**PROMOTING UPTAKE OF FOCUSED ANTENATAL CARE
AMONG PREGNANT WOMEN IN BANGLADESH BY
USING AN EXTENDED PROTECTION MOTIVATION
THEORY:
THE ROLE OF MOBILE COMMUNICATION**

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GLOSSARY OF TERMS

Maternal Mortality

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (ICD, 2004).

Antenatal Care (ANC)

ANC is defined as systemic supervision and care of a pregnant woman including examination and advice during pregnancy until the delivery of a child. It varies from simple health measurement to intensive health teaching and ancillary services. The aim of ANC is to assist women to remain healthy, to find and correct adverse conditions when present and thus to aid the health of the unborn (WHO/Euro, 2002).

Access to Antenatal Care

Access to antenatal care is the self-reported ability of a woman to obtain care for herself and fetus during pregnancy (Norris & Aiken, 2006). Maternal motivation is a precursor to access and utilization is the consequence of motivation and access.

Uptake of Antenatal Care

Uptake of ANC is defined as a woman receiving ANC. Uptake and utilization are synonymous. Khan and Bhardwaj (1994) define utilization as “realized access.” According to them, a woman’s potential to enter care and utilization is the quantifiable “proof” of access. Utilization is frequently used as a marker for access in research studies,

although a lack of utilization could signal lack of access or a lack of maternal motivation for care (Khan & Bhardwaj, 1994; Leatherman, Blackburn, & Davidhizar, 1990)

Maternal Mortality Ratio

The number of maternal deaths per 100,000 live births which is related to pregnancy, labor or period of 42 days after delivery (WHO, 2014).

Maternal Morbidity

Any departure, subjective or objective, from a state of physiological or psychological well-being during pregnancy, childbirth and the postpartum period up to 42 days (Last & Abramson, 1995).

Skilled Birth Attendant (SBA)

The World Health Organization (WHO, 2004) defines a skilled birth attendant as “an accredited health professional - such as a midwife, doctor, or nurse -who has been educated and trained in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns”.

mHealth

The WHO defines mHealth as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices” (WHO, 2011).

Disability Adjusted Life Year (DALY)

DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to

Disability (YLD) for people living with the health condition or its consequences (WHO, 2010).

Traditional Birth Attendant (TBA)

A traditional birth attendant (TBA) is “a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or by working with other TBAs” (WHO, 2004).

ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Care
BDHS	Bangladesh Demographic and Health Survey
BMMS	Bangladesh Maternal Mortality and Healthcare Survey
BRAC	Bangladesh Rural Advancement Committee
DALY	Disability Adjusted Life Year
EmOC	Emergency Obstetric Care
MMR	Maternal Mortality Rate
NIPORT	National Institute of Population Training and Research
PMT	Protection Motivation Theory
UNICEF	United Nations Children's Fund
UNMDG	United Nations Millennium Development Goals
WHO	World Health Organization
ITU	International Telecommunication Union
SMS	Short Message Service
BTRC	Bangladesh Telecom Regulatory Commission

ABSTRACT

Maternal mortality is still a serious problem in Bangladesh despite commendable reproductive health care improvements in the past four decades. Regardless of sound provisions for antenatal care (ANC), the focused uptake of ANC among pregnant mothers has been unsatisfactory. Research on the uptake of ANC has so far been only from the health system perspective. Although theories of health behavior highlight perceived risk as a significant factor for people to adopt health behavior, little is known about the association between uptake of ANC and perception of pregnancy complications in Bangladesh. The current research attempts to investigate the causes of maternal mortality from a behavioral perspective. A framework based on Protection Motivation Theory (PMT) is used to examine whether cognitive and socio-cultural beliefs related to pregnancy serve as a meaningful source of motivation to uptake ANC. The proposed framework extended the existing variables of PMT and added other socio-cultural variables such as social connectedness, women's autonomy and perceived social norms that may influence pregnant mothers' intention to uptake ANC. The research also sought to design and examine the effectiveness of an appropriate theory-based communication intervention aimed at promoting ANC uptake by comparing mobile platform with traditional communication channel.

The research involved two preliminary studies. The first preliminary study using a survey, and the second using a focus group design investigated ANC promoting behaviors and the need for a communication intervention in Bangladeshi context. Building upon the findings from the preliminary studies, a quasi-experimental intervention study was

conducted to examine the effects of the proposed research model after assessing it for hypothesized links. Analyses using structural equation modelling revealed a good fit for the proposed research model for intention to uptake ANC. The hypothesized links showed response efficacy, self-efficacy and social connectedness as significant predictor of intention to uptake ANC with attitude as mediator between cognitive variables (response and self-efficacy) and intention, and perceived social norm as mediator between social connectedness and intention. In the intervention, expectant mothers were assigned to conditions where the health messages were manipulated along with various platforms. Results from a two-way Analysis of Variance (ANOVA) suggested a higher change in value of response efficacy, self-efficacy, social connectedness, women's autonomy, and intention to uptake ANC after intervention in mobile platform compared to traditional platform. The differential change by threat-framed message on mobile-based platform and coping-framed message on combined platform can be explained by the power of the mobile phone in this research.

Findings of this study demonstrated that increasing the level of both cognitive and socio-cultural beliefs is important in increasing intention to uptake ANC. The results of this research are likely to contribute to deeper understanding of communication intervention to influence ANC seeking behavior by adding socio-cultural variables to PMT theory, and providing guidance to develop future new media-based interventions. It is further expected that with this new communication design, ANC uptake will be increased to ultimately improve pregnancy outcomes while reducing maternal morbidity and mortality in a resource-poor setting.

CHAPTER ONE INTRODUCTION

Allan Guttmacher, a gynaecologist and obstetrician from the United States said (as cited in Jaffe, 1974),

No woman is completely free unless she is wholly capable of controlling her fertility and...no baby receives its full birth right unless it is born gleefully wanted by its parents. ...Too many women die every day for no other reason than bringing a new life into the world.

Maternal mortality remains a major challenge to health systems worldwide (Zureick-Brown et al., 2013). Henceforth, the aim of the global health community is to focus further attention on the need to save lives and improve the health of expectant mothers globally. While developed countries have made enormous progress in bringing down the huge death rates associated with pregnancy, expectant women in low-income countries (World Bank, 2015a) including Bangladesh continue to face very high risks of death and disability as a result of pregnancy. This sets the background of this research on maternal health in Bangladesh.

Background

Global Situation of Maternal Mortality and Morbidity

Improving maternal health has been a global health agenda for many years. Maternal mortality ratio (MMR) is one of the health indicators that showed great disparity between high- and low-income countries (World Bank, 2015a). A lifetime risk of a pregnant woman to die from pregnancy-related complications may range from 1 in 15

in some low-income countries of the world, such as those in sub-Saharan Africa to 1 in nearly 15,000 women in some Nordic countries (WHO, 2014b). Globally, each year, an estimated 289,000 women or 800 per day die because of complications during pregnancy and child birth (WHO, 2014a). Analysis of national censuses in low-income countries show that 99% of all maternal deaths occur in these countries (WHO, 2014a) . The same WHO report mentions that in South Asia, where Bangladesh is situated, maternal deaths contribute to one-third of global maternal deaths. Due to a growing awareness and various interventions in maternal health care, the number of maternal deaths has been lowered more than half worldwide between 1990 and 2013, however, it is still unacceptably high in many low- and middle-income countries (WHO, 2014a).

The absolute figure of maternal mortality is only the tip of the iceberg; behind each death a huge burden of life-threatening and chronic morbidities exists. For every women who dies of pregnancy-related causes, 20 or 30 others experience acute or chronic morbidity, often with permanent sequelae that undermine their normal functioning (Reichenheim, Zylbersztajn, Moraes, & Lobato, 2009). According to a statistics of 2012, every year, 7% to 8% of pregnant women suffer from acute maternal complications resulting in about 9 million morbid events worldwide (World Health Statistics, 2012). Although mortality is a part of the story, morbidity uncovers many other aspects and tells us how pregnancy-related complications affect women's quality of life. Higher mortality rate in delivery and postpartum period is the consequence of antenatal morbidity. Therefore, controlling maternal morbidity by identifying risk factors in antenatal period is the key aspect that could bring down maternal mortality rate (Sen, Govender, & Cottingham, 2007). However, the true burden of maternal morbidity is still not known due

to lack of standard estimation method for calculation, evolving definition of maternal morbidity, and the absence of standard identification criteria (Firoz et al., 2013).

Preventing problems for mothers and babies depends on an operational continuum of care with accessible, high quality care before and during pregnancy, childbirth, and postnatal period. It also depends on the support available to help pregnant women reach services, particularly when complications occur (Tinker, Hoope-Bender, Azfar, Bustreo, & Bell, 2005). An important element in this continuum of care is effective Antenatal Care (ANC), which is regarded as the one of the most important preventive measures to reduce the threat of maternal death from complications (Lincetto, Mothebesoane-Anoh, Gomez, & Munjanja, 2006). ANC is also part of the Safe Motherhood Initiative, and helps provide interventions that are necessary for healthy pregnancy outcomes (Alam, Hajizadeh, Dumont, & Fournier, 2015). ANC from a medically-trained provider is important to monitor the status of a pregnancy, identify the complications associated with the pregnancy, and prevent adverse pregnancy outcomes. To be most effective, there should be regular ANC throughout pregnancy.

Substantial research on ANC has provided strong evidence on its usefulness, particularly in detecting pregnancy-related complications, and its timely management (Bloom, Lippeveld, & Wypij, 1999; Hollowell, Kurinczuk, Oakley, Brocklehurst, & Gray, 2009; WHO, 2011b). Globally, however, there is a wide variation in ANC attendance. While some high income regions registered improvements in ANC utilisation between 2000 and 2013, statistics from some low-income countries were not encouraging (WHO 2014). Extant data indicates that between 1990 and 2013, the American region's ANC utilization for at least one visit improved from 87% to 95%, South-East Asia moved from

40% to 77%, Europe improved from 95% to 99%, Eastern Mediterranean improved from 38% to 77% and the Western Pacific region registered an increase from 86% to 95%, whereas only 60 % of expectant mothers in South Asian countries received ANC from qualified medical workers in 2012. This means that about 70 million would-be mothers did not seek assistance from medical personnel during pregnancy and child birth (World Health Statistics, 2012). It is reported that between 2007 and 2014, ANC coverage of at least one visit was globally 83%, African region 77%, American region 96%, South East Asia region, where Bangladesh is placed, 77%, Eastern Mediterranean 78% and Pacific region 95% (World Health Statistics, 2015).

WHO Recommendation for ANC

The international community led by the World Health Organization (WHO) continuously monitors the global maternal health situation and shifted focus on how pregnant women, especially in low-income countries, can be encouraged to uptake ANC. To this end, it began promoting a new ANC model for low-income countries, moving away from the traditional model, developed largely in the West. The traditional model required upto 12 visits, one visit every month from three months to seven months, then fortnightly visits upto nine months, and then weekly visits upto delivery (Merkatz, Tharpson, & Walsh, 1990). The updated model, based on ‘reduced but goal-orientated clinic visits’ is the ‘focused’ ANC, consisting of at least four visits to a health facility during an uncomplicated pregnancy (Villar et al., 2001). In this focused ANC approach, first visit is recommended before the end of the first trimester or before week 12 of pregnancy. The second visit is recommended during the second trimester or close to week

26. The third visit should take place around week 32 and the final visit should take place between weeks 32 and 36 of pregnancy. Focused ANC services provide specific evidence-based interventions for all women, carried out at certain critical times in the pregnancy (Lincetto et al., 2006). It is a goal-oriented approach that aims to promote health of the mother and their babies through targeted assessments of pregnant women by classifying them into low and high-risk by predicting the complications ahead of time, whereas in traditional ANC, the number of visits were more and ‘risk approach’ was missing (Merkatz et al., 1990).

Each ANC visit comprises history taking and examination of patient including routine clinical investigations. During these visits, health care providers usually advise on possible risk factors of pregnancy and motivate them for delivery under skilled supervision (Villar et al., 2001). Focused ANC is an important point of contact between health care providers and pregnant women, providing an opportunity for health education, including how to detect pregnancy complications and development of a birth plan to ensure delivery at a health facility (Villar & Bergsjö, 2002). This health education during ANC visits enhances knowledge and skills related to pregnancy. It also discusses the role of husbands and other members of family during pregnancy, which helps promote future visits for ANC.

Current Status of Utilizing Focused ANC

In the Countdown to 2015 report (UNICEF-WHO, 2014), data collected from 39 countries showed that less than 50% of expectant mothers had ANC services at least four times during their pregnancy. Data from 68 countries in the same report, however,

revealed that the percentage of women receiving ANC services at least once was around 75%. According to latest data, although ANC uptake at least once is 83% globally for the period 2007-2014, only 64% of pregnant women received the recommended minimum of four ANC visits or more during the same period (World Health Statistics, 2015). In spite of government efforts in many low-income countries, records indicate that few expectant women uptake focused ANC to improve their health status and those of the unborn babies, suggesting that large expansions in ANC coverage is still needed. In addition, despite increasing coverage of delivery by a skilled birth attendant both globally and in several regions, coverage is still only 51% in the WHO African region and in low-income countries (World Health Statistics, 2015). These low levels of turn up for ANC can best be investigated and understood in the social-cultural scenario of a specific country, individual perception and beliefs towards pregnancy and the associated socio-economic factors interacting with the available services affecting ANC seeking behavior. The report of the Expert Panel on Prenatal care entitled “Caring of Our Future in United States of America” noted, besides traditional care concerns, the importance of psychosocial and environmental patient and family needs (Rosen, Merkatz, & Hill, 1991).

Health System in Bangladesh

Bangladesh is a densely populated and developing country in South Asia. As of August 2015, it had a population of 159.05 million that is expected to increase to around 218 million by 2030 (BBS, 2015). The country is undergoing considerable social and economic changes and has recently graduated to a lower middle-income country status (World Bank, 2015b). Bangladesh is ranked the 7th most populous country in the world

with a population density of 1033 per square kilometre. Although a Muslim majority (90% of total population) by religion, ethnically, the country is almost homogenous with a small tribal population residing in the south-eastern part of Bangladesh. It is experiencing a high rate of urbanization with the population of the capital Dhaka growing from 5.8 million in 1990 to 16.8 million (estimated) in 2015 (BBS, 2011). In spite of poverty and calamities, Bangladesh has made good progress in both primary and secondary education, and the adult literacy is 66%. Primary education is compulsory, and education for girls is free upto graduate level.

Bangladesh spends around 3.1% of its Gross Domestic Product in the health sector, and public expenditure for health care was 32 US\$ annually in 2013 (World Bank, 2013) which is only 36% of total health expenditure. Low spending of public resources as well as low per capita expenditure for health care resulted in a scarcity of skilled human resources in the health sector. In 2013, there were little over four doctors for every 10,000 people (World Bank, 2013). Thus, the government faces major challenges to plan and implement health and population services. According to the Bangladesh Maternal Mortality and Health Care Survey (BMMS, 2010), the Maternal Mortality Ratio (MMR) has come down from 322 per 100,000 live births in 2001 (WHO, 2002) to 194 per 100,000 live births (GoB, 2010), with maternal morbidity estimated to be 30 times higher. The most recent estimate of MMR in 2013 was 170 per 100,000 live births (UNICEF - WHO, 2014). Despite success in bringing down the maternal mortality rates, challenges still remain; one among them is ensuring safe motherhood for all (NIPORT, 2012). To address this, the government of Bangladesh has placed reproductive and child health at the center of developing health policy (MOHFW, 2011).

Provision for Maternal Health Care

In Bangladesh, both formal and informal sectors provide maternal health services. Private and Non-Government Organizations (NGO) also provide such services which are widely available. In fact, 60% of all institutional deliveries took place in NGOs and private care centers (NIPORT, 2015). In the light of the high rate of maternal mortality in Bangladesh, the government attempts to put extra emphasis on strengthening its maternal care services. The government delivers this service through all primary, secondary and tertiary facilities situated respectively at sub-district, district and big cities. These have both indoor services and outdoor clinics for regular obstetric care and Emergency Obstetric Care (EmOC). Field level health care providers make home visits for preventive health care services including maternal care services such as skilled delivery at home.

Problem Statement

Maternal mortality in Bangladesh contributes to an estimated 3% of the global burden and an estimated 6,848 pregnant women die from pregnancy-related complications every year (UNFPA, 2014). Although in 2011, the national statistics shows an MMR of 194 per 100,000 live births, regional variations remain, and estimates of MMR are as high as 782 in remote areas of the country (Sikder et al., 2011). More than 62% of all deliveries in Bangladesh take place at home with unskilled attendance (NIPORT, 2015), putting the maternal life at risk even more. Even though there is some success in reducing MMR in Bangladesh in the last two decades, the approaching target by United Nations Millennium Development Goal-5 (UNMDG-5) and Bangladesh's new status as a lower middle-income country requires that MMR be reduced further. A Lancet commentary (El Arifeen

et al., 2014) mentions that a decrease in maternal death is sometimes attributed to a decrease in fertility rate, change in age pattern of mothers and shifts in parity. In effect, this means, pregnant women are still vulnerable to death during pregnancy. These reasons underscore why further emphasis on new strategies to reduce maternal deaths in Bangladesh is warranted. Hence, there is a need to analyse the magnitude of the situation, strategies currently in place to reduce maternal mortality and search for a new potential approach to reduce maternal mortality.

The availability of and accessibility to ANC in Bangladesh have been widely studied. According to the Bangladesh Maternal Mortality and Healthcare Survey (BMMS) study (2010), ANC by medically trained providers in Bangladesh increased from 40% to 54% in the last 9 years preceding 2010. A low uptake of focused ANC prevails and continues to threaten both mothers and their unborn children. Although in 2014, ANC by any provider increased to 79%, four needed visits by pregnant women recommended by WHO accounts for only 31% of total visits (NIPORT, 2015). The Bangladesh Demographic and Health Survey (BDHS, 2014) also reported that 46% of urban women visited for four or more times to uptake focused ANC in the three years before the survey compared to 26% of rural women, thus showing an urban-rural difference. The Health, Population and Nutrition Sector Development Program adopted for implementation by the government of Bangladesh sets a target so that 50% of pregnant women make at least four antenatal care visits by the end of 2016 (MOHFW, 2011). Data from the BDHS (2014) show that Bangladesh lags far behind in reaching this target. By the year 2014, ANC from a medically trained provider increased to 64%. BDHS also reports that although ANC from a skilled caregiver has increased among all subgroups of population, there is a huge

gap in the usage of ANC from a trained provider between the richest and the poorest sections of the society, which has declined only slightly (from 57% to 53%) between 2011 and 2014 (NIPORT, 2015). The same report suggests that this inadequate uptake of focused ANC is attributed to insufficient resources, lack of skilled health workers and low quality of service, and these remain a problem in Bangladesh. These problems are compounded by poor health communication efforts for promoting ANC, weak intrinsic quality of communication limiting the ability to assess intervention effects, limited information sources for main target groups, and inadequate health seeking behavior. These factors contribute to high mortality and morbidity rate among pregnant mothers (Shahjahan, Chowdhury, Akter, Afroz, & Hafez, 2012).

When considered from another perspective, gender, ethnicity and culture also have significant effects on beliefs about illness and health practices of every individual (Helman, 2007). Women will have a different set of expectations and traditions in every society that will also affect their access to health care and health outcomes. The underlying potential influence of these social factors suggest that these could be equally true for ANC seeking behavior. An awareness of these multiple influences may advance the understanding of the reasons for low uptake of focused ANC in Bangladesh. While much has been ascertained from various studies, the psycho-social process involved in expectant women's ANC uptake behavior has been largely ignored.

The concept of psycho-social processes refers to causation or mediating factors and context or outcomes, and defined as “the social factors on an individual's mind and behavior” (Psychosocial process, 2015). Recognizing the value of psycho-social process, a fruitful starting point for this research could be something pertaining to the interrelation

of behavioral and social factors. A central constituent of a psycho-social explanation of health is that social processes lead to perceptions and psychological processes at the individual level. These psychological changes can influence health through direct psycho-biological processes or through modified behaviors and lifestyles (Martikainen, Bartley, & Lahelma, 2002). The research is intended to show how these two types of factors- socio-cultural factors and theory-based cognitive motivators-might result in the changes in ANC seeking behavior, and also how they are actually played out in local cultural settings in Bangladesh.

Previous studies found that lack of adequate knowledge about risk factors during pregnancy, low perceived risk, fear of complications (Islam, Chowdhury, & Akhter, 2006), and cultural issues such as women's position in the family and the society, modesty and embarrassment about physical changes during pregnancy (NIPORT, 2015) contribute to Bangladeshi women's ANC attendance. Literature also mismatches between ANC targets and attendance, and in response, various statistics aimed at exploring this gap have been conducted. A study by Anwar et al. (2008) has correlated a range of socio-demographic factors with ANC attendance, for example, women's education, asset quintile, husband's education, distance to hospital. Another study (Koblinsky, Anwar, Mridha, Chowdhury, & Botlero, 2009) also pointed out that lack of proper support services to poor section of the society such as motivation to family planning, help for menstrual regulation discourages them to go for ANC services. However, such statistical associations offer little insight into the theoretical mechanisms related to psycho-social behavioral factors. Since, an incomplete picture of non-health system related psycho-social factors that influence ANC uptake is presented, it is important to gain a better

understanding of potential strategies and approaches, and theoretical perspectives to encourage pregnant women to change their behaviors so that uptake of focused ANC can be increased.

One critical aspect of demonstrating health behavior change is intervention. Intervention efforts to change behaviors are communicative acts (Rimal & Lapinski, 2009). As such, health communication has long been practised to channel healthy behaviour in a desired direction. Most health interventions to promote ANC in Bangladesh are commonly produced as promotional materials, especially in print forms (Sarker, Mridha, Dasgupta, Islam, & Reichenbach, 2012). So far, these print-based promotional materials have focused on access, delivery and availability of support services for ANC targeted to pregnant women, their attendants and general population. The contents of these campaigns are mostly concerned with general guidelines for pregnancy care. However, in adopting the transmission view of communication, it is reasonable to think carefully about the channels through which intervention messages are disseminated, to whom the message is attributed, how audience members respond and the features of messages that have the greatest impact (Rimal & Lapinski, 2009). Channel selection is also determined by the usage patterns of target audiences and the nature of the message and topic within the constraints of available resources (Balch & Sutton, 1997). To be successful, a campaign must effectively communicate to the publics it is trying to reach (Ressler & Toledo, 1997). It is, therefore, vital to understand what motivates the publics and then understand the channels of communication and distribution that would be most effective in motivating them in order to establish and maintain a successful program (Rimer & Glanz, 2005).

The widespread availability and ease of use of mobile phones have permitted this technology to gain wider acceptance as a potential medium for delivering communication campaigns. Taking this in view, recently, some public health and communication researchers have shifted focus to mobile-based communication to encourage healthy behaviors (Chib, Lwin, Ang, Lin, & Santoso, 2008). Research in the field has gained substantial momentum, and extant studies have shown that mobile-based communication intervention can be effective in promoting various healthy behaviors among diabetic patients, smoking prevention, alcoholism, and cancer screening (Krishna, Boren, & Balas, 2009). A number of initiatives have already been implemented in Bangladesh since the late 1990's. These have mainly focused on mobile phones, especially amongst the rural and underserved communities for their potential to overcome geographical boundaries. In 2011, WHO reported Bangladesh as one of the 15 countries using mHealth to raise health awareness (Kay, Santos, & Takane, 2011). It is further reported that the Ministry of Health and Family Welfare of Bangladesh reached 98% of its target population through Short Message Service (SMS) on health education but did not provide messages in Bangla, which is the first language of the majority of the population (Chowdhury, Kabir, Ashrafuzzaman, & Kwak, 2009).

While Bangladesh is confronted with challenges of a high burden of cases, weak referral systems and health worker shortages, the use of mobile phones presents a unique opportunity to optimize the use of limited resources. The use of mobile phones can potentially help extend the reach of health information and service provision, and improve the quality of care through enhanced connections between citizens and health care providers (Ahmed et al., 2014). An increase in use of mobile phones by large sections of

population including women in Bangladesh provides a potential opportunity for this research to investigate whether Mobile-based SMS in local language has a potential to enhance ANC utilization. However, to the best of the researcher's knowledge, research using mobile phones to deliver psycho-social theory-based communication intervention to promote ANC uptake has not been conducted in Bangladesh. In the above context, efforts to develop a grander framework for promoting ANC uptake by associating cognitive and socio-cultural factors while taking into account both macro and micro aspects of prevailing gender disparities is a unique proposition. Together, both mechanisms may increase the behavioral intention to uptake ANC when theory-based message framing is used as an intervention technique.

Aim and Objectives

It is of prime importance to understand the distinguishing characteristics of ANC seeking behavior from other health behaviors. Although primarily a bio-medical state, pregnancy has a sociological value. Pregnancy with its high degree of naturalness has very distinct features from other health behavior change, and hence, the key determinants which play a significant role in developing the intention to uptake ANC need special attention. The fundamental concerns are, therefore, to understand the motivations of the expectant women to uptake ANC. Many strategies have been undertaken to address this concern; yet, their success has been less than desired. Since current models do not adequately provide a psycho-social theory-based framework to increase expectant women's intention to uptake ANC, a conceptual framework based on such approaches to

design an effective communication intervention in a resource poor setting of Bangladesh is proposed as the goal of this research.

This goal elicits a major research gap addressed in this research. The key research gap is to identify a theoretical framework to explain Bangladeshi women's intention to uptake ANC. Prior research on health behaviors has used multiple social cognitive theories. Nonetheless, with an aim to effectively theorize the role of natural and sociological factors in promoting ANC uptake, this research intends to introduce a new theoretical framework based primarily on Protection Motivation Theory (PMT) which can later be used for a communication intervention. It is also extremely important to understand and explore the psycho-social factors in-depth by exploring their pivotal roles in developing motivations for expectant women to uptake ANC. Without studying these factors, the target pregnant women may not be effectively reached through the most effective channel of communication. Hence, the first research objective is as follows,

Research Objective One: To develop and assess a theoretical framework to propose psycho-social factors in promoting intention to uptake ANC among pregnant women in Bangladesh.

Definitive evidence demonstrates the impact of health communication campaigns on increasing knowledge and awareness, and on altering beliefs, perceptions, and attitudes of targeted audiences (Catalán-Matamoros, 2011). Although ANC interventions have been found to impact the survival and health of the mother and infant (Bullough et al., 2005; WHO & UNICEF, 2003), the role and implication of better communication intervention have not been adequately studied for ANC research in Bangladesh. Therefore, the next objective of this research is to examine how the proposed psycho-

social factors can be manipulated by communication intervention to increase intention of pregnant women to uptake focused ANC. While past research shows that both mobile-based (Vital Wave Consulting, 2009) and traditional print-based communication (Little, Griffin, Kelly, Dickson, & Sadler, 1998) campaign can have potential in promoting healthy behavior, it is important to know how differently and to what extent these two different channels of communication influence expectant women's intention to uptake ANC. In Bangladeshi context, a theory-based communication intervention program has not been undertaken to promote uptake of ANC. Therefore, greater emphasis needs to be put on the efficacy of the intervention program and disseminating results to inform future program design and policy making. Generally 'Efficacy' refers to the beneficial effects of a program or policy under optimal conditions of delivery (Flay, 1986). By efficacy of the intervention, this research means ability to achieve the intended ANC uptake in Bangladeshi context. If the target audiences never get the message through the proper communication channel, they will most likely never make the behavior change that could improve their lives. This research plans to conduct a quasi-experiment study to evaluate the efficacy of a communication intervention program where health messages sent via traditional and mobile platform will be compared by measuring the uptake of ANC among the expectant mothers. Hence, the second objective of the research is:

Research Objective Two: To design and examine the efficacy of an appropriate theory-based communication intervention aimed at increasing utilization of focused ANC.

Significance of this Research

This research will be a significant endeavour in promoting a theory-based communication intervention to uptake ANC in a resource-poor environment. To the best of author's knowledge, this is first such research that explores cognitive beliefs using PMT in the context of ANC seeking behavior in Bangladesh. The findings are also expected to underscore the need to design modern media-based behavioral interventions in the future. It is important on account of the applied utility of the knowledge it generates as well as its contribution to the theoretical knowledge. Concerning the former, the findings are aimed at aiding government and other non-government service providers to design educational programs focused on promoting ANC attendance based on perceptions about pregnancy complications and other socio-cultural factors attached to pregnancy and child birth. By understanding the needs of the pregnant women explored in this research, the new antenatal education curriculum will ensure effective strategies to prevent pregnancy complications. This will also help pregnant women to make informed decisions to increase ANC attendance. Based on the recommendations, doctors, midwives, hospital administrators, healthcare students, and community health workers can use the findings to promote ANC uptake among expectant women.

From a theoretical point of view, this study presents detailed information on how local socio-cultural beliefs and perceptions of pregnancy complications influence ANC among women within the reproductive age group guided by a new theoretical framework. Using psycho-social theories, this research extends the literature on PMT by explicitly adding socio-cultural determinants of intention to uptake ANC. This greatly supplements the less than adequate information that is present in this area. By doing so, the study fills a

knowledge gap in maternal health care seeking behavior. Furthermore, the findings will form the basis for further studies in the field of social and health psychology with regard to pregnancy and ANC seeking behavior.

Scope of the Research

Understanding the context in which pregnant women and their families would be willing to accept new practices, that is, knowing what changes they would make under what conditions is essential for crafting realistic and relevant behavior-change messages. This study seeks to fill in this knowledge gap by highlighting the underlying reasons influencing existing maternal care practices which fall within the purview of research objective one. The current research also intends to design and examine the efficacy of a theory-based communication intervention to promote ANC uptake among pregnant Bangladeshi women, which is objective two of this research. This, in turn, is expected to inform the program interventions which will hopefully improve maternal survival.

In the first phase, this research explores general awareness about pregnancy complications and usefulness of ANC, current measurement of media use pattern among pregnant women in Bangladesh using a cross-sectional survey of pregnant women from a public hospital in Dhaka, Bangladesh. In addition, a focus group design along with key informant interviews will be conducted to find out the psycho-social factors that facilitate or prohibit pregnant women to uptake ANC, and if social connectedness, social norms and women's autonomy play any role in this. The focus group method also explores how pregnant women's social networks and service providers perceive ANC seeking behavior, and will investigate the need and form of communication channels suitable for pregnant

women. Findings from this phase are expected to inform potential psycho-social determinants for an ANC uptake model, and help design a communication campaign.

In the second phase, this study evaluates the efficacy of a theory-based communication intervention to promote ANC uptake by a quasi-experiment using samples from a hospital in Dhaka. The period of the study in both phases was during different times between 2013-2015. In Bangladesh, the population growth that started in the second half of the 20th century has evolved into unparalleled urban growth. The essential feature of current Bangladeshi urbanization is that the pace of urbanization has outstripped economic growth, making it difficult for authorities to provide sufficient and appropriate health care services at affordable cost. Thus, the advantages that urban areas previously had over rural areas on health, social and economic indicators have narrowed over time. This basic information is relevant to the design of a communication intervention program.

Organization of Thesis

The organization of this dissertation is advanced over the course of several chapters. This introductory chapter documents the magnitude of maternal mortality in the global context while briefly highlighting the complications associated with pregnancy. After discussing the Bangladeshi scenario of maternal mortality and ANC, the research will identify gaps in promoting ANC in Bangladesh using a psycho-social behavioral perspective. It also ascertains gaps in health communication strategy to address ANC uptake in Bangladesh. Thus, it comes up with a proposal to reduce maternal mortality by promoting focused ANC through development of a theory-based communication intervention.

Chapter Two gives an insight into the foundation on which the research project has been built. It highlights the most relevant literature review in the fields of global maternal health, maternal health in Bangladesh context, use of mobile phone by women, use of mobile technology for maternal health in low-income countries and relevant behavioral theories. The goal is to highlight the gaps that exist in Bangladesh with regard to strategies relevant to reduce maternal mortality. In doing so, it reviews the evidence of existing communication campaign strategies undertaken to promote ANC uptake.

Chapter Three illustrates the approaches undertaken by this research to predict ANC seeking behavior, and proposes a base framework guided by PMT. It also explores the potential role of technology-based new communication campaign in motivating ANC behavior in a low-resource environment.

Chapter Four deliberates on the research process followed. This chapter discusses two preliminary studies undertaken as part of this research. The first preliminary study using a survey method was undertaken in Bangladesh in mid-2013 to test the association of Protection Motivation Theory (PMT) motivators with ANC uptake in Bangladeshi context, and to measure the media use patterns among pregnant Bangladeshi women. The second preliminary study was conducted using focus groups and key informants interviews in Bangladesh in late 2014 to understand their ANC seeking behavior, psychosocial facilitators and barriers to ANC uptake, need for communication intervention and media-use preference. Method and findings of the studies are discussed. Finally, the base framework is extended adding the socio-cultural factors.

Chapter Five assesses the extended theoretical framework for intention to uptake ANC. This framework hypothesizes cognitive and socio-cultural belief related factors

contributing to ANC uptake in Bangladesh. The framework is tested for hypothesized links using a survey in Bangladesh in late 2014. This chapter also details the design of a communication intervention based on the research model proposed. Method and findings of the survey are discussed.

Chapter Six describes an intervention study to examine the efficacy of theory-driven communication campaign aimed at promoting intention to uptake ANC among pregnant women in Bangladesh. The quasi-experimental study was conducted using a survey in late 2014 to early 2015. The intervention was delivered using traditional, mobile and combined platforms for a period of three months. Method and findings are then discussed.

Chapter Seven informs the overall research findings in line with research objectives, and conclusion and implications of the research. It also suggests a set of best practices for promoting uptake of ANC. This last chapter critically examines several aspects of the research, and highlights areas for potential future work that would address other pressing issues identified in the research.

CHAPTER TWO LITERATURE REVIEW

This chapter seeks to establish a theoretical foundation for maternal health care seeking behavior by conducting a critical review of relevant academic literature. Although this research primarily focuses on Bangladesh, special attention was paid to literature focusing on low income countries to more fully contextualize the study. Linking maternal health and effective communication to improve it using new technology in a low-income country is a fairly recent concept. Added to that, the potential use of mobile phones for promoting ANC uptake using a health behavior theory is a novel idea in Bangladeshi context. Hence, literature review is the first step to examine this idea. However, preliminary search showed relevant literature on ANC uptake and a mobile-based communication intervention in low-income countries to be limited, indicating a lack of information on this issue. Moreover, different topics and sectors are covered in the research, implying expanded literature search. Therefore, the literature search was expanded from including only ANC uptake and mobile phone use to use of mobile-based technology for all types of health behavior change.

This dissertation, thus, builds upon a rich body of prior work in four principal areas: 1) Maternal health and ANC; 2) Maternal health and mobile phones; 3) Theories of health behavior change; and 4) Communication intervention. Due to a rapidly growing interest in the topic of mobile-based health intervention, new information appeared continuously during the research. This chapter summarizes the most relevant prior work that forms the foundation of this research.

Factors Contributing to Maternal Health Problems in Bangladesh

Problems of Maternal Health

The consequences of poor maternal health are widespread, affecting women, families, communities, and societies. Limited access to ANC, delay in seeking care and lack of skilled attendance at birth can lead to maternal death and long-term maternal morbidities. According to global estimates in 2007, 38 million disability adjusted life years (DALYs) are lost among women as a result of pregnancy-related causes in 2007. About 40% of pregnancy-related DALYs lost in Sub-Saharan Africa, and another 36% are in South Central Asia in the same year (Speidel, 2007). With limited and patchy data, and due to evolving definitions of maternal morbidity, updated data on this are difficult to collate. Despite that, maternal deaths and disabilities are considered a leading contributor to the burden of disease among women. Maternal conditions were second to HIV/AIDS in terms of women's death worldwide in 2005, however, the scenario has been reversed in recent times. Although the maternal mortality ratio has declined from 330/100 000 live births in 2000 to 210/ 100 000 live births in 2013 globally, the MMR is still more than four times the cause specific deaths (49/100 000) from infectious causes, namely HIV/AIDS, Tuberculosis and malaria (World Health Statistics, 2015).

Maternal deaths can be triggered by both direct and indirect causes. About 80% of maternal deaths are due to direct causes of which a major contributor is unsafe abortion. It causes about 13% of the maternal deaths globally and 49% in some settings in low-income countries (Khan, Wojdyla, Say, Gulmezoglu, & Van Look, 2006), implying a need for awareness. Although the odds of maternal mortality to that of live births in 2000-

2008 has been reduced to 4.9, a continuous campaign is needed to sustain it within tolerable limits (Rahman, DaVanzo, & Razzaque, 2014). Other causes include obstetric complications such as severe bleeding, infection, hypertensive disorders, and obstructed labor. Women also die of indirect causes, such as malaria, diabetes, hepatitis, heart disease, and anaemia as these diseases or conditions can be exacerbated during pregnancy (WHO, 2012). A significant number of these unwanted deaths can be avoided with improved care during pregnancy and labor. There are evidences (Mbalinda et al., 2014) that women knowledgeable of signs of complications, such as poor or no movement of baby, blood or abnormal discharge or symptoms leading to above direct or indirect causes tend to receive medical attention and this has a positive influence on ANC uptake. Extant studies performed in different African countries have shown that health education during ANC enhances the utilization of skilled health care and improves mothers' knowledge about obstetric danger signs. In other words, regular ANC visits by creating awareness about pregnancy complications can reduce the risk of death for pregnant women.

United Nations Millennium Development Goals

One of the targets of UNMDG-5 is to ensure that 80% of births are assisted by a skilled attendant by the year 2015, in addition to reducing maternal mortality by three-quarters between 1990 to 2015 (UN, 2000). While new data on maternal mortality show signs of progress in improving maternal health, progress has been uneven within and across countries prior to the final deadline (UNICEF-WHO, 2014). Although a trend analysis of maternal mortality by the World Health Organization (WHO) for the years 1990 to 2013 showed an overall decline of mortality by 47% globally, the reduction in

low-income countries remains drastically low (WHO, 2014). Moreover, many pregnancy-related deaths still go unnoticed or unreported, and substantial errors in the estimates of maternal mortality persist in low-income countries (Ronsmans, Collin, & Filippi, 2007). All of these, in effect, require further investigation into maternal mortality and actions to reduce it.

Socio-economic Determinants of Maternal Health Care Seeking

This sub-section describes the socio-economic dimensions of the underlying factors for poor maternal health. ANC, as other health seeking behavior, can be viewed as an integral part of a person, like family, experience and community factors. The totality of these interrelationships include patterns of individual beliefs, norms governing choices, perceptions and attitudes of the people involved (Mackian, 2008). Every society provides a system of knowledge and behavior for pregnancy and ANC which is rooted in the beliefs, perceptions and practices of each society (Yamba, 2003). This forms the basis of the social dimensions of ANC seeking behaviors and suggests a link between ANC uptake and the cultural set up of the society.

Past studies identified different factors which influence ANC uptake. The factors identified include young maternal age, high parity, woman's level of education, household income (Maekam, 2003), local practices and customs, husband's education level, social networks of the household, existing government policy, perceived risks of the pregnancy and costs of the services (Simkhada, Teijlingen, Porter, & Simkhada, 2008). According to a report by United Nations Children Emergency Fund (UNICEF, 2007), the root causes of poor maternal health lay in the disadvantaged position in the society a woman has in many

low-income countries and the lack of attention to her rights. Various studies found that ANC use was influenced by characteristics of healthcare services including poor quality of care, negative and unfriendly attitudes of service providers, poor relationships between patients and healthcare providers (Anwar et al., 2008), long queues in hospitals, distance and transport to healthcare facilities (Kamal, Hassan, & Islam, 2013). The most pronounced reason for not receiving the services is that it was “not needed” (Kamal, Hassan, & Islam, 2013).

As in other low-income countries, maternal health care use in Bangladesh varies among women with different socio-economic status, demographic area, educational level of parents, religious factors and decision making power (Shahjahan et al., 2012). A study of Safe Motherhood Program in Bangladesh (Policy Project, 2006) showed that low status of women in society, poor quality of maternity care services, lack of trained providers, delay in ANC seeking behavior and poor infrastructure all contribute to high maternal death rates. A survey found that, among the respondents, 61.6% said they did not seek ANC as they thought it was not needed for successful delivery of a child. The rest of the reasons for not seeking ANC were service too expensive (26.3%), service site too far (7.2%), did not know of need for care (6.8%), unable to go/not permitted to leave house (5.6%), did not know of a place (2.4%), religious reason (3.6%), and privacy (1%) (NIPORT, 2012). Although many socio-cultural factors are presented in various research (Choudhury & Ahmed, 2011), still this information is insufficient to account for the ANC seeking behavior in Bangladesh. Thus, the influence of socio-cultural factors on ANC seeking behavior warrants a detailed investigation.

Interventions to Promote Maternal Health

The strategies that have been promoted as potentially effective ways to overcome the high rates of maternal mortality have been multiple. One of these is a systemised screening program for ANC introduced in Western Europe at the beginning of the 20th century (Rooney, 1992). During the following decades, a substantial and steady decline in maternal mortality rates have occurred in countries offering ANC which seemed to validate this preventive approach. Yet, delays in deciding to uptake ANC are more pronounced in some areas than others. Studies in Bangladesh (Barkat, Rahman, Bose, & Akhter, 1997), Pakistan (Shamshad, 2008), Nepal (Thapa, Chongsuvivatwong, Geater, & Ulstein, 2001) and Nigeria (Odimegwu et al., 2005) showed that education and ANC visits influenced the delay in decision making to go to hospital when expectant women needed skilled care. These findings have important implications for ANC seeking behavior.

Current health center-based interventions such as EmOC to deal with obstetric complications are found effective in preventing or minimizing maternal death due to severe complications. Addressing delays for decision making and skilled birth attendance are also advocated as important factors in preventing maternal deaths (Ahsan, Streatfield, & Ahmed, 2008). Obaid (2007) estimated that skilled attendance at birth in addition to access to EmOC could reduce maternal deaths by about 75% in Bangladesh, while the estimation by UNICEF is 80% for the same (UNICEF, 2007). Evidence from low-income countries that increased access to obstetric care can reduce maternal mortality is limited. For instance, findings from a large community-based study in Matlab, Bangladesh which provided support for professional midwifery care in the community have not produced

actionable results due to methodological issues (Ronsmans, Vanneste, Chakraborty, & Van Ginneken, 1997). Among other strategies, training and promotion of traditional birth attendants (TBAs) in rural China, training of professional midwives in Malaysia and universal institutional delivery in Sri Lanka were introduced to achieve low maternal mortality (Ronsmans et al., 2008). All these countries have successfully managed to make pregnancy outcomes safer by emphasizing increased access to and quality of obstetric care. However, a context of universal financial and geographical access to skilled care and a backup support of referral to higher care centers were required to ensure this success (Campbell, Graham, & Lancet Maternal Survival Series steering group, 2006).

Recognizing the problem, in 2007, Bangladesh Rural Advancement Committee (BRAC), a non-government development organization initiated a women-focused intervention program called Manoshi (BRAC, 2007). This program provides basic maternal, neonatal and child health services through home visit conducted by a cadre of community health workers who provided information to pregnant women and community on danger signs of pregnancy complications, when and where to seek care, treatment of minor ailments, and appropriate referral for obstetric complications. Manoshi also provides financial support to poor pregnant women in slums who cannot seek timely EmOC due to lack of money for transport and fees at the health center. However, a lack of skilled manpower in Bangladesh acts as a hindrance to this approach.

Many of the suggested strategies for maternal health promotion were modelled after other health problems. The desire for finding cost-effective community-based interventions has also left many of the barriers of ANC seeking behavior unaddressed (Ronsmans et al., 2008). Additionally, providing access to universal institutional care for

expectant women is seemingly impossible for a country like Bangladesh where resource constraints is imperious. Thus it requires strategies that optimize use of resources.

Behavior Change Communication in Bangladesh

Communication campaigns have long been a tool for promoting public health. Evidence from selected studies suggests that effective campaign principles can lead to effects not only on attitudes, but on health behavior change as well (Farrelly, Davis, Haviland, Messeri, & Heaton, 2005; Hornik, 2002; Noar, 2006). Relatively few of the intervention strategies in Bangladesh to prevent maternal mortality involved behavior change communication to facilitate ANC (Care, 2012). However, some research suggest that the barriers to ANC should be addressed as part of health interventions through information, education and communication programs to early entry to ANC (Kamal, Hassan, & Islam, 2013). Previous studies also suggest that the factors associated with the utilization of skilled maternal health care include factor like access to mass media (Quayyum et al., 2014).

Currently, in Bangladesh, traditional forms of communication, brochures and leaflets are used to inform pregnant mothers about pregnancy complications and usefulness of ANC (Nguyen & Rahman, 2013). Although most health professionals expressed positive views about informed choice provision by leaflets, however, they were seldom used to maximum effect. Leaflets for maternal health promotion were sometimes being withheld from ANC seeking women because either staff disagreed with the contents or were concerned that choices promoted by leaflets were unavailable locally. Some healthcare service providers also made assumptions about the ability of women to

participate in decision making (USAID, 2012). The potential of the leaflets was further diluted because of their distribution style, as sometimes they were given out with advertising materials or concealed within the maternity folder. Time pressure also encouraged healthcare providers to distribute leaflets without discussing the contents with ANC seekers (Henderson, Gao, & Redshaw, 2013). Some maternal health programs in Bangladesh, such as, Mobile Alliance for Maternal Action (MAMA) provide free, adaptable mobile health messages for programs that are using mobile phones to inform and empower new and expectant mothers. There is currently the Aponjon program in Bangladesh where mothers can call to a designated number to hear messages about maternal health (SHOPS Project, 2015).

The Bangladesh Communication Working Group (BCWG) established to study communication strategies and operational approaches identified major gaps in strategies, implementation, content, and monitoring and evaluation of health communication campaigns (BBCCWG, 2013). The group also observed that not all strategies are based on a sound theory or evidence-based communication approach. More importantly, most of the communication campaigns or interventions provided in Bangladesh aimed at providing information without specific behavioral strategies to help individuals to undertake certain behaviors (BBCCGW, 2013). Hence, this research recommends that application of new approaches such as leveraging of technology using behavioral theories are required to make further progress on essential health indicators including reduction of maternal mortality in Bangladesh.

Women and Mobile Phone

In Developing Countries

Mobile phones are key tools for improving the lives of women in low- and middle-income countries. Mobile phones help women feel safer and more connected with friends and family, save time and money, and provide access to life enhancing services including health related services (GSMA Connected Women, 2015). The use of mobile phones by people in developing countries has exploded in last few years. However, a survey conducted by Groupe Special Mobile Association (GSMA) on use of mobile phone in low- and middle-income countries reported in 2015 that among 3 billion people in low- and middle- income countries who do not own mobile phones, 1.7 billion were women. Nearly two-third of unconnected females live in South Asia and East Asia & Pacific regions. The gender gap in mobile phone ownership is wider in certain parts of the world. For example, over 594 million females in South Asia still do not own a mobile phone, and women are 38% less likely than men to own a mobile phone (GSMA Connected Women, 2015).

The analysis of mobile phone in the global south suggests that mobile communications cannot be properly understood without paying close attention to the local contexts, social relations and power structures within which they are used (Wallis, 2011). The disparity in mobile phone ownership between men and women in low- and middle-income countries, thus, drew increased attention to the issue of women's access to mobile phones. Although access to mobile phones has increased substantially, including for women, there are still challenges to be overcome in ensuring that women are included in an increasingly connected world. The lower level of ownership is driven by a complex set

of socio-economic and cultural barriers negatively affecting women such as frequency and nature of use, cost of set, service delivery issues, social and cultural norms, and other systemic barriers such as socio-economic conditions, lower level of education, lack of technical literacy and confidence (Aker & Mbiti, 2010). In most developing countries, GSMA reported, fewer women than men phone owners report using mobile services beyond voice. The lower level of usage including less SMS messaging by women compared to men can be explained by low level of literacy and poorer socio-economic conditions. Another major barrier to women's mobile phone use is cultural attitudes which emphasize that it is primarily men who should maintain contact with persons outside the household or community. However, mobile technology has seen to produce benefits for women in rural India by helping them to remain in close touch with their relatives (Sirpa, 2008). Mobile communications among social network can also help increase social learning (Bandiera & Rasul, 2006). Thus, closing the gender gap in mobile ownership and usage in low- and middle-income countries can have substantial benefits to women and society. Increasing mobile phone access and use can positively impact economies and provide a valuable tool through which both public and private services including mHealth services can be delivered, and particularly could help women receive the assistance they need. Another significant finding of research is that the common problem shared by the poor in all developing countries is lack of affordable access to relevant information and knowledge services (Kalba, 2008). There is widespread consensus that mobile phones with higher functions such as text messaging option has particular promise that has the potential to present a solution to this problem. Mobile phones are more affordable compared to other information and communication

technology devices, their connectivity costs are relatively low, do not require the user to have much technological knowledge or even to be able to read and write, and are easy to carry from place to place (Stark, 2010). The growing investment in ICT and the telecommunications industry has seen a substantial diminution of ‘technophobia’ among the general public, and has improved access, especially for the poor. Close studies of mobile phone use in the Global South reveals how uptake can make existing social relationships, and processes of change, more visible (Ling & Horst 2011). Mobile phones can help challenge power structures and alter communicative practices and norms (Tacchi, Kitner, & Crawford, 2012).

There has been a noticeable rise over the past two years in the percentage of people in the emerging and developing nations who say that they use the internet and own a smartphone (Pew Research Center, 2016). The report mentioned that while people in advanced economies still use the internet more and own more high-tech gadgets, the rest of the emerging world is catching up. In 2015, a median of 54% across 21 emerging and developing countries, as against 45% in 2013, reported using the internet at least occasionally or owning a smartphone compared to a median of 87% using internet across 11 advanced economies (Pew Research Center, 2016). However, large gender gaps appear on smartphone ownership in many countries where men are more likely to own a smartphone. The lowest levels of smartphone ownership are in poorer countries concentrated in sub-Saharan Africa and South Asia. Among the smartphone owners factors such as education, young age, and regional variation remain consistent for both low-income and developed economies.

In Bangladesh

Bangladesh is a densely populated country and 34% of its people lives in urban areas. Mobile phone ownership in Bangladesh is expanding rapidly, and the penetration is high even in rural and remote areas. According to BDHS (2014), possession of mobile phones has continued to increase, from 78% in 2011 to 89% of households in 2014 (NIPORT, 2015). The increase is mainly due to a larger increase of mobile phone ownership in rural areas (from 75% in 2011 to 87% in 2014) than in urban areas (from 89% in 2011 to 93% in 2014). There is a competitive market for mobile operators in Bangladesh. In 2011, the fixed line penetration was 0.6% and mobile penetration was 80% (ITU, 2014). However, the users of mobile phone has increased to more than 121.8 million in late 2015 (BTRC, 2015). The number of smartphone users in Bangladesh also increased by 3.1 million to 8.2 million in the year 2015 (Counterpoint Technology Market Research, 2015).

In a survey in Bangladesh in 2014, it is found that women are less likely to own a mobile phone although the mobile ownership is not greatly influenced by regional variation (GSMA Intelligence, 2014). Thus, in Bangladesh, the gender effect exists while the location effect is negligible. Among the socio-economic factors, primary education and higher income have positive impact on the mobile ownership. The same study reports that those who have a primary education have a 46.7% and those with higher income have a 74.7% greater likelihood of owning a mobile phone. It is shown that lack of education is not necessarily what is causing lower ownership among women. Perhaps the barrier might be the inability to read or write in English since most phones utilize the Latin script, but the data is not sufficient to confirm this.

Bangladesh is, in many ways, a country ahead of its time in terms mobile access. Despite being ranked as a low-middle income country, subscriber penetration reached 40% at the beginning of 2014 and it is expected to grow to 50% by 2020 (GSMA Intelligence, 2014). Currently, unique mobile subscriber penetration is around 42%. Since, a third of the Bangladesh population is under 16, adjusting for this, ownership among adults is actually above 50%. Although urban-rural divide is present, yet the rural penetration is around 50%. Mobile penetration is higher than would be expected given its low-income status. Bangladesh has also outpaced all its peers in terms of network coverage (GSMA Intelligence, 2014). The combination of limited disposable income and more mature mobile usage means the customers of Bangladesh are more discerning. Mobile network operators in Bangladesh are, therefore, looking to innovative value added services to remain competitive and respond to the slowing growth in core mobile services. Services that add value to and improve on the livelihoods of the consumer are more likely to support these goals. Bangladesh has a myriad of social challenges, including low literacy rates, maternal health issues, and a significant urban-rural divide. This local context has the potential to look for innovative value added services on mobile platform.

The use of mobile in driving socio-economic improvement is on the rise. The country now has a relatively solid mobile consumer base, much of which are underserved in core life needs. While it is true the majority of the unconnected are in rural areas, there is a not insignificant untapped audience of 6 million individuals in urban centres who do not possess mobile phones due not only to lack of network coverage but also for affordability issues. As the prices of both handsets and airtime continue to fall, the mobile phone will complete its transformation from an elite status symbol to a necessity for

adults at nearly all income levels. Indeed, mobile operators are continuing to innovate in their push to reach more subscribers. For its part, the Bangladesh government has been heavily involved in promoting ICT, spearheaded by the flagship initiative -“Digital Bangladesh by 2021” (A2I, 2011). The vision proposes mainstream ICTs as a tool for digital empowerment through human resource development, increasing mobile penetration, digitising government services to increase access, and integrating ICT in business. Where operators are not in a leadership position, NGOs are increasingly filling the gap, especially in the health, agriculture and learning sectors. Currently, mobile communication is the predominant technological platform for mHealth-based service delivery in the country, mainly established around consultation via call centers and SMS (Labrique et al., 2012).

One important aspect of mobile phone use in Bangladesh is lack of gender-disaggregated data, i.e. data on female mobile phone access and usage, which is not widely available or tracked in Bangladesh. Another is lack of focus on women, i.e. mobile operators often do not focus on female customers and potential female customers. Policy makers also typically place a low focus on gender relative to other priorities.

Evidence of Mobile Phone Use for Health

Health practitioners have often been at the forefront of using mobile phones as a development tool in many developing countries with a variety of mobile health (mHealth) projects. In reviewing the supporting evidence for the effectiveness of mobile phone-based health applications, it is found that this is predominantly limited to developed countries, with a focus on the prevention and management of chronic diseases, including

HIV and tuberculosis, and support to lifestyle changes. These m-health projects range in variety and scope, from monitoring disease, such as, measles outbreaks to supporting diagnosis and treatment by health workers, to sending health education messages, to sending reminders to treatment seekers. With rapid penetration of mobile phones in low- and middle-income countries, mHealth applications are widely perceived as potential solutions for addressing the needs and challenges of health systems in these countries (Kahn, Yang, & Kahn, 2010). Mobile phones are also extending the reach of medical workers and medical services and have been used in the collection, measurement and monitoring of health data, such as monitoring and tracking epidemics.

Evidence suggests that campaigns are required to be placed in channels with great potential to reach the target audience for effectiveness (Salmon & Atkin, 2003). The mobile-based solutions, for example, Mobiles4Health (Telenor Group, 2011), Text4Baby (Text4baby, n.d.), Wired mothers (Enreca Health, 2009; Lund & Hemed, 2010) to improve maternal and child health so far focused on information gathering and delivery, effectiveness of the system in terms of cost-benefits and availability of resources and so on. BRAC has introduced mobile technology in maternal health interventions in 2007 in both rural and urban areas of Bangladesh (BRAC, 2010). It was used for enrolling newly identified pregnancy to ensure ANC, communicating information about birth outcome, and more importantly, for referral of complications. While there is little evidence to link use of mobile phone and uptake of ANC, Parker and Ratzan (2010) suggested that mobile phones present an opportunity to move beyond the traditional print-based IEC (Information, Education, and Communication) approach. They also argued that mobile communication not only capitalized on the increasing reach within the society, but also

fostered a shift toward citizen-centered health systems by making them more involved in health decision making. Additionally, mobile phones as technological devices offer a novel method for addressing accessibility, equity and delay issues (Hall, Fottrell, Wilkinson, & Byass, 2014). Despite popular use and recent scientific support of mobile phone use for various health interventions, research that actively evaluates efficacy of mobile-based campaign compared to traditional methods is still very few in ANC domain, and hence, the evidence of impacts on maternal mortality rates is rarer (Tomlinson, Rotheram-Borus, Swartz, & Tsai, 2013). While past literature suggests that mobile phone coverage and adoption have had positive impacts on healthcare in certain countries, empirical evidence is still somewhat limited in Bangladesh on many crucial issues including maternal health.

Overview of Theories in Behavior Change Research

Theories of Health Behavior

An effective intervention to address the low uptake of ANC cannot be devised unless the underlying mechanisms and contexts of ANC seeking behaviour are understood and addressed. Past research suggests that communication strategies should be grounded in a sound theory (Obregon, 2000) for these to be designed for effective health promotion strategies and to generate solutions. Theories also provide insight into various psychosocial factors that contribute to health risk behaviors (McLeroy et al., 1993).

Various social cognitive theories developed over the past 30 years have proved to be helpful in analysing the determinants of protective health behavior. Included within the family of social cognition models (Conner & Norman, 2005), the most used theories are

Theory of Reasoned Action (TRA) (Fisbein & Ajzen, 1975), Theory of Planned Behavior (TPB) (Ajzen, 1991; Conner & Sparks, 2005), Protection Motivation Theory (PMT) (Norman, Boer, & Seydel, 2005; Rogers, 1975) and Health Belief Model (HBM) (Hochbaum, 1958). These theories focus on cognitive variables to promote behavioral changes, and share the assumptions that attitudes and beliefs, knowledge about the problems, as well as expectations of future events and outcomes, are major determinants of health related behaviors. These theories propose that individuals will choose the action that lead most likely to positive outcomes when faced with various alternatives. While no cognitive theory has been used to conceptualize the low uptake of ANC, several theoretical models have been used to conceptualize and frame ANC access.

The Health Belief Model (HBM) (Rosenstock, 1974) is the most frequently utilized theoretical framework in studies of ANC access. It is based on the understanding that a person will take a health-related action if that person (a) feels that a negative health condition can be avoided, (b) has a positive expectation that by taking a recommended action, he/she will avoid a negative health condition, and (c) believes that he/she can successfully take a recommended health action. The model was spelled out in terms of constructs representing the perceived threat and net benefits, namely, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. New concepts like cues to action and self-efficacy were added by Rosenstock, Strecher, & Becker (1988) to help this model fit the challenges of changing habitual unhealthy behaviors, such as being sedentary, smoking, or overeating better. This model, however, paid little attention to the socio-emotional aspects of early pregnancy. These non- disease facets of pregnancy are not easily incorporated into the Health Belief Model framework

but are important components of women's access to care. In addition, this model has a strong focus on the individual, which limits its applicability at the supportive care by the community or society. However, it can be argued that there is a need for situational and environmental factors to be included as individual component in this model. In circumstances such as ANC procedure, various cultural beliefs like health professional's gender, professionalism as well as privacy and comfort of environment are often situational and out of control of a pregnant women. Therefore, situational factors can have important influence in regards to attendance and individual's confidence and satisfaction (DeHart, 2008). Past experience and self-efficacy are also not well captured in the Health Belief Model.

The Health Promotion Model (HPM) has been used as a theoretical framework in studies exploring access to ANC (Pender, Murdaugh, & Parsons, 2002) as well. This particular model adapts previous theories of illness prevention, including the Health Belief Model, into a theory about behaviors surrounding health and wellness promotion. While this is more accurate in describing women's paths to ANC by including barriers to care, it remains a predominately cognitive model focused on individual internal factors only, and does not provide concrete understanding of psycho-social factors to discuss or explain the barriers to ANC.

Theory of Reasoned Action (TRA) asserts that the most important determinant of behavior is behavioral intention (Fisbein & Ajzen, 1975). Direct determinants of individuals' behavioral intention are their attitudes toward performing the behavior and their subjective norms associated with the behavior. Theory of Planned Behavior (TPB) adds perceived control over the behaviour (Ajzen & Fishbein, 1980; Ajzen, 1991), taking

into account situations where one may not have complete volitional control over behavior. Among the determinants of ANC seeking behavior, as discussed earlier, social pressure to go or not go for ANC uptake is held to be a function of a pregnant women's salient normative belief. Perceived behavioral control in Theory of Planned Behavior refers to the perceived ease or difficulty of performing the behavior, and is assumed to reflect past experience as well as anticipated obstacles (Sutton, 2001) which are somewhat similar to response cost in PMT.

Despite the benefits of ANC, the low uptake may be the result of counterproductive health beliefs, including low self-efficacy and inaccurate risk perception. Among Bangladeshi women who received ANC, only one in three women was provided with advices on danger signs (BMMS, 2010). Past research, as discussed in chapter one, suggests low perceived risk influenced ANC seeking behavior in Bangladesh (Islam, Chowdhury, & Akhter, 2006). However, in the absence of strong evidence of a direct link between low perceived risk and uptake of ANC, the next step is to search for evidence of a link between risk perception and ANC seeking behavior. In this context, this research proposes to examine PMT, which was developed by Rogers (1975) to provide a framework for fear-based appeals. It had been modified later by Maddux and Rogers (1983) and used as a general model of decision making in relation to threats. PMT can be regarded as an adaptation of the Health Belief Model. Pregnant women are needed to protect themselves from complications which require timely and careful examination by health care providers as part of ANC. For this to happen pregnant women needs motivation. This motivation is defined operationally as the intention to adopt the recommended action (Rippetoe & Rogers, 1987). According to PMT theory, intention to

engage in disease prevention depends on four main constructs (see Figure 1), (i) perceived vulnerability to the threat (PV), (ii) perceived severity of the threat (PS), (iii) perceived effectiveness of the recommended behavior in reducing the risk of the threat (response efficacy, RE), and (iv) the belief in one's ability to perform the recommended risk reduction behavior (self-efficacy, SE). Perceived Severity and Perceived Vulnerability forms the threat appraisal which is weighed against coping appraisal (combination of Response Efficacy and Self-efficacy) for decision making for intended behavior. PMT posits, if all four constructs are positively influenced, protection motivation or intention to engage in the risk reduction behavior is increased, which should positively influence behavior. The theory also postulates that another construct, response cost (RC, costs for adopting certain behavior) should be outweighed by a combined effect of response and self-efficacy.

Figure 1. Schematic Representation of PMT (Adapted from Rogers, 1983)

The cognition models and Health Promotion Model outlined above show a number of important resemblances and dissimilarities. Some concepts are common among models. For example, perceived susceptibility or perceived vulnerability occurs in both the Health Belief Model and the Protection Motivation Theory. Other concepts appear to be identical, for example, perceived behavioral control (in TPB) and self-efficacy (in PMT). PMT along with other such theories of health behavior share an underlying premise that health intentions stem from a desire to avoid potential negative outcomes through cognitive appraisals. The basic determinants of behavior in these models are costs and benefits of possible future courses of action, while other determinants of behavior are perceived facilitators and barriers. All the above-mentioned models assume that individuals consider all these determinants before making a decision. However, PMT proposes it systemically by threat and coping appraisal. Methodologically speaking, the majority of studies to assess cognitive models use non-experimental between-subjects designs, thus testing the models at the individual level (Hedeker & Gibbons, 1997). On the other hand, Floyd, Prentice-Dunn, and Rogers (2000) informed that most PMT studies have provided much stronger evidence of causal effects due to experimental manipulation of constructs. They further mentioned that a multitude of studies have investigated the components of PMT using experimentation in different health contexts that include cervical cancer screening, breast self-examination, breast cancer screening, insulin use, cigarette smoking, and physical exercise. A review of the overall utility of PMT found that intervention guided by this model was effective in predicting health-related behaviors and eliciting health-related behavior change (Lwin & Saw, 2007). The models also differ with regard to their scope of application. For example, Theory of Planned Action and

Theory of Planned Behaviour are general theories that can be applied to any domain or behavior. By contrast, key constructs of the Health Belief Model and Protection Motivation Theory, namely, perceived susceptibility and perceived severity with respect to a given health threat necessarily limit their use in protective health behavior, although these components can be extended to non-health related risk models as well. While the above cognitive theories have gained support over the years for predicting behavior and behavioral intention, these have noticeable weaknesses too. First, they fail to include socio-cultural factors that can affect behavior. Past theories suggest that health behavior is affected by expected outcomes – which, in addition to material losses and benefits, may also be social, including social approval or disapproval of an action (Munro, Lewin, Swart, & Volmink, 2007). Second, many of these theories give little attention to the origin of socio-cultural beliefs and how these beliefs may influence other behaviors. In addition, it has been argued that they ignore power relationships among the women and her social surroundings (Gebhardt & Maes, 2001). Another limitation of current theory development is that cognitive models have been primarily tested in Western cultural settings. Moreover, they overlook the emphasis given on family or group behaviors in non-western population (Obregon, 2000). Despite the cross-cutting nature of the above frameworks, and the importance of such multilevel frameworks, these models have little salience in ANC uptake, and offer little guidance for ANC providers who wish to improve access.

In the end, however, the decision has to be made on the basis of these models' best capacity to predict and influence ANC behavior. It is not an easy choice as some of these theories have overlapping concepts. Among the theories, Protection Motivation Theory

appears to be more concrete and specific framework. The reasons for these are various. Firstly, even though one might wish for pregnant women to act in a protecting way to prevent bad pregnancy outcomes, it does not probably happen very often. Secondly, PMT acknowledges maladaptive behavior, and existence of rewards in pregnancy with a hope for delivery of a healthy baby, that keep ANC uptake going. It also offers solutions in form of communication. Last but not the least, it clearly establishes self-efficacy and past behavior as important factor. In conclusion, for intervention purposes PMT is more suitable for predicting and influencing screening behavior such as ANC.

Despite its widespread use in various risk reduction strategies by communication scholars, ANC uptake has not been examined using PMT. Moreover, the effectiveness of PMT-grounded threat- and coping-based messaging has not yet been investigated in pregnant Bangladeshi women. In view of the above, this research proposes to use PMT as a guide to investigate the possible linkage between perceived risks of pregnancy and ANC uptake in Bangladeshi context.

Framing Theory

Public health advocates often use persuasive messages as one strategy to motivate people to adopt healthy behaviors or modify unhealthy ones (Gallagher & Updegraff, 2012). Framing theory suggests that how something is presented influences the choices people make (Benford & Snow, 2000). Framing method has been employed in many fields of communication campaign (Scheufele, 1999). It is defined as a technique used in communication to shape perceptions and construct the meaning, which presupposes that the way an audience responds to a particular message can depend on how the message is

tailored and subsequently encoded by the recipient (Davis, 1995; Pelletier & Sharp, 2008).

Variation in how health information can be framed is important because research has shown that although often conveying essentially identical information, one type of message frame may be more effective than another at promoting health behavior change (Gallagher & Updegraff, 2012). Tversky and Kahneman (1981) first illustrated this concept that variation can influence an individual's health behavior. This was originated out of the Prospect Theory of psychology which describes how people make decisions between alternatives that involve risk. Framing has since garnered strong interest among scholars in the domain of health persuasion. Framed messages may emphasize either the benefits of engaging in a behavior (gain framed) or the consequences of failing to engage in a behavior (loss framed). Message framing guidelines suggest that loss-framed messages are most effective for encouraging detection behaviors (e.g., mammography) (Banks et al., 1995) whereas gain-framed messages more effectively persuade prevention behaviors (e.g., physical activity) (Latimer et al., 2008). However, a randomized experiment of women's intention to uptake screening test for cervical cancer found that framed messages differentially influence health behaviors depending on the risk involved in performing the behavior (Rivers, Salovey, Pizarro, Pizarro, & Schneider, 2005).

Research further suggests that framed messages are not the only information that a person consider while deciding to change a behavior, societal practices and attitude towards delivery method also play a role, and hence framed information must be integrated with prior perceptions (Rothman & Salovey, 1997). Past research also suggests that all individuals are not equally susceptible to issue framing effects (Hiscox, 2006). Recipients may be more likely to respond cognitively and behaviorally to messages tailored to match

the ways that they typically process the health information, one of which could be tendency to attend to or avoid threatening information, i.e. their individual coping styles (Williams-Piehota, Pizarro, Schneider, Mowad, & Salovey, 2005). Schneider (2006), therefore, suggested that additional research is needed to determine whether framed health messages encouraging health-promotion behaviors are effective among the medically underserved. This research proposes to apply PMT-based (threat and coping) framing method for developing communication intervention for pregnant Bangladeshi women to motivate low ANC seekers for focused ANC uptake. It offers that a message could be framed on the basis of what it evokes. For example, the avoidance of risky behavior can be promoted through increasing perceptions of threat, such as “if you don’t go for ANC, there is a possibility that you will suffer from pregnancy related complications which cannot be detected in time” or increasing perceptions of coping, such as “if you go for regular ANC, any complications that may occur can be detected early and can be treated with success”. Both messages advocate the behavior of ANC uptake; however, one emphasizes on the threat appraisal process for not adopting, while the other focuses on the coping appraisal for adopting ANC uptake. To date, PMT-based message framing for promoting ANC uptake by pregnant women has been very insufficiently explored . This study addresses this gap by examining the impact of threat-framed and coping-framed messages targeted to pregnant Bangladeshi women in order to increase intention to uptake ANC.

CHAPTER THREE CONCEPTUAL BACKGROUND AND THEORETICAL FRAMEWORK

Conceptual Background

While selecting a health behavioral framework, research (Glanz, Rimer, & Lewis, 2002; Tones & Green, 2004) suggests embracing a holistic multi-level strategy taking into account theories explaining behavior at all levels and integrating these. In essence, this necessitates the development of new approaches to advance the theoretical proposition by taking local cultural variation into account. Discussion so far highlights the importance of cognitive constructs and socio-cultural aspects in ANC seeking behavior. Moreover, a better understanding of health behavioral determinants is useful in developing effective intervention strategies to influence behavioral change (Fishbein & Capella, 2006). This research, thus, intends to use the proposed framework to develop a novel communication intervention model by leveraging the power of technology to increase intention to uptake ANC. Chapter Three describes three approaches, cognitive, socio-cultural and technological, that form the basis of this theoretical framework in detail.

Cognitive Approach

Among various behavioral prediction theories discussed in chapter two, PMT provides an important primary theoretical foundation for cognitive belief-related constructs. It has been found that individuals who perceive a higher level of risk for not adapting behavior are more likely to engage in risk reduction activity. The perception and belief that pregnancy has some risks motivate expectant women to seek ANC. Therefore, if pregnant women perceive that the risk of not going for ANC is high, they will certainly

go for ANC. This approach proposes to use the PMT framework to examine whether information about the usefulness of ANC in preventing maternal complications increases intention to uptake ANC. Earlier research by Gaston and Prapavessis (2009) concluded that PMT-grounded information is effective in positively influencing pregnant women's health beliefs, intentions, and supporting initial behavior changes. However, no published study of PMT has presented health communication for promoting ANC. Given that PMT has been widely applied to promoting health protective behavior, it provides a suitable framework to understand cognitive beliefs in predicting intention for ANC uptake among pregnant women in Bangladesh.

Socio-cultural Approach

The key criticism of the cognitive approach is that it focuses on individuals only, and social and cultural factors are excluded. Health seeking behavior in a particular socio-cultural environment is not just one isolated event; it is influenced and facilitated by the wider socio-cultural context. In social definition of pregnancies, society is central in influencing ANC seeking behaviors. There are differences in the understanding and definitions held by people about pregnancy in different societies and cultures. These differences in opinion account for differences in behavior exhibited by women during pregnancy. Researchers propose that socio-cultural factors such as social support from family and friends and the observation of role models and diverse elements such as women's status in the family and society, role of husbands and in-laws can influence decisions to undertake ANC (Kyomuhendo, 2003). As such, while PMT may provide a

solid basis, on which this research is based, concepts from research in the socio-cultural realm should inspire the formulation of a comprehensive ANC uptake framework.

Technological Approach

This research argues that while theoretical models are able to provide the backdrop and understanding of contextual factors addressing a certain health problem and subsequent behavioral change, their propositions for promoting suggested behavior are best furthered through designing an appropriate intervention strategy. As discussed in chapter one, theory-based communication intervention could be an option to further the ANC uptake among pregnant Bangladeshi women as this type of intervention has not been conducted earlier in Bangladesh. Although communication intervention could be developed and delivered to address low uptake of ANC, intervention using all types of platforms may not be equally cost-effective.

The rapid spread of mobile phones as a communication tool over the past decade and its potential to directly engage large population have undoubtedly created new opportunities for mobile-based health communication (Parker & Thorson 2009; Wright, Sparks, & Dan O’Hair, 2008). The ubiquity of mobile phones along with convenient features such as portability, sturdiness, ease of maintenance, affordability, cheaper service costs, and text capabilities in local language, provision of immediate communication from any location, allow it to overcome some constraints of other media-based communication (Déglise, Suggs, & Odermatt, 2012; Leach-Lemens 2009). Although the adaptation of technology has not been examined for ANC seeking behavior, several past studies have empirically validated the significance of ease of use and usefulness for developing

behavioral intentions to adopt and use different technologies (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000). Unlike traditional methods, such as leaflets which requires comparatively more resources, mobile phones provides the information quickly and economically. In addition, mobile-based communication has the potential to disseminate information to a larger group of people using less resources. It is, thus, proposed that mobile-based technology can be used to develop communication intervention for pregnant Bangladeshi women to promote their ANC uptake.

Behavioral Intention

In this research, the primary goal of the communication intervention is to promote focused ANC visits. As past research suggests individual's behavioral intention is an established predictor of voluntary behavior (Fishbein & Ajzen, 1975), change in ANC uptake in this research is likely to be predicted by intention to uptake ANC. Here, intention is defined as the amount of effort one is willing to exert to attain a goal (Ajzen, 1991). These researchers further suggest that a given behavior may not be performed because either a person has formed an intention to perform the recommended behavior but is unable or unwilling to act upon it or the person has little or no intention to perform the recommended behavior. Most theories of health behavior discussed earlier share a belief that the single best predictor of an individual's behavior is simply his/her intention to engage in that behavior. Thus, virtually all health-behavior theories include some version of the construct of behavioral intention as a proximal antecedent to action (Kim & Hunter, 1993). While investigating ANC uptake in context of this research, it is essential to investigate behavioral intention of pregnant women for uptake of ANC. In this research,

behavioral intention is a dependent variable. The first research objective, thus, explores cognitive and socio-cultural factors associated with intention to uptake of focused ANC.

Theoretical Framework

After elaborating the conceptual background, this section of the research, anchoring on PMT, is aimed at developing the theoretical framework for intention to uptake ANC. Hence, PMT guides the base framework of this research. As Figure 2 shows, it proposes that appropriate communication channels and health education messages can together influence an expectant mother's cognitive beliefs. In turn, these beliefs can drive her attitude and intention to uptake ANC. In the proposed framework, intention appears on the right-hand side with arrows from cognitive beliefs which is in line with the essence of PMT. Although PMT was originally developed for health-protective behavior, it is currently applied also to health-promoting behavior recognizing the environmental factors that may influence perceived benefits of health behavior (Bartholomew, Parcel, Kok, & Gottlieb, 2001).

Furthermore, researchers (Dako-Gyeke, Aikins, Aryeetey, Mccough, & Adongo, 2013) emphasize socio-cultural influence on use and non-use of public health facility services in low-income countries. This includes extensive evidence provided on how gender roles in the society and differences among women and men lead to inequalities in health-related options. In some contexts, it has been observed that a women's use of ANC is the outcome of a complex interplay between her position in the family and society in relation to decision-making power exercised by her in-laws or older female relatives for all health-related decisions including care during pregnancy (Mumtaz & Salway, 2009).

A systematic review by Simkhada and colleagues (2008), after analysing the ANC use in low-income countries, identified perceptions about pregnancy and cultural beliefs as key influential factors for increase ANC uptake. Likewise, low uptake of focused ANC in Bangladesh suggest that need for further investigation into the socio-cultural context of uptake of ANC. Hence, this research proposes to expand the original base model guided by PMT and add several potential socio-cultural variables based on theories, namely, social connectedness and women's autonomy as predictors of intention to uptake ANC.

The social norms approach to health promotion assumes that people have mistaken perceptions of the attitudes and behaviors of others. This approach seeks to correct these misperceptions by giving people a more realistic sense of actual behavioral norms, thereby reducing risky behavior. Although there is no evidence of using this theory in maternal health care, this has been applied widely in the United States to reduce excessive drinking among college students and has been associated with decreased alcohol misuse and smoking. In deciding to go for ANC, the individual role and choice of a pregnant women may be affected or influenced by existing social norms. It is clear that social norms, meanings, and roles of others may undermine individual autonomy. Pregnant women may believe on reflection, the act of seeing a doctor for ANC should not be a source of shame; but in some communities, the decision to go for ANC early may be inconsistent with the existing social norms. On the other hand, in studying social norms, it is important to determine the appropriate reference group or groups (Rimal, Lapinsky, Cook, & Real, 2005). Strong social ties can have a direct and positive impact on health. Social connectedness are associated with lower blood pressure rates, better immune responses, and lower levels of stress hormones, all of which contribute to the prevention

of chronic disease (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Social connectedness can also promote health indirectly. Bonding and bridging relationships between individuals can create healthy social norms, help people connect with local services, provide emotional support, and increase knowledge about health within social networks (Kim, Subramanian, & Kawachi, 2006). These proposed socio-cultural variables in this research are expectations of behavior within the group of pregnant women, which are often unspoken and these offer social standards of appropriate and inappropriate behavior governing what is or is not acceptable and coordinating that specific group's interactions with others. It is, therefore, proposed that these new variables will influence perceived social norm. Social norms are highly influential in shaping individual behavior too. However, they do not necessarily correspond with an individual's attitude (positive or negative feelings towards an idea), although they may influence these attitudes if norms becomes internalized. Hence, this research also proposes that socio-cultural variables will affect attitude of a pregnant woman. Both perceived social norm and attitude will in turn increase intention to uptake ANC. Control variables shown in Figure 2 pertain to factors that will either facilitate or interfere with the performance of ANC uptake. These are age, past obstetric history, employment status, education and household income of pregnant women. The proposed extended framework aims to explain intention to uptake ANC more effectively than could the original constructs in PMT and help build a more powerful model of ANC uptake. Moreover, to ascertain the efficacy of the communication platform in promoting ANC uptake, this research compares traditional leaflet-based, mobile-based and combination of both while disseminating two types of theory-based messages.

Figure 2. Conceptual Framework for ANC Uptake Intervention

Base Model for Cognitive Constructs

Using PMT, various health related studies demonstrated the significance of cognitive constructs for determining intention. Furthermore, past discussion in this research provided some insights about the risk-related constructs for intention to uptake ANC. This section elaborates base framework (as shown in Figure 3) to understand the significance of cognitive beliefs, namely, perceived severity, perceived vulnerability, response efficacy, self-efficacy and response cost as determinants to intention and attitude.

Perceived Severity

Witte (1992, p. 10) defines perceived severity as a person's beliefs about the significance or magnitude of a health threat (for example, skin cancer leads to death). It includes how people perceive the deleterious consequences of a serious health event or outcome, such as a diagnosis of cancer. Perceived severity is seen to be associated with breast and cervical cancer screening among Hispanic women (Austin, Ahmad, McNully, & Stuart, 2002). On the other hand, using the PMT model to examine the role of perceived severity in physical exercise among pregnant women led to significantly higher perceived severity, and increased physical activity behavior (Downs, Chasan-Taber, Evenson, Leiferman, & Yeo, 2012). Therefore, an individual with high perceived severity is more likely to be motivated to adopt the recommended protective behavior (Boer & Seydel, 1996; Henson, Cranfield, & Herath, 2010; Prentice-Dunn & Rogers 1986). Research on PMT indicated that the association between perceived severity and concurrent health behavior generally mirrored its relative association with intention. Building upon prior research, this research proposes perceived severity of pregnancy

complications to be a predictor of intention to uptake ANC. As such, when an expectant woman is aware of maternal complications a process of perception of severity occurs. As a result, her intention to seek ANC may increase. Hence, it follows:

Hypothesis 1: Perceived severity is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.

Perceived Vulnerability

Perceived vulnerability, also called perceived susceptibility, refers to one's perception of the risk or the chances of contracting a health disease or condition (Witte, 1992). It also can include estimates of susceptibility to illness in general (Rosenstock, Strecher, & Becker, 1994). Wurtele and Maddux (1987) examined the relative effectiveness of persuasive appeals for increasing exercise using the four main components of PMT model. The results revealed that vulnerability to cardiovascular disease was a predictor of intentions to perform exercise. It is suggested that individuals who personally perceive a higher level of risk of developing breast cancer are more likely to follow through with cancer screening and engage in cancer risk reduction activity (Katapodi, Lee, Facione, & Dodd, 2004). Past research also found that higher levels of vulnerability (i.e., perceived risk for breast cancer and carrier status) lead to increased fear about the disease which subsequently increase motivation for screening test (Helms, 2002).

During pregnancy, an expectant mother may be afraid of possible disease or complications in her or her unborn fetus which may affect her emotion and produce anxiety about her unborn child's fate. Her past experience of her difficult pregnancy or

such experience in another woman she knows may lead to think about vulnerability about her present condition. Hence, it is hypothesized,

Hypothesis 2: Perceived vulnerability is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.

Response Efficacy and Self-efficacy

Response efficacy is defined as the extent people believe a recommended action effectively deters or alleviates a health threat (Witte, 1992, 1994). Self-efficacy, on the other hand, is the perceived ability of an individual to perform the coping response (Rogers, 1983). Self-efficacy has been considered as an important influencing factor in motivational, cognitive, and affective processes (Bandura, 1992). It is particularly warranted as a key factor of any health behavior theory (Schwarzer, 1992), and it increases the probability of selecting the adaptive responses (protective responses). Within PMT, response efficacy is part of a second appraisal (coping) following exposure to a fear appeal message. If a perceived threat (threat appraisal) is judged to be high, then an individual will engage in assessing both self-efficacy and response efficacy. If both efficacy appraisals are judged to be sufficiently high, then an individual will be motivated to reduce the threat (by adopting message recommendations). If one or both of the efficacy appraisals are insufficiently high, then the individual will be motivated to reduce fear by a number of different strategies (for example, message derogation, message avoidance). Floyd et al.(2000) reviewed 65 protection motivation studies using a meta-analysis, and mentioned that response-efficacy and self-efficacy appear to be consistently maintained and related to engaging in protective behavior. Findings of previous study by

Wurtele and Maddux (1987) indicated that self-efficacy was the most powerful predictor of intentions to exercise. Other researchers (Henson et al., 2010) also indicated that response-efficacy and self-efficacy had a positive and significant association with functional food purchase intention.

Confidence in labor and birth has been identified as an important marker of women's coping abilities during labor (Lowe, 2000). Self-efficacy was also positively related to protection motivation in breast cancer patients (Helms, 2002) and improved self-care behavior among pregnant women in Iran (Zhianian, Zareban, Ansari-Moghaddam, & Rahimi, 2015). Similarly, perceived response efficacy to the effectiveness of prenatal screening test determined women's intention to having a prenatal screening test (van den Berg et al., 2008). Research has generally found that individuals with high response efficacy beliefs are better able to translate knowledge into behavior (Wong, 2009). Based on these findings, it can perhaps be assumed that when a pregnant mother gathers knowledge about usefulness of ANC in preventing maternal complications and acquires confidence about her ability to uptake ANC through health messages, that is, response efficacy and self-efficacy she experiences will increase her intention to uptake ANC. The hypotheses, therefore, are proposed as follows:

Hypothesis 3: Response efficacy is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.

Hypothesis 4: Self-efficacy is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.

Response Cost

PMT suggests that response costs (costs for performing a desired behavior) are important for coping appraisal and protection motivation behavior (Floyd et al., 2000). Floyd and colleagues argue that the response cost if relatively low, will be having positive impact on coping appraisal. Thus, the overall prediction from PMT is that response efficacy and self-efficacy will increase the probability of choosing an adaptive response. On the contrary, high response costs will decrease the probability of selecting the adaptive response.

Research in low-income countries show that income, cost of consultation and, in particular, travel distance to the health care facility are significantly associated with the demand for antenatal care (Overbosch, Nsowah-Nuamah, Van den Boom, & Damnyag, 2004; Simkhada et al., 2008). In context of this research, direct and indirect response costs, such as, treatment cost, travel time and distance to hospital, and long queues in hospitals are captured, which are barriers for ANC uptake. It is likely that high response cost to undertake ANC will decrease a pregnant woman's intention to uptake it, however, the opposite happens when the response cost diminishes, thus promoting intention to uptake ANC. Hence, the next hypotheses are put forth:

Hypothesis 5: Response cost is negatively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.

Role of Attitude in Influencing Behavior

In cognitive research, Knowledge-Attitude-Behavior (KAB) model proposes that behavior changes gradually (Baranowski, Cullen, Nicklas, Thompson, &

Baranowski, 2003). As knowledge accumulates in a particular domain, changes in attitude are initiated. Over some period of time, changes in attitude accumulate, resulting in behavioral change. Knowledge refers to act of acquiring information about a particular fact or situation (Hornby, 2000; P: 658). Role of knowledge and attitude in influencing uptake of ANC by expectant women in Bangladesh have been supported by studies undertaken to explore the current practices by pregnant women for ANC uptake (Khan & Kraemer, 2008; Vanneste, Ronsmans, Chakraborty & Francisco, 2000). Given the known association between Knowledge and behavior (for example, Armitage and Connor, 2001), knowledge is thus assumed to influence behavior through a mediating variable which is attitude. Knowledge and perception are closely interlinked. The status of perception as a source of knowledge would be derivative rather than primary. Clearly, there are many different ways in which knowledge comes to be but an absolutely basic source of knowledge is perception. So in this research fundamental understanding of knowledge is “what is yielded by perception in certain circumstances” (Snowden, 1998; P:301). Mother’s knowledge is an important factor in enabling them in attending ANC. It is revealed that greater proportion of mothers have positive attitude towards ANC although very few of them were knowledgeable on the effect of pregnancy related risk factors (Eni-Olorunda, Akinbode, & Akinbode, 2015). It is recommended that health talks received by mothers should be more explicit in order to further aid knowledge of mothers with low level of perception on risk factors during pregnancy (Bayrampour, Heaman, Duncan, & Tough, 2012). Understanding perception of pregnancy risk is important, because it can affect women’s health care use, motivations to seek care, pregnancy and labor decisions, adherence to medical recommendations, and health behavior (Eni-

Olorunda, Akinbode, & Akinbode, 2015). In addition, mothers should avail themselves of attending programs that would enhance their knowledge on pregnancy which would subsequently change their attitude that can influence pregnancy outcomes. Based on the PMT theory, this research proposes that perceptions of severity, vulnerability, response efficacy and self-efficacy acquired from knowledge of various risk factors and complications of pregnancy can motivate a pregnant women to uptake ANC by changing her attitude towards ANC. TPB also explicates role of attitude as mediator between attitudinal belief and behavior. In effect, such models essentially assume a linear progression of knowledge to increased awareness, which in turn increase behavioral intention through attitude. Socio-cultural factors also play a key role in influencing women's knowledge and practices related to maternal health (Shamaki & Buang, 2014). In the context of this research, knowledge-attitude-behavior relationship is that the more expectant women know about complications of pregnancy and understand the usefulness of ANC in averting these, the more likely they will engage in ANC uptake. Thus, an expectant mother who holds strong beliefs that positively valued outcomes will result from ANC uptake, will have a positive attitude toward ANC. Conversely, an expectant woman who holds strong beliefs that negatively valued outcomes will result from ANC uptake, will have a negative attitude. Hence, the first research question and hypothesis are posed:

Hypothesis 6: Attitude towards ANC is positively associated with intention to uptake ANC.

RQ1: Does attitude mediate the relationship between PMT-based cognitive variables and intention to uptake ANC?

Figure 3. Base Model for ANC Uptake

CHAPTER FOUR PRELIMINARY STUDIES

Two preliminary studies were first conducted as formative research to explore various factors associated with ANC seeking behavior in expectant women in Bangladesh and assess further needs to improve ANC uptake. Details of the preliminary studies including methods used and findings are reported in respective sections below.

Preliminary Study One

In light of previous discussion, there is a need to assess cognitive factors associated with intention to uptake ANC in Bangladesh. Hence, the purpose of this study was to review findings of PMT-based cognitive factors among Bangladeshi pregnant women and compare these with findings of PMT-based studies in current literature. Accordingly, preliminary study one tests hypotheses (H1a, H2a, H3a, H4a, H5a) proposed in Figure 3.

This preliminary study assesses the efficacy of PMT to investigate predictions of pregnant women's motivation to uptake ANC for possible risks of pregnancy. Data in various other studies showed that women needed more information on easily detectable symptoms which could be early warning signs of pregnancy complications (Anwar, 2008). Therefore, prior to any intervention on risk perception of pregnant women and subsequent utilization of ANC services, a greater understanding of women's perception of pregnancy complications and their effects on maternal health and well-being is essential. A small scale survey was conducted to ascertain pregnancy related cognitive beliefs among expectant women in Bangladesh and their current awareness about usefulness of ANC. The survey also sought to measure the current state of ownership and use of mobile

phones among potential mothers. The interviewer-assisted survey was conducted in 2013 at a hospital in Dhaka city of Bangladesh.

Method

Participants

The first preliminary study was performed in urban settings where residents have access to antenatal check-up facilities at public and private health facilities. The sample was recruited from the Bangabandhu Sheikh Mujib Medical University Hospital's (BSMMU) outpatient department in order to reaching out to study population. Eligible participants were identified from pregnant females aged between 18-49 years who were not admitted to hospital at the time of survey. The sample included women attending clinic for the first time as well as women who had attended for check-up earlier. The survey excluded mothers who came to hospital with known symptoms of potential complications (such as vaginal discharge, high blood pressure, high fever, convulsion etc) and those expected to deliver within three months. Symptoms for potential complications were reported by patients themselves on query. A purposive sampling method was adopted to recruit participants. After briefing the recruited women on the purpose of the study, surveys were conducted on 220 potential mothers, of which, completed questionnaire of 200 women were identified for analysis.

Instrument Development

A questionnaire was developed by identifying and adapting appropriate measures from the existing literature. The questionnaire consists of four sections: a) demographic

characteristics; b) media use pattern; c) perceptions related to general health; and d) perception about antenatal check-up, pregnancy related complications and various measures of cognitive and other psycho-social theories conceptualized earlier in the dissertation.

The questionnaire was translated by the researcher into standard Bangla and back translation of the scale was done after the survey. To evaluate the content validity of the translated version in terms of its accuracy, appropriateness and applicability, a panel of experts comprising one each from medical, nursing and public health specialists, and two women who met the inclusion criteria were invited.

Questionnaire Pre-test

The questionnaire (in translated Bangla version) was pre-tested to assess its clarity among the participants. Pretesting was done on 10 pregnant women in Dhaka ahead of the main study. Based on their feedback, questionnaire was slightly revised to correct few inconsistencies, repetition and ambiguities. A retest assessment after a lapsed time period of two weeks were conducted on the same sample of 10 women. The final version of the questionnaire used for the survey is at Appendix A.

Measures

The items for measuring various constructs were adapted from the scales developed and validated by past research in the field of health communication, public health and social science. The items adapted from other health-related research were modified to suit the proposed research on uptake of ANC in Bangladesh. All PMT constructs along with details from where these were adapted are discussed below:

Perceived Severity. Champion (1984) developed measures of the health belief constructs in the context of breast self-examination. The strengths of the scale developed to measure severity are that the items are largely self-referenced, and hence measure the impact of the illness would have on the individual. Participants were asked to respond to four items about severity of pregnancy complications. Answers were to be selected on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A sample question used here is, “Pregnancy complication is a serious matter”. A higher score indicates a higher perceived severity.

Perceived Vulnerability. Measures of perceived vulnerability focus on absolute measures of risk (van der Pligt, 1998). Absolute measures refer to the perceived likelihood that a negative event will occur. In this research, two-item questions (for example, Chance of your being diagnosed with pregnancy complications is high) were asked to participants about vulnerability of the respondent that she might suffer from complications. Participants responded on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A higher score indicates a higher perceived vulnerability.

Response Efficacy. Three-item scale were derived and modified from Witte, Cameron, McKeon, and Berkowitz (1996). Participants answered questions (for example, Regular antenatal check-up will provide me with reassurance of good pregnancy) on the effectiveness of uptake of ANC against pregnancy complications or bad pregnancy outcomes. Answers were to be selected on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A higher score reflects a higher response efficacy.

Self-efficacy. The General Self-Efficacy (GSE) scale (Schwarzer & Jerusalem, 1995) was created to predict coping with daily hassles as well as adaptation after

experiencing various kinds of stressful life events. It was originally a four-point scale. But, for this research, it was modified and respondents were asked to grade their response to the ability issues on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Three-items (for example, I am confident of acquiring information on pregnancy complications) were included in the analysis. A higher score indicates a higher self-efficacy.

Response Cost. Response cost was measured on 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) with high score indicating high response cost. It included two items. An example of questions used here is, “it is expensive for me to go for regular antenatal screening”. This scale was adapted from measures of the health belief constructs in the context of breast self-examination developed by Champion (1984). Response cost indicated subjects expecting to lose incentive to go for uptake of ANC. The higher the response cost, the higher the expectation of losing incentive to go for uptake of ANC.

Intention to Uptake ANC. Four items were adapted from Armitage and Conner (2001) to measure the intention to uptake ANC by pregnant mothers. The respondents were asked to answer on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The items were preceded by a phrase “I intend to....” and expressed pregnant mother’s intention to know more about pregnancy complications and issues related to ANC uptake. A higher score indicates stronger intention to uptake ANC.

Use of Mobile Phone. Use of mobile phone (with internet and/or text enabled) for communicating with others for seeking information regarding health related issues were constructed for this research. 5-point Likert scale ranging from 1 (Extremely

Unlikely) to 5 (Extreme Likely) on participants' likelihood of using new media for seeking health information was used to record the responses. An example of items used here is "Are you likely to seek public health information through following media sources?" A higher score indicates a higher use of mobile phone.

Ethical Considerations

Ethical considerations related to this study included upholding the ethical principles of human subjects' research, balancing the benefits and risks, and obtaining informed consent. During the time of data collection for preliminary study one, the author contacted the School Authority to know about the School's policy for overseas data collection. It was informed that overseas data collection by survey would not require approval from Institutional Review Board (IRB) of Nanyang Technological University (NTU). Hence, administrative approval from overseas research site would suffice. Accordingly, administrative approval was taken from the relevant office of BSMMU, Bangladesh (Appendix C). The purpose and nature of the study were explained to all eligible participants. Before the study, participants were asked to sign a written consent form (Appendix F). Once the participant had agreed to participate in the study, the questionnaire was completed in a private place provided by the hospital. A small monetary incentive (US\$3.25) was provided to all participants.

Data Analysis

Data were analysed using SPSS software version 18. Descriptive statistics, including frequencies, means and standard deviation were employed as general analytic procedures to describe the demographic profile of the participants.

Findings

The objective of the current study was to find out the behavioral factors associated with ANC uptake among Bangladeshi pregnant women using PMT theory. In this section, results of the cross-sectional survey are reported. Another goal of the study was to obtain information about media use by women of reproductive age. Findings of this study will be used in conjunction with findings of focus group design to develop a framework for communication intervention.

Sample Characteristics

Sample characteristics and motivation for change of behavior are summarized (see Table 1). Among the total 200 pregnant women, 56 (28%) attained education below 10th grade and remaining 144 (72%) attained 10th grade and above. Number of employed women was 40 (20%) and the rest (160 or 80%) were unemployed. The employed women included part-time, full-time and self-employed women. Pregnant women representing low-income household were 138 (69%) and high-income household were 61 (30.5%). Pregnant women with first pregnancy were almost equal to the women with one or more children (50.5% as opposed to 49%). Among the women having children, 65 (66.33%) said they had a good experience of their previous pregnancy. The rest 33 (33.67%), however, reported moderate or bad experience in past pregnancy. New media facility such as computer, mobile phone and internet access were available in 32.7%, 97% and 25.6% households respectively. Mobile phone was a common ICT equipment evident by the fact that mean (*SD*) number of phone per participants was 1.40 (.88) with a range from 1-6. Among the mobile phone owners, 16.6% had e-mail or internet access in their phones.

Among the participants, only 32 (16%) said they used computer for a satisfactory time (3 and above on a 5-point Likert scale). Intention to change behavior returned a good result with a Mean (*SD*) of 4.06 (.82) on a 5-point Likert scale. Chi-square test indicated that on average women with first pregnancy (Mean= 4.12) had greater intention to change behavior than women with one or more children (Mean= 4.00), however, the result is not significant ($p>.05$).

Table 1.

Demographic Characteristics of the Study Sample (n=200)

Characteristics	Number	Percentage
Educational level		
Below Secondary School	56	28
Complete Secondary School and above	144	72
Household Income		
Low income (<25000Tk)	138	69
High Income (>25000Tk)	61	30.5
Number of Children		
First Pregnancy	101	50.5
One or more Children	98	49
Past obstetric history		
Good	65	66.33
Moderate	20	20.41
Bad	13	13.26
Employment Status		
Employed	40	20
Unemployed	160	80
New Media availability at home		
Mobile Phone	193	97
Computer	65	32.7
Internet access	51	25.6
Number of mobile phones with functions	1.40±0.88 (Mean± <i>SD</i>)	1-6 (Range)
E-mail	33	16.6
Internet access	33	16.6

Use of Computer		
Very infrequently	157	78.9
Infrequently	10	5.0
Neutral	17	8.5
Frequently	11	5.5
Very frequently	4	2.0
Intention to Uptake ANC		Mean (SD)
To go for regular check up	4.06 (.82)	
To know about complications	4.13 (.72)	

Item Responses and Reliability

Unidimensionality was tested for the measures through exploratory factor analysis for each construct, using varimax rotation in principal component analysis. As suggested by Hair, Black, Babin, and Anderson (2010), the factor loading for each item should be more than 0.50. Constructs were then assessed for internal reliability using a Cronbach's alpha of 0.70 as a benchmark (Nunnally, 1978). All measures satisfied the criterion set above. A summary of all PMT constructs together with item code, scale items and Cronbach's alphas are presented in Table 2. The Mean scores (SD) and standardized loadings of items of the PMT constructs are also reported. The number of participants with missing data for individual PMT items varied from 1-4 (<2.00%).

The mean (SD) score of the five PMT constructs were Perceived Severity 4.10 (.93), Perceived Vulnerability 3.27 (.93), Response Efficacy 4.43 (.60), Self-efficacy 3.19 (1.10) and Response Cost 3.35 (.95). All mean scores of PMT constructs were above the middle point (=3.00) of the 5-point Likert scale. The mean scores (SD) for the 14 items of five PMT constructs varied from 2.89 (1.20) for Self-efficacy item 3 (SE3- It is easy for me to acquire information on pregnancy complications) to 4.47 (.66) for Response

Efficacy item 1 (RE1- Regular antenatal check-up will provide me with reassurance of good pregnancy). The mean (*SD*) score of Mobile Phone use is 1.90 (1.00).

Table 2.

Item Reliability and Validity for PMT Measures and Mobile Phone

Variable	Item Code	Item descriptions	Mean (<i>SD</i>)	Factor Loading	Cronbach's α
Perceived Severity (PS)			4.10(.93)		.89
	PS1	Pregnancy complications is a serious matter	4.30(.94)	.78	
	PS2	Late detection of pregnancy complications increases the possibility of death of child in womb or during delivery	4.20(1.00)	.89	
	PS3	Complicated pregnancy can cause death to pregnant mother	4.33(.94)	.90	
	PS4	Complicated pregnancy can lead to mental stress at a later date	3.59(1.43)	.75	
Perceived Vulnerability (PV)			3.27(.93)		.73
	PV1	The chance of your being diagnosed with pregnancy complications is high	3.01(1.09)	.86	
	PV2	It is possible that you may have pregnancy complications even if you or any of your family member does not have history of pregnancy complications	3.53(1.00)	.83	
Response Efficacy (RE)			4.43(.60)		.81
	RE1	Regular antenatal check-up will provide me with reassurance of good pregnancy	4.47(.66)	.89	
	RE2	Going for regular antenatal screening could save my baby and my life	4.46(.70)	.90	
	RE3	Early detection of pregnancy complications increases the likelihood of successful treatment	4.37(.76)	.63	
Self-efficacy (SE)			3.19(1.10)		.70
	SE1	I am able to go for regular antenatal screening	3.00(1.19)	.71	
	SE2	I am confident of acquiring information on pregnancy complications	3.67(.90)	.75	
	SE3	It is easy for me to acquire information on pregnancy complications	2.89(1.20)	.84	
Response Cost (RC)			3.35 (.95)		.71
	RC1	It is time consuming for me to go for regular antenatal screening	3.38(1.06)	.81	
	RC2	It is expensive for me to go for regular	3.34(1.13)	.86	

antenatal screening			
Intention to Uptake ANC (Protection Motivation-PM)		4.04(.69)	.87
PM1	I intend to go for regular antenatal check up	3.99(.86)	.70
PM2	I intend to know more about pregnancy complications	4.13(.72)	.82
PM3	I intend to find out more about how to proceed to avoid pregnancy complications	4.07(.76)	.89
PM4	I intend to get to know more about healthy lifestyle before I conceive	3.97(.92)	.84
Use of Mobile Phone (MP)		1.90(1.00)	.71
MP1	Are you likely to seek public health information through following media sources? (smart mobile phone with internet)	1.56(1.03)	.79
MP2	Are you likely to seek public health information through following media sources? (mobile phone)	2.23(1.36)	.78

Correlation among Variables

Results of Pearson's correlation (r) analysis at Table 3 indicate that the three PMT constructs individually, namely, Response Efficacy ($r=.31$), Self-efficacy ($r=.42$) and Response Cost ($r=.23$) were significantly correlated ($p<.01$ for all) with intention to change health behavior towards uptake of ANC. Perceived Severity and Perceived Vulnerability were significantly correlated with each other, however, both these variables were very weakly correlated ($r= .05$ for both) with intention to change behavior. On the other hand, Mobile Phone use for seeking health information were significantly correlated ($r=.21$) with intention to change health behavior towards uptake of ANC ($p<.01$). Results showed that self-efficacy was most strongly correlated variable with intention ($r=.42$) among all the indicators. Mobile Phone use for seeking health information was significantly related to self-efficacy ($r=.30$).

Among the demographic variables, only pregnant women from lower income household were shown to significantly associated ($r= .22$, $p<.01$) with intention to uptake ANC. Those in their first pregnancy were shown to be associated at a very low level

($r=.11, p>.05$) with intention to uptake ANC. Other demographic variables such as educational and employment status did not show any significant correlation with intention to uptake ANC.

Table 3.

Correlation of Variables

	Perceived severity	Perceived vulnerability	Response efficacy	Self-efficacy	Response cost	Mobile phone use
Perceived severity						
Perceived vulnerability	.65**					
Response efficacy	.40**	.34**				
Self-efficacy	-.09	-.15*	.15*			
Response cost	-.00	-.09	.14*	.20**		
Mobile phone use	-.13	-.02	-.09	.30**	-.06	
Intention to uptake ANC	.05	.05	.31**	.42**	.23**	.21**

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Hypotheses

Hypothesis 1a and 2a proposed that perceived severity and perceived vulnerability respectively will be positively associated with intention to uptake ANC; the results, however, did not support these hypotheses ($\beta = -.10, p>.05$ and $\beta = .12, p>.05$).

Hypothesis 3a postulated that response efficacy will be positively associated with intention, and the results supported this hypothesis ($\beta = .24, p < .01$). Further, Hypothesis 4a suggested that self-efficacy will be significantly associated with intention to uptake ANC, and the results showed support for H4a ($\beta = .32, p < .001$). Hypothesis 5a postulated that response cost will be negatively associated with intention, the results did not provide support for H5a ($\beta = .14, p > .05$).

Hierarchical Regression Analysis

Prior to conducting a hierarchical multiple regression, the relevant assumptions of this statistical analysis were tested. First, a sample size of 200 was deemed to be adequate given 10 independent variables to be included in the analysis (Tabachnick & Fidell, 2001). Second, an examination of correlations (see Table 3) revealed that no independent variables were highly correlated, with the exception of Perceived Severity and Perceived Vulnerability.

A hierarchical regression analysis was employed to determine the relative effect of the predictor variables on intention to uptake ANC. The relationship between predictor variables and intention to uptake ANC (dependent variable) scores was examined using a four-step hierarchical regression analysis conducted with 10 predictors as shown in Table 4. As existing literature suggest the importance of demographic factors in ANC uptake behavior, these factors such as household income, occupational status of women, number of pregnancy, and educational status of women were entered to model in block one. This research proposes that mobile communication and PMT measures such as threat and coping appraisal might predict the ANC uptake behavior among Bangladeshi pregnant women. Therefore, these variables are entered in block two, three and four respectively as predictors (independent variables) after controlling the variables in previous blocks. The unique contribution of each block of variables was investigated. This analysis was carried out through a series of multiple regression tests, with each block entered last to the regression equation. The specific order of variable entry was selected according to the theoretical framework proposed in this research so that each predictor contributed to the

explanatory variance of intention to undertake ANC after controlling for the variance explained by the previous variables, and also, in order of presumed causality.

Regression was done first with demographic variables, in block one, such as household income, number of pregnancy, educational and employment status of women ($R^2 = .07$, $F(4,188)=3.64$, $p<.01$). Among the demographic variables, only household income and unemployment predict intention to undertake ANC and all demographic variables together accounted for 7% of the variation in intention to uptake ANC.

Since mobile phone use was strongly correlated with intention, this was used next to perform regression to see how it predicted intention to uptake ANC. With addition of 2nd block of predictors to dependent variable after controlling for demographic variables, intention to uptake ANC showed $R^2=.14$, $F(1,186)=6.08$, $R^2_{adj}=.12$, $p<.001$, with observed variance 14%. The mobile phone use turned out to be a fairly good predictor of dependent variable, intention to uptake ANC. The linear regression shows R^2 change = .07, $F(1, 186)=15.69$, $p<.001$ accounting for change in 7% of variance for variable, mobile phone use.

The next steps are done with threat appraisal constructs of PMT and intention to change behavior in block three, and later with coping appraisal constructs of PMT and intention to uptake ANC in block four. The results showed that threat appraisal constructs could not predict intention as R^2 change was .01 ($F(2,184)=1.58$, p not significant). The Anova results for threat variables was $R^2=.15$, $F=(2, 184)=3.99$, $p=.22$, having a change of only 1% of observed variance. Later, it was found that after addition of coping appraisal constructs as predictor for intention to uptake ANC (dependent variable), the results of Anova showed a greater change ($R^2=.38$, $F(3, 181)=11.18$, $R^2_{adj}=.35$,

$p<.001$) and 38% of variance was observed. The coping appraisal constructs indicated a change of 23% of observed variance (R^2 change=.23, $F(3, 181)=21.55$, $p<.001$). Table 4 summarizes results of multiple linear regressions.

Table 4.

Hierarchical Regression Analysis Summary for Intention to Uptake ANC (n=200)

Variable	B	B	t	R ²	Adjusted R ²
Step 1				.07	.05
Number of Pregnancy	.04	.12	1.69		
Educational status	.08	.15	1.88		
Employment status	.04	.07	1.01		
Household income	-.32	-.25	-3.20**		
Step 2				.14	.12
Number of Pregnancy	.40	.13	1.80		
Educational status	.05	.10	1.30		
Employment status	.06	.11	1.61		
Household income	-.37	-.29	-3.84**		
Mobile Phone Use	.19	.29	3.96***		
Step 3				.15	.13
Number of Pregnancy	.04	.12	1.64		
Educational status	.05	.10	1.26		
Employment status	.07	.13	1.82		
Household income	-.39	-.31	-4.02**		
Mobile Phone Use	.20	.30	4.10***		
<i>Threat Appraisal</i>					
Perceived Severity	.03	.04	.45		
Perceived Vulnerability	.06	.09	1.02		
Step 4				.38	.35
Number of Pregnancy	.04	.11	1.86		
Educational status	.02	.04	.56		
Employment status	.09	.16	2.63		
Household income	-.30	-.24	-3.46**		
Mobile Phone Use	.15	.22	3.33***		
Perceived Severity	-.06	-.08	-.98		
Perceived Vulnerability	.09	.14	1.74		
<i>Coping Appraisal</i>					
Response Efficacy	.29	.26	3.77***		

Self-efficacy	.28	.35	5.43***
Response Cost	.07	.09	1.44

* $p < .05$, ** $p < .01$, *** $p < .001$

Preliminary Study Two

The purpose of this study was to explore the perception about risks of pregnancy, role of psycho-social factors contributing to ANC uptake and the need for a novel communication intervention for promoting focused ANC seeking behavior. A focus group discussion (FGD) and in-depth interview (IDI) were adopted for this study which was conducted in Bangladesh in late 2014. The goal was to understand previously reviewed cognitive and socio-cultural concepts from all relevant stakeholders (pregnant women, their husband, relatives, health care providers) giving due emphasis to understand the meaning, views and experiences by them about pregnancy and ANC seeking behavior. These groups are potential decision makers in Bangladeshi cultural context. Husbands, pregnant women, and relatives are divided in three focus groups. Because, simultaneous presence of members from all three groups in same discussion group may hinder the objective of getting everybody's perceptions and arguments in presence of the other as these opinions could be contradictory. Additionally, women in Bangladeshi society are generally conservative and feel shy to talk in presence of males. The health care providers were asked for IDI as they could not be gathered at a time. The focus group design enabled the usage of descriptive and explanatory approaches.

As focus group studies are qualitative in nature, the qualitative data can be analysed to uncover a range of perspectives and themes on a given subject. Focus group method can be regarded an effective way of collecting qualitative data from relatively homogenous population about attitudes, perceptions, and opinions that may influence important behaviors. Focus groups are also advantageous when compared with conducting one-on-one interviews because they allow participants to feed off one another's ideas and

spark thoughts that may not have been captured in isolation. The group format fosters self-disclosure from participants and idea generation via group norm and group interaction (Krueger, 1994). The focus groups are also appropriate for researching sensitive issues such as individual experience, perceptions and feelings. In Bangladeshi cultural context, the issue of pregnancy is associated with women's status in the family and society, so interpersonal dynamics of having similar condition might enable participants to gain mutual comfort and reassurance.

Method

Study Sample and Participant Selection

The activities of conducting a focus group include- identification of the objectives of the focus group discussions, preparation of questions, selection of participants, selection of location, facilitator, note-taker and planning of session.

The sample for the study comprised total 50 participants. They were subdivided for FGDs and key informant interviews. This research recruited 40 participants for three separate FGDs and 10 key informants for IDIs. Three FGDs were formed, namely, (a) FGD for pregnant women comprising 20 pregnant women eligible for inclusion (non-complicated pregnancy, between 18-49 years of age, 3-6 months pregnant), (b) FGD for husbands comprising 10 husbands of pregnant women, and c) FGD for relatives comprising 10 relatives of pregnant women. The selected respondents provided information on women's pregnancy complications, beliefs, perceptions, and experiences on ANC seeking behaviors alongside other social factors and how these influenced ANC seeking behavior for them. They also discussed about various communication channels

for an intervention. Three separate groups of FGD comprising pregnant women themselves, their husbands, friends and relatives were conducted to capture separately from each group the cognitive beliefs and perceptions about the pregnancy complications and their influence on ANC seeking behaviors alongside other socio-cultural factors that motivate the uptake of ANC.

Three FGDs were conducted involving all relevant stakeholders of ANC uptake. For sampling, purposive method was used to include pregnant women of different age groups, parities and gestational ages from across the different settlements (within the field sites). Fifteen pregnant women were purposively selected from BSMMU-run clinic at the peripheral sub-urban area of Dhaka city where they came for reproductive health services. Some pregnant women were obtained through introduction by the pregnant women selected earlier purposively, and out of them five were recruited following satisfaction of the eligibility criteria mentioned above. Finally, a total of 20 pregnant women were included in FGD.

The women were asked to bring their husbands and relatives for two separate FGDs. They were not informed which husbands or relatives will be selected for FGD of that specific group. On the day of FGD, 10 husbands out of 20 were randomly selected by paper-based lottery depicting numbers 1-20. The small closed papers containing numbers were randomly distributed among the participants by a research assistant. Those who hold the numbers from one to ten in husband's group were selected as participants of the respective group of FGD. 10 relatives for the FGD were selected in a way so that they were not associated with the pregnant women whose husbands were selected earlier.

For the IDIs, the health care providers interviewed were selected through purposive sampling. All IDI participants, doctors and nurses, were female, more than 30 years old and had at least 10 years of working experience in ANC unit. They were included due to their potential knowledge about the pregnancy related issues including ANC, possible nature and remedies of pregnancy complications, and their perception about psycho-social factors that interact with and influence the ANC seeking behaviors. The interviews concluded at the point of saturation when no further novel insights were identified from interviewees. The key informants included five medical doctors and five midwives of the same hospital where pregnant participants came to uptake ANC.

Data Collection Procedure

An approval from the hospital authority for this data collection was sought and obtained (Appendix D). The research instruments used to collect data included ‘Guide Lines’ for key informants and focus group. The topic under investigation was the psycho-social constructs of ANC seeking behavior, perceptions and beliefs on pregnancy and their influence on these behaviors and the communication factors interacting with these to influence intention to uptake ANC. Informed consent was taken from all participants after they were briefed about the study. Topics of discussion were mentioned to the participants, but the specific goals of the study were not disclosed. Each participant had been asked some general questions regarding their demographic status and common understanding of ANC and pregnancy.

Each FGD was conducted at a different place and time convenient to participants, and in a room rented for the purpose. FGDs were conducted using a set of semi-structured

questions to guide group discussions. FGDs were held in Bangla language, tape recorded and transcribed in English language immediately after the procedure. A semi-structured interview approach was taken for IDIs which were done at the work places of the key informants. Starting from broad research questions, the topics explored further, and questions posed during interviews were guided by an interview topic guide. Data were collected in Bangla language following the guide. The interviews were conducted at different times in convenient places by two experienced research assistants trained by the researcher.

Facilitators used probes at their discretion and these varied across groups. They alternately used nominal group technique and open brainstorming to control the tempo of discussions and optimize uniform participation across members. Each FGD was lasted for approximately 90 minutes. Their responses were discussed, criticized and recorded. An IDI typically lasted between 1½ and 2 hours and tape recorded. A research assistant also took note of the discussions. Participants were paid a stipend of Tk 200 (US\$ 3.00), and also provided with a light meal.

For this particular study, several techniques were employed to ensure the reliability of the findings: data were triangulated using both interviews and focus groups with a range of respondents. Furthermore, data collection and analysis were carried out by more than one research assistant to reduce the potential for data to be biased.

Interview and Focus Group Guide

FGD and IDI guides were developed to collect data from participants (see Appendix E). FGD were conducted with the aid of FGD guide to facilitate and guide the capturing of information on PMT and other socio-cultural motivators, perceptions about

pregnancy complications, and how these influence ANC seeking behaviors alongside communication factors interacting with these factors to influence the phenomena under study. The participants also discussed other factors they thought as facilitators or barriers to ANC uptake. The IDI guide comprised topics related to the concepts mentioned above. In addition, the health care providers were asked about provisions in hospitals that facilitated ANC uptake and on their work facilities. Both FGD and IDI guides included questions on the socioeconomic status of the respondents. Focus Group and IDI guide questions were prepared by the researcher and pretested with a convenience sample of participants.

Data Processing and Analysis

Every day the collected information was checked, coded and cross-checked by the interviewers and finally by the researcher at the field sites in order to avoid any misreporting. At the conclusion of each session, a moderator/recorder report which summarized key points, notable quotes, and overall findings was completed. Any confusion arising out of this matter was settled on the following day during subsequent visits. The procedure of the study are presented in Table 5.

Table 5.

Procedure of Focus Group and In-depth Interview

Types	ID	Participants and Numbers	Interview Time	Location
FGD	FGD 1	Pregnant women (PW)-20	1 and ½ hours	BSMMU hospital
	FGD 2	Husbands (H)-10	1 and ½ hours	BSMMU hospital
	FGD 3	Relatives and friends (FR)-10	1 and ½ hours	BSMMU hospital
IDI	IDI 1	Doctors (D)-5	90 minutes to 2 hours each	BSMMU hospital
	IDI 2	Nurse (N)-5	90 minutes to 2 hours each	BSMMU hospital

The discussions and interviews were recorded and audiotapes were transcribed verbatim immediately after the FGDs and IDIs. Transcriptions were augmented with field notes made during the data collection. Analysis was done manually. During the process of data collection and data analysis, emphasis was placed in order to identify the research themes that were considered important variables of PMT and other socio-cultural factors, and communication factors that influence intervention for ANC seeking behaviors. Thematic coding was used to analyse the data collected (Boyatzis, 1998). After data collection, information gathered on the same code and categories was assembled together and explanatory quotations were identified and used in the report. Responses on same themes were grouped together. Emerging themes were used to address the objectives of this study. Another research assistant helped with the transcribing independently which was most useful as there were a few tapes and the content of each discussion needed to be examined in careful detail. The research assistant confirmed selection of categories and themes. This was done to control possible bias. Inter-coder reliability was established and there was a high level of concordance between reviewers. Themes and codes are listed in Appendix M.

The author edited the data before and after leaving the field. This entailed checking for uniformity, accuracy, consistency, legibility and comprehensibility. Necessary frequencies and percentages were generated where applicable.

Ethical Considerations

The research subjects were informed and assured of confidentiality for the information they provided. It was confirmed to them that information given would not be

shared with a third party, neither will it be traced back to the respondents. Informed consent for voluntary participation was taken during which they were informed on the scope, purpose, reporting, and method of maintaining anonymity in the study. The consent form and the research tools were translated into Bangla (see Appendix F). Oral consent to use the tape recorder was obtained from all participants. The respondents were also informed that participation in the study was voluntary and that withdrawal from the study at any time of the process was their right. Permission to conduct the study within the research site was granted to the author by the local hospital authority (Appendix D) and the whole process was approved by the IRB of NTU, Singapore (Reference: 2014-01-034, Appendix B).

The respondents were also informed that participation in the study would cause no harm to them and that the information given was for educational purposes. The setting in which the study was conducted was not harmful to the respondents; all risks that would cause harm to respondents were minimised. The participants were also provided with monetary incentive of upto US\$ 3.25 according to their involvement in the study.

Findings

The findings presented are based on three separate FGDs (20 pregnant women, 10 husbands and 10 relatives) and IDIs of two types of health care providers (5 doctors and 5 nurses/TBAs). The health care providers were involved with the provision of ANC at health facilities.

Participant's Characteristics

According to the demographic profile of 20 women respondents (pregnant women) in the area of education, most of them (40%) had attained secondary level of education, 30% had primary level education, and the percentage of women who had never been to school was 15 % of the sample while 15% attained tertiary level education. There was a noted influence between the women's education levels and ANC uptake (Simkhada et al., 2008). Expectant women with tertiary education reported to have obtained ANC from medical professionals unlike their counterparts who had never been to school. Some of the women who had never been to school did not visit ANC health clinics. In terms of occupation, it was observed that a large percentage of the recruited women were house wives (75%), followed by students (15%) and employment holders (10%). The women who were unemployed mentioned that they did not have money to pay for ANC, and had to depend on husband for this. They also said they would remain busy at home for household work and have less access to information. In this regard, one of the women who is a house wife said,

"I often find it hard to pay a visit to the antenatal clinic due to lack of money to travel to the health center". (FGD, 38 year old uneducated pregnant housewife).

As for the age, most of them (40%) were between the ages of 20-24, followed by other age groups. Based on the findings, it was noted that fewer women within the age group of 40-44 (5%) became pregnant, while women between the ages of 20-24 (40%) and 30-34 (25%) constituted the largest number of expectant women. Three teenage pregnant participants was not aware of focused ANC visits, and hence, did not plan beforehand to come for ANC. The pregnant women who was above 44 years was also not

interested about ANC visits very much at the early stage and came for the check up at a later stage of pregnancy.

Among the participants of the two other FGDs, 10 husbands were all educated at least upto secondary level and all of them had jobs. They were the head of their households. Out of 10 relatives, all were females except one. They were educated at least upto secondary level. All of them were housewives except one who had a job. The socio-demographic characteristics of the respondents of FGD are presented in Appendix N.

Different socio-cultural factors and perceptions about pregnancy that influence whether and when expectant women would attend the ANC were discussed. From the analysis of FGD and IDI, five major themes emerged (i) Perception about ANC and pregnancy complications; (ii) Social connectedness; (iii) Women's autonomy; (iv) Social norms; and lastly, (v) Preferred channel of communication. Each theme is examined separately and reported below.

Perception about ANC and Pregnancy Complications

All focus group participants defined and perceived pregnancy as a valuable and important affair in their or their families' lives. They saw it as a great gift from God that required extra attention and care including attending ANC. The importance of ANC was repeatedly expressed as central subject while participants were discussing pregnancy related issues. Most participants of three FGD groups discussed and agreed that ANC was important to prevent different types of problems of mothers and unborn children. In all the three FGDs held, discussants said that pregnancy was experienced as fear of being uncomfortable.

Pregnant women viewed pregnancy as a biological phenomenon that is shrouded with a lot of uncertainty. Pregnancy and delivery were widely perceived as critical, “natural,” “painful” and “stressful” experiences that expose a pregnant woman and the fetus to threats.

“To me, it is a risky thing.... Both mother and child can die. Sometimes the mother dies and at other times the baby may die. Both can create a lot of suffering”.
(FGD, 24 years old pregnant student)

Perceptions of pregnancy as a threatening experience generate fear among several pregnant women. Some women, including both primigravids and multigravids, seeking care from health facilities and alternative care users expressed pregnancy-related fear and anxiety as a common experience:

“I panic when I am pregnant. Sometimes I can dream that I did not get the baby after delivery”. (FGD, 21 year old pregnant housewife)

The causes of these fears are either linked to biological conditions, including overdue pregnancy and cesarean section, or knowledge of other women’s negative childbirth experiences. For instance one woman stated that:

“Pregnant women are very much afraid of Cesarean Section. So mostly when health worker are referring them they don’t want to go for referral because they know there is a problem”.(FGD, 33 year old employed pregnant woman)

Most FGD respondents among pregnant women were able to distinguish a healthy pregnancy from one with complications. Most of the pregnant interviewees reported to have experienced bleeding, nausea, dizziness, headache, loss of appetite, being weak and vomiting. Regarding their own vulnerability to complicated pregnancy, they thought it was decided by God. Some of the discussants (for example, a 38 year old housewife with no education) argued that expectant women who would not show these signs severely did

not have a reason to visit for ANC. The respondents, however, perceived pregnancy as risky. Most agreed that complications could arise during delivery, but this belief did not always lead to ANC uptake at hospital. Despite these elaborate indications of pregnancy-related complications, few participants who received facility-based ANC during their current pregnancy said they could overcome fear through regular ANC uptake and also assurance from previous positive maternity experiences.

In FGD of husbands, most husbands, 9 out of 10, were found knowledgeable about aspects of pregnancy and childbirth. They were aware of the benefits of delivering in a health facility and stated that they would prefer their wives to have an institutional care attended by a trained health worker. They also demonstrated some awareness of potential pregnancy related complications such as bleeding, high blood pressure and swelling of the feet etc.

Both doctors and nurses confirmed that, pregnancy was a meaningful concept for women and influenced ANC attendance. The care providers also held similar perceptions as pregnant women that pregnancy brings uncertainty. They told that ANC attendance was needed for the pregnant women for at least four times, particularly in first and second trimesters one time each, and in the third trimester twice. However, all participants felt pregnant women needed more information for timely uptake of ANC. It was mentioned that some women even came to health centers for ANC uptake only in the 3rd trimester with complications, thus, posing potential harm both for mother and unborn child during delivery. Despite widespread availability of ANC services, most women attended their first ANC late (after 16 weeks). One of the reasons for this was to avoid coming many times; that is, if a woman would start early, she would have to attend ANC more.

It was revealed that some of the pregnant women opted not to seek care from the qualified medical workers as they felt the benefits were not much. Despite perceived usefulness of ANC uptake, half of the interviewed women indicated that they visited ANC clinic for just once during their pregnancy. According to them the potential contributing factor for not visiting ANC clinic is limited information on future complications that they received during health talks and one-to-one consultations during ANC. A recurring issue for non-uptake of ANC was various costs involved. All doctors and nurses identified financial hardship as an important reason for underuse or delay in ANC uptake. In order to ascertain the relevance of lack of money as direct cost that influenced ANC uptake, virtually all pregnant women identified lack of money if they decide to go to hospital without discussing with her husband.

“I totally depend on my husband's financial support to travel to antenatal clinic or pay for fees. If he is away for work, then I wait for him until he is back”. (FGD, 44 year old pregnant housewife with no education)

The participants were also quick to highlight other reasons for underuse of services which included low motivation, family decisions, long and difficult journeys, lack of resources and trained professionals at hospitals, unfriendly attitude and misbehavior of care providers, and long queues in ANC clinics. Such indirect costs were highlighted consistently during discussions.

“I don't visit the antenatal center because the health center does not have enough medical equipment. When we have a problem, all they will do probably is to refer us to another private hospital”. (FGD, 30 year old pregnant housewife with secondary education)

“Some get discouraged when the nurses do not give them the “proper care” that they need, so they stop coming”. (FGD, 20 year old pregnant housewife)

Overworked personnel, long hours, low salary and lack of infrastructure are factors identified by doctors and nurses to explain negative attitudes and unprofessional behavior in some cases. One nurse mentioned:

“We are very busy here, 120-130 patients a day. The situation is intolerable, of course we get tired and burned out. We keep going because we need a job, but this threatens our health”. (IDI, Nurse)

However, 8 pregnant women out of 20 who attended ANC maintained that some medical professionals were caring, understanding and experienced enough to encourage expectant women to seek further ANC. All three focus group participants and health care providers both identified willpower and confidence as motivators for intention to ANC uptake. One pregnant woman (39 year old housewife) who used ANC care previously said she would go back to caregivers with questions about complications.

Health care providers emphasized that pregnancy is a condition full of health risks due to biological and physical changes that occur within the woman’s body that deserve medical attention. They argued timely ANC could manage pregnancy complications adequately. They endorsed ANC as ideal for safety purposes and emergencies.

“During pregnancy a woman needs to get enough rest, maintain good hygiene, physical exercise, good feeding and medical check-ups to keep the pregnancy healthy and to reduce the health risks related to pregnancy”. (IDI, Doctor)

Health care providers further expressed that pregnant women should attend ANC more than once as it was perceived beneficial to monitor progress of their pregnancy or to check the position of the unborn child or to find out other pregnancy related complications. It was emphasized that pregnant women’s perception of pregnancy as a normal condition was a reason for women to sometimes neglect ANC.

“I have to explain to them that they might experience complications affecting themselves and their unborn child during their pregnancy”. (IDI, Nurse)

Pregnant women (12 out of 20 FGD participants) stated that they attended ANC to monitor the progress of their pregnancy or to check the position of the unborn child. The rest of the pregnant women attended ANC to identify problems during pregnancy. Some pregnant women also highlighted the importance of taking medications provided during ANC to ensure healthy pregnancy and the development of the baby. Most pregnant women (17 out of 20), 7 relatives (for example 31 years sister) and 7 husbands also said they trusted health care providers' advice, and they claimed to follow their instructions. This is epitomized by pregnant women's attitude to come for next follow-up ANC appointments.

Husbands and relatives (31 year old sister of pregnant woman) viewed existing care as beneficial. They preferred to send their pregnant wife or relatives to hospital, because care providers provided treatment step by step, counseled sometimes about pregnancy related complications and gave them more time, and motivate them for next ANC visits. Complications of pregnancy could also be better managed because they were staffed with qualified personnel and had the necessary equipment.

“Pregnant women get full care from the health care provider, get tetanus injection, doses of vitamins; urine & blood test, counseling for birth preparedness, iron and folic acid to prevent anemia and they also get the other check-up facilities during the period of ANC”. (FGD, 39 year old husband with tertiary education)

Husbands reported that primary pregnancy support such as disclosure of pregnancy was rarely made to them in the first instance. Most men reported that women typically chose their mothers-in-law or their mothers or sisters. Men told that they thought

delayed disclosure or even non-disclosure to their husband was often due to shyness or possible reaction of husband for unplanned pregnancy. One of the husbands, who reported this was a reason for late reporting for antenatal care uptake, mentioned:

“She told one of her in-laws about the pregnancy, but she did not tell me. When I knew it was already five months. Luckily nothing serious happened”. (FGD, 36 year old husband with tertiary education)

It emerged from discussions that understanding of pregnancy complications might play a vital role in undertaking ANC by pregnant women.

Social Connectedness

Pregnant women seek psychosocial support to help manage pregnancy related fear and anxiety. Psychosocial support is mainly sourced from health care providers and husbands through pampering, and also with involvement of other relatives. All three FGD participants agreed the relevance of psychosocial support.

Pregnant women were receptive of the ideas of getting support from family, friends and relatives during pregnancy, with emotional and informational support preferred. They further noted that social connectedness attempted to influence behaviors of the recipient in a caring, trusted, and respectful context. Some participants (for example, 21 year old housewife with secondary education) believed that if pregnant women were connected to others in the society, many unknown problems could be solved by sharing their experiences. Some relatives (for example, 26 year old sister-in-law, and 49 year old tertiary educated employed mother-in-law) emphasized that networking with family members, friends and other pregnant women could resolve pregnancy related complications including any unwanted situation that might warrant any future problem.

“Pregnant mother should contact and communicate with the family members and other friends. During pregnancy they get advice about what will be done, what should not do, which will be better for their health, when they will go to hospital/clinic, & how they remain safe from complication so that their fetus will be healthy”. (FGD, tertiary educated husband)

The participants identified various ways through which expectant women got access to information of ANC. For example, when asked how they got information concerning ANC behaviors, seven of the expectant mothers (for example, 19 year old pregnant tertiary level student) indicated that women accessed information about ANC from their social networks such as other female friends and colleagues. Seven out of twenty women (for example, 21 year old pregnant housewife) reported that having poor or bad relations with one’s parents or in-laws and other relatives might cause harm to the women and unborn child. According to these women, complications of pregnancy could be eliminated by maintaining good relations with parents, relatives and other people within the community. Health care providers believed husbands ought to be the most supportive person for a pregnant wives. While there was a degree of openness to the idea that there is still more room for men to be involved in pregnancy care, pregnant women during their discussion believed that husbands failed to do so. But in some cases, mother-in-laws played a vital role for making decisions for pregnant women to go for ANC. Pregnant women further believed that sometimes neighbors also helped them know about the pregnancy related problems, and counseled them how to remain well during pregnancy based on their practical experiences.

“Pregnant women should keep a better relationship with neighbors. They would share their experiences and provide information about hospital for better treatment. They can also provide good advices for test, support and inspire them to take good steps for their better treatment”. (IDI, Nurse)

Women's Autonomy

Most of the FGD participants (pregnant women, relatives and friends) were predominantly housewives without any fixed source of earnings. To examine their role in decision making, views on their freedom of movement and role in households purchases were asked. Most of the pregnant women suggested that they were free to go out of home, but most of the time they could not go for lack of money. They further suggested that Bangladesh's patriarchal and hierarchical society limited their decision making power even for regular health related issues, let alone for ANC uptake.

"I comply with my husband's decision. If the husband is not present, they can take their own decision or follow the decision made by other members of the family". (FGD, 34 year old secondary educated pregnant housewife)

All pregnant women mentioned that they would not decide on major purchases in their households, however, they had a say in daily small purchases. The important barrier as reported by all pregnant participants was that most of them did not have means to pay on their own and had to depend on their husbands for the costs involved for ANC uptake.

"My husband meets the costs because he loves and cares for me but in situations when he is unable to pay, I cannot go to hospital". (FGD, 20 year old pregnant housewife)

The patriarchal role of Bangladeshi men was reflected in their identification of being in charge of household money and thus they were the decision makers of issues related to maternal healthcare. In addition to financial authority, some men also justified making decisions based on their wives poor health seeking behavior, due to ignorance of relevant information and laziness. As a result, some husbands reported forcing their wives to go for antenatal check-up.

“Even if the clinic is near, my wife needs to be forced to go there to seek care or to see a traditional birth attendant”. (FGD, tertiary educated male husband)

For ANC uptake, among pregnant women who were less than 24 years of age (11 out of 20), compared to older women more than 24 years of age, perceived that husbands and in-laws were the most influential persons to make decision. For older women, it was pregnant woman herself who sometimes decided to go for ANC.

Health care providers consistently raised the issue of women’s autonomy in decision making as they believed it was important to prevent delay for treatment of potential complications. Another prominent finding was, despite some knowledge on pregnancy complications, women had low motivation to go for ANC uptake. In the focus group for pregnant women, 16 women out of 20 knew that during pregnancy complications might occur. In spite of that 12 of them did not go for early check-up. When asked what could be the reasons for their non-show up for ANC visit, they said they were not aware which condition was normal and which was a complication.

“I don’t know the symptoms of pregnancy problems. I don’t have any information to understand problems. So, I could not decide to ask for help”. (FGD, 20 year old pregnant housewife with primary education)

Social Norm

Pregnant women were highly aware of the influence of important others in the family and society, such as husbands and mothers-in-law. It was reported by 9 pregnant women (out of 20) that their mothers-in-law did not give permission to them to go to uptake ANC early. The mothers-in-law had misconceptions about ANC that the process might rather convince expectant women to do caesarian section.

“My mother-in-law doesn’t help at my work. It might be due to her past experiences. She used to do all the work by herself during her time of pregnancy,

so she wants me to do the same. So I don't have time for antenatal check-ups".
(FGD, 21 year old housewife)

Some of the pregnant participants, however, stressed that mothers and mothers-in-law were role models in the society. They further highlighted that it was beneficial to go to traditional birth attendants as they charged low fees and were local. They argued that these were reasons their mothers or mothers-in-law took their services and they followed the practices for the same reasons. To them, pregnancy was viewed as a part of normal life event rather than a medical condition requiring professional monitoring and supervision. This was especially true for multiparous women in FGD. Indeed, women who delivered without any problem in previous pregnancy did not see a doctor for ANC until her late stage of pregnancy. Despite some husbands' comments that pregnant women should take advice from senior members of the family for ANC, it was revealed that raised consciousness about good outcome of pregnancy compelled their families' decision makers to increasingly allow them to go for ANC.

"Pregnant women will take any type of decisions from their relatives, neighbors and other family members. They also mentioned that they will take the decisions from those people who stay nearer to them all the time". (FGD, secondary educated 52 year old mother-in-law)

The majority of pregnant women thought that educating husbands would be beneficial for the mother and child's health. The desire for further ANC related education for men was pointed out:

"It's necessary to teach the men...in case a complication occurs and the husband is knowledgeable about that, they will take the wife to health care facility". (FGD, 32 year old secondary educated employed pregnant women)

The perceived benefits, according to them, would oblige husbands to know more about women's pregnancy care and complications, in considering the necessity of women's reduction in workload during pregnancy, to make positive decision making etc. However, preferences over the style of health education varied. Due to prevalent cultural norm in Bangladesh, most of the women preferred one-to-one education instead of group setting. Somewhat surprisingly, husbands were aware of their reluctance in giving importance to focused ANC and voiced a sense of urgency in knowing more about pregnancy complications and ways to prevent them. This gap in knowledge was acknowledged by one husband.

“This is the problem, we don't know what to do at which time of pregnancy, what food is required when and how to take care when signs of complications occur”.
(FGD, 26 year old secondary educated husband)

Preferred Channel and Medium of Communication

All participants acknowledged that expectant women might not attend ANC if they were not aware of benefits of attending ANC clinics even when the government equipped the hospitals with all required drugs, equipment and skilled personnel. Interestingly, most husbands reported that it was beneficial to accompany their wives for ANC, because sometimes they would not understand what was the nature of complications and how would they manage it. At the same time, husbands told that sometimes it was difficult to accompany them due to job related preoccupation. On the other hand, some husbands reported that there had been some other barriers that prevented them from accompanying their wives. Firstly, pregnancy related care was seen as a 'female' role and thus it was the responsibility of female in-laws. The second barrier stemmed from the negative attitude

the healthcare providers had towards men participating in ANC which subjected them to unfriendly attitude.

“I have heard others say that if they go to the maternity clinic, the care givers there are rude to them. So they are afraid of being harassed. (FGD, 32 year old secondary educated and employed husband)

It was agreed that there were various ways through which expectant women got access to information related to ANC uptake such as newspaper, leaflets and word of mouth from friends and family. Five pregnant women reported to have received information about ANC from health care providers and five from electronic media. Very few (22 year old tertiary educated and 21 year old secondary educated) reported to have accessed the information on ANC through the printed media like the newspapers and printed posters or leaflets. Six women reported that during ANC visits, some health care providers forgot to advise them about the schedule of the next visit. Furthermore, discussion of focus group and interviews of health care providers confirmed that communication between women attending ANC and health staff was limited due to high patient turn over. The health care providers was particularly concerned about this inadequate communication and attributed this to time constraint and long queues of pregnant women waiting to see a health care provider. When asked, women who used mobile phone informed that they did use the mobile phones in emergency health situation such as calling in a doctor or health provider or to arrange a transport. The pregnant women found the mobile phone as a reliable equipment on which they could depend when they felt helpless.

“I am lucky that I have a mobile phone to call or inform anyone I need. I feel mentally strong when I think that I can use that anytime I want”. (FGD, 30 year old secondary educated pregnant housewife)

All pregnant women stated that mobile phone is becoming gradually cheaper, easy to carry, and does not require much technical knowledge to handle. They said they learnt to use this mostly from friends and relatives. One pregnant woman (39 year old housewife who did not go to school) said:

“I was afraid of using a mobile phone, when a relative showed me how to use it, I found it very easy to manipulate.”

Types of communication channels were discussed, and preferences varied among the participants across FGDs. Husbands preferred traditional and mobile-based channels equally, while most of the pregnant women who were younger than 24 years (11 pregnant women out of 20) were inclined to mobile-based communication. The younger age group (less than 24 years) were interested because they were conversant with use of mobile phone and they thought it would help them getting information about pregnancy related care to enable them making strong arguments for ANC care. The women who were receptive to mobile-based communication for information about ANC preferred receiving SMS messages at least once weekly if not daily. Pregnant women informed that they were familiar with traditional communication based ANC information. When probed further about familiarity of mobile-based communication for ANC information, all pregnant participants confirmed they had never experienced mobile-based communication for ANC uptake before. The health care providers also appreciated the proactive nature of mobile-based SMS communication over traditional communication.

Model for Socio-cultural Constructs

This section of the research discusses the second theoretical constructs, socio-cultural factors identified as crucial for intention to uptake ANC. The important findings of preliminary study two were the role of social norm, women's autonomy and social connectedness for pregnant women's intention to seek ANC. The pregnant women's use of maternal health care was influenced by perceived social norm that impeded their autonomy in decision making. It was noted that pregnant women's social networks not only provided them with ANC-related information, but also promoted their ANC behavior by providing emotional support. Researchers argued the values of kinship and collectivism in influencing health behaviors and outcomes (Kreuter & McClure, 2004). Result from FGD and IDI, thus, substantiated that these socio-cultural constructs have a role in facilitating ANC uptake.

In accordance with past research on ANC seeking behavior (Dako-Gyeke, Aikins, Aryeetey, Mccough, & Adongo, 2013), the influence of socio-cultural factors appear vital for intention to uptake ANC. Although socio-cultural concepts derived from various psycho-social theories are presented in the different documentations available, yet this information is insufficient to account for intention to uptake ANC. Figure 4 presents the socio-cultural theoretical constructs specifying the determinants of intention to uptake ANC.

Figure 4. Model Comprising Socio-cultural Constructs for ANC Uptake

The rationale for the model hinges on socio-cultural factors playing a key role in developing perceived social norm and attitude for ANC behavior among pregnant women. A detailed investigation is undertaken as follows to provide theoretical support for hypothesized relationships:

Perceived Social Norm

Most definitions of social norms have two common features. First, individuals perceive that most people around them conform to particular behaviors. Second, individuals have a perception that other people around them – i.e. society - believe they

ought to conform to those behaviors. Thus, expectations of what we should do, and of what others expect us to do, constitute 'social norms' (Bicchieri, 2005). Although the importance of social influences on ANC uptake has not been clearly demonstrated in maternal care research, other health-promoting behaviors such as physical activity and healthy eating have increasingly recognized the role of social influences. The study of social influence and, in particular, the impact of social norms upon behavior has been a central theme in social psychology (White, Smith, Terry, Greenslade, & McKimmie, 2009). Several theoretical approaches have traditionally been used to conceptualize the mechanisms through which social norms affect behavior. One of these, the social norms approach (Berkowitz, 2004; Berkowitz & Perkins, 1986) provides theoretical reasoning as to why perceived norms should play such a role to influence behavior. It argues that because individuals are motivated to act in ways similar to relevant others (for example, a reference group), their perception of a reference group's behavior will influence his or her subsequent behavior (Berkowitz, 2004). In TPB, the concept of norm was theorized as subjective norm. However, several researchers (Ajzen, 1991; Conner & Armitage, 1998; Godin & Kok, 1996) have pointed out that subjective norms are only weakly related to intentions, especially compared to that of attitude. Sheeran and Orbell (1999) described some approaches that have been used in attempts to improve this weak relation. One approach is to pay more attention to the specific situations on the social norm-behavioral intention relation where social identity, that is, influences of behaviorally relevant reference group moderates norm-intention relation. A second approach is to include a broader notion of norm. This research, thus, proposes perceived social norm, instead of subjective norm, as predictor of intention.

The concept of perceived social norm have contributed significantly to studies of many health behaviors including condom use (Albarracin, Kumkale, & Johnson, 2004), HIV-risk behaviors (Latkin, Forman, Knowlton, & Sherman, 2003) substance use (Etcheverry & Agnew, 2008) and drunk driving (DeJong & Hingson, 1998). Most relevant for present purpose is evidence that social norms play an important role in predicting intentions for uptake of protective behavior, such as screening for breast, colon and prostate cancer (Smith-McLallen & Fishbein, 2008). However, social norms can be seen externally, while the changes in attitude is internal and, therefore, invisible to others. In many societies, influence of normative beliefs approved of by family and friends predicted women's intention to perform a certain behavior. This is supported by a Jordanian study where women acknowledged the influence of significant others on their intention to undergo mammography (Ham, 2005; Tolma, Reininger, Ureda, & Evans, 2003). Bangladeshi society, being a muslim conservative society, practices similar culture. The intensity of antenatal visits appears to be spatially correlated in some survey villages in Ghana, implying that there may be some social influences that affect a woman's decision to utilize ANC (Owoo & Lambon-Quayefio, 2013).

Much has been discussed on the relationship between social support and influence of others in the society and how both processes can interact for subsequent increase in intention to engage in a behavior (Lin & Kaslow, 2009). In postulating these relationships in the context of ANC uptake, the concept of social norm may be the conduit between the socio-cultural factors (for example, social connectedness) and ANC uptake. The integrative model of behavioral prediction (IMBP; Fishbein, 2000) hypothesized that perceived norms impact behavior in conjunction with several other factors. In TPB,

perceived norm links normative belief with behavior suggesting its potential role as mediator. The findings of a study in Bangladesh where community-based intervention program was employed suggest that the program aiming to influence knowledge and practices can successfully initiate changes in social norms and practices related to maternal health care (Taleb et al., 2015). Effectively designed media interventions can influence the collective beliefs which can drive social norms. BBC Media Action's research in Bangladesh, for example, identified that social norms affected the uptake of antenatal care (ANC) (Frank, Jodrell, & Smethurst, (in press). Many Bangladeshi women – and their husbands and brothers – are uncomfortable with the idea of being treated by male health workers at health clinics and hospitals. There is also a popular view that the main purpose of ANC is to advise whether a woman should give birth in hospital or at home. These beliefs feed normative disapproval towards women who seek ANC. While this research argues norms define the behavior of an expectant women who occupy a certain status or position in society due to her pregnancy condition, it proposes that changes in her behavior would be preceded by changes in norms and attitude if they are to become permanent. It is further proposed that expectant women are more likely to act upon their intention to uptake ANC when they enjoy autonomy in decision making and are influenced by their social network. Thus, the next research question and hypothesis follow:

Hypothesis 7: Perceived social norm is positively associated with intention to uptake ANC.

RQ2: Do perceived social norm and attitude mediate the relationship between socio-cultural factors and intention to uptake ANC?

Women's Autonomy

Women's autonomy can be conceptualized as the woman's ability to determine events in her life, or capacity to manipulate one's personal environment through control over resources and information in order to make decisions about one's own concerns or about close family members (Doan & Bisharat, 1990; Dyson & Moore, 1983; Safilios-Rothschild, 1982). In recent years several studies have focused on the relationship between women's autonomy and maternal healthcare use. In Indonesia, Beegle et al. (2001) found that a woman's control over economic resources influenced both antenatal care and use of delivery care. The woman's household socio-economic status often determines women's ability to seek ANC by not only for her ability to pay fees but for lack of adequate access to information (World Bank, 2006). A study from India found that women's autonomy was associated with use of prenatal and postnatal care (Balk, 1994). Several studies have reported a lack of association between women's autonomy and reproductive healthcare-seeking behavior. For instance, a study from Guatemala found that women's decision making power was not associated with place of childbirth or with having a postpartum check-up (Becker et al., 2006). A study from Nepal also reported that women's participation in domestic decision making was not associated with use of either antenatal or delivery care (Furuta & Salway, 2006).

In general, the proportion of women seeking ANC goes up with increased access to the required information needed to make informed decision regarding ANC (Trinh, Dibley, & Byles, 2007). Literature suggests that more than one-third of women identified their husbands as the main healthcare decision maker, while 35% listed other male relatives, such as fathers, fathers-in-law, and uncles. For example, studies found that

husband's refusal was one of the major reasons for non-utilization of ANC in Nigeria (Adamu & Salihu, 2002). In addition, a review of the literature on care practices for mothers and newborns in Bangladeshi homes, Darmstadt, Syed, Patel, and Kabir (2006) found that fathers generally took decisions for seeking care outside the home from a trained provider in the event of complications. Further, the 2007 Bangladesh Health and Demographic Survey indicated almost one third of currently married women between 15-49 years agreed they had no final say, even on decisions concerning their own health, with 32.3% reporting that their husbands made the final decision (NIPORT, 2009). In addition, Hossain and Ross (2006) found that nearly 70% of women surveyed in Bangladesh indicated the need to seek approval from other family decision-makers to use hospital services. Similarly, a study in rural North India (Pallikadavath, Foss, & Stones, 2004) identified women's position in the household and society and her autonomy in decision making to be positively related to use of ANC. Travelling in the company of another adult (accompanied mobility), another indicator of women's autonomy, was positively associated with ANC use in Pakistan (Mumtaz & Salway, 2005). These cross-country studies highlight the importance of women's autonomy as contributor to intention to uptake ANC.

Overall, review of the literature shows that few studies from Bangladesh have looked at the relationship between women's autonomy and their reproductive healthcare-seeking behavior. United Nations Development Program (UNDP) (2011) reported that Bangladesh ranks 112 out of 187 in context of Gender Inequality Index which implies a composite measure reflecting inequality in achievements between women and men in three dimensions: reproductive health, empowerment and labor market. Empowered

women, particularly those who are more autonomous, have increased pregnancy health care-seeking (Haque, Rahman, Mostofa, & Zahan, 2012) and are more likely to have skilled delivery attendance (Haque et al., 2012; Fotso, Ezeh, & Essendi, 2009).

The research proposes to investigate the determinants of women's autonomy and power and their relationship to women's reproductive intentions and behavior. As suggested earlier, change in behavior is mediated through change in attitude. It is proposed that during pregnancy, feeling confident about one's ability to manage pregnancy, having control over minor household purchases, and a sense of responsibility for health of her and unborn child are necessary for an expectant women to form a positive attitude toward ANC uptake. It is likely that pregnant mother's high autonomy will also change the existing social norm that determines women's position in the society, and is required for her to decide on the uptake of ANC. In this context, the following hypotheses are proposed:

Hypothesis 8: Women's autonomy is positively associated with (a) intention to uptake ANC, (b) perceived social norm, and (c) attitude.

Social Connectedness

Social connectedness is described as the relationships between an individual and other people, communities and environments which promote a sense of trust, belonging and social identity (Hagerty, Lynch-Sauer, Patusky, & Bouswema, 1993; Mitchinson, Kim, Geisser, Rosenberg, & Hinshaw, 2008). It refers to the overall quantity and quality of relationships that individuals experience (Mitchinson et al., 2008). Further, it has been characterized as an enduring and ubiquitous sense of the self in relation to the world (Lee

& Robbins, 2000, p. 485) which permits individuals to identify with others that are different than the self (Lee & Robbins, 1995). A sense of social connectedness has been found to be related to higher levels of well-being in such populations as low income pregnant women (Zachariah, 2004). In Bangladesh, kinship remains the principal unit of social and economic organization (Muhuri & Preston, 1991). The families here are closely knit and many families share household to optimise their individual income. The first hand relatives also keep contact with each other for social reason. Thus, it is common that a pregnant women gets support during pregnancy condition. Feeling isolated and alone are common experiences for women in the early months of motherhood, so it is not surprising that women value the offer of reassurance and companionship so highly. Here the motivation for supporting relatives and friends is to increase women's confidence in their capacity to birth, to encourage, praise and empower them by providing companionship and reassurance, as well as comfort.

Connectedness with the fellow community, relevant others including healthcare providers could be a potential protective factor that may diminish risk-taking behaviors and promote uptake of healthy behavior. Researchers have found that patients' perceptions of the extent of their connectedness or the quality of the relationship with their healthcare providers is associated with increased participation in decision-making (Marelich & Murphy, 2003), and decreased risk-taking behaviors (Beach, Keruly, & Moore, 2006). Studies suggested family and peer support might also be important for safety behavior (White, Johnson, & Buyske, 2000). For example, one can be influenced by peers, and these types of influences can play a role in a person's decision to behave in a certain manner. Some authors suspect that the vast majority of diseases and other health

outcomes such as functional status, disability, and well-being are affected by the social world surrounding everybody (Berkman & Kawachi, 2000; Cohen, 2004). Past research suggests that failure of husband to provide support to expectant women also influences ANC seeking behaviors (Safadi, 2005; Yamba, 2003). A Nepalese study highlighted that senior members in the family, such as mothers, mothers-in-law had influential roles regarding pregnancy care, and decision making by pregnant women for ANC uptake (Deo & Bhaskar, 2014). This is supported by research of Erci (2003) where he mentioned that social support from family members significantly affected use of ANC. Another research found that women who felt friends and family to be unsupportive were twice as unlikely to attend ANC as other women (McCaw-Binns, La Grenade, & Ashley, 1995).

Shared norms and mutual trust among members of a society may be expected to promote communal action. Indeed, members of common social networks may share opinions and experiences and then act according to suggestions and general expectations. Therefore, a woman's social network has the potential to play a significant role in her decision to use prenatal care services (Heaman, Green, New-burn-Cook, Elliot, & Helewa, 2007; Andersen & Newman, 2005).

Using data on 34 neighborhoods in Brazil, Lamarca, do C Leal, Sheiham, & Vettore (2013) found that women between their first trimesters of pregnancy and postpartum who had strong social support and were part of social networks reported that they had good health during this period, emphasizing the importance of an individual's social network in influencing health behaviors and outcomes. Another study in Ghana also investigated the importance of social support (including information support, religious activities, relatives and friends, neighborhood association) among pregnant women and

found that these were significant social determinants for the appropriate use of prenatal care (Owoo, & Lambon-Quayefio, 2013). Results from interviews with pregnant women living in rural Mexico (Lapinski, Anderson, Cruz, & Lapine, 2015) revealed limited social networks; often, only a woman's mother or the baby's father were consulted about ANC decisions. However, in the same study women also indicated that communication with others during pregnancy provided important normative information regarding ANC uptake.

Berkman (2010) in her model of social network and health suggested that both face-to-face interaction and non-visual contact influences adherence to treatment by behavioral mechanisms. These type of social connectedness can increase social support by informing or apprising a person on a specific health issues and influence his/her attitude and norms towards treatment adherence. Hence, socially connected pregnant women who are motivated by fellow pregnant women, friends, service providers and family members to uptake ANC may show stronger intention to do the same. Thus, the research hypothesizes,

Hypothesis 9: Social connectedness is positively associated with (a) intention to uptake ANC, (b) perceived social norm, and (c) attitude.

Developing Extended Model for ANC Uptake

After hypothesizing the key roles of cognitive variables in base framework, the extended research framework is developed adding socio-cultural factors based variables. The extended research framework is conceptualized to understand the role of these factors to promote focused ANC uptake among Bangladeshi pregnant women. As discussed

earlier in Chapter Three and Four, social norms and attitude do play mediating roles for uptake of ANC as shown in Figure 5.

Figure 5. Extended Model for ANC Uptake

After proposing the extended theoretical framework for uptake of ANC, the research summarises hypotheses, research objectives and research questions in Table 6.

Table 6.

Summary of Research Hypotheses, Research Objectives and Research Questions

Research Hypotheses	
H1	Perceived severity is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.
H2	Perceived vulnerability is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.
H3	Response efficacy is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.
H4	Self-efficacy is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.
H5	Response cost is negatively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.
H6	Attitude towards ANC is positively associated with intention to uptake ANC.
H7	Perceived social norm is positively associated with intention to uptake ANC
H8	Women's autonomy is positively associated with (a) intention to uptake ANC, (b) perceived social norm, and (c) attitude.
H9	Social connectedness is positively associated with (a) intention to uptake ANC, (b) perceived social norm, and (c) attitude.
Research Objectives	
RO1	To develop and assess a theoretical framework to propose psycho-social factors in promoting intention to uptake ANC among pregnant women in Bangladesh.
RO2	To design and examine the efficacy of an appropriate theory-based communication intervention aimed at increasing utilization of ANC.
Research Questions	
RQ1	Does attitude mediate the relationship between PMT-based cognitive variables and intention to uptake ANC?
RQ2	Does perceived social norm and attitude mediate the relationship between socio-cultural factors and intention to uptake ANC?

CHAPTER FIVE ASSESSING THEORETICAL FRAMEWORK AND DESIGNING INTERVENTION MODEL

The chapter is aimed at assessing the final extended theoretical model and designing research model for communication intervention. Taking inputs from descriptive and inferential data from preliminary Study One and findings from the focus group study in preliminary Study Two, a research model was designed for a communication intervention. Theory-based health messages were delivered on three types of communication platforms. The efficacy of the communication intervention was evaluated using a quasi-experimental study. The deployed method and findings of hypothesis testing for the research model are described in respective sections. Lastly, this chapter summarizes the design of the communication intervention.

Assessing Extended ANC Uptake Model

This section reports the assessment of the proposed extended theoretical model (as shown in Figure 5 in Chapter Four) using survey method before embarking on the intervention study. The data from the survey was used to test the hypothesized relationships proposed in the model. This extended theoretical model for ANC uptake comprised PMT-based cognitive motivators and socio-cultural constructs. The proposed relationship of hypothesized links to attitude, perceived social norm and intention to uptake ANC are also presented.

Method

Sample and Data Collection Procedure

The sampling frame for this research model comprised pregnant women living in the suburbs of Dhaka city in Bangladesh. In agreement with the research problem, this research examined intention to uptake ANC for those respondents who own a mobile phone. Hence, the first step was to pre-screen pregnant women satisfying this requirement indicated as a qualifying criteria of this survey. In addition to informing the potential respondents about eligibility, check questions were included in the survey to verify different aspects of using mobile phone, such as how frequently do they use mobile phone for purposes namely, for talking or text messaging etc. Inclusion criteria for recruitment were as follows:

- ◆ Mobile phone user
- ◆ Bangladeshi pregnant women between 18-49 years of age
- ◆ Duration of pregnancy between 3-6 months
- ◆ Uncomplicated pregnancy
- ◆ Not admitted to hospital during the period of survey
- ◆ Not participating in any other survey or intervention

Eligible pregnant women complying with the above inclusion criteria were recruited through purposive sampling. Sampling was purposive, as participants could not be randomly selected since they were automatically a target group for the study and had to fulfil specific inclusion criteria. Some participants were also recruited through introduction by their contacts who had visited the hospital's obstetric clinic for ANC.

Among them, those who fulfilled the purposive selection criteria were recruited. Sample size was calculated by OpenEpi, a free Web-based open source operating system that provide a number of epidemiologic and statistical tool (Sullivan, Dean, & Soe, 2009). The calculation of sample was done using the following information: Population size of the study- 47 million women of reproductive age, conservative anticipated frequency that 50% of the recruited women will go for desired ANC uptake, confidence limit 95% and margin of error 5%. The online calculator uses the formula below for designing a survey or experiment to estimate a population mean:

$$ME = z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \text{ which also translates to } n = \frac{\hat{p}(1-\hat{p})z^2}{ME^2}$$

where ME is the desired margin of error,

z is the z-score, e.g. 1.96 for 95% confidence interval

$\hat{p}$ is the value of anticipated frequency

n is the sample size

With ME = 0.05, $\hat{p}$ = 0.5, z = 1.96, we get $n = \frac{0.5 \times 0.5 \times 1.96 \times 1.96}{0.05 \times 0.05} = 384.2$

However, as the research planned for seven conditions for communication intervention, it targets returned responses from at least 420 recruits, 60 pregnant women for each condition. With the help of a few research assistants who were trained by the researcher, the paper-based survey questionnaires were individually distributed to 450 pregnant women who attended the antenatal clinic of BSMMU in late 2014. Subsequently, completed responses from 420 pregnant women were included in the later analyses. The respondents were assisted by the trained research assistants so that the completion of the

questionnaire can be facilitated. The high response rate is attributed to the fact that the survey was administered on the site with the help of the research assistants.

Instrument Development

For data collection, a questionnaire was developed by identifying and adapting appropriate measures from the existing literature. The questionnaire consisted of three sections: (a) demographic characteristics; (b) media use pattern; and (c) perceptions about antenatal check-up, pregnancy related complications, and various measures from health behavior theories. The final version of the questionnaire, presenting a list of items used in the thesis is presented in Appendix G.

The questionnaire was translated into standard Bangla by the researcher and back translation was done after the survey. To evaluate the content validity of the translated version in terms of its accuracy, appropriateness, and applicability, a panel of experts comprising one each of gynaecologist, nursing specialist and public health specialists, and two women who met the inclusion criteria were invited.

Measures

The items for measuring various constructs were adapted from the scales developed and validated by past research in the field of health communication, public health and social science. The items were modified to suit the proposed research on uptake of ANC in Bangladesh. PMT-based motivators, except *perceived severity* construct, used for preliminary Study One were revised for the constructs for the proposed research model based on feedback from participants of the Study One. One item each was added for *response efficacy* and *response cost*, one item was deleted for *intention to*

uptake ANC, and for *self-efficacy* item numbers remain same but rephrased. Four new constructs, namely, *attitude*, *social connectedness*, *perceived social norm* and *women's autonomy* are added as measures. All constructs proposed for the model along with details from where these were adapted are discussed below:

Perceived Severity. Champion (1984) developed measures of the health belief constructs in the context of breast self-examination. The strength of the scale developed to measure severity is that the items are largely self-referenced, and hence, measure the impact of the illness (breast cancer) would have on the individual. For this research, participants were asked to respond to four items about severity of pregnancy complications (for example, complicated pregnancy can cause death to pregnant mother). Answers were to be selected on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates a higher perceived severity.

Perceived Vulnerability. Measures of perceived vulnerability focus on absolute measures of risk (van der Pligt, 1998). This refers to the perceived likelihood that a negative event will occur. In this research, three items were asked to participants about vulnerability of the respondent that she might suffer from complications. Participants responded on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). An example of questions used here is, “The chance of your being diagnosed with pregnancy complications is high”. A higher score indicates a higher perceived vulnerability.

Response Efficacy. Four-item scale were derived and modified from Witte, Cameron, McKeon, and Berkowitz (1996). Participants answered questions on the effectiveness of uptake of ANC against pregnancy complications or bad pregnancy

outcomes. An example of questions used here is, “Early detection of pregnancy complications during antenatal check-up increases the likelihood of successful treatment”. Answers were to be selected on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score reflects a higher response efficacy.

Self-efficacy. The General Self-Efficacy (GSE) scale (Schwarzer & Jerusalem, 1995) was created to predict coping with daily hassles as well as adaptation after experiencing various kinds of stressful life events. It was originally a four-point scale. But, for this research, it was modified and respondents were asked to grade their response to the ability issues on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Three items were included in the analysis. An example of item used here is “I am confident of my ability to go for regular antenatal screening”. A higher score indicates a higher self-efficacy.

Response Cost. Response cost was measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) with high score indicating high response cost. It included three items (for example, Regular antenatal check-up is expensive for me). This scale was adapted from measures of the health belief constructs in the context of breast self-examination developed by Champion (1984). Response cost indicated subjects expecting to lose incentive to go for uptake of ANC. The higher the response cost, the higher the expectation of losing incentive to go for uptake of ANC.

Women's Autonomy. For the construction of women's autonomy, a combination of measures reflecting women's degree of control in their lives, decision-making power, and the extent of freedom of movement (Bloom, Wypij, & Gupta, 2001; Jejeebhoy & Sathar, 2001) were investigated. For this research, six questions were included of which

four measured expectant mother's ability or confidence about decision making, one measured control over finances and the other on women's freedom to travel outside her house (for example, I can visit alone friends and family I like). The questions regarding a woman's decision-making power for intention to uptake ANC assessed the degree to which women had a say in different situations. The allowed responses included measures from 1 (strongly disagree) to 5 (strongly agree) on a 5-point Likert scale. The higher score indicates a higher autonomy.

Perceive Social Norm. To identify and measure effective social norm, it could be useful to know: what the respondent does, what the respondent believes about what others believe she does with regard to engaging in a behavior (subjective norm), and what the respondent believes she should do with regard to engaging in a behavior (injunctive norm). Allowed responses on five items included both subjective and injunctive norm on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scale was adapted from scales developed by Ajzen and Fishbein (1980). An example of question used here is, "Most people who are important to you think that you should go for antenatal check-up". A higher score indicates a higher perceived social norm.

Social Connectedness. Social connectedness was measured using both qualitative and quantitative appraisals of social relationships. Qualitative appraisals included feelings of closeness and involvement in each other's lives, knowledge of each other's thoughts and feelings, and sharing experiences (for example, I feel sense of togetherness with other pregnant women) and quantitative aspects refer to the satisfaction with both the size of one's social network (for example, I feel that I have close relations with my family and friends) and amount of social interaction such as conversations in each other's company

or through media (telephone, text messaging, etc.). For this research, four items were developed modifying Social Connectedness Scale (Lee & Robbins, 1995) which assesses the degree to which youth feel connected to others in their social environment. Allowed responses on intention to ANC uptake were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates stronger sense of social connectedness.

Attitude towards ANC. The questions on attitude towards ANC comprised three items on knowledge of pregnant women about usefulness of ANC and two items on their attitude toward uptake of ANC considering the outcome expectations. The scale is adapted from Marteau, Dormandy, and Michie (2001). This research argues that people are less critical to accept conclusions that are consistent with their attitudes - they expect that the reasoning is correct. The questions to measure attitude consisted of five positive statements about usefulness of ANC (for example, ANC is very important to the health of pregnant women and their unborn child). Responses were to be selected on a 5-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates a higher attitude towards ANC.

Intention to Uptake ANC. Three items were adapted from Armitage and Conner (2001) to measure intention to uptake ANC by pregnant women. The respondents were asked to answer on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The items were preceded by a phrase "I intend to..." and expressed pregnant mother's intention to know more about pregnancy complications and issues related to ANC use. A higher score indicates stronger intention to uptake ANC.

Control Variables

In addition to the specific research constructs, this research model also incorporated suitable control variables as they may explain significant variance in the dependent variable. For these control variables, which are demographic in nature, we added past history of pregnancy, educational status, age, employment status, household income as controls because demographic variables have been found to significantly affect ANC seeking behavior (Chakraborty, Islam, Chowdhury, Bari, & Akhter, 2003; Simkhada et al., 2008).

Pre-testing

Two separate rounds of pre-tests were conducted on the preliminary questionnaire (in translated Bangla version) to assess comprehension and obtain feedback on the length and viability of the questions. The first pre-test was conducted with three health service workers who did not participate in study after briefing them on the research objectives. Participants in the pre-test were requested to review the questionnaire for various inconsistencies, repetitions, ambiguities, grammatical errors, incorrect sentence construction and any such problems which would pose difficulties in responding to the questions. Based on their feedback, some questions were rephrased.

In accordance with the research objectives, the second round of pre-test was conducted with a small sample of five pregnant women who were not the participants in the study. They found the questionnaire to be fairly comprehensible and well-designed. The retest assessment was done in a lapsed period of two weeks on the same sample in Dhaka ahead of the main study. Based on their feedback, questionnaire was slightly

revised to correct few linguistic inconsistencies, repetition and ambiguities. Thus, the final version of the questionnaire was deemed ready for dissemination to target respondents.

Ethical Considerations

All ethical guidelines to undertake research involving human participants were maintained throughout this survey for assessing the research model and for subsequent intervention study. Necessary IRB approval and administrative clearance to conduct the study in Bangladesh were granted to the researcher as referenced earlier in the dissertation. The participants were informed of the nature of the study, informed written consent were obtained and confidentiality of the participants were ensured. A small monetary incentive of US\$ 3.00 was provided to participants for this study.

Data Analysis

Structural Equation Modelling (SEM), a covariance-based software for statistical analysis was used to analyse data for this research model. This technique, which is more suitable for confirmatory theory testing research, is used via maximum likelihood estimation in AMOS 18 (Gefen, Straub, & Boudreau, 2000; Hair et al., 2010). SEM allows for the testing of relations among all exogenous and endogenous variables (Kelloway, 1998), and unlike traditional multivariate analyses, it is able to account for measurement error in explanatory variables (Hair et al., 2010).

Findings

Characteristics of Respondents

The demographic profile of survey respondents are provided in Table 7. Among the total of 420 pregnant women, 326 (77.62%) attained education above or equivalent to grade 10 and above and remaining 94 (22.38%) attained below grade 10. Ten per cent of total respondents were employed. The remaining 90% were either housewives or students with no recourse to financial sources. Pregnant women representing households with income <25,000 Tk/month were 296 (70.5%) and those representing household with income more than 25,000 Tk/month were 124 (29.5%). Percentage of pregnant women with first pregnancy were close to the women with one or more children (52.9% as opposed to 47.1%). Past obstetric experience was good for 133 women (67.2%) out of 198 participants who were pregnant before. The rest 65 (32.8%) women who had children reported moderate or bad experience. Mobile phone was a common ICT equipment, and hence, to fulfil the research criteria those participants with at least one mobile phone was recruited for this study. The range of mobile phone ownership was between one and three. Numbers of participants were highest in the age group of 20-24 years (34.05%) and the lowest were the teens. Most of the participants were between 20-34 years (89.05%).

Table 7.

Demographic Characteristics of Respondents (n=420)

Characteristics	N	Percentage
Educational level		
Primary	79	18.8
No education	15	3.6
Secondary School	177	42.1

Higher Secondary	68	16.2
Graduate and above	81	19.3
Household income		
<25000Tk/month	296	70.5
25000-40000Tk/month	94	22.4
>40000Tk/month	30	7.1
Number of children		
First Pregnancy	222	52.9
One	134	31.9
More than one	64	15.2
Past obstetric history		
Good	133	
Moderate	23	
Bad	42	
Employment status		
Full time job	35	8.3
Part time job	6	1.4
Self employed	1	0.2
Housewife	348	82.9
Student	30	7.1
Age		
18-19 years	8	1.9
20-24	143	34.0
25-29	75	17.9
30-34	156	37.1
35-39	26	6.2
40-44	12	2.9
45 and above	0	0
ICT ownership		
Mobile Phone	420	100
Computer	104	24.8
Internet access	88	20.9
Number of mobile phones		
One	310	
Two	99	Range 1-3
Three	11	

Measurement and Structural Model

As recommended by Anderson and Gerbing (1988), a two-step methodology, estimation of measurement and structural model, was employed. Five fit indices were

used to estimate the model fit: model chi-square (χ^2), relative chi-square (χ^2/df), comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). χ^2 should not be significant if the model fits the data well. However, to account for sensitivity to sample size, the χ^2 value is divided by the degrees of freedom. The resultant relative χ^2 value should be below acceptable limit of 3.0 (Gefen et al., 2000). For CFI and TLI, a value between 0.95 and 1.00 indicates a good fit, while a value of 0.06 and below for RMSEA indicates a good fit (Hu & Bentler, 1999).

Confirmatory factor analysis (CFA) was first run to validate the measures of the latent constructs, to investigate any possible offending estimates in the model, and to assess the multidimensionality of the concepts (Hair et al., 2010). Results indicated a good model fit ($\chi^2 (df) = 1075.27 (664)$; $\chi^2/df = 1.62$; CFI = .96; TLI = .95; RMSEA = .04).

Table 8.

Items for Constructs with Indicators and Factor Loadings

Constructs and Indicators	Items	Factor loadings	∞
Perceived Severity (PS)			.89
PS1	Pregnancy complications is a serious matter	.83	
PS2	Late detection of pregnancy complications increases the possibility of death of child in womb or during delivery	.81	
PS3	Complicated pregnancy can cause death to pregnant mother	.81	
PS4	Complicated pregnancy can lead to mental stress at a later date	.75	
Perceived Vulnerability (PV)			.71
PV1	The chance of your being diagnosed with pregnancy complications is high	.74	
PV2	It is possible that you may have pregnancy complications even if you or any of your family member does not have history of pregnancy complications	.77	
PV3	It is possible that I have complicated pregnancy even if I don't feel any problems	.83	
Response Efficacy (RE)			.90
RE1	Regular antenatal check-up will provide me with reassurance of good pregnancy without complications	.77	

RE2	Going for regular antenatal check-up could save my baby and my life	.85
RE3	Antenatal check-up could help detect the existence of pregnancy complications early	.88
RE4	Early detection of pregnancy complications during antenatal check-up increases the likelihood of successful treatment	.84
Self-efficacy (SE)		.77
SE1	I will be able to come for regular antenatal check-up to know about pregnancy complications	.67
SE2	I can tell the doctors about problems I am having in pregnancy during antenatal check-up	.84
SE3	I am confident about understanding information on pregnancy complications during antenatal check-up	.85
Response Cost (RC)		.79
RC1	It is time consuming for me to travel for regular antenatal check-up	.78
RC2	Regular antenatal check-up is expensive for me	.85
RC3	I have to wait for long time for my antenatal check-up	.82
Women's Autonomy (WA)		.80
WA1	I can probably take care of what I need to do during pregnancy	.75
WA2	I can probably deal with what I am worried about	.77
WA3	I have confidence about managing the pregnancy	.66
WA4	I can take decisions about my health needs	.68
WA5	I can visit alone friends and family I like	.83
WA6	I have a say in household purchases	.64
Social connectedness (SC)		.86
SC1	I feel that I have close relations with my family and friends	.66
SC2	I feel personally responsible for well-being of another person	.84
SC3	There is someone I could talk to take important decisions in my life	.86
SC4	I have sense of togetherness with other pregnant women.	.76
Social Norm (SN)		.86
SN1	Most people who are important to you think that you should go for antenatal check up	.73
SN2	Most people whose opinion you value would approve of your attending antenatal clinic regularly	.76
SN3	In your opinion, your family and friends offer encouragement and orientation to safe birth	.79
SN4	Women in your family and friends serve as positive role models for you	.74
SN5	Do you think that it is generally expected by the people you know that a pregnant woman should modify her health behavior	.67
Attitude towards ANC (ATT)		.88
ATT1	ANC is very important to the health of pregnant women and their unborn child	.84
ATT2	ANC improves pregnancy outcome	.82
ATT3	ANC prevents complications	.77
ATT4	ANC is necessary for purpose of treatment of minor illnesses during pregnancy	.74
ATT5	ANC can reduce morbidity and mortality in women	.81

Intention to uptake ANC (INT)		.75
INT1	I intend to go for regular antenatal check-up for whole duration of pregnancy	.68
INT2	I intend to know more about pregnancy complications	.73
INT3	I intend to find out more about how to proceed to avoid pregnancy complications	.71

Unidimensionality was tested for the measures through exploratory factor analysis for each construct, using varimax rotation in principal component analysis. The measures, together with their indicators, items and factor loadings, are presented in Table 8. For assessing the measurement properties of CFA model, three types of validity were tested namely, content validity, convergent validity, and discriminant validity. Content validity assesses whether the measures chosen capture appropriately the full domain of the construct (Straub, Boudreau, & Gefen, 2004). In this research, content validity was examined by checking for consistency between the measurement items and the existing literature followed by pre-testing the instrument (Srivastava & Teo, 2006). Convergent validity refers to the extent to which the items under each construct are actually measuring the same construct. To test the convergent validity, the item reliability was examined for each item, which suggested that the factor loading of each item on its corresponding construct must be higher than 0.55 (Falk & Miller, 1992). As shown earlier in Table 8, all items had a loading above the suggested threshold. Convergent validity was also tested by examining the composite reliability (CR) and average variance extracted (AVE). This was done to ascertain that the indicators were sufficient to represent their corresponding constructs (Moorman, 1995; Oliver & Bearden, 1985). Studies have suggested taking 0.7 as the threshold for CR of the measures for reliable measurement (Byrne, 2013). The AVE measures the variance captured by the indicators relative to measurement error (Fornell &

Larcker, 1981), and it should be greater than 0.50 to justify using a construct. Analyses were conducted using the SEM construct reliability formula and variance extraction procedure suggested by Garver and Mentzer (1999). In the CFA model, CR results ranged from 0.71 to 0.90, and AVE results ranged from 0.52 to 0.70. These results are consistent with the recommended values and reflected sufficient representation of the constructs convergent validity.

Discriminant validity refers to the extent to which a given construct differs from other constructs. Barclay, Thompson, and Higgins (1995) have suggested criteria to examine discriminant validity. This requires that values of the square root of the AVE (reported on the diagonal in Table 9) are all greater than the correlations between the constructs, indicating that constructs share more variance with their own measures than with other constructs. This criterion is satisfied by the current data, as demonstrated in Table 9, thereby exhibiting satisfactory discriminant validity. Internal consistency was assessed using composite reliability. Cronbach's alpha assumes equal weights of all the items of a construct and is influenced by the number of items, whereas composite reliability assesses actual loadings to compute the factor scores, and thus, provides a better indicator for measuring internal consistency (Srivastava and Teo, 2006). As shown in Table 9, the composite reliability values for all constructs in the model were above the threshold value of 0.7 (Fornell & Larcker, 1981). In addition, as seen in Table 8, the high values of Cronbach's Alpha ranging from 0.72 to 0.90, that is, more than 0.70 (Nunnally, 1978) highlight the reliability of the measures of the various constructs used in the study.

Table 9.

Cronbach's, CR, AVE and Square Root of AVE of Variables

Constructs	CR	AVE	Int	PS	PV	RE	SE	RC	SC	WA	Att	SC
Intention	.75	.62	.79									
PS	.89	.68	.73	.82								
PV	.71	.52	.61	.69	.72							
RE	.90	.70	.75	.56	.57	.84						
SE	.77	.55	.77	.49	.61	.73	.74					
RC	.79	.56	-.38	.32	-.37	.33	.40	.75				
SC	.86	.61	.74	.48	.45	.60	.71	.38	.78			
WA	.80	.53	.68	.47	.53	.63	.66	.32	.68	.73		
Attitude	.88	.68	.76	.52	.46	.71	.65	.41	.71	.69	.82	
SN	.86	.66	.76	.47	.44	.68	.65	.42	.70	.68	.79	.81

(PS-Perceived Severity; PV-Perceived Vulnerability; RE-Response Efficacy; SE-Self-efficacy; RC-Response Cost; SC-Social Connectedness; WA-Women's Autonomy; Att-Attitude; SN-Social Norm)

After validating the measurement model, SEM was run to test the hypothesized research model (H1 to H9). The results of the hypothesized model showed a good fit to the data [χ^2 (df)= 1274.18 (809); χ^2/df = 1.57; CFI = .95; TLI = .95; RMSEA =.04].

Figure 6 and 7 respectively presents the measurement and structural model and standardized regression weights.

Figure 6. Measurement Model for Intention to Uptake ANC

Figure 7. Structural Model for Assessing Intention to Uptake ANC

* $p < .05$, ** $p < .01$, *** $p < .001$

Assessing the cognitive determinants of intention to uptake ANC, it is found that the relationships between perceived severity with intention ($\beta=.07, p>0.05$) is not significant, thereby rejecting H1a, but with attitude is significant ($\beta=.14, p<0.01$), thus H1b is supported. H2a and H2b hypothesized relation of perceived vulnerability respectively with intention ($\beta=.00, p>0.05$) and attitude ($\beta= -.01, p>0.05$), which are not significant, thus rejecting H2a and H2b respectively. H3a and H3b postulated respectively that response efficacy is associated with intention and attitude, results for intention ($\beta=.18, p<.001$) and attitude ($\beta=.32, p<.001$) supported these hypotheses. The relationship between self-efficacy and intention (H4a) and between self-efficacy and attitude (H4b) are significantly associated ($\beta=.21, p<.001$) and ($\beta=.33, p<.001$) respectively, thereby supporting both H4a and H4b. Hypotheses 5a and 5b proposed that response cost will be negatively associated with ANC intention and attitude. The results rejected H5a ($\beta = .03, p >.05$), while supported H5b ($\beta = -.11, p <.01$). It is found that attitude towards pregnancy has a strong significant relationship with intention to uptake ANC ($\beta=.23, p<0.001$), thereby supporting H6.

Next, the results for the socio-cultural determinants of intention to uptake ANC are observed. The relationship of social norm with intention to uptake ANC is significant ($\beta = .12, p<.05$). Hence, H7 is supported. H8a postulated that women's autonomy will be associated with intention, but the results ($\beta = .00, p >.05$) did not support it. In contrast, women's autonomy has a significant relationship with social norm ($\beta = .31, p<.001$), thereby supporting H8b. Further, H9a and H9b respectively postulated that social connectedness will be significantly associated with both intention and social norm, the results for intention ($\beta = .33, p<.001$) and social norm ($\beta = .50, p<.001$) showed strong

support for both H9a and H9b. The relationship of Women's autonomy with attitude (H8c) and social connectedness with attitude (H9c) are significantly associated ($\beta = .17, p < .01$) and ($\beta = .19, p < .01$) respectively, thereby supporting both H8c and H9c.

Among the demographic control variables, only education ($\beta = .08, p < .05$) is significantly associated with intention to uptake ANC, whereas, employment status ($\beta = -.05, p > .05$), household income ($\beta = .01, p > .05$), the past obstetric history ($\beta = .00, p > .05$) and age ($\beta = .02, p > .05$) respectively are not significant. The fairly significant amount of variance ($R^2 = .46$) explained by this research model demonstrates the robustness of this model and the significant role of cognitive and socio-cultural factors in developing intention to uptake ANC among Bangladeshi pregnant women.

Test of Attitude and Social Norm as Mediators

Based on the results, further analyses were conducted to test for (a) attitude as a potential mediator between PMT-based cognitive variables and intention to uptake ANC, and (b) social norm and attitude as a potential mediator between socio-cultural constructs and intention to uptake ANC. Mediation tests were conducted based on techniques suggested by Baron and Kenny (1986). First, a model of direct effects (predictor $\rightarrow$ criterion variable) without any link to the mediator was specified. The relationship between the predictor and criterion variables should be significant to establish that a potentially mediated relationship exists between the two. Next, a saturated model that included both the hypothesized mediation and potential direct effects was specified. The significance and strength of the relationship between the predictor and criterion variable was noted. Last, we conducted bootstrap procedures on the saturated model, as

recommended by Preacher and Hayes (2004). Bootstrapping enables us to test for indirect effects through mediation and is recommended for data with smaller samples (Shrout & Bolger, 2002). In this procedure, the data is resampled 2000 times to estimate the confidence intervals of the mediated effects. This enables mediation analysis to be interpreted based on data distribution rather than assuming a normal distribution of the data, which is a common criticism of traditional mediation methods (Preacher & Hayes, 2004; Zhao, Lynch, & Chen, 2010). If the specification of a saturated model results in an insignificant relationship between the predictor and criterion variables, and a significant indirect effect is found in the bootstrap, the effect of the predictor on the criterion variable is said to be fully mediated. If the specification of the saturated model results in a significant relationship between the predictor and criterion variables, and a significant indirect effect is found in the bootstrap, a partially mediated relationship is said to exist.

In the test for attitude as a potential mediator between PMT-based cognitive variables and intention for ANC uptake, results from the direct model showed significant relationships between response efficacy and intention ($\beta = .18, p < .001$), self-efficacy and intention ($\beta = .21, p < .001$), and social connectedness and intention ($\beta = .33, p < .001$). Next, results from the saturated model still showed significant relationships between response efficacy and intention ($\beta = .12, p < .05$), self-efficacy and intention ($\beta = .16, p < .01$), and social connectedness and intention ($\beta = .20, p < .001$) the relationships were weaker though. Last, bootstrapping results showed a significant indirect effect of response efficacy through attitude ($\beta = 0.29, p < .001$), indirect effect of self-efficacy through attitude ($\beta = .30, p < .001$), and indirect effect of social connectedness through attitude ($\beta = .24, p < .001$). These results provide support that attitude partially mediates the relationship

between response efficacy and intention, self-efficacy and intention, and social connectedness and intention.

In the test for social norm as a potential mediator between socio-cultural constructs and intention for ANC uptake, results from the direct model showed a significant relationship between social connectedness and intention ($\beta = .33, p < .001$). While results from the saturated model still showed significant relationship between social connectedness and intention, the relationship became weaker ($\beta = .20, p < .001$). Last, bootstrapping results showed a significant indirect effect of social connectedness through social norm ($\beta = .21, p < .001$). The results suggest that social norm partially mediates the relationship between social connectedness and intention to uptake ANC.

To reconfirm mediation, it was computed using the SPSS macro “Indirect” (Hayes, 2009). With this macro, the data were resampled 5,000 times to estimate the confidence intervals of the mediated effects. The bootstrapping effect for variables with attitude as mediator showed bias corrected and accelerated Confidence Interval (CI) for response efficacy, self-efficacy, and social connectedness contains no zero (CI= .22 to .36), (CI=.22 to .37), and (CI=.15 to .27) respectively within its lower and higher limits. Similarly, bootstrapping using SPSS macro “Indirect” for variables with social norm as mediator showed bias corrected and accelerated CI for social connectedness contains no zero (CI= .14 to .31) between its lower and upper limits. These results provides confirmatory support to our earlier propositions.

Table 10.

Summary of Results for Research Hypotheses

H1	Perceived severity is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.	(a) Not supported (b) Supported
H2	Perceived vulnerability is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.	Not supported
H3	Response efficacy is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.	Supported
H4	Self-efficacy is positively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.	Supported
H5	Response cost is negatively associated with (a) intention to uptake ANC, and (b) attitude towards ANC.	(a) Not supported (b) Supported
H6	Attitude towards ANC is positively associated with intention to uptake ANC.	Supported
H7	Perceived social norm is positively associated with intention to uptake ANC	Supported
H8	Women's autonomy is positively associated with (a) intention to uptake ANC, (b) perceived social norm, and (c) attitude.	(a) Not supported (b) Supported (c) Supported
H9	Social connectedness is positively associated with (a) intention to uptake ANC, (b) perceived social norm, and (c) attitude.	Supported

Designing Communication Intervention

Communication has an essential role in any action that aims to improve health by informing or influencing behaviors among the target audience (Rice & Atkin, 2009; Rogers & Storey, 1987). Communication in health takes place on many levels, including individual, group, organization, community or mass-media. Past research suggests that systematic planning and use of learning principles are determinants of effectiveness (Kok, van den Borne, & Mullen, 1997). Hence, this study planned the intervention based on previous research on determinants of ANC uptake and research framework proposed. Bartholomew, Parcel, Kok, and Gotlieb (2011) indicated that the development of theory-based health communication program also needed appropriate intervention materials and channel preference to match the reality of priority populations. With this in view, this research focuses its attention on method for message delivery, its content and channels of communication as these can influence the effectiveness of the intervention. As discussed earlier in Chapter Two, framing method is used for message creation. The inputs for the messages are taken from cognitive beliefs and socio-cultural norms and practices of pregnant women. Threat and coping appraisal based messages for educating mothers on the antecedents of intention to uptake ANC and the intention itself were delivered through various channels of communication. To examine the efficacy of the channels used, this research proposes to compare traditional channel (leaflet-based) with mobile communication. Both channels are also combined to see if these might have an additive effect on the adoption of ANC uptake.

Inputs for Research Model for Communication Intervention

The findings from preliminary Study One deepens the understanding of the associations of PMT motivators with the utilization of ANC that influence maternal health in a developing country like Bangladesh. The results of this study inform that response efficacy and self-efficacy constructs of PMT are associated with intention to uptake ANC. Contrary to anticipation, the threat appraisal constructs, perceived severity and perceived vulnerability, are not able to significantly predict behavioral intention to uptake ANC. The strongest predictor of behavioral intention to uptake ANC is self-efficacy which suggests a high confidence of pregnant women in their ability to change attitude towards ANC. These findings are consistent with the results reported by various studies with respect to the role of self-efficacy to increase intention to adapt a healthy behavior (Floyd et al., 2000; Milne et al., 2000). In addition, results are in line with previous research suggesting that coping appraisal is the better predictor of health behaviour than threat appraisal (White, Johnson, & Buyske, 2000). Among other indicators, mobile phone use is significantly associated with intention and self-efficacy. Mobile phone use also predicted, although slightly, intention to uptake ANC, and accounted for additional 7% of variance.

Preliminary Study Two suggests that socio-cultural constructs contribute to ANC seeking behavior in Bangladesh. The role of social norm, women's autonomy and social connectedness were found as important for influencing pregnant women's intention to seek ANC during three separate focus group discussions of pregnant women, husbands, friends and relatives. It was discovered that pregnant women's use of maternal health care was influenced by prevalent social norms in Bangladeshi society which greatly hampered autonomy in decision making for ANC uptake by pregnant women. In past literature

better pregnancy outcome have been shown when men are directly involved in maternal health care through ANC attendance and pregnancy support (Kululanga, Sundby, Malata, & Chirwa, 2011). However, FGD in preliminary Study Two suggests that despite a sense of need for ANC for future pregnancy complications, focused ANC visits are not satisfactory. It also suggests that according to husbands, pregnancy care is a female responsibility, although husbands are the decision maker and financial provider for uptake of ANC. Evidence from FGD suggests that most men in the study were strongly in favour of their wives having ANC care, and they felt that it could be beneficial to accompany them. However, sometimes they failed to do so due to preoccupation for economic activity and prevalent social norm where they were not like to be accompanied by some healthcare providers. Husbands also suggested they needed to accompany their wives to understand the nature and remedy of complications which they were afraid their wives would not fully comprehend. These factors demonstrate the potential for mobile as a channel of communication that could overcome the issue of non-availability of husbands and could help women discuss the issues of ANC and pregnancy complications when they were not accompanied by their husbands. Since the younger pregnant women had to depend on their husbands and relatives for ANC decision making, use of mobile could potentially help them undertake informed decision making. Moreover, younger age groups are found more conversant with using mobile phones than that of their older peers which is also supported in past research (Tacchi, Kitner, & Crawford, 2012) and this may make them more confident. This is complemented by husbands' preference to receiving ANC related information through mobile phones.

It was noted that pregnant women's social networks not only provided them with cognitive information, but also promoted their ANC behavior by providing emotional support, and motivation for seeking access to resources. Since, FGD for pregnant women suggested that husbands' role to get more involved is less than adequate, support from others in the society essentially could play important role in pregnancy care. Such others could be relatives and female in-laws and this kind of social connectedness can protect pregnant women from being harassed by healthcare providers such as nurses (Mathole, Lindmark, Majoka, & Ahlberg, 2004).

Previous studies have highlighted significant barriers to male participation as pregnancy and childbirth are often perceived as women's jurisdiction. Men's involvement is culturally discouraged as many barriers for their participation such as social pressure, need for knowledge and pregnancy communication are gender related. There is, however, gradual shift towards improving male involvement in maternal health care. The decision making role of husbands and mother-in-laws for ANC uptake is also changing, due to more information sharing, thus allowing pregnant women's increasing role in deciding to undertake ANC.

There is also clearly expressed desire by both husbands and women for information gathering about pregnancy care. Some key health education topics to be considered include the prompt recognition of maternal danger signs. Although male involvement may help their wives understand the usefulness of ANC visits, it is yet not universal in the socio-cultural context of Bangladesh. Thus, how the pregnant women wish to gain knowledge of ANC use is a matter of significant consideration in the development of health education.

In preliminary Study One, pregnant women were found to be conversant with mobile phone's SMS option to contact their friends and relative, and 97% of pregnant women had their own mobile sets. They were also interested to gather health-related information through mobile phone. The FGD of pregnant women, their relatives and husbands indicated that communication intervention was needed and the health related messages should be provided to expectant women. All the participants in FGD and IDI opined in favour of providing information to motivate expectant women to uptake ANC. Past literature from various low-income countries discussed in Chapter Two supported the effectiveness of interventions to increase ANC uptake. On channel of communication, mobile-based SMS messages was reported to be one of the most preferred means for communicating health messages among the FGD participants. In the study, it was found that about a quarter of pregnant women cited electronic media as their sources of information for ANC, while two women cited print-based media as source of ANC information. Previous research on communication channels suggest that delivery channels of communication influence attitudes and health behaviors (Block & Keller, 1995; Loro, 2007; Meijnders, Midden, & Wilke, 2001). The health care providers highly valued the features of mobile-based SMS communication and agreed that it had great potential to support ANC seekers distantly when unforeseen problems might arise. This finding was supported by past studies, for instance, Thailand's "Better border health care program" (Kaewkungwal et al., 2010) which successfully documented dissemination of information via SMS regarding ANC appointments. Another study on "Wired mothers' mobile intervention in Zanzibar" (Lund et al., 2014) significantly increased the proportion of women receiving the recommended four antenatal care visits during

pregnancy. Some of these interventions were designed to change an existing behavior while other interventions were designed to promote positive behaviors. Moreover, inadequate communication with pregnant women during visits attributed to time constraint. Thus, mobile communication messages could be an alternate way to inform the pregnant women about much needed ANC care.

In summary, preliminary studies that the research undertook revealed that despite provision of fairly good ANC services and health care providers' willingness to support pregnant mothers, ANC uptake was not satisfactory. The respondents in Study One who used mobile phone showed a positive association with intention to uptake ANC. Discussants in FGD and IDI from all stakeholders identified the needs for communication intervention to address the low uptake of ANC. The intervention needs to be feasible, relevant and effective in significantly changing communication patterns to encourage pregnant women for focused ANC uptake. The participants of FGD further suggested that mobile phones with text capability could provide relevant information to women so that they could understand the potential complications and know where to go for advice. This suggests merit in using mobile-based SMS for communicating health messages to promote ANC uptake. The availability of mobile phone among women population in Bangladesh and increasing accessibility to using the phone coupled with less need for technical literacy and texting option in local language have created potential for mobile based intervention in Bangladeshi context. This research, thus, proposes that the hypothesized research framework could be used as a guide for designing a PMT-based threat and coping message intervention for promoting ANC. The research model for

communication intervention along with proposed hypothesis (H10a-H10e) is presented in Figure 8.

Figure 8. Research Model for Communication Intervention

Intervention Constructs

This proposed research model for communication intervention is expected to promote existing low ANC uptake behavior by delivering health education messages on various communication channels. Marshall McLuhan (1994, p. 7) suggested “the

medium is the message.” The central theory behind this is that the medium through which content is carried plays a vital role in the way it is perceived. Lieberman (2001) and other scholars have suggested that the medium by which messages are communicated can have differential impact on audiences. As discussed earlier in this chapter, this research plans to use mobile phone and compares this channel with traditional channel to examine the efficacy of PMT-based health education message interventions to promote ANC uptake. Among the mobile-based medium, SMS has some advantages over traditional methods (for example, leaflets), such as, ease of use, confidentiality, simultaneous delivery to large group of people, low-cost and convenient storage option. There is a growing body of research on text messaging for a range of health problems such as diabetes, asthma, obesity and weight loss, tobacco dependence etc. (Cole–Lewis & Kershaw, 2010; Fjeldsoe, Marshall, & Miller, 2009; Heron & Smyth, 2010; Krishna, Boren, & Balas, 2009; Steegers, von Dadelszen, Duvekot, & Pijnenborg, 2010). Nonetheless, evidence of discrepancy between high- and low-income households and ethnicities on mobile phone use are not recorded (Pew Internet & American Life Project, 2010), highlighting that SMS could be a particularly useful intervention medium for disenfranchised population and vulnerable and marginalised groups in the society. Labrique (2010) argues that the use of mobile phones can critically reduce the incidence of maternal death and disability by facilitating access to information and healthcare services to expectant women in low-resource settings. There are indications that mobile technologies offer opportunities for technology-enhanced social connections that promote positive health behaviors (Fogg & Eckles, 2007). These evidences suggest that mobile phones are being used to improve the effective delivery of maternal health services in multiple ways, in many contexts. In order

to conceptualize the linkages between the functions of a mobile phone and improved maternal health outcomes, a logic model shows that that mobile phone can be used to enhance the delivery of maternal health services by not only improving the quality of care but also improving a client's perceptions about pregnancy and her self-efficacy to manage it (Mitchell, 2014). Although Lee and Jayachandran (2009) suggested that mobile phones do not significantly increase women's autonomy in decision-making for healthcare, drawing on research evidence, other researchers (Obijiofor, 2015) suggest that empowerment derived from knowledge and decision-making autonomy is facilitated by use of mobile phone through access to networks and relevant expertise. In addition, mobile phone use can make themselves more independent (Noordam, Kuepper, Stekelenburg, & Milen, 2011). Case study examples from both Uganda and India demonstrate that text messages can help encourage people to change behaviors and attitudes toward issues as diverse as HIV/AIDS and reproductive rights (FrontlineSMS, n.d.). Moreover, in Bangladeshi context, we found from preliminary Study One that response efficacy and self-efficacy promote intention for ANC uptake, preliminary Study Two suggested women's autonomy and social connectedness have the potential to promote ANC uptake. In summary, this research proposes that mobile-based SMS has the potential to increase response efficacy, self-efficacy, social connectedness, women's autonomy, and change in health behavior. However, past research suggest that the amount of information, encouragement, and support that can be conveyed during health center-based interventions or through traditional media (for example, leaflets) is limited (Free et. al., 2013). Despite abundance of research on the above constructs, very few of them have been conducted on pregnant women, and to the best this author's knowledge,

there is no evidence concerning the impact of coping- and threat-framed health messages on ANC uptake among Bangladeshi pregnant women. Thus, this research proposes the following hypothesis:

Hypothesis 10: Among expectant women exposed to health messages, mobile-based intervention will elicit more favourable responses for a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC compared to traditional (leaflet-based) platform.

Past research on overall utility of the PMT model in predicting and eliciting health-related behavior change suggested that use of PMT in the design of persuasive disease prevention messaging was promising (Milne, Sheeran, & Orbell, 2000). Health promotion research conducted earlier for promoting healthy behaviors such as physical activity revealed that coping-framed messages can have a positive influence on belief about that activity (Courneya & Hellsten, 2001; Graham, Prapavessis, & Cameron, 2006). While the coping appraisal component of PMT is generally considered to be more closely related to elicit intention to perform a behaviour than the theory's threat appraisal component (Plotnikoff & Higginbotham, 2002), researchers suggest that messages imbued with threat or fear appeals can produce favourable outcomes on intention when coping messages that individuals can easily undertake are also proposed simultaneously (Lwin & Malik, 2014). Hence, assessing the comparative effects of these two message frames in different contexts, that is, when coupled with a mobile-based SMS intervention and when coupled with traditional leaflet-based intervention is of considerable research interest. Moreover, there is dearth of message intervention research combining these two platforms, that is, traditional and mobile. This research, thus, aims to explore any possible

additive or differential effects of three platforms on various constructs for ANC uptake.

Accordingly, this research poses the following research question:

RQ3: Among expectant women receiving messages on various platforms, how do the interaction between health messages (coping versus threat frames) and the media used (traditional, mobile and combined) fare in influencing a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC?

CHAPTER SIX INTERVENTION STUDY

The purpose of this study was to examine the efficacy of the proposed theory-based ANC uptake research model through a between-subjects experiment. As discussed previously, conducting an intervention is necessary to efficiently measure the effects of message types on delivery platforms and explore the changes in hypothesized variables linked to intention to uptake ANC. Despite many advantages of mobile phones and growing empirical support for mobile-based interventions targeting general behavioral changes, there is little information on the acceptability of text messaging as opposed to traditional channels like leaflets for those with reluctance to undertake ANC, especially in a low resource environment. Evidence from FGD undertaken in this research provides greater opportunities for mobile-based SMS communication in Bangladesh where women in marginalised and hard-to-reach areas are increasingly getting better access to mobile phones (BDHS, 2014) with texting capability in local language. Evaluation of this theory-based multiple-platform communication intervention is, therefore, needed before scaling up such intervention for widespread use.

This research assesses three platforms, traditional, mobile and combined along with two message components, threat-framed and coping-framed, to examine which is or are the most effective combination in motivating pregnant women's intention to uptake ANC through a quasi-experimental intervention design. As shown in Figure 7, seven intervention conditions were allocated including a control group. It is expected that the intervention group not only scores higher in intention to ANC uptake, but also on

hypothesized measures of PMT and socio-cultural constructs. Following is a review of the H10 and RQ3 that were proposed in the previous chapter for this intervention study:

Hypothesis 10: Among expectant women exposed to health messages, mobile-based intervention will elicit more favourable responses for a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC compared to traditional (leaflet-based) platform.

RQ3: Among expectant women receiving messages on various platforms, how do the interaction between health messages with coping versus threat frames and the media used (traditional, mobile and combined) fare in influencing a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC?

Method

Participants, Data Collection and Measures

The 420 expectant women recruited earlier to test the research model were invited to participate in this communication intervention program. The initial survey conducted for hypothesis testing was regarded as baseline assessment. They were assigned to one of the seven conditions using random numbers generated by an open source computer software. The same participants were asked to return for follow-assessments after three months of intervention. Rigorous efforts were made to convince the participants so that the women returned for the follow up survey. Since the recruited pregnant women were in their second trimester and beyond, they were encouraged to come for ANC check up on a monthly basis. The research assistants took note of their first interview date and reminded the pregnant women to come for follow up ANC closer to the date after 3 months, and

again called them on their registered mobile number enlisted with the team on the day prior to their arrival date at the end of intervention period. To prevent future attrition, baseline survey participants were reminded that they would be offered incentives (gift voucher of Tk 200, equivalent to US\$ 3.00) when they would complete both baseline and follow-up assessments. This amount of money was a small but good incentive, since most of the pregnant women were unemployed. Constructs and measurement scale remained same as baseline assessments.

Pre-test for Intervention

Lack of research on developing empirically guided mobile content necessitates performing a foundational research for intervention development. To achieve this aim, we performed a pre-test in laboratory setting. It assessed self-reported intention to uptake ANC when two types of health messages (threat-framed and coping-framed), three messages of each type were delivered via traditional (leaflet) and mobile-SMS. In addition, the questionnaire included user preferences in relation to messaging logistics. As Figure 8 shows, 40 expectant women received health messages on two different platforms- traditional and mobile. Past research suggests that lab-setting experimentation could provide necessary feedback before embarking on a field study experiment (Jerit, Barabas, & Clifford, 2013). Another purpose of this was to avoid contamination with confounders which may be encountered in the field interventions.

The four intervention groups comprising 10 pregnant women (PW) each (see Figure 9) were asked to fill-out the survey questionnaire immediately after receiving messages sent by the research team. Findings suggested an interaction effect between

platform and health message, that is, intention to uptake ANC increased more when threat framed message was communicated via mobile phone than it did through traditional platform such as leaflets. The intention to uptake ANC remained almost the same for coping messages in both platforms.

Intervention Design and Conditions

The communication intervention to promote ANC uptake among pregnant women in Bangladesh was developed based on review of relevant literature and findings from two preliminary studies by the researcher. These documentations were used as guidelines for developing an intervention. First, a baseline assessment of participants with a uniform baseline questionnaire was conducted in late 2014, following which a follow-up assessment was conducted with the same participants after a three-month intervention program in early 2015.

Message \ Platform	Traditional	Mobile	Combined	Control
Threat-framed	10 PW	10 PW		
Coping-framed	10 PW	10 PW		
Message type 1 (Threat-framed)	60 PW (group 2)	60 PW (group 3)	60 PW (group 4)	60 PW (group 1)
Message type 2 (Coping-framed)	60 PW (group 5)	60 PW (group 6)	60 PW (group 7)	No intervention

Figure 9. Intervention Conditions in Pre-testing and Main Experiment

*Arabic numbers in boxes denotes numbers of pregnant women as participants

As Figure 9 shows, a 2 x 3 (2 types of messages x 3 types of communication platforms) factorial design was developed for this study totalling seven conditions combined including control. As discussed earlier in Chapter Two, framing method was used for message creation. The inputs for the messages were taken from cognitive beliefs and socio-cultural factors and practices of pregnant women. Total seven intervention conditions were planned. Out of these, three conditions were with message type 1 (threat-framed) in three communications channels, namely, traditional (leaflet), mobile and combined, and three conditions were with message type 2 (coping-framed) while the remaining one was control condition with no intervention. The threat-framed and coping-framed messages addressed threat appraisal and coping appraisal processes respectively to influence pregnant women to uptake or not to uptake focused ANC. The platforms used were intended to see which channel would stimulate PMT motivators, socio-cultural constructs and intention to uptake ANC more over the other.

Participants in intervention conditions were given health education messages relating to importance and benefits of ANC uptake, possible complications of pregnancy, women's autonomy, and usefulness of having a social network of friends, relatives and others in the society. These messages were framed accordingly in either PMT's coping or threat appraisals. Participants in the coping appraisal condition, for example, were provided with tips on how a pregnant woman could develop intention for regular ANC check-up taking cues from benefits of ANC, improve confidence and ability to make decision to go for ANC, and gather information about importance of ANC from others in the society. On the other hand, those in the threat appraisal condition received messages highlighting the negative health outcomes associated with pregnancy, such as,

vulnerability of both mother and unborn child due to possible complications, unpredictability of pregnancy complications, and future physical, mental and financial sufferings due to non-use of ANC. The contents of the brochure and SMS communication were developed by the researcher as the existing health communication material in Bangladeshi ANC clinic did not capture fully the PMT-based threat and coping appraisal processes. Threat-framed and coping-framed messages were expected to educate and aware the pregnant women about the risks of pregnancy and usefulness on ANC, promote connectedness within their social network (health care providers, peer groups of pregnant mothers, family and friends in the community), train them to improve skills to identify and manage their health condition including encouraging decision making for ANC uptake.

Participants in the traditional communication (leaflet) groups were provided with one-page A4-sized brochure containing threat-framed and coping-framed messages. These brochures, which employed Bangla language suitable for Bangladeshi pregnant women, were distributed after the interview for baseline assessment. They were asked to retain them and read the messages in the brochures at least once a week in their own time for a period of three months according to the sequence mentioned in the brochure. The research assistants explained the participants any vocabulary they did not understand. Participants in the mobile groups were sent one SMS communication each week in Bangla language. A total of twelve messages were sent in three months' intervention period. The messages were sent in the early afternoon of the weekend when pregnant women were relatively free from any household or other activities. Participants in the combined group were given brochures and sent SMS communication in the manner described above. The English and

Bangla versions of messages are shown in Appendix L. Participants in the control group received no intervention in this three-month period. After taking part in the three-month program, a self-completion paper-and-pen survey was administered to all participants. Research assistants assisted in administering the survey and answering queries. Follow-up questionnaires for traditional, mobile, combined and control groups are enclosed in Appendices H, I, J and K.

Manipulation

Manipulation served to vary the types of messages while receiving it on different channels. Varying the types of messages is essential to analyse their potential effects on intention to uptake ANC and other cognitive and socio-cultural variables of interest here. For a particular type of channel being used for a group of pregnant women, the only point of departure was the types of messages, threat-framed and coping-framed, for that group and this difference served as the manipulation in this study. Manipulation checks were undertaken and the results are discussed under findings.

Data Analysis

The data were analysed using SPSS software version 20. Descriptive statistics, including frequencies, means and standard deviation were employed as general analytic procedures to describe the demographic profile of the participants. Change scores were calculated to compare mean scores of tested variables between all intervention groups before and after the intervention. To test hypothesis, H10 and RQ3 of the intervention study, two-way ANOVA was used to identify interaction (channel x message) effects. Pairwise and post-hoc comparisons of change scores were used to identify differences of

variables across various communication channels and types of messages after the intervention.

Findings

Manipulation Check

To test for the effectiveness of the message manipulation, that is, whether threat-framed message evoked feelings of threat and coping-framed message evoked feelings of coping, participants were asked to rate their responses on six questions comprising three statements each for threat and coping perceptions on the same questionnaire used for follow-up survey. The participants responded to the statements (for example, I felt that messages were threatening or I felt that messages increased my coping ability) on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Independent samples t-test revealed that message manipulation was successful for coping perception ($t(358) = -18.86, p < 0.01$). Participants who received coping framed message reported a higher score ($M = 4.27, SD = .53$) on coping perception compared to those who received threat framed message ($M = 3.28, SD = .46$). On the other hand, independent samples t-test for threat perception also showed that message manipulation was successful ($t(358)=12.92, p<0.01$). Participants who received threat framed message reported higher score ($M=4.32, SD=.50$) on threat perception than those who received coping framed message ($M=3.69, SD=.43$).

Intervention Study

To check whether the initial measures of hypothesized variables including intention to uptake ANC differed among participants in different intervention groups, two-way analysis of variance (ANOVA) on the baseline data on these were performed. A one-way ANOVA of the follow up assessments comparing the seven cells (see figure 8) was also conducted for all dependent variables. Significant differences were revealed between intervention conditions for some hypothesized variables in baseline assessments. Although the intervention groups were assigned by randomization, due to few group differences in the baseline, ANOVA of change was preferred for analysis (Van Breukelen, 2006). The test for normality, examining standardized skewness (between -1 and +1) indicated the data were statistically normal. The test for homogeneity of variance was not met for all variables, however, it can be overlooked as all cells have equal sample size of 60 which is bigger than minimum required sample size of 30 and the highest square variances are found to be within the required limit of not more than three times than the lowest square variances (Conover, Johnson, & Johnson, 1981). An alpha level of .05 was used for the initial analyses.

To test hypotheses, *H10a – H10e*, a two-way (2 x3) ANOVA was run to determine the effects of various platforms when threat-framed and coping-framed messages were delivered. To reiterate, two independent variables (factors) in this study were messages (threat-framed and coping-framed) and channels (traditional, mobile and combined). The dependent variables were changed responses at follow-up for a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC. Although these were independent variables which influence intention to uptake ANC in

theoretical framework, for the communication intervention model these were dependent variables to messages and channels.

The results of the experiment are presented as changed responses of variables (*H10a-H10e*) across various platforms, and variation when two factors are used to interact. The changes in mean of hypothesized variables following intervention are calculated by subtracting baseline assessments from follow-up assessments, with higher differences in scores indicate higher levels of change in that variable. The means of changed responses and standard deviations of all cells are presented in Table 11.

Table 11.

Changed Responses after Intervention: Means (Standard Deviations) of Hypothesized Variables

Variable (change score)	Control	Traditional	Mobile	Combined	Total
Response Efficacy	.05 (.66)				
Threat		.35 (.51)	.65 (.60)	.67 (.58)	.55 (.57)
Coping		.14(.72)	.22 (.43)	.76 (.61)	.37 (.66)
Total		.24 (.63)	.52 (.55)	.43 (.60)	.42 (.54)
Self-efficacy	.18 (.60)				
Threat		.33 (.48)	.68 (.53)	.68 (.47)	.56 (.52)
Coping		.25 (.71)	.36 (.40)	.81 (.53)	.47 (.61)
Total		.29 (.60)	.52 (.49)	.74 (.50)	.70 (.58)
Social Connectedness	.08 (.57)				
Threat		.20 (.68)	.67 (.43)	.53 (.46)	.47 (.57)
Coping		.15 (.84)	.24 (.40)	.78 (.44)	.39 (.65)
Total		.18 (.76)	.45 (.47)	.66 (.47)	.38 (.62)

Women's Autonomy	.05 (.79)			
Threat	.28 (.70)	.79 (.44)	.65 (.53)	.57 (.60)
Coping	.38 (.66)	.38 (.49)	.75 (.47)	.50 (.57)
Total	.33 (.68)	.59 (.51)	.70 (.50)	.47 (.64)
Intention to uptake ANC	.21 (.68)			
Threat	.38 (.39)	.74 (.62)	.80 (.47)	.64 (.51)
Coping	.41 (.71)	.51 (.47)	.93 (.56)	.61 (.62)
Total	.58 (.57)	.63(.55)	.86 (.53)	.62(.60)

The results of two-way ANOVA indicated significant main effects for platforms (mobile and traditional) and interaction effects between platforms and messages (see Table 12). Specifically, the results revealed significant main effects of platforms for a) response efficacy ($F(2, 413)=15.37, p<.001$], b) self-efficacy ($F(2, 413)=20.93, p<.001$), c) social connectedness ($F(2, 413)=21.82, p<.001$), d) women's autonomy ($F(2, 413)=13.25, p<.001$), and e) intention to uptake ANC($F(2, 413)=19.27, p<.001$).

Table 12.

Main and Interaction Effects of Hypothesized Variables (Change Scores)

Variables	F statistic	Effect size (η^2)	Adjusted R^2
Response Efficacy			
Platform	$F(2, 413)=15.37***$		
Message	$F(1, 413)=3.78$		
Platform * message	$F(2, 413)=6.46**$	.03	.13
Self-efficacy			
Platform	$F(2, 413)=20.93***$		
Message	$F(2, 413)=2.35$		
Platform * message	$F(2, 413)=5.24**$	.03	.14
Social Connectedness			
Platform	$F(2, 413)=21.82***$		
Message	$F(1, 413)=1.76$		

Platform * message	$F(2, 413)=10.96^{***}$	.05	.16
Women's Autonomy			
Platform	$F(2, 413)=13.25^{***}$		
Message	$F(1, 413)=1.11$		
Platform * message	$F(2, 413)=7.35^{***}$	.04	.14
Intention to uptake ANC			
Platform	$F(2, 413)=19.27^{***}$		
Message	$F(1, 413)=.09$		
Platform * message	$F(2, 413)=5.02^{**}$	.03	.12

$p<.01^{**}, p<.001^{***}$

Hypothesis 10 posited that among expectant women exposed to health messages, mobile-based intervention will elicit more favourable responses for a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC compared to traditional channel. The two-way ANOVA results showed significant main effects for hypothesized dependent variables on platforms. A review of group means indicated that mobile platform elicited more favourable response for response efficacy ($M_{\text{mobile}}=.52$, $\eta^2=.03$) than traditional platform ($M_{\text{traditional}}=.24$, $\eta^2=.01$) after intervention with health messages, thus providing support for *H10a*. Similarly, group means after intervention for self-efficacy were ($M_{\text{mobile}}=.52$, $\eta^2=.02$; $M_{\text{traditional}}=.29$, $\eta^2=.00$), social connectedness ($M_{\text{mobile}}=.45$, $\eta^2=.04$; $M_{\text{traditional}}=.18$, $\eta^2=.00$), women's autonomy ($M_{\text{mobile}}=.59$, $\eta^2=.03$; $M_{\text{traditional}}=.33$, $\eta^2=.00$) and intention to uptake ANC ($M_{\text{mobile}}=.63$, $\eta^2=.005$; $M_{\text{traditional}}=.58$, $\eta^2=.001$). These findings showed more favourable responses on mobile platform than traditional platform, thus providing support for *H10b*, *H10c*, *H10d*, and *H10e* respectively.

RQ3 sought to assess the comparative effects of health messages with coping versus threat frames among expectant women receiving messages on various platforms

used (traditional, mobile and combined) for hypothesized variables. As mentioned earlier, the two-way ANOVA results indicate a strong support for the interaction of health messages and platforms on which messages were delivered in respect of all hypothesized dependent variables.

For **response efficacy**, the ANOVA results showed (see Table 12) a significant interaction between health messages and platforms used ($F(2, 413)=6.46, p<.01$). Simple main effect analysis was performed to examine which type of health message framing was more effective in eliciting favourable responses among expectant women receiving messages on mobile platform. Figure 10 shows that more favourable and significant response for response efficacy was found for expectant women who were exposed to threat message than those exposed to the coping message ($M_{\text{threat}}=.65$ versus $M_{\text{coping}}=.22$; $F(1,118)=12.58, p<.001$). In case of traditional platform, although interactions were detected for response efficacy, no significant differences were found for type of health messages. Interaction effects were also examined among expectant women receiving health messages on combined platform to find out which type of message fare better in eliciting more positive responses. It was revealed that the pattern was reversed on combined platform. On this platform, response among expectant women exposed to the coping- rather than threat-framed messages elicit more favourable change score for response efficacy ($M_{\text{coping}}=.76$ versus $M_{\text{threat}}=.67$; $F(1,118)=31.18, p<.008^1$).

¹To control type I error alpha was set at .008.

Figure 10. Interaction of Message and Channel on Response Efficacy

A significant interaction was revealed between expectant women's platform use and health message treatment on **self-efficacy** ($F(2, 413)=5.24, p<.01$) (see Table 12). Simple main effect analyses found that, as shown in Figure 11, for mobile users, those in threat-framed message condition scored significantly higher on the change self-efficacy score than those in the coping-framed conditions ($M_{\text{threat}}=.68$ versus $M_{\text{coping}}=.36$; $F(1,118)=13.74, p<.001$). Conversely, for combined platform users, those in the coping-framed conditions scored significantly higher on the same measure than those in the threat-framed condition ($M_{\text{coping}}=.81$ versus $M_{\text{threat}}=.68$; $F(1,118)=27.65, p<.008$). For traditional platform users, no significant difference found between framing of health messages.

Figure 11. Interaction of Message and Channel on Self-efficacy

As shown in Table 12, there was a significant interaction between message framing and channels used for **social connectedness** ($F(2, 413)=10.96, p<.001$). Figure 12 shows, when mobile platform was used, the presence of threat-framed message lead to higher change in social connectedness compared to when coping-framed was present ($M_{\text{threat}}=.67$ versus $M_{\text{coping}}=.24$; $F(1,118)=32.64, p<.001$). When expectant women used traditional platform, social connectedness slightly differed, but not significantly. However, when combined platform was used, social connectedness scored higher change when coping-framed message was offered compared to threat-framed message ($M_{\text{coping}}=.78$ versus $M_{\text{threat}}=.53$; $F(1,118)=49.96, p<.008$).

Figure 12. Interaction of Message and Channel on Social Connectedness

For **women's autonomy**, the interaction (see Table 12) between health message framing and types of channels also was found to be significant ($F(2, 413)=7.35, p<.001$). Figure 13 shows, when expectant women used mobile channel, the presence of threat-framed message produced higher change in women's autonomy than when coping-framed message was provided ($M_{\text{threat}}=.79$ versus $M_{\text{coping}}=.38$; $F(1,118)=24.38, p<.001$). When expectant women used combined channel, the coping-framed message led to higher change in women's autonomy than threat-framed message ($M_{\text{coping}}=.75$ versus $M_{\text{threat}}=.65$; $F(1,118)=21.31, p<.008$). For traditional platform, women's autonomy did not differ significantly when health messages were either threat-framed or coping-framed.

Figure 13. Interaction of Message and Channel on Women's Autonomy

Finally, the ANOVA results (see Table 12) showed an interaction of health message framing and platforms on **intention to uptake ANC** ($F(2, 413)=5.02, p<.01$). Simple main effect analyses, as shown in Figure 14, found that for those pregnant women on mobile platform, threat-framed message led to higher change of scores on intentions than coping-framed messages ($M_{\text{threat}}=.74$ versus $M_{\text{coping}}=.51; F(1,118)=7.38, p<.01$). In contrast, for expectant women who used combined platform during intervention, coping-framed messages elicit more favorable responses on intention to uptake ANC than threat-framed message ($M_{\text{coping}}=.93$ versus $M_{\text{threat}}=.80; F(1,118)=18.14, p<.008$). Measures on traditional platform followed the same pattern of non-significant results for message framing.

Figure 14. Interaction of Message and Channel on Intention to Uptake ANC

This interaction effects suggest that any differences between threat-framed and coping-framed messages were dependent upon types of channels used, and that any differences between traditional, mobile and combined channels were dependent upon types of messages received. In particular, **threat-framed** messages fared better in influencing a) response efficacy, b) self-efficacy, c) social connectedness, d) women's autonomy, and e) intention to uptake ANC on **mobile** channel, whereas *coping-framed* messages fared better on *combined* channel to elicit favourable responses for these variables.

CHAPTER SEVEN DISCUSSION

The present study attempted to assess a health intervention programme to promote focused ANC among Bangladeshi pregnant women using quantitative design, qualitative design and experimental design. The results of the studies provided insights for explaining ANC seeking behaviour in resource poor setting, and can serve as a foundation for future maternal health care interventions using new media-based communication design. This chapter will discuss in detail the research findings in accordance with each research objective and hypothesis. The following sections will also discuss implications for theory and practice, address the limitations of this study, and provide suggestions for future research.

Discussion of Objectives

The first research objective was to develop and assess a theoretical framework to propose psycho-social factors in promoting intention to uptake focused ANC among expectant Bangladeshi women. To address this, after a detailed literature review to understand ANC seeking behaviour in Bangladesh and other developing countries, a PMT guided theoretical framework was proposed. A survey (Preliminary Study One) was undertaken to test the PMT motivators amongst Bangladeshi pregnant women. The result indicated the presence of PMT motivators in encouraging ANC behaviour, and that mobile phones were being utilized to gather health information. The findings revealed that pregnant women lacked information about complications of pregnancy, and how to deal with pregnancy. Participants rated response efficacy and self-efficacy to be significantly associated with their intention to uptake ANC. Since health behaviour during pregnancy

differs from other health behaviours, potential risk of developing pregnancy complications needed special attention. The exhaustive literature review in the area of health and cultural context revealed possible influence of important socio-cultural factors towards ANC seeking behaviour (Simkhada et al., 2008). The next study, the focus group (Preliminary Study Two) sought to identify perceptions of Bangladeshi women and health care providers about complications of pregnancy and usefulness of ANC, and role of Bangladeshi socio-cultural beliefs in ANC seeking behaviour. In analysing the data, some useful information was found in the focus group study, such as potential role of women's autonomy and social connectedness in Bangladeshi socio-cultural context. Insights from the focus group study indicated that health education messages were needed to encourage pregnant Bangladeshi women to uptake focused ANC, and mobile based SMS could be an option for messaging in addition to existing traditional leaflet-based communication. Based on factors derived from cognitive and socio-cultural theories associated with ANC uptake, a research framework was then conceptualized as predictive model for intention to uptake ANC in Bangladeshi context. The research model was assessed using structural equation modelling which demonstrated good fit. The overall finding will be beneficial in helping health authorities and educators to design intervention programmes aiming to promote focused ANC uptake among Bangladeshi pregnant women.

The second research objective was to design and examine the efficacy of an appropriate theory-based communication intervention aimed at increasing utilization of ANC. To address research objective two, a communication intervention was designed using the framework proposed by the research. The efficacy of the programme design was

evaluated through a quasi-experiment study comparing traditional print-based channel of communication (for example, leaflets) with mobile-based SMS communication. The combination of channels was also utilized during the communication of intervention to examine potential additive effect.

Discussion of Main Findings

The overall aim of the research was to contribute to knowledge in understanding the drivers of ANC uptake among pregnant Bangladeshi women. Results of the study deepened the understanding of the wide ranging association of PMT and other theory-based socio-cultural factors with the utilization of ANC. The study analysed the predictive ability of the constructs of PMT and other socio-cultural factors in influencing intention to uptake ANC among expectant women.

Discussion of Cognitive Constructs

Earlier hypotheses predicted positive association of coping appraisal constructs—response efficacy (*H3a*) and self-efficacy (*H4a*) with intention to uptake ANC. Contrary to the anticipation, the threat appraisal constructs—perceived severity (*H1a*) and perceived vulnerability (*H2a*) were not found to significantly predict behavioural intention to uptake ANC. These findings were supported both in preliminary study one and in results of SEM for the proposed theoretical framework. It was found that self-efficacy is the strong predictor of ANC seeking behavior as it was strongly associated with intention to uptake ANC. This implies that the confidence of pregnant women in their ability to uptake ANC drives the intention to uptake ANC. These findings are consistent with the results reported by past studies with respect to the role of self-efficacy to increase

intention to adapt a healthy behaviour in various health settings such as smoking behaviour, use of alcohol, pre-natal screening etc.(Floyd et al., 2000; Milne et al., 2000). Furthermore, results are in line with previous research, thus, suggesting that coping appraisal is a better predictor of health behaviour than threat appraisal (White et al., 2000). Based on the findings of this research, it can be suggested that threat communication incorporating information on risks of pregnancy complications may be less effective to influence ANC uptake.

The results also showed that perceived severity (*H1b*), response cost (*H5b*), response efficacy (*H3b*), and self-efficacy (*H4b*) were associated with attitude according to research propositions. This suggests that perceived severity, response efficacy and self-efficacy positively influenced attitude towards ANC, whereas response cost negatively influenced attitude towards ANC. Further, *H6* had posited that attitude is positively associated with intention and the results supported this hypothesis. This may have some significance as past research suggest changes in attitude accumulate over time to result in behaviour change (Mermelstein & Riesenber, 1992). Accumulation of positive attitude will increase behavioural intention, while accumulation of negative attitude will reduce intention to perform the behaviour. Attitude developed due to increase in perception of a health condition is known to result in positive outcome (Bandura, 1998), and in the context of this research, has the ability to result in greater motivation for ANC uptake.

The conceptualization of the above-mentioned hypotheses naturally leads to the question of whether attitude is a potential mediator between the PMT constructs and intention to uptake ANC. Mediation analyses revealed that attitude mediates the relationship between both response efficacy and intention, and self-efficacy and intention.

These results imply that in this research context, the impact of some PMT constructs on intention to uptake ANC is partially dependent on the ability to increase attitude towards ANC among expectant women (RQ1).

Studies on Asian women have found that individual cognitive factors based on PMT constructs such as response efficacy and self-efficacy have been more pronounced and are likely to encourage women's motivation to protect themselves against women's health care issues (e.g. breast cancer) (Ahmadian & Samah, 2013). Similar to these studies, other studies also suggest cognitive belief such as fear about pregnancy, vulnerability, perceived value of ANC influence late uptake of ANC (Haddrill, Jones, Mitchell, & Anumba, 2014). Some women in the same study demonstrated a more active, considered approach to their pregnancies, engaging in a process of self-care. This self-reliance, as in self-efficacy in PMT, was seen as a positive, purposeful element by the women, who wished to take control, stay well and informed, and make their own decisions about the pregnancy. The findings of the current research also suggest this positive coping strategy of pregnant women as the best choices for themselves in their circumstances. A study on the inner-city women in Canada (Heaman, 2015) while investigating the potential facilitators, barriers and motivators for ANC utilization noted that several psycho-social and attitudinal factors, when they are negative, increased the likelihood of inadequate uptake of ANC among socio-economically disadvantaged population. Heaman's (2015) study suggested response efficacy and self-efficacy motivated them to undertake ANC. Similar results were found in the current research where majority of the women surveyed have household incomes of less than 25,000 Bangladeshi taka (and hence categorized as lower middle income).

Preliminary Study Two informs that perception and beliefs about pregnancy and its complications, costs involved in the seeking of ANC, quality of the service provided, and access to information related to ANC seeking have an influence on the ANC seeking behaviours among women of child bearing age. When these factors are favourable, the expectant women attend antenatal clinics under the supervision of the trained medical professionals for the recommended number of times and deliver under the supervision of same medical team. Literature suggests, in some cases, change in attitude may not result in change in behaviour if perceived response cost of performing the behaviour is too high or the expectant woman thinks that her pregnancy is less severe or safe (Witte & Allen, 2000). Hence, the change in attitude of expectant women with high response efficacy and self-efficacy experienced during the course of pregnancy is essential to counterbalance response cost, and subsequently intensify intention to uptake ANC.

The findings of this research suggests that interventions aiming to affect changes in household and community practices related to maternal health care can set into motion the desired evolutions. From research findings it appears that interventions related to complication readiness have resulted in heightened intention to uptake ANC. Past literature suggests that the benefit of complication readiness as an effective intervention for increasing the utilization of skilled care is included within ANC (Chavane et al., 2014), which supports the research findings.

Discussion of Socio-cultural Constructs

PMT constructs accounted for around 38% of variance in preliminary Study One, and past literature suggested association of socio-cultural factors with intention to uptake

ANC. Accordingly, our research model included additional variables augmenting PMT constructs with other theory-based socio-cultural factors, such as perceived social norm, social connectedness and women's autonomy. Results suggested that the new model accounted for 46% of total variance for intention to uptake ANC which justified the inclusion of socio-cultural factors as predictors of intention to uptake ANC. The findings in various Asian studies stated earlier also suggest that multi-level, socio-cultural interventions that focus on cognitive factors have much promise in predicting ANC uptake.

Among the socio-cultural factors, social connectedness (*H9a*) predicted positive association with intention to uptake ANC, whereas women's autonomy (*H8a*) did not show any association with intention. However, both women's autonomy (*H9a*) and social connectedness (*H9b*) were positively associated with perceived social norm. Women's autonomy and social connectedness are also positively associated with attitude towards ANC (*H8c* and *H9c* respectively). Further, perceived social norm (*H7*) was associated with intention. These findings suggest that drawing attention to readily available norm information can be an effective strategy for behavioural change.

The association of women's autonomy, although did not show significant association in this research, was however, evidenced in a program in a Bangladeshi district (Taleb et al., 2015) which employs a rights-based approach. This approach has increasingly been recognized by the international community to prevent maternal mortality and morbidity (Mesquita & Kismödi, 2012). The programme promotes women's maternal health rights by increasing community awareness of women's right to access quality maternal health services, and by increasing women's household decision-

making authority so that they can autonomously seek care. The reason for contradictory results on women's autonomy could be attributable to measurement issues of the women's autonomy scale. This research added items pertaining to the ability to make decisions, control over finances and freedom of movement. However, the results did not show women's autonomy to be associated with intention to uptake ANC despite extant literature suggesting that women's autonomy is associated with intention to uptake ANC. Findings from a study in a northern Indian city suggested that freedom of movement was the only measure that demonstrated a statistically significant relationship with the level of ANC, but the other two indices that this research included, namely, ability to make decisions and control over finances, to measure women's autonomy demonstrated no such relationship (Bloom, Wypij, & Gupta, 2001). Both survey and FGD conducted for preliminary studies informed that 90% of the pregnant women were unemployed implying that they were reliant on their husbands for costs of services. This lack of control over finances may account for non-significant finding of women's autonomy in this research. Another reason was that there might not have been enough power to detect an effect. This could be due to non-inclusion of all dimensions of women's autonomy. These findings underscore the importance of further examination of different dimensions of women's autonomy in Bangladeshi context in order to understand the relevant constituent items.

Young pregnant women in this research were identified as less knowledgeable about complications of pregnancy. The nuclearization of urban and semi-urban families is also making them vulnerable as they lack traditional knowledge of pregnancy that transpired from earlier generations. On the other hand, modern information technology such as mobile phone, which the younger generation of females in Bangladesh are

becoming increasingly familiar with, offer an important vehicle for new health education initiative (GSMA Intelligence, 2014).

Mother-in-laws play a key role in determining pregnant women's access to maternal health care (Deo & Bhaskar, 2014; Simkhada et al., 2008) especially for younger age groups. This research is no exception to the past findings. However, in this research it is found that both tertiary educated, employed and uneducated mother-in-laws shared similar perceptions/practices while allowing or not allowing their daughters-in-laws to uptake regular ANC visits. This demonstrates that education or employment of mothers-in-law did not play any role in their decision making, thus, endorsing a deep rooted social norm. Younger relatives and female relatives from own family, on the other hand, supports the decision making by pregnant women herself denoting that this prevalent social norm can be prevented through suitable health education.

In this research, husbands irrespective of age and educational status were also supportive that pregnant women should visit ANC clinics more, and some of them accompanied their wife for ANC check-up. This changing attitude found in this research was contradictory to traditional norm of nonchalant role that husbands usually play in low-income countries. However, this changing pattern of husbands' behavior is supported by past research (Brunson, 2010).

Findings in this research also showed that social connectedness is positively associated with perceived social norm, and perceived social norm is significantly associated with intention to uptake ANC. Although most of the empirical studies on ANC and other health utilization services have emphasized on the importance of individual characteristics without paying as much attention to the societal impact (Leal, Pereira,

Lamarca & Vettore, 2011), the strong relationship between social connectedness and intention in the research model suggest that other than increasing perceived social norm in expectant women, social connectedness can directly impact their intention to uptake ANC.

The mediation analysis also revealed that social connectedness is mediated by perceived social norm and attitude (RQ2). It is seen that people often adopt the opinion of other group members and converge to social norms (Smith, Mackie & Claypool, 2014). Thus, when pregnant women see fellow expectant mothers going for ANC uptake, they also find themselves forming a similar norm, and their attitude changes in favour of adopting the group behaviour.

Since misperceptions about ANC uptake can be addressed through communication campaigns that promote accurate and healthy norms about ANC uptake, any planned communication intervention should also think about increasing connectedness among pregnant women's social network. Taleb et al. (2015) demonstrated that education, referral and social support of women could increase ANC utilization in Bangladesh.

Discussion of Intervention Study

The main aim of this study was to examine the impact of a three-month intervention program using various platforms to deliver theory-based health messages to promote intention to uptake ANC among pregnant women in Bangladesh. In this quasi-experimental study, participants received threat-framed and coping-framed information to increase their perceptions on various cognitive and socio-cultural constructs proposed for this research. Findings revealed significant effects of combined intervention on pregnant women's response efficacy, self-efficacy, social connectedness, women's autonomy, and

intention to uptake ANC, thus suggesting the importance of employing more than one intervention component. More specifically, the research revealed significant differences in hypothesized dependent variables among expectant women receiving health messages on mobile media than those using traditional media.

The findings of the intervention study revealed that there was significant increase in response efficacy of mobile channel users than traditional channel users. This finding supported hypothesis *H10a*. In addition, mobile phone users showed significant increase in self-efficacy than the traditional channel users. This finding supported hypothesis *H10b*. A similar pattern of results were found for both social connectedness and women's autonomy, and significant differences in mean were found at follow-up assessments, where change in means for mobile channel users was greater compared to traditional channel users. These findings supported the research hypotheses *H10c* and *H10d*. Mean scores of intention to uptake ANC for both mobile and traditional channel group at baseline assessment were not significantly different. However, for follow-up assessment, the mobile intervention group showed a significant increase in intention from baseline to three-month over traditional channel, thus supporting hypothesis *H10e*. The results demonstrated the more positive impact of mobile phone (over traditional channels) in communicating theory-driven health messages to increase intention to uptake ANC.

The findings also showed a significant interaction between platform and message for dependent variables proposed in the intervention study. The interaction is the direct result of message processes delivered on three platforms. On the question of how frames of messages interact with traditional, mobile and combined platforms fare in eliciting responses for hypothesized variables, the findings showed significant differences in

response efficacy, self-efficacy, social connectedness, women's autonomy, and intention to uptake ANC among expectant women receiving messages on mobile platform, but only among those exposed to health messages with threat-frames. This is likely due to threat messages leading to greater awareness of severity of the health issue and digitally mediated health messages offering a more immediate coping mechanism to the threat. Corresponding to past research (Self & Rogers, 1990; Witte & Allen, 2000), threat-framed messages appear to be effective when the pregnant women feel empowered to overcome the health threats of pregnancy. However, when such solution is unavailable, exposing them with threat-framed messages may prove to have detrimental effects. This research supports this notion by demonstrating that threat-framed messages, when delivered on mobile platform can improve pregnant women's cognitive and socio-cultural beliefs to a level roughly matching that of their counterparts exposed to coping-framed messages. Fry and Prentice-Dunn (2005) also found that a high level of threat leads to adoption of health recommendations most often when coping information is provided as well. On the other hand, among expectant women exposed to coping-framed messages, message interaction effects with combined platform revealed significant more positive responses for dependent variables. These findings addresses RQ3.

The research findings refer to the potential role of mobile phone as a medium influencing cognitive and socio-cultural factors on intention to uptake ANC, and that the effect is more pronounced when threat-framed messages were deployed over coping-framed messages. It appears that perceptions about threat-framed messages are more immediate when expectant women receive them via mobile platform, creating a more urgent sense of threat about complications of pregnancy and provoking intention to

uptake ANC. Mobile phones do not add much additional influence to coping-framed messages, possibly because messages framed in this manner are generally more effective in influencing ANC predicting variables than threat-framed messages. Moreover, the established perceptions of coping appraisals among expectant women does not elicit much higher change in addition to what they have already gathered from leaflets. However, the inclusion of mobile phones may level out the effect of differently framed health messages in influencing beliefs about ANC seeking behaviour, particularly in enhancing the intention to uptake ANC of those in the threat-framed condition. This supposition is evidenced by the finding that the level of intention among pregnant women in the total threat-framed message intervention became on par with that in the total coping-framed message intervention (see Table 11). In other words, incorporating mobile-based messages along with existing traditional-based health education may promote pregnant women's intention equally regardless of which health message framing they were exposed to.

The findings imply that receiving messages on mobile media can help boost pregnant women's confidence building, perceptions about pregnancy complications, enhance her social network and ANC related expertise, decision making autonomy, and in turn lead to more positive attitudes and intention to uptake ANC. Various research (Fogg & Eckles, 2007; Lund & Hemend, 2010; Obijiofor, 2015) on mobile phones, indeed, validated these findings. Taken together, the results of this research indicate that persuasive message on mobile phone can influence pregnant women's response efficacy, self-efficacy, social connectedness, women's autonomy, and intention to uptake ANC as motivators during pregnancy.

Theoretical Implications

While most ANC research in developing countries have considered outlining the interventions addressing the accessibility and supply side issues, this research marks one of the first attempts to construct a theory-based communication intervention model for promoting ANC uptake among pregnant women in Bangladesh from the user perspective. Determining the impact of new communication design on intention to uptake ANC and actual uptake is important, and this research has further shed light on the underlying mechanism that makes the proposed communication design an effective tool for promoting ANC uptake. Building on the foundations of PMT, the research findings showed that threat and coping appraisal processes are two essential components that can encourage both cognitive and psycho-social variables predicting intention to uptake ANC via a mobile-based SMS communication. Indeed, it was found that response efficacy and self-efficacy can drive a pregnant mother to learn the possible complications of pregnancy and usefulness of ANC in countering the complications, and change her attitude towards ANC. The findings suggest that messages that advocate risk of a possible condition (that is, complications of pregnancy) by increasing threat appraisal might be effective on some platforms. Although a mobile platform might magnify threat appraisals for intention to uptake ANC, other platforms such as traditional appear to lead to rejection of such threat promoting messages. The literature on fear appeals (Henthorne, LaTour, & Nataraajan, 1993; Witte & Allen, 2000) has made similar claims suggesting that appeals that create fear or stress might be effective only up to a certain threshold. The lack of predictive validity of threat appraisal variables to behavioural intention further indicates that communicating risks of complications should be carefully formulated so as to impart

confidence in pregnant mothers about her skills and belief that she is capable of ANC uptake. These findings support the threat and coping appraisal processes within PMT literature and further extend their applicability in context of ANC uptake in Bangladesh.

Although pregnancy is a bio-medical condition, it has socio-cultural definitions as well. Yet, there is limited understanding about whether socio-cultural factors can influence ANC seeking behaviour. The study has shown that in a particular social environment, it is important to consider social psychological theories in conjunction with theories of cognitive behaviour. In this case, threat and coping appraisal processes were examined collectively with concepts of perceived social norm, social connectedness and women's autonomy. While social connectedness and women's autonomy have been studied separately in behaviour change research, this study has examined these concepts together in promoting ANC uptake through health messages. Important people in a pregnant woman's social network help her feel autonomous and more connected, and thereby, modify her perceived social norm positively to promote ANC uptake. As a result, expectant mothers who experience higher autonomy and connectedness due to health messages through mobile phones exhibit stronger intention to uptake ANC. These results indicate that these socio-cultural factors are essential to influence ANC uptake. Thus, this research contributes to the existing literature on maternal health services utilization and fill the research gap by investigating the potential role that social interactions play in influencing women's decision to patronize these services.

As mobile phones are becoming increasingly pervasive and accessible, it is not difficult to imagine health communication research in the field of maternal health care has come to include mobile-based health education programme for promoting ANC uptake.

Additionally, an understanding of cognitive and socio-cultural factors derived from social environments of pregnant mothers in Bangladesh will provide guidance to develop future interventions using mobile phones that may diminish risk-taking behaviours, and improve maternal health in a low-income country.

Practical Implications

This research is designed to address the long standing challenges of improving maternal health care in Bangladesh where there is an urgent need to reach all groups in the population irrespective of their demographic and socio-economic characteristics. This new mobile-based communication design, while facilitating uptake of ANC, will provide an opportunity for early detection and follow-up of pregnancy complications including routine and emergency referrals. It is important to acknowledge that sometimes policy practices, resource constraints and community dynamics interact, thus, creating a complex situation for much needed improvement in certain healthcare goal. When policies are formulated with little reflection of local conditions within which they are to be implemented, and use communication channels that fail to appreciate the accessibility and usage of the target population, the implementation of desired changes could be difficult. It is also critical to keep in mind that implementing change might be difficult if it is not based on realities, knowledge, experiences and perspectives of those implementing the change and those expected to benefit from it. In this study, data collected by survey and FGD on cognitive and socio-cultural determinants showed that increased coping perception and social connectedness promoted intention to ANC uptake. On the other hand, threat perception and lack in decision making power in Bangladeshi society did not

have any positive association with ANC uptake intention. The intervention study further identified that mobile communication can increase ANC uptake by encouraging women's autonomy and facilitating social connectedness, and thereby, bringing change into existing social norm. When this is coupled with threat and coping based messages, ANC uptake was promoted more in pregnant women who used mobile phone. These new knowledge and relative supremacy of theory-based message intervention through mobile phone could be shared with policy makers to formulate new ANC uptake regime. The new intervention guideline and protocol should be available in all health clinics that provide ANC services. All healthcare providers involved in ANC should have received some training in using threat and coping based messages so that they can motivate pregnant women with potential of having complications for focused ANC visits. The new knowledge of how ANC seeking behaviour is influenced by cognitive and socio-cultural beliefs can also be used to tailor new health education materials matching the needs and beliefs of the target population.

In addition to strengthening the health system in a low resource country, the suggested communication design will provide expectant women opportunities to enhance their individual capacities by encouraging learning of pregnancy related issues and providing support in decision-making processes. Past studies indicate that upgrading of one's status and recognition as an individual result in a higher uptake of health care services (Amin & Li, 1997) and use of communication tools may provide the necessary recognition and empower woman in the society (GSMA Intelligence, 2014). Moreover, mobile-based health education has the potential to improve overall ANC uptake in Bangladesh by ensuring accessibility for all, including the poor and marginalized section

of the society. Accessibility, cost-effectiveness, efficiency, raised feeling of autonomy by providing access to knowledge and enhanced communication within social network promoted by the design can subsequently reduce inequalities in seeking health care.

Good adherence and compliance to antenatal check-up will reduce expenses at public and private level due to less numbers of complicated deliveries and reduced maternal morbidities. This will lead to saving resources in a developing country. Although a large number of its population live below poverty line, usage of mobile and internet technology are on the rise in Bangladesh. On the other hand, access to health care facilities for less advantaged people is becoming costly. Therefore, future development of a mobile-based platform for comprehensive pregnancy care could be a consumer friendly option for the poor and hard-to-reach segment of the population as well as health care providers.

Limitations and Future Research

The variables used in this research have been well-tested in various health settings across developed and developing countries. However, these are not yet tested in Bangladesh for intention to uptake ANC. While findings from this study make significant contributions to the existing literature on utilization of ANC in Bangladesh, a number of limitations need to be mentioned.

This study examined the impact of both PMT-based and other psycho-social theory based constructs, which are essentially part of social cognition models, in facilitating threat and coping appraisal processes on intention to uptake ANC. Although the findings here endorsed significant contributions of such models to ANC seeking

behaviour and health communication literature, it is equally important to examine the influence of models other than individual cognition models. Elements worthy of exploration include social behaviour theories such as Stage Models (Weinstein, Rothman, & Sutton, 1998), Diffusion of Innovation Theory (Rogers & Shoemaker, 1971), and Social Network Theory (Berkman, 1995; Latour, 2005). Social systems theories of behaviour change like Weick's Model of Organizing (Weick, 2012) and Theory of Gender and Power (Connel, 1987) might also be examined as frameworks for guiding strategic communication interventions to promote uptake of focused ANC. Moreover, communication intervention can also be designed using different media such as mobile applications and web-based platform. Elements of these theories, new media and multi-channel communication have the potential to influence the outcome of communication interventions and may contribute to expectant women's ANC seeking behaviour.

The proposed model in this research was explored and tested by intervention using a quasi- experiment. While the study design was carefully conceived and procedures strictly followed to maintain internal validity, issues with external validity need to be acknowledged. Study participants consisted of pregnant women of Bangladesh, who tend to be less educated and less technology-friendly to understand health messages on new media, such as mobile phones as compared to traditional channel, namely leaflet. It should also be noted that only urban and semi-urban pregnant women attending ANC clinic at the study sites (one in BSMMU hospital and another in BSMMU run clinic at sub-urban periphery) in Dhaka city of Bangladesh were recruited for this study. Although the sample is representative for an urban or semi-urban population, it cannot be considered representative for all pregnant women in Bangladesh. A systematic review of inequalities

in developing countries found that the association between place of residence and receipt of early ANC uptake was not consistent. Out of five studies analyzed for urban-rural differences, one study showed that urban women in Jamaica were significantly less likely than rural women to attend ANC, two studies reported no significant difference between urban and rural women in India, two studies done respectively in Brazil and Ecuador reported that urban women were significantly more likely to attend ANC at early stage (Say & Raine, 2007).

In Bangladesh, rural people tend to rely on their larger groups for reciprocity and mutuality of trust which play a great role in improving their capabilities, and they manage their risks and uncertainties firstly in cooperation with the existing such groups (Rahman & Haque, 2011). In Bangladeshi social settings, most rural women communicate with each other when they attend social events like marriage ceremonies, funerals, festivals, and occasional market days. They may exchange information with each other on the benefits of ANC and the resultant positive pregnancy outcomes, which may encourage other women to also patronize these maternal care services. According to Fukuyama (1995), the benefits that individuals enjoy through interactions with their social groups can result in a decrease in inadequate uptake of ANC on a broader scale such as at the village level. These interactions may be expected to increase the scope and rate of information dissemination. Additionally, healthcare workers often take the opportunity to schedule their clinic sessions on these festival and market days to educate women about the importance of ANC. Therefore, the potential of similar results in rural population may not be overstated. From a policy perspective, programs which are aimed at increasing women's participation in ANC utilization may take advantage of such social networks in

disseminating relevant information about medical care. Mass communication by sending messages through mobile phones during these events may also be used since women may discuss the new information and their own experiences with each other at regular social events. These special characteristics of social interactions in rural areas of Bangladesh may have the potential to give a different scenario for promoting ANC uptake than that provided by urban interactions.

Despite that caution needs to be used in generalizing the findings to women living in rural areas. Hence, future research should extend the study to incorporate participants from different hospitals, at least one each from a city area and a rural region in order for the results from this research to be extrapolated to a general population.

This study sought to conceptualize a model of intention to uptake ANC using both cognitive and psycho-social theories. While findings provided support for the model, future studies could examine whether cognitive or socio-cultural factors are more effective to influence ANC seeking behaviour in Bangladesh among different population segments, rural and urban, rich and poor. This differential influence of population characteristics may help develop a more effective intervention model for intention to uptake ANC.

Results of SEM suggested strong and significant relationships between social connectedness and perceived social norm, which mediates the relationship of social connectedness to intention. However, literature also suggests the existence of alternative relationships where perceived social norm can influence social connectedness (Cattell, 2001). Future studies can take a closer look at this reverse relationship, and explore if

perceived social norm is mediated by social connectedness instead while increasing intention.

The research variables in this study were assessed using a self-reported questionnaire, and may therefore differ from actual measures. Limitations inherent to self-report may under- or over-estimate the association by common bias. For example, social desirability bias, particularly relevant in intervention studies after participants have received the intervention, could conflate the association, while, on the other hand, poor validity can attenuate correlations (Cook & Campbell, 1979). Although this research intended to use the participants' observations to obtain and validate data, this was not possible due to resource and time constraints. However, given the consistency of findings in focus group design and past literature discussed in the research, it can be fairly assumed that the findings represent actual practices. Future studies for ANC seeking behaviour may use other objective methods to validate the accuracy of measures.

The scales used in this study are taken from previously validated measures used in studies in various settings. However, women's autonomy indicators used in this study are not a previously validated measure of women's decision making power in Bangladesh. The lack of support for *H8a* clearly draws attention to the need to develop locally sensitive and meaningful measures of women autonomy.

Lastly, the research model in this study was cross-sectional; that is, it measures perceptions and intentions at a single point in time. As a result, it was not possible to infer causal relationships between variables, such as, perceived severity and perceived vulnerability with intention to future ANC uptake. Although perceptions change with time and experience of users (Mathieson, Peacock, & Chin, 2001), longitudinal data could not

be collected for this research as it would require prolonged time to observe the actual behaviour requiring more resources. Since the research deals with pregnant women, actual uptake of focused ANC would mean collecting data after delivery of child which was not possible due to time constraints. Future research should aim at testing the influences of research variables on actual uptake of focused ANC using the longitudinal data.

Taking all these elements into consideration, evidence from this research suggests that an effective communication design should feature an effective medium that is widely accessed and used by pregnant women, increase opportunity for networking, and focus on cost-effectiveness. Future health communication interventions should consider these factors in developing efficient intervention before embarking on pilot testing and evaluation.

Conclusion

One of the key strategies to reduce maternal mortality is promoting focused ANC uptake. This research was, thus, inspired in part by calls to understand the factors that influence the ANC seeking behaviour in Bangladesh, and an increased focus on the role of theory-driven communication intervention to change existing health behaviour. Many pregnant women in Bangladesh are at risk of pregnancy complications and need to be helped and motivated to uptake focused ANC. Promoting ANC and thereby, potentially reducing maternal mortality and morbidity is therefore an important issue for Bangladesh health services. This research identified message delivery channels and theory-based message frames as ways of making health messages more effective, and thereby, underscoring recent perspectives in the health communication literature. The studies

extended the current models of ANC seeking behaviour by adding socio-cultural factors to cognitive beliefs as the determinants of intention to uptake ANC. The findings from this research suggest that intervention designed in combination with the research model can serve as a useful strategy in increasing the favourable responses of predictor variables and intention to uptake focused ANC. This research, thus, highlights the importance of enhancing cognitive and socio-cultural beliefs so that ANC utilization could be increased in Bangladesh.

The strong relationships between theoretical concepts that were unfolded in this research provide a good foundation for theory-based health communication design to promote ANC uptake through mobile-based SMS and future new media-based interventions. The information gained from this and future studies will result in a better understanding of the underlying mechanisms of intention to uptake focused ANC in a low resource setting, assist health communication practitioners to design more effective and impactful intervention model, and provide assistance to public health specialists in formulating campaigns and interventions to increase intention and actual uptake of focused ANC among the expectant women.

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APPENDICES

Appendix A: Questionnaire for Preliminary Study One

SECTION 1: DEMOGRAPHICS

101. What is your address? Write down the locality.

102. What is your marital status?

1. Single
2. Married
3. Separated
4. Divorced/widowed
5. Refuse to answer/Don't know

103. How many immediate family members are staying with you ?

104. What is your highest educational level?

1. No education
2. Primary school or equivalent
3. Secondary School Certificate or equivalent
4. Higher Secondary Certificate or equivalent
5. Bachelor or equivalent and above
6. Refuse to answer/Don't know

105. What is your primary Occupation ?

1. Full time employed
2. Part time employed
3. Business answer/Self employed
4. Housewife
5. Student
6. Unemployed
7. Refuse to answer/Don't know

106. How much is your monthly household income?

1. Below 25,000 taka
2. Between 25,000-40,000 taka
3. Above 40,000 taka

107. What is your home type? is it owned by your household (1) or rented (2) ?

1. Unstructured home

2.: Landed home

3. Apartment

4. Brick built

108. Do you have the following things at home based on their primary functions?

	Yes (1)	No (2)
a. Mobile phone		
b. Computer		
c. Internet access		
d. Television		
e. Subscription to newspaper/magazines		

SECTION 2: MEDIA SOURCE

201. How much time, on average, do you spend using the following media?

Don't know

a. Bangla newspaper		minutes/day	
b. English newspapers		minutes/day	
c. Television		minutes/day	
d. Radio		minutes/day	
e. Computer-based Internet at home		minutes/day	
f. Computer-based Internet at cyber-cafes		minutes/week	
g. Magazines		minutes/week	
h. Movies at cinema		movies/week	

202. How many mobile phones do you have?

203. Is your mobile phone equipped with the following function ?

	Yes (1)	No (2)
a. Email		
b. Internet access		

204. How much do you use our mobile phone to do the following activities every day?

	Very infrequently	Infrequently	Neutral	Frequently	Very Frequently
a. Send and receives SMS	1	2	3	4	5
b. Make calls	1	2	3	4	5
c. Share photos	1	2	3	4	5
d. Share videos	1	2	3	4	5
e. Social media(e.g. facebook, twitter)	1	2	3	4	5
f. Gaming	1	2	3	4	5

205. How much do you use the following devices?

	Very infrequently	Infrequently	Neutral	Frequently	Very Frequently
a. Desktop	1	2	3	4	5
b. Laptop	1	2	3	4	5

206. Please rate how important do you feel about the reasons for mobile phone use.

	Least important	Not that important	Neutral	Quite important	Most important
a. Keep in touch with people (eg.facebook)	1	2	3	4	5
b. Search for information (eg.Youtube)	1	2	3	4	5
c. Share information	1	2	3	4	5
d. Share interests	1	2	3	4	5
e. Make appointments	1	2	3	4	5
f. Meet new people	1	2	3	4	5
g. Pass leisure time/entertainment	1	2	3	4	5

SECTION 3: GENERAL HEALTH

301. How would you rate your health today?

1. Very good
2. Good
3. Moderate
4. Bad
5. Very bad
6. Refuse to answer/Don't know

302. How often do you visit a doctor?

1. Once a month
2. Once every 3 months
3. Once every 6 months
4. Once a year
5. When necessary

303. Do you agree to the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. You always find out more information about your own health	1	2	3	4	5
b. You know where to find reliable health information.	1	2	3	4	5
c. If you have a question about your own health you always try to find an answer for it.	1	2	3	4	5
d. You can evaluate which health information is reliable and which is not.	1	2	3	4	5

304. Are you likely to seek public health information from these media sources?

	Extremely unlikely	Unlikely	Neutral	Likely	Extremely likely
a. Radio	1	2	3	4	5
b. Television	1	2	3	4	5
c. Newspaper	1	2	3	4	5
d. Magazines	1	2	3	4	5
e. Posters/pamphlets	1	2	3	4	5
f. Internet via computers	1	2	3	4	5

g. Mobile phones	1	2	3	4	5
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305. If you hear about a disease outbreak in your neighborhood, which of the following sources are you likely to seek medical advice from.

	Extremely unlikely	Unlikely	Neutral	Likely	Extremely likely
a. Local government authorities	1	2	3	4	5
b. Family members	1	2	3	4	5
c. Friends	1	2	3	4	5
d. Doctors	1	2	3	4	5
e. Nurses/midwives	1	2	3	4	5
f. Traditional medicine practitioners	1	2	3	4	5
g. Religious leaders	1	2	3	4	5
h. Pharmacist/Local medical store	1	2	3	4	5
I. NGOs who work on health	1	2	3	4	5

SECTION 4: Pregnancy related health check-up

401. How many children do you have?

1. One
2. More than one
3. First pregnancy

402. How was the experience of your previous pregnancy?

1. Good
2. Moderate
3. Bad

403. What brings you to the antenatal clinic?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Fear about your pregnancy outcome/fetal well-being	1	2	3	4	5
b. You just followed what your family members and friend were doing	1	2	3	4	5

c. You are advised by husband or any member of your family	1	2	3	4	5
--	---	---	---	---	---

404. How strongly do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Is it inappropriate to discuss your pregnancy with somebody other than your family members	1	2	3	4	5
b. Do you think a pregnant woman should eat more protein during pregnancy	1	2	3	4	5
c. Do you feel embarrassed to come to hospital for antenatal check up	1	2	3	4	5

405. About coming for antenatal check how far do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Most people who are important to you think that you should go for antenatal check up	1	2	3	4	5
b. Most people whose opinion you value would approve of your attending antenatal clinic regularly.	1	2	3	4	5

406. How far do you agree with the comments below about pregnancy complication?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Pregnancy complications is a serious matter	1	2	3	4	5
b. Late detection of pregnancy complication increases the possibility of death of child in womb or during delivery	1	2	3	4	5
c. Complicated pregnancy can cause	1	2	3	4	5

death to pregnant mother.					
d. Complicated pregnancy can lead to mental stress at a later date					

407. How far do you agree with the following comments about pregnancy complications?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The chance of your being diagnosed with pregnancy complications is high	1	2	3	4	5
b. It is possible that you may have pregnancy complications even if you or any of your family member does not have history of pregnancy complications.	1	2	3	4	5
c. Pregnancy complications can happen during any pregnancy	1	2	3	4	5
d. The older I am, the higher the risk of pregnancy complications					

408. During your pregnancy, were you concerned about any of the following conditions?

	Very unconcerned	Unconcerned	Neutral	Concerned	Very concerned
a..The position of your baby	1	2	3	4	5
b. The size of your baby	1	2	3	4	5
c. Whether your baby might be premature	1	2	3	4	5
d. The chance of having a baby with a disability or abnormality	1	2	3	4	5
e. Your own health	1	2	3	4	5
f. Other possible complications of pregnancy	1	2	3	4	5

409. How far do you agree with the following points about antenatal check-up?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Regular antenatal check –up will provide m with reassurance of good pregnancy	1	2	3	4	5
b. Going for regular antenatal screening could save my baby and my life.	1	2	3	4	5
c. Early detection of pregnancy complication increases the likelihood of successful treatment	1	2	3	4	5
d. Regular antenatal screening is effective in detecting pregnancy complications at its early stage	1	2	3	4	5

410. Do you agree with following comments?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I am confident of my ability to go for regular antenatal screening	1	2	3	4	5
b. It is easy for me to go for regular antenatal screening	1	2	3	4	5
c. I am confident of acquiring information on pregnancy complications	1	2	3	4	5
d. It is easy for me to acquire information on pregnancy complications	1	2	3	4	5
e. It is time consuming for me to go for regular antenatal screening	1	2	3	4	5
f. It is expensive for me to go for regular antenatal screening	1	2	3	4	5
g. It is not convenient for me to go for regular antenatal screening	1	2	3	4	5
h. I feel uncomfortable going for antenatal screening	1	2	3	4	5
i. I intend to go for regular antenatal check up	1	2	3	4	5
j. I intend to know more about pregnancy complications	1	2	3	4	5
k. I intend to find out more about how	1	2	3	4	5

to proceed to avoid pregnancy complications					
1. I intend to get to know more about healthy lifestyle before I conceive	1	2	3	4	5

Appendix B: IRB Approval by Nanyang Technological University

Research Support Office

Reg. No. 200804363R

IRB-2014-01-034

18 November 2014

Associate Professor May Oo Lwin
Wee Kim Wee School of Communication and Information

NTU INSTITUTIONAL REVIEW BOARD APPROVAL

Project Title: Promoting uptake of antenatal care (ANC) services among pregnant women in Bangladesh by using an extended protection motivation theory: the role of innovative new media solution

I refer to your application for ethics approval with respect to the above project.

The Board has deliberated on your application and noted from your application that your research involves collecting behavioral data from participants through Intervention programme.

You have also confirmed that informed consent will be obtained from the participants and you have guaranteed the confidentiality of your participants' biodata obtained from them.

The documents reviewed are:

- a) NTU IRB application form dated **24 January 2014**
- b) Participant information sheet and consent form: version 1 dated **24 January 2014**
- c) Data collection form: version 1 dated **24 January 2014**

The Board is therefore satisfied with the bioethical consideration for the project and approves the ethics application under **Full Board** review. The approval period is from **18 November 2014 to 17 November 2015**. The NTU IRB reference number for this study is **IRB-2014-01-034**. Please use this reference number for all future correspondence.

The following protocol and compliances are to be observed upon NTU IRB approval

1. All research involving procedures greater than minimal risk on minors (individuals who are less than the legal age of 21 years old) requires IRB approved written Parental Consent and assent from the participant to be obtained before any research protocols can be administered. Minimal risk refers to an anticipated level of harm and discomfort that is no greater than that ordinarily encountered in daily life, or during the performance of routine educational, physical, or psychological examination.
2. Only the approved Participants Information Sheet and Consent Form should be used. It must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject should be given a copy of the signed consent form.

Blk N2.1, B4-01, 76 Nanyang Drive, Singapore 637331 Nanyang Avenue, Singapore 639798
Tel : +65 6791 9867, Fax: 6793 2019
www.ntu.edu.sg

Research Support Office

3. Consent forms are important documents therefore they should be stored in the strictest arrangement. Loss of consent form would result in disciplinary action.
4. No deviation from, or changes of, the protocol should be initiated without prior written NTU IRB approval of an appropriate amendment.
5. The Principal Investigator should report promptly to NTU IRB regarding:
 - a. Deviation from, or changes to the protocol.
 - b. Changes increasing the risk to the subjects and/or affecting significantly the conduct of the trial
 - c. All serious adverse events (SAEs) which are both serious and unexpected.
 - d. New information that may affect adversely the safety of the subjects of the conduct of the trial.
 - e. Completion of the study.
6. Continuing Review Request/ Notice of Study completion form should be submitted to NTU IRB for the following:
 - a. Annual review: Status of the study should be reported to the NTU IRB at least annually using the Continuing Review Request/ Notice of Study completion form.
 - b. Study completion or termination: Continuing Review Request/ Notice of Study completion form is to be submitted within 4 to 6 weeks of study completion or termination.

A handwritten signature in black ink, appearing to read 'Lee Sing Kong'.

Professor Lee Sing Kong,
Chair, NTU Institutional Review Board
encl.

cc Chair, Wee Kim Wee School of Communication and Information
Members, NTU Institutional Review Board

Appendix C: Approval by BSMMU for Preliminary Study One

Prof. Dr. Abu Nasir Rizvi
MBBS, MD

**Director
Planning & Development**
Bangabandhu Sheikh Mujib Medical University
Shahbag, Dhaka-1000

10 January 2013

Md Monwar Hossain
PhD Candidate
WKW School
Nanyang Technological University
Singapore

Re: Baseline study on the current perception and awareness about antenatal care, and media use pattern among Bangladeshi pregnant women

Dear Mr. Hossain,

This is to confirm that Mr Md Monwar Hossain and his team are permitted to collect necessary data by survey questionnaire from the pregnant women at the outpatient department of Bangabandhu Sheikh Mujib Medical University (BSMMU) for the "Baseline study on the current perception and awareness about antenatal care, and media use pattern among Bangladeshi pregnant women". However, while collecting data, the data collection procedure should maintain all standard ethical guidelines and take written consent of the participants in the study.

This administrative approval for collecting data from the outpatient department of BSMMU will remain valid for a period of one year from the date of this letter. If there is any question regarding the approval, please contact me at 1880-1819216104 or aburizvi1@gmail.com.

Sincerely,

Professor Dr. Abu Nasir Rizvi
Director (Planning and Development)

Phone : +88-02-9676262 (Office) PABX : 8614545-9, Ext.4609
E-mail : aburizvi4@hotmail.com

Appendix D: Approval by BSMMU for Preliminary Study Two and Intervention

Prof. Dr. Abu Nasir Rizvi
MBBS, MD

**Director
Planning & Development**
Bangabandhu Sheikh Mujib Medical University
Shahbag, Dhaka-1000

09 September 2014

A/Prof May Oo Lwin
Associate Dean (Graduate Education)
College of Humanities, Arts and Social Sciences
&

Md Monwar Hossain
PhD Candidate
WKW School
Nanyang Technological University
Singapore

Re: Promoting uptake of antenatal care among pregnant women in Bangladesh by using protection motivation theory: the role of new media solution

Dear Prof. Lwin and Mr. Hossain,

On September 08, 2014 the Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka reviewed the research proposal entitled, "Promoting uptake of antenatal care among pregnant women in Bangladesh by using protection motivation theory: the role of new media solution". This outpatient based project is designed to identify the current status of perception about antenatal care among the pregnant women and will measure their intention to undertake the future visits. The project will also measure the efficacy of a mobile based text messaging intervention in comparison with traditional leaflet based campaign. As there is no invasive procedure involved, the IRB opined that work on the data collection by survey (pre- and post-test) and in-depth interviews may begin. This administrative approval for collecting data from the outpatient department of BSMMU will remain valid for a period of one year from the date of this letter and will require continuation approval if the research project extends beyond 10 September 2015.

If there is any question regarding the approval, please contact me at +880-1819216104 or aburizvi@gmail.com.

Sincerely,

Professor Dr. Abu Nasir Rizvi
Director (Planning and Development)

Phone : +88-02-9676262 (Office) PABX : 8614545-9, Ext.4609
E-mail : aburizvi4@hotmail.com

Appendix E: Topic for Interview Guide for FGD and IDI

Participants	Question guide for moderator
<i>Questions for all participants</i>	<ol style="list-style-type: none"> 1. What are the barriers for not coming to undertake ANC? Cost? Distance from hospital? Any other? 2. What are the facilitators for ANC uptake? 3. How is the quality of ANC? 4. Is the environment of clinic/hospital good? 5. What could be done more to improve ANC care? 6. Do you use of mobile phone for text message/SMS? 7. Demographic data: age, marital status, education, occupation, parity
Pregnant women who come to ANC (20- FGD)	<ol style="list-style-type: none"> 1. Do you think pregnancy could be complicated and you may be vulnerable? 2. Are there any factors, which may have prompted or helped you see a doctor or a midwife earlier in your pregnancy? 3. What is your understanding of the first antenatal booking visit? Are you aware that it is recommended between the 8th and 12th weeks of pregnancy? 4. When ideally would you first like to see a midwife or a doctor during pregnancy, and why? 5. Do you think ANC helps your pregnancy?
	<ol style="list-style-type: none"> 1. Have you sought support from sources other than doctors? 2. Do you talk to family and friends about your pregnancy? 3. Do you think support provided by relatives and friends of pregnant women can help her to overcome problems during pregnancy?
	<ol style="list-style-type: none"> 1. Who take decision about your daily health matters? 2. Who take decision about your pregnancy matters? 3. Do you have any restrictions from family in your decision or daily life? 4. Who makes decision about your everyday household matters? Small purchase? Big purchase?
	<ol style="list-style-type: none"> 1. Do you take advice about pregnancy and ANC from people who are important in your life? 2. Do you think people who are important in your life approve of your decisions about pregnancy/ANC? 3. Do you follow your mother/mother-in-law/sisters for pregnancy related matters?

	<ol style="list-style-type: none"> 1. Do you think mobile phone/communication can help utilize ANC more? Or traditional way like leaflet is more helpful? 2. What is your idea about SMS/text message? Does it help in informing you about pregnancy and ANC?
Husbands (10- FGD)	<ol style="list-style-type: none"> 1. Family support for ANC utilization 2. Do you think your wife should talk to other females about pregnancy and ANC? <ol style="list-style-type: none"> 1. Do you think your wife should take advice about pregnancy and ANC from people who are important in her life 2. Do you your wife should follow your mother/mother-in-law/sisters for pregnancy related matters <ol style="list-style-type: none"> 1. Traditional beliefs and practices during ANC 2. Do you think pregnancy could be complicated and you may be vulnerable? 3. Do you think ANC helps pregnancy? <ol style="list-style-type: none"> 1. Who decides about your household health problems to see a doctor? 2. Who decides for sending wife to see doctor during pregnancy (ANC utilization)? 3. Who take decision about your everyday household matters? Small purchase? Big purchase? <ol style="list-style-type: none"> 1. Do you think mobile phone/communication can help utilize ANC more? Or traditional way like leaflet is more helpful? 2. What is your idea about SMS/text message? Does it help in informing you about pregnancy and ANC?
Families/relatives (10- FGD)	<ol style="list-style-type: none"> 1. How much do you know about ANC? 2. Do you think pregnancy could be complicated and a pregnant woman may be vulnerable? 3. Do you think ANC helps pregnancy? 4. What is your perception about ANC service providers? <ol style="list-style-type: none"> 1. Do you think pregnant women should decide herself about her pregnancy related issues? If not who should decide? Relatives? 2. Do you think husband or in-laws of pregnant women should decide about her pregnancy related issues? <ol style="list-style-type: none"> 1. Do you think support provided by relatives of pregnant women can help her to overcome problems during pregnancy? 2. Do you think pregnant women should keep contact with friends, relatives and other pregnant women? <ol style="list-style-type: none"> 1. Do you think pregnant women are free to take decision about her health matters? 2. Do you think pregnant women are free to take decision about her pregnancy matters?

	<ol style="list-style-type: none"> 1. Will SMS be able to inform about pregnancy and ANC? 2. Do you think mobile communication/text message can help utilize ANC more? Or traditional way like leaflet is more helpful?
--	---

In depth interview guide for Key informants

<p>Health care providers (doctors)</p> <p>(5- interview)</p>	<ol style="list-style-type: none"> 1. Are the content of ANC care currently practiced are helpful? 2. What are the obstacles to deliver ANC? 3. How you communicate to patient during and after providing ANC service? 4. How is pregnant women's response towards existing ANC care? Satisfactory or not? 5. Who do you think most supportive to pregnant women? 6. Do you think support provided by relatives of pregnant women can help her to overcome problems during pregnancy? 7. Why do women go to the clinic for ANC, yet mostly deliver at home? 8. Do you think mobile communication/text message can help utilize ANC more? Or traditional way like leaflet is more helpful?
<p>Health care providers (nurses/midwives)</p> <p>(5- interview)</p>	<ol style="list-style-type: none"> 1. Are the content of ANC care currently practiced are helpful? 2. What are the obstacles to deliver ANC? 3. How you communicate to patient during and after providing ANC service? 4. How is pregnant women's response towards existing ANC care? Satisfactory or not? 5. Who do you think most supportive to pregnant women? 6. Do you think support provided by relatives of pregnant women can help her to overcome problems during pregnancy? 7. Why do women go to the clinic for ANC, yet mostly deliver at home? 8. Do you think mobile communication/text message can help utilize ANC more? Or traditional way like leaflet is more helpful?

Appendix F: Sample Consent Form for Research Studies

Post-test survey questionnaire- A

গর্ভবতী নারীদের মধ্যে গর্ভকালীন সাস্থ্যপরীক্ষা উত্থাপকরণের ক্ষেত্রে মোবাইল ফোনের মাধ্যমে খুদেবার্তা প্রেরণের কার্যকারিতা পরীক্ষা

গ্রুপ নং আই.ডি. নং তারিখ

সম্মতিপত্র

সম্মতকারীর নাম ও ঠিকানা

মোঃ মনোয়ার হোসেন
উই কিম উই স্কুল অব কমিউনিকেশন এন্ড ইনফরমেশন
#০৫-১৮, ৩১ নানইয়াং লিঙ্ক
নানইয়াং টেকনোলজিকাল ইউনিভার্সিটি
টেলিফোন: (৬৫) ৬৭৯০-৬৫৬৬
ই-মেইল: mdmonwar001@e.ntu.edu.sg

C/O

রাজিব মন্ডল
বি.এস.সি. ইন ফিজিওথেরাপি (চূড়ান্ত বর্ষ)
স্টেট কলেজ অব হেলথ সায়েন্সেস
মোবাইল: ০১৫৩৬-১৭৮৫০৭
ই-মেইল: udayrajphysio@yahoo.com

সম্মতি: আমাকে উপরে উল্লিখিত বিষয় সম্পর্কে যথাযথভাবে জানানো হয়েছে এবং আমি স্বেচ্ছায়
এই ফরম পূরণে সম্মতি জ্ঞাপন করছি। আমার কোন প্রশ্ন থাকলে তা আমি করতে পারব এবং
উত্তর পাব বলে আমাকে জানানো হয়েছে।

অংশগ্রহণকারীর নাম: মোবাইল নং:

সাক্ষর ও তারিখ:

সহায়তাকারীর নাম

সাক্ষর ও তারিখ

Appendix G: Baseline Questionnaire for Model Assessment and Intervention Study

SECTION 1: DEMOGRAPHICS

101. What is your address? Write down only the locality.

102. What is your marital status?

1. Single
2. Married
3. Separated
4. Divorced/widowed
5. Refuse to answer/don't know

103. How many immediate family members are staying with you?

104. What is your highest educational level?

1. No education
2. Primary school or equivalent
3. SSC or equivalent
4. HSC or equivalent
5. Bachelor or equivalent and above
6. Refuse to answer/don't know

105. What is your primary occupation?

1. Full time employed
2. Part time employed
3. Business owner/Self employed
4. Housewife
5. Student
6. Unemployed
7. Refuse to answer/don't know

106. How much is your monthly household income?

1. Below 25,000 taka
2. Between 25,000-40,000 taka
3. Above 40000 taka

107. What is your home type? Is it owned by your household (1) or rented (2)?

1. Unstructured home	____
2. Landed home	____
3. Apartment	____
4. Brick built	____

108. Do you have the following things at home based on their primary functions?

	Yes (1)	No (2)
a. Mobile phone		
b. Computer		
c. Internet access		
d. Television		
e. Subscription to newspaper/magazines		

SECTION 2: MEDIA SOURCES

201. How much time, on average, do you spend using the following media resources?

			Don't Know
Bangla newspapers		minutes/day	
English newspapers		minutes/day	
Television		minutes/day	
Radio		minutes/day	
Computer-based Internet at home		minutes/day	
Computer-based Internet at cyber-café		minutes/week	
Magazines		minutes/week	
Movies at cinema		minutes/week	

202. How many mobile phones do you have?

203. Is your mobile phone equipped with the following function?

	Yes (1)	No (2)
a. Email		
b. Internet access		

204. How much do you use your mobile phone to do the following activities every day?

	Very infrequently	Infrequently	Neutral	Frequently	Very frequently
a. Send and receive SMS	1	2	3	4	5
b. Make calls	1	2	3	4	5
c. Share photos	1	2	3	4	5
d. Share videos	1	2	3	4	5
e. Social media (for example, facebook, twitter)	1	2	3	4	5
f. Gaming	1	2	3	4	5

205. How much do you use the following devices?

	Very infrequently	Infrequently	Neutral	Frequently	Very frequently
a. Desktop	1	2	3	4	5
b. Laptop	1	2	3	4	5

206. Please rate how important do you feel about the reasons for mobile phone use.

	Least important	Not that important	Neutral	Quite important	Most important
a. Keep in touch with people (eg. facebook)	1	2	3	4	5
b. Search for information (eg. Youtube)	1	2	3	4	5
c. Share information	1	2	3	4	5
d. Share interests	1	2	3	4	5
e. Make appointments	1	2	3	4	5
f. Meet new people	1	2	3	4	5
g. Pass leisure time/entertainment	1	2	3	4	5

SECTION 3: PREGNANCY RELATED HEALTH CHECK-UP

301. How many children do you have?

1. One
2. More than one
3. First pregnancy

302. How was the experience of your previous pregnancy?

1. Good
2. Moderate
3. Bad

303. How far do you agree with the comments below about pregnancy complications?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Pregnancy complications is a serious matter	1	2	3	4	5
b. Late detection of pregnancy complications increases the possibility of death of child in womb or during delivery	1	2	3	4	5
c. Complicated pregnancy can cause death to pregnant mother	1	2	3	4	5
d. Complicated pregnancy can lead to mental stress at a later date	1	2	3	4	5

304. How far do you agree with the following comments about pregnancy complications?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The chance of your being diagnosed with pregnancy complications is high	1	2	3	4	5
b. It is possible that you may have pregnancy complications even if you or any of your family member does not have history of pregnancy complications	1	2	3	4	5
c. Risk of having pregnancy complications is more in older age	1	2	3	4	5
d. It is possible that I have complicated pregnancy even if I don't feel any problems	1	2	3	4	5

305. How far do you agree with the following points about antenatal check-up?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Regular antenatal check-up will provide me with reassurance of good pregnancy without complications	1	2	3	4	5
b. Going for regular antenatal check-up could save my baby and my life	1	2	3	4	5
c. Antenatal check-up could help detect the existence of pregnancy complications early	1	2	3	4	5
d. Early detection of pregnancy complications during antenatal check-up increases the likelihood of successful treatment	1	2	3	4	5

306. Do you agree with the following comments?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I will be able to come for regular antenatal check-up to know about pregnancy complications	1	2	3	4	5
b. I can tell the doctors about problems I am having in pregnancy during antenatal check-up	1	2	3	4	5
c. I am confident about understanding information on pregnancy complications during antenatal check-up	1	2	3	4	5
d. When I am confronted with complications, I am able to take decision what to do	1	2	3	4	5
e. It is time consuming for me to travel for regular antenatal check-up	1	2	3	4	5
f. Regular antenatal check-up is expensive for me	1	2	3	4	5
g. I feel embarrassed to do antenatal check-up	1	2	3	4	5
h. I have to wait for long time for my antenatal check-up	1	2	3	4	5
i. I intend to go for regular antenatal check up for whole duration of pregnancy	1	2	3	4	5
j. I intend to know more about pregnancy complications	1	2	3	4	5
k. I intend to find out more about how to proceed to avoid pregnancy complications	1	2	3	4	5

l. I intend to get to know more about healthy behaviour during my pregnancy	1	2	3	4	5
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307. How far do you agree with the following comments?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I feel that I have close relations with my family and friends	1	2	3	4	5
b. I keep contact with friends and family through mobile phone	1	2	3	4	5
c. I keep contact with friends and family through internet (computer)					
d. There are people among my family and friends I can depend on to help me if I need	1	2	3	4	5
e. I have close relationships that provide me with a sense of emotional security and well being	1	2	3	4	5
f. There is someone who shares my interests and concerns	1	2	3	4	5
g. I feel personally responsible for well being of another person	1	2	3	4	5
h. There is someone I could talk to take important decisions in my life	1	2	3	4	5
i. I have sense of togetherness with other pregnant women.	1	2	3	4	5

308. About attending ANC how far do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Most people who are important to you think that you should go for antenatal check up	1	2	3	4	5
b. Most people whose opinion you value would approve of your attending antenatal clinic regularly	1	2	3	4	5
c. In your opinion, your family and friends offer encouragement and orientation to safe birth	1	2	3	4	5
d. Women in your family and friends serve as positive role models for you	1	2	3	4	5
e. Do you think that it is generally expected by the people you know that a pregnant woman should modify her health behaviour	1	2	3	4	5

f. You take a lot of mother/in-law's advice because she had went through pregnancies	1	2	3	4	5
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309. How do you perceive the following about antenatal check-up (ANC)?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. ANC is very important to the health of pregnant women and their unborn child	1	2	3	4	5
b. ANC improves pregnancy outcome	1	2	3	4	5
c. ANC prevents complications	1	2	3	4	5
d. ANC is not very useful to multi-parous women	1	2	3	4	5
e. ANC is necessary for purpose of treatment of minor illnesses during pregnancy	1	2	3	4	5
f. ANC can reduce morbidity and mortality in women	1	2	3	4	5

310. How much do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I can probably take care of what I need to do during pregnancy	1	2	3	4	5
b. I can probably deal with what I am worried about					
c. I can probably determine when to see the doctor	1	2	3	4	5
d. I can obtain information I need about pregnancy and childbirth from medical professionals	1	2	3	4	5
e. I probably can deliver like other people	1	2	3	4	5
f. I am satisfied with my life	1	2	3	4	5
g. I have confidence about managing the pregnancy	1	2	3	4	5
h. When I don't know what to do, I can probably research and solve the problem by myself	1	2	3	4	5
i. My family and friends supports my way of managing life's activities	1	2	3	4	5
j. My family and friends understand my	1	2	3	4	5

current situation by saying 'you can be as you are' and provide support					
k. I can consult with others and ask for help to achieve my goals	1	2	3	4	5
l. I can ask for help when I need to	1	2	3	4	5
m. I would like to enjoy my pregnancy	1	2	3	4	5
n. I am looking forward to life after childbirth	1	2	3	4	5
o. I am excited about the reality that I will be a mother	1	2	3	4	5
p. I feel affection for my unborn baby	1	2	3	4	5
q. I can do small purchases for my daily needs	1	2	3	4	5
r. I can take decisions about my health needs	1	2	3	4	5
s. I can visit alone friends and family I like	1	2	3	4	5
t. I have a say in major household purchases	1	2	3	4	5

Appendix H: Follow-up Questionnaire for Traditional (Leaflet) Group

SECTION 1: DEMOGRAPHICS

101. What is your address? Write down only the locality.

102. What is your marital status?

1. Single
2. Married
3. Separated
4. Divorced/widowed
5. Refuse to answer/don't know

103. How many immediate family members are staying with you?

104. What is your highest educational level?

1. No education
2. Primary school or equivalent
3. SSC or equivalent
4. HSC or equivalent
5. Bachelor or equivalent and above
6. Refuse to answer/don't know

105. What is your primary occupation?

1. Full time employed
2. Part time employed
3. Business owner/Self employed
4. Housewife
5. Student
6. Unemployed
7. Refuse to answer/don't know

106. How much is your monthly household income?

1. Below 25,000 taka
2. Between 25,000-40,000 taka
3. Above 40000 taka

107. What is your home type? Is it owned by your household (1) or rented (2)?

1. Unstructured home	____
2. Landed home	____
3. Apartment	____
4. Brick built	____

108. Do you have the following things at home based on their primary functions?

	Yes (1)	No (2)
a. Mobile phone		
b. Computer		
c. Internet access		
d. Television		
e. Subscription to newspaper/magazines		

SECTION 2: MEDIA SOURCES

201. How much time, on average, do you spend using the following media resources?

			Don't Know
Bangla newspapers		minutes/day	
English newspapers		minutes/day	
Television		minutes/day	
Radio		minutes/day	
Computer-based Internet at home		minutes/day	
Computer-based Internet at cyber-café's		minutes/week	
Magazines		minutes/week	
Movies at cinema		minutes/week	

202. How many mobile phones do you have?

203. Is your mobile phone equipped with the following function?

	Yes (1)	No (2)
a. Email		
b. Internet access		

204. How much do you use your mobile phone to do the following activities every day?

	Very infrequently	Infrequently	Neutral	Frequently	Very frequently
a. Send and receive SMS	1	2		4	5
b. Make calls	1	2		4	5
c. Share photos	1	2		4	5
d. Share videos	1	2		4	5
e. Social media (for example, facebook, twitter)	1	2		4	5
f. Gaming	1	2		4	5

205. How much do you use the following devices?

	Very infrequently	Infrequently	Neutral	Frequently	Very frequently
a. Desktop	1	2	3	4	5
b. Laptop	1	2	3	4	5

206. Please rate how important do you feel about the reasons for mobile phone use.

	Least important	Not that important	Neutral	Quite important	Most important
a. Keep in touch with people (eg. facebook)	1	2	3	4	5
b. Search for information (eg. Youtube)	1	2	3	4	5

c. Share information	1	2	3	4	5
d. Share interests	1	2	3	4	5
e. Make appointments	1	2	3	4	5
f. Meet new people	1	2	3	4	5
g. Pass leisure time/entertainment	1	2	3	4	5

SECTION 3: PREGNANCY RELATED HEALTH CHECK-UP

301. How many children do you have?

1. One
2. More than one
3. First pregnancy

302. How was the experience of your previous pregnancy?

1. Good
2. Moderate
3. Bad

303. How far do you agree with the comments below about pregnancy complications?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Pregnancy complications is a serious matter	1	2	3	4	5
b. Late detection of pregnancy complications increases the possibility of death of child in womb or during delivery	1	2	3	4	5
c. Complicated pregnancy can cause death to pregnant mother	1	2	3	4	5
d. Complicated pregnancy can lead to mental stress at a later date	1	2	3	4	5

304. How far do you agree with the following comments about pregnancy complications?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The chance of your being diagnosed with pregnancy complications is high	1	2	3	4	5
b. It is possible that you may have pregnancy complications even if you or any of your family member does not have history of pregnancy complications	1	2	3	4	5
c. Risk of having pregnancy complications is more in older age	1	2	3	4	5
d. It is possible that I have complicated pregnancy even if I don't feel any problems	1	2	3	4	5

305. How far do you agree with the following points about antenatal check-up?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Regular antenatal check-up will provide me with reassurance of good pregnancy without complications	1	2	3	4	5
b. Going for regular antenatal check-up could save my baby and my life	1	2	3	4	5
c. Antenatal check-up could help detect the existence of pregnancy complications early	1	2	3	4	5
d. Early detection of pregnancy complications during antenatal check-up increases the likelihood of successful treatment	1	2	3	4	5

306. Do you agree with the following comments?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I will be able to come for regular antenatal check-up to know about pregnancy complications	1	2	3	4	5
b. I can tell the doctors about problems I am having in pregnancy during antenatal check-up	1	2	3	4	5
c. I am confident about understanding information on pregnancy complications during antenatal check-up	1	2	3	4	5
d. When I am confronted with	1	2	3	4	5

complications, I am able to take decision what to do					
e. It is time consuming for me to travel for regular antenatal check-up	1	2	3	4	5
f. Regular antenatal check-up is expensive for me	1	2	3	4	5
g. I feel embarrassed to do antenatal check-up	1	2	3	4	5
h. I have to wait for long time for my antenatal check-up	1	2	3	4	5
i. I intend to go for regular antenatal check up for whole duration of pregnancy	1	2	3	4	5
j. I intend to know more about pregnancy complications	1	2	3	4	5
k. I intend to find out more about how to proceed to avoid pregnancy complications	1	2	3	4	5
l. I intend to get to know more about healthy behaviour during my pregnancy	1	2	3	4	5

307. How far do you agree with the following comments?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I feel that I have close relations with my family and friends	1	2	3	4	5
b. I keep contact with friends and family through mobile phone	1	2	3	4	5
c. I keep contact with friends and family through internet (computer)					
d. There are people among my family and friends I can depend on to help me if I need	1	2	3	4	5
e. I have close relationships that provide me with a sense of emotional security and well being	1	2	3	4	5
f. There is someone who shares my interests and concerns	1	2	3	4	5
g. I feel personally responsible for well being of another person	1	2	3	4	5
h. There is someone I could talk to take important decisions in my life	1	2	3	4	5
i. I have sense of togetherness with other pregnant women.	1	2	3	4	5

308. About attending ANC how far do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Most people who are important to you think that you should go for antenatal check up	1	2	3	4	5
b. Most people whose opinion you value would approve of your attending antenatal clinic regularly	1	2	3	4	5
c. In your opinion, your family and friends offer encouragement and orientation to safe birth	1	2	3	4	5
d. Women in your family and friends serve as positive role models for you	1	2	3	4	5
e. Do you think that it is generally expected by the people you know that a pregnant woman should modify her health behaviour	1	2	3	4	5
f. You take a lot of mother/in-law's advice because she had went through pregnancies	1	2	3	4	5

309. How do you perceive the following about antenatal check-up (ANC)?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
g. ANC is very important to the health of pregnant women and their unborn child	1	2	3	4	5
h. ANC improves pregnancy outcome	1	2	3	4	5
i. ANC prevents complications	1	2	3	4	5
j. ANC is not very useful to multi-parous women	1	2	3	4	5
k. ANC is necessary for purpose of treatment of minor illnesses during pregnancy	1	2	3	4	5
l. ANC can reduce morbidity and mortality in women	1	2	3	4	5

310. How much do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I can probably take care of what I	1	2	3	4	5

need to do during pregnancy					
b. I can probably deal with what I am worried about					
c. I can probably determine when to see the doctor	1	2	3	4	5
d. I can obtain information I need about pregnancy and childbirth from medical professionals	1	2	3	4	5
e. I probably can deliver like other people	1	2	3	4	5
f. I am satisfied with my life	1	2	3	4	5
g. I have confidence about managing the pregnancy	1	2	3	4	5
h. When I don't know what to do, I can probably research and solve the problem by myself	1	2	3	4	5
i. My family and friends supports my way of managing life's activities	1	2	3	4	5
j. My family and friends understand my current situation by saying 'you can be as you are' and provide support	1	2	3	4	5
k. I can consult with others and ask for help to achieve my goals	1	2	3	4	5
l. I can ask for help when I need to	1	2	3	4	5
m. I would like to enjoy my pregnancy	1	2	3	4	5
n. I am looking forward to life after childbirth	1	2	3	4	5
o. I am excited about the reality that I will be a mother	1	2	3	4	5
p. I feel affection for my unborn baby	1	2	3	4	5
q. I can do small purchases for my daily needs	1	2	3	4	5
r. I can take decisions about my health needs	1	2	3	4	5
s. I can visit alone friends and family I like	1	2	3	4	5
t. I have a say in major household purchases	1	2	3	4	5

311. To what extent you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The leaflet has communicated the information clearly	1	2	3	4	5
b. The leaflet content was related to the	1	2	3	4	5

skills and knowledge I needed during pregnancy					
c. The information motivated me to come to antenatal check up	1	2	3	4	5
d. The information motivated me to learn more about pregnancy complications	1	2	3	4	5
e. I have the confidence to use the knowledge gained from the leaflet in my pregnancy	1	2	3	4	5
f. I will visit antenatal clinic for my future pregnancy	1	2	3	4	5
g. The leaflet motivated me to talk to my family and friends to learn about the pregnancy and its complications	1	2	3	4	5
h. The leaflet motivated me to learn more about antenatal care and its usefulness	1	2	3	4	5

312. Please indicate how many times in a week you talked with your group (family/friends/other pregnant women).

1. Once in a week
2. 2-3 times in a week
3. 4-5 times in a week
4. Every day of the week

313. Please tell us three messages that you could remember from the leaflet you received.

314. Please tell us how many times you visited to antenatal clinic/doctor for pregnancy related issues during the last 3 months.

Appendix I: Follow-up Questionnaire for Mobile Group

(Questions are similar to Leaflet Group upto no. 310 except the following)

311. To what extent you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The SMS has communicated the information clearly	1	2	3	4	5
b. The content in SMS was related to the skills and knowledge I needed during pregnancy	1	2	3	4	5
c. The information motivated me to come to antenatal check up	1	2	3	4	5
d. The information motivated me to learn more about pregnancy complications	1	2	3	4	5
e. I am confident about my ability to use the knowledge gained from the SMS in my pregnancy	1	2	3	4	5
f. The SMS motivated me to talk to my family and friends to learn about the pregnancy and its complications	1	2	3	4	5
g. The SMS motivated me to learn more about antenatal care and its usefulness	1	2	3	4	5
h. I will visit antenatal clinic for my future pregnancy because of SMS messages	1	2	3	4	5

312. Please indicate how many times in a week you talked with your group (family/friends/other pregnant women).

1. Once in a week
2. 2-3 times in a week
3. 4-5 times in a week
4. Every day of the week

313. Please tell us three SMS messages that you received during the last 3 months.

314. Please tell us how many times you visited to antenatal clinic/doctor for pregnancy related issues during the last 3 months.

Appendix J: Follow-up Questionnaire for Combined Group

(Questions are similar to Leaflet Group upto no. 311 except the following)

312. To what extent you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The SMS has communicated the information clearly	1	2	3	4	5
b. The content in SMS was related to the skills and knowledge I needed during pregnancy	1	2	3	4	5
c. The information motivated me to come to antenatal check up	1	2	3	4	5
d. The information motivated me to learn more about pregnancy complications	1	2	3	4	5
e. I am confident about my ability to use the knowledge gained from the SMS in my pregnancy	1	2	3	4	5
f. The SMS motivated me to talk to my family and friends to learn about the pregnancy and its complications	1	2	3	4	5
g. The SMS motivated me to learn more about antenatal care and its usefulness	1	2	3	4	5
h. I will visit antenatal clinic for my future pregnancy because of SMS messages	1	2	3	4	5

313. Please indicate how many times in a week you talked with your group (family/friends/other pregnant women).

1. Once in a week
2. 2-3 times in a week
3. 4-5 times in a week
4. Every day of the week

314. Please tell us three messages that you could remember from the leaflet you received.

315. Please tell us three SMS messages that you received during the last 3 months.

316. Please tell us how many times you visited to antenatal clinic/doctor for pregnancy related issues during the last 3 months.

Appendix K: Follow-up Questionnaire for Control Group

(Questions are similar to Leaflet Group upto no. 310 except the following)

311. Please indicate how many times in a week you talked with your group (family/friends/other pregnant women).

1. Once in a week
2. 2-3 times in a week
3. 4-5 times in a week
4. Every day of the week

312. Please tell us how many times you visited to antenatal clinic/doctor for pregnancy related issues during the last 3 months.

Appendix L: Sample Intervention Messages

Message Type 1 (in Bangla)

আপনি জানেন কি?

- প্রতি বছর বাংলাদেশে ৭৫০০ গর্ভবতী মা গর্ভধারণ জটিলতায় মারা যায়। বেশী বয়সে গর্ভধারণ করলে, নিয়মিত চেকআপ না করলে আপনার গর্ভের বাচ্চা বা আপনি নিজে গর্ভকালীন জটিলতায় আক্রান্ত হতে পারেন। এ সমস্যা এমনকি শিশু বা আপনার নিজের মৃত্যুর কারণ হতে পারে।
- বেশী বয়সে গর্ভধারণ করলে, পরিবারের মধ্যে মা বা বোনের অতীতে এ সমস্যা না থাকলেও আপনি গর্ভকালীন জটিলতায় আক্রান্ত হতে পারেন। কোন সমস্যা না মনে হলেও, গর্ভকালে আপনি যে কোন শারীরিক জটিলতায় ভুগতে পারেন।
- গর্ভকালীন চেকআপে আসলে যাতায়াত ও হাসপাতালে ভীড়ের কারণে সময় নষ্ট হয়। প্রচুর অর্থও ব্যয় করতে হয়। তাই গর্ভকালীন চেকআপ যত বেশী করতে হয় ততই আপনার পরিবারের আর্থিক ক্ষতি হবে।
- গর্ভকালীন জটিলতা একটি মারাত্মক রোগ। আপনি যে কোন সময় এতে আক্রান্ত হতে পারেন। যত দেরিতে এটি ধরা পড়বে বিপদের সম্ভাবনা তত বেড়ে যাবে।
- গর্ভকালীন জটিলতায় আক্রান্ত হলে আপনার শিশু মারাত্মক শারীরিক ত্রুটি নিয়ে জন্ম নেবে। এটি আপনার পরিবারে সারা জীবনের মানসিক অশান্তির কারণ হবে।
- গর্ভকালীন জটিলতায় আক্রান্ত হলে আপনার নিরাপদ এবং স্বাভাবিক প্রসব হবে না। আপনি সন্তান জন্মদানের পরেও অসুস্থ থাকবেন। আপনার শারীরিক ও আর্থিক খতি হবে।
- যে কোন গর্ভবতী মা যেকোন বয়সেই বা পারিবারিক কোন ইতিহাস ছাড়াই জটিলতায় আক্রান্ত হতে পারেন। নিয়মিত চেক-আপ না করলে আপনি বা আপনার শিশু গর্ভে বা প্রসবকালেই মারা যেতে পারে।
- পারিবারিক বাধা উপেক্ষা করে হলেও চেক-আপ করানো প্রয়োজন। চেক-আপ না করলে মারাত্মক অসুস্থ শিশুর জন্ম দেয়ার সম্ভাবনা বেড়ে যাবে।
- যারা নিয়মিত চেক-আপ করতে চান না, তারা গর্ভকালে পুরো সময়ে ভালো থাকেন না। গর্ভকালীন জটিলতায় আপনার শরীরের যে কোন গুরুত্বপূর্ণ অঙ্গ নষ্ট হয়ে যেতে পারে।
- গর্ভকালীন সময়ে আত্মীয়-বন্ধু ও অন্যান্য মহিলাদের সাথে যোগাযোগ রাখুন। তাহলে গর্ভকালীন জটিলতামুক্ত থাকতে পারবেন। কম যোগাযোগ জটিল প্রসব এবং মৃত্যুর সম্ভাবনা বাড়াবে।
- গর্ভকালে আপনি বা আপনার শিশু এমনকি মারাও যেতে পারে। তাই নিজের সিদ্ধান্ত নিয়েই নিন। গর্ভকালীন সময়ে চেক-আপ সময়মতো এবং নিয়মিত ভাবেই করুন।
- গর্ভকালীন চেক-আপ এর জন্য সময় বা অর্থ খরচ হতে পারে। হাসপাতাল অনেক দূরে থাকতে পারে। হাসপাতাল এ বেশি সময় লাগতে পারে। তবুও ডাক্তার এর কাছে যান এবং গর্ভকালীন চেকআপ করান।

Message Type 2 (in Bangla)

আপনি জানেন কি?

- গর্ভবতী অবস্থায় নিয়মিত চেকআপ করলে আপনি জটিলতা মুক্ত থাকতে পারবেন এবং গুরুতর কোন সমস্যা ধরা পড়লে তা চিকিৎসক সমাধানের জন্য পর্যাপ্ত সময় পাবেন। এতে আপনার গর্ভস্থ শিশু এবং আপনি ঝুঁকিমুক্ত থাকবেন।
- আপনার ও আপনার গর্ভস্থ শিশুর নিরাপত্তার জন্য নিয়মিত চেকআপ করুন। আপনার সুস্বাস্থ্য আপনার হাতে। আপনি নিজের ইচ্ছাতেই ডাক্তারের কাছে চেকআপে যেতে সক্ষম।
- চেকআপে ডাক্তারের সঙ্গে আপনার গর্ভকালীন কি কি সমস্যা হতে পারে জানতে চান, সমস্যা হলে কি করতে হবে বুঝে নিন। পরিবারের অন্যদের ও বন্ধুদের সাথে কথা বলুন। আপনার প্রসব নিরাপদ হবে।
- সুস্থ শিশু সকল মা-বাবার কাম্য। গর্ভকালীন চেক-আপ নিরাপদ প্রসব এবং সুস্থ শিশুর জন্ম নিশ্চিত করে।
- গর্ভকালীন চেক-আপ নিয়মিত করলে সহজেই গর্ভকালীন জটিলতা প্রতিবোধ করা যায়। আপনি যে কোন ডাক্তার বা স্বাস্থ্য কেন্দ্রে গিয়ে অল্প খরচে চেক-আপ করতে পারবেন।
- মা-বোন, বন্ধু, স্বামী ও অন্য মা-দের সংগে যোগাযোগ রাখুন। তাহলে নিয়মিত চেক-আপের সিদ্ধান্ত নেয়া আপনার জন্য সহজ হবে।
- আপনি নিজেই গর্ভকালীন চেক-আপ এর সিদ্ধান্ত নিন। স্বাস্থ্য কেন্দ্রে যে কোন গর্ভকালীন জটিলতার সমাধান আছে। হাসপাতাল বা স্বাস্থ্য কেন্দ্রে সম্প্রদানের জন্য দিন।
- আপনার বন্ধু বান্ধব, আত্মীয়, প্রতিবেশী সবাই নিয়মিত চেক-আপ করিয়েছেন, আপনিও তা করতে পারেন। নিয়মিত চেক-আপ আপনাকে জটিলতা মুক্ত রাখবে।
- সময় বা অর্থ খরচের কথা না ভেবে চেক-আপ করানো জরুরী। চেক-আপ না করলে পরবর্তীতে আপনি বা আপনার শিশুর চিকিৎসায় আরো বেশী খরচ হতে পারে।
- ঘরের অনেক বিষয়েই সিদ্ধান্ত আপনিই নিতে পারেন। গর্ভকালীন চেক-আপ এর সিদ্ধান্তও নিজেই নিন। নিয়মিত চেক-আপ করলে আপনার এবং নবগত শিশুর জীবন নিরাপদ হবে।
- আপনি চাইলে ডাক্তার এর কাছে যেতে পারেন। গর্ভকালীন চেক-আপ অবশ্যই আপনার করা উচিত। আপনি পারবেন। অন্যান্যদের সহযোগিতা নিন। বিপদমুক্ত প্রসব চাইলে আপনাকে এটা পারতে হবেই।
- সুস্থ শিশুর জন্মের জন্য দরকার গর্ভবতীকালীন চেক-আপ। এর কারণে আপনি আগেভাগেই অনেক বিপদজনক রোগের হাত থেকে মুক্তি পাবেন। সবাই যাচ্ছে, আপনিও নিয়মিত চেকআপ করান।

Message Type 1 (in English)

Did you know?

- Every year around 7500 pregnant women die of pregnancy complications. If you conceive at an old age and do not go for regular antenatal check-up, you or your unborn child may suffer from complications. This can lead to death of a pregnant woman or her unborn child.
- Conception at any age could cause you suffer from pregnancy complications even if none of your family members, such as your mother or sister suffered from such complications.
- Antenatal check-up costs money in addition to travel time and long queues in the hospital. Do you think these are more troublesome than your or your unborn baby's health?
- Pregnancy complications can be very severe. It can affect you and unborn child anytime during pregnancy. Late detection of pregnancy complications endangers life more.
- Pregnancy complications can lead to birth of child with serious physical or functional defect which may cause lifelong mental agony for your family.
- If you suffer from pregnancy complications, your delivery will not be safe and normal. You will continue to be ill even after childbirth. This will cause physical and economic loss to you.
- Less communication with relevant others may lead to complicated delivery and increase the chances of death during labour. Think yourself, you want to talk to other women, friends and relatives during pregnancy or you want to suffer from complications.
- Your unborn child may even die in the womb. Decide yourself to go for antenatal check-up. Do it timely and on a regular basis.
- Antenatal check-up may cost you money, hospital may be far away from your house. It may take time to go to hospital or to see a doctor due to long queues. Nevertheless, go to a doctor or healthcare provider for antenatal check-up.
- Any pregnant women may suffer from pregnancy complications irrespective of age or family history. If you don't go for regular antenatal check-up, you or your unborn child may die during delivery.
- Pregnant women should go for antenatal check-up even defying the orders of her family members. Otherwise, chances will be more that a pregnant woman will deliver an unhealthy baby.
- Those who do not go for antenatal check-up do not remain well during the whole period of pregnancy. Pregnancy complications may damage any important organ of your body.

Message Type 2 (in English)

Did you know?

- You can be free from pregnancy complications if you go for regular antenatal check-up. Moreover, your doctor will get enough time to treat any complication that may arise due to pregnancy. As a result, you and unborn child will remain risk free.
- Go for regular check-up for yourself and for the safety of your unborn child. Your health is at your hand. You can decide yourself whether you like to see a doctor.
- During antenatal check-up ask your doctor about pregnancy complications, and remedy to these complications. Talk to other members of the family, friends and relatives. You will have a safe delivery.
- Every parent wants healthy baby. Antenatal check-up ensures safe delivery and birth of a healthy baby.
- Regular antenatal check-up can prevent pregnancy complications without much effort. You can do it at a low cost in any maternity clinic and a doctor's chamber.
- Keep in touch with other pregnant women, friends, family and relatives. It will be easier for you to make decision for antenatal check-up.
- You take many decisions in your household. Decide yourself to go for antenatal check-up too. Regular check-up will make sure that you and your unborn child will be safe.
- You can go to a doctor if you wish to. You should go for antenatal check-up, and you have to do it for safe delivery. Take help of others. You are able to do it.
- Antenatal check-up ensures safety of your unborn child. This check-up helps you know about the possible complications well ahead. Many women are going for antenatal check-up. You need to go for it as well.
- Take your decision to go for check-up yourself. Complicated pregnancy can be treated at maternity centers and hospitals. Go to any hospital or health center for delivery.
- Many of your relatives, friends and neighbors went for regular antenatal check-up. You will also be able to go for it. Regular antenatal check-up will save you from pregnancy complications.
- Do not think about loss of time or money. It is important to have regular check-up. If you do not go for check-up now, it may cost more money in the future to treat an unhealthy mother or baby.

Appendix M: List of Codes for Focus Group Design

Themes	Categories	Codes
Perception about ANC and pregnancy complications	Threat explaining	Threat to health
		Kill mother or unborn child
		Uncertainty
		Fear of complications
	Coping explaining	Usefulness of ANC
		Medicines and treatment
		Help by caregivers
		Trust care providers
		Listen to their advice
	Response cost	Travel time
		Financial cost
		Delay in hospital
		Unfriendly caregivers
Social norm		Mother-in-laws dictate
		Normal life event
		Change in practice to ANC
Social connectedness		Emotional support
		Care, trust and respect
		Networking for information
		Sharing of experiences
Women's autonomy		Lack of money
		Hierarchical society
		Decision by mother-in-law or husband
Communication channel		Access to information
		Appointment reminder
		Convenience of mobile

Appendix N: Characteristics of FGD and IDI Participants

FGD (Pregnant women-PW) 20 participants	FGD (Husbands-H) 10 participants	FGD (Relatives-R) 10 participants	IDI (Doctor-D) 5 participants	IDI (Nurse-N) 5 participants
PW1: F, P, 18, HW	H1: M, S, 26, E	FR1: F, S, 26, HW	D1: F, 52	N1: F, 37
PW2: F, T, 19, ST	H2: M, S, 30, E	FR2: F, S, 31, HW	D2: F, 44	N2: F, 34
PW3: F, P, 19, HW	H3: M, S, 32, E	FR3: F, S, 35, HW	D3: F, 46	N3: F, 36
PW4: F, P, 20, HW	H4: M, S, 33, E	FR4: F, S, 37, HW	D4: F, 45	N4: F, 31
PW5: F, P, 20, HW	H5: M, T, 36, E	FR5: F, S, 38, HW	D5: F, 50	N5: F, 41
PW6: F, T, 22, ST	H6: M, T, 39, E	FR6: F, S, 40, HW		
PW7: F, S, 21, HW	H7: M, T, 39, E	FR7: F, T, 42, HW		
PW8: F, S, 23, HW	H8: M, T, 42, E	FR8: F, T, 44, HW		
PW9: F, T, 24, ST	H9: M, T, 43, E	FR9: F, T, 52, HW		
PW10: F, S, 23, HW	H10: M, T, 47, E	FR10: M, T, 49, E		
PW11: F, S, 21, HW				
PW12: F, S, 30, HW				
PW13: F, S, 32, E				
PW14: F, S, 33, E				
PW15: F, S, 34, HW				
PW16: F, P, 34, HW				
PW17: F, P, 37, HW				
PW18: F, D, 39, HW				
PW19: F, D, 38, HW				
PW20: F, D, 44, HW				

According to sex (Male=M, Female=F), education (Primary=P, Secondary=S, Tertiary=T, Did not attend School=D), age (in years), and occupation (Housewife=HW, Student=ST, Employed=E)

Appendix O: Assumptions of the Research

The assumptions of this research are as follows:

- 1) Questionnaires are administered within the healthcare facilities according to the study's protocol.
- 2) Questionnaires accurately assess the subjects' risk perceptions about pregnancy and childbirth.
- 3) Subjects complete the questionnaires according to the instructions.
- 4) Subjects understand and truthfully responded to the self-report questionnaires.
- 5) Majority of the subjects complete the survey in its entirety.
- 6) Subjects do not have any other medical issues or problems during pregnancy.
- 7) At the time of the Focus Group Discussion (FGD) and In-depth Interview (IDI), all the above assumptions are correct.
- 8) Differences exist regarding the demographic characteristics among women in the study.
- 9) Participants' responses are based on intention to treat principle for intervention design.