation, 1995).

Factors which can increase the risk of LBW are a maternal body mass index (BMI) less than 18.5 at the time of conception or poor maternal weight gain during pregnancy (R. Ahmed, Rahman, Hossain, Afroze, & Ahmed, 2003; Neggers, Goldenberg, Tamura, Cliver, & Hoffman, 1997; Williamson, 2006). If the mother is of normal BMI prior to her pregnancy, a maternal weight gain of 12 kilograms (10-14 kilogram range) at full term is associated with a healthy outcome for both the mother and the baby (Hytten & Robertson, 1971; Williamson, 2006). Due to socio-economic factors causing malnutrition and poverty in developing countries, women are often underweight and have a low micronutrient status at the time of conception (R. Horton, 2008). Malnourished and underweight women have a greater need for additional weight gain during pregnancy to compensate; nevertheless, this is most often not achieved because of underlying poverty factors.

Babies born with LBW have:

- a 40 fold increased risk of dying in the neonatal period[1] (Rodrıguez-Bernal et al., 2010; UNICEF, 2002),
- a decreased IQ by 5-10 points (Howlader et al., 2012; Walker, et al., 2007),
- increased likelihood of long term mental disorders including irreversible visual, hearing, and cognitive impairments (UNICEF, 2002; Victora et al., 2008; Walker, et al., 2007),
- increased susceptibility to infection and disease (Bhaskaram, 2002; R. Black et al., 2008; UNICEF, 2002),
- and an increased risk of premature death (Lawn, Cousens, Zupan, & Lancet Neonatal Survival Steering Team, 2005; UNICEF, 2002).

These factors initiate a negative effect on the child's development, health and socio-economic status as they grow older. Consequently, this amplifies the malnutrition cycle that perpetuates throughout generations in developing countries; trapping

[1] First 28 days of life

people further into poverty and poor health *(figure 1.1) (Admission Committee on Coordination (ACC)/Standing Committee on Nutrition (SCN), 2000).* Figure 1.1 depicts how the challenges of malnutrition continue throughout the life cycle. Poor nutrition often starts in the womb and continues, especially for females, throughout childhood and adult life with additional detrimental effects at each stage (Admission Committee on Coordination (ACC)/Standing Committee on Nutrition (SCN), 2000).

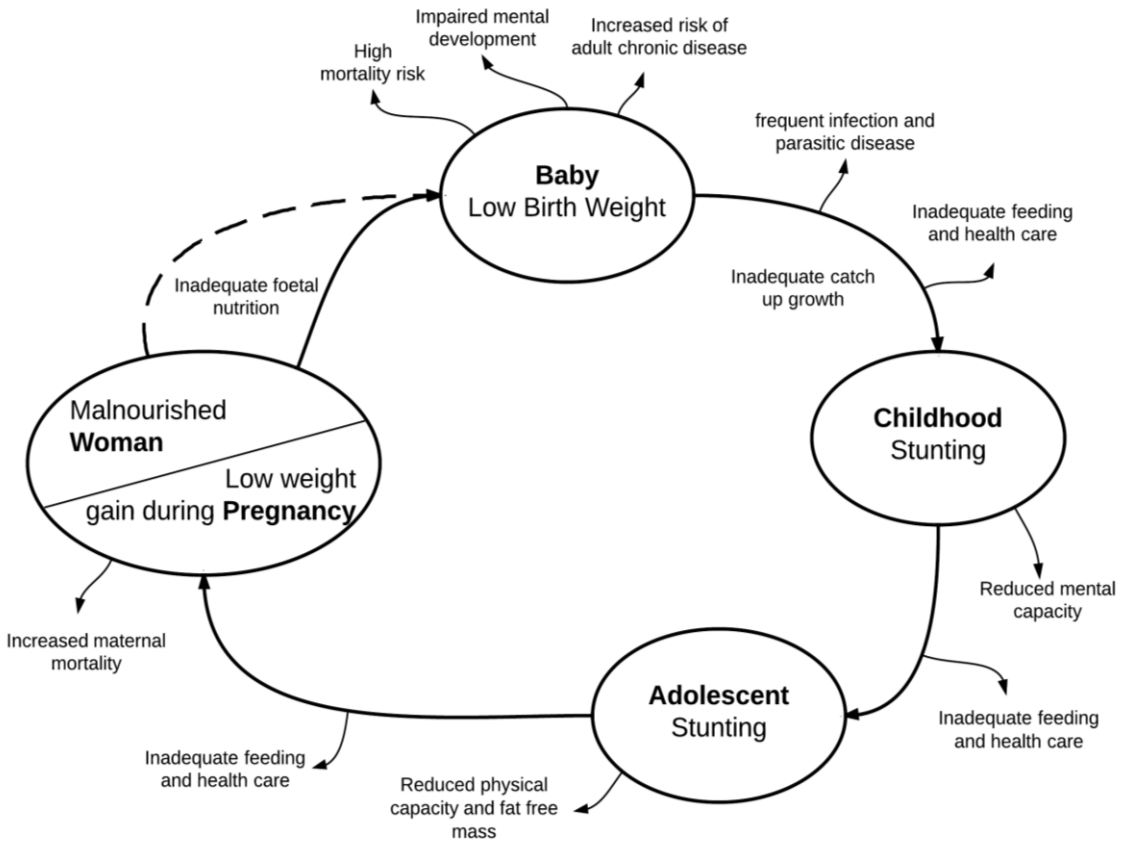

Figure 1.1 Malnutrition cycle (adapted from (Admission Committee on Coordination (ACC)/Standing Committee on Nutrition (SCN), 2000))

The duration of a woman's pregnancy offers a unique opportunity to establish a healthy and long life for her baby and future generations. The window of opportunity is the 1000 days from the women's conception, throughout her pregnancy (270 days) and until the child is two years of age (730 days) (1000 DAYS, 2011). A healthy and well-nourished woman throughout her pregnancy is more likely to break the cycle of

malnutrition and can have a major impact on the child's ability to grow, learn and rise out of poverty (1000 DAYS, 2011).

Asia is home to over 50 percent of the world's malnourished children and has the highest prevalence of maternal malnutrition and LBW of any continent (Osmani & Bhargava, 1998; Shannon, et al., 2008; UNICEF, 2009a). Maternal and infant deaths during the labour period and mortality of children under five years old are disproportionately greater in Asia than any other part of the world (UNICEF, 2009a). Bangladesh is located in the heart of Asia and nearly half the population live in extreme poverty (classified as living on less than US$1.25 per day) (The World Bank Group, 2012b). It is a priority area for many international Non-Government Organisations (NGO's) as it is currently ranked by the United Nations as one of the poorest and least developed countries in the world (United Nations, 2011). Bangladesh is prone to natural disasters, is highly populated and its slow economic growth depends on agriculture and manufacturing which generates limited exports (World Vision Bangladesh, 2012a). This situation therefore limits the countries development and the people's ability to work their way out of poverty.

Due to poverty and malnutrition in Bangladesh 30 percent of all women have a BMI less than the underweight cut-off of 18.5 (Khatun & Rahman, 2008; National Institute of Population Research and Training, 2009). More than one million LBW babies (40 percent of annual live births) are born each year in Bangladesh which is among the highest in the world (Khatun & Rahman, 2008; National Institute of Population Research and Training, 2009; Shannon, et al., 2008). Rates of high malnutrition continue into childhood, with 36 percent of children being stunted (low height-for-age), 41 percent being underweight (low weight-for-age) and 16 percent being wasted (low weight-for-height) (National Institute of Population Research and Training, 2011). These malnutrition rates are all above the maximum levels set by the World Health Organisation (WHO) to indicate a severe public health problem (UNICEF, 2009a) and therefore indicating the critical need for improved maternal nutrition in Bangladesh.

1.2 The study setting

Bangladesh is made up of 500 upazilas (geographical classification used for administrative purposes.) An upazila is similar to a 'district' found in New Zealand or a 'county' found in Britain. This research study was carried out in the Pirganj upazila, located 220 kilometres north of the capital city, Dhaka. Pirganj is in the southernmost upazila, in the Rangpur district, in the Rangpur division *(figure 1.2).*

Figure 1.2 Administrative map of Bangladesh with Pirganj upazila map insert (adapted from (SASNET - Swedish South Asian Studies Network, 2011))

According to the 2001 census[2], Pirganj has a population of 345,593 people. The total land area of Pirganj is 409.37 square kilometres and is a fair representation of rural Bangladesh. Like other rural areas, Pirganj has a high population density of 741 people per square kilometre, fertile low lying land, limited health care and a low literacy rate of 39 percent (Bangladesh Bureau of Statistics, 2001). The main crops cultivated include rice, wheat, potato, sugarcane, corn, banana, chilli and mustard seed. There is one upazila health complex with 50 beds, 24 local doctors and an additional 15 smaller health clinics serving the area (Bangladesh Bureau of Statistics, 2001). The majority of the population is Muslim (91.49%), followed by Hindu (6.75%) and other religions, including Christian (1.76%) (Bangladesh Bureau of Statistics, 2001).

Pirganj upazila is made up of 15 unions (further geographical subdivision) and within these, there are 333 villages. World Vision currently works in four of the unions, which are Pirganj, Chatra, Bara-Alampur and Tukuria *(figure 1.3).*

*Figure 1.3 Map of Pirganj upazila. The four unions World Vision is working in highlighted in red. Adapted from (Banglapedia, 2006))*Similar to other rural area of

[2] Data from the 2011 census is yet to be released

Bangladesh, Pirganj has a low standard of living with high levels of poverty and malnutrition. The baseline survey of the area (completed by World Vision Bangladesh in 2009) recorded that a large percentage (80%) of the population lives on two meals per day with the majority of the population relying on seasonal agricultural work. Half of the school aged children have dropped out of school by class five (11-12 years of age), 60 percent of households have no toilet facilities, and 27 percent of babies are born with LBW (World Vision Bangladesh, 2011).

Bangladesh was part of the British Raj and when separated from India this was done on terms of religion. The majority of Bangladeshi people are Muslim and are referred to as 'Bengali'. However, there are 46 different ethnic minority groups with varying cultural heritages also living throughout Bangladesh (Besra, 2006). In the local Bangla language, the term in which ethnic minority groups refer to themselves as is 'Adivasi' (Besra, 2006). Therefore throughout the course of this research study all women belonging to an ethnic minority group (as opposed to the Bengali majority) will be referred to as Adivasi. The Pirganj upazila has a high population of Adivasi groups with most Adivasi communities classified as 'ultra-poor[3]' by World Vision Bangladesh. This is because Adivasi groups are often landless, restricted from purchasing land by Bangladeshi law and often unable to seek employment above that of farming. Adivasi groups are politically and economically marginalized and by many are not considered as true citizens of Bangladesh (Besra, 2006; L. Karim, 1998).

1.3 The partnership

Due to a strong personal desire to work in partnership with a humanitarian organisation and to undertake research in a developing country, I approached World Vision New Zealand during 2011 to explore potential options. World Vision is an international Christian based NGO, working in more than 90 countries around the

[3] 'Ultra-poor' is the lowest category when ranking households on the basis of wealth. The four wealth ranking categories World Vision uses is; rich, middle, poor and ultra-poor. Ultra poor households are generally landless, very low annual income and own few assets.

world to overcome poverty and injustice. World Vision New Zealand was established in 1970 and currently operates in 25 countries, supporting more than 55 projects (World Vision New Zealand, 2012a). Following discussion with World Vision New Zealand, I was offered the opportunity to design and plan formative research that could contribute to the Optimal Nutrition During Pregnancy (ONDP) project. The ONDP project was in its initial stage of development and is now being implemented (2012-2014) through World Vision in the Pirganj upazila. World Vision Bangladesh was established in 1970 after the Bhola cyclone struck coastal regions of Bangladesh. World Vision Bangladesh currently reaches over four million beneficiaries, employs thousands of local staff and volunteers, and operates throughout 62 Area Development Programs (ADP) (World Vision Bangladesh, 2012b). An ADP is a centre which contributes to the local community's sustainable development with the support and integration of various programmatic areas (World Vision, 2012).

World Vision completed a baseline survey of the Pirganj area in 2009 which included basic demographics, prevalence of health indicators and food security indicators (World Vision Bangladesh, 2011). From the baseline survey World Vision Bangladesh identified Pirganj as having the highest rates of malnutrition in Bangladesh and due to its remote location, limited aid agencies were operating in the area (World Vision Bangladesh, 2011). Therefore, World Vision established an ADP in Pirganj in 2010, and will continue to support the community to build their own development infrastructure until 2025. Due to these reasons, Pirganj was selected as the study site for the ONDP project which aims to measure whether a contextually appropriate supplementary food given during pregnancy, can have a positive impact on the child's health outcome and effectively break the malnutrition cycle. Although World Vision had completed an initial baseline survey (World Vision Bangladesh, 2011), information about locally available foods, traditional diets, eating habits, food taboos and beliefs specific to pregnant women in the Pirganj area was not included in the survey and was crucial for the success of the ONDP project. Therefore, this formative research study aimed to investigate food consumption practices and the role of traditional eating habits and taboos of pregnant women living in Pirganj. The findings from this research study

enhanced the ONDP project's study design, the development of a supplementary feeding product, the data collection tools and the education tools used throughout the ONDP project.

The research collaboration between Massey University and World Vision enabled me as the researcher to take advantage of local knowledge, the NGO's technical and cultural expertise, access to and acceptance by communities, and to use local staff with additional logistical support. The Pirganj ADP has established government and non-government relationships in the community, which encouraged motivated community leaders and stakeholders to participate in research activities and contribute human resources to add to the collection of high quality data. In exchange, World Vision staff gained experience and enhanced capacity in research methods and study protocols, a summary of main findings which were incorporated into the ONDP project and will be presented with a copy of the final thesis on its completion. This collaboration with World Vision endeavoured to give the best possible outcome for the Bangladeshi people, with all parties in the partnership reaping benefits by using a two way model of sharing expertise.

1.4 Conceptualisation

The cause of malnutrition is dependent on a multitude of variables unique to each individual. Factors such as income, food security, climate, traditions, gender, religion, food preferences, and knowledge are referred to as an individual's 'foodways'[4] (Devadas, 1970). Foodways underlie food consumption and exert negative or positive influences on the individual's immediate nutritional state. All countries, groups within countries and individuals within groups have varying foodways which are influenced by their economic, cultural, social and environmental situations in relation to food

[4] Foodways are an individual's cultural, social and economic environment which effects their food production and consumption practices (Devadas, 1970).

production and consumption (Devadas, 1970; D. Lee, 1957; Shatenstein & Ghandrian, 1998).

The diversity of an individual's diet is determined by foodways such as food availability (via harvesting, purchasing or gathering), food access, cultural norms and socio-economic level (Hoddinott & Yohannes, 2002). Dietary diversity is a measure of the number of food groupings eaten over a reference period and is recognised as a key dimension of diet quality (Ruel, Deitchler, & Arimond, 2010). A diet high in diversity is more likely to provide essential micronutrients and energy for rapid growth and development, which is especially important during pregnancy and childhood (Arimond & Ruel, 2004). However, sufficient dietary diversity is often not achieved in developing countries (Thorne-Lyman et al., 2010). In resource poor communities diets are usually based on low quality, monotonous, starchy staple foods, with the reliance on annual harvesting to meet basic food intakes (Campbell et al., 2010; Hoddinott & Yohannes, 2002). Families who are able to grow and harvest their own crops are likely to be less vulnerable to the negative effects of underlying foodways, and are able to sustainably increase their dietary diversity and intake of micronutrient dense foods (Iannotti, Cunningham, & Ruel, 2009; Thorne-Lyman, et al., 2010).

Eating habits are the frequently repeated and subconscious behaviour patterns concerning the preparation and consumption of food (Hunt, Matarazzo, Weiss, & Gentry, 1979). Eating habits are shaped by foodways such as food availability and accessibility, cultural customs and social systems (Devadas, 1970; Shatenstein & Ghandrian, 1998). Eating habits are the result of a group or an individual's present environment and past history, while influenced by their attitudes, beliefs and experiences (Lowenberg, Todhunter, Wilson, Savage, & Lubawski, 1974; Shatenstein & Ghandrian, 1998). Traditional food taboos and beliefs are foodways which are deeply imprinted into cultures and influence daily eating habits. Food taboos and beliefs, which determine what can and cannot be eaten, may amplify malnutrition by limiting nutritious foods during periods of nutritional stress, such as pregnancy (Devadas, 1970; Mukhopadhyay & Sarkar, 2009; Shatenstein & Ghandrian, 1998). The Bangladeshi

culture has a strong belief system which stems from traditional religious practices and is thoroughly engraved into everyday life (Piechulek, Aldana, Engelsmann, & Hasan, 1999). Their beliefs and taboos have been shown to influence what women may or may not consume during pregnancy (Choudhury & Ahmed, 2011; Piechulek, et al., 1999; Shannon, et al., 2008) and are amongst the most conservative of any culture (Maloney, Aziz, & Sarker, 1981). In a country where food security is low and extensive malnutrition exists, further limitations on food intake during pregnancy due to following traditional beliefs or harmful habitual practices may have a compounding effect on the mother and her baby's health (Maloney, et al., 1981).

To successfully decrease the prevalence of LBW, micronutrient deficiency disease and therefore the burden of malnutrition in Bangladesh, we must first understand which factors influence women's food choices when pregnant, and why. If we gain a robust understanding of eating habits and why pregnant women will consume some foods whilst they avoid others, we can encourage relevant and sustainable behaviour changes to improve food intake and nutritional status in this particular group. Other studies set in Bangladesh have investigated women's health care and eating practices during pregnancy, delivery and the postpartum period, but only briefly touched on their food habits and beliefs (Choudhury & Ahmed, 2011; Piechulek, et al., 1999; Shannon, et al., 2008). Several studies have focused on taboos and beliefs surrounding actual birthing practices (Barnett et al., 2006; Choudhury & Ahmed, 2011; Goodburn, Gazi, & Chowdhury, 1995), or investigated eating practices and beliefs of breastfeeding women or children (Choudhury & Ahmed, 2011; Goudet, Faiz, Bogin, & Griffiths, 2011; Moran et al., 2009; Piechulek, et al., 1999; Zeitlyn & Rowshan, 1997). No study has solely focused on understanding pregnant women's eating habits and their cultural taboos and beliefs surrounding eating practices, in the context of dietary diversity and household harvest in rural Bangladesh. Therefore this research study will provide new insight into a relatively unexplored area and will be specific to pregnant women living in the Pirganj upazila.

1.5 Study justification and problem statement

Currently Bangladesh suffers from some of the worst maternal and childhood malnutrition rates worldwide. This research will fill a large knowledge gap and enrich the ONDP project which could ultimately contribute to the improvement of Bangladeshi women's nutritional status during a critical life stage. This research is extremely worthwhile in Pirganj upazila because of high malnutrition rates, clusters of ultra-poor Adivasi groups and because little is known about underlying malnutrition factors such as the eating habits, taboos and beliefs of pregnant women in this area. In figure 1.4 below, this research study's theoretical framework shows how the underlying factors of dietary diversity, household crop harvest, beliefs and eating habits interact with one another to form foodways and influence food consumption practices during pregnancy. Only once foodways are thoroughly explored can we understand how to achieve optimal nutrition during pregnancy through integrated nutrition interventions (Shannon, et al., 2008).

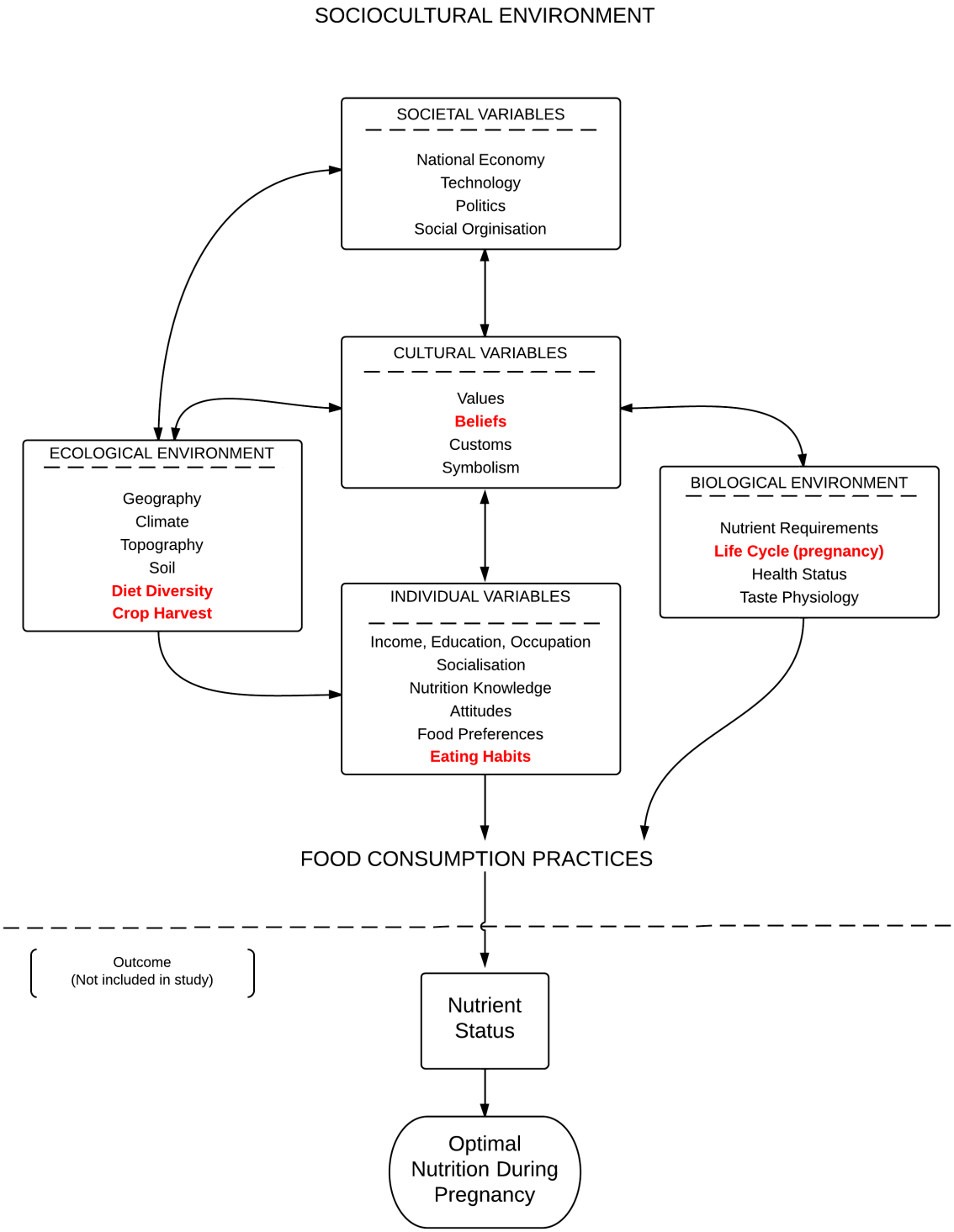

Figure 1.4 Theoretical framework of the research study. (Highlighted in red are the factors targeted in this research study. Adapted from (Parraga, 1990))

The problem is that if women continue to follow detrimental habits and beliefs, coupled with diets low in diversity during their pregnancy, they will continue to suffer from the wide effects of malnutrition and propagate them throughout future generations. Gaining a holistic understanding of the cultural, social and economic environment, and how these may result in a low nutritional status is essential for nutritionists when developing contextually effective interventions (Devadas, 1970; D. Lee, 1957; Shannon, et al., 2008; Shatenstein & Ghandrian, 1998). If eating habits, practices and taboos whilst pregnant are understood, nutrition interventions will have increased success in creating behaviour change during this unique window of opportunity and make sustainable improvements within these resource poor communities.

1.6 Aim and objectives

The aim of this study is to investigate the food consumption practices of women during pregnancy and the role of traditional eating habits and taboos in the maternal diet in rural Bangladesh (Pirganj, Rangpur).

The objectives are to:

- Explore the dietary diversity of pregnant women in rural Bangladesh.
- Determine the household production of food crops in rural Bangladesh.
- Describe the eating habits of pregnant women in rural Bangladesh.
- Explore beliefs and taboos surrounding food consumption of pregnant women in rural Bangladesh.

1.7 Thesis structure

This first chapter has set the scene by providing a background to current research, presents the researcher's interest in the topic, conceptualises and justifies the research problem, and presents the aims and objectives.

The literature is reviewed in chapter two by examining the state of poverty and malnutrition in the world and the malnutrition situation in Bangladesh. This is followed by a description of basic and underlying foodways which affect the food intake and health status of pregnant women living in rural Bangladesh, and includes a justification of the mixed-method design used throughout this research study.

Chapter three describes the materials and methodologies employed leading up to, during and after the data collection. It describes the mixed-method approach used, including quantitative and qualitative tools appropriate for trans-cultural research and describes how the data was handled and analysed.

Chapter four reports the quantitative results from the study where the characteristics of the participants are described, their dietary diversity is analysed and the harvest calendar is presented. Following this, the qualitative findings are presented and described. The findings are presented according to the two core categories 'habits' and 'beliefs', and the three inter-related themes; food, cultural and health practices that emerged from data analysis.

Chapter five discusses and interprets the findings from both the quantitative and qualitative results according to the study objectives.

Finally chapter six summarises the study by making conclusions about the findings, stating study limitations, making recommendations for future research and applying the research study findings to the ONDP project.

CHAPTER TWO: REVIEW OF THE LITRATURE

2.1 Malnutrition

Despite numerous advances in health care and rapid economic growth, malnutrition still remains one of the most significant public health challenges worldwide; particularly affecting those living in developing countries and during critical life periods (childhood, pregnancy, lactation and elderly) (Victora, et al., 2008). Malnutrition is the condition that occurs from eating an unbalanced diet where certain nutrients are either lacking or in excess (Schroeder, 2008). Malnutrition can be classified as either undernutrition or overnutrition *(figure 2.1).*

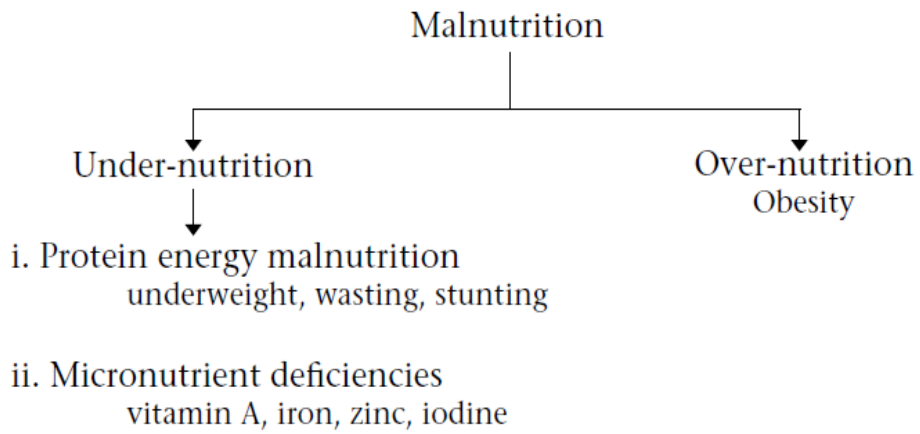

Figure 2.1 Classification of malnutrition (ICDDR B, 2011).

Clinically, it is defined as 'a pathologic state resulting from a relative or absolute deficiency or excess of one or more essential nutrients sufficient to produce disease' (Scrimshaw, Taylor, & Gordon, 1968, p. 19). Undernutrition is the insufficient intake of nutrients and energy leading to hunger and is aggravated by the individuals increased susceptibility to repeated infectious disease (Imdad, et al., 2011; Y. Khan & Bhutta, 2010; UNICEF, 2009b). The focus of this research study is in an undernutrition context and therefore throughout the rest of this document undernutrition will be referred to as malnutrition.

2.2 State of malnutrition in the world

The FAOs most recent 'The State of Food Security in the World' publication estimated that 868 million people are suffering from malnutrition throughout the world, with the majority coming from Southern Asia (304 million) and Sub-Sahara Africa (234 million) *(figure 2.2)* (Food and Agriculture Organisation, 2012).

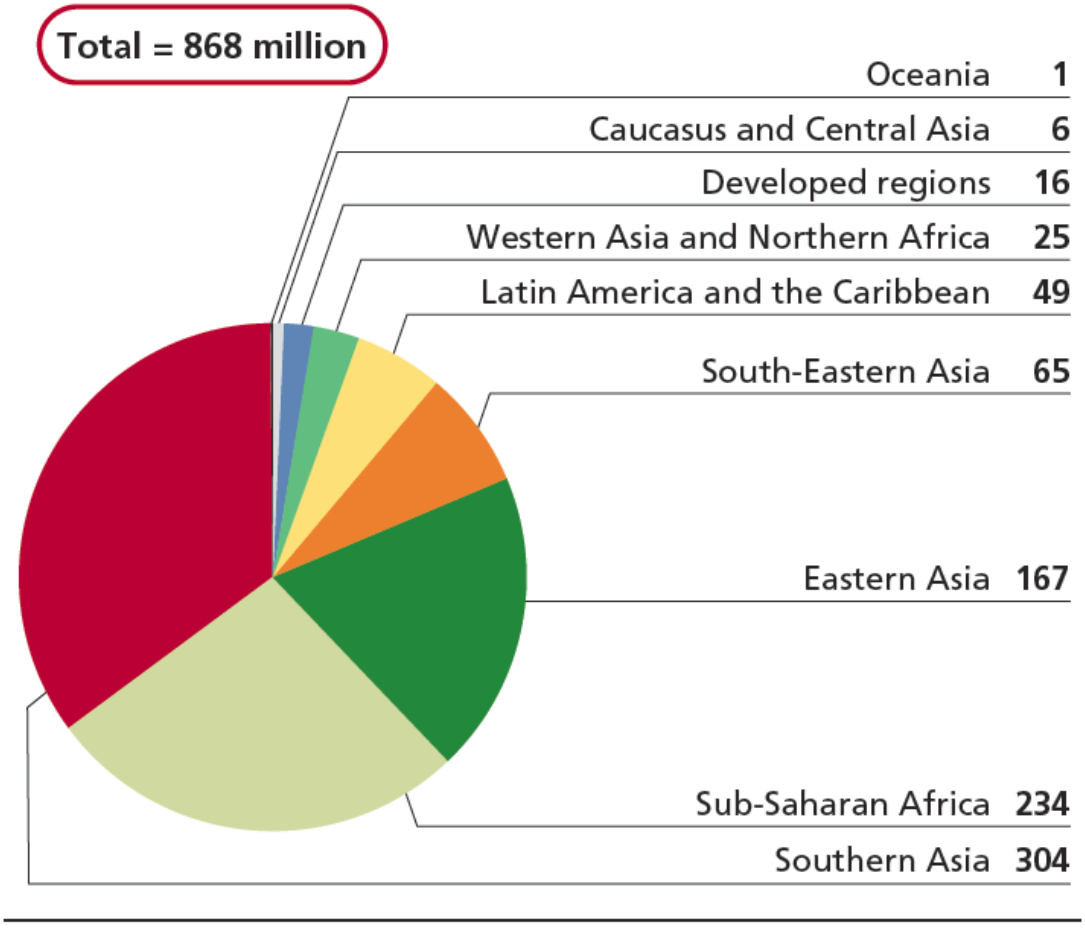

Figure 2.2 Proportion of the world who are hungry in 2012 (Food and Agriculture Organisation, 2012).

In 2008, *The Lancet* journal published a high profile series on maternal and childhood nutrition which aimed to bring the importance of nutrition to the forefront of the international development agenda (Bhutta et al., 2008; R. Black, et al., 2008; Bryce, Coitinho, Darnton-Hill, Pelletier, & Pinstrup-Andersen, 2008; Morris, Cogill, & Uauy, 2008; Victora, et al., 2008). It focused on the disease burden attributable to undernutrition and the use of integrated interventions aimed at strengthening food

security, maternal and childhood care and control of infectious disease. The series concluded that malnutrition is the largest underlying factor of mortality in children under the age of five and is associated with an increased risk of death five to eight times that of a nourished child (M. Black, 2003; Caulfield, Richard, & Black, 2004; Crookston, 2009). Malnutrition in children under the age of five makes up 11 percent of the total global disability-adjusted life years (DALYs) (T. Ahmed et al., 2012), and is associated with more than 35 percent of the annual preventable deaths in children under five years of age (R. Black, et al., 2008). Nearly 30 million children are born each year with LBW due to malnutrition while in the womb. If not corrected, LBW often leads to impaired development and low nutritional status throughout childhood and ultimately life (Victora, et al., 2008). Malnutrition is assessed by varying anthropometric indicators, including stunting, wasting, underweight, and micronutrient deficiencies (World Health Organisation, 1995). According to anthropometric measurements, it is estimated that approximately 25 percent of all children in the world under the age of five years are stunted (de Onis, 2008), with nearly half (78.3 million) of these children found in South Asia (Admission Committee on Coordination (ACC)/Standing Committee on Nutrition (SCN), 2000; S. Horton, Alderman, & Rivera, 2008). Stunting is not a result of genetics, but rather due to inadequate nutrition received by a growing foetus and during the first two years of life (Grantham-McGregor et al., 2007). The majority of stunted children become stunted adults (Crookston, 2009; Frongillo, 1999) and therefore it is appropriate to say that nearly 25 percent of the world suffers from stunting. As well as a high prevalence of stunting, the most recent data indicates that 20 percent of the world's population of children under the age of five years are underweight and 23 million are wasted (de Onis, 2008; UNICEF, 2009b).

As shown in figure 2.1, it is not just a lack of energy which indicates malnutrition, but micronutrient deficiencies are also responsible for decreased developmental potential and are usually indicative of a low quality diet (Bhutta, et al., 2008). Micronutrient deficiencies are often referred to as 'hidden hunger' as they do not manifest in a state of starvation (Allen, 2002). Women may be consuming enough energy but have a diet

deficient in certain micronutrients; therefore creating additional detrimental effects on their own and their child's physical and mental health (Allen, 2000). It has been estimated by WHO that in developing countries approximately 50 percent of women and 40 percent of children under the age of five suffer from iron deficiency anaemia (Shamah & Villalpando, 2006; World Health Organization, 2013; Yip, 2002). There are 5.2 million children under the age of five and 9.8 million pregnant women suffering from night blindness and vitamin A deficiency (World Health Organization, 2005). Over 1.9 billion of the world's population have insufficient intakes of iodine, indicated by urinary concentration below 100μg/L (World Health Organization, 2004). Most world wide data on the prevalence of malnutrition is from before the maternal and childhood nutrition series was published in *The Lancet* (Bhutta, et al., 2008; R. Black, et al., 2008; Bryce, et al., 2008; Morris, et al., 2008; Victora, et al., 2008) and the consequent formation of international organisations that target this area of health (1000 DAYS organisation and the Scaling Up Nutrition (SUN) movement). Malnutrition is likely to still be a problem and more recent data is needed to determine if the integrated nutrition approach is having an effect on lowering the world wide prevalence of malnutrition.

2.3 Malnutrition throughout the life cycle

Malnutrition of the mother during pregnancy can result from a combination of factors such as low pre-pregnancy BMI, young age and inadequate maternal weight gain (Allen & Gillespie, 2001). Malnourishment during pregnancy increases the risk of maternal, neonatal and child death, LBW, and delays the child's growth and development (Howlader, et al., 2012; UNICEF, 2006). Children born into malnutrition often have impaired immune systems with lower resistance to infections and disease with a higher mortality rate due to common childhood conditions such as respiratory infections or diarrhoea (Victora, et al., 2008). When children do survive infancy, their growth and cognitive development are often impaired and they are more likely to suffer from recurring sickness (R. Black, et al., 2008; Imdad, et al., 2011). If the malnourished child is a female, she will most likely be malnourished when she

becomes pregnant, therefore repeating the cycle once again *(figure 1.1)* (Admission Committee on Coordination (ACC)/Standing Committee on Nutrition (SCN), 2000; Bangladesh Bureau of Statistics (in collaboration with UNICEF), 2007; Victora, et al., 2008).

There is a wealth of information reviewing the concept of the malnutrition cycle in terms of growth and development (Abu-Saad & Fraser, 2010; Barker, 1998; Bhaskaram, 2002; Grantham-McGregor, et al., 2007; Victora, et al., 2008). The 1000 days has become a well-known phrase for improving maternal, new born and child health (MNCH). The 1000 days provides a window of opportunity through a woman's pregnancy (270 days) until the child's second birthday (730 days) for improved health outcomes (1000 DAYS, 2011). When a child is malnourished at birth and living in poverty, the likelihood of catch up growth and improved nutrition before their second birthday is unlikely (Graham & Adrianzen, 1972). Once children pass their second birthday, malnutrition induced problems such as stunting and reduced cognition become irreversible and have detrimental effects for the rest of the child's life (Grantham-McGregor, et al., 2007; Victora, et al., 2008).

When a child is born, approximately 70 percent of their brain development is complete with the remaining 30 percent is developed by the age of three (Singh, 2004). Children who are born undernourished learn basic skills such as sitting, walking, and talking later than their well-nourished peers (Grantham-McGregor, et al., 2007). Malnourished children generally have lower attention spans and activity levels, and struggle with development of fine motor skills and psychomotor functions (Behrman, Alderman, & Hoddinott, 2004; Martorell, Khan, & Schroeder, 1994). They are more likely to enrol in school later, have more days out of school due to illness, and perform at a lower level in school compared to other children their age (Behrman, et al., 2004; UNICEF, 2006). Studies have shown LBW to be associated with a lower IQ by 5 percentage points (UNICEF, 2002), stunting associated with a lower IQ by 5–11 points (Howlader, et al., 2012), and iodine deficiency disorders associated with a lower IQ by 10–15 points (Delange, 2001; Grantham-McGregor, Fernald, & Sethuraman, 1999; Howlader, et al.,

2012; Walker, et al., 2007). Frequent illness adds to the malnourished state of children because it limits appetite and the absorption of nutrients (Borgen, 2010). Consequently the child develops into a stunted, low educated adolescent usually working in hard physical labour for minimal wage; further trapping them into poverty (UNICEF, 2009b). Malnutrition prevents individuals from reaching their full potential, with delayed development not only at the individual level but also the family, community and national level (Bangladesh Bureau of Statistics, 2007b; Imdad, et al., 2011; Victora, et al., 2008). Children who develop into malnourished women consequently have an increased risk of delivery a baby with LBW which perpetuates the cycle of malnutrition (Victora, et al., 2008). Women, who are stunted, young and underdeveloped when they become pregnant, or have short intervals between pregnancies, are at greater risk of mortality and morbidity during delivery (King, 2003). This is due to an increased risk of obstructed labour from a small birth canal and because malnutrition weakens the women leaving them with fewer reserves for recovery from child birth and illness (Haseen, 2005; King, 2003). Nutrient deficiencies such as iron deficiency anaemia also increase the risk of mortality and morbidity in the mother and baby during labour due to the increased risk of sepsis and haemorrhage (Allen, 2000; Scholl & Reilly, 2000).

An additional concern that recent research has shown, is that children who experience a malnourished state while in the womb and are born with LWB are more likely to suffer from chronic diseases; such as diabetes and cardiovascular disease in later life (Allen & Gillespie, 2001; Behrman, et al., 2004; Victora, et al., 2008). This is commonly known as the foetal origins of adult disease hypothesis. The foetal origins hypothesis predicts that impaired intrauterine growth and development influences chronic disease risk in later life through the mechanisms of 'foetal programming' (Barker, 1998). It has been shown that changes in stimulus at critical periods during antenatal growth have a permanent effect on the physiology, function and structure of tissues and organs which results in disease later in adult life (Barker, 1998; Godfrey & Barker, 2000). Growth restriction of the foetus which results in LBW and low postnatal weight gain of the baby, have been associated with increased risk for hypertension, type 2

diabetes, cancer and obesity (Williamson, 2006). Foetal programming of adult disease as a result of malnutrition in utero extends the negative health consequences of malnutrition in populations who are already suffering from its effects. There is a genetic basis for developing these chronic diseases and mechanisms to explain the foetal programming hypothesis have been varied. Large reviews have found indicative but not conclusive results linking poor maternal diet to an increased risk of chronic disease later in the babies' lives (Barker, 1998; Lucas, Fewtrell, & Cole, 1999; Mcmillen & Robinson, 2005; Victora, et al., 2008) and therefore investigation into this topic continues (Capra, Tezza, Mazzei, & Boner, 2013; Dessì, Ottonello, & Fanos, 2012; Rogers & Velten, 2011).

The malnutrition cycle is extremely prevalent throughout all of Bangladesh. High rates of infants are born with LBW who continue on to become malnourished children and adolescents due to poverty and a lack of opportunity and resources (Hosain, Chatterjee, Begum, & Saha, 2006; E. Karim & Mascie-Taylor, 1997; Shannon, et al., 2008; Victora, et al., 2008). Adolescent girls are married early and may bear their own children at a young age while they themselves are malnourished (Lipton & Ravallion, 1995). During pregnancy women often have a poor nutritional status and experience inadequate weight gain resulting in a new generation of LBW children being born (Howlader, et al., 2012). Therefore, a logical place to intervene and break the malnutrition cycle is during pregnancy; well before the malnourished child is born. To be able to do this successfully, ecological factors which influence women's food consumption practices during pregnancy must first be thoroughly understood so they can be addressed within an integrated approach.

2.4 Prevalence of malnutrition in Bangladesh

Nearly 80 percent of the world's malnourished children live in just 20 countries with Bangladesh being one of them (Bryce, et al., 2008). Bangladesh has a population of 160 million people living on just over 147,000 square kilometres of land. It is one of the most densely populated countries in the world despite the fact that nearly 80 percent

of the population is rural (Bangladesh Bureau of Statistics, 2010). According to the World Bank, in 2010 43.3 percent of the population (National Institute of Population Research and Training, 2011) was living on less than US$1.25 per day (The World Bank Group, 2012b). US$1.25 is the international threshold to indicate extreme poverty, (threshold was raised from US$1 to US$1.25 by the World Bank in 2008 to reflect the current value of world currencies) and those living beneath it struggle to obtain adequate food and care (The World Bank Group, 2012a). Bangladesh is ranked number 146th out of 187 countries on the 2011 Human Development Index[5] by the United Nation Development Programme (United Nations Development Programme, 2011), indicating its low human development level compared with other United Nations member countries. Approximately 40 percent of the entire population are undernourished and 20 percent are severely malnourished (T. Ahmed, et al., 2012). Almost half the population of children under five years and half the women of child bearing age suffer from malnutrition (T. Ahmed, et al., 2012; National Institute of Population Research and Training, 2011). According to these statistics, Bangladesh is making insufficient progress in reducing the proportion of those who suffer from hunger and are therefore unlikely to meet the first Millennium Development Goal (eradicate extreme poverty and hunger) by 2015 (Howlader, et al., 2012).

There are two main documents used to report and monitor the health situation in Bangladesh. The first is the Multiple Indicator Cluster Survey (MICS) published by the Bangladesh Bureau of Statistics (BBS) and funded by UNICEF. The MICS is an international survey used to provide data on the situation of women and children and make comparisons between countries. The second is the Bangladesh Demographic and Health Survey (BDHS) conducted under the authority of the National Institute of Population Research and Training (NIPORT) which is part of the Ministry of Health and Family Welfare in Bangladesh. The most recently published data is the preliminary report from the 2011 BDHS that includes results from data collected between the

[5] A statistic calculated based on the combination of life expectancy, education, and income indices to rank countries (United Nations Development Programme, 2011).

years 2007 and 2011. Both the MICS and the BDHS collect similar prevalence statistics which creates redundancy. Nevertheless, a combination of sources will be used to describe the most accurate situation of malnutrition in Bangladesh at this date.

Between the years 2007 and 2011 overall childhood mortality (<5 years) in Bangladesh was 53 deaths per every 1000 live births *(figure 2.3)* (National Institute of Population Research and Training, 2011). Therefore one in every nineteen children born in Bangladesh will die before turning five. Data from surveys conducted ten years prior indicated that the number was higher at 87 deaths per 1000 live births (Feed the Future, 2011). Deaths within the neonatal period (first month of life) account for 60 percent of total deaths in children under the age of five and are dependent on the nutrition conditions the baby receives while in the womb (National Institute of Population Research and Training, 2011). Between the years 1993-1994 and 2007-2011 neonatal deaths have decreased by 38 percent. This decrease has had a large impact on reducing the overall childhood mortality rate, however, improvements are still needed as rates in Bangladesh are still some of the highest in the world (UNICEF, 2009a, 2009b). Childhood mortality is a good indication of women's nutritional status and their access to health and social services during pregnancy (National Institute of Population Research and Training, 2011).

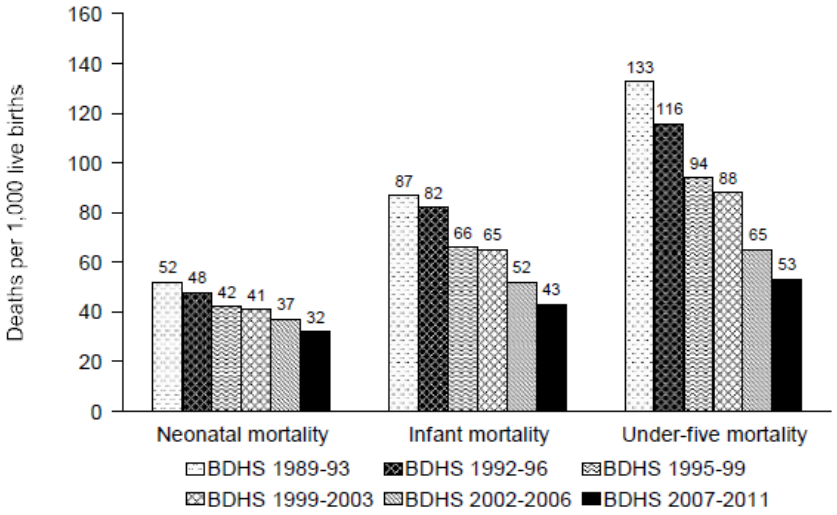

Figure 2.3 Childhood mortality trends in Bangladesh (National Institute of Population Research and Training, 2011).

Despite recent progresses in childhood mortality, other indicators of malnutrition still show a serious public health issue in Bangladesh (Bangladesh Bureau of Statistics, 2007a). The prevalence of underweight children under the age of five is currently at 36 percent, with 10 percent being severely underweight (National Institute of Population Research and Training, 2011). Between the years 1996-1997 and 1999-2000 there was a large drop in underweight from 53 percent to 42 percent. However, between the years 2000 to 2007 and 2007 to 2011 there has been less of a decrease *(figure 2.4)* (T. Ahmed, et al., 2012; National Institute of Population Research and Training, 2011).

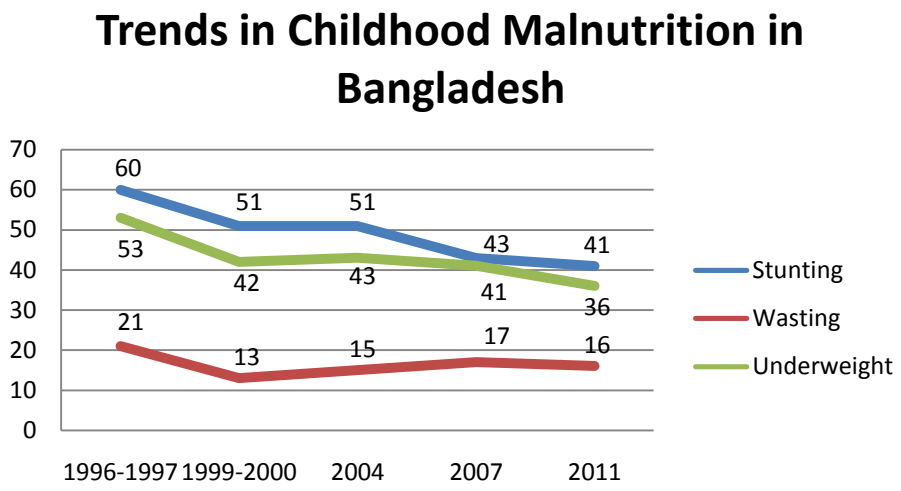

Figure 2.4 Trends in malnutrition in Bangladesh (Adapted from (T. Ahmed, et al., 2012; National Institute of Population Research and Training, 2011; UNICEF, 2009a, 2009b)).

The BDHS report concluded that in 2011, 41 percent of children under the age of five were stunted with 15 percent severely stunted (National Institute of Population Research and Training, 2011). Children living in rural areas are at a greater risk of being stunted than children in urban areas (43 percent compared with 36 percent), as those living in rural areas are more vulnerable to poverty with less access to resources and infrastructure (Bhuiya & Streatfield, 1991; Shannon, et al., 2008). The prevalence of stunting underwent a significant decrease from 51 percent in 2004 to 43 percent in

2007, but has since levelled out *(figure 2.4)* (National Institute of Population Research and Training, 2011).

The percentage of children under the age of five who are wasted was 16 percent with 4 percent being severely wasted in 2011 (National Institute of Population Research and Training, 2011). The trend in wasting over the years has been inconsistent with it reaching 21 percent in 1997, lowering to 15 percent in 2004, increasing to 18 percent in 2007 and at 16 percent in 2011 (*figure 2.4)* (T. Ahmed, et al., 2012; National Institute of Population Research and Training, 2011). In the last 15 years the level of wasting in Bangladesh has barely been below the 15 percent cut off set by WHO; indicating that it is a continuous public health issue (UNICEF, 2009a, 2009b).

Overall, prevalence of malnutrition in Bangladesh indicates a downward trend over time with the biggest reduction of approximately 10 percent in all indicators occurring between the years 1996-1997 to 1999-2000. However, what is of concern, is that the rate of improvement has been considerably less in more recent years as it becomes more difficult to make substantial improvements *(figure 2.4)* (Director General Health Services, 2009). Other surveillance data by independent research has shown similar results. Not only are malnutrition rates high in Bangladesh, but the rate of improvement has slowed significantly over the most recent decade (Bangladesh Bureau of Statistics (in collaboration with UNICEF), 2007; Helen Keller International, 2006; Hossain & Bhuyan, 2009; Howlader, et al., 2012). This finding highlights the need for more effective and integrated interventions to reduce malnutrition.

In recent years the prevalence of LBW in Bangladesh has reduced from 40 to between 20 to 22 percent (T. Ahmed et al., 2005; United Nations Children's Fund, 2003). Although the prevalence of LBW has decreased by nearly 50 percent, this rates are still one of the highest of any country in the world (UNICEF, 2009b). Based on the current birth rate, approximately 80,000 children in Bangladesh are born each year with LBW, therefore increasing their mortality and morbidity risk and contributing to delayed development (ICDDR B, 2012). A maternal BMI less than 18.5 indicates adult malnutrition and is correlated with a LBW outcome of the baby (R. Ahmed, et al., 2003). The percentage of women of gestational age in Bangladesh with a BMI less than

18.5 has steadily decreased from 52 percent in 1997 to 30 percent in 2007 (National Institute of Population Research and Training, 2009). Adult malnutrition is the result of an insufficient intake of energy and micronutrients. The prevalence of energy deficiency in mothers in a rural settings is almost double than those in urban setting (Bangladesh Bureau of Statistics, 2007b) due to higher poverty rates and food insecurity (Shannon, et al., 2008). The study by Haseen (2005) which was conducted across four settings (rural location with high rates of poverty and malnutrition) similar to Pirganj, found that the average calorie intake of a pregnant women was 1609 kcal/day, compared with the recommendation of 2400kcal/day (Haseen, 2005). The rural women's diet is not only lacking in energy, but is most likely to be low in quality due to a limited diversity of accessible foods. Women who have diets low in diversity are not likely to be meeting their requirements for most micronutrients (Arsenault et al., 2013). There has been a wealth of research conducted in Bangladesh to classify micronutrient deficiency prevalence in the population. Tables 2.1, 2.2 and 2.3 below, highlight recent research that has investigated the three micronutrients, iron, vitamin A and iodine, which are a major public health problem in developing countries (Bhaskaram, 2002; R. Black, 2001).

Table 2.1 summarises four research studies which have investigated anaemia prevalence in a rural settings and conducted within the last ten years.

Table 2.1 Recent research investigating the prevalence of anaemia in rural Bangladesh

Study	**Reference**	**Study design**	**Result**
Anaemia and iron deficiency during pregnancy in rural Bangladesh.	Hyder, S., Persson, L., Chowdhury, M., Lonnerdal, B., & Ekstrom, E. (2004). *Public Health Nutr, 7*(8), 1065-1070.	Cross sectional study in the northern rural district Mymensingh. Venous blood collected from a sample of 214 pregnant women based on an anaemia cut off of 110g/L.	Mean Hb* was 110g/L (107-111g/L) and 50% of the women were classified as anaemic.
Baseline survey 2004: National Nutrition Programme.	Ahmed, T., Roy, S., Alam, N., Ahmed, A., Ara, G., Bhuiya, A., et al. (2005). Dhaka: International Centre for Diarrhoeal Disease Research (special publication no. 124).	Blood samples from 360 pregnant women from six areas in Bangladesh. Tested capillary blood based on an anaemia cut off of 110g/L.	Reported that 45% of pregnant women have iron deficiency anaemia.
The burden of Aaemia in rural Bangladesh: the need for urgent action.	Helen Keller International. (2006). Nutrition survalence project bulletin No.16	A multi-staged cluster sampling design across 24 rural sub-districts in 102 pregnant women. Capillary blood used and based on an anaemia cut off of 110g/L.	Prevalence of iron deficiency anaemia in pregnant women was 39%.
Prevalence of anemia and micronutrient deficiencies in early pregnancy in rural Bangladesh, the MINIMat trial.	Lindstrom, E., Hossain, M., Lonnerdal, B., Raqib, R., Arifeen, S., & Ekstrom, E. (2011). *Acta obstetricia et gynecologica Scandinavica, 90*(1), 47-56.	Blood samples from 740 pregnant women from Matlab, a rural sub-district. Venous blood used and based anaemia cut off of 110g/L.	Reported that 28% of pregnant women had iron deficiency anaemia

*Haemoglobin.

In all four studies, the prevalence of iron deficiency anaemia during pregnancy was between 28 and 50 percent indicating a severe public health problem according to WHO indicators (World Health Organization, 2013). The studies by Ahmed (2005) and Helen Keller International (2006) were conducted in a large sample of pregnant women from a geographic area representing the whole of Bangladesh. The studies by Hyder (2004) and Lindstrom (2011) were conducted in large sample sizes, but localised to only one rural geographic area. The two localised studies measured haemoglobin in venous blood which is considered a more accurate indicator than capillary blood (Morris, 1999) which was used in the studies by Helen Keller International (2006) and Ahmed (2005). However, as the prevalence of anaemia was similar in all studies, it would indicate that there is moderate to severe iron deficiency anaemia in pregnant women in all areas of Bangladesh. The results in relation to the publication dates indicate that the prevalence could be decreasing over time; however there is no nationally coordinated data collection to confirm this. We can however say that rates of anaemia are still extremely high in pregnant women in Bangladesh, due to additional research showing inadequate intake of iron rich foods, poor bioavailability of iron sources and a very limited diversity in the diet (Arimond & Ruel, 2004; Arimond, Torheim, Wiesmann, Joseph, & Carriquiry, 2009; Arimond et al., 2010; Arsenault, et al., 2013; Helen Keller International, 2006; Kimmons et al., 2005).

Table 2.2 summarises four studies which collected data on vitamin A status and vitamin A supplementation of women in rural Bangladesh. Three of the studies were published in the previous ten years but the last study by Helen Keller International was published in 1999. It is included here as it was the last nationwide assessment of vitamin A prevalence in women based on blood samples.

Table 2.2 Recent research investigating the vitamin A deficiency in rural Bangladesh

Study	Reference	Study design	Results
Vitamin A status throughout the lifecycle in rural Bangladesh: National Vitamin A survey 1997–98.	Helen Keller International/Institute of Public Health Nutrition. (1999). Dhaka, Bangladesh:	Multi staged sampling to include 23,984 households from 40 rural sub-districts	Based on serum blood levels, 23.7% of pregnant women were vitamin A deficient.
Bangladesh Multiple Indicator Cluster Survey (MICS) 2006.	Bangladesh Bureau of Statistics. (2007). Dhaka, Bangladesh.	A clustered sample of 1,950 primary sampling units (of approximately 100 households) from 64 rural and urban districts	Of women who had given birth in the previous two years, 17.2% had received a vitamin A supplement capsule.
Extent of vitamin A deficiency among rural pregnant women in Bangladesh.	Lee, V., Ahmed, F., Wada, S., Ahmed, T., Ahmed, A., Banu, C., et al. (2008). *Public Health Nutr, 11*(12), 1326-1331.	Cross sectional study in 200 pregnant women in rural Bangladesh.	• Found that 53% of pregnant women were not consuming the RDI* of 770 RAE**. • Mean intake was 732 RAE. • Authors predicted their results to correlate with 18.5% of pregnant women having serum retinol concentrations below the cut off of 0.70µmol/L.
Micronutrient profile of children and women in rural Bangladesh: study on available data for iron and vitamin A supplementation.	Rahman, M. (2009). *East African J Pub Health, 6*(1), 102-107.	Data from the 2004 Bangladesh Demographic and Health Survey. Included 8854 women from urban and rural areas.	• 13% of pregnant women received the recommended vitamin A supplement two months after giving birth. • 8% of women had difficulty with night blindness after birth.

*Recommended daily intake (RDI).

**Retinol A equivalents (RAE).

In 1973 the Bangladesh government started the Nutritional Blindness Programme which aimed to reduce high rates of vitamin A deficiency (F. Ahmed, 1999). This policy is still functioning today in Bangladesh where children aged between 6-59 months and women who have given birth in the previous two years receive two vitamin A capsules each year during 'National Immunization Days', in line with UNICEF/WHO recommendations (F. Ahmed, 1999; Bangladesh Bureau of Statistics, 2007a). The uptake of this program is successful in children with 89 percent of children surveyed in the 2006 MICS survey consuming the vitamin A supplement, however not as successful in pregnant women (17%) (Bangladesh Bureau of Statistics, 2007a). Unfortunately the 2009 MICS survey was restructured and the questionnaire was shortened to no longer collect information on vitamin A supplementation (Bangladesh Bureau of Statistics, 2010). The last nationwide assessment of vitamin A status in Bangladesh was by Helen Keller International and the Institute of Public Health Nutrition in 1997-1998. They recorded the prevalence of vitamin A deficiency in pregnant women as 23.7 percent (Helen Keller International/Institute of Public Health Nutrition, 1999). More recent independent research by Rahman (2009) and Lee (2008) indicates that vitamin A deficiency has not been properly addressed in Bangladesh as a low number of women are receiving vitamin A supplements during pregnancy (13%), women are experiencing night blindness (8%) and over half are not consuming the daily RDI from food (V. Lee et al., 2008; Rahman, 2009). These studies indicate that the Bangladesh government needs to bring the seriousness of vitamin A deficiency during pregnancy back to the forefront of their agenda and cannot assume that supplementation up until the age of 59 months is adequate for long term health.

Table 2.3 summarises three studies published in the last ten years which have investigated urinary iodine levels or consumption of iodine fortified salt at the household level.

Table 2.3 Recent research investigating the prevalence of iodine deficiency in rural Bangladesh

Study	Reference	Study design	Results
Bangladesh Multiple Indicator Cluster Survey (MICS) 2006.	Bangladesh Bureau of Statistics. (2007). Dhaka, Bangladesh.	A clustered sample of 1,950 primary sampling units (of approximately 100 households) from 64 rural and urban districts.	Reported that 84.3% of households used iodised salt of at least 10ppm*.
Sub-clinical iodine deficiency still prevelent in Bangladeshi adolescent girls and pregnant women.	Ara, G., Melse-Boonstra, A., Roy, S., Alam, N., Ahmed, S., Khatun, U., et al. (2010). *Asian J Clin Nutr, 2*(1), 1-12.	Random selection of 254 pregnant women from 113 upazilas across 6 districts.	• 56% of the pregnant women had urinary iodine levels less than the cut off of 150µg/L. • 45% of the women were consuming salt fortified at inadequate levels (<15ppm*)
Iodine status in pregnancy and household salt iodine content in rural Bangladesh.	Shamim, A., Christian, P., Schulze, K., Ali, H., Kabir, A., Rashid, M., et al. (2012). *Maternal and Child Nutrition, 8*(2), 162-173.	A cluster-randomized, placebo-controlled trial in rural Northwest Bangladesh, in 2118 women.	• 75% of households used household salt fortified at a level lower than 15ppm*. • Urinary levels were below the 150µg/L cut off in 80% of the women.

*Parts per million

The large participant study by Shamim (2012) and the large geographical area study by Ara (2010), both indicate that a high proportion of women (80% and 56%) have urinary iodine levels below the 150 µg/L cut off value (Ara et al., 2010; Shamim et al., 2012). All studies, including the 2006 MICS, indicate that consumption of salt fortified with adequate iodine is very low (Ara, et al., 2010; Bangladesh Bureau of Statistics, 2007a; Shamim, et al., 2012). The Bangladesh government passed the 'saltbye-law' in 1994, making it mandatory to fortify salt to a level above 15ppm. Subsequently the total goitre rate in women has dropped from 55.6 percent in 1993 to 11.7 percent in 2004-

2005 (Yusuf et al., 2008). However, as evident from recent research, iodine deficiency is still a major public health issue in rural Bangladesh and the production of salt iodised above 15ppm is not being closely monitored. In addition, the more recent 2009 MICS survey is no longer collecting information on the level of fortified salt at a household level (Bangladesh Bureau of Statistics, 2010).

From the recent studies presented above, it is evident that deficiencies in micronutrients exist and their prevalence is high in women living in rural areas of Bangladesh. The Bangladesh government, local organisations and research agencies need to re-establish coordinated and accurate monitoring systems and use integrated approaches to address these deficiencies beyond childhood.

Research has shown that a major cause of micronutrient deficiencies in developing countries is due to consuming diets lacking in diversity (Arimond & Ruel, 2004; Arimond, et al., 2009; Arimond, et al., 2010; Arsenault, et al., 2013; Hatloy, Torheim, & Oshaug, 1998; Hoddinott & Yohannes, 2002; International Food Policy Research Institute, 2003; Oldewage-Theron & Kruger, 2011; Savy, Martin-Prével, Sawadogo, Kameli, & Delpeuch, 2005; Torheim et al., 2004). However, what have not been thoroughly explored are the underlying causes and practices which leads to consuming a diet low in diversity and hence deficient in adequate nutrients.

2.5 Causes of malnutrition

Malnutrition is the physical manifestation of what we do or do not consume with the most commonly perceived cause as living in poverty. Factors affecting our nutritional status are more complex and multi-layered than poverty alone (Bellamy, 1998). To discover the cause of malnutrition in societies a wider perspective should be considered, including the complex interactions between the food we consume, our health status and the cultural, social and economic environment in which we live (Muurling-Wilbrink, 2005). Amartya Sen who is a respected West Bengali development economist, expressed during his Nobel lecture in 1998 that poverty should not only be defined in economic terms but as a serious lack of capabilities to lead a minimally

acceptable life (Sen, 1998). Poverty is dependent on available sources, opportunities and situations; such as access to food, rights to land, political stability and quality of health services. This evolution and broadening of the definition of poverty to include not only economic, but also social, cultural, environmental and political factors, has established the importance of food and nutrition security in alleviating poverty (Vorster, 2010).

The global dilemma of malnutrition can be explained by the UNICEF conceptual framework *(figure 2.5 (with the addition of this study's objectives in red))* in terms of how poverty, food insecurity and other factors consequently affect nutritional status. The framework recognises three compacting layers of factors, which contribute to malnutrition:

- Immediate (disease, poor diet); which operate at the individual level.
- Underlying (poor basic health care, unsatisfactory care practices, food insecurity); influencing households and communities.
- Basic (poverty, low status, conflict, prejudice, infrastructure, natural disasters etc); stemming from societal structures and processes (Bellamy, 1998).

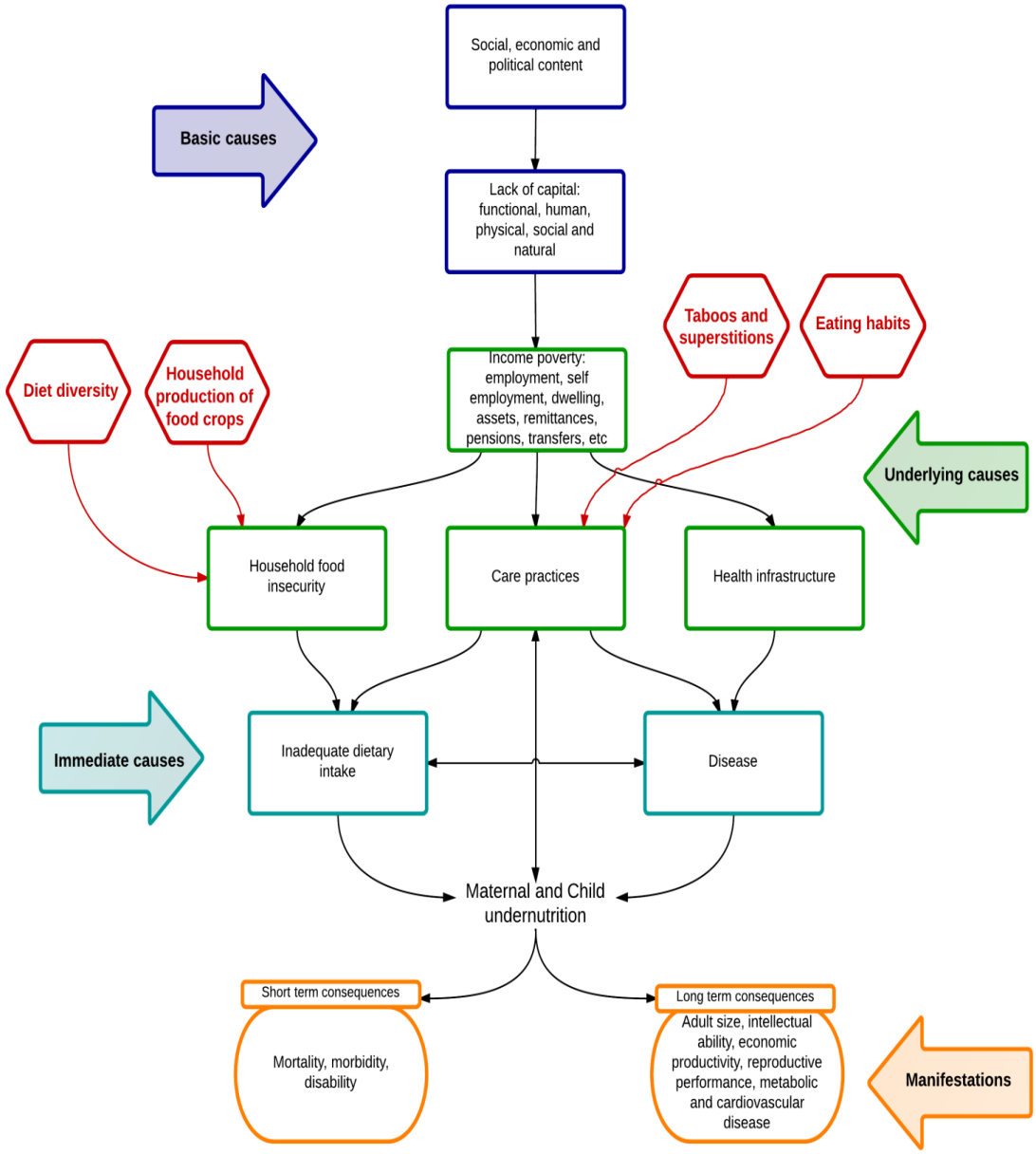

Figure 2.5 Basic, underlying and immediate causes of malnutrition. (Addition of the study objectives are in red. Adapted from the UNICEF conceptual framework of malnutrition (Bellamy, 1998).

The framework shows that causes of malnutrition are multi-sectorial whereby a variety of factors on each level influence one another to determine the nutritional status of the individual. Ecological relationships between an individual and their cultural, economic and social environment all influence food consumption practices (Parraga, 1990). These can be referred to as an individual's 'foodways' and result in a complex

array of human behaviours (Devadas, 1970). During pregnancy, a woman's nutritional status is determined by immediate factors of food consumption and health status. The woman's food intake and health is determined by underlying conditions that affect household food security, care practices (including knowledge, habits and beliefs) and health infrastructure. Food, practices and services are in turn determined by the utilisation of resources at a societal level, including political, economic, cultural and environmental structures. All factors which lead to malnutrition and their relationship to one another must be understood with integrated methods to sustainably address them.

2.5.1 Basic causes

Basic causes of malnutrition relate to the availability and control over human, economic and organisational resources within a society. The control of these resources is influenced by various interrelated factors:

- Political factors affect the structure and function of the state and include labour law, trade, political stability, goods and services.
- Economic factors include economic growth, distribution of assets, aid dependency, inflation and exchange rates.
- Cultural factors are a set of customs and traditions which are unique to each society. They include religion, beliefs, ethnic heritage and cultural norms.
- Environmental factors include agriculture, seasons, natural disasters and geography.

The unequal distribution or a lack in these basic resources offset and influence the nutritional outcome during pregnancy (Bellamy, 1998).

Influencing factors on potential basic resources in Bangladesh

Population and geography: Bangladesh is one of the world's most densely populated countries and is situated on a flat plain above the world's largest river delta. The southern areas are at extreme risk of cyclones and are estimated to be losing 1 percent of agricultural land each year due to rising sea levels caused by climate change

(Bender, 2004; Feed the Future, 2011). Every year, 20 to 30 percent of the country's land mass is flooded from monsoon rains and flash floods which destroy crops (Feed the Future, 2011; Thorne-Lyman, et al., 2010). When food crops are destroyed, nutritious food becomes less available and accessible to most vulnerable groups therefore increasing the risk of malnutrition. Demographic trends estimate that by the year 2050 the population will have reached 220 million and is likely to exceed food production (Feed the Future, 2011). This rapid population growth is putting a strain on the land and the food sources it can provide to adequately feed its population; most of whom are already living below the poverty line and consuming a basic diet based on rice (Devadas, 1970).

Industrialization and urbanization: Like most developing countries, Bangladesh is undergoing rapid urbanization with people moving from rural areas to the city in search of better jobs and opportunities. Urbanization has converted arable land into housing and businesses, thereby reducing the amount of land and people available to grow crops. There has also been a growth in cash-crops to produce money and feed the urban communities which further depletes the soil and reduces food variety (Feed the Future, 2011). Industrialization has brought with it a growth in transportation and communication facilities which have in turn brought new foods from distant countries influencing the Bangladeshi people's food consumption habits (Devadas, 1970).

Political situation: Bangladesh was formally known as East Pakistan until it won its independence in the Bangladesh Liberation War in 1971 after many years of political and economic suffering (Bender, 2004). Since its liberation, Bangladesh has continued to struggle with violence and corruption throughout its political and governance systems, affecting both economic growth and social development (Roy, 2005). The Bangladeshi Government commits approximately 4.4 percent of the national budget to health each year (Director General Health Services, 2009). This amount is well below the level of investment required for a developing country. It is estimated that health expenditures should be between 10–15 percent of the national budget to achieve significant gains in the health status in Bangladesh (Howlader, et al., 2012).

Ethnicities: Bangladesh's colourful history has resulted in it being home to a wide variety of religions and ethnicities. Bangladesh was part of the British Raj and geographically split from India and into East Pakistan in 1955 on terms of religion. This has led to the majority of the population following the Islamic religion (89%), with 46 Adivasi groups throughout Bangladesh who are indigenous to the land but not part of the Islamic majority (known as Bengali) (Bender, 2004). The Adivasi groups make up around 1.5 percent of the total Bangladeshi population and have their own languages and culture (Besra, 2006). Like many minority groups, the Adivasi's have often been subjected to violence, discrimination and persecution (L. Karim, 1998). The government has refused their right to self-identification and passed a law for them to be universally known as 'Bengalis'. Discrimination against Adivasi groups has led to low literacy rates and cultural practices of communal land ownership have resulted in most Adivasi families losing their land and consequently increasing their level of poverty (Besra, 2006; Minority Rights Group International, 2008). Landlessness and discrimination of Adivasi communities has resulted in less opportunities and rights which causes greater poverty and higher malnutrition rates in these groups compared with the wider population.

Culture: Culture is a set of patterns of human behaviour, including customs and traditions, within a society or a societal group (Jerome, Kandel, & Pelto, 1980; Mennell, Murcott, & van Otterloo, 1992). Bangladeshis have strong cultural traditions which stem from a rich heritage and are distinct from those of neighbouring countries. Cultural customs and traditions influence all aspects of food choice and behaviour. Culture defines the what, how and why certain foods are consumed (D. Lee, 1957). These customs are learnt from a young age and indicate what food items a society will accept or reject and what are considered as socially acceptable eating behaviours (D. Lee, 1957; Lowenberg, et al., 1974). Cultural practices evolve over time and have the potential to change under new circumstances (Kuhnlein & Receveur, 1996; D. Lee, 1957).

Religion: Religion defines several aspects of culture by influencing behaviours, beliefs and customs (D. Lee, 1957). Bangladesh is a Muslim dominated society with smaller proportions of Hindu, Buddhist and Christian communities. The Muslim religion is conservative and possesses a strong influence on dietary behaviours in Bangladesh. Muslim religion is often associated with the restriction of certain foods, such as pork, and the observation of fasting during *Ramadan* (Ahmad, 1984; Piechulek, et al., 1999). Other religions have their own unique beliefs which dictate certain practices and rules about foods that can and cannot be consumed. Religious celebrations are often centred around symbolic foods, therefore influencing their consumption and defining cultural practices (Devadas, 1970).

Social status: Women in Bangladesh generally have a lower social-economic status than men and are often socially discriminated against in terms of education, access to food and resources, income and rights (Balk, 1994). Bangladesh has a very high rate of child marriage, which is often followed with frequent pregnancies from a young age; increasing the risk of malnutrition in both the mother and the child (Haseen, 2005). Studies have shown that women, and especially young girls, receive fewer kilocalories than other members in their household and are often the last to eat (Carloni, 1981; Chen, Huq, & D'Souza, 1981; Devadas, 1970). Women have to work longer hours to receive the same wages as men which negatively impacts their health and education, resulting in a greater risk of chronic malnutrition (Lipton & Ravallion, 1995). Family attitudes and customs towards the feeding and health of women, especially during pregnancy, often directly relate to a higher prevalence of malnutrition in females which therefore spreads throughout future generations (Chen, et al., 1981; Devadas, 1970).

2.5.2 Underlying causes

A combination of negative underlying causes leads to inadequate food intake and poor health during pregnancy. Underlying causes differ between communities and from

family to family. The underlying causes of malnutrition are grouped into three main factors; namely, food security, care practices and health infrastructure.

- Food security refers to the availability and accessibility of sufficient, safe and healthy food and the utilisation thereof to meet nutritional requirements during pregnancy (Food and Agriculture Organisation, 2012; Hoddinott & Yohannes, 2002). Food security includes both physical and economic access to food to sustainably meet dietary needs and food preferences (Food and Agriculture Organisation, 2012).
- Care practices include having the time and resources to follow positive habits and beliefs about healthy practices during pregnancy. These can be influenced by women's knowledge, social status and work load (Shannon, et al., 2008).
- Health infrastructure refers to the sanitary level of the household environment and the women's access and affordability of good quality health care services. Unsanitary living conditions and limited access to health care can cause disease, hinder nutritional practices and exacerbate disease during pregnancy (Bellamy, 1998; Chen, et al., 1981).

Influencing factors on potential underlying resources in Bangladesh

Household food production: Bangladesh is an agrarian economy with their main crops being rice, jute, wheat and vegetables. However, due to a variety of basic causes, most families in rural areas do not have access to land or have the resources to grow and harvest their own food (Arsenault, et al., 2013; Thorne-Lyman, et al., 2010). Most families' food intake is dependent on seasonal waged labour to buy food from local markets; making them more vulnerable to economic fluctuations (Gibson & Hotz, 2001; Thorne-Lyman, et al., 2010). Households who produce their own crops are able to sustainably increase the diversity of their diets by increasing year round availability and consumption of micronutrient dense foods (Iannotti, et al., 2009; Thorne-Lyman, et al., 2010).

Dietary diversity: Dietary diversity refers to the number of different food groupings and the number of different food items consumed over a given reference period (Ruel,

2003b). It is a useful indicator of the access dimensions an individual or household have to enough nutritious food. Dietary diversity is strongly linked with food security and socio-economic status (Arimond & Ruel, 2004; Hatloy, Hallund, Diarra, & Oshaug, 2000; Hoddinott & Yohannes, 2002), as a greater income is more likely to lead to a more diverse diet. Those living in rural areas in developing countries, such as Pirganj, often lack availability, accessibility and utilisation of a large variety of foods. Diets in rural Bangladesh are based on starchy staples (rice) with limited intakes of animal proteins and seasonal fruits and vegetables (Arimond & Ruel, 2004; Arsenault, et al., 2013). Research has shown that those who are consuming a more diverse diet are more likely to improve their diet quality with an increased likelihood of meeting their nutritional needs (Arimond, et al., 2010; Hatloy, et al., 1998; Tarini, Bakari, & Delisle, 1999). During times of increased vulnerability such as pregnancy, a diverse diet is of even more importance to meet additional energy and micronutrient requirements and to have a healthy pregnancy outcome.

Eating habits: Habits are frequently repeated behaviours which become subconscious practices over time (Hunt, et al., 1979). Eating habits develop from a young age and affect what, how and when food is prepared, cooked and consumed. Eating habits are the result of a group or individuals' present environment and past history as influenced by their attitudes, beliefs and experiences (Lowenberg, et al., 1974; Shatenstein & Ghandrian, 1998). Outside influences modify habits over time, resulting in the adoption of new habits and dietary patterns (Kuhnlein & Receveur, 1996; Lowenberg, et al., 1974). When the British colonised South Asia, they introduced white sugar which is now more highly regarded than locally produced molasses. The use of wheat to make flat breads has replaced rice at breakfast for most Bangladeshis and the introduction of fruits such as grapes, apples and oranges are becoming more available and accepted throughout the country. However, adoption of food habits within a community does not always bring a positive outcome. The introduction of infant formula has reduced the number of women breastfeeding, as infant formula is often more desirable and regarded as more nutritious and convenient than breast milk. This leads to higher mortality and morbidity rates in infants due to inaccurate feeding

practices and less cash to provide nutritious food for other family members (Kuhnlein & Receveur, 1996).

Presented below in table 2.4 is a summary of relevant studies looking at the dietary diversity and eating habits of women in Bangladesh.

Table 2.4 Summary of studies looking at the dietary diversity and eating habits of women in Bangladesh

Title	Reference	Country	Methods	Subjects	Main findings
Dietary diversity as a measure of the micronutrient adequacy of women's diets: results from rural Bangladesh site.	Arimond, M., L. Torheim, et al. (2009). Washington, DC, Food and Nutrition Technical Assistance II Project (FANTA-2).	Bangladesh,	Diet diversity questionnaire and 24 hour recall.	(Number not specified)	• Nearly half the non-pregnant, non-lactating women in the Bangladesh sample had a low BMI (<18.5). • Total carbohydrate as a percentage of energy was 82% in Bangladesh • Prevalence of adequacy of 9 out of 11 micronutrients was below 50% in Bangladesh • Relationships between food group diversity and micronutrient adequacy shown to vary by season. • Micronutrient intakes for women of reproductive age are far from adequate.
Very low adequacy of micronutrient intakes by young children and women in rural Bangladesh Is primarily explained by low food intake and limited diversity.	Arsenault, J., Yakes, E., Islam, M., Hossain, M., Ahmed, T., Hotz, C., et al. (2013). *J Nutr, 143*(2), 197-203.	Bangladesh (two sub district in northern Bangladesh).	12 hour recall and weighed food record.	240 women and children.	• The mean dietary diversity score of the women was 4.3 out of a possible 9 food groups. • The prevalence of adequate micronutrient intake was 26% for women and 43% for children. • 0-3% of the women had adequate intakes of calcium, folate, riboflavin, vitamin B12 and vitamin A. • Only 16% of women had adequate iron intakes

(Table continues)

Title	Reference	Country	Methods	Subjects	Main findings
Household dietary diversity and food expenditures are closely linked in rural Bangladesh, increasing the risk of malnutrition due to the financial crisis.	Thorne-Lyman, A., Valpiani, N., Sun, K., Semba, R., Klotz, C., Kraemer, K., et al. (2010).. *J Nutr, 140*(1), 182-188.	Bangladesh.	7-d household dietary diversity questionnaire.	188,835 households.	•Approximately 60% of household expenditure was spent on food. •Household dietary diversity scores of individual foods ranged from 0-43 with a mean of 10.3. •Significant associations were found between dietary diversity and parental education and amount of cultivatable land owned.
Dietary pattern, nutrient intake and growth of adolescent school girls in urban Bangladesh.	Ahmed, F., Zareen, M., Khan, M., Banu, C., Haq, M., & Jackson, A. (1998).. *Public Health Nutr, 1*(2), 83-92.	Bangladesh.	24 hour recall and 7-d food frequency questionnaire.	384 high school girls.	•A large proportion of the girls did not consume eggs (26%), milk (35%) or dark green leafy vegetables (20%). •Only 9% of girls met the RDI* for energy intake and only 17% met the RDI for protein intake. •Over 60% of the girls did not meet the RDI* for calcium, vitamin A, vitamin C, riboflavin, thiamine and niacin.
Food consumption, energy and nutrient intake and nutritional status in rural Bangladesh: changes from 1981 – 1982 to 1995 – 96.	Hels, O., Hassan, N., Tetens, I., & Thilsted, S. (2003). *Eur J Clin Nutr, 57*, 586-594.	Bangladesh.	Two cross sectional surveys.	Anthropometric measurements of 1,883 individuals and 24 hour recall of 404 households.	•Percentage of underweight and wasted children and percentage of chronic energy deficiency in adults all decreased between 1981-1982 to 1995-1996. •Intakes of fish and green leafy vegetables, iron and calcium increased between 1981-1982 to 1995-1996. •Intake of rice and vitamin A remained unchanged between 1981-1982 to 1995-1996.

*Recommended daily intake (RDI).

Several well designed studies have been conducted in Bangladesh to assess women's dietary diversity in relation to nutritional adequacy (Arimond, et al., 2009; Arsenault, et al., 2013). The study by Arimond (2009) was part of a larger study carried out under the Food And Nutrition Technical Assistance (FANTA) project (Arimond, et al., 2010). This study included five resource poor settings (including Bangladesh) and concluded

that using simple measures of dietary diversity is an effective tool for measuring women's nutritional adequacy in these settings. The study by Thorne-Lyman (2010) shows the relationship between economic resources and household dietary diversity, however, not between economic resources and individuals within the households (e.g. pregnant women) (Thorne-Lyman, et al., 2010). The studies by Ahmed (1998) and Hels (2003) explored eating habits, but they did not focus on pregnant women in rural settings and were published over ten years ago. Other more recent studies have looked at eating habits of Bangladeshis, but these have all been focused on changing food habits of Bangladeshis who have immigrated to other countries (Chowdhury, Helman, & Greenhalgh, 2000; de Brito-Ashurst et al., 2009; Lofink, 2012).

Beliefs: Beliefs and taboos can form without a scientific base, (eg, hot and cold foods do not describe their actual temperature, but the symbolic reaction they produce within the body when consumed) (Devadas, 1970; Messer, 1984) or start as a mere avoidance, turn into a tradition and eventually become a taboo (Harris & Ross, 1987; Meyer-Rochow, 2009). Cultures often avoid eating a food due to traditional taboos and superstitions which are passed down through generations (Meyer-Rochow, 2009). Taboos are not just the avoidance of a food but are unwritten social rules based on sacred, dangerous or powerful perceptions (Fieldhouse, 1995; Meyer-Rochow, 2009). Whether scientifically correct or not, traditionally taboos were initially followed to protect from health hazards or to conserve resources (Shatenstein & Ghandrian, 1998) and if not thoroughly investigated, the root cause of food avoidances can be missed. Taboos stem from traditional protective methods, which may no longer be relevant but still considered taboo. For example the Muslims and Jews do not consume pork because it is still considered unclean and can cause disease (D. Lee, 1957). Although taboos and religious avoidances have strong moral value and are usually harmless, if adhered to, they can place children, pregnant and lactating women at nutritional risk during these physiologically critical times (Shatenstein & Ghandrian, 1998).

Presented below in table 2.5 are studies which have looked at beliefs, taboos and practices surrounding maternal and child care and nutrition. Two studies have been carried out in Bangladesh while the others are set in other developing countries.

Table 2.5 Summary of studies looking at beliefs and food taboos surrounding pregnancy.

Title	Reference	Country	Methods	Subjects	Main findings
Maternal care practices among the ultra poor households in rural Bangladesh: a qualitative exploratory study.	Choudhury, N., & Ahmed, S. (2011). *BMC Pregnancy and Childbirth, 11*(15), 1-8.	Bangladesh.	Interview.	20 women: • 12 lactating • 8 pregnant	• Women decreased consumption due to food aversion, lack of money. • Women increased consumption due to cravings, willingness and linkage with improved baby's health. • Pigeon, duck beef and fish (hilsha, taji, chanda, puti) were considered 'hot' and avoided during pregnancy. • No fruit was avoided. • Cooking and movement during eclipse can cause baby to be born with a cleft palate. • Restrictions and beliefs most frequently imposed by elder family members. • Women drink blessed water for strength during delivery.
Beliefs and practices regarding delivery and postpartum maternal morbidity in rural Bangladesh.	Goodburn, E., Gazi, R., & Chowdhury, M. (1995). *Stud Fam Plann, 26*(1), 22-23.	Bangladesh.	Focus group discussions.	90 women: 30 women 1-3 pregnancies 30 women 4 or more pregnancies 30 Traditional birth attendants	• Avoidance of 'hot' foods during pregnancy. • Pineapple can cause abortion. • Coconut can make babies blind ("white eye"). • Duck egg can cause asthma in baby. • Milk, certain fish species and cucumber were also avoided by some. • Heavy lifting and rice husking should be avoided.
Influences on maternal and child nutrition in the highlands of the northern Lao PDR.	Holmes, W., Hoy, D., Lockley, A., Thammavongxay, K., Bounnaphol, S., Xeuatvongsa, A., et al. (2007). *Asia Pac J Clin Nutr, 16*(3), 537-545.	Lao.	Focus group discussions, interviews and observations.	16 villages.	• Limited diet with rice as staple food. • Food taboos during pregnancy are less common than taboos after delivery. • From the fifth month, eating forest vegetables and mushrooms is not allowed. • Meat from animals killed by a tiger is prohibited. • Women restrict their diet by 'eating down' (avoid eating large amounts so labour is not painful). • Women avoid hard physical work.

(Table continues)

Title	Reference	Country	Methods	Subjects	Main findings
Understandings of prenatal nutrition among argentine women.	Hess, C., & Maughan, E. (2012). *Health Care for Women International, 33*, 153-167.	Argentina.	Interview.	10 women.	• Women had limited knowledge about healthy nutritional changes during pregnancy • About half the women did not recognise the relationship between their nutrition and their babies health outcome • Oranges clean babies skin and oily food will make babies skin oily when born. • Milk will help with anaemia and yoghurt has lots of vitamins • Most women did not comply with taking iron tablets because of nausea nor eating 'healthy' food as they could not afford it
A qualitative study of beliefs about food relating to child nutrition in the Lower Jimi Valley.	Keeble, J., & Keeble, R. (2006). *PNG Med J, 49*, 162-165.	Papua New Guinea	Focus group discussion	(Number not specified)	• Women avoid oily and salty foods and strong drinks (Pepsi). • Fruits, vegetables, meat and plant proteins considered good for pregnant woman. • There is no perceived shortage of available nutritious food. • Men eat first, followed by children and women.

(Table continues)

Title	Reference	Country	Methods	Subjects	Main findings
Antenatal taboos among Chinese women in Hong Kong.	Lee, D., Ngai, I., Ng, M., Lok, I., Yip, A., & Chung, T. (2009). Midwifery, 25(2), 104-113.	Hong Kong.	Interview.	832 women.	• 75 antenatal dietary and behavioral taboos were found. • 49 of these taboos were observed by at least 50% of the participants. • All participants observed at least one taboo during pregnancy. • Most common reasons to abide to taboos were fears of miscarriage, fetal malformation and an imperfect baby. • Participants most commonly learnt the taboos from family, friends and books.
Pregnancy-related food habits among women of rural Sikkim, India.	Mukhopadhyay, S., & Sarkar, A. (2009). Public Health Nutr, 12(12), 2317-2322.	India.	Questionnaire.	199 women.	• 60% of participants consumed 'special' foods during pregnancy. • The most common 'special' food consumed during pregnancy was milk, followed by animal protein and green vegetables.
Traditional practices of women from India: pregnancy, childbirth and newborn care.	Choudhry, U. (1997). *JOGNN, 26*(5), 533-539.	India.	(Review)		• Hot foods are considered harmful during pregnancy and cold foods considered beneficial. • Hot food consumption is encouraged during late stages of pregnancy to expel baby. • Fish, meat, certain spices and papaya considered harmful. • Yoghurt, milk, banana and left over cold food can cause sticky layer of fat around foetus causing pain during labour. • Belief in 'eating down' (avoid eating large amounts so labour is not painful). • Women eat last at meal times. • Twins or multiple births considered unlucky.

The two studies investigating beliefs and practices of women in Bangladesh were focused on beliefs and practices surrounding delivery and in the postnatal period (Choudhury & Ahmed, 2011; Goodburn, et al., 1995). The studies only briefly explore beliefs and taboos during the antenatal period (the period this research study is focused on) and were completed in different locations and population groups.
The addition of studies set in other developing countries in table 2.5 was to explore beliefs and practices found within other cultures. These studies will guide the development of the research tools and can be used to make comparisons with the findings from this research study.

Education: Education is a vital prerequisite to empower people to have the knowledge and skills to work their way out of poverty (Bhuiya & Streatfield, 1991). The 2009 MICS reported that 81.3 percent of children of primary school age (6-10 years) were attending school but this dropped to 49 percent by secondary school age (11-15 years) (Bangladesh Bureau of Statistics, 2010). Due to wide spread poverty, children are often taken out of school to work when families can no longer afford their school fees. Additionally, as a result of poverty and traditional customs, girls are often married at a young age and often leave school and become pregnant (Khandker, Pitt, & Fuwa, 2003). According to national data women aged between 15-24 years were found to have a literacy rate of 72 percent (Bangladesh Bureau of Statistics, 2010). Having a sound education is a key factor to progressing out of poverty. Education can prevent malnutrition by enabling the full use of surrounding opportunities, overcoming negative dietary prejudices and beliefs, and the adoption of a nutritionally sound diet via earning a more prosperous livelihood (Devadas, 1970).

Health services: Bangladesh's infrastructure struggles to provide adequate health services to its population. Most women living in rural areas lack the access to affordable health care during their pregnancy (S. Ahmed, Hossain, & Chowdhury, 2009). If a health clinic is available, it is often insufficiently stocked and lacks quality practitioners with sound nutritional knowledge (S. Ahmed, et al., 2009). Women in rural settings heavily rely on Traditional Birth Attendants (TBA's) and village doctors for

medicines and advice during pregnancy and birth. The TBA provides the majority of maternal health care to pregnant women living in developing countries. Their knowledge and experience is mainly based on informal traditions and practices from within the community (Hodnett, 2012; Lefeber & Voorhoever, 1997; Paul & Rumsey, 2002). Village doctors are well respected in local village communities but again have usually not received any formal education (S. Ahmed, et al., 2009; Mahmood, Iqbal, Hanifi, Wahed, & Bhuiya, 2010). The practices that both TBA's and village doctors follow are strongly influenced by traditional or *Ayurbedic* medicines. *Ayurbedic* medicine involves medicines made from herbs, roots and metals but with no proven scientific base therefore compromising the quality of health care available to the women (Chopra & Doiphode, 2002).

2.5.3 Immediate causes

Underlying factors interact with each other and produce the two most immediate causes of malnutrition; inadequate food intake and disease. Poor food intake and illness during pregnancy tends to cause a vicious cycle of malnutrition *(figure 2.6).*

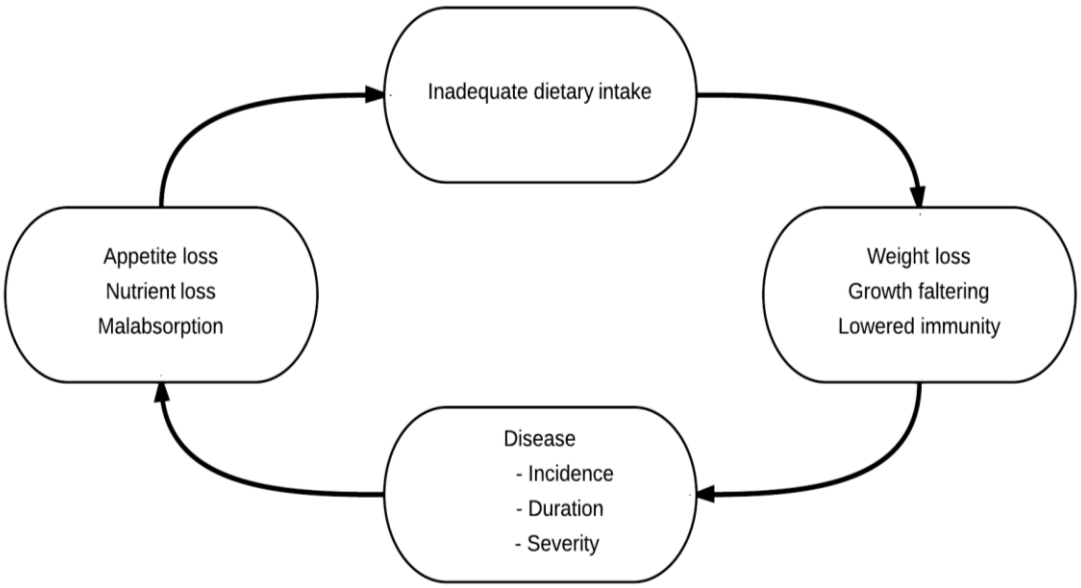

Figure 2.6 Inadequate dietary intake and disease cycle (Bellamy, 1998).

A poor dietary intake which leads to malnutrition lowers the body's immune function to resist and fight disease. This results in more frequent and more prolonged illnesses. Disease and infection lowers a woman's appetite, absorption and metabolism which again increase her requirement for nutrients during this already vulnerable period (Bellamy, 1998).

2.5.4 Applying the UNICEF framework to the ecological model

Ecology refers to the relationship between people and their physical and social environments (Bronfenbrenner, 1979). The factors investigated in this study are part of the pregnant women's ecology and therefore the ecological model is proposed as a theory-based framework which can be used to apply findings from the UNICEF model *(figure 2.5)* into a basic format representing real life outcomes. Like the UNICEF conceptual framework, the ecological model is used to assess the multiple levels of influence on an individual's nutritional status (Bronfenbrenner, 1979; Carroll, 1988). The four levels, individual, relationship, community and society, are shown in figure 2.7 below. The ecological model can be used to stratify the relationships between underlying variables to help produce multi-level interventions and evaluations to improve nutritional status during pregnancy (Glanz, Rimer, & Viswanath, 2008; Gregson et al., 2001).

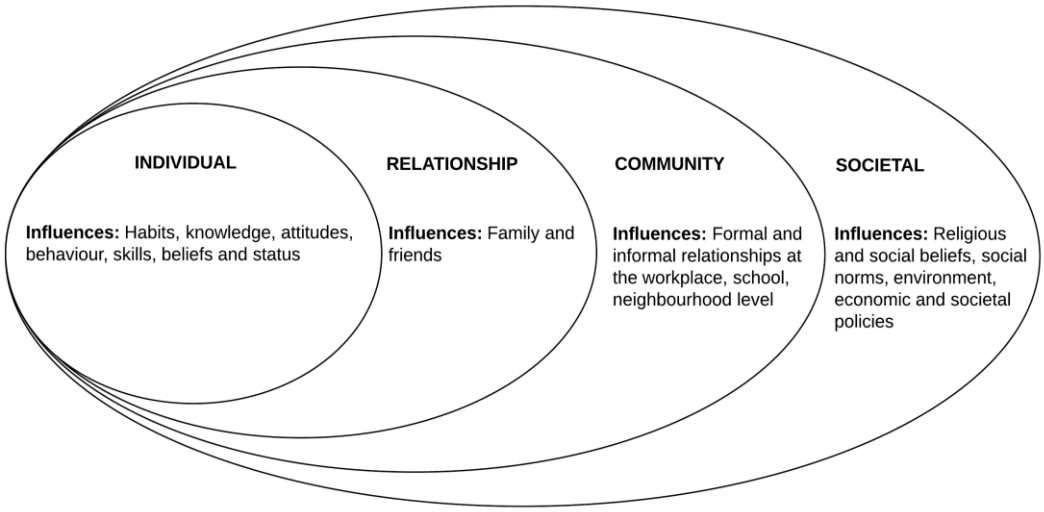

Figure 2.7 Ecological model (adapted from (Bronfenbrenner, 1979))

2.5.5 Summary

There are an overwhelming number of research studies with a focus on malnutrition occurring throughout Bangladesh. This is mainly due to it being declared a priority area for malnutrition, it is easily accessible, the research costs are cheap, and the high-density population. However, this is leading to sporadic and unregulated research methods and reporting of data; often producing conflicting results in most research areas. This is commonplace in many developing countries where data collections are repeated, resources are inefficiently used, which therefore limits conclusive reporting. From the review of current literature, it is evident that poverty, malnutrition and disease (immediate causes) are widespread throughout Bangladesh. However, less is known about the socio-cultural environment (basic causes) and how they may affect *pregnant women's eating habits*, *beliefs*, *diet diversity* and *crop harvest* (underlying causes) in *rural Bangladesh*. Eating behaviours, practices and the ecological relationships which lead to food choices are composed of complex foodways and human behaviours. Therefore in addition to evident economic and environmental factors, a complete understanding of how social and cultural factors influence food consumption practices needs to be explored to discover the underlying reasons of malnutrition. If not, current methods of intervention will be undermined by these additional factors if not known and understood, and efforts to reduce malnutrition will continue to stagnate in Bangladesh.

2.6 Methodological rationale

Traditionally in the field of nutritional science, research has focused on biology, microbiology, biochemistry, and physiology as nutritionists aim to quantify disease prevalence and set nutritional standards (Green & Thorogood, 2004; Mennell, et al., 1992). However, it has been argued that nutritional intake is influenced by numerous ecological factors and should therefore be studied from the perspectives of multiple and mixed study areas (Happ, Dabbs, Tate, Hricik, & Erlen, 2006; Mennell, et al., 1992). The aim of this research study was to, 'investigate the food consumption practices of women during pregnancy and the role of traditional eating habits and taboos in the

maternal diet in rural Bangladesh.' As shown throughout this literature review, a wealth of information exists, demonstrating that there is a serious problem of malnutrition during pregnancy in rural Bangladesh. Less is known about the habits and beliefs which effect food consumption practices and lead to a low nutritional status especially in the local Pirganj area. Therefore, taking into consideration the explorative nature of this research study and the unique setting, a mixed methodological approach with a strong qualitative design was deemed the most appropriate. Mixed method studies use more than one research method to gain a more complete range of findings which complement and enrich one another to explore a research area (Denzin & Lincon, 2000; Happ, et al., 2006; Tashakkori & Teddlie, 2002). It is argued by Harrison (1994) that quantitative and qualitative methods are intertwined and do not exist independently to one another, which reflects the ecological nature of this research study and therefore enhances the appropriateness of a mixed method approach (Harrision, 1994). A predominantly qualitative approach will be used to explore the unknown topic of the women's perceptions and practices about habits and beliefs during pregnancy, while quantitative methods will be used to quantify the practices in a complementary approach.

The central research theme is to explore the view point and perceptions of the participants in an area which is not well understood. Understanding 'what', 'how' and 'why' about the particular phenomenon and not to quantify 'how many' or 'how much' requires qualitative methods (Happ, et al., 2006). Qualitative approaches are more appropriate at understanding human behaviour and how they are affected by their ecological relationships (Green & Thorogood, 2004). Common qualitative research data collection methods are focus groups, interviews and observation (Denzin & Lincon, 2000; Green & Thorogood, 2004). To explore the participants' perceptions on eating habits, beliefs and practices while taking into account the study setting (rural villages, resource poor, trans-cultural) and the participants' demographics (female, low education, culture) focus group discussions were considered more appropriate than individual interviews. Focus group discussions are reputable for their success in trans-cultural settings with illiterate populations and are therefore favoured for research in

developing countries and in poor, rural locations (Hennink, 2007). Focus groups aim to start with a structured format but let the participants guide the development of the conversation to produce a rich and in-depth understanding with multiple viewpoints of a poorly understood topic (De Vos, Strydom, Fouche, & Delport, 2005; Morgan, 1988). Focus groups collect a wider range of information within a shorter period of time than interviews and the group discussion creates a dimension of interaction between participants' attitudes, feelings, beliefs, experiences and reactions, therefore, gaining additional perspective which is difficult to achieve in a trans-cultural one-on-one format (Morgan, 1988).

Focus groups will provide a rich description of the participants' perceptions; however, a form of observation is needed to objectively confirm what the participants have said during verbal discussion. Taking into account the study setting (rural villages, trans-cultural) and logistical restrictions (researcher must follow World Vision security regulations, limited staffing and resources) participant photographic observation was most suitable. Participant photographic observation uses the data collection technique of observation with the addition of photography to objectively complement the narrative description and increase the accuracy of documentation. It will capture the women's practices during key food consumption periods, namely breakfast, lunch and dinner and therefore require less time but focus on food practices (Schurink, 1998). The data collection process is non-intrusive and allows participants to carry out their usual practices while being observed and photographed. The analysis of the photographs provides findings which can often be hidden or misinterpreted when using verbal methods in a trans-cultural setting (Collier & Collier, 1986; Schwartz, 1989). This method is appropriate for use in a mixed method study as its findings will be used to confirm and complement the additional tools used (Schwartz, 1989).

In the essence of a mixed method approach and to address the objective of dietary diversity and household production of food crops, quantitative methods were required. As stated earlier in the literature, dietary diversity refers to the number of food groups or food items found in the diet, not the nutrients. Therefore the Individual

Dietary Diversity Questionnaire (IDDQ) is a tool suitable tool to quantify and describe the women's dietary diversity and food intake over a 24 hour reference period as it collects data according to food groupings. The IDDQ is specifically designed for use in a developing country with a low socio-economic population or in a trans-cultural setting as it is intended to be easily adapted by following set guidelines to increase its contextual appropriateness (Arimond & Ruel, 2004; Food and Agriculture Organisation, 2007; Hoddinott & Yohannes, 2002). Data will need to be collected via a trained facilitator, therefore IDDQs are suitable because they are less invasive and less complex to administer compared with other methods (e.g. food frequency questionnaire, 24 hour recall, diet history, diet record) and require minimal resources (no food scales, no multipage questionnaire, no computer for analysis) (Arimond & Ruel, 2004; Hoddinott & Yohannes, 2002). The IDDQ has been validated to show that the data it collects represents similar data which would be collected using these more complex methods (Arimond, et al., 2010; Oldewage-Theron & Kruger, 2011; Ruel, et al., 2010; Savy, et al., 2005). The last objective is to quantify the participants' household harvest over a year reference period. Data could be collected through a questionnaire or as part of the focus group however it was decided to use the 'ten seed method' to collect this data through an interactive medium. Participants use seeds to represent crop harvest which is therefore better suited to this population group (low literacy, trans-cultural) than other possible methods. The ten seed method is commonly used throughout developing countries with low literacy participants and encourages equal participation. The method is quick, simple and will be completed immediately after quantitative methods to act as an icebreaker and enhance discussion between the group participants throughout the rest of the data collection session. The ten seed method allows for contextual adaptions and uses local resources (sticks and seeds) which are familiar to the participants. The ten seed method was designed by and used throughout World Vision programs, therefore the facilitators will already be familiar with its use (Jayakaran, 2002).

CHAPTER THREE: METHODOLOGIES

3.1 Study design

A cross sectional study design with a multi-method approach was used to explore eating habits and taboos of pregnant women living in rural Bangladesh (Pirganj, Rangpur). Quantitative (demographic questionnaire, ten seed method), qualitative (focus group discussion, photographic participant observation) and mixed (individual dietary diversity questionnaire) data collection tools were used to gather complementary results which could be cross referenced to more thoroughly explore the research aim (section 1.6). The demographic questionnaire was designed to provide a rich description and make comparisons of the study participants. The ten seed method was used to produce a household harvest calendar which provided a pictorial description of what food crops the participants have available over a year time span. The harvest calendar also assisted in the exploration of the participants' dietary diversity and eating habits. The individual dietary diversity questionnaire (IDDQ) determined the diversity of the participants' diets and therefore helped describe their eating habits in terms of food consumption practices and indicated diet quality. The focus group discussion contributed to exploring the diversity of the participants' diet and their eating habits, but also explored any food taboos, superstitions or beliefs held by the participants. The photographic participant observation provided additional descriptive information and objectively confirmed findings from previous methods by providing a photographic description of the participants' practices and behaviours. Dietary diversity, food taboos, and the household crop harvest are foodways which are shown in the theoretical framework *(figure 1.4)* of this research study to affect eating habits and food consumption practices that ultimately impact the nutritional status of a pregnant woman living in rural Bangladesh. Once an understanding of the underlying factors which influence a woman's nutritional status during pregnancy has been achieved, multi-dimensional recommendations to help achieve optimal nutrition during pregnancy can be made.

Due to the exploratory nature of this research study the data collection procedures were conducted in three separate, consecutive phases. The sequenced phases which incorporated the data collection methods to meet the study objectives are presented below in figure 3.1. For each of the objectives the figure indicates the methods used to provide supporting results.

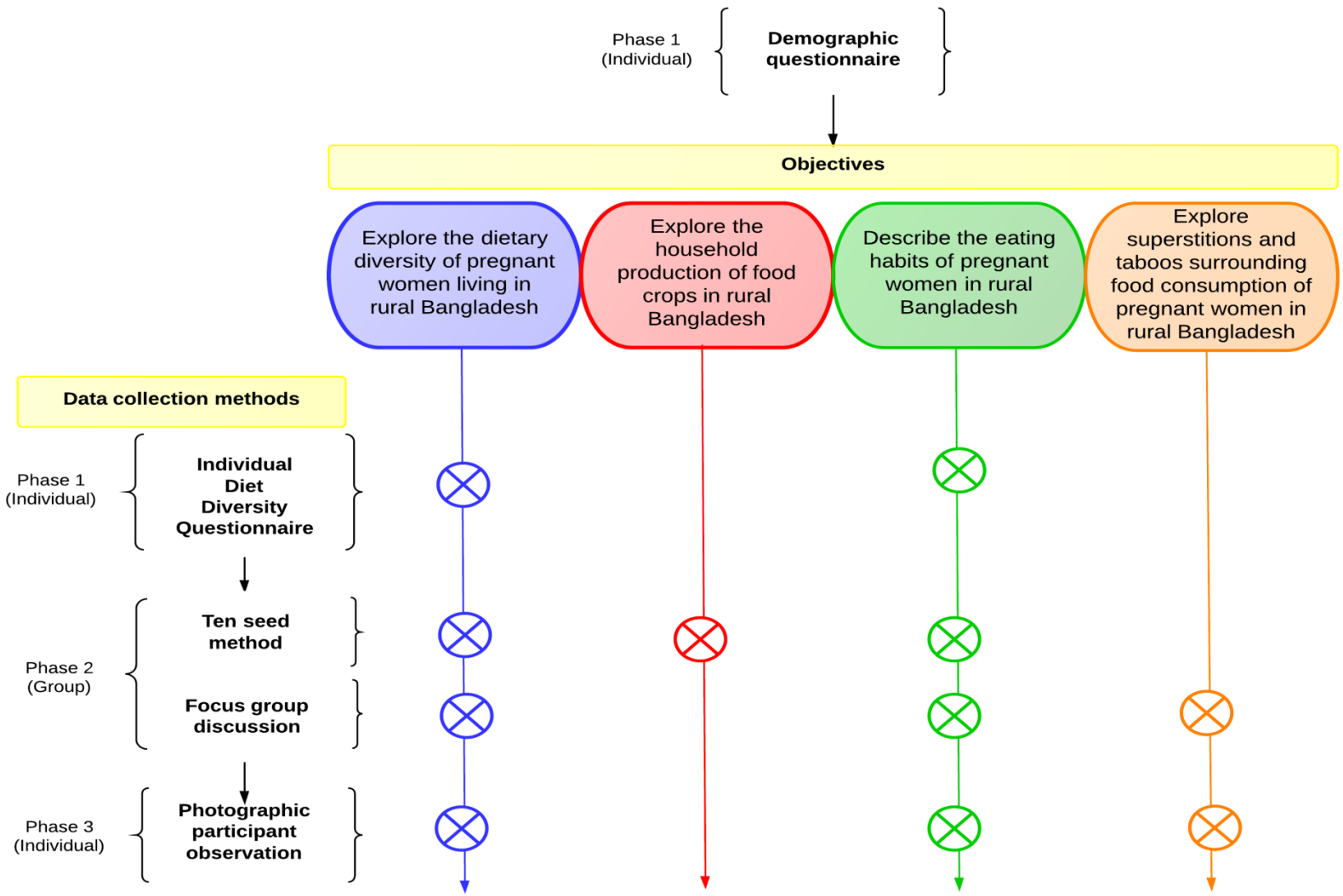

Figure 3.1 Operationalising methods

3.2 Definition of concepts

Dietary diversity

Dietary diversity is the number of unique food groups consumed over a given period of time. Dietary diversity reflects the quality of the diet and a diet higher in diversity is associated with micronutrient adequacy (Food and Agriculture Organisation, 2007).

Food variety

The number of individual food items consumed over a reference time period. A food variety score can be used to indicate the nutritional adequacy of a diet (Hatloy, et al., 1998).

Eating habits

Habitual behaviour patterns that include the choice preparation and consumption of food (Hunt, et al., 1979).

Beliefs

Beliefs are a psychological state in which an individual confidently believes something to be true regardless of supporting or opposing evidence (Parraga, 1990).

Food taboos

Food taboos are foods which people abstain from eating due to religious or cultural restrictions. The word taboo comes from the Polynesian word 'tabu' which means sacred or forbidden (Meyer-Rochow, 2009).

Household crop harvest

Foods that a family member has grown and harvested on available land around their home with the intention of providing the food for their immediate family's consumption or income.

Adivasi group

People belonging to one of the 46 ethnic minority groups found throughout Bangladesh. Adivasi groups are indigenous to the land but have different languages, cultures and religions to the majority Bengali group (Besra, 2006).

Bengali group

Bengali is the name given to the largest cultural group in Bangladesh; forming approximately 98 percent of the population. They speak the Bengali language and are predominantly of Muslim religion (Bender, 2004).

3.3 Ethics

This study was conducted in collaboration with World Vision New Zealand, World Vision Bangladesh and Massey University New Zealand. This partnership allowed access to research participants by utilising World Vision's country-based knowledge and their relationships established in the target community, as well as providing guidance when working with diverse and vulnerable groups. Data was collected with the assistance and support of local (Bangladeshi) staff members employed by World Vision. The collaboration facilitated the training of local World Vision staff members in research methods and protocols used throughout the study. This enhanced their capacity in the research process and will support the implementation of high quality projects in the future. World Vision was interested in collaborating and supporting this study because the research findings will inform future programs in Pirganj and other areas of Bangladesh. However, this research study was designed as a stand-alone project and independent of the current World Vision agenda in Bangladesh. The researcher and study design did not compromise World Vision's reputation and their work in the community or vice versa. Potential participants were informed that their decision to participate or not, would have no effect on their entitlement to additional benefits from World Vision in their community. The researcher discussed with the trained facilitators ethical considerations and concerns when working within vulnerable communities such as Pirganj. Confidentiality agreements were signed by

the facilitators before research commenced (appendix B). A memorandum of understanding was signed between Massey University, World Vision New Zealand and World Vision Bangladesh to ensure all parties adhered to the commitments they made to this research.

This study was trans-cultural in nature and carried out within a vulnerable group. Therefore additional aspects that needed to be addressed to ensure cultural and target group appropriateness were:

- acceptance of the researcher by the community to ensure openness of the participants,
- language barriers between participants, facilitators and researcher,
- social status of participants, facilitators and researcher,
- literacy level and age of participants,
- potential negative influences or pressures participants and communities were exposed to,
- researcher personal security.

These aspects were addressed by using suitable data collection methods which were appropriate for low literacy and trans-cultural settings; extensive consultation with community leaders to increase acceptance and support for this research; adequate training with World Vision staff members to ensure accuracy and standardisation of data collection and that suitable research protocols were followed; adhering to World Visions safety guidelines; and building a strong rapport with staff, communities and participants throughout the study to ensure appropriateness and acceptability of this study in the target communities (further preliminary procedures are explained in detail in section 3.6).

The study was explained to all potential participants using the participant information sheets (appendix C and H). Those participants who agreed to participate in the study then signed/fingerprinted individual consent/confidentiality agreements (appendix D and I). Anonymous identity codes were assigned to ensure confidentiality throughout the data collection process.

Ethical approval was first obtained from the Bangladesh Medical Research Council (095-03-10-11). On the condition of gaining approval from the Bangladesh ethnical board and meeting New Zealand ethical standards, Massey University Human Ethics Committee: Northern, (MUHECN 11/064) granted their approval for this study.

3.4 Research tools

3.4.1 Demographic questionnaire

The demographic questionnaire (appendix E) was designed to collect information to describe the characteristics of the women and their households. It included information on the pregnant women's age, marital status, parity, religion, ethnicity, and schooling level and household information such as the number of people in the household, responsibilities for cooking, harvesting and buying food, main income earner, main income source and cultivation of land. The questionnaire was adapted from the 'Joint Programme for Children, Food Security and Nutrition in Cambodia' (Millenium Development Goal Achievement Fund, 2012) under the Millennium Development Goal Achievement Fund, that was designed to collect demographic information relevant to maternal health. This was adapted to include contextually appropriate information and reduce participant burden.

3.4.2 Individual dietary diversity questionnaire

The IDDQ (appendix F) is a tool designed to measure the quality of an individual's diet over a 24 hour reference period. A diet high in diversity is more likely to provide a variety of high quality foods with adequate energy and micronutrients (Ruel, 2003b). The IDDQ was initially designed for use in the Food and Nutrition Technical Assistance (FANTA) project. It was designed for easy use in developing countries with illiterate participants and to have low participant burden (Food and Agriculture Organisation, 2007). A reference period of 24 hours is most commonly used as it limits recall bias and is more accurate (Ruel, 2003b). The IDDQ is a tool specifically designed to be adapted for use in many developing countries with varying foods, while still producing

validated results. Therefore, following the Food and Agriculture Organisation (FAO) guidelines, examples of foods in the original questionnaire were expanded to reflect locally available foods, for which information was obtained using local community members, market research and consultation with the trained facilitators and World Vision staff members (Food and Agriculture Organisation, 2007).

The IDDQ contained 14 nutritious food groupings namely cereals and grains; vitamin A rich vegetables and tubers; white tubers and roots; dark green leafy vegetables; other vegetables; vitamin A rich fruits; other fruits; organ meats; flesh meats; eggs; fish and seafood; legumes, nuts and seeds; milk and milk products; fats and oils. No minimum quantity cut off was used and every food item consumed, even in the smallest quantity, contributed to the IDDQ.

The questionnaire was administered following guidelines set by the FAO and the FANTA project. Participants were first asked if the previous day was a feast day or celebration where unusual dietary patterns were observed. If the answer was yes, the IDDQ was re-scheduled for another day. If the answer was no, the facilitator continued with the questionnaire (Food and Agriculture Organisation, 2007). Participants were asked to freely recall all foods (including snacks) and drinks consumed during the previous 24 hours, starting at the previous morning. The facilitator circled the foods in the appropriate food groupings and used standardised probes to collect more detail. If a food was listed by a participant but not on the original IDDQ, the facilitator consulted with the researcher and added the food name under the appropriate food group, allowing for further adaptation of the tool if required. Once the participant finished recalling what they ate over the past 24 hours, the facilitator prompted the participant with any empty food groups and frequently forgotten foods (e.g. sugar, oil, garlic, milk in tea) (Food and Agriculture Organisation, 2007). This was done to ensure that all foods consumed during the previous 24 hours were accurately recorded.

3.4.3 Harvest calendar

In developing countries and especially in rural areas, food intake is highly dependent on what is available via local harvesting (Torheim, et al., 2004). The production of a harvest calendar helps explore the availability of food crops to the participants and therefore aids in determining the diversity of their diet, their eating habits and ultimately their nutritional status. The 'ten seed technique' was used as an interactive method to produce a harvest calendar by the study participants. It is a modified participatory, learning and action tool developed by Dr Ravi Jayakaran from World Vision International, China (Jayakaran, 2002). It is designed to allow illiterate participants equal contribution during data collection and is easily modifiable to collect a large range of data; one of these being a harvest calendar (Jayakaran, 2002). To produce the harvest calendar, the guidelines set by Dr Jayakaran (which allows for adaption) were followed. The months of the Bengali year were laid out in order with a small cup beside each month. Participants were each given ten seeds and asked to systematically spread the seeds over the calendar to indicate when they harvest individual crops and the yield proportion of each crop (Jayakaran, 2002). Participants whose household did not harvest any crops, did not place any seeds in the calendar. An example of how this was represented is shown in figure 3.2.

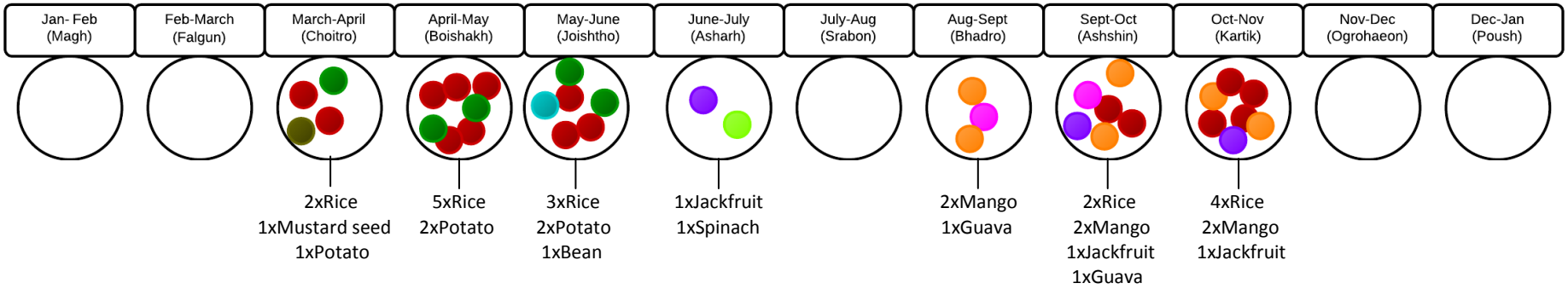

Figure 3.2 Example of harvest calendar using ten seed method

If in one month more than one crop was harvested, the women decided as a group how these seeds were to be distributed between the crops to indicate the yield proportions. Using the example of the figure above, once all women had placed their seeds over the calendar the month of May-June contained six seeds. This represents the harvest of rice, potato and beans, however initially the individual proportion of these three crops was unknown. Therefore the facilitators would ask the participants to decide as a group how the six seeds should be split over the three crops.

3.4.4 Focus group discussion

The focus group discussion was used as the priority method due to its success in trans-cultural and illiterate population settings (Hennink, 2007; Kruger & Gericke, 2003). The aim of the focus group was to gain an in-depth understanding of the participants' perceptions about their eating habits, food taboos and beliefs during a group discussion format.

The semi-structured focus group schedule (appendix G) was developed with pre-planned probes to prompt discussion about food habits, cultural beliefs and taboos adhered to during pregnancy; which the group was unlikely to discuss freely. Due to the use of a trained facilitator and working across cultures, it was necessary to plan the structure and flow of the discussion as the researcher was not able to direct the discussion when necessary. The focus group schedule covered the following topics: usual eating patterns before and during pregnancy, food changes during pregnancy, nutritional knowledge, beneficial and harmful foods, food harvesting and preparing jobs, food customs, taboos and opinions on preferred food/diet during pregnancy. The focus group was conducted by the two trained facilitators who followed appropriate prompts when necessary. The researcher was present during all focus group discussions to assist (with the aid of a translator) the facilitator to collect robust data if necessary and record observations and events throughout the discussion (e.g. participants' behaviours, group dynamics, environment and timing of events). Each discussion ran for approximately two hours and was recorded using a Dictaphone. The transcription of the recording was started within 12 hours of data collection by the primary facilitator and the principle researcher to maximize data capture. The immediate transcription and reflection of the focus group conducted on a research day allowed further standardisation of prompts which therefore improved the delivery throughout the course of the research (Hennink, 2007; Morgan, 1988).

3.4.5 Photographic participant observation

The photographic participant observation method used technology to complement and clarify findings from the previous tools. It provided an objective view of the participant's eating habits, dietary diversity and practices. It was also used to provide additional findings which could be hidden or misinterpreted during previous methods due to the trans-cultural setting (Collier & Collier, 1986; Schwartz, 1989).

The two trained facilitators and the researcher arrived unannounced at a randomly selected (from participants who has completed previous data collection phases and indicated that they would be willing to participate in this phase of the research) woman's house before meal preparation and consumption. The woman was not informed in advanced to ensure her eating practices were as close to normal as possible. The primary facilitator explained the method and read the participant information sheet. If the woman agreed to participate she signed/finger printed the consent form and data collection commenced. The facilitators would photograph all aspects of the woman's meal preparation and consumption while descriptive notes of the process and observations were recorded in a narrative format by the researcher. Figure 3.3 shows the researcher writing notes during a photographic participant observation session with a pregnant woman.

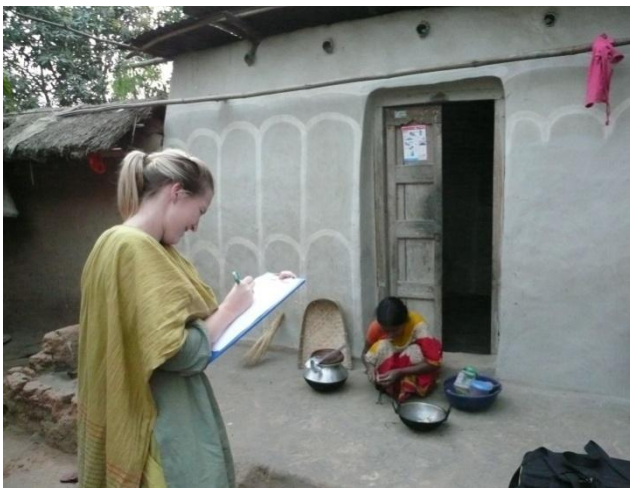

Figure 3.3 Researcher writing notes during photographic participant observation session.

3.5 Study setting

This research was carried out in the Pirganj Upazilla, in rural Northern Bangladesh. Pirganj is a fair representation of rural Bangladesh, with livelihoods based on agriculture, high population density, low socio economic levels, high poverty rates and a mixture of ethnicities living throughout the region (World Vision Bangladesh, 2011). Figure 3.4 is of a typical rural scene in the Pirganj area (and many other rural areas of Bangladesh) with flat land covered in rice fields.

Figure 3.4 Pirganj country side.

World Vision established an ADP in Pirganj in 2010 due to concerning poverty rates and community vulnerability, and will continue to support the community in building their own development infrastructure until 2025. The ADP is relatively new and this study will help World Vision understand the community's situation and the needs to empower their own development (World Vision New Zealand, 2012b).

The World Vision Pirganj ADP currently works in four unions (Pirganj, Chatra, Bara Alampur and Tukuria) out of the 15 unions which make up Pirganj. This study targeted nine villages throughout the four unions which were, Kangur Para, Chatra, Bara Bhagabanpur, Anantapur, Patgram, Atiabari, Kishoregari, Sujarkuthi and Rajarampur *(figure 3.5).*

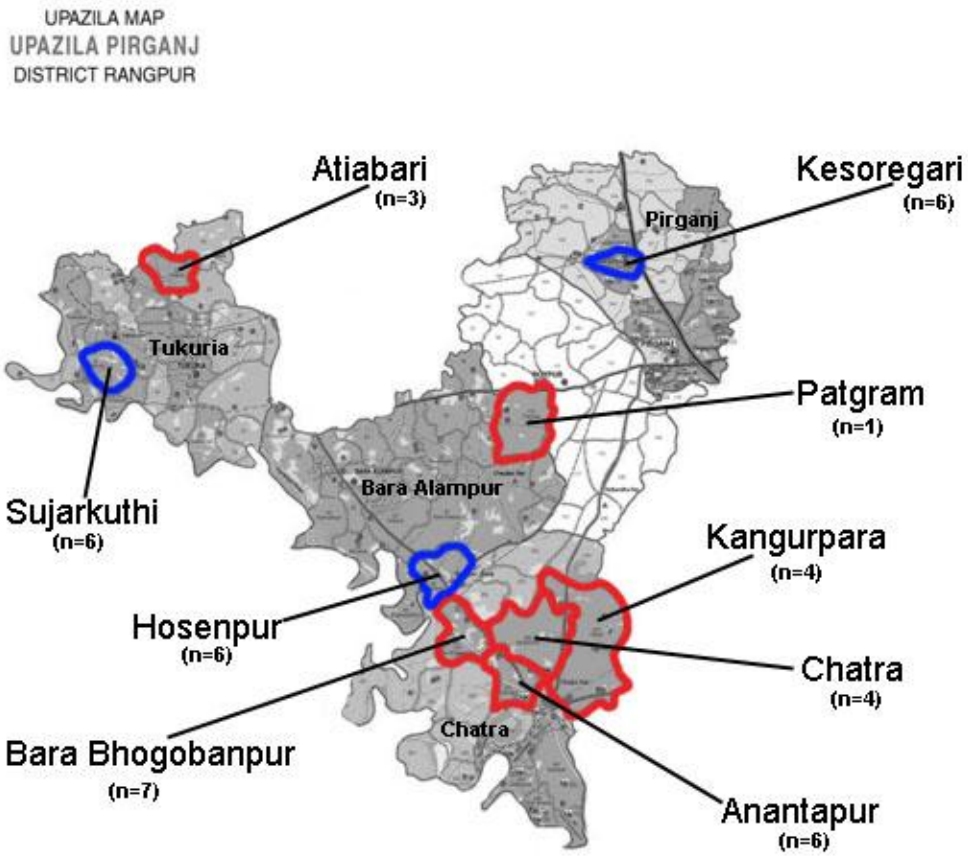

Figure 3.5 World Vision, Pirganj working area. (Villages with Adivasi participants recruited from are in red and villages with Bengali participants recruited from are in blue. The number of participants from each village is indicated below each village name. Adapted from (World Vision Bangladesh, 2011))

3.6 Preparation and training

3.6.1 Preparation

Following ethics approval, the researcher received training at World Vision New Zealand regarding cultural orientation to Bangladesh and conducting research and working in developing countries. While in New Zealand, the researcher conducted a face to face discussion with a native Bangladeshi. The discussion provided appropriate context regarding Bangladeshi culture and aided data collection tool development (appendix A). The data collection tools were piloted on three lay New Zealand women to ensure understandability and formatting, thus allowing appropriate adjustments to be made before travelling to Bangladesh.

When in Bangladesh, the researcher discussed the research study with the Health and Nutrition Specialist at World Vision Bangladesh National Office in Dhaka, taking on board any contextual suggestions (local Bangladeshi food names, malnutrition context in Pirganj and general Bangladeshi food beliefs and practices during pregnancy). Meetings were held with several National Office staff members in regards to country context, culture and safety. To respect local customs and cultures, a Shalwr Kameez was worn by the researcher throughout the research process in Bangladesh. In Pirganj the researcher was introduced and welcomed by an inauguration ceremony attended by all Pirganj ADP staff members, the Divisional Director and selected village members.

Following the IDDQ and harvest calendar recommended implementation guidelines (Food and Agriculture Organisation, 2007), the researcher conducted a meeting with the Livelihoods Officer at the Pirganj ADP to further adapt the data collection tools by adding location specific foods and to translate commonly consumed crops and foods (Food and Agriculture Organisation, 2007; Jayakaran, 2002). The local Pirganj food market was visited to increase the researcher's knowledge of locally available foods and food names in the Bangla language to aid the adaptation of and ensure the accuracy of data collection methods.

Before data collection commenced, the researcher, ADP manager and two facilitators visited the Pirganj Union Council[6]. Research objectives and methods were discussed with the Chairman and other council members to gain local approval and support from influential community members. Three potential participants (pregnant women) were visited in their homes to discuss the study, provide feedback about their willingness to participate in the study and to initiate the snowballing method of recruitment. These two steps in the consultation process are pictured below in figure 3.6.

Figure 3.6 Consultation process with Pirganj Union Council (left) and local village members/potential participants (right).

3.6.2 Training

The principle researcher simultaneously trained two World Vision staff members over two sessions to ensure standardisation of data collection techniques. On day one, the study objectives were explained and methods and logistics were discussed. Over all techniques of respecting participants privacy, helping participants feel comfortable when discussing their personal perceptions and ways to encourage in-depth answers were prepared. The demographic questionnaire was discussed and the purpose of each question was explained;

[6] Union Councils are the smallest rural administrative and local government units in Bangladesh (United States Agency for International Development (Bangladesh), 2011).

followed by a practical session to standardise delivery. The IDDQ was explained, including its purpose, delivery techniques and technical issues (minimum quantities, foods which can be classified into more than one food group, mixed dishes) and was discussed according to the FAO guidelines (Food and Agriculture Organisation, 2007). The ten seed method is commonly used by World Vision and both facilitators had used the tool before. The facilitators practiced its use to produce a harvest calendar according to Dr Ravi Jayakaran's recommendations and to standardise the process (Jayakaran, 2002). The facilitators completed a role play to familiarise themselves with the tools, which was followed by a debrief session to refine the tools and answer any questions (Food and Agriculture Organisation, 2007).

On the second day, the objective of focus group discussions and the role of the facilitator were discussed. All questions were analysed to ensure understandability and accurate interpretation in Bangla by both facilitators (Hennink, 2007). The information sheet and the semi-structured focus group questions were translated from English into the commonly spoken rural dialect of Bangla. Translated versions were revised and discussed to ensure a standardization of delivery techniques and accurate translation. Facilitators were shown how to use the digital camera and what the focus of the photos during the photographic participant observation should be. It was explained that the method should aim to gather an objective view of the participants' dietary diversity and their food preparation and eating practices.

3.7 Recruitment and sampling

The inclusion criteria for this study were:

- Female
- Pregnant
- Any age
- Living in World Vision Pirganj ADP area.

This study aimed to collect data from currently pregnant women to explore current habits and beliefs and to limit recall bias. Pregnant women of any age were included in the study to

ensure a wide representation, to thoroughly explore the research question and to meet data saturation.

In Bangladesh, the Adivasi groups are persecuted and consequently live with high rates of poverty (Minority Rights Group International, 2008). Therefore, the main target group for this study was pregnant women belonging to an Adivasi group to align with World Vision's strategy of working with children, families and communities living in extreme poverty and injustice. When data saturation was reached in this group of pregnant women, the recruitment strategy for this research was further expanded to Bengali participants who were also living in a rural and ultra-poor/poor environment. This ensured a robust investigation of the research question and explored whether differences exist between these groups of women.

Identification of pregnant women in both the Adivasi groups and Bengali groups relied on the personal contact of local World Vision Volunteers with communities in rural settings. The volunteers used the techniques of: local informants, door to door recruitment and the snowballing technique (current participants recruiting new participants).

All pregnant women belonging to a Adivasi group were invited into the study and convenience sampling was used to group them according to village location based on focus group sizes of four to eight participants (according to recommendations) (Morgan, 1988). Recruitment of Adivasi women ceased when data saturation was met and no more pregnant women could be identified. Bengali women were selected from the remaining villages using random and convenience sampling to also form focus groups of four to eight participants.

Once phase two *(figure 3.1)* of the data collection was completed with all participants, a subgroup was randomly selected using excel (random function) from a list of all participants who had attended previous phases and verbally indicated an interest in completing phase three (photographic participant observation). Three Adivasi and three Bengali women were

randomly selected and were systematically assigned to breakfast, lunch or dinner observations across two consecutive days.

The recruitment and sampling of participants was a continuous process and occurred throughout the research period; from the 26th of January to 1st of March 2012. A total of 43 pregnant women completed phase one (demographic questionnaire and IDDQ) and phase two (ten seed method and focus group). During phase two five (n=25) focus group discussions with Adivasi women and three (n=18) with Bengali women were conducted. Six of the participants additionally completed phase three (photographic participant observation) of the study.

3.8 Data collection procedure

The participants, facilitators and researcher met at 9 am on the morning of a planned data collection session in a selected participant's private courtyard *(figure 3.7).* This was organised by a village volunteer on the previous day.

Figure 3.7 Household courtyard used for data collection session.

The information sheet was read aloud by the primary facilitator and if participants were satisfied and agreed to the study, individual consent/confidentiality agreements were signed

by all participants. Participants unable to sign their name used their finger print as their confirmation of consent.

The demographics questionnaire and IDDQ were administered by the facilitators on an individual basis with each participant, in a private area of the courtyard. Data accuracy was checked straight after collection by the researcher for clarity and completeness. Incomplete data was amended by the facilitator with the participant. The demographic questionnaire and IDDQ took approximately 10 minutes to complete with each participant.

Once the individual data collection methods were complete, all participants were gathered together in the courtyard where the facilitators conducted the harvest calendar activity using the ten seed method. The ten seed method is interactive and enjoyable, therefore intended to make the women feel comfortable within the group before the focus group commenced *(figure 3.8).*

Figure 3.8 Completing the ten seed method before the start of the focus group discussion.

Participants were informed that the focus group should run as a fluid discussion with the facilitator guiding the conversation. The facilitator explained that there was no right or wrong answer, asked the women to be as honest as possible and emphasised that all their information was valuable. The ten seed method and the focus group discussion ran for approximately two hours and when concluded, participants were thanked for their time and

given the opportunity to ask any questions. All participants were provide with snacks and 200 Taka (Bangladesh currency), as this is equivalent to a day's work in the fields. During all data collection methods the researcher recorded all significant observations, such as participants' behaviours, group dynamics, environment and timing of events.

Once all focus groups were completed the photographic participant observation commenced systematically. Participants were not advised in advanced to eliminate the opportunity for them to arrange changed eating habits; however an indication as to whether each participant would be willing to participate in this phase was given at the end of the focus group discussion meeting by verbal consent. The two trained facilitators and the researcher arrived at the selected woman's home shortly before a meal time. Phase four of the study was explained to the participant and if agreed, they signed an additional consent form. The participants were asked to continue with the preparation of the meal in their usual manner and not change what they were planning to prepare or consume. The facilitators photographed the participant during her meal preparation and consumption while the researcher wrote descriptive notes of the process and observations. Once the meal was finished the participants were thanked and given the opportunity to ask any questions. The photographic participant observation method was repeated for six meal periods, one woman for each period (three Adivasi and three Bengali women), over the course of two days.

3.9 Data handling and analysis

All data was cleaned and coded. Quantitative data was analysed using SPSS (version 16.0) and qualitative data was analysed using the software NVivo[7] (version 8).

[7] NVivo is the brand name for a 'Computer Assisted Qualitative Data Analysis Software'. NVivo is a tool which facilitates the management and analysis of data.

3.9.1 Quantitative data

Questionnaire results and ten seed calendar results were analysed using descriptive statistics and graphs. Individual dietary diversity scores (IDDS) were calculated by summing the number of food groups consumed by the individuals over the 24 hour period. A mean IDDS was calculated for the whole sample and compared between Adivasi and Bengali groups.

The dietary diversity guidelines set by the FAO (Food and Agriculture Organisation, 2007) recommend the use of fourteen food groupings, as what was used in this study for the IDDQ. However, more recent research by Arimond (2010) reported that the use of nine food groupings (known as the Woman's Diet Diversity Score (WDDS)) as a proxy indicator of dietary diversity produced validated results specific to women of reproductive age living in resource poor settings (Arimond, et al., 2010; Ruel, et al., 2010). Therefore, the food groupings in the IDDQ were rearranged to represent the nine food groupings in the Woman's Diet Diversity Score (WDDS). The nine food groups included cereals and white tubers, green leafy vegetables, vitamin A rich fruit and vegetables, other fruit and vegetables, organ meat, meat and fish, eggs, legumes, nuts and seeds, and milk products. The WDDS was calculated for the whole sample group.

A measure of distribution of the IDDS was calculated by creating terciles. The percentage of individuals who had a low (≤4 food groups), medium (5-6 food groups) or high (≥7 food groups) IDDS was calculated and the most common foods groupings consumed in each tercile were listed; according to guidelines set by the FAO (Food and Agriculture Organisation, 2007). Dietary diversity by tercile was calculated for the whole sample and compared between Adivasi and Bengali groups.

A food variety score (FVS) was calculated, using the same information collected in the IDDQ, by summing the number of individual food items a participant consumed over the previous 24 hours. The FVS was calculated for the whole sample and compared between Adivasi and Bengali groups.

3.9.2 Qualitative findings

The audio recordings were translated from Bangla to English by the researcher and the primary facilitator. These were combined with the researcher's observations for each focus group discussion. The translated raw data was cleaned for typing errors. An independent World Vision New Zealand staff member (fluent in English and Bangla) verified the translation quality of 30 minute sections from four transcripts once the researcher returned to New Zealand.

The raw data was transferred to the NVivo software for an inductive approach to qualitative content analysis (Morgan, 1993). The general inductive approach allows formation of core categories based on the research aims and objectives followed by lower level themes emerging from multiple readings of the text (Thomas, 2003). NVivo was used to openly code the raw data into three principle concepts (with sub concepts); namely, usual eating habits, habits which influence the women during pregnancy, and habits which influence the baby during pregnancy *(figure 3.9).*

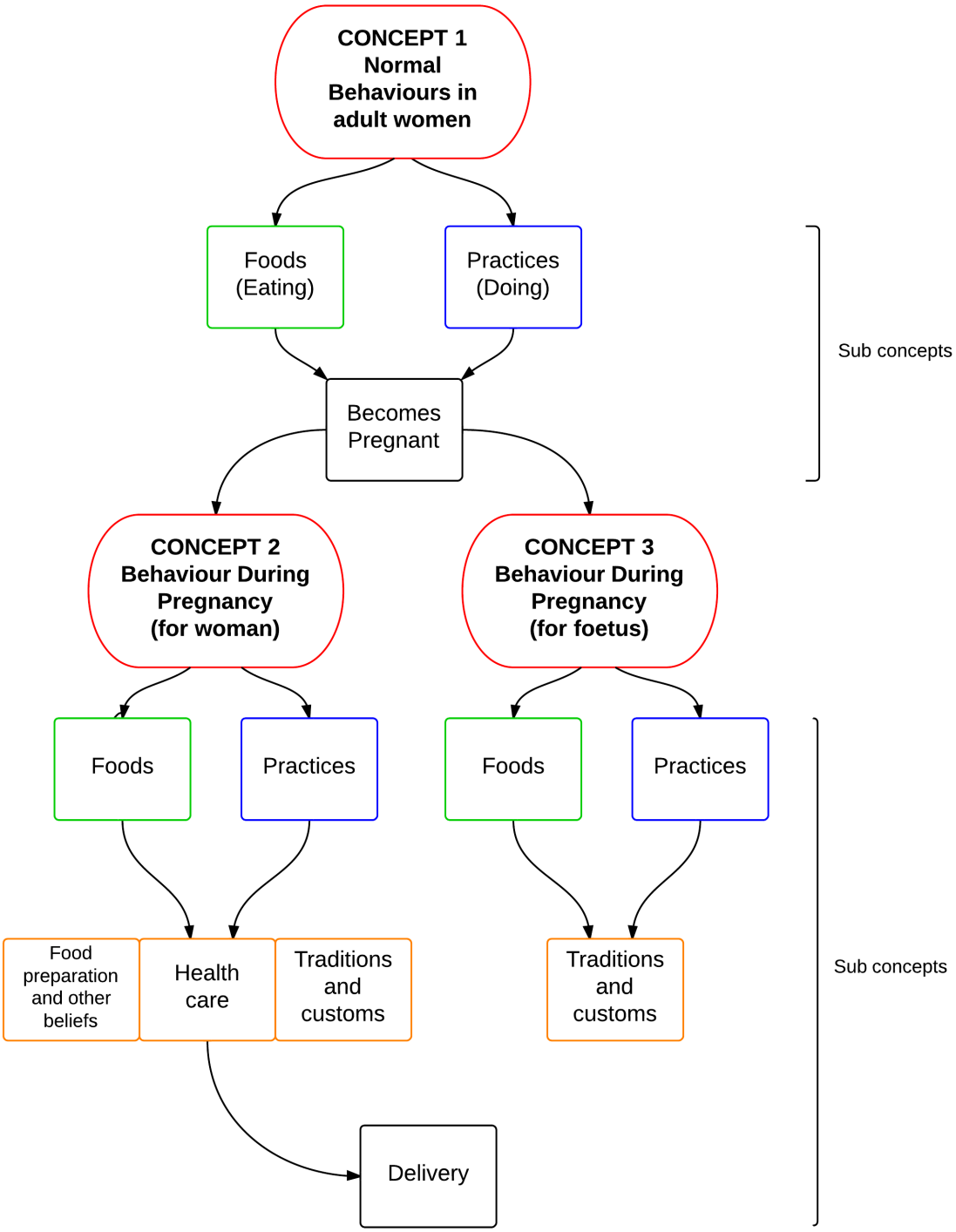

Figure 3.9 Concept flow diagram

Through the process of continual review and analysis of the concepts and using axial and selective coding, two core categories (habits and beliefs) based on the research aims and objectives emerged. Within the categories are three inter-related themes (food, cultural and health practices) and sub themes based on the logic of grounded theory *(figure 3.10).*

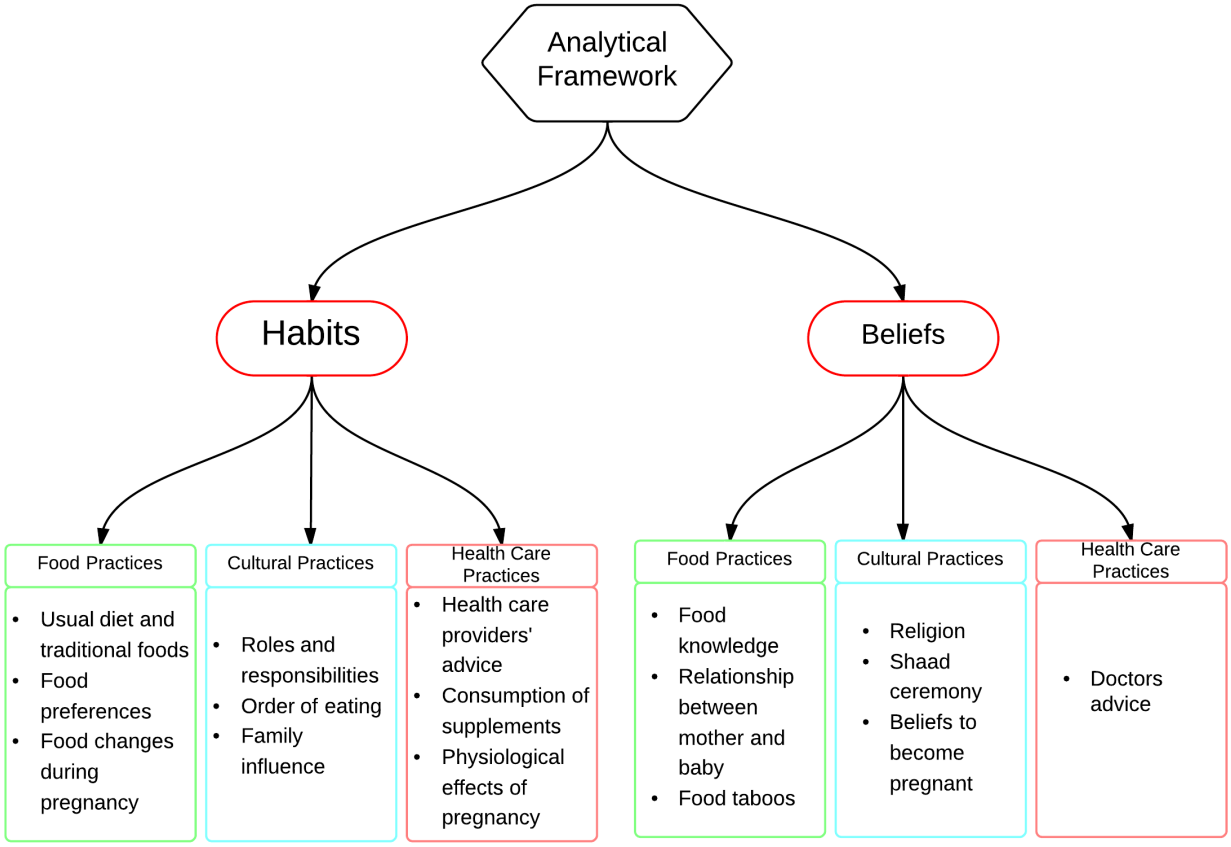

Figure 3.10 Analytical framework of categories and themes

The findings are presented as two core categories and underlying inter-related themes. Ethnography is used to provide direct quotations from the focus group discussions and enrich descriptions. Observations and photographs from the photographic participant observation were coded to appropriate themes or quotations using NVivo to include alongside and enrich the findings.

3.10 Dissemination of results

The results from this research study were summarised and shared with World Vision New Zealand and World Vision Bangladesh. The findings and recommendation were incorporated into the ONDP project by the researcher and the Pirganj ADP during October 2012. World Vision will be provided with the final thesis following examination.

A summary of the results from this study were presented at the New Zealand National Nutrition Conference in November 2012 in Auckland, and a manuscript will be submitted for publication to a peer reviewed journal in the near future.

CHAPTER FOUR: RESULTS

Quantitative data collected using the methods: demographic questionnaire, IDDQ and the ten seed method, will be presented prior to the findings from the qualitative methods: focus group discussions and photographic participant observation. Quantitative data is presented first to describe the study population and to quantify eating habits and dietary diversity; which is then built upon by the qualitative findings.

4.1 Quantitative results

4.1.1 Demographic characteristics

A total of 43 pregnant women from the Pirganj upazila in Bangladesh participated in this study. Women were grouped according to their ethnicity; into Adivasi or Bengali groups. Results were analysed as a total population group and by separate ethnicities to describe the women and determine any differences between the groups in table 4.1. Women in the Adivasi group belonged to three ethnic minorities prevalent in the Pirganj area: Santal, Pahari and Urao. Women from both the Adivasi and the Bengali groups were similar in all demographic characteristics, apart from religion (*table 4.1*). This is expected as the majority of Bengalis are Muslim and most Adivasi groups are of Christian or Hindu religion.

Table 4.1 Demographics

Characteristic	All participants (n=43)	SD	Adivasi participants (n=25)	SD	Bengali participants (n=18)	SD	p-value
Age (yr)	25.8	6.8	25.4	7.12	26.1	6.76	0.439
Married	98%*	-	96%*	-	100%	-	-
Number of Children	1[β]	(1,2)[μ]	1[β]	(1,2)[μ]	1[β]	(0,1)[μ]	0.222
Number of Pregnancies	2[β]	(1,3)[μ]	3[β]	(2,3)[μ]	2[β]	(1,3)[μ]	0.197
School attendance	65%	-	64%	-	72.2%	-	0.570
Class level	7.56	2.25	7.56	1.93	7.54	2.67	0.266
Religion			-	-	-	-	
Islam	42%	-	0%	-	100%	-	**0.000[α]**
Hindu	23%	-	40%	-	0%	-	
Christian	35%	-	60%	-	0%	-	
Number in HH	4[β]	(3,5)[μ]	4[β]	(3,5)[μ]	3.5[β]	(3,5)[μ]	0.133
Number of adults	3[β]	(2,4)[μ]	3[β]	(2,4)[μ]	2[β]	(2,3.25)[μ]	0.288
Number of children	1[β]	(1,2)[μ]	1[β]	(1,2)[μ]	1[β]	(0.75,2)[μ]	0.110

*HH = Household, [α] = Significant difference in religion between Adivasi and Bengali groups, [β] = Median, [μ] = 25th, 75th Quartiles * = Contains missing data*

4.1.2 Household information

Information about the women's household situation was collected to further enhance the description of the women in terms of food and income. Household information was analysed as a total group and separately (Adivasi group and Bengali group) and presented in table 4.2. Questions addressed the responsibilities within the household for cooking, harvesting and purchasing food to determine who influences the food availability and intake. The results identified that in both groups, the majority of women are responsible for cooking, while men are responsible for harvesting and purchasing household food (*table 4.2*). Most women had some type of cultivation on their household land (90.7%), which may influence the women's food availability and intake. Questions were asked to identify the main income earner in the household and their income source. From the results it was evident that a larger number of women belonging to the Adivasi group, compared with the Bengali group, worked outside of their home. In both groups, the husband was most often the main provider of income for the household (83.7%) *(table 4.2).*

Table 4.2 Household Information

Characteristics	**All participants (n=43)**	**Adivasi participants (n=25)**	**Bengali participants (n=18)**
Responsible for cooking			
Yourself	**37 (86%)**	**21 (84%)**	**16 (88.9%)**
Husband	0 (0%)	0 (0%)	0 (0%)
Your parents	2 (4.6%)	1 (4%)	1 (5.6%)
Parents-in-law	2 (4.6%)	1 (4%)	1 (5.6%)
Child	1 (2.3%)	1 (4%)	0%
Responsible for harvesting			
Yourself	**0 (0%)**	**0 (0%)**	**0 (0%)**
Husband	33 (76.7%)	19 (76%)	14 (77.8%)
Your parents	3 (7.0%)	2 (8%)	1 (5.6%)
Parents-in-law	5 (11.6%)	3 (12%)	2 (11.1%)
Child	2 (4.6%)	1 (4%)	1 (5.6%)

(Table continues)

Characteristics	**All participants (n=43)**	**Adivasi participants (n=25)**	**Bengali participants (n=18)**
Responsible for buying			
Yourself	**0 (0%)**	**0 (0%)**	**0 (0%)**
Husband	35 (81.4%)	21 (84%)	14 (77.8%)
Your parents	2 (4.6%)	1 (4%)	1 (5.6%)
Parents-in-law	6 (14%)	3 (12%)	3 (16.7%)
Do you work outside you home?			
Yes	**22 (51.2%)**	**21 (84%)**	**1 (5.6%)**
Type of work?			
Rice/crop farmer	20 (80%)	20 (80%)	0%
Salaried work	2 (4.6%)	1 (4%)	1 (5.6%)
Other	0 (0%)	0 (0%)	0 (0%)
N/A	21 (48.8%)	4 (16%)	17 (94.4%)
Who's land do you work on?			
Own	3 (7.0%)	3 (12%)	0%
Someone else owns land	17 (39.5%)	17 (68%)	0%
N/A	6 (14%)	5 (20%)	1 (5.6%)
Do you cultivate your land?			
Yes	**39 (90.7%)**	**22 (88%)**	**17 (94.4%)**
Who is your household's main income earner?			
Yourself	2 (4.6%)	1 (4%)	1 (5.6%)
Husband	**36 (83.7%)**	**22 (88%)**	**14 (77.8%)**
Your parents	2 (4.6%)	1 (4%)	1 (5.6%)
Other	3 (7.0%)	1 (4%)	2 (11.2%)
What is your household's main income source?			
Rice/crop farmer	**39 (90.7%)**	**23 (92%)**	**16 (88.9%)**
Waged labour	1 (2.3%)	1 (4%)	0%
Salaried work	3 (7.0%)	1 (4%)	2 (11.1%)

4.1.3 Individual dietary diversity questionnaire

An assessment of the participant's individual dietary diversity measured the individual's diet quality over a 24 hour reference time period. Results from the IDDQ are presented in varying formats below to gain an in-depth understanding of the variety and the diversity of the women's diet.

The percentage of total women who consumed from each food grouping is presented in figure 4.1. From the 14 food groupings assessed, the most commonly consumed food group was cereals and grains (100%). From this food grouping, all 43 women had eaten *baht* (rice), seven had eaten bread and one had eaten a biscuit; indicating the importance of rice in the women's diets. Over half of the participant's diet commonly includes the top five food groupings: cereals and grains (100%), white tubers and roots (98%), oils and fats (93%), other vegetables (88%) and legumes, nuts and seeds (56%). The variety of foods within the food groupings was very limited and usually only one food was eaten from each food grouping. For example, 97.7 percent of women consumed from the white tubers and roots food group, however the only food item listed in this grouping was white potatoes. Analysing food groupings rich in micronutrients can indicate the woman's micronutrient status. Plant based food groupings high in vitamin A (vitamin A rich vegetables and tubers, vitamin A rich fruits and dark green leafy vegetables) were consumed by 28 percent of the women and food groupings high in iron (organ meats, flesh meats and fish and seafood) were consumed by 61 percent of the women *(figure 4.1).*

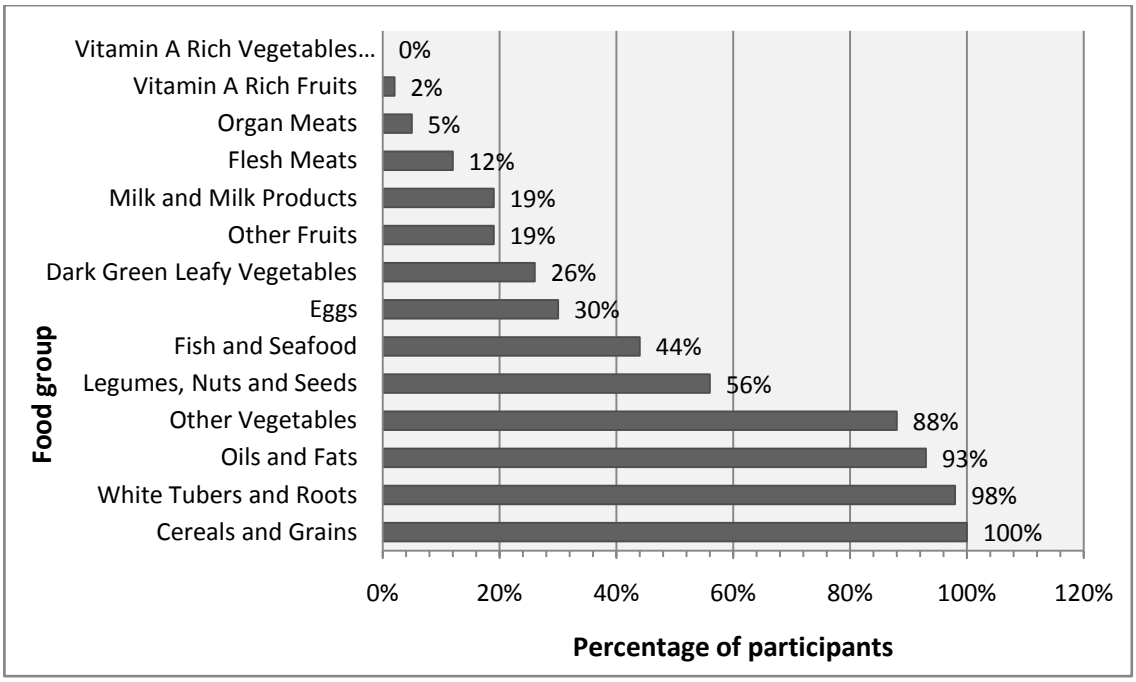

Figure 4.1 Percentage consumption of individual dietary diversity food groupings

The data from the IDDQ was analysed as an overall Individual Dietary Diversity Score (IDDS). The IDDS is the total sum of food groupings a participant consumed from and is represented as a bar graph in figure 4.2 and 4.3.

The mean IDDS of all 43 women was 5.9 (±1.5) food groupings from a possible 14 (*figure 4.2).* The lowest IDDS was three and the highest was ten; both of which were women from the Bengali group. Only two women ate from more than seven food groupings and nearly half the women ate from five or less; reflecting an overall limited dietary diversity.

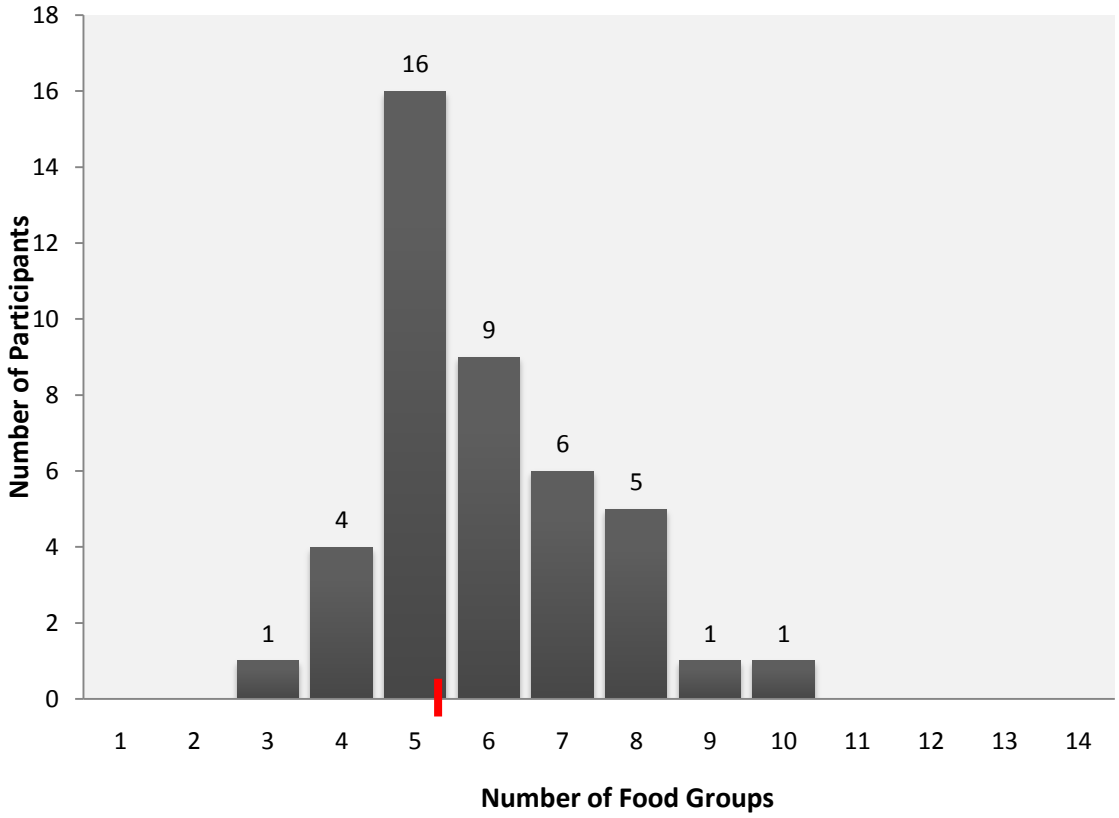

Figure 4.2 Dietary diversity scores for all pregnant women using 14 food groupings. Red bar indicates mean value.

The data is further analysed in terms of the two ethnic groups to allow comparisons. The Adivasi group (5.4 ± 1.2) had a lower mean IDDS than the Bengali group (6.6 ± 1.6) indicating greater nutrient vulnerability in the Adivasi group (*figure 4.3).*

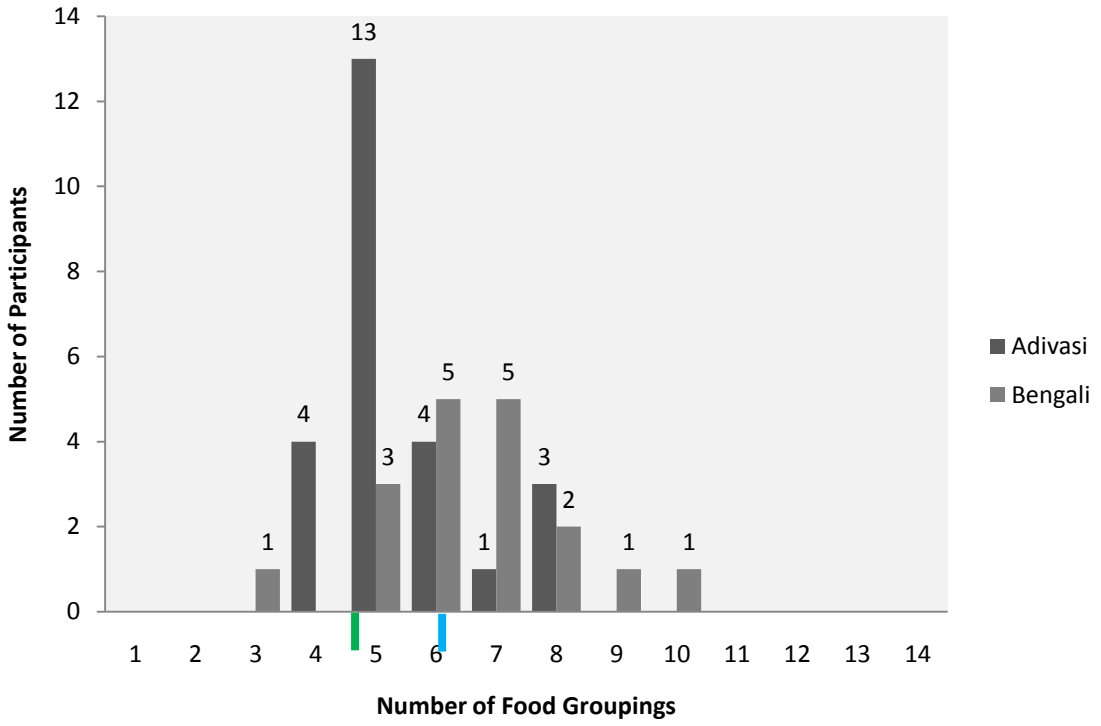

Figure 4.3 Dietary diversity scores from 14 food groupings for pregnant Adivasi compared with Bengali women. Green bar indicates mean value for Adivasi group and blue bar indicates mean value for Bengali group.

The data collected in the IDDQ was rearranged into the Women's Dietary Diversity Score (WDDS) as explained in section 3.9.1. The results from all 43 women are presented in a bar graph in figure 4.4. The overall WDDS averaged 3.7 (±1.1) food groups from the nine food groupings with a minimum of two and a maximum of six food groupings consumed over the previous 24 hours *(figure 4.4).*

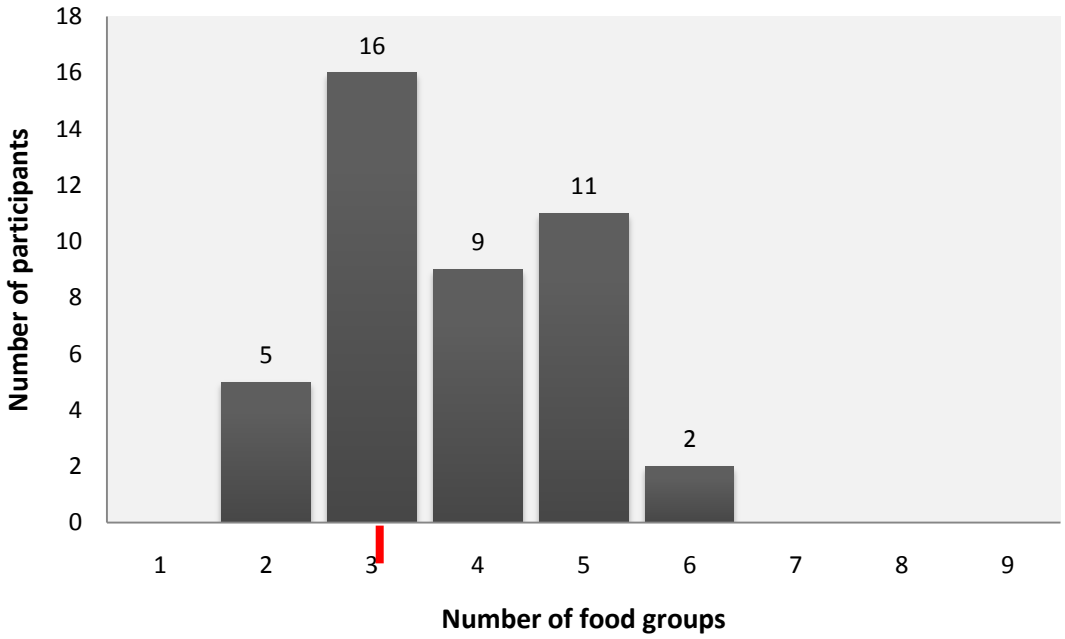

Figure 4.4 Dietary diversity scores for all pregnant women using 9 food groupings. Red bar indicates mean value.

Further analysis was carried out on the IDDQ data by separating food groupings into terciles (as explained in section 3.9.1) and is presented in table 4.3. Women with low scores (11.6%) had a very basic diet and consumed from only four foods groups at most. In most cases these groups were cereals and grains, white tubers and roots, oils and fats and other vegetables, which make up a very basic traditional Bangladeshi diet. Women with medium scores (58.2%) commonly added in foods from the legumes, nuts and seeds and the fish and seafood food groupings therefore obtaining a wider variety of nutrients in their diet. In comparison with the low and medium dietary diversity tercile, women who had higher scores (30.2%) were able to add in more animal foods (eggs, and milk and milk products) and a greater variety of fruits and vegetables *(table 4.3).*

Table 4.3 Percentage of all women by dietary diversity tercile of commonly consumed food groups

Low Dietary Diversity (≤4 food groups)	**Medium Dietary Diversity (5-6 food groups)**	**High Dietary Diversity (≥7 food groups)**
Cereals and Grains	Cereals and Grains	Cereals and Grains
White Tubers and Roots	White Tubers and Roots	White Tubers and Roots
Oils and Fats	Oils and Fats	Oils and Fats
Other Vegetables	Other Vegetables	Other Vegetables
	Legumes, Nuts and Seeds	Legumes, Nuts and Seeds
	Fish and Seafood	Fish and Seafood
		Eggs
		Dark Green Leafy Vegetables
		Other Fruits
		Milk and Milk Products
11.6% (n=5)	**58.2% (n=25)**	**30.2% (n=13)**

When data is presented according to ethnicity *(table 4.4)* more women in the Adivasi group ate a low (16%) or medium (68%) diversity diet compared with the Bengali group. Adivasi women who consume a diet higher in diversity supplement into their diet more dark green leafy vegetables than eggs, and more flesh meat than milk and milk products when compared with the Bengali group. One Bengali woman (5.6%) had a diet of low diversity compared with four (16%) in the Adivasi group. Half the Bengali women (50.0%) had a high dietary diversity score; which is much greater than the number of Adivasi women (16%). Milk and milk products are more commonly introduced by Bengali women than Adivasi women in the high dietary diversity tercile.

Table 4.4 Percentage of Adivasi women compared with Bengali women by dietary diversity tercile of commonly consumed food groups

Low Dietary Diversity (≤4 food groups)		**Medium Dietary Diversity (5-6 food groups)**		**High Dietary Diversity (≥7 food groups)**	
Adivasi	**Bengali**	**Adivasi**	**Bengali**	**Adivasi**	**Bengali**
Cereals and Grains	Cereals and Grains	Cereals and Grains	Cereals and Grains	Cereals and Grains	Cereals and Grains
White Tubers and Roots	White Tubers and Roots	White Tubers and Roots	White Tubers and Roots	White Tubers and Roots	White Tubers and Roots
Oils and Fats	Oils and Fats	Oils and Fats	Oil and Fats	Oils and Fats	Oils and Fats
Other Vegetables	Other Vegetables	Other Vegetables	Other Vegetables	Other Vegetables	Other Vegetables
		Legumes, Nuts and Seeds	Legumes, Nuts and Seeds	Legumes, Nuts and Seeds	Legumes, Nuts and Seeds
		Fish and Seafood	Fish and Seafood	Fish and Seafood	Fish and Seafood
				Dark Green Leafy Vegetables	Eggs
				Eggs	Milk and Milk Products
				Other Fruits	Other Fruits
				Flesh Meats	Dark Green Leafy Vegetables
16% (n=4)	**5.6% (n=1)**	**68% (n=17)**	**44.4% (n=8)**	**16% (n=4)**	**50.0% (n=9)**

4.1.4 Food Variety Score

The food variety score (FVS) is the total sum of individual food items a woman consumed and the scores are presented in figure 4.5. The limited quality of diet of the overall population group is reflected in the low mean FVS of 7.2 (±2.1) out of a possible 105 foods, from all 43 women. The highest FVS was fourteen and the lowest was four (white rice, white potato, green beans, lentils) *(figure 4.5).* A total of 45 food items were consumed out of a possible 105 foods identified on the IDDQ by all 43 women. Of these 45 foods, 13 were different species of fish, therefore not increasing the diversity of the diet.

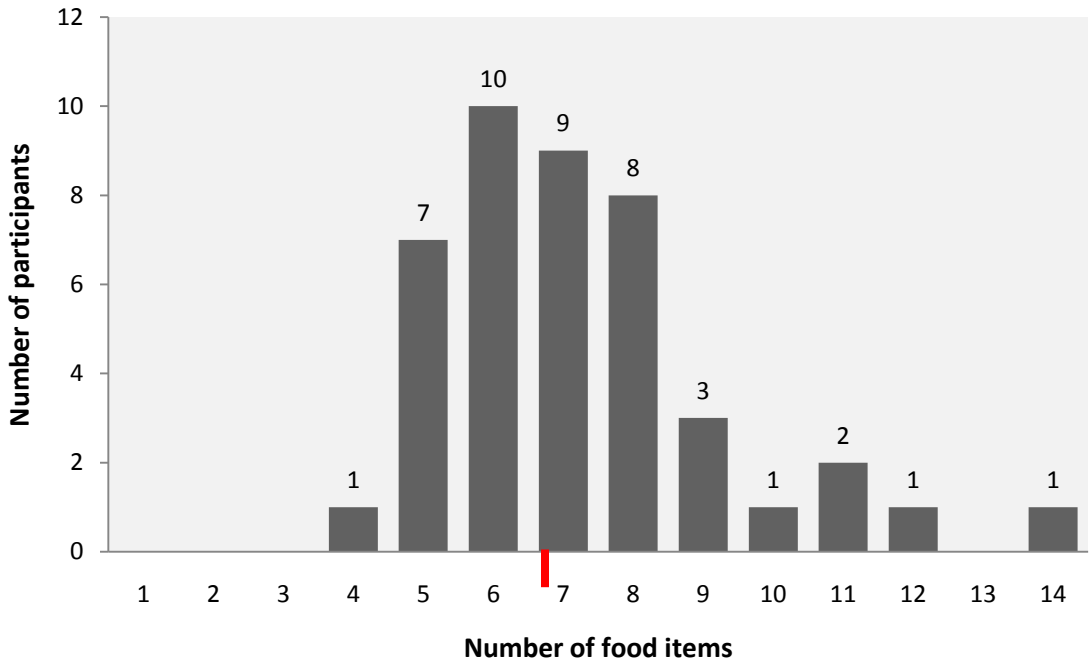

Figure 4.5 Food variety scores of all women. Red bar indicates mean value.

Figure 4.6 presents the FVS of the Adivasi compared with the Bengali groups. The Bengali group (8.2 ± 2.5) had a higher mean FVS than the Adivasi group (6.5 ± 1.3). No women in the Adivasi group ate more than nine food items while women in the Bengali group ate up to fourteen food items *(figure 4.6).*

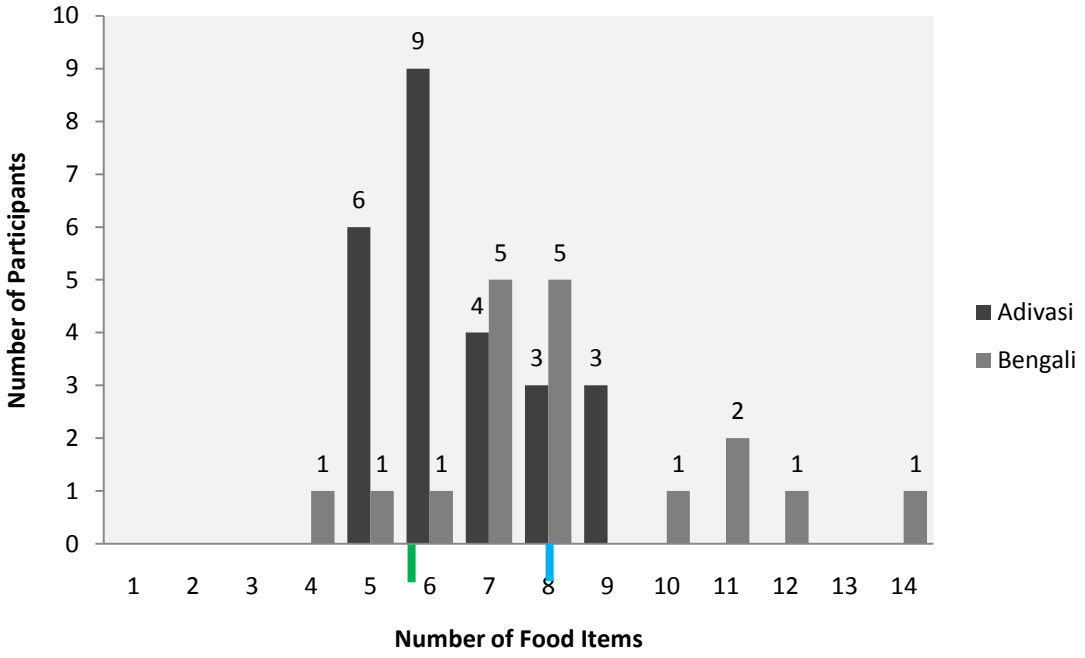

Figure 4.6 Food variety scores of Adivasi compared with Bengali groups. Green bar indicates mean value for Adivasi group and blue bar indicates mean value for Bengali group.

4.1.5 Harvest Calendar

The results from the ten seed method are presented in figure 4.7 as a harvest calendar in a stacked bar graph format. A large proportion of the women (86%) said they harvested some type of crop throughout the year. Out of the total 370 seeds (37 women x 10 seeds each) used during this method, rice was harvested in most abundance. The harvest calendar identified two main harvests of rice each year in *Joishtho* (May-June/summer) and in *Ogrohaeon* (November-December/late autumn). The most common fruits harvested by the women were jackfruit and mango; both in *Joishtho* month (May-June/summer). Nutrient dense foods such as eggplant, pumpkin, bean and banana were harvested in small proportions compared with rice, therefore influencing habitual intake of nutrient dense foods and dietary diversity. Between the months *Asharh* (June-July/monsoon) and *Kartik* (October-November/late autumn) very little food is harvested and would be considered as the lean season (*figure 4.7).*

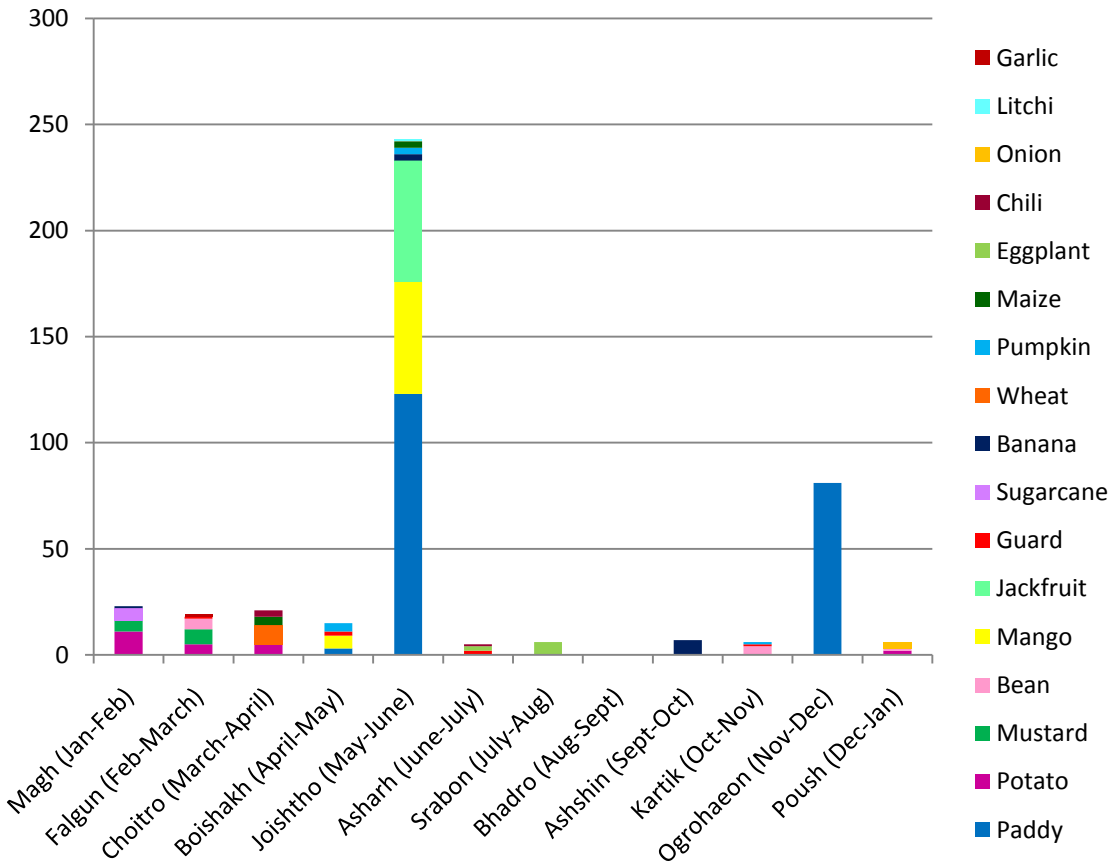

Figure 4.7 Harvest calendar

4.2 Qualitative results

Presented below is the information gathered using qualitative research methods in this study. The findings from the focus group discussions and the photographic participant observations are reported according to the two core categories, 'habits' and 'beliefs', which are based on the study objectives. Within the two core categories there are three inter-related themes with sub themes (*see figure 3.9*). The qualitative findings enrich and complement the data reported above in the quantitative results.

Qualitative approaches to research are based on building theory; therefore the findings are presented with a degree of interpretation to form context and meaning (Glaser & Strauss, 1967; Sandelowski, 2000). Direct quotations and photographs are used throughout the findings to enrich the ethnographic description[8] and allow further understanding of the participants' perceptions and context (Creswell, 1998).

4.2.1 Habits

The first core category which was established through data analysis was habits. Habits are firmly established behavioural patterns which when frequently repeated over time, result in an automatic cognitive process (Hunt, et al., 1979). Habits are triggered by situational cues and determine an individual's practices. (Shatenstein & Ghandrian, 1998; van't Rieta, Sijtsemaa, Dagevosa, & G De Bruijnb, 2011). For example, drinking tea every morning is a habit which is triggered by the situational cue of consuming breakfast. As habits are learnt behaviours there is the possibility for adaptation over time (Hunt, et al., 1979; Shatenstein & Ghandrian, 1998). Habits are subconscious acts of behaviour and considered 'the norm'; therefore, they have profound influences on what is consumed and subsequently an individual's nutritional status (van't Rieta, et al., 2011). Within the context of this research study, the women's habits underlie their subconscious food, cultural, and health care practices.

[8] The interpretation of cultures and their interaction between social systems (Creswell 1998)

4.2.1.1 Food practices

Usual diet and traditional foods

Food habits are reflected in what an individual consumes throughout the usual day. Although these eating choices are made at both a conscious and subconscious level and therefore become routine, they are influenced and formed by the individual's surrounding environment and cultural traditions. Through data collection methods and additional contextual observations (visits to local markets and the researcher living in Pirganj for seven weeks and being immersed in the cultural and environmental setting) foods which are commonly available and consumed were identified. The Bangladeshi diet is based on rice, which is the country's staple food and dominates their meal patterns. Rice is often consumed for breakfast, lunch and dinner; it is used as a vehicle for side dishes/foods and is an affordable way to reach satiety. The side foods include seasonal vegetables, lentils and less often, protein rich foods such as egg, fish, and meat. The side foods are either boiled or fried along with spices and aromatics to make either a *bhorta* or a *tor kari. Bhorta* is used to describe a side food which has been mashed. Foods such as potato, pumpkin or eggplant are boiled and mashed with chilli, onion and garlic to make *bhorta*. *Tor kari* is a generic term used for a curry base with vegetables. It can sometimes include egg, fish or meat when available in the household.

- "Potato and tomato mixed. This is another type of *tor kari* "(FG6).
- "We eat mixed cabbage and potato at lunch time. We call it *caffi* (cabbage) *tor kari* "(FG6).
- "[*Tor kari* is] when we cook with some vegetables, like cabbage, potato" (FG7).
- "I eat egg in *tor kari*" (FG6).
- "*If you eat fish and potato, what is this called? … Tor kari*" (FG8).

A staple meal including rice, *tor kari* and *bhorta* is shown in figure 4.8.

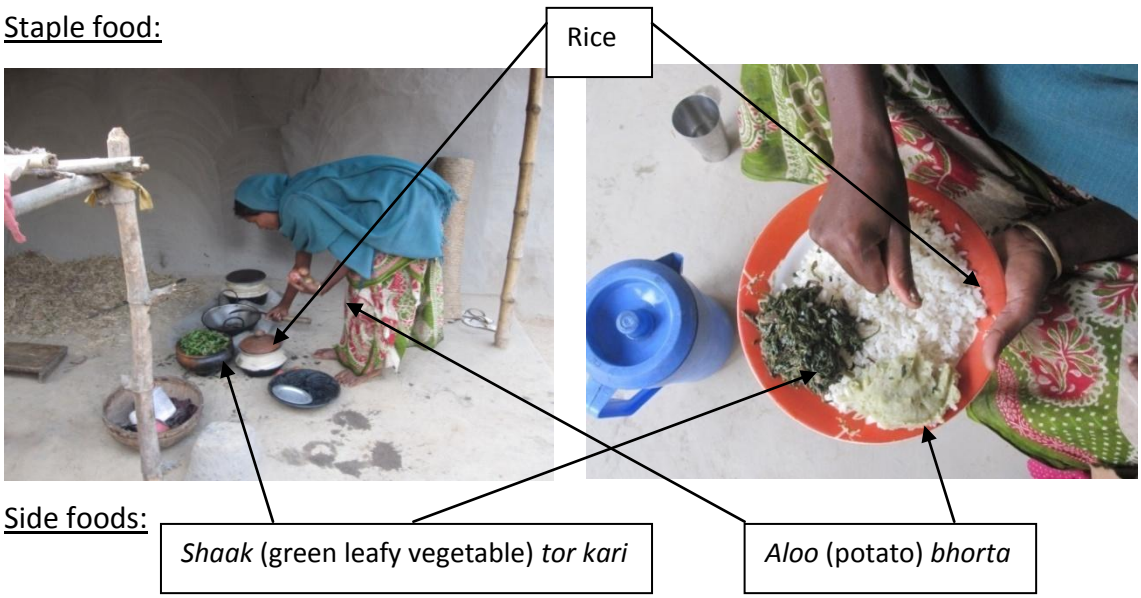

Figure 4.8 Staple meal in rural Pirganj communities (photo from breakfast photographic observation session with Adivasi woman)

The staple meal (or a variation thereof) is consumed for breakfast, lunch, and dinner due to reinforced habits and situation difficulties. It is common practice, especially in the Adivasi groups, to consume the same food at lunch time as what was cooked for breakfast. This is often due to the fact that the women have limited income and accessibility to obtain a more varied meal pattern, and they follow traditional methods of preparation and cooking which requires time consuming procedures.

- "At breakfast time I eat rice, pulse and boiled potato. I eat rice and *tor kari*, especially potato for lunch. For dinner I eat rice and *tor kari* and especially potato again" (FG3).
- "For breakfast I eat rice and vegetables which are dry fried in oil. I also eat rice and vegetables for lunch and for dinner" (FG3).

The variation of vegetables in the *tor kari* and *bhorta* are based on their seasonal availability. Therefore the same vegetables may be consumed for not just breakfast,

lunch, and dinner, but also for consecutive weeks. This habit is determined by the women's environmental situation and further limits their dietary diversity.

- "I eat food which is available in my house for breakfast" (FG6).
- "I eat potato during the potato season. I eat eggplant during its season" (FG6).
- "It depends on what season it is to which vegetables are available" (FG7).

Protein-rich animal foods (fish, egg and meat) are essential sources of micronutrients such as protein, iron, vitamin B12, zinc and iodine, in the women's diet. However, these foods are expensive and dependent on foodways, such as the household's economic status, seasonal income and geographical location. These foods are not consumed every day in poor rural areas and the frequency in which these foods were eaten varied between participants. Generally fish was consumed more frequently than meat as it is more affordable to the women (*also shown in the IDDQ results in figure 4.1*).

- "If fish is available in my house I will eat fish. Otherwise we just eat vegetables" (FG6).
- "I eat fish one day per week but for two meals" (FG3).
- "I only eat fish some days if we have bought it from the market" (FG1).
- "I eat meat once every three months" (FG7).
- "We are able to eat fish when we have work available. But in *Choitro* (March-April) and *Boishakh* (April-May) months there is no work available [and therefore cannot purchase fish]. If it is possible to go to the river, we can collect fish to eat from there" (FG2).

Popular breakfast dishes, consumed by approximately half the women, were *muri* (puffed rice) or *rice fry* (uncooked rice which is dry fired for a few minutes until it turns light brown) mixed with *gur* (molasses product). Pictures of *muri* and *rice fry* are shown below in figure 4.9.

Figure 4.9 Muri and Rice fry

There is no nutritional difference between eating *muri* and *rice fry* for breakfast or eating cooked rice for lunch. They are both the same food item but are prepared using different cooking methods; therefore, adding no variation or extra nutrients to the diet. *Muri* and *rice fry* are cheap, easily obtainable, requires little preparation and provides satiety, hence their popularity. During pregnancy several women had replaced eating *muri* and *rice fry* at breakfast with cooked rice and *tor kari* when it is available to them. When followed, this change is advantageous because the vegetables provide additional nutrients to the diet. Alternative carbohydrates such as bread eaten with *dhal* (lentils) or cakes and sweets were consumed by some women, therefore, increasing their dietary diversity and nutrient intake.

- "Most of the time I eat *muri* and sometimes I eat rice" (FG6).
- "Now I eat rice and vegetables at 8am, before I ate *rice fry*. I stopped eating *rice fry* because it is hard in my mouth and can be painful" (FG4).
- "[I eat] cakes or sweets but most of the time I eat bread" (FG4).

Most women ate breakfast at 7 to 10am, lunch around 12 to 2pm and dinner from 6 till 10pm each day. During pregnancy women should increase the amount of food they consume to meet their increased nutritional requirements (Imdad, et al., 2011; Williamson, 2006). Consuming at least three meals each day will help the women to maintain adequate nutritional intakes and have a healthy pregnancy outcome (Siega-Riz, Herrmann, Savitz, & Thorp, 2001). However, in this community not all women are able to consume three meals a day due to the poverty factors they face. Two women

reluctantly admitted that they only consume two meals a day. Due to living in rural areas and being faced with chronic poverty with a lack of income available to purchase foods, consuming only two meals a day becomes some women's habit which is formed well before pregnancy. Women become so accustomed to this habit that they are unwilling to eat more food during pregnancy, even if it were available.

- "My baby will be healthy if I eat three times a day" (FG3).
- "Most of the time I do not have lunch. Sometimes I have my breakfast late. Sometimes I eat breakfast at lunch time... Sometimes I eat lunch during dinner time. Almost every day I will skip one meal" (FG2).
- "I didn't eat anything at midday. We only eat in the evening and in the morning....When I was at my father's house we ate only two meals in a day and here it is also the same" (FG5).
- "[I do] not feel like eating more. I am unwilling to eat more" (FG2).

Approximately half the women (48%) ate *nasta* (snacks) during the day. The most common snacks were tea, biscuits, and *muri* mixed with *gur*. A few women (11%) only consumed fruit as a snack as it is not part of their habitual dietary pattern to eat fruits every day. "I eat a small amount of apples and oranges" (FG8).

Food preferences

Food preferences are formed through social experiences and determine food choices (D. Lee, 1957). Therefore, in the first section of the focus group schedule the women were asked about their most and least preferred foods. Involving all the women in this way helped increase the rapport within the focus group and started the process to explore the women's usual eating patterns. Interestingly the most favoured food was rice, which is the staple food in Bangladesh. Bangladeshi's have a very strong preference towards consuming rice which was demonstrated when asked "*What is your favourite food?",* one of the women immediately replied that, "All Bengalis like rice" (FG7). As rice is such an integral part of the women's culture and survival, it becomes favoured because of its symbolic status of prosperity and security (Shatenstein & Ghandrian, 1998). Additional preferred foods are presented below in

table 4.5 to show the range of most favourite foods within the group of women. The results are presented as a group response and the total number of focus groups, who listed the food as a favourite, is recorded in the far right column.

Table 4.5 Participants most preferred foods

	FG1 (n=5)	FG2 (n=6)	FG3 (n=4)	FG4 (n=6)	FG5 (n=4)	FG6 (n=6)	FG7 (n=6)	FG8 (n=6)	Total (n=43)
Rice	X	X	X	X			X		5
Egg		X			X	X	X		4
Vegetables	X	X		X					3
Pulse	X		X	X					3
Potato	X	X				X			3
Meat					X		X	X	3
Fish						X	X	X	3
Green leafy vegetables						X		X	2
Beef		X							1
Bean		X							1
Tomato		X							1
*Dudhbaht**		X							1
Bread				X					1
Muri				X					1
Chicken					X				1
Apple					X				1
Milk						X			1
*Gourd***								X	1
Milk Sweets								X	1

**Dudhbaht* is rice which is cooked in milk.

***Gourd* is a vegetable which is similar to pumpkin, cucumbers and melons. *Bottle gourd*, pictured below *(figure 4.10*), is available in the local market and commonly included in the women's diet.

Figure 4.10 Bottle gourd at local Pirganj Market

To understand the spectrum of food preferences, participants were also probed regarding foods they disliked to eat. A common saying in Bangladesh is, “Fish and rice make a Bengali” (Machh-e-bhat-e-Bengali), yet contradicting to this, fish was the most frequently disliked food mentioned in five out of eight focus groups. However, usually not all fish are disliked and it is dependent on the size or species of the fish, or the method used to obtain the fish. Specific fish which were liked included hilsha and silver cup fish. Hilsha is Bangladesh’s national fish and silver cup is a small fish bred in household ponds.

- ‘I dislike big fish … the big fish which we get from farm hatchery or we buy it from the market. But I like the fish which we catch from rivers, ponds and lakes” (FG5).

Table 4.6 is presented in the same format as table 4.5 to show the full range of foods which are disliked by the women.

Table 4.6 Participants least preferred foods

	FG1 (n=5)	FG2 (n=6)	FG3 (n=4)	FG4 (n=6)	FG5 (n=4)	FG6 (n=6)	FG7 (n=6)	FG8 (n=6)	Total (n=43)
Fish	X		X (small)	X (small)	X (big)		X		5
I like all foods	X			X	X	X			4
Potato		X		X		X		X	4
Eggplant	X	X						X	3
Pork	X			X					2
Beef		X		X					2
Green leafy vegetables		X			X				2
Duck			X	X					2
Pulse						X	X		2
Chicken		X (caged)							1
Green bean	X								1
Curd			X						1
Egg				X					1
Pumpkin							X		1
Sweets								X	1
Bread								X	1
Rice							X		1

Potato and eggplant were the most frequently disliked vegetables even though they are commonly consumed in the staple diet. Potato is the second largest contributor to carbohydrates (rice is the first) in the women's diet. The importance of potato as an affordable and easily accessible food overrides the women's preferences and is therefore still routinely consumed most days. Pork, which is forbidden to be consumed in the Muslim religion, was not listed as a disliked food by any of the Bengali groups. Perhaps this is because it is never eaten and not considered as a food choice at all. The sensory aspects of food influenced whether food was liked or disliked. Both foods described as boiled or dry were disliked as they may be less palatable.

- "Boiled vegetables. I dislike any boiled vegetables" (FG6).
- "I do not like *bhorta* ... because it is dry" (FG5).

Food changes during pregnancy

The majority of participants (88%) made some type of change to their usual food intake during pregnancy, with only five women from the total forty three participants stating that they did not make any changes to their diet. Most frequently changes were made with the intention of a healthier pregnancy outcome. There was consensus in the focus groups that women generally increased their intake of water as this is seen as beneficial during pregnancy to prevent illness.

- "Yes … Milk and eggs. I eat these more often than I did before" … "*Why?"* … "For my baby's nutrition" (FG1).
- "I eat more bananas and apples … So my baby will be nutritious" (FG7).
- "Our taste increase now so we take extra food ... We get energy from these foods ... We get energy and from us our baby also gets energy" (FG5).
- "I have increased the amount of water I drink … They will reduce the mothers' sickness while pregnant" (FG3).

Sensory cravings such as sour foods for taste and dry foods for texture impacted the women's food practices during pregnancy which led to an increase in consumption of these types of foods.

- "Because our taste increases now, so we take extra food" (FG5).

- “I increase dry foods, which I buy from the market. Like biscuits, *muri* and *chanachur* (bhuja/bombay mix)…..I eat *rice fry* …….I eat *piazu* (deep fried lentil mixture.) and *singara* (Bangladeshi samosa)” (FG2).
- “While I have been pregnant I have increased eating sour foods like *jujube (figure 4.11),* tamarind and olives ... I think these foods are tasty and I want to eat them ... I also add more sour foods” (FG2).

Figure 4.11 Jujube (Indian Baroi fruit)

All women had opinions about what should be added or increased in their diet for a healthy pregnancy outcome. While some women did change their diet by increasing or adding ‘healthy’ foods, most women could not make all of their desired changes due to confounding factors. Women are only able to consume foods which are available to them in their household as it is not their responsibility to go to the market and purchase the household food. Some women’s husbands do not bring home additional nutritious foods for them to eat during pregnancy either due to ignorance or poverty. This means that although women can identify and discuss healthy food practices during pregnancy, they are restricted in their choice of food as they are reliant on other members of the household to provide for them. If their husband has misconceptions or there is not enough money to purchase adequate or specific foods, the women’s nutrient intake will be compromised.

- “I did not eat as per my requirement. Today I only ate rice with lentils” (FG4).

- “No I don’t, because of the money crisis. At the moment we are in need of money and I cannot eat what I feel like when I want it” (FG2).
- “There is a lack of food available in my house” (FG8).
- “I have a large number of family members so I do not eat enough” (FG3).
- “I do not have enough money so I cannot purchase enough food from the market” (FG7).
- “We can either purchase rice, or we can purchase fruits” (FG8).
- “I should eat vegetables, milk and banana”....”*Do you eat these?”* ... “No I do not. I do not get it” ... “*Why don’t you get it?”* ... “My husband does not bring it from the market [because] we have lack of money” (FG8).

The principle of eating an increased amount and a greater variety of food during pregnancy was well accepted by the women. If the women had the capability to consume more food they indicated that they would like more sour foods like *jujube*, tamarind, and tomato and more ‘healthy’ foods like milk, banana, fish, eggs, and apple. Their preference for sour foods (*jujube*, tamarind, tomato) was due to mouth feel, reducing nausea and taste. Their preference to be able to consume more ‘healthy foods’ was because the women associated positive health outcomes for their baby with these foods.

- “*Are you willing to eat more food?” … “* Yes … I am willing but I am not capable” (FG7).
- “No, we desire to eat it but don’t eat it regularly but because of poverty we cannot buy it” (FG5).
- “It will feel good in my mouth during pregnancy and be tasty” (FG1).
- “I would like to drink more milk” (FG3).
- “I would like to eat more apples and bananas [because] my baby would be nourished” (FG7).

Summary

Women have habitual food patterns which are dictated by their level of poverty, cultural norms and food availability. The women’s habitual food patterns are based on

a traditional diet of rice and seasonal vegetables with the occasional protein source, offering minimal variation to their diet. Food preferences for healthy (milk, egg, fruits meat), sour, and dry foods during pregnancy influence the women's eating habits; yet practical realities exert a greater influence on their actual intake. During pregnancy the women desire to make healthy changes to their diet for a beneficial pregnancy outcome and the positive impact it will have on their baby's health and development. However, this is not always possible as the majority of these foods are relatively expensive and the women are dependent on what their husband chooses to harvest or purchases from the market. Therefore, the majority of the women's diets continue to be based on rice with little variation of other nutrient-rich food sources during pregnancy.

4.2.1.2 Cultural practices

Often cultural practices are so deeply engrained within a group that they are not easily recognised by oneself as habitual (Cassel, 1957). Several habits regarding practices which stem from family dynamics and religious traditions were however highlighted by the women and are presented below.

Roles and responsibilities

The habitual roles and responsibilities within a household were shown to influence what, when and where women are able to eat. It is traditionally the woman's role to stay at home and look after the children and attend to household responsibilities. Due to extreme poverty and to earn additional income, most Adivasi women (84%) worked outside of their house; usually as energy intensive rice labourers. It was however very uncommon for women in the Bengali group (5.6%) to work outside of their home. The extra work load of the Adivasi women throughout their pregnancy means that they would require additional food to meet their nutritional requirements.

All the Bengali women were of Muslim religion which has very strict beliefs about when, where and how women can go outside of their homes (Ahmad, 1984). As

related to the last section, this restriction in movement determines the women's habits and impacts what food is available in their house as they cannot easily gather, grow or purchase food. It is the male (usually the husband) family members' responsibility for choosing and purchasing food from the market and therefore they influence what food is available in the household and subsequently available to the women. Even though women desire to consume more fruits during pregnancy, as they are regarded as healthy, when asked why they do not eat more apples and oranges, the woman replied, "My husband does not bring them to my house" (FG8), or "Yes, sometimes I eat an apple, an orange or other fruit which my husband has bought for us" (FG5).

Order of eating

The difference in social status and the hierarchy of men and women in Bangladesh was evident when referring to the order of eating at meal times. Like many other cultures it is the habit of the woman to eat after all other family members have eaten. This often results in the woman not having enough food or being left with the least desirable or least nutritious food. For example women often have to eat the fish head with many small bones or eat last when there is a desirable food item, such as *payesh,* served. *Payesh* is a luxurious dessert dish eaten on special occasions in Pirganj. It is typically made from rice, cardamom, raisins, *gur* and milk and pictured below in figure 4.12.

Figure 4.12 Payesh

This practice affects the women's dietary intake and ultimately their nutritional status. When the women were asked to describe their eating situation, mixed reports were found. Most women indicated that their husband get priority at meal times since they were the main income providers for the family. However, there were inconsistencies in the women's responses. Several eating preferences for a variety of reasons were discussed and include the following practices;

Almost half of the participants (46%) responded that the men or their husbands will have first choice in terms of preference and portion size.

- "I should not eat before my husband" (FG8).
- "My husband earns the money. My husband eats lots and I eat smaller because my husband works so hard" (FG6).
- "If I do not give enough food to my husband he might get ill and then who will be able to look after me" (FG6).
- "My husband does the most work so he gets priority" (FG3).

Eighteen percent of the women's parents-in -aw ate first:

- "My father-in-law gets food priority because he is the most aged and does not have long to live" (FG3).
- "[My parents-in-law] get priority before me. If I do not serve them properly they may tell me off" (FG4).
- "I am afraid of getting a bad reputation with those who live near me [if I do not serve my mother-in-law first]" (FG7).

Fifteen percent said that their children were given the most nutritious food first:

- "My husband and father-in-law or mother-in-law tell me to give the good food to the children" … "*Why?*" … "For love … to increase their growth" (FG2).

Twelve percent said that they eat together and at the same time as a family:

- "I eat jointly at the table [but with separate bowls]" (FG7).
- "We eat equally" (FG1).
- "We all get equal as per need" (FG5).

What was not expected was that for approximately one third (33%) of the women, these practices changed during their pregnancy so that they were given priority at

meal times. This change occurred because other family members recognised the importance for the pregnant woman to increase her food intake to provide a healthy pregnancy outcome; indicating the inter-relation between cultural practices and knowledge.

- “Now I eat before them and I also get priority before my husband” (FG4).
- “Sometimes my husband tells me to eat first” (FG7).
- “My husband sometimes says to me ‘you should eat lots more’ ” (FG2).
- “All of my family like me and support me while I am pregnant so I eat first” (FG3).
- “My family members say that I need to make sure I eat more, and as a result my baby and I will be healthy” (FG4).

Nevertheless, this was not the practice followed by all and many women still continued to have last priority at meal times. The order of eating and whether or not this practice changed during pregnancy was different for each woman and dependant on individual circumstances, such as, food availability, household income, women’s social status, cultural customs and nutritional knowledge.

Family influence

In addition to influencing what food is available in the home and the order of meal consumption, family members largely influence eating habits and practices during pregnancy by providing advice and recommendations. Family members gave advice about the consumption of nutritious foods (milk, egg, fruit, banana, green leafy vegetables), the increased consumption of water, and the avoidance of unsafe or unhygienic foods (cold foods such as rice cooked on the previous day). This advice is in line with the usual practical recommendations given to women during their pregnancy to ensure a healthy delivery.

- “[My aunt] told me that I need to eat milk, eggs, and extra food during my pregnancy time” (FG5).
- “Yes, my mother in law told me [that] I should eat good food’ (FG4).
- “[My husband] told me that I should not eat cold rice (cooked previous day). He also said that I should drink more water and eat more vegetables” (FG6).

Women were also advised by family members to reduce the amount of physical labour they do during pregnancy. Reducing physically laborious tasks is a way to protect the woman from hurting herself and her baby during pregnancy, and is a method to conserve energy which should be prioritised towards the baby's growth. This advice contradicts the actual practice in the Adivasi groups as they may be told not to do hard work, however, they are still expected by their family to work in the fields up until the end of their pregnancy and earn additional wages.

- "My father in law said that I should not push the tube well pump too many times *(figure 4.13*). He also said that I should reduce the amount of cloth washing I do" (FG4).

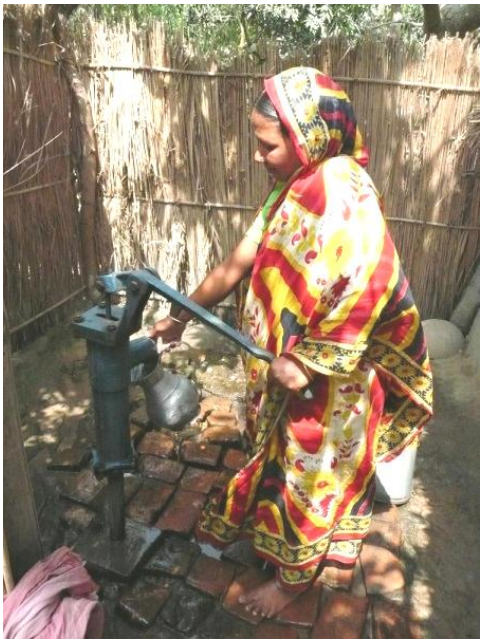

Figure 4.13 Pregnant woman using tube well.

Summary

Societies become accustomed to traditional practices, established family dynamics and the women's status in society, which influence how women can interact within their communities. Pregnant women's eating habits and food knowledge are determined by these interactions and are strongly built into their practices. The women's status within the family is evidently much lower than male members. Women lack decision making power and experience discriminatory food allocations which restrict their

access and utilisation of healthy practices during pregnancy. It requires the support of family and community members to understand and provide adequate nutrition during the woman's pregnancy. Therefore, the incorporation of husbands and key household figures in education and behaviours change messages will continue to close the uneven gap between women and men.

4.2.1.3 Health practices

Health care providers' advice

In addition to family members having an influence on eating practices, village doctors, TBA's and BRAC (Bangladesh Rural Advancement Committee) health workers are all highly regarded by the pregnant women and their communities. Women received practical advice from both village doctors (traditional healers) and qualified practitioners about how to keep themselves healthy during pregnancy. One woman said her doctor told her to drink more water if she felt hungry, perhaps as a mechanism to deal with hunger when not enough food was available.

- "They told me that I should eat more milk and eggs … [to] … fill up and improve my babies nutritional status" (FG3).
- "The doctor told me that if I eat vegetables, fish, meat, and fruits, then both me and my baby will get power, energy, and have good health." (FG5).

Village doctors and television advertisements advised women to always purchase packaged salt (iodised) and not 'open salt' (non-iodised), otherwise it is believed to cause blindness. This in itself is incorrect and women are receiving misinformation as it is a deficiency in vitamin A, not iodine, which causes blindness. During the photographic participant observation, women were asked to show what salt they were using in their households. Most were using open salt (non-iodised) in their cooking as this salt is less costly and therefore a more influential factor in the formation of this habit. Below in figure 4.14 is a photograph of a pregnant women mixing open salt (in brown jug, bottom left corner) into chillies in preparation for making potato *bhorta*.

Figure 4.14. Open (non-iodised) salt

Many BRAC clinics are operating in the Pirganj upazila and have a good reputation among the communities. BRAC volunteers advise the women to increase their intake of healthy foods such as, egg, milk, meat, and fruit; to drink more water; attend monthly health check-ups; to take iron and calcium tablets and to receive tetanus immunization during pregnancy. Similar messages about healthy eating during pregnancy were reported to come from other local organisations such as Union Health Clinics, Smiling Sun Clinics, and Christian Commission for Development in Bangladesh and World Vision.

- "The BRAC volunteer told me to increase my water intake" (FG2).
- "[BRAC] told me that I should eat more milk and eggs" … "Why?" … "To fill up and improve my babies nutritional status" (FG3).
- "[The BRAC volunteers] take care of me. Sometimes they measure my blood pressure" (FG8).
- "[Your] blood pressure is low so [you] should eat more vegetables, milk and banana so that [your] blood pressure will return to normal" (FG8).

Supplement consumption

Women received iron, calcium and vitamin tablets from their local health clinic or a BRAC volunteer. The BRAC volunteers help increase the women's compliance rate of taking supplements by visiting the women in their houses once a month and giving them the tablets for free or at a reduced price during their pregnancy. Iron was the most commonly consumed supplement with women having a general understanding that consuming iron during pregnancy is important for their blood; however, common misconceptions are demonstrated below:

- "[Iron] will fill up our blood and it will clean our blood" (FG3).
- "The iron tablet will increase my blood and vitamins will keep her body well" (FG2).
- "[Iron] will keep my eyesight good, especially at night time" (FG3).
- "[Vitamins] protects us from disease and iron tablets cleans our blood" (FG5).

Calcium tablets were correctly identified in strengthening bones but there was less consistency in how many women routinely took both calcium and vitamin tablets.

- "If I take calcium tablets my finger bones will stay strong and I will not get cramp in my legs" (FG3).
- "I will not get sore fingers if I take calcium" (FG3).

Women who follow the BRAC volunteers' advice and take supplements during pregnancy will enhance their intake of some essential micronutrients and decreases the risk of a poor pregnancy outcome; it is however unclear exactly how many women regularly practice this advice.

Physiological effects of pregnancy

In addition to poverty and cultural factors which negatively impact the diet during pregnancy, the women experienced the typical physiological effects of pregnancy. In the 'food practices' theme above (*section 4.2.1.1*), it was stated that women experienced food cravings. Women increased their consumption of sour and dry foods for their enjoyment of taste and to relieve nausea; which are both physiological effects that increase the amount or type of foods a woman consumes. Most other physiological effects are detrimental to the woman by causing changes to her habits

and further limiting her food intake during varying stages of pregnancy. The loss of appetite which is caused by the strong smell of food and women feeling nauseous was a common physiological response during pregnancy. This response was so strong that some women even omitted the staple food rice from their diet, which is relatively bland. Other foods that caused nausea included fish and green leafy vegetables, mostly due to their strong aroma during preparation.

- “I do not eat anything in the first three months [of pregnancy]” (FG1).
- “When I do not feel like eating food, I dislike all food, even rice” (FG8).
- “I could not eat in early pregnancy because I do not feel like it. I did not like the smell of rice” (FG2).
- “The smell of food makes me feel sick” (FG1).

Other symptoms experienced during pregnancy included heartburn, physical discomfort which restricts movement, and mouth ulcers which further limited the women’s consumption of foods.

- “I do not eat enough because of vomiting problems” (FG5).
- “I do not eat enough every day because I am suffering from ulcers in my mouth” (FG1).
- “If I eat a lot of food I cannot move easily. Sometimes it gives me stomach acidity” (FG6).
- “Sometimes [food] gives me stomach acidity ... [but] I do not take the tablet. For this reason I eat a low amount” (FG6).

These undesirable effects of pregnancy resulted in some women not wanting to increase the amount of food they consume during pregnancy

- “If I eat a lot of food I cannot move easily” (FG7).
- “I cannot stand up easily, so I only eat a low amount” (FG6).
- ”We will feel uneasy and in pain if we eat too much” (FG2).

Some of these physiological effects, such as ulcers, may be caused by the women’s poor nutrient variety and diets lacking in important nutrients. This creates a cycle of limited intakes of nutritious food, which further worsens the women’s malnutrition risk.

Summary

Women acknowledge and respect the advice they receive from doctors, TBA's and BRAC volunteers and thus these individuals influence what health practices women follow during pregnancy. It must therefore be ensured that the advice they give is accurate and technically based. Due to their advice the women's knowledge is increased which may change their habits and influences their practices. The physiological effects of pregnancy that are universally experienced by all women can negatively impact the women's eating habits during this period, regardless of the knowledge of or the availability of nutritious food they may have. Women should be encouraged and supported to increase their consumption of foods they enjoy eating and foods which counteract physiological effects (e.g. sour and dry foods). Women will therefore be more likely to meet their energy requirements, while micronutrient intakes can be optimised by an accessible and well monitored supplement scheme based on international recommendations.

4.2.2 Beliefs

A belief is a physiological state in which an individual confidently believes something to be true regardless of supporting or opposing evidence. Beliefs are formed from our individual interpretations of values and basic cognitive attitudes. For example, the belief that eating liver or drinking red wine is 'good for the blood' (Parraga, 1990). Traditional taboos and superstitions are beliefs which form depending on an individual's preconditioned cultural setting. Beliefs and knowledge are inter-related, as beliefs that are true are knowledge, and defined as a 'justified true belief'. Meaning in order for something to be true, an individual must believe that it is true as well as having justification (Gettier, 1963). However, learning new knowledge can influence an individual's beliefs, values and attitudes. Beliefs, and taboos even more so than habits, are major barriers to change and significantly affect behaviours and practices (D. Lee, 1957; Meyer-Rochow, 2009).

4.2.2.1 Food practices

Food knowledge

Knowledge and beliefs about nutritious foods will impact food consumption practices during pregnancy. Therefore a question early on in the focus group schedule was aimed at understanding the participants' knowledge level about what foods are believed to be healthy during pregnancy. When asked what a balanced and healthy diet is, the women were able to list general food items but were lacking the understanding about food groupings, their related nutrient details and their importance in the pregnant woman's diet, indicating that their knowledge and understanding in this area is limited. The participants' knowledge about specific nutrients and their food sources was minimal, and often inaccurate.

- "Leafy vegetables, papaya, mango, jackfruit, fish, milk, beef, chicken meat, egg, nuts, these are balanced foods" (FG2).
- "We get protein from fish, meat, and eggs" (FG5).
- "*Do you know what protein foods are*?" … "No we don't" (FG3).
- "Banana has iron; rice, bread, egg, and fish have protein" (FG7).

The most frequently mentioned 'healthy' food was vegetables, followed by milk and fish. This signifies the importance of these foods in the diet during pregnancy, however, due to their lack in specific nutritional knowledge, a very generic list of foods was produced. The full list of foods is displayed in table 4.7 below. Individual answers are presented as a group response and the total number of focus groups that listed the food as a favourite is recorded in the far right column.

Table 4.7 Participants perceptions of healthy foods

	FG1 (n=5)	FG2 (n=6)	FG3 (n=4)	FG4 (n=6)	FG5 (n=4)	FG6 (n=6)	FG7 (n=6)	FG8 (n=6)	Total (n=43)
Vegetables	X	X	X	X (yellow)	X	X	X	X	8
Milk		X	X	X		X	X	X	6
Fish			X	X	X	X	X	X	6
Fruit		X (yellow)	X		X		X (yellow)	X	5
Meat		X		X	X	X		X	5
Egg		X			X	X	X	X	5
Rice						X	X		2
Legumes				X					1
Nuts		X							1
Bread							X		1

Although rice is a preferred food and a significant part of the Bangladeshi diet, it was not perceived to hold strong health benefits as it was only mentioned by two groups. Several focus groups associated the colour of foods with specific nutritional qualities. The most common association was the relationship between yellow coloured foods and vitamin A (reduces night blindness), however the foods which were listed were often incorrect (cabbage, banana and orange) and indicates their lack of knowledge.

- "Yellow fruits like jackfruit, cabbage and pumpkin [are healthy]" (FG7).
- "....banana, papaya, jackfruit and orange … [these] yellow fruits can reduce diseases in the mother and baby"... "*What type of disease?*" ... "Reduced eye sight at night" (FG4).

Women were able to list food items which they believed would have a positive health effect on their baby once it was born. Foods which they thought to be especially good for their growing baby were milk, egg, fruit, meat, fish, vegetables, water, Horlicks (malt flavoured supplement drink), and Dano (brand name of a common milk powder). A variety of reasons about why pregnant women should consume these healthy foods were discussed. The most important aspects mentioned were related to general health and wellbeing, cognitive development, and growth. Some of the responses highlighting these were:

- To give their baby energy and strength:

"My baby will have power, energy and have good health" (FG5).

- To improve the intelligence of their baby:

  "The baby's brain will be well and will always work the right way" (FG1).

- Their baby will have optimal growth:

  "If the mother eats fruit while pregnant, then her baby will be fat which is good" (FG2).

  "The baby will be the perfect weight when it is born. The baby's weight will increase day by day" (FG2).

Relationship between mother and baby

The relationship between what a woman consumes and the health status of her baby was a commonly known belief. Their knowledge on this issue was more thorough than their knowledge about food sources of specific nutrients. Women knew that while in the womb, their baby receives food through their blood; this is correct as there are arteries which run through the umbilical cord. The relationship between what the mother consumes and the positive health outcomes for her baby was frequently discussed and well understood.

- "If I eat, baby will eat from me" (FG4).
- "When a mother eats her baby will feel well and a nutritious baby will be born" (FG2).
- "The food which I eat reaches my baby through my blood" (FG7).

If they did not consume nutritious foods, the consequences were also well-understood:

- "If I do not eat nutritious food my baby can have a lot of problems. It can easily have a cold once it is born and it can start to develop jaundice while I am still pregnant. If I eat nutritious foods these diseases will not happen" (FG6).
- "Baby cannot walk or sit. Maybe reduced eye sight. Baby will not get enough strength in her hands or legs" (FG4).

It is important for women to increase the amount of food they consume during pregnancy not just to feed themselves and their baby, but to also lay down nutrients

and fat stores. The women correctly identified that these additional stores in the body ensured that they will produce sufficient breast milk to feed their baby once it is born:

- "[Nutritious food] can increase my breastfeeding ability, so that my baby will get enough food from me" (FG2).
- "If you eat enough food now, then your child will get enough breast milk" (FG5).

Food taboos

In addition to generally increasing healthy foods in their diet, choosing foods necessary for physiological reasons, or based on nutritional knowledge, dietary changes also occurred because of specific beliefs, taboos and superstitions about what a pregnant woman can and cannot eat. Several focus groups discussed specific food items which may have negative effects on their baby if consumed during pregnancy. These include a variety of beliefs that link specific foods to harming the baby, for example, eating chicks can cause the baby to be born with pneumonia; pineapple and green papaya can cause an abortion; pineapple mixed with milk is poisonous and can causes death; cucumber or cow's intestine can cause the baby to be born with '*fhata*' (most likely itchytosis); and consuming food which had gone cold after cooking can result in reduced cognitive ability in the baby. Some of these beliefs were believed by all the women (e.g. cold food is harmful), whilst some of these beliefs were not (e.g. chickens and pneumonia), and others were practiced by only the Bengali women (e.g. pineapple and green papaya causes abortion).

- "If a pregnant mother eats a small chicken while pregnant, her baby may suffer from *Hapani* (pneumonia)" (FG3).
- "Eating pineapple or green papaya can cause an abortion" (FG7).
- "Pineapple mixed with milk can be poisonous and people might die" (FG7).
- "If we eat cold food during pregnancy our baby will feel the cold. The baby will suffer from head disease" (FG1).

High poverty and childhood malnutrition rates in the Pirganj area indicate that families cannot easily afford to provide for and take care of a small baby. Therefore having twins means caring for two babies at once, which would further worsen the family

situation. Having twins is thus not a favourable event and results in taking steps to avoid it happening, such as the avoidance of eating double bananas during pregnancy which was believed to reduce the likelihood of having twins.

- "Village people say that we should not eat joint banana, or maybe baby will be double" (FG7).
- "If we eat joint banana, we may deliver two babies" (FG8).

Many taboos are based on preconditioned beliefs as many women practised the taboos without an understanding of the reasoning behind it, but followed the advice from their families and previous generations. The belief about cucumbers causing the baby to be born with cracked skin (*'fhata'*) was only mentioned by one woman. She continued to say that she does not follow this advice because cucumbers are a good source of nutrients; demonstrating that taboos and superstitions do not always lead to practice (Parraga, 1990).

- "I should not eat cow's intestine. It might make the skin on my baby's body cracked" (FG8).
- "Cucumber has a lot of nutrients and it is a green fruit. If I eat it, I will benefit from it" (FG7).

Below is a photograph of cucumbers available at the local Pirganj market. Their appearance is dry and cracked which could indicate where the belief stems from (*figure 4.15).*

Figure 4.15 Cucumbers with cracked skin resembling 'fhata'

It is commonly believed by the women that consuming healthy foods such as fruits, milk, vegetables, fish, and banana will improve the appearance of their baby when it is born. Light coloured skin on the baby's face is particularly important to the women. This most likely originates from social hierarchy and the belief that the wealthy work indoors while the poor work outdoors in the sun, darkening the colour of their skin.

- *"Do you know any specific foods which can help your baby be beautiful? Like beautiful skin or face?....*Coconut water and banana" (FG7).
- "[If I eat] apple, orange, pumpkin, milk, egg, *gourd*, vegetables, and small fish … the baby will have a long, beautiful face with good structure and beautiful skin. It will have light skin" (FG2).
- "Yes, if mother drinks more milk then maybe her baby will be nice. Like nice light skin" (FG6).

In contrast, consuming certain foods was also believed to cause an undesirable skin tone. Consuming foods such as *rice fry*, *khoi (*dry fried paddy (unprocessed rice*))*, *muri* and arum leaf (green leafy vegetable) during pregnancy, was believed to cause their babies' skin to become black or dirty. The belief that these three foods, which are all products of rice (*rice fry, khoi* and *muri*), will cause the baby to have an undesirable skin tone is fortunately not harmful to the woman. These three foods do not increase the woman's dietary diversity and therefore add very little additional nutrients to the diet.

- "I do not eat *rice fry*, *khoi* and *muri*" … "*Why*" … "It might make my babies skin dirty" (FG8).
- "If I eat arum leaf my baby can have darker coloured skin" (FG2).

All women indicated that they still however eat these foods in their habitual diet during pregnancy because they are available and cheap. Some women disagreed with the belief that certain foods can influence the colour of their babies' skin and indicated that it is dependent on the genetics of the baby's mother and father.

- "I don't know anything more. If the mother and father are well, their baby will also be well" (FG2).
- "If the father is black, then the baby will be black" (FG5).

There are certain beliefs and practices which women follow in terms of preparing for and having a good delivery. All women agreed that having 'healthy foods' such as milk, egg, and fruits during pregnancy will give the mother strength for delivery; often a time associated with fear. Several women said that increasing the amount of water they drink during pregnancy, especially in the last three months, will make the delivery easy because they believe that their baby lives in water (amniotic fluid). Another common belief was that consuming hot (temperature) foods, especially hot milk, can speed up the delivery, make it easy, and reduce the pain, as these foods help expel the baby from the womb. *Bashi* foods (cold foods cooked on the previous day), cold water or duck eggs can make the delivery difficult and can be harmful to the mother and baby. *Batul* foods which were listed as beef, fish, and mutton should be avoided after delivery to prevent the baby from becoming sick. Most of these beliefs were not described in all focus groups and often caused disagreement within the groups (e.g. duck egg).

- 'If I eat these foods there will be no problem during my delivery time" (FG8).
- "During the delivery period, the mother might die because lack of strength, so to prevent this we eat more" (FG4).
- "After delivery mothers should not eat beef, shrimp, fish, and mutton" (FG7).
- "After delivery we should not eat fish because it might make my baby ill" (FG8).

A summary of beliefs about what women can or cannot consume during pregnancy is presented below in table 4.8.

Table 4.8 Summary of food beliefs during pregnancy

Belief/taboo	**Believed effect**
Do not eat chicks	The baby may be born with pneumonia
Do not eat pineapple or raw papaya	Pregnant woman may have an abortion
Do not eat pineapple mixed with milk	Mixture is believed to poisonous and may kill the mother and baby
Do not eat cucumber or cows intestine	Baby might be born with itchytosis
Do not eat food once it has gone cold (temperature)	Can lower the babies cognitive function
Do not eat joint bananas	Woman may give birth to twins
Eat healthy foods such as milk, egg, and fruit	Baby may be born with beautiful light coloured skin
Do not eat *rice fry*, *khoi* or *muri*	Baby may be born with dark, dirty skin
Increase water intake and drink hot milk	Delivery may be quick and easy
Do not eat foods cooked on the previous day or duck eggs	Delivery might be difficult
Do not eat '*batul*' foods (beef, fish, mutton) after delivery	Baby may become sick

As in other resource poor countries, a common food misconception amongst the women was that by consuming less food during pregnancy their baby will be small and the delivery will be quick and trouble-free. They further believed that if women have small bellies during pregnancy, they will be able to continue to work during their pregnancy which is often essential for their families' livelihood. This belief may however justify the women's food insecurity status which is an underlying factor causing limited consumption during pregnancy. Women are able to keep their bellies small during pregnancy by only eating rice and no nutritious foods.

- "Birth will be easy … Mother will not feel any pain if baby is small" (FG5).
- "Small bellies are good because then the mother can move and work easily" (FG6).
- "If we do not eat nutritious food, our baby will not be large and also our belly will be small. If baby is a large size, our belly will also be a large size" (FG4).

In contrast, women also believed that if they eat too much food during pregnancy their stomach will be too large and their baby will be unable to grow.

- “If stomach is empty, then baby can grow large” (FG7).

Although these were the women’s beliefs, most women recognised that a small baby is indicative of poor nutrition and consequently an unhealthy baby. The majority of women agreed that a big belly is the best because a healthy baby is the most important outcome of pregnancy. Only one woman out of all 43 participants said that a small belly is still the best practice.

- “Baby will be small and born with low nutrition” (FG6).
- “If baby is small, baby will be ill” (FG4).
- “Yes big belly is the best because my baby will be born healthy” (FG6).

As well as taboos and superstitions surrounding what women can and cannot consume during pregnancy, beliefs about food preparation have a strong influence on the women’s food practices. The most common taboo which was discussed in all focus groups was that women cannot cut food during an eclipse as this may result in their baby being born with a cleft lip. The origin of this taboo was not able to be identified, however the women followed it as this was what previous generations also did.

- “I don’t know, but my father-in-law and mother-in-law informed me that I should maintain this rule” (FG1).
- “I don’t know but previous generations also maintained this rule, so for this reason we also maintain it” (FG1).

Other taboos and superstitions concerning food preparation and other behaviours during pregnancy which were not as frequently discussed are listed below in table 4.9.

Table 4.9 Food preparation and other beliefs during pregnancy

Belief/taboo	**Believed effect**	**Quote**	**Focus group number**
Do not cut anything during eclipse	It is believed that the baby can be born with a cleft lip / palate, or deformed hands, lips, ears, legs or nose.	"There is a tradition that during pregnancy we do not cut off anything ... because we think that if we cut something then there is a possibility to cut off our baby's lips, legs, hands, ears or fingers."	FG 1, 2, 3, 4, 5, 6, 7, 8
Do not break an egg shells during pregnancy	Believed that the amniotic sac may break early and splash the birth attendant in their face.	"If I break an egg during pregnancy period my water bag will break early and forcefully splash in my midwife's or TBA's mouth."	FG 2, 4
Do not fry *tel pitha**	Frying *tel pitha* during pregnancy can cause the baby to be born with large ears.	"We should not fry *tel pitha* during pregnancy. If we do fry it, our baby's ears will be large size."	FG 4
Do not make a new fire stove**	Believed that the baby might be born with '*guti guti*'***.	"We should, not make a fire stove … the baby might have *guti guti*."	FG 4
Do not cut beetle nut****	Baby may have deformed and misshaped ears.	"Do not cut beetle nut ... maybe the baby will have cut ears."	FG 4
Do not bend or tie anything around wrist or belly	Believed that the women's umbilical cord can wrap around the babies neck and cause an abortion.	"[My mother-in-law] advised me not to bend or tie anything surrounding my wrist or belly ... because if we do it, there is a possibility to tie the umbilical cord around my babies' throat."	FG 5
Do not clean or touch the fire stove	Baby could be born with a vascular birthmark.	"Do not touch or clean the hot stove or burn fire wood or there is the possibility of birthmarks, which is harmful for baby."	FG 5
Do not break fire wood	Baby might be born with deformed arms or legs.	"Do not break wood ... or babies' hands or legs may be broken."	FG 7

(Table continues)

Belief/taboo	Believed effect	Quote	Focus group number
Size of instrument used to clean cooking utensils determines the size of the placenta	Using a large cleaning utensil will result in a large placenta, and a small utensil will result in a small placenta.	"If the instrument used to wash and clean cooking utensils is large, then the mother's placenta will also be large. If it is small, then the size of the mother's placenta will be small."	FG 5
Women must not walk around and especially not walk from one room to another while eating food	Delivery might be painful and can result in shoulder dystocia of the baby.	'If we are pregnant, we should not move out of the room while we are eating. We should stay where we are until we finish eating because if the mother is moving while eating the baby and mother will feel pain during birth."	FG 5
Do not repair any (rat) holes in the walls of your house	Believed that the delivery might be difficult.	"Do not fill in rat holes ... or it will be hard for the woman during delivery time."	FG 4

**Tel pitha* is a fried sweet bread, similar to doughnuts. Pictured below in figure 4.16

**Fire stove is the earthen stove the women use to cook on. Pictured below in figure 4.16

***Described as bumpy skin such as a rash.

****Beetle nut is commonly chewed, wrapped in beetle leaf

Figure 4.16 Tel pitha and woman prepping fire stove before using it to cook dinner

Summary

Women have basic nutrition knowledge, however, the correct knowledge they do have does not often lead to beneficial practices due to inter-related underlying restrictions such as a lack of money. Food beliefs and taboos are often collective within communities, but there are variations between individuals due to differing circumstances (e.g. religion, ethnicity, knowledge level, family influence). Dominant beliefs (e.g. not cutting food during an eclipse) are shown to dictate what foods the women are able to consume and influence their eating behaviours. Many taboos and superstitions are well known in the community; however, it is not known how closely they are followed and practiced. By understanding the women's beliefs in relation to food availability, their knowledge can be expanded to include a more diverse range of nutritious foods that do not pose a conflict to the currently practiced taboos.

4.2.2.2 Cultural practices

Religion

The religious aspects of the Bangladeshi culture are highly regarded and deeply rooted in the culture of the community; with religious beliefs and customs influencing many aspects of the women's eating habits. As expected, the women from the Bengali groups did not consume pork meat and the Hindu women from the Adivasi groups did not consume beef. These two food avoidances are widely practiced all throughout Muslim and Hindu cultures throughout the world (Ahmad, 1984; Kocturk, 2002).

Religious festivals are commonly linked with foods and therefore determine what people can and cannot consume during these periods. One woman belonging to the Hindu religion said that Hindus do not eat protein food sources (fish, meat, and eggs) during *Ekadashi* which is an *upavas* (fasting) period occurring once or twice a month (dependant on the lunar calendar). Another Hindu woman said she does not eat any rice or protein foods, only bread and vegetables during *Ekadashi*. Those belonging to the Muslim religion do not eat during the day time while they are observing *Ramadan*; the month before the celebration of *Eid ul-Fitr.* Women who are Christian only consume two meals each day and do not eat any fish or meat on Wednesdays or

Fridays during the month of 'Easter Sunday' (Bangladeshi month of *Chaitro* (March-April)). Religion is a very strong part of both the Adivasi and the Bengali cultures; however, the corresponding food restrictions can place added stress on the woman during pregnancy.

When the women were asked if they still maintained these rules during their pregnancy the responses were mixed; with most saying they did not. Only two participants, both from the Bengali groups said that they had maintained *roja* (fasting) during their pregnancy. Maintaining *roja* throughout *Ramadan* is not a healthy practice to observe during pregnancy as women should be increasing, not restricting, the amount of food they consume. Abstaining from food during the day time can cause further decreases in nutrient intake and women can become ill.

- "I know [the rules], but I do not maintain any rule during pregnancy" (FG3).
- "No, we do not follow these rules during pregnancy period" (FG4).
- "Yes I maintained *roja* when my last child was in my belly" (FG8).
- "I maintained *roja* for one day out of thirty days … [I stopped *roja*] because it made me ill and vomit" (FG6)

***Shaad* ceremony**

Women believed that because they do not consume nutritious foods throughout their pregnancy, they must therefore be provided with a '*shaad*' ceremony during the seventh month of pregnancy. A '*shaad*' ceremony is when the pregnant woman's parents provide her with multiple foods and a new sari or dress.

- "Yes I have eaten *shaad*. I ate meat, fish, fruit, and seven types of sweets" (FG5).
- "A big sized banana leaf is cleaned and placed on the ground. There was some rice, *khir* (boiled milk and sugar product) *khoi*, *muri*, milk, banana, and also some fruits from the market on the banana leaf. Then two or three people eat it together with the pregnant woman" (FG8).

The '*shaad*' ceremony has a powerful significance to the women and if it is not completed, both the mother and her baby are believed to suffer.

- "If the pregnant woman does not eat *shaad* then maybe her child will have *nahla* (dribbling)" (FG8).
- "[Completing the *shaad* ceremony will] protect the woman from death during her delivery" (FG8).

Beliefs to become pregnant

Like many cultures women had their own beliefs concerning females who cannot conceive (*baja)* and what they can do to become pregnant. The *baja* women can visit a spiritual place such as a church, temple or a mosque to improve the connection with their god when praying for a baby. Some women also believed that they could sacrifice an animal's life in return for their child's life; which was referred to as *'manoth'.*

- "Some people go to a temple or mosque to receive a blessing from God or the woman might offer a special prayer for getting a baby" (FG5).
- "I sacrificed a goat for god so that he would give me a baby" (FG2).
- "At church or a temple I would say "if you give me a baby, I will give a goat or another commitment"" (FG3).

Women said that *baja* females can receive *Ayurbedic* medicines from their village doctor to help them conceive. Such as, drinking *kobiraj* (blessed water) or splashing blessed water on the woman's face (*jhar fuk*). *Kobiraj* and *jhar fuk* are also used by the TBAs during delivery to help remove pain and make the delivery quick and easy. Women were unsure what Auyrebedic medicine was but would still take it because this is what their doctor advised. They could not describe any particular foods or food groups which may be consumed to increase the chances of becoming pregnant. One focus group discussed the practice of '*ghor bondhok*' where a "needle and hook are wrapped in paper and buried in the four corners of my house" (FGD6). Women trying to conceive can also wear '*tabis*' (small silver containers filled with symbolic items such as soil, leaves or papers).

Summary

Beliefs are entangled throughout the women's cultural practices and often stem from religious and traditional customs. Religious practices dictate what, when and where women can consume certain food items. Sound judgment, influenced by knowledge, has been shown to override these practices when they may cause harm to the pregnant woman and her baby such as not following the practice of fasting during *Ramadan* if pregnant. The cultural practice of '*shaad*' which intends to prepare a woman for delivery are resistant to change as delivery is often a feared experience due to high death rates in poor rural settings such as Pirganj.

4.2.2.3 Health practices

In addition to health care practices which have been mentioned in previous sections (e.g. yellow foods, supplements, *Auyrbedic* medicine); women strongly believe that they should not take any medicines or injections during their pregnancy without their doctor's advice. If they do this, their baby could be born with deformities.

- "We should not take any medicine without a doctor's advice" (FG7).
- "Yes, if I take a power tablet it can have a bad effect on my baby … their hands or legs might be abnormal" (FG6)
- "Pain killer medicines. If I hurt myself and take medicine without my doctors' advice it may harm my baby" (FG4).

Although this advice is mostly practical, the doctor's information can sometimes be wrong and therefore detrimental. Women said they did not take deworming tablets during pregnancy as their doctor told them it can cause them to have an abortion. This advice is concerning as parasitic worms are common causes of anaemia and therefore exacerbate the problem of iron deficiency anaemia and the concurrent malnutrition consequences within the pregnant women. This demonstrates the doctor's great influence within the communities as anything a doctor says is believed to be the truth.

Summary

Village doctors provide an important opportunity and resource of delivering nutrition and health care knowledge to the women during their pregnancy. Advice from doctors

is valued by the women and within the communities. It is essential that doctors support women during their pregnancy and are delivering well informed advice so that behaviour change is not undermined.

CHAPTER FIVE: DISCUSSION

The dual scourge of hunger and malnutrition will be truly vanquished not only when granaries are full, but also when people's basic health needs are met and women are given their rightful role in societies. –Gro Harlem Brundtland (former Director General of the World Health Organisation)

5.1 Statement of findings

The findings from this study set in Pirganj, Bangladesh, show that during pregnancy women have low dietary diversity (5.9) and food variety score (7.2) due to their diets being very monotonous, with the majority of meals based on rice. Their diets are particularly low in variety in animal foods and fruits. Most women are able to harvest some type of crop throughout the year; however, the majority of this was rice, as limited nutrient dense foods are grown. Women have very basic nutritional knowledge, but they have the desire to make positive changes to their eating habits and practices during pregnancy. Due to underlying factors such as social status, household role, insufficient money, religion, and cultural restrictions, this is often not possible. Women belonging to the Adivasi group were less likely to attend school and were faced with more dietary limitations compared with women in the Bengali group. Dietary taboos and food aversions exist within both cultures, but many are specific among ethnicities and individuals.

This chapter will begin with a description of the participants and their household characteristics. Following this, the discussion will be structured according to main topics which address the four research objectives stated in chapter one *(section 1.5).*

5.2 Participant and household characteristics

The nine villages included in this study are located within the four unions of Pirganj upazila that World Vision is currently working in; namely, Pirganj, Chartra, Bara Alampur and Tukuria unions. Each union has a main hub providing access to local food

markets, businesses (i.e. small restaurants, mechanics, saw mills), and schools. Villages are made up of household clusters throughout the village geographical area and are predominantly surrounded by rice fields. Households have no electricity, consist of one or two earth rooms around a communal courtyard/cooking area, and typically house the pregnant woman, her husband, children and parents-in-law. Pictured below in figure 5.1 is the main road in Chatra village (left) and the courtyard/cooking area in a typical village home (right).

Figure 5.1 Main road in Chatra village (left) and the courtyard/cooking area in a typical village home (right).

The percentage of women who have been to school is lower in this study population (65%) compared with the national average (72.3%) (National Institute of Population Research and Training, 2011). However, it is higher than what the last Bangladesh Bureau of Statistics survey recorded for the Pirganj upazila (39%) (Bangladesh Bureau of Statistics, 2001). The major employment opportunity in Pirganj is agricultural wage labour; especially for those who are ultra-poor and own limited assets. In this study, most of the women surveyed said that the main income for their household is from agricultural labour. In rural areas there is little demand for labour from sectors other than agriculture therefore limiting alternative sources of employment and increasing

vulnerability (Ahamad, Khondker, Ahmed, & Tanin, 2012; Food and Agriculture Organisation, 1991).

As in other rural Bangladesh populations (Balk, 1994; Piechulek, et al., 1999; Shannon, et al., 2008), the women's social status is low, which was evident in their lack of decision making power. None of the women were responsible for the harvest or the purchase of household food, therefore limiting their control over dietary intake and practices.

5.3 The dietary diversity of pregnant women in rural Bangladesh.

Diverse diets are rare among poor rural Bangladeshi populations (Arimond, et al., 2009; Arimond, et al., 2010; Arsenault, et al., 2013; Hels, Hassan, Tetens, & Thilsted, 2003; Thorne-Lyman, et al., 2010) despite evidence which proves that a diverse diet is important in the development and health of both the mother and the child during pregnancy (Arimond, et al., 2010; Ruel, et al., 2010; Savy, et al., 2005). Like many resource poor countries, the typical Bangladeshi diet is monotonous and based on high starch staples, in this case rice, which is energy dense but micronutrient poor (Campbell, et al., 2010; Piechulek, et al., 1999). This was confirmed in this research study as all women had consumed rice in the previous 24 hours. To meet micronutrient requirements, starchy staples must be supplemented with foods from other vitamin and mineral dense food groups. However, this was not the case as there was low consumption of many food groupings *(figure 4.1)* which would provide additional nutrients to the women's diets. Animal food sources are recognised as key indicators of high quality diets (Campbell, et al., 2010). In this study no more than half the women had consumed from any of the animal food groupings, indicating that their overall diets are likely to be low in nutritional quality. Like most developing countries, anaemia rates during pregnancy are high in Bangladesh (39%) (Helen Keller International, 2006). Iron requirements increase by over 50 percent during pregnancy, however, half the women did not consume any food groupings rich in iron, therefore the women's risk of anaemia and consequently mortality and morbidity of the mother and child is high (World Health Organization, 2013). Consumption of plant based

vitamin A foods are especially low *(figure 4.1)* and indicates that the women may have a higher risk of vitamin A deficiency during pregnancy. However, the IDDQ was conducted in February, which in the harvest calendar was not indicated as a month when crops rich in vitamin A are harvested in this area *(figure 4.7).* Therefore to get a clearer idea of the women's usual intake of micronutrients, the IDDQ should be conducted at intervals throughout the year. Ruel (2010) recommends that the IDDQ can be effectively used in this way for monitoring and evaluation of diet quality (Ruel, et al., 2010).

The women's overall dietary diversity score of 5.8 from a possible 14 food groupings is comparable to other research studies presented in table 2.4. Other dietary diversity studies completed in Bangladesh (Arimond, et al., 2009; Arsenault, et al., 2013) and in other resources poor populations (Arimond, et al., 2010; Hatloy, et al., 1998; Labadarios, Steyn, & Nel, 2011; Sanusi, 2011; Torheim, et al., 2004) have reported a mean IDDS which range between three to eight. Different classifications of food groupings and different cut off values have been employed in these studies, making it difficult to make accurate comparisons. The most comparable dietary diversity study was by Arsenault (2013) who used the WDDS (nine food groupings), in a similar setting (rural northern Bangladesh) and with similar participants (non-lactating women). The mean WDDS calculated for pregnant women in Pirganj (4.4) is very similar to what was found by Arsenault (4.3) (Arsenault, et al., 2013). Arsenault (2013) calculated the correlation between dietary intakes and the prevalence of nutritional adequacy; which was concluded as low. Only 16 percent of women in their study had adequate iron intakes and adequacy of the micronutrients calcium, folate, riboflavin, vitamin B12, and vitamin A were extremely low (0-3%). Arsenault (2013) concluded that most of these inadequacies can be attributed to low food energy intakes and low dietary diversity (Arsenault, et al., 2013). As the mean WDDS was close in both Arsenault's and this study, we can predict that overall nutritional and micronutrient intake may be inadequate in pregnant women living in Pirganj. Reconfirming this relationship assumption is the study by Arimond (2010) which was also carried out in women living in rural Bangladesh. Arimond (2010) found that the mean WDDS was 4.5 and based on

this score it was calculated that half the women had inadequate intakes of seven micronutrients (Arimond, et al., 2010). The study by Arimond (2010) concluded that a dietary diversity questionnaire based on nine food groupings is the most accurate method for use in women of reproductive age and living in resource poor areas. Hence, it was included in this research study and should be continued to be used to streamline comparisons between future studies.

Based on guidelines set by the FAO the IDDS was assessed in terciles that allowed the comparison between the proportion of women who scored low, medium or high dietary diversity (Food and Agriculture Organisation, 2007). The largest proportion (58.2%) of women scored a medium IDDS which reflects the same trend found in two other African studies who used the tercile approach (Sanusi, 2011; Savy, et al., 2005). However, both these studies used different food groupings and tercile cut offs, making accurate comparisons difficult. Calculating terciles is an effective method to measure the distribution of a population's dietary diversity and should be included in all assessments of dietary diversity, yet standardisation of tercile groupings needs to be achieved

Results from this research study show that more women fall into the high compared with the low dietary diversity terciles *(table 4.3*). This is unexpected as women in this research study are classified as ultra-poor or poor and malnutrition rates during pregnancy are high in Pirganj (World Vision Bangladesh, 2011). This result could be because of the tercile cut off limits. The FAO guidelines recommend the cut offs as: low; ≤4 food groups, medium; 5-6 food groups and high; ≥7 food groups (Food and Agriculture Organisation, 2007). When using the IDDS based on 14 food groupings, a diet including up to six of the food groupings is classified as low and medium diversity, while a diet including seven or more food groupings is classified as a high diversity; therefore increasing the likelihood of scoring a high dietary diversity score. This being said, when used to make comparisons between the Adivasi groups and the Bengali groups, it is evident that the Adivasi women have a lower dietary diversity score based on tercile groups *(table 4.4).* Table 4.3 and 4.4 also provide information about the types of food groupings introduced at each tercile level. Those who have low dietary

diversity consume a basic diet based on cereals and grains (rice), white roots and tuber (potato), oils and fats for cooking and other seasonal vegetables. The food groupings introduced at the high tercile are nutrient dense, but not so readily available to all because of seasonality or cost, and vary between the Adivasi and Bengali groups.

While the diversity of food groupings is an important proxy indicator for diet quality, calculating a FVS allows further understanding of the variety of foods the women consume and therefore the quality of nutritious foods in their diet. The FVS of the women was extremely low as a mean of 7.2 individual foods were consumed from a possible 105 foods available. This result is comparable to other studies which have looked at 24 hour FVS in rural resource-poor areas and reported an average variety range of 4.9 to 8.3 foods (Saibul et al., 2009; Savy, et al., 2005; Steyn, Nel, Parker, Ayah, & Mbithe, 2012). Therefore, it can be summarised that pregnant women in rural Bangladesh are faced with limited access to a variety of foods which is most likely due to high levels of poverty. If calculating the FVS for the entire group (all 43 women), only 45 different foods out of the possible 105 foods available in the area were consumed. If further scrutinised, 13 of these 45 foods were different species of fish; therefore not increasing the variety or adding additional nutrients to the diet. This does however indicate how important fish is in the women's diet and that a large variety of fish species are available in Pirganj. Comparisons between the IDDS (5.9) and FVS (7.2) indicate that there is little variation of food items within the food groupings. This low variety within food groupings is evident when groupings are further analysed. Almost all women had eaten from the white tubers and roots grouping, however, white potato was the only food item consumed. Most women had eaten from the 'other vegetables' grouping, however only six different vegetables (onion, tomato, cauliflower, *gourd*, cabbage and eggplant) were listed between all women. These results show that while women may be eating from a relatively diverse number of food groupings, the variety of foods within the groups is very low; decreasing the likelihood of women meeting their nutritional requirements. It also shows the importance of using both indicators in this population group as using the IDDS alone can provide a false impression of the women's diet quality.

When making comparisons between the Adivasi and Bengali groups, the Adivasi group consistently had a lower score in each result derived from the IDDQ (IDDS, tercile groupings and FVS). Even though women in both the Adivasi and Bengali groups are considered as being poor or ultra-poor, the Adivasi's limited land ownership and the discrimination they suffer, impacts their food security and is reflected in their lower quality diet (World Vision Bangladesh, 2011).

Simple indicators of dietary diversity derived by the recall of foods and food groupings have gained increased attention over recent years, with many studies showing their relationship in predicting dietary quality and nutritional adequacy; especially in a developing country context (Arimond, et al., 2010; Bhargava et al., 1985; Ruel, 2003b; Savy, et al., 2005; Torheim, et al., 2004). Although the use of dietary diversity questionnaires are becoming more common, they still pose some limitations (Ruel, 2003b).

There are multiple versions of the dietary diversity questionnaire with foods classified into a varying number of groupings (range from 4-16) (Food and Agriculture Organisation, 2007; Ruel, 2003a). Using more groups provides more detailed information, however it increases the difficulty for the facilitator to place foods into the correct groups (Food and Agriculture Organisation, 2007). Previous studies have used different minimum cut off points of food consumption. Some studies use no minimum cut off while others use 1 gram or 15 grams. The 15 gram cut off is used because foods consumed as a flavouring or garnish are small and do not significantly contribute to nutrient intake. This study used no minimum cut off to limit confusion and encourage the participants to name all foods consumed during the 24 hour reference period. A recent review comparing five different dietary diversity scores with varying design found that no cut off level was more accurate than another at predicting energy consumption (Coates et al., 2007). The reference period during which information is collected also varies between studies. This period should be limited to minimise memory bias and burden, but long enough to capture the participants usual consumption (Palaniappan, Cue, Payette, & Gray-Donald, 2003), leading to much debate over how long the recall period should be. The recall over 24

hours does not provide enough information to reflect a habitual intake as there may be daily variations. In this research study women struggled to even remember their intake from the previous 24 hours and a longer recall period would not have been successful in this population. Data collected from a 24 hour reference period and repeated on a monthly basis would therefore provide an accurate description of the women's dietary diversity and would also show seasonal variations (Savy, et al., 2005). The adaptability of the IDDQ is an advantage during data collection; however, the same adaptability creates difficulties during analysis. A lack of consensus in the questionnaire design makes it difficult to make accurate comparisons between studies and countries. Therefore, homogeneity within population subgroups needs to be resolved before the tool can be used to its full potential (Ruel, 2003a; Sanusi, 2011).

5.4 Household production of food crops in rural Bangladesh.

The agricultural potential in Bangladesh is considerable as the country is situated on the world's largest delta, resulting in some of the most fertile soils in the world (Feed the Future, 2011). Yet, due to negative foodways, such as their large population, a lack of infrastructure, and restrictive cultural customs, a significant proportion of the population is living in poverty and suffering from malnutrition (Bushamuka et al., 2005). The dietary habits of communities living in poverty and in rural settings are dependent on what they can locally grow and harvest. These communities have limited incomes available to purchase food from markets and are often isolated from accessing a wide variety of foods. Their dietary diversity and essentially their nutritional status is dependent on what they can locally harvest (Torheim, et al., 2004). By facilitating the production of a harvest calendar with the participants using the ten seed method, the annual production of household crops was determined. Household crop harvest is an important food source and an underlying factor affecting nutritional status. The harvest calendar will guide interventions to encourage the future harvest of a wider variety of fruit and vegetables. Photographs of the ten seed method being conducted during two data collection sessions are pictured below in figure 5.2.

Figure 5.2 Pregnant women placing seeds in harvest calendar.

In this study, 86 percent of the participant's households were involved with harvesting some type of crop throughout the year. However, like several other studies which have been carried out in Bangladesh (Bushamuka, et al., 2005; Hossain, Naher, & Shahabuddin, 2005), none of the women were responsible for what or when crops are harvested, thus limiting their control over the source of food at their household level

The findings from the harvest calendar and from other research (Bushamuka, et al., 2005) shows that the largest abundance of crops are grown during the winter months and that the lean season falls between *Srabon* to *Kartik* (August to November). During the lean season, Northern Bangladeshis and especially those who do not own their own land (ultra-poor/poor and most Adivasi households), are most vulnerable to seasonal food insecurity (Ahamad, et al., 2012). Household income falls due to a loss of agricultural wage opportunities and food prices rise, which decreases the accessibility of nutritious foods to vulnerable groups (Ahamad, et al., 2012). Households who have the ability and actively harvest their own crops are less affected by these seasonal fluctuations. They have more consistent access to a variety of nutritious non-rice foods which effectively increases dietary diversity (Bushamuka, et al., 2005).

Harvesting crops at the household level has been shown to increase dietary diversity and ultimately improve nutritional status (Iannotti, et al., 2009), however, in this study the majority of the crops harvested was rice (*figure 4.7*). If women's staple diets are

traditionally based on rice, the household harvest of additional rice will not increase the diversity of their diet. In Pirganj, there are two rice harvests each year; one is in *Joishtho* (May-June/summer) and the other in *Ogrohaeon* (November-December/late autumn). The Pirganj upazila is recorded to be one of the largest producers of banana, mango, and jackfruit in Bangladesh (World Vision Bangladesh, 2011). However, in proportion to the amount of rice harvested, rice crops are substantially greater, confirming the importance of rice in the Bangladeshi diet. A review by 'The International Rice Research Institute' determined that rice production accounts for approximately 71 percent of crops harvested in Bangladesh each year (Hossain, et al., 2005).

Mango and jackfruit are the most commonly grown fruits at a household level according to the harvest calendar. Both fruits are important sources of vitamin A in the women's diet, but both are harvested in *Joishtho* (May-June/summer) month. The lack of vitamin A rich fruits (2%) in the IDDQ confirm that the participants diets are dependent on what they locally harvest as mango/jackfruit were out of season during the data collection (completed in February). Vegetable sources of vitamin A available in the traditional diet, such as pumpkin, are harvested at the same time of the year (April – June) as mango and jackfruit. Therefore, for the rest of the year there is low availability of crops which are rich in vitamin A. Red amaranth (*figure 5.3*) is an important vegetable source of vitamin A in the local diet yet it was not mentioned as a harvested crop. This could be because it grows abundantly on the side of the road as a weed and gathered from the environment. Intentional harvesting is therefore not necessary, and hence not indicated in the harvest calendar. Households should be encouraged to grow a wider variety of crops rich in vitamin A to improve their access to vitamin A throughout all seasons of the year.

Figure 5.3 Red amaranth seen at local market in Pirganj

Pirganj upazila is known as the largest producer of bananas in Bangladesh, but the ten seed method showed only a small proportion of seeds represented bananas on the harvest calendar (3% of crops harvested by the participants were banana). A local World Vision staff member explained that the variety of bananas grown in the Pirganj upazila is a cash crop and intended for export. The variety of bananas the women consume in the villages are transported in from a neighbouring district (Bogra), and sold in the local markets. This therefore increases the price of the banana and reduces their availability. Participants and World Vision staff members mentioned several times that they consume banana flowers when they are in season as they are known as a good source of iron. Banana flowers are a good source of iron in the women's diet, however, it must be ensured that the nutrients found in the flower are not mistaken for the nutrients found in the fruit. Also of interest is that the amount of potato harvested seems considerably low compared to the quantity consumed as indicated in the IDDQ, focus group and during the photographic participant observation. Potatoes are very easy to grow and are suited to the Pirganj climate. If women are able to grow potatoes, this can supplement a large portion of their diet and allow the household to spend money on other nutrient dense foods at the market.

5.5 Eating habits of pregnant women in rural Bangladesh.

Food

The general meal pattern observed amongst the participants was consuming three meals each day, with a few women only consuming two meals due to economic or health reasons. This is different to what was reported in World Visions 2009 baseline survey as they found that the majority (80%) of people in Pirganj ate only two meals a day (World Vision Bangladesh, 2011). This is perhaps because the baseline survey includes all members from the population whereas only pregnant women were included in this study. In this research study, even though the women were consuming three daily meals, when the meal size and the diversity was confirmed during the photographic participant observation, meals were seen to be largely based on rice with only small portions of other foods. The daily diet of women living in Pirganj was very similar between all religions and ethnicities. A staple meal consisted of a plate full of cooked white rice with two or three vegetables (nearly always potato with other seasonal vegetables) cooked as *tor kari* or *bhorta* to mix through plain rice. The women found it difficult to explain usual meal patterns and what *tor kari* and *bhorta* are. The women are habituated in consuming these foods so that these behaviours become subconscious and therefore hard to explain. The Bangladeshi meal plate is different to the western standard of a 'healthy eating plate' where three main components (meat, carbohydrate, fruit/vegetables) are in similar proportions and eaten alongside each other (Harvard School of Public Health, 2013). The Bangladeshi plate consists of mainly rice with the purpose of the vegetable or meat to mix through and add flavour to the rice as shown in figure 5.4.

Figure 5.4 Dinner prepared by Adivasi woman. Contains cooked white rice and potato (aloo) and bean (sim) tor kari.

Rice is such an integral part of the Bangladeshi diet that Hossain (2005) concluded that the concept of being food secure in Bangladesh is synonymous with achieving self-sufficiency in rice production (Hossain, et al., 2005; Thorne-Lyman, et al., 2010). Up until recent years, rice was the main food consumed for breakfast, lunch and dinner; however through personal communication it was discovered that *roti* (bread) with dhal or vegetables consumed for breakfast is gaining popularity even in rural populations. Like many people living in Asia, most Bangladeshis cannot reach satiety without consuming rice (D. Lee, 1957). When asked about favourite foods, a participant stated 'all Bengalis like rice', and when discussing lunch time food with a village member, he said "it is not a meal without rice." It is of interest that the majority of women list rice as their favourite food. Rice is their staple food and perhaps considered their favourite because they cannot conceive living without it. Much like in the Middle East where a meal without bread is unimaginable as bread itself is the meal and all other 'food' is an accompaniment. (D. Lee, 1957). Some cultures value sameness, while others value luxurious foods and variety. Therefore food preferences and what is recognised as food, is culturally driven and can have a symbolic meaning within communities (D. Lee, 1957; Shatenstein & Ghandrian, 1998)

Studies have calculated that the daily energy provided by rice alone is between 76 to 84 percent (Bangladesh Bureau of Statistics, 2003; Chen, et al., 1981; Hossain, et al.,

2005). This is one of the highest in the world and indicates a serious imbalance in dietary diversity and nutritional intake (Gill et al., 2003). In countries such as Bangladesh where rice is such a culturally significant part of the diet, researchers have concluded the theory that the purchase and consumption of non-rice foods is dependent on the price of rice (Campbell, et al., 2010; Hartini, Padmawati, Lindholm, Surjono, & Winkvist, 2005; Torlesse, Kiess, & Bloem, 2003). When rice prices increase, families continue to buy the same amount of rice to feed their families but purchase less micronutrient rich non-rice foods such as eggs, milk, fruits and meat. (Campbell, et al., 2010; International Food Policy Research Institute, 2003; Thorne-Lyman, et al., 2010; Torlesse, et al., 2003). This was made clear by one participant saying: "we can either purchase rice, or we can purchase fruits", exemplifying how they choose to purchase rice over nutritious foods such as fruit to ensure their family will at least feel satiated. Research has shown that families who spend more money on rice foods and therefore have a more limited diet are more likely to have family members, such as pregnant women, suffering from malnutrition (Campbell, et al., 2010; Hoddinott & Yohannes, 2002).

Rice, potato, onion, spices, mustard oil, fish, wheat flour, pulses and milk account for approximately 95 percent of the daily intake in a Bangladeshis diet (Pitt, 1983). Not only are Bangladeshi diets limited in diversity but they are also very monotonous. It is the women's habit to cook the food for both breakfast and lunch in the morning because they said they do not have enough money to purchase a large variety of food to cook at different meal times.

Traditionally *dahl* is a large part of the Bangladeshi diet (Piechulek, et al., 1999) and is an excellent source of protein and nutrients for poor communities who cannot readily afford meat. The IDDQ indicated that 56 percent of the participants ate from the legumes, nuts, and seeds food grouping. However during observations, it was noted that the traditional way to prepare *dahl* was like a soup, with small quantities of the actual lentil used. The *dahl* is usually flavoured with onion, garlic and chilli. The consumption of lentils has been declining over the past decade (Hossain, et al., 2005),

which could be due to the increase in food prices with families opting to spend their money on rice or due to changes in the production technologies (Bangladesh Bureau of Statistics, 2001; Government of Bangladesh, 2000). Other research has found that societies perceive some nutritious foods based on their historical or social views, rather than scientific facts, which could be applicable to lentils as they may be perceived as 'common' (Drewnowski & Levine, 2003; Popkin, Duffey, & Gordon-Larsen, 2005). Further investigation into this finding and methods to encourage the consumption of lentils is recommended as they are an important source of affordable nutrients.

Spices are used every day in Bangladeshi cooking with garlic, turmeric, cumin, coriander, ginger and chilli being most common. Dried red chillies and fresh green chillies are added to curries during the cooking process. Green chillies are often consumed raw as a compliment to meals and fresh limes are squeezed over rice. Although spices (such as garlic, ginger, lemon and chilli) are consumed in small proportions, their addition to the diet is important as it increases the diversity and the nutritional quality of their diet to some extent.

Soyabean oil is the most common oil to cook with and mustard seed oil is often added to dishes such as *aloo bhorta* (potato mashed and mixed with onion, chilli and mustard seed oil) or salad (cucumber, onion, tomato, mustard seed oil and lime) to flavour the dish. Ninety-three percent of the women indicated that they had eaten from the oil and fats food grouping during the IDDQ which was confirmed during the photographic participant observation as all six women added oil to their dish when frying foods such as onion, garlic or chilli. Photographs of women adding oil to their meal during preparation are shown below in figure 5.5.

Figure 5.5 Photograph of women adding soyabean oil to spices (chillies, onion and garlic) at breakfast and dinner.

Oil is a concentrated source of energy and its consumption should be encouraged, especially during pregnancy to help meet the women's increased nutrient demands. The use of palm oil in cooking should be encouraged during pregnancy to increase the women's intake of vitamin A and other essential nutrients (e.g. vitamin E, omega-3 and omega-6). Palm oil is available in Bangladesh and in the local Pirganj market. However, barriers such as higher price and the perception that it is inferior to other oils, in terms of cooking and nutritional qualities limit its use.

Fish is consumed once or twice a week and meat is consumed every one to three months; dependent on personal circumstances. The IDDQ indicated that 44 percent of participants had eaten from the fish and seafood food grouping, 5 percent had eaten from the organ meat food grouping and 12 percent had eaten from flesh meat food grouping. Based on indications during the focus group about how often meat was consumed, the number of women who had eaten from the flesh meat food group was higher than expected. If women did eat meat once a month the percentage of women who should have indicated that they ate from the meat food group in the previous 24 hours should have been approximately 1.5 percent. Therefore the women's meat consumption may actually be higher than what they perceive, but additional data would be needed to confirm this finding.

Family dynamics

It is common throughout many resource poor countries, including Bangladesh, that disparity in the distribution of food exists with discrimination towards females (Ahamad, et al., 2012; Chen, et al., 1981; Nag, 1994; Piechulek, et al., 1999; Shannon, et al., 2008). Unequal food distribution in Bangladesh is an underlying factor which leads to higher rates of malnutrition in females (Chen, et al., 1981). The traditional sequence of food distribution is that male adults and male children eat first, with often insufficient food being left for females (Chen, et al., 1981; Piechulek, et al., 1999; Raman, 1988). This research study confirmed this traditional practice; however exact sequence was dependent on personal living situations and family dynamics. Underlying factors as to why households followed this practice was justified that men need additional food to work and provide for their families. This reasoning is logical but the behaviour also stems from the traditionally inferior role that women have in the Bangladeshi society (Chen, et al., 1981; Shannon, et al., 2008). What is noticeably different to other reports is that one third of the women in this research study said that before pregnancy they ate last, however, during their pregnancy their family gave extra support by encouraging them to eat first during meal times. This finding may indicate that traditional practices are changing in this area of rural Bangladesh and the social status of women is improving, especially during pregnancy. The study by Choudhury (2011) highlighted that husbands could play a positive role during pregnancy by reducing the women's work load and providing extra care (Choudhury & Ahmed, 2011). The same as in this research study, family members helped with heavy work and pregnant women were encouraged to rest. This was not found in the similar study by Shannon (2008) where two thirds of the participants reported their greatest barrier to rest was a lack of family support to reduce their workload (Shannon, et al., 2008). This change in behaviour may be location specific, a result of external influences (e.g. education material distributed by local health practitioners or NGOs in Pirganj), or represent a change in attitudes over time.

Education level is an important factor for the livelihood and nutritional status of women (Sanghvi, Ross, & Heymann, 2007). Education offers opportunities for a greater

income and provides knowledge and freedom to a healthier future (Bhuiya & Streatfield, 1991). Nevertheless, education is another cause for disparities and discrimination against females in resource poor and rural settings (Bhuiya & Streatfield, 1991; Khandker, et al., 2003). As stated earlier, the average literacy rate of women in this research study is lower than national levels (National Institute of Population Research and Training, 2011). The average school attendance rate was lower in the Adivasi women (64%) than the Bengali women (72.2%). The school attendance rate may be lower in the Adivasi group because the families are too poor to pay for their daughters schooling or Adivasi groups may have higher rates of child marriage and child labour. In the 1990s the Bangladesh government set up an initiative to provide incentives such as scholarships or reduced fees to keep female children enrolled in school (Khandker, et al., 2003). Due to traditional mentality and local customs, such as the role of the women in society, there still remains a large gender gap in the Bangladeshi education system (Bhuiya & Streatfield, 1991; Khandker, et al., 2003). Illiteracy can lead to women being ill-equipped with marketable employment skills and uninformed about family planning, health care, and nutrition. Studies have shown that the level of maternal education is inversely linked to the mortality risk of her child (Bhuiya & Streatfield, 1991; Chen, et al., 1981). Literacy levels of the woman may also affect the degree in which food taboos and superstitions are learnt and adhered to (Khanum & Umapathy, 1976; Nag, 1994). Other research studies have concluded that food taboos are more common and more closely followed by those who have a higher literacy level (Khanum & Umapathy, 1976) and by those with a higher income (Nag, 1994). In this research study, the woman who knew the greatest number of food taboos had the highest literacy rate, although she was also the only participant to speak out and say that she does not follow the restriction of consuming cucumber during pregnancy. This is contradictory to the other research studies and could indicate a change in cultural customs or differences between communities/population groups.

Health care

Women experience physiological effects of pregnancy which result in food avoidances or changes in practices. This is largely based on biomedical factors rather than cultural factors. The feelings of tiredness, nausea, heart burn, and mouth ulcers were common amongst the women and lead to the avoidance of important food sources, such as, fish, green leafy vegetables and meat. Women would even avoid consuming rice during periods of their pregnancy as they felt too nauseous. This is concerning as rice is the staple food in their diet and is the greatest contributor of energy and other micronutrients (Chen, et al., 1981). Women need to be encouraged to consume regular small servings of low aroma foods (e.g. fresh fruit, bread, milk), ensure they drink plenty of water, and family members should help with meal preparation to limit the time pregnant women are around food. As well as food avoidances, during pregnancy women often experience food cravings. No women in this study talked about craving unusual foods such as charcoal, mud or clay (referred to as pica), however they did crave sour (tamarind and lemon) and dry foods (biscuit and *muri*). Cravings for sour and dry foods are advantageous because it encourages the consumption of additional foods which counteract the feeling of nausea. Cravings and avoidances during pregnancy are said to be innately based for the protection of the mother and baby during pregnancy (Piechulek, et al., 1999). The craving for lemon and tamarind have been suggested to indicate the women's needs for increased micronutrients (Landman & Hall, 1989). The occurrence of mouth ulcers preventing the consumption of food is often caused by an unbalanced diet lacking in certain nutrients such as B vitamins, iron, folate and zinc (Wray, Ferguson, Hutcheon, & Dagg, 1978; Wray, Ferguson, Mason, Hutcheon, & Dagg, 1975). This is a likely to be true for this group of women based on their low diet quality. Increased access and compliance to taking supplements and increased consumption of locally available and affordable foods (nuts, seeds, eggs, lentils and green leafy vegetables) should be encouraged in this population to improve their likelihood of meeting micronutrient requirements.

5.6 Beliefs and taboos surrounding food consumption of pregnant women in rural Bangladesh.

Food beliefs

As in most countries, there are specific beliefs about what should or shouldn't be consumed during pregnancy for a successful reproductive outcome. Other cultures have been studied in terms of food beliefs and practices during pregnancy, however, all communities have unique attitudes, values and interpersonal experiences (Meyer-Rochow, 2009). Therefore these should be individually investigated and when necessary used to produce a multi-sectorial nutrition intervention to reduce maternal malnutrition.

Previous research in Bangladesh and other neighbouring Asian countries have reported both similar and variable taboos, as was discovered in this research study *(table 2.5).* The most frequently mentioned and the strongest taboo in this research study was for pregnant women not to cut food during an eclipse to prevent the baby being born with a cleft lip or deformed limbs/features. This was also found in the Bangladeshi study by Choudhury (2011) that was carried out in two northern districts (Rangpur and Kurigram), near the Pirganj upazila. An eclipse only occurs up to four times each year, therefore will not dramatically limit the women's food intake throughout her pregnancy. Nevertheless, women living in rural areas already have limited diets and a high prevalence of malnutrition and this additional restriction could be detrimental. Similar superstitions have been found throughout other cultures including Mexican (Castro, 1995), South African (Patel & Ross, 2003; Ross, 2007) and Indian (Jain, 1994; Loh & Ascoli, 2011; Naram et al., 2012). The study in Mexico reported that the belief may have risen from traditional Mexican medicine where the communities believe that going outside in an eclipse may separate one's body from their shadow (soul) (Castro, 1995; Santos-Torres & Vásquez-Garibay, 2003). Patel (2003) and Ross (2007) both reported that according to Hindu beliefs an eclipse is considered a 'bad time' and the Hindu scriptures state all temples should be closed (Patel & Ross, 2003; Ross, 2007). Many Hindu beliefs surrounding pregnancy are borrowed from other religions,

including the Islamic belief of fasting during a lunar eclipse (Ahmad, 1984). Therefore, as the majority of the Bangladeshi population are Muslim and because they neighbour with India, it is very likely that this is where the belief stems from. A second food preparation practice which was mentioned in more than one focus group was to not break egg shells during pregnancy to prevent the woman's amniotic sac from rupturing at an early stage during labour, which may result in amniotic fluid splashing in the midwife's face. The egg shell may reflect the women's amniotic sac and the raw egg resembles the amniotic fluid. Like the sac, when the egg shell is broken the raw egg bursts out.

Beliefs surrounding 'hot' and 'cold' food are widespread throughout most of Asia (especially in India and China) (Choudhry, 1997; D. Lee et al., 2009; Meyer-Rochow, 2009). However, the underlying criteria for classifying foods into either category are not clear and vary between countries and communities. The 'hotness' or 'coolness' of food does not depend on the temperature or spiciness of the food but more so on the beliefs about the reaction the food has when ingested (Nag, 1994; Pool, 1987). Most information concludes that during pregnancy the woman is in a state of 'hotness' and therefore consuming foods which are also considered as 'hot' can bring harm to herself or her baby. Conversely the consumption of cold food is considered beneficial (Nag, 1994). Other studies carried out in Bangladesh have previously described the avoidance of 'hot' foods during pregnancy (Choudhury & Ahmed, 2011; Goodburn, et al., 1995; A. Khan, 1981; Rea, 1981), however, in this research study women did not specifically mention 'hot' or 'cold' foods in the same context. Women explained that 'hot' foods are hot in temperature and that eating hot cooked rice or drinking hot milk or water can speed up the delivery process. Nag (1994) reports that 'hot' foods become desirable during the third trimester as it provides heat to force the baby out during delivery (Nag, 1994). Therefore the concept of hot food aiding in the delivery is the same but the specific food items and their classification is different compared with other research. Cold foods such as cold water or *bashi* foods (food cooked on previous day) are believed to be harmful to the mother or baby and imply a protective hygiene practice.

Other food taboos which were mentioned multiple times during this research (by Bengali groups only), and are reported in other studies (Andersen, Thilsted, Nielsen, & Rangasamy, 2003; Choudhury & Ahmed, 2011; Ferro-Lazzi, 1980; Goodburn, et al., 1995; Mahadevan, 1961; Nag, 1994) were the restricted consumption of pineapple and papaya as it is believed to cause an abortion and the restriction in consumption of double bananas as it is believed to cause twin births. A photograph of a double banana is pictured below in figure 5.6.

Figure 5.6 Double bananas found at local Pirganj market

Possible theories as to why pineapple or papaya can cause an abortion are: that they act on the uterus in 5-10 percent of women and cause bleeding (Ferro-Lazzi, 1980); it induces the menstrual period; or the enzymes found in these fruits breakdown protein in meat which is believed to do the same to the foetus (Nag, 1994). The avoidance of these fruits is concerning as they are both rich sources of nutrients, especially vitamin A found in papaya which is lacking in the women's diets. Double bananas are avoided because twins are considered unlucky (Choudhury & Ahmed, 2011). If the mother is malnourished she may have difficulties during pregnancy or caring for two babies and the family may not be able to meet the babies' nutritional needs. Interestingly both of these taboos were only mentioned by the Bengali groups and never by the Adivasi women. This could be because it is linked with the Bengali culture and not passed

through the Adivasi heritage, or it could be related to the higher education level of the Bengali group.

Women within the study group commonly believe that by consuming certain foods during pregnancy it can affect the colour of their baby's skin at birth. Healthy foods (milk, egg, fruits) lead to the skin being light coloured and 'beautiful', while consuming *rice fry*, *khoi* and *muri* will cause dark, dirty skin. This belief is beneficial as *rice fry, khoi* and *muri* are all products of rice and do not add additional nutrients to the women's diet.

Several taboos were mentioned once but not confirmed by other participants, such as: eating small chickens can cause pneumonia in the baby, or eating pineapple mixed with milk is poisonous and can kill the baby and the mother. This demonstrates that within a community, perceptions of specific food item restrictions can vary between individuals. Hence the importance of repeated data collection in multiple groups of women until data saturation had been met on major themes. The similarities and differences found in this research study compared with previous studies *(table 2.5)* confirm that food taboos are specific to each location and community which reinforces the importance of formative research when designing a nutrition intervention.

Nutrition knowledge

Informed knowledge about good nutrition plays an integral part in food choices and is critical in maternal health (Simkhada, Teijlingen, Porter, & Simkhada, 2006). When asked what a healthy diet is the women were able to name food items which they considered as healthy, however, no details about specific nutrients were provided. When women were further probed, they could only identify that vitamin C is contained in green leafy vegetables and that vitamin A improves night vision. The women's limited nutritional knowledge could be attributed to their low education level or because the Bangladeshi culture uses a different nutrient classification system. Western societies use food pyramids or macro and micro nutrient groupings whereas the Bangladeshi culture classifies food into six food elements (fats, oils and sweets;

dairy; meat, legumes, nuts and seeds; fruits; vegetables; grains); creating a cultural difference of understanding.

It was observed during every participant photographic observation that women would boil potatoes whole and once cooked, they would peel off the skins *(figure 5.7).* When asked why they did this, the participants responded that they knew most of the nutrients were under the skin, but considered the peeled potatoes to look more appealing. This demonstrates that knowledge does not always translate in to practice (Shannon, et al., 2008) and that cultural customs and habits are strong influencing factors.

Figure 5.7 Mother and pregnant daughter peeling the skins off boiled potatoes at breakfast time

Size of the foetus

The term 'eating down' is common throughout Asia, including in Bangladesh. It refers to when a woman eats less during her pregnancy so that her baby will be small and delivery will be easy (Choudhry, 1997; Mukhopadhyay & Sarkar, 2009; Nichter & Nichter, 1997; Piechulek, et al., 1999; Rao, 1985; Shannon, et al., 2008; Society for Education Welfare and Action - Rural Research Team, 1992; Sood & Kapil, 1984). Deliveries are almost always carried out on the household dirt floor with a TBA

present. Obstructions are the leading cause of difficult deliveries and can be fatal, and therefore generates local fears for the labour and birthing process (Nag, 1994). The concept of 'eating down' was discussed by most focus groups in this research study with all women agreeing that by eating less, their baby will be smaller and the delivery will be less painful/difficult; compared with eating lots and giving birth to a large baby. This being said, most women believed that a larger baby is best practice as they are more likely to give birth to a healthy baby. Most women valued the health of their baby over the perceived chance of an easier delivery and do not further compromise their already malnourished state by 'eating down'. Research shows that there is more risk in a difficult labour if the baby is small and malnourished compared to whether it is of appropriate size (>2500g) (Williamson, 2006). Another misinformed belief regarding baby size was that if a woman eats too much food her stomach will be large and prevent the baby from growing. Some other studies have also reported that pregnant women decrease their food intake to allow the baby sufficient room for growth in the womb (Agrahar-Murugkar & Pal, 2004; Nichter & Nichter, 1997; Society for Education Welfare and Action - Rural Research Team, 1992) which may have detrimental health effects on both the mother and baby.

Religious beliefs

Religious beliefs often dictate what, when, and where certain types of food can be consumed, especially during festivals. The study participants belonged to one of three religions: Muslim, Hindu and Christian. All three religions have varying restrictions on certain foods during certain times of the year (e.g. Muslims don't eat pork or Christians don't eat meat and fish on Wednesdays and Fridays). These restrictions have limited effect on the women's usual intakes, as these foods (meat and fish) are not frequently consumed in the women's staple diet.

Religious beliefs support the use of *Ayurbedic* medicine to assist the probability of conception. *Ayurbedic* medicine is a form of traditional medicine which originated in India and usually involves a mixture of herbs, roots and metals (Chopra & Doiphode, 2002). *Ayurbedic* medicine also comes in the form of blessed water which is consumed

by the pregnant woman (*Kobiraj*) or splashed over her face (*Jhar Fuk*) during delivery to remove pain and speed up labour. The women in Choudhury's (2011) study reported that they drink blessed water during their pregnancy to increase their strength and to prepare them for delivery (Choudhury & Ahmed, 2011)

Bangladeshi people classify the length of a women's pregnancy as ten months in duration. They believe that the baby is born nine months and ten days after conception as this is found in the lyrics to a famous traditional song. Part of the Bangladeshi culture recommends women to complete '*shaad*' during the seventh month of their pregnancy. *Shaad* is when family members provide the women with a range of nutritious foods near the end of their pregnancy to prepare them for labour. This custom is beneficial and should be encouraged for all women to complete. It is evident that the Bangladeshi people have strong religious pride and religious beliefs influence many aspects of their behaviours and practices. Religious beliefs often aim to protect and are difficult to change (D. Lee, 1957; Meyer-Rochow, 2009). These beliefs and practices should not be discouraged but incorporated as an additional dimension when planning interventions or education materials to increase the likelihood of their success in reducing malnutrition (Piechulek, et al., 1999; Shannon, et al., 2008; Shatenstein & Ghandrian, 1998)

Health

Most women in this research study had contact with a village doctor, TBA or a BRAC volunteer during their pregnancy. Local health practitioners (especially village doctors) are highly regarded by villagers and BRAC has become a reputable organisation throughout Bangladesh. Although local health practitioners and NGO volunteers are not professionally trained, they are the resources who connect with pregnant women at a village level and have an immediate impact on pregnancy outcomes. This can be used to the benefit of the women, by collaborating with organisations with similar health objectives and forming partnerships to enhance each other's service to the community. An increased number of women will be reached and the long term benefits of an intervention will be achieved by local involvement and empowerment. A

‘training of trainers’ approach will ensure that technically based skills and knowledge are delivered to pregnant woman on an on-going basis through local health practitioners and NGO volunteers.

CHAPTER SIX: CONCLUSION

6.1 Summary

The most important time in a human's development is the 1000 days between conception and two years of age. The correct nutrition during this period is critical for shaping a child's healthy and productive life (1000 DAYS, 2011). The maternal diet requires additional nutrients to maintain maternal stores and facilitate the growth and development of a healthy baby (Mukhopadhyay & Sarkar, 2009; Williamson, 2006). Maternal underweight due to malnutrition is the primary cause of LBW in babies; which leads to impaired growth and development (Fowles & Gabrielson, 2005; Imdad, et al., 2011; Williamson, 2006). Unless catch up growth is experienced by the age of two; which is unlikely in poor rural areas such as Pirganj Bangladesh, the child and their future will be permanently stunted and the cycle of malnutrition will persist.

During pregnancy a woman's food consumption practices and hence her nutritional status is influenced by multiple underlying factors called foodways. Foodways are made up of interrelated social, economic, cultural and environmental factors and are therefore contextually specific to each individual or community. Foodways are complex and multi-layered, and their relationship to one another must be understood to sustainably address malnutrition. Previous research has firmly established the high prevalence of maternal malnutrition and limited food intakes in rural Bangladesh. However, less is known about the underlying reasons 'why' women are not consuming enough nutritious foods during their pregnancy.

This research study aimed to gain an in-depth understanding of how household crop harvesting, cultural taboos, and beliefs may impact on the dietary diversity, eating habits and food consumption practices of pregnant woman living in Pirganj, Bangladesh. This research was extremely worthwhile in Pirganj upazila because of the existing high malnutrition rates, clusters of ultra-poor Adivasi groups resident in this area and because little is known about the underlying factors that may contribute to

maternal malnutrition in this area. The findings from this research study were used as the basis of several interventions in the on-going ONDP project. Subsequent to the completion of this formative research study, the ONDP project has been implemented in the Pirganj community and aims to reduce the cycle of malnutrition by providing malnourished women with a supplementary food intervention. The findings from this research study were able to inform the availability of local foods for use in the production of the supplementary food product; the food consumption practices and habits of pregnant women and hence the gaps in their diets which the intervention are expected to improve; and the local food taboos and beliefs specific to the Pirganj community which have been incorporated into educational materials that are used in this project.

The research tools used during this research study were a mix of innovative quantitative (demographic questionnaire, ten seed technique), qualitative (focus group discussions and participant photographic observation) and mixed (individual dietary diversity scoring) methods. The mixed method approach was effective in gaining a holistic understanding of underlying factors which influence the pregnant woman's food consumption practices (*figure 1.4*). By cross referencing between the quantitative and qualitative methods, findings were complementary to each other and provide an enriched understanding of the research aim (Happ, et al., 2006). The combination of tools used were appropriate to meet the study objectives (*figure 3.1*) while taking into account the study setting (rural villages, resource poor, trans-cultural) and population group (female, low literacy, ethnicity).

6.2 Findings

The findings from this research study met the research aim and will be concluded below according to the four objectives stated in chapter one (*section 1.6*).

Dietary Diversity: Based on the results of this study, the dietary diversity of pregnant women in Pirganj is low since their diet is monotonous and based heavily on rice. The

mean total dietary diversity score was 5.9 (from a possible 14 food groupings) while the mean FVS was 7.2 (from a possible 105 individual foods). This indicates that although the women did have access to staple food groups (cereals and grains; white tubers and roots; fats and oils; and seasonal vegetables), the variety of individual foods eaten from within the groups was limited. Usually only one food item was ever consumed from any single food group resulting in poor food variety and thus low dietary diversity and diet quality. The results from this study show similar dietary diversity scores and FVSs compared with other studies in similar resource poor areas. These similar studies calculated mean dietary diversity scores within the range of 3 to 8 (Arimond, et al., 2009; Arsenault, et al., 2013), and mean FVSs between 4.9 to 8.3 foods (Saibul, et al., 2009; Savy, et al., 2005; Steyn, et al., 2012), and also concluded that the participants in their studies had low dietary diversity. Intakes of food groupings rich in vitamin A and iron were very low. The Adivasi group had an even lower mean dietary diversity score and mean FVS compared with the Bengali group, indicating that their diet is less likely to be meeting energy and micronutrient requirements during pregnancy.

Household harvest: In order to determine the household production of food crops, different food crops and the relative quantities grown by all households in the study was established by producing a harvest calendar. Most of the pregnant woman in the Pirganj area harvested some variety of food crops at the household level throughout the year. The largest proportion of crop harvested was rice with two main harvest seasons each year, confirming the importance of rice in the Bangladeshi diet. Micronutrient dense crops such as eggplant, pumpkin, bean and banana, were harvested in small proportions compared with rice. This proportional difference (between rice and other nutrient dense crops) was clearly shown in the women's low dietary diversity score and FVS as their habitual intake of nutrient dense crops was limited and reliant on the seasonal availability of what they grew. Unfortunately, none of the women were responsible for which crops or when the crops were harvested. Therefore they have limited control over what food is available to them in their household on a day-to-day basis, including during pregnancy. The harvest calendar can

be interpreted to illustrate when local crops are available and thus indicate potential interventions to better utilise these crops and increase the diversity of the women's diet. It is evident that the women have access to rice, however, an educational change to increase the volume and the variety of nutrient dense fruits and vegetables harvested at the household level will increase their availability and the quality of the women's diet.

Eating habits: A three meal daily eating pattern was evident amongst pregnant women in Pirganj and should be encouraged to increase the likelihood of meeting their increase energy and nutrient demands. A meal usually consisted of a plate of boiled white rice with small portions of *tor kari* (seasonal vegetable curry that sometimes included egg or fish (once or twice a week) or animal meat (once every three months)) and *bhorta* (mashed vegetables with spice). Women (predominantly Adivasi groups) would consume the same food at lunch time as what was cooked for breakfast. Cooking food once in the morning for both breakfast and lunch was mainly to reduce costs and save time to allow women to earn an income or complete household responsibilities. During pregnancy women try to increase their consumption of foods which they consider as being healthy; including fruit such as apple, orange and bananas and green leafy vegetables, milk, eggs and meat. However, whether this is actually practiced is dependent on each individual's access to and the availability of these foods. The availability of foods for the women's consumption is dependent on seasonal availability and purchases made from the market by the family provider (usually the husband). Although women usually eat last at meal times in the Bangladeshi culture, over a third of the women's families encouraged them to eat first during their pregnancy which is different from previous research findings (Chen, et al., 1981; Piechulek, et al., 1999; Raman, 1988; Shannon, et al., 2008). This change in practice may give the women increased access to more nutritious foods and may indicate that traditional practices are changing and the social status of women is improving during pregnancy in this rural area of Bangladesh. Local health services and NGOs (BRAC volunteers) provided women with supplements during their pregnancy, with women consuming iron tablets most regularly. Normal physiological effects of

pregnancy, such as fatigue, nausea and vomiting were found in these already vulnerable pregnant women and resulted in additional avoidance of nutritious food throughout pregnancy. These physiological effects can override nutrition advice or planned practices the women were attempting to carry out and subsequently further restrict their already limited diet.

Beliefs and taboos: The findings from this study indicated that the women were able to list foods which they believed to be healthy, in particular fruit, milk, eggs, green leafy vegetables and meat, but were lacking understanding about nutrient details and their importance in the pregnant woman's diet. Women had a general understanding about the nutritional dependency of the baby on the mother whilst in the womb; however, their knowledge did not include which nutrients are important and how they are important for the baby's growth and development. Several cultural beliefs and taboos were in place surrounding food intake during pregnancy in this community. The results revealed that the most prominent taboo is the belief that cutting food during an eclipse can cause their baby to be born with a cleft lip or deformed features/limbs. Women also believe that breaking an egg shell while pregnant can cause their amniotic sac to break early during labour and that the amniotic fluid may splash their midwife's face, which is embarrassing and socially unacceptable. Healthy foods (milk, egg and banana) can cause their baby to have light 'beautiful' skin, whilst consuming rice, *muri* and *khoi* can cause their baby to have dark 'ugly' skin. Cold food can make the delivery difficult/painful while hot food (especially milk) can make it easy. Other beliefs were discussed, however many were only known by select women (e.g. eating chicks causing pneumonia in the baby) or known by only the Bengali groups (e.g. eating joint bananas causing the birth of twins or eating pineapple and papaya can cause an abortion). Specific beliefs resulting in food restriction were less rigid than expected and demonstrate that every individual has varying foodways that may be influenced by underlying factors. As in previous research, women believed that if they ate nutritious foods their belly and baby will be large and delivery will be difficult (Choudhry, 1997; Piechulek, et al., 1999; Shannon, et al., 2008; Sood & Kapil, 1984). However, in this research study the majority of women understood the importance of consuming

nutritious foods during pregnancy and believed the good health of their baby was the most important outcome of their pregnancy and therefore did not restrict their food intake for this purpose. All women described eating restrictions due to their religious beliefs (including *Ramadan*); however, most women indicated that they did not follow these restrictions when they were pregnant which is to the benefit of the mother and baby. Family members and local village health practitioners have the most influence on women's nutritional knowledge and health care practices during pregnancy. They advised the women to consume healthy foods and to reduce their work load during pregnancy; however, whether this was actually practiced was dependant on the individual's underlying economic and societal circumstances.

6.3 Use of findings in the Optimal Nutrition During Pregnancy project

The ONDP project aims to identify the correlation between maternal nutrition and child growth faltering, and to identify the impact of an intervention (supplementary food) on maternal and child nutrition status in Pirganj. By using the ecological model, the findings from this study are shown to inform the ONDP projects study interventions across multiple levels, including data collection tools, supplementary food design, education materials, training of facilitators and collaboration with local services/organisations, which incorporates every level of the ecological model – from the individual through the societal levels. Figure 6.1 below demonstrates how the findings from this research study were incorporated into individual, relationship, community and societal levels.

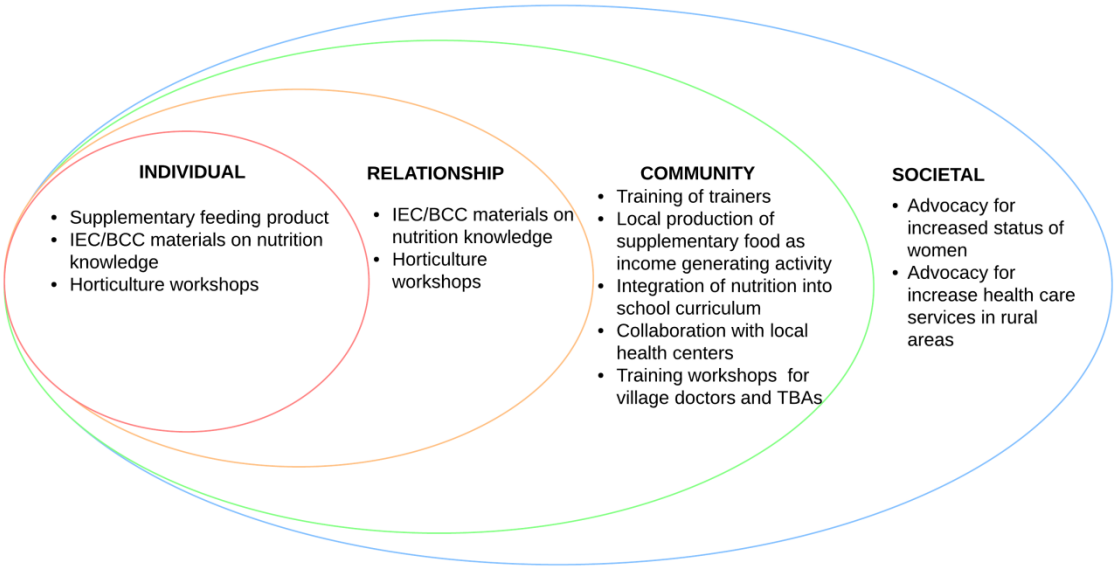

Figure 6.1 Application of the research findings to the Optimal Nutrition During Pregnancy project using the ecological framework.

Individual: The major intervention in the ONDP project is the development of and intervention with a supplementary feeding product (named '*Pushti Khadda'*, Bangla for nutritious food), given to pregnant women who are identified as being malnourished. *Pushti Khadda* was designed to include foods which the majority of women identified during the focus group discussions of this research study as their favourite food and also associated as being nutritious (e.g. lentils, milk and banana); while still conforming to the WHO guidelines of macro and micronutrient content required in supplementary products. The supplementary food is based on locally available foods which were identified during the harvest calendar, IDDQ, and market visit; therefore its production will be sustainable by the community and accessible to all women if they want to replicate it themselves.

Aspects of the women's nutritional knowledge, health care and cultural practices which were found in this research study helped design Information, Education, Communication/Behaviour Change Communication tools, such as:

- a health care monitoring card (encouraging women to attend health care examinations and take supplements during pregnancy),

- posters informing about micronutrient rich foods easily grown and available in the area (e.g. mango, potato, banana, eggplant, gourd and beans which were identified in the harvest calendar and IDDQ),
- a leaflet informing about good care practices during pregnancy (e.g. increase food intake by adding a meal each day or nutritious snacks (fruit, tamarind, biscuits),
- making savings to pay for doctor/hospital/transport if complications arise during pregnancy/delivery,
- increase rest and restrict physically demanding work,
- purchase iodised salt.

All of these are recommendations identified from the findings in the focus group discussion.) The tools will encourage women to consume sufficient amounts of nutritious foods and to diversify their diets by consuming more locally available and accessible foods (lentils, nuts, seasonal fruits, seasonal vegetables, eggs and milk). Current taboos and superstitions need to be approached with caution as they stem from traditional and cultural beliefs and therefore are not easily modified. Therefore, women will be provided with advice about alternative food choices which don't cause conflict with beliefs and practices. All health care and nutrition information will be delivered in the women's homes and during community workshops by ONDP staff.

Relationship: The findings from this research study show that family members (especially husbands) have a large influence over what food is available to the woman during her pregnancy (husband responsible for harvest and purchase of household food). They also influence the level of support the woman receives to increase the quality and quantity of food and care during pregnancy (family members advise women to consume nutritious food and increase rest, and family hierarchy of eating at meal times were both identified during focus groups). Therefore family members and especially husbands will be involved in community workshops focused on increasing their knowledge about the importance of the women's nutrition during pregnancy. If family members have an increased understanding of the importance of nutrition during pregnancy and are aware of nutritious behaviours and practices readily

available in to them, they are more likely to feel empowered and provide beneficial support.

Community: The ONDP project staff will consist of one project manager, two supervisors and eight village facilitators. The staff will be involved in collecting anthropometric data, recruiting women into the ONDP intervention, delivering Pushti Khadda and facilitating the community health and nutrition workshops. Therefore before the ONDP started, a week long training session was provided to all eleven staff members to ensure the quality of their technical nutrition and research knowledge. The training incorporated findings from this research study such as locally harvested crops (from harvest calendar), information on food groups lacking in the women's diets (from IDDQ) and therefore what to advise as accessible alternatives (e.g. lentils, orange/yellow coloured fruits and vegetables, banana flower, milk) which did not cause conflict with food taboos, and how they can encourage beneficial health practices by the women during pregnancy (e.g. consume more and a wider variety of foods, increase rest, take supplements (especially, iron/folate and vitamin A) during pregnancy, attend health examinations).

A collaborative relationship has been built with local schools to teach health and nutrition as part of the curriculum. Schools provide the ideal opportunity to reach both male and female children and empower them with knowledge and behaviours which will change the malnutrition cycle even before pregnancy. A collaborative relationship has also been established with local health centres. World Vision will refer pregnant women who are malnourished or require an examination/medical attention to the local health centres. In return the health centres will support the ONDP project by providing health care and collecting additional study data (e.g. anthropometric, haemoglobin, disease record). Photographs of the consultation process with local schools and representatives from local health clinics are pictured in figure 6.2.

Figure 6.2 Consultation process (for the ONDP project) with local schools (left) and a representative from a local health clinic (right) to establish collaborative relationships.

Societal: This research has provided an understanding of cultural and religious practices and their influence has been considered at all underlying levels.

World Vision and the ONDP project will advocate for the increased social status of women within poor rural areas and the priority of increasing access to quality health care services for pregnant women in rural areas.

6.4 Limitations

The trans-cultural setting was a major factor in this research study. To mitigate the possible trans-cultural barriers the study was designed and data collection tools were selected to best meet the study objectives in the specific population group (pregnant females, low literacy, and rural resource poor area). This study employed a strong mixed method approach which was simple to facilitate, non-intrusive, and the findings produced were complementary to one another. A lengthy preparation and consultation process *(section 3.6*) was followed before this study commenced to ensure the researchers cultural appropriateness, to build report between the researcher, World Vision, community members and potential participants, and to follow ethically appropriate procedures. Despite these preparations, it is important to realise that there are gaps existing between cultures which persist and may impact the understanding and interpretation of data gathered in such research contexts. Research

in future transcultural settings should also allow ample time before data collection commences to build rapport and learn cultural sensitivities and to ensure the best possible interpretation of research results.

Observers (neighbouring village members) were often present in the surrounding areas where the focus groups were held (household court yard). This was due to uncontrollable circumstances such as, high unemployment rates in the communities, the large population density even in rural villages and the villagers' curiosity of the research/researcher. At the start of each data collection session the observers were informed about the study and given the opportunity to ask any questions. Once data collection was ready to commence the facilitators or a local World Vision volunteer would explain the confidentiality issues and politely ask the observers to provide privacy during the data collection period. However, it was taken into account that this situation may impact on the participants and their eagerness to share information.

Translation/transcription of the focus group discussions was a lengthy process but essential to ensure data collection was accurate and in depth. There is always the risk of misinterpretations through this three-way process between participants, facilitators and the researcher, therefore it is critical to ensure that transcribed data is as accurate as possible. Four 30 minute sections were re-transcribed by a Bangladeshi once back in New Zealand who verified that transcriptions were accurate.

This study was restricted by the geographical area of the World Vision Pirganj ADP. Therefore the findings from this research study cannot be extended to pregnant women living in other areas of Bangladesh and are specific to only the population living in the Pirganj area.

6.5 Strengths

The collaboration between Massey University and World Vision successfully fulfilled two research agendas within this research study and effectively used the strengths of

all parties involved. Staff members enjoyed and valued the research collaboration and the success of this research study demonstrates the potential of relationships formed between universities and NGOs to complete high quality research.

The mixed method study design was suitable for the context of this research study and produced holistic and valid findings which were used to shape the design and implementation of the ONDP project.

6.6 Future research recommendations

Further focus group discussions focused on food taboos and beliefs should be conducted in additional groups of the population such as mothers and mothers-in-law, male family members, and local health practitioners (village doctors, BRAC volunteers and TBAs). This would add to the information already gathered and provide varying perspectives from throughout the community. Any variations or conflicts between pregnant women and influential figures would be identified and any potential changes in traditional beliefs or practices would be discovered.

The IDDQ proved to be an effective research tool in this setting. However, its implementation in this research study only measured food intake over a single 24 hour period. Additional data collection should occur at intervals throughout the year to provide data on the difference in seasonally consumed foods to further analyse usual eating habits.

In addition to the harvest calendar, the ten seed method could be used to provide additional information on what and when food is obtained via other food-coping strategies, such as gathering, trading or purchasing.

An effective method to further explore this research study's problem statement would be the use of a long term observation method. This would provide in-depth objective

findings about the daily practices, habits and beliefs the women follow during pregnancy and their interactions with the ecological environment.

Interventions should be multi-disciplinary and therefore it is recommended for the ONDP project to partner with World Vision livelihood program, which is already established in the Pirganj area. This could be achieved by providing horticulture workshops to the communities. Women should be encouraged to become more involved in the decision making towards family food procurement. Horticulture workshops can include education on harvesting a larger variety of nutrient dense crops and rearing of small animals to improve the women's and their family's access to a more diverse diet. Family members should also be involved in horticulture workshops and work in collaboration with women to harvest and rear additional nutritious food for their family.

Additional studies in other pregnant population groups could provide information on the possible differences between other ethnic groups, between regions, or between rural an urban locations.

6.7 Conclusion

This aim of this research was to 'investigate the food consumption practices of women during pregnancy and the role of traditional eating habits and taboos in the maternal diet in rural Bangladesh (Pirganj, Rangpur)' and was met throughout the course of this study. In conclusion, this research study has found that food consumption practices, habits and taboos, are an integral part of the Pirganj women's culture and are specific during the time of pregnancy. The women's food habits were influenced by cultural beliefs and a low dietary diversity that was driven by the limited household harvest of nutrient dense crops, which can further limit nutrient intake and increase malnutrition. Some women were able to make positive nutritional changes to their diet during pregnancy; however, the overriding factor in this community which limits healthy behaviours during pregnancy was economic restrictions. Therefore increased access to

a greater variety of nutrient dense foods grown at the household level must be achieved through expanding the woman's and their community's knowledge and positive practices to better utilise available foods and resources. The findings of cultural beliefs and traditional taboos specific to pregnant women living in Pirganj can be used to the women's advantage by using innovative strategies to maximise positive habits, beliefs and practices and enhance diet diversification.

The findings from this research study confirmed the importance of investigating the multiple underlying factors of malnutrition in relation to how the factors can influence the women's food consumption practices and therefore the nutritional status of pregnant women living in Pirganj *(figure 1.4).* Although some findings in this research are shared with other studies in Bangladesh, the in-depth exploration in this research setting lead to the discovery of contextually specific findings (local crop harvest, local diet, unique habits, beliefs and practices). This confirms the importance of formative research in the same population when designing a nutrition intervention (ONDP project). By completing this formative research study which incorporated an exploration of social, cultural, and environmental factors of malnutrition, it allowed the ONDP project to become a more targeted and sustainable programme. The ONDP project is more likely to successfully improve nutrition during pregnancy and therefore break the malnutrition cycle.

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Appendix A: Consultation letter from Dr Ali Ajmol

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To whom it may concern

I was delighted to be approached by Moniek Kindred and her supervisors to consult on the following research project:

Investigating the food habits and beliefs of pregnant women living in rural Bangladesh

During the consultation we discussed many aspects of living and conducting research in Bangladesh as well as food habits and cultural aspects which were relevant to her project. The following points highlight the issues which were discussed:

- Background information on Bangladesh, its location, setting and the diversity of the Bangladeshi culture
- Appropriate dress code for a Caucasian female to wear when in Bangladesh
- Types of foods eaten, preparation of foods and influence of poverty on food habits in Bangladesh
- Internet access and contact with supervisors or myself whilst in Bangladesh
- Rural community living conditions, sanitary arrangements and hygiene (advised to carry bottled water, hand sanitizer, water purification tablets, basic first aid equipment)
- Cultural beliefs regarding pregnancy, food, religion and celebrations
- The importance of families and hierarchy
- The working roles of men and women in society
- The effect of season on food choice

I was born in a rural village in Bangladesh (not unlike the region where Moniek will be based) before emigrating to the UK at a young age. I have since visited Bangladesh numerous times and still maintain close ties with my family who still reside there. I am therefore well placed to advise Moniek on safety and cultural aspects as well as nutrition-related topics.

I am happy to provide ongoing consultation and support for Moniek during her project. I look forward to hearing about her results and wish her well with the research and her travels.

If you require any further information then please do not hesitate in contacting me.

Yours faithfully

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Appendix B: Transcriber's/translator's confidentiality agreement

Investigating the Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

TRANSCRIBER'S/TRANSLATOR'S CONFIDENTIALITY AGREEMENT

I ..... (Full Name - printed) agree to translate and/or transcribe during the individual interviews, focus groups and the recordings provided to me.

I agree to keep confidential all the information provided to me.

I will not make any copies of the transcripts or keep any record of them, other than those required for the project.

Signature: ..... **Date:** .....

Appendix C: Participant information sheet

Investigating the Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

PARTICIPANT INFORMATION SHEET

(Demographic Questionnaire, IDDQ, Harvest Calendar, Focus Group Discussion)

The researcher for this project is Moniek Kindred. The research she is completing will contribute to her Masters qualification at Massey University in New Zealand. Moniek is conducting research under the umbrella of World Vision, which is a non-governmental organisation that works in many regions of Bangladesh.

The research will look at food availability, eating habits and beliefs of pregnant women living in rural Bangladesh. You have been chosen to take part in this study because you are female, are pregnant and live in the Pirganj Upazila. If you choose to take part, it will involve being asked a few questions about you, your home life and the foods you eat. We will also ask you to be part of a group with 3-5 other pregnant women. With the other women you will be asked to complete a simple task of putting seeds into cups representing the seasons when the crops you plant and eat are available. After this task, you will be talking in the group about what you believe one should eat and do during your pregnancy. This will be tape recorded but we will not be able to link what is said in the group to any particular woman. After the group meeting Moniek and the translator will make written copies of the group discussion using the tape recordings regarding all the information you shared, but without any names individually linked to the focus group discussion. Your name will only be recorded once on a sheet with an allocated identification number. This sheet will be separate to any other research materials.
The information you provide will increase our understanding of what and when foods are eaten by pregnant women in a rural Bangladesh as well as any traditional habits or beliefs that may affect your food intake. A summary of the information collected will be given to World Vision to allow them to plan ways in which they can help women to eat well during pregnancy. The study results will be made available for you and your community via World Vision staff, once the research paper has been written.

The questions we need to ask you will take about 30 minutes and then the group tasks and discussion will take about 2 hours.

Taking part in this project is completely voluntary and you can stop taking part at any time without telling us why. If you do not want to take part or choose to pull out at any time during the research, this will not have any effect what so ever on the work World Vision or other NGO's are doing in your village. All information you provide will be kept confidential and you will not be

identified in any way when presenting the results of this project. If you, your family members or community has any worries

or questions about the research during any part of the study, please feel welcome to voice your opinions to the translator or any World Vision staff member, who will pass the information on to Moniek (researcher), who will address them.

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any question;
- withdraw from the study at any time
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used, and that all information will be treated as confidential by the researchers and translators;
- be given access to a summary of the project findings once it is finished.

We would like invite you to participate in this research study. If you would like to take part in this research, please listen to the agreement and sign the consent form.

Please contact the researcher or either of her university supervisors at any time if you have any queries or concerns about this research project.

Researcher = Moniek Kindred, mon.kindy@gmail.com
Principle supervisor = Rozanne Kruger, R.Kruger@massey.ac.nz
Assistant supervisor = Cathryn Colon, c.conlon@massey.ac.nz
Massey University = +64 6 350 5701

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 11/064. If you have any concerns about the conduct of this research, please contact Dr Ralph Bathurst, Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x 9570, email humanethicsnorth@massey.ac.nz.

Appendix D: Participant consent form/confidentiality agreement

Investigating the Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

PARTICIPANT CONSENT FORM/CONFIDENTIALITY AGREEMENT

The information about this project has been explained to me and I have had the opportunity to ask questions. I've also been made aware that I can ask questions at any time, that I can refuse to answer a question and that I can withdraw from the study at any time.

I agree to the group discussion being sound recorded

I agree that information discussed as part of the group is confidential.

I agree to take part in this study which has been explained to me.

Identification number: [__][__]

Signature: …… **Date:** ……

Alternative mark or fingerprint

Appendix E: Demographics questionnaire

Investigating Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

CONFIDENTIAL

All information collected in this survey is strictly confidential and will be used for statistical purposes only

DEMOGRAPHICS QUESTIONNAIRE

1	ID number	[__][__]	
2	Date of birth Age	___/___/_____ YEARS [__][__] 99 = DON'T KNOW [__][__]	
3	What is your current marital status?	1 = CURRENTLY MARRIED [__] 2 =SEPERATED 3 = DESERTED 4 = DIVORCED 5 = WIDOWED 6 = NEVER MARRIED	
5	How many children do you have and what are their ages?	NUMBER OF CHILDREN [__][__] AGES [__][__] [__][__] [__][__] [__][__] [__][__] [__][__] [__][__] [__][__] 99 = DON'T KNOW [__][__]	
6	How many times have you been pregnant?	NUMBER OF PREGNANCIES [__][__] (Including abortion or miscarriage)	
7	Have you ever attended school?	1 = YES [__] 2 = NO →	**If no, skip to Q10**
8	What is the highest level of school you have completed?	1 = PRIMARY [__] 2 = SECONDARY 3 = COLLEGE AND HIGHER	
9	What is the highest class you completed at that level?	CLASS [__]	

10	What is your religion?	1 = ISLAM [__] 2 = HINDUISM 3 = CHRISTIANITY 4 = OTHER _____	
11	What is your ethnicity?	_____	
12	How many people live in your household? (Household defined by those that share the same cooking space)	NUMBER OF PEOPLE [__][__] ADULTS [__][__] CHILDREN [__][__]	
13	Who is responsible for the majority of the cooking in the household?	1 = YOURSELF [__] 2 = HUSBAND 3 = YOUR PARENTS 4 = YOUR HUSBANDS PARENTS 5 = YOUR CHILD 6 = OTHER _____	
14	Who is responsible for growing/harvesting most of the food for the household?	1 = YOURSELF [__] 2 = HUSBAND 3 = YOUR PARENTS 4 = YOUR HUSBANDS PARENTS 5 = YOUR CHILD 6 = OTHER _____	
15	Who is responsible for buying most of the food for the household?	1 = YOURSELF [__] 2 = HUSBAND 3 = YOUR PARENTS 4 = YOUR HUSBANDS PARENTS 5 = YOUR CHILD 6 = OTHER _____	
16	Aside from your own housework, do you work outside the home?	1 = YES [__] 2 = NO →	**If no, skip to Q20**
17	If yes to 16, what type of work do you do outside of home?	1 = RICE/CROP FARMER [__] 2 = ANIMAL RAISING/SALE Of ANIMAL PRODUCTS 3 = FISHING 4 = WAGED LABOUR/ CASH INCOME 5 = SKILLED WORK 6 = SALARIED WORK 7 = SMALL BUSSINESS OWNER 8 = GATHER GOODS FROM FOREST 9 = HUNTING 10 = COLLECT FIREWOOD/CHARCOAL 11 = MONEY LENDING 12 = OTHER _____	

18	If yes to 16, whose land do you work on?	1 = OWN [__] 2 = FAMILY OWNED 3 = RENTED 4 = SOMEONE ELSE OWNS LAND 5= N/A	
19	Are you able to use the land that you cultivate?	1 = YES [__] 2 = NO	
20	Are you the main income earner in your household?	1 = YES → 2 = NO [__]	**If yes, skip to Q22**
21	If no, who is the main income earner?	1 = HUSBAND [__] 2 = PARENTS 3 = CHILD 4 = OTHER _____	
22	What is your household's main income source?	1 = RICE/CROP FARMER [__] 2 = ANIMAL RAISING/SALE Of ANIMAL PRODUCTS 3 = FISHING 4 = WAGED LABOUR/ CASH INCOME 5 = SKILLED WORK 6 = SALARIED WORK 7 = SMALL BUSSINESS OWNER 8 = GATHER GOODS FROM FOREST 9 = HUNTING 10 = COLLECT FIREWOOD/CHARCOAL 11 = MONEY LENDING 12 = MONEY FROM AID ORGANISATION 13 = OTHER _____	
Thank you for your time.			

Appendix F: Individual Dietary Diversity Questionnaire

Investigating Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

INDIVIDUAL DIETARY DIVERSITY QUESTIONNAIRE (IDDQ)

(Adapted from FANTA HDDQ and Bangladesh DHS)

Identification number: [__][__]

Was yesterday a celebration or feast day or a personal celebration where you ate special foods or where you ate more, or less than usual?	1 = YES [__] 2 = NO	**If YES, arrange another time to complete the questionnaire.**

Please complete the form below indicating the foods (breakfast, lunch, dinner and snacks) that you ate yesterday during the day and night, whether at home or outside the home. (CIRCLE ALL FOOD GROUPS AND FOODS CONSUMED, ADD IN ANY EXTRAS ON DOTTED LINE)

Group Number	Food group	Examples
1	CEREALS AND GRAINS	bread, noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat .....
2	VITAMIN A RICH VEGETABLES AND TUBERS	pumpkin, carrots, squash, orange sweet potatoes, *sweet pepper, red Chili pepper,* paprika, red amaranth .....
3	WHITE TUBERS AND ROOTS	white potatoes, arum root, cassava, or foods made from roots. .....
4	DARK GREEN LEAFY VEGETABLES	celery leaves, arum leaves, pumpkin leaves, bottle guard leaves, carrot leaves celery leeaves, spinach, kang kong, tamarind leaves .....
5	OTHER VEGETABLES	onion, cucumber, eggplant, celery, tomato, snake gourd, bottle gourd, raddish, sweet gourd, celery, bitter gourd, peas, lettuce, cauliflower, cabbage, ladies fingers, green papaya, green banana, country bean .....
6	VITAMIN A RICH FRUITS	ripe mangoes, cantaloupe, dried apricots, dried peaches, orange papaya, guava, palm (tal), monkey jackfruit, watermelon, banana flower .....
7	OTHER FRUITS	wild fruits, bananas, apples, grapes, pomegranate, jackfruit, berries, litchi, lemon , orangem mandarin, grapefruit, pineapple, jujube .....
8	ORGAN MEAT (IRON RICH)	liver, kidney, heart or other organ meats or blood-based foods .....

9	FLESH MEATS	beef, pork, lamb, goat, mutton, rabbit, wild game, chicken, duck, pigeon or other birds		
10	EGGS			
11	FISH AND SEAFOOD	fresh or dried fish (hilsa, bhetki, silver fish, ruhi) or shellfish, sweet or salt fish, smoked fish paste, fermented shrimp paste		
12	LEGUMES, NUTS AND SEEDS	beans, soybeans, peas (pulse), chickpeas, lentils, nuts (peanuts, cashew, pistachio), seeds(sesame, pumpkin, sunflower, jackfruit) or foods made from these		
13	MILK AND MILK PRODUCTS	milk, cheese, yogurt, milk powder or other milk products like curd, misti doi, UHT milk		
14	OILS AND FATS	oils, fats or butter added to food or used for cooking, ghee, coconut and coconut products, mustard seed oil		
15	Did you eat anything **outside** the home yesterday?		Yes No →	If yes, go to Q16
16	If yes, what did you eat outside the home yesterday?	_____ _____		
Thank you very much for participating in this part of the survey!				

Appendix G: Focus group schedule

Investigating the Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

FOCUS GROUP SCHEDULE

Date: _____

Time: _____

Village: _____

Facilitator: _____

Introduction:

I would like to thank you all again for coming to this group meeting. My name is _____ from World Vision organisation, and I am conducting discussion groups on behalf of Moniek Kindred from Massey University in New Zealand. As mentioned this morning, Moniek is collecting research on food habits, beliefs and taboos in pregnant women living in rural Bangladesh. World Vision can then use the information collected to contribute to more effective nutrition programmes they run in your communities and throughout Bangladesh.

Having you here to discuss and contribute to this focus group is the best way to explore and understand different food habits, beliefs and taboos you may have while you are pregnant. Even if you are unsure about any topics which may come up, all views, experiences and opinions are valuable to this research, so please don't feel shy during the discussion and feel free to bring up all aspects you may be thinking of. There is no right or wrong answer to any sections which will be covered.

As discussed in the consent form, your participation in this group discussion is completely voluntary. If you prefer not to be part of this meeting, you are free to leave at any point. However, we value and appreciate everyone's views and hope you will stay and share your thoughts. The information collected today is confidential. It will have no direct link to any individual and will only be used for research purposes. All information collected will be securely stored and only accessible by the research team.

For the first 30 minutes of this meeting I will ask you to help complete a harvest and consumption calendar. You will each be given 10 seeds which I will ask you to place in a container corresponding to a month of the year depending on when you harvest and consume a variety of crops. We will then move onto the main discussion of the meeting. This will involve a series of questions which you can all discuss together for two hours and a half.

During the discussion, _____ will be taking notes and reminding me if I forget to ask something. However, so that he does not have to worry about writing down every word, we would also like to tape record the discussion. This will later be referred to for research purposes, but please do not be concerned, as the recording will remain completely confidential. Is it okay with everyone that the discussion is tape-recorded? (Ensure everyone consents to recording).

It is also important that we try to let only one person talk at a time so that we do not miss anything. We will not be going around the room so please just join in when you have something to say. We would like to hear about as many opinions and experiences as possible, so feel free to disagree with others and share your own opinions.

The meeting will run for a total time of two hours. Does anyone have any questions before we start?

➜ = Leading comments to help the focus group facilitator get an accurate response
* = Sub-questions to be asked after the main question in order to get additional in-depth information

General knowledge/Icebreaker

- 1 Can you tell me what you think a healthy diet is?
  .....
  .....
  .....

- 2 What is your favourite food? (ask everyone in group)
  .....
  .....
  .....

- 3 What foods do you dislike? (ask everyone in group)
  .....
  .....
  .....

- 4 Describe your usual eating pattern throughout a day when you are not pregnant
  .....
  .....
  .....
  (➜ Breakfast, lunch, dinner, snacks, timing of meals)

2. Food practices during pregnancy

- 5 Does what you eat change when you are pregnant?
  YES/NO .....
  * How? (for each change mentioned)
  .....
  .....
  .....
  .....
  (➜ Timing of meals, preferences of food)

  * Why? (for each change mentioned)

.....

.....

.....

(➔ No appetite, was told not to eat certain foods, feeling nauseous, always hungry)

- 6 Did you make any of the changes mentioned above because this was what you were told to do?
YES/NO

  .....

  * What changes were they?

  .....

  .....

  .....

  * Why? (for each change mentioned)

  .....

  .....

  .....

  * Who told you to make these changes while pregnant?

  .....

  .....

  .....

  (➔ *Parents, relative, doctor neighbour, clinic nurse*,)

- 7 Is it important to eat while you are pregnant?
YES/NO

  .....

  * Why?

  .....

  .....

  .....

  (➔ *babies growth and development, mothers health, build fat stores for breastfeeding*)

  * What is important to eat specifically?

.....

.....

.....

(➔ specific nutrients, food groups, carbohydrates, meat, vegetables)

- 8 Is how many meals you eat every day important while pregnant?
  Number of meals =

  .....

  * Why?

  .....

  .....

  .....

- 9 Does what you eat have an effect on your baby once it is born?
  YES/NO

  .....

  * How?

.....

.....

.....

  * Why?

.....

.....

.....

- 10 Are there any foods which can harm your baby while you are pregnant?
  YES/NO

  .....

  * What are they and how can they harm your baby?

  .....

  .....

  .....

  (➔ cause miscarriage, improper development)

- 11 Are there specific foods you should eat while pregnant to help your baby grow? YES/NO.....

  .....

  * What are they and how do they help your baby grow?

  .....

  .....

  .....

  (➔ *nutrients, herbs, proteins, fats)*

- 12 Should you eat any specific foods while pregnant for any other reason than the growth of your baby?
  YES/NO.....

.....

  * What are they?

  ……

  ……

  ……

  * Why?

  .....

  .....

  .....

- 13 Are there specific foods that should be eaten during early pregnancy? (First three months)
  YES/NO

  .....

  * What are they and why?

  .....

  .....

  .....

- 14 Are there specific foods that should be eaten during late pregnancy? (last three months) YES/NO

  .....

  * What are they and why?

  .....

  .....

  .....

- 15 Do you know of any foods which may have an influence on the birthing/labour process?
YES/NO.....
.....

  * What are they and what influence do they have?

  .....
  .....
  .....

  (➔ *foods which make the labor easier etc)*

- 16 Are there any foods you can eat to help you become pregnant?
YES/NO.....
.....

  * What are they?

  .....
  .....
  .....

- 17 Are there any food harvesting or cooking jobs that you do which change while you are pregnant?
YES/NO

  .....

  * What are they?

  .....
  .....
  .....

  * Why do they change?

  .....
  .....
  .....

  (➔ *physically can't do it because of tummy size, unsafe, unhygienic)*

- 18 Do you eat any herbs, traditional medicines or tablets to influence your pregnancy?
YES/NO

  .....

  * What are they?

.....

.....

.....

(➔ *iron, protein, plant pastes, powders, infusions)*

* Why? (for each answer above)

.....

.....

.....

3. Eating habits

- 19 Describe your eating habits during religious festivals (e.g. Ramadan, Eid, Pujar, Lent), while you are pregnant?

.....

.....

.....

(➔ *do they change? eat more, eat less, any special celebrations food*)

- 20 At what meal time do you eat the most?

.....

.....

.....

(➔ *Breakfast, lunch, dinner)*

* Why?

.....

.....

.....

- 21 Do you eat snacks between meals?
YES/NO

.....

* What do you eat?

.....

.....

.....

(➔ *Drink, sweets, fruits, supplements)*

- 22 Who gets food priority at meal times?

.....

.....

.....

(➔ Men, children, elderly)

* Why?

.....

.....

.....

- 23 Do you eat enough food while you are pregnant?
YES/NO

.....

* Why?

.....

.....

.....

- 24 Would you like to be able to eat more?
YES/NO

.....

* Why?

.....

.....

.....

- 25 Are there any foods that you would like to eat while you are pregnant?
YES/NO

.....

* If yes, why would you like to eat these foods?

.....

.....

.....

(➔ *will help my baby, like the taste)*

* Why don't you eat these foods?

.....

.....

.....

(➔ Cant afford it, not available all year)

- 26 Do you think the traditional ways of eating and preparing food is the best? YES/NO.....

  .....

  * Why?

  .....

  .....

  .....

- 27 Are there any traditional eating habits during pregnancy that you would like to change?

YES/NO.....

.....

  * Why?

  .....

  .....

  .....

4. Closing statement

We have reached the end of the focus group discussion. Does anyone have any questions?

.....

.....

.....

Thank you all very much for your time and opinions. Once again, the information collected today is completely confidential and will only be used for research purposes.

Appendix H: Participant information sheet (Photographic participant observation)

Investigating the Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

PARTICIPANT INFORMATION SHEET

(Photographic Participant Observation)

You have been randomly selected from a list of women who participated in the initial stage of Moniek Kindred's research on food habit and beliefs of pregnant women living in rural Bangladesh. The second stage of this study is called 'Photograph Inspection'. We would like to observe you while you cook a meal in your home which we will photograph and make written notes. The information we collect from our observation and photographs will complement the information you provided during the focus group discussion. It is important that you do not change your usual cooking habits during this process as we want to accurately record what you normally eat.

The images will be analyzed as part of the data collection for this research. The images may be used in the research summary and presentation of findings. Images will be stored in a secure location and only research staff will have access to them. They will be kept as long as they are relevant and after that time destroyed.

Taking part in this project is completely voluntary and you can stop taking part at any time without telling us why. If you do not want to take part or choose to pull out at any time during the research, this will not have any effect what so ever on the work World Vision or other NGO's are doing in your village. All information you provide will be kept confidential and you will not be identified in any way when presenting the results of this project. If you, your family members or community has any worries or questions about the research during any part of the study, please feel welcome to voice your opinions to the translator or any World Vision staff member, who will pass the information on to Moniek (researcher), who will address them.

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any question;
- withdraw from the study at any time
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used, and that all information will be treated as confidential by the researchers and translators;
- be given access to a summary of the project findings once it is finished.

We would like invite you to participate in this section of the research study. If you would like to take part in this research, please listen to the agreement and sign the consent form.

Please contact the researcher or either of her university supervisors at any time if you have any queries or concerns about this research project.

Researcher = Moniek Kindred, mon.kindy@gmail.com
Principle supervisor = Rozanne Kruger, R.Kruger@massey.ac.nz
Assistant supervisor = Cathryn Colon, c.conlon@massey.ac.nz
Massey University = +64 6 350 5701

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 11/064. If you have any concerns about the conduct of this research, please contact Dr Ralph Bathurst, Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x 9570, email humanethicsnorth@massey.ac.nz.

Appendix I: Participant consent form/confidentiality agreement (Photographic participant observation)

Investigating the Food Habits and Beliefs of Pregnant Women Living in Rural Bangladesh

PARTICIPANT CONSENT FORM/CONFIDENTIALITY AGREEMENT

The information about this project has been explained to me and I have had the opportunity to ask questions. I've also been made aware that I can ask questions at any time and that I can withdraw from the study at any time.

I agree to be photographed during this research

I give permission for my images to be used for the purpose of this research

I agree to take part in this study which has been explained to me.

Identification number: [__][__]

Signature: …… **Date:** ……

Alternative mark or fingerprint