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Knowledge and Practice of Reproductive Health among Mothers and their Impact on Fetal Birth Outcomes: A Case of Eritrea

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Knowledge and Practice of Reproductive Health Among Mothers and Their Impact on Fetal
Birth Outcomes: A Case of Eritrea

by

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A dissertation submitted in partial fulfillment
of the requirements of the degree of
Doctor of Philosophy
College of Nursing
University of South Florida

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Africa, maternal mortality

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DEDICATION

To my beloved husband, Gebrehiwot, for the extraordinary patience and love he has showed me always and especially throughout my study years

To my parents, Gebriela and Negusse, and my brothers, Daniel, Yoseph, Biniam, and Samuel for being the best family I could ever wish for

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ABSTRACT

Maternal mortality is a huge concern globally leading to more than a quarter of a million deaths every year. Similarly, an estimated 4 million neonates die every year worldwide, contributing to the majority of deaths of under-5 children. The majority of these deaths take place in under-developed countries, and specifically, in the sub-Saharan Africa region. It is evidenced that maternal ill-health and death contribute to the majority of child deaths. Reducing the death of children under 5 years by two thirds and also improving maternal health/reducing maternal death by three quarters between the years 1990 and 2015 are two of the eight aims of the Millennium Development Goals (MDGs), MDG-4 and MDG-5 respectively. The report on maternal health services in Eritrea, a nation in the sub-Saharan Africa, shows a low utilization of antenatal care, family planning services, and postnatal care. Furthermore, there is insufficient use of skilled assistance at delivery. The purpose of this study was to explore the reproductive health knowledge and practice of women aged 18-49 and the impact of these on infant birth outcomes. Participants were all living in the Central Zone of Eritrea. This study proposed that knowledge of reproductive health is one of the key factors contributing to the health of women in the reproductive age group, and thereby reduction of maternal and child deaths and morbidities. An exploratory cross-sectional study design was implemented in this study using an investigator-designed questionnaire. Data were collected from participants intending to assess awareness on the domains of reproductive health including knowledge of family planning, sexually transmitted diseases (STDs), antenatal

and postnatal care, importance of vaccinations, and identification of pregnancy/labor danger signs. Data on the most recent birth outcome that took place in the past five years were collected to investigate any existing associations. Findings showed that a majority of participants recognized danger signs and where to seek help in case of complications related to pregnancy and childbirth. Participants also stated the importance of child vaccination, identified STDs and family planning methods as well. Further, the majority also acknowledged the importance of antenatal care (ANC) and postnatal care by skilled personnel. However, a large percentage did not start ANC visits until after the first trimester. Also, a large number of participants did not know when fetal anomalies were most likely to occur or when conception can happen in relation to the menstrual cycle. Looking at birth outcomes, marital status and educational status showed a significant relationship with birth weight, while educational status was further a significant predictor of maturity of fetus at birth. Overall, these findings indicate the need for increased efforts in providing adequate reproductive health education, especially in certain target areas, so that women are better equipped with the necessary basic reproductive health information. This will hopefully contribute to the betterment of maternal health, further leading to a desired birth outcome.

CHAPTER ONE: INTRODUCTION

Background

The health of mothers and children reflects the well-being of a society.

Unfortunately, insufficient health care, poor nutrition and the general effects of ill-health increase the mortality of these precious groups in the community. High maternal mortality rates remain a constant setback worldwide. Maternal mortality ratio (MMR) is considered to be high if greater or equal to 300/100,000 live births and extremely high if greater or equal to 1000 deaths per 100,000 live births (World Health Organization, UNICEF, UNFPA, & The World Bank, 2012). The report further states that Eritrea, the country of interest in this study, is considered to have a moderate MMR at 240 deaths per 100,000 live births.

Problems during pregnancy and delivery are the major reasons for death among women of reproductive age in poor resource countries (World Bank, 2011). Worldwide, pregnancy and childbirth complications have a staggering mortality estimated at 500,000 women every year (UNICEF, 2008), while an estimated 10 million mothers experience severe health issues related to childbirth. In 2010, developing nations accounted for 99% (284,000) of global maternal deaths. Sub Saharan Africa and Southern Asia contributed 85% of this global burden, with sub-Saharan Africa contributing more than half of this percentage (56%) (World Health Organization et al., 2012). As mothers in poor countries tend to have more children, the probability of dying is even greater (World Bank, 2011).

A report from UNICEF (2008) states that the life time risk of death of a woman in a developing country is 1 in 76, as compared to 1 in 8,000 in the developed world.

Improving maternal health has been one of the major concerns globally including the Millennium Summit, which adopted it as one of the eight millennium development goals in 2000 (World Health Organization, UNICEF, UNFPA, & The World Bank, 2010). One of the Millennium Development Goals (MDGs), Goal 5, focuses on maternal health and targets a reduction of maternal mortality rate by three quarters between 1990 and 2015 (World Health Organization, 2007a). The global maternal mortality rate has only decreased by an average of less than 1% between 1990 and 2005, as compared to the desired 5.5% reduction yearly in order to achieve the fifth MDG (World Health Organization, 2007a). Additionally, the report states that the rate in the sub-Saharan Africa is extremely low, at approximately 0.1%.

Ensuring universal access to reproductive health services by 2015, recommended by the Millennium Project Task Force on Maternal and Child Health, is the second target of MDG-5 (UNFPA, 2004). Among strategies to promote maternal health is providing antenatal care services to women which provides the opportunity for communication with health professionals. These services offer diagnosis and treatment of existing health issues, screening for anemia and HIV/AIDS, health education related to prevention of mother- to-child transmission of HIV and healthy motherhood (UNFPA, 2004). Women who received antenatal care are also more likely to receive a skilled attendant at birth.

Another important intervention to reduce the huge number of maternal deaths is to ensure appropriate care of women during childbirth (UNICEF, 2008; World Health Organization, 2008a). Needless to say, achievement of Goal 5 will obviously require

focus on the improvement of reproductive health care for women. Further, it is important to address women's health in general including a balanced diet and prevention of infectious illnesses. Such health interventions have valuable association with goals set for maternal and child health and save the lives of both (UNFPA, 2004).

The International Conference on Population and Development (ICPD) report (United Nations, 1995) states that reproductive health should include information and services for family planning, antenatal care, skilled attendance at birth, postnatal care, management of complications of abortions, and treatment of sexually transmitted illnesses. Even further, the report emphasizes the importance of women's involvement in the development, performance and assessment of reproductive health care programs. In broad terms, health literacy encompasses the understanding and implementation of information provided by health care professionals and that it is critical in the identification of pregnancy complications and health care seeking behavior among women (Kohan, Ghasemi, & Dodangeh, 2007). Further, the authors specifically emphasize the importance of literacy of women as it affects both the health of the woman and also of the whole family. Educating mothers and ensuring their awareness of reproductive health, hence, plays an invaluable role in assisting mothers to help themselves by working together with those who stand to help them. This can possibly contribute to the reduction of the unacceptably high maternal mortality and also improving birth outcomes.

The report on maternal health service utilization in Eritrea (NSEO & ORC-Macro, 2003) states that at a national level, 3 in 10 women do not received antenatal care (ANC), and that family planning utilization is only at 8%. Further, the majority of deliveries take

place at home with the assistance of traditional birth attendants (72%). The Cesarean section (C-section) rate is only 3%. A C-section rate of fewer than 5% is in general considered to be an indication of inadequate access to proper maternal health care (World Health Organization, 1985). Last but not least, postnatal care is sought by very few women (2% within the first 2 days, and 5-7% within 5-41 days postpartum). This study, therefore, proposed to assess the reproductive health knowledge and practice of women aged 18-49 years in the Central Zone, one of the 6 zones (regions) of Eritrea.

Definition of Terms

Reproductive Health

Reproductive health is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes” (United Nations, 1995).

Maternal Mortality

According to the (World Health Organization et al., 2010), maternal mortality is defined as “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.”

Traditional Birth Attendant (TBA)

A traditional birth attendant is “a person who assists the mother during childbirth and initially acquired her skills by delivering babies herself or through apprenticeship with other traditional birth attendants” (World Health Organization, UNICEF, & UNFPA, 1992).

Skilled Birth Attendant

“An accredited health professional – such as a midwife, doctor or nurse – who has been educated and trained to proficiency 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” (World Health Organization, 2004b).

Postnatal Period

The period following the first six weeks after birth (The Partnership for Maternal Newborn Child Health, 2006).

Significance of Study

Maternal and child mortality are huge problems worldwide and specifically, in poor countries (Bhutta, Cabral, Chan, & Keenan, 2012). The fourth and fifth Millennium Development Goals (MDGs) aim to reduce child mortality and improve maternal health respectively. The MDG 4 aims to reduce child (under 5 years) mortality by two thirds while MDG-5 targets two issues: reduction of maternal mortality by three quarters between 1990 and 2015 and also to ensure universal access to reproductive health by 2015 (World Health Organization et al., 2010). Additionally, 99% of maternal deaths take place in developing countries and more than 50% of these are contributed by sub-Saharan Africa. The death of a mother goes beyond just her death and impacts her infant, family, community and the nation as a whole because a woman is the nurturer of the family in many developing countries. Similarly, every year, 4 million neonatal deaths occur worldwide and again, only 1% takes place in developed nations while the rest happens in the developing world (Chomba et al., 2008). In general, complications that cause

maternal morbidity and mortality also affect their unborn infants. The majority of neonatal mortality is secondary to similar factors that lead to maternal injury or deaths. These include poor maternal health, insufficient antenatal care, and improper management of the mother during labor and immediate postnatal care along with poor hygiene and insufficient newborn care (World Health Organization & Maternal Health and Safe Motherhood Programme, 1996).

Eritrea is a developing country located at the North East of Africa and one of the sub-Saharan countries suffering from a moderate maternal mortality ratio (240/100,000 live births) (Andemichael, Haile, Kosia, & Jacob, 2009; World Health Organization et al., 2012). Specific studies regarding the knowledge and practice of women towards reproductive health related issues during pregnancy, birth and postnatal periods and also the relationship with fetal birth outcome are not available in Eritrea. Based on the theory of life course perspective, which states that the health status of a woman before and during her pregnancy can affect both her health condition during/after pregnancy and her birth outcome, this study aimed to explore the reproductive health awareness among women in the Eritrean community in order to identify any knowledge and practice gaps that might exist and also investigate the relationship between maternal awareness and fetal birth outcomes. Information was collected from women of child-bearing age regarding their birth experiences over the past five years.

The high maternal mortality in underdeveloped countries is an indication of the need for strategies specific to those regions (Bullough et al., 2005). Understanding the underlying condition of the dilemma in a particular area, therefore, could greatly guide in

planning appropriate approaches for the desired solutions to be implemented in this specific area.

Aims

The purpose of this study was to explore the awareness of the reproductive health of mothers in the Eritrean community living in the Central Zone. Maternal and child mortality remain a challenge in Eritrea. Studies have shown that a woman's health status during pregnancy can affect her birth outcome. Therefore, this study also aimed to assess relationships existing between women's knowledge and practice of reproductive health and fetal birth outcomes.

Specific aims of this proposed study were to:

1. Develop questionnaire items that measure knowledge and practice of reproductive health among Eritrean women living in the Central Zone.
2. Assess the level of reproductive health knowledge of Eritrean mothers living in the Central Zone
3. Identify common health related practices of Eritrean mothers during pregnancy, birth and postnatal periods
4. Examine the association between mothers' reproductive health knowledge and reproductive health practices among those living in the Central Zone of Eritrea.
5. Investigate the variation in mothers' reproductive health knowledge and practices among those living in the Central Zone of Eritrea by demographic characteristics (age, parity, ethnicity, occupation, religious status and education)
6. Investigate the association between a mother's level of knowledge and practices of reproductive health and fetal birth outcomes.

Theoretical Framework

The life course perspective framework by Misra, Guyer, and Allston (2003) is used in this study. The Life course perspective (LCP) theory emphasizes the preconception and interconception periods and associates stages in life and realms of activities that influence maternal health (Misra & Grason, 2006). A number of the major causes of problems in childbearing outcomes are associated with the health of the woman prior to pregnancy (Misra et al., 2003).

Research Questions

1. What is the level of reproductive health knowledge of Eritrean mothers living in the Central Zone?
2. What are the common practices of Eritrean mothers during pregnancy, birth and postnatal periods?
3. Is there an association between mothers' reproductive health knowledge and reproductive health practice among those living in the Central Zone of Eritrea?
4. Is there an association between mothers' reproductive health knowledge and practices among those living in the Central Zone of Eritrea based on their demographic characteristics (age, occupation, and education)?
5. What are the relationships between a mother's knowledge and practice of reproductive health and fetal birth outcome?

Summary

This chapter presents an overview of the worldwide problem of maternal mortality with an emphasis on sub-Saharan Africa and Eritrea. Eritrea is one of the developing nations located in the North East of Africa with a moderate maternal

mortality ratio. The study used a quantitative cross-sectional study design to examine the existing knowledge and practice of women in the reproductive age group and associated birth outcomes. The findings of this study are expected to add to the limited studies done in Eritrea in regard to maternal reproductive health knowledge and, in turn, re-structure practice provided by health professionals.

CHAPTER TWO: LITERATURE REVIEW

Globally, more than half a million women die every year due to complications of pregnancy and childbirth and an estimated 10 million mothers experience severe consequences related to childbirth (UNICEF, 2008). A great majority of maternal mortality (99%) occurs in the developing countries. The sub-Saharan Africa and Southern Asia regions contribute the greater part, i.e., 162,000 and 83000 respectively (World Health Organization et al., 2012). As women are the key care takers of children and the rest of the family especially in poor-resource countries, their death is a huge loss to the community as a whole. Similarly, every year, 4 million neonatal deaths occur worldwide and again, only 1% takes place in developed nations while the rest occur in the developing world (Chomba et al., 2008). Prematurity-related disorders are among the leading causes of neonatal deaths (Davanzo, 2004). Preterm birth which is defined as birth before 37 completed weeks is a major determinant of neonatal morbidity having chronic adverse consequences on their health status (Wang, Dorer, Fleming, & Catlin, 2004). When compared to children born at term, infants born preterm have increased risk for respiratory problems and nervous system disorders including sensory deficits, cerebral palsy, and learning problems (Beck et al., 2010). The authors further state that medical conditions of the mother are among causal factors linked to preterm delivery of infants.

Eritrea, a state in the sub-Saharan Africa, suffers from a high maternal mortality (Andemichael et al., 2009) at 240 per 100,000 live births (World Health Organization et

al., 2012). The number of births attended by skilled health professionals in Eritrea is only 28% (World Health Organization, 2011f). In reality, requesting assistance from a skilled birth attendant is not a practical matter in many under-developed countries (Sibley & Ann Sipe, 2004) including Eritrea. Current evidence supports the significance of antenatal care and skilled attendance during birth in the reduction of maternal and infant mortality. Even with this information, little is known about Eritrean mothers' awareness of reproductive health issues.

According to Kidney et al. (2009), it is possible to reduce maternal mortality by involving the community to increase awareness through education or training and advancement of care-seeking behavior along with improving access to care facilities. Kidney et al. (2009) did a meta-analysis of studies which showed the considerable benefit of community-level interventions (included traditional birth attendant training, facilitator-led women's groups to promote antenatal care practices, and midwives working with community health workers) to reduce maternal deaths.

According to the report by the United Nations Development Program (UNDP, 2005), even though there is no official MDG outlining aims for sexual and reproductive health (SRH), the MDGs won't be achieved in resource poor countries without paying attention to access to SRH. According to a study by Alvarez, Gil, Hernández, and Gil (2009), maternal mortality in resource poor countries was associated directly with a number of factors including low antenatal care coverage, low skilled attendance at birth, and poor adult literacy rate, which are all embraced under SRH.

The following literature provides a review of the evidence on maternal mortality worldwide and in sub-Saharan Africa, specifically in Eritrea. Causes and measures of

maternal mortality, epidemiology, introduction to the MDGs, introduction to the situation of sub-Saharan Africa and Eritrea in regard to maternal health and mortality, impact of maternal death along with the role of maternal awareness of reproductive health is presented. A summary follows the review of literature.

Measures of Maternal Mortality

The causes and extent of maternal deaths show the risks associated with pregnancy and birth and also the performance of health care systems in regard to accessibility and quality of care given (World Health Organization, 2004a). Estimates of maternal mortality are valuable in that they direct a nation's decision-making in resource allotment, direct advocacy efforts and support investigations (Hill et al., 2006) . Identifying the accurate number of maternal deaths and advancement towards achieving the fifth MDG, however, have been hindered by inadequate information provided from the developing nations where maternal mortality is high (United Nations, 2010). Without an accurate registration of maternal mortality, measuring the maternal mortality rate precisely is challenging (World Health Organization, 2011b). The World Health Organization (2007a) lists possible reasons for the inaccuracy of information on maternal deaths including poor registration systems which makes calculating maternal mortality erroneous. Another challenge is the fact that the pregnancy status of the mother is usually unknown, making reporting of maternal deaths inaccurate. An additional challenge exists in developing countries where there is a poor system of documenting causes of death, contributing to the inaccurate number of pregnancy related deaths and their causes. In order to assess the trend of the MDG-5, the maternal mortality ratio (MMR), is a popular measure used to estimate maternal mortality (Shah & Say, 2007). It is the measure that

portrays the risk of death of a mother from pregnancy related causes in relation to the number of live births (World Health Organization, 2007a).

Other possible measures include:

Maternal Mortality Rate (MMRate)

The proportion of maternal deaths in a population to the number of women in the reproductive age (World Health Organization, 2007a). The MMRate depicts the number of women able to give birth in a population, in addition to the rate of maternal mortality.

Lifetime Risk of Maternal Death

The life time risk of maternal death is defined as “the cumulative loss of human life due to maternal death over the female life course” (Wilmoth, 2009)

Proportionate Mortality Ratio

The death of a pregnant woman as a proportion of all deaths of women 15-49yrs (reproductive age) in a given time (World Health Organization et al., 2012).

Late Maternal Death

The death of a woman from direct or indirect obstetric causes, more than 42 days but less than one year after termination of pregnancy (World Health Organization et al., 2010).

Pregnancy-related Death

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (World Health Organization et al., 2010).

The Millennium Development Goals

In the recent past, governments at several conferences have strongly committed themselves to improving maternal health (World Health Organization, 2004a). Three

Table 1: Data Sources Used by Countries in order to Calculate Maternal Mortality (Chandoevrit, Kasitipradith, Soranastaporn, Vacharanukulkiety, & Wibulpolprasert, 2007; Hill et al., 2006; World Health Organization et al., 2010).

	Data source	Definition
1	Vital registrations	The registration of births and deaths with causes of death
2	Reproductive-age mortality studies (RAMOS)	Assesses the causes of death for women in the reproductive age in a specific population using multiple sources (e.g., Family member interviews, vital registrations, health facility records, burial records, traditional birth attendants, midwives)
3	Household surveys	Deaths in each household in a specific period prior to the census
4	Sisterhood methods	Interview of a sample of participants regarding the survival of all their adult sisters
5	Verbal autopsy	Interview with family or community members revealing cause of death
6	Civil registration systems	Routine registration of births and deaths

themselves to improving maternal health (World Health Organization, 2004a). Three decades ago, 189 nations approved the Millennium Declaration of commitment to meeting eight goals, which are recognized as the Millennium Development Goals (MDGs) (Ronsmans & Graham, 2006; World Health Organization, 2007b). Those goals encompass fighting extreme poverty and hunger, improving education, promoting gender equality, betterment of health and combating disease, making sure of environmental sustainability and worldwide partnership for development (World Health Organization, 2007b, 2011c). The reduction of maternal mortality and maintaining the health of mothers has become the focus of interest since the late 1980s and many international conferences have addressed it, besides the Millennium Summit in 2000 (Nations, 2000). The 2000 Millennium Summit established the improvement of maternal health as the fifth MDG. Maternal mortality became an outcome evaluation tool as an achievement of this goal. As a result, MDG-5 targeted the reduction of maternal mortality ratio by three

fourth between the years 1990 and 2015 and making reproductive health available universally (World Health Organization et al., 2010). According to the Millennium Summit's decision, a nation is expected to have an average reduction of 5.5% of maternal mortality ratio in a year to achieve the fifth MDG (Hill et al., 2007). The indicators for measuring maternal mortality are maternal mortality ratios and proportion of skilled attendance at birth. The report by United Nations (2008) states that there are a number of indicators for universal access to reproductive health including contraceptive prevalence rate, teen-age birth rate, antenatal care coverage and unmet family planning needs.

Epidemiology of Maternal Mortality

Global Overview

Healthy mothers are the backbone of a society. To support the health of a nation's society, it is important to maintain the health of mothers in order to keep a healthy family and community. Pregnancy is a state where the majority of women desire to be at a certain point in their lives. However, this normal state might cause a significant negative experience (MDG, 2010; World Health Organization, 2004a), which may go beyond the affected woman's life to other people in the woman's life as well. Further, the MDG (2010) states that maternal death during delivery causes the baby's life to be shortened, leads the rest of the family and dependents to poverty and other poor social outcomes. Every year, 210 million women become pregnant and approximately 500,000 mothers die worldwide due to pregnancy and pregnancy related issues while another 10 million mothers suffer from consequences of complicated pregnancy including fistulas and infertility (Hogan et al., 2010; McCarthy, 2002; World Bank, 2009).

Globally, improvements in the health indicators for achieving the other MDGs have been seen, except for the maternal mortality ratio which remained unchanged (Donnay, 2000). The majority of maternal deaths could be prevented if adequate preventive health care were provided to women (World Health Organization, 2004a). Further, Donnay (2000) states that the inadequate activities toward protecting women's health and lack of empowerment of women, both of which are strongly embedded in societies, are the underlying causes for the constantly high maternal mortality ratios. The following map shows the six WHO regions.

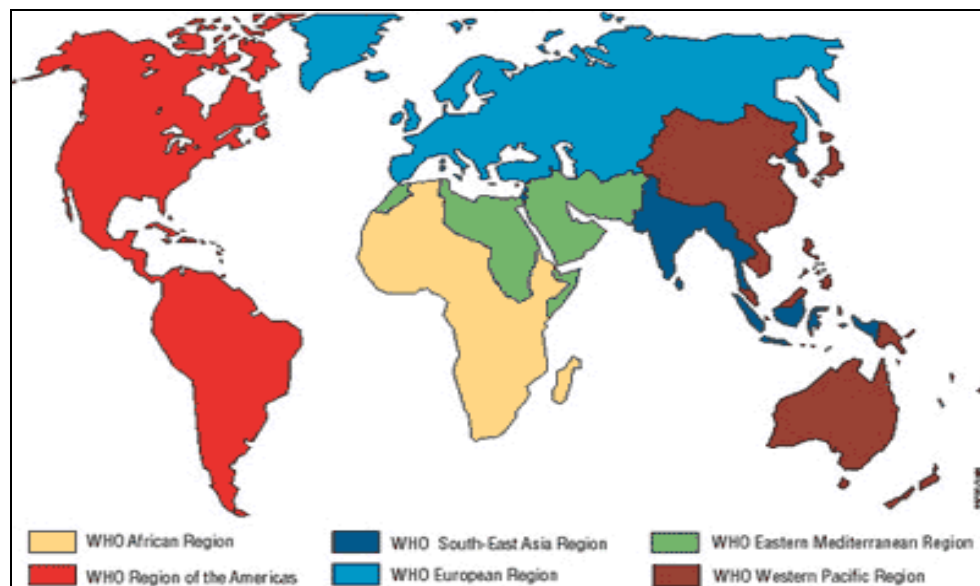


Fig 1: Map of the WHO regions (World Health Organization, 2011e)

Sub-Saharan Africa

The World Health Organization et al. (2010) states that resource poor countries account for 99% of maternal deaths. Although the maternal mortality ratio has reduced by 47% according to the most recent report in 2010, still, the majority of deaths occur in developing nations and it is estimated that 56% of all maternal deaths take place in the sub-Saharan Africa region alone (World Health Organization et al., 2012). In the year

2008, the global maternal mortality rate was 260 deaths per 100,000 (World Health Organization et al., 2010). Of this, three fifths happened in the sub-Saharan area, having the highest maternal death rate at 640 per 100,000 live births.

According to the MDG report (2010), many African countries have managed to show improvements in meeting almost all MDGs, despite the challenges the continent is facing. However, this is not true for MDG-5 (Falconer, 2010). Sub-Saharan Africa remains a region with extremely high maternal morbidity and mortality (Rogo, Oucho, & Mwalali, 2006). In sub-Saharan Africa, a woman's risk of dying from pregnancy related causes throughout her life time is 1 in 31 (World Health Organization et al., 2010).

The reduction in maternal mortality in the sub-Saharan region was only 0.1% per year between 1990 and 2005, far from the expected reduction of 5.5% globally (World Health Organization, 2007a; World Health Organization & Department of Reproductive Health and Research, 2008), and studies show that this region will not meet the MDG-5 (De Allegri et al., 2011; Waage et al., 2010; World Health Organization, 2007a). Even though no other region has achieved this goal, Eastern Asia has had a maternal mortality reduction of 4.2% (World Health Organization, 2007a). Assessments done in Tunisia, Sri Lanka, India (the state of Kerala), Cuba, China, and Russia show that maternal mortality ratios were significantly reduced because of the cumulative effect of equal education for all, universal access to primary health care, adequate prenatal/postnatal nutrition, access to family planning services, skilled attendance at childbirth, access to quality care in case of complications, and the introduction of policies advocating for better women's socioeconomic status (Donnay, 2000; World Health Organization, 2009). In contrast, between 1990 and 2005, the maternal mortality in sub-Saharan Africa rose from 212,000

to 270,000 (World Health Organization, 2007a) associated with an increase in the birth rate of the continent from 23 million to 30 million. As a result, there has been only minimal reduction in the maternal mortality in this region.

The majority of maternal deaths (about 60%) take place during childbirth or immediately after birth, about half of them occurring in the first 24 hours (Rogo et al., 2006). According to the WHO (2007a), one of the measures to reduce maternal deaths is the availability of adequate and efficient pregnancy and delivery care. Skilled birth attendance is increasing globally except in the majority of South Asia and sub-Saharan African regions. Even if the percentage of skilled attendance in low and middle income countries increased from 47% in 1990 to 61% in 2006, it is still far behind the expected 80% by 2005, 85% by 2010 and 90% by 2015 (World Health Organization, 2011d). Despite supporting evidence both from developed and some developing countries, only a small number of skilled professionals are present in Africa and less than half of pregnant women receive skilled care (World Health Organization, 2004b, 2007a, 2007b). Sixty per cent of the pregnant women in Eastern and Southern Africa do not receive skilled attendance during childbirth and there was no clear evidence of skilled care between 1995 and 2005 (UNICEF, 2008). The percentage of health professional assisted deliveries in the sub-Saharan Africa showed only a minor increase between the years 1990 (42%) and 2008 (46%) (Kinney et al., 2010). The report from UNICEF (2008) states that this region contributes a fifth of the world's maternal mortality and has the second highest maternal mortality ratio among all regions.

Another important risk factor for complications during pregnancy is adolescent pregnancy, a common occurrence in Africa (UNICEF, 2008). Sub-Saharan Africa has the

highest teen-age pregnancy rate at 123/1000 (UNICEF, 2012). In addition to being biologically immature, teenagers are also at increased risk for poor access to both service and information regarding pregnancy and birth. When women begin to have children as adolescents, they tend to have a greater number of children, increasing their life time risk. Life time risk is higher among those populations with higher maternal death ratios and total fertility rates. Therefore, where there is high fertility, the risk of maternal mortality is multiplied (UNICEF, 2008). The high levels of fertility in the sub-Saharan Africa region, a total fertility rate of 5.0, contribute to the high lifetime risk of death (UNICEF, 2008). The following chart shows the distribution of maternal mortality among Asia, sub-Saharan Africa and the rest of the world.

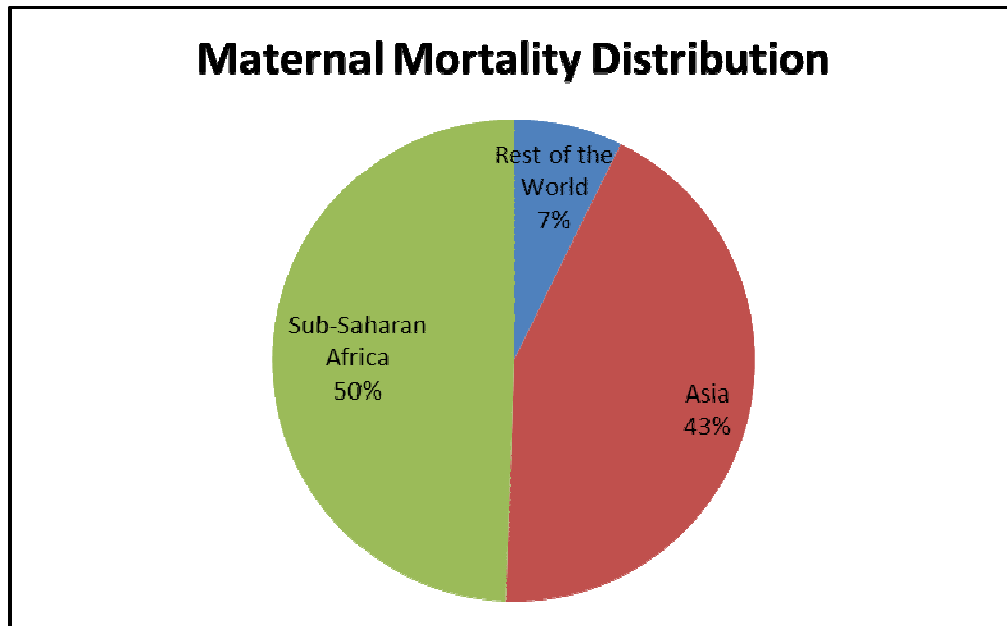


Fig 2: Regional distribution of maternal death in 2005 (Kinney et al., 2010)

The WHO (2009) report states that it is not only important that health care services be available for women during pregnancy and childbirth but also those should be provided in a way that are culturally appropriate for the community and, at the same time,

need to be responsive to the needs of those women. The Center for Communicable Diseases and Prevention (CDC) (National Center for Health Statistics, 2001) emphasizes the importance of increased awareness to health related issues which are specifically designed for a community as it has a significant role in attaining the desired objective. Maternal awareness involves modifying the capability of women in planning as to the number of children and timing of birth and is evidenced to have reduced the health risks associated with pregnancy and childbirth (World Bank, 2009). Previous studies have shown that health literacy is a good predictor of health awareness (LeVine, LeVine, Rowe, & Schnell-Anzola, 2004; Lindau et al., 2002). According to the Agency for Healthcare Research and Quality (AHRQ)(2011), health literacy is defined as, “ the degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions.”

Eritrea

Eritrea is a young nation at the North East of Africa, with an area of 122,000 square kilometers. It was a northern part of Ethiopia until its independence in 1991. Eritrea has a border with Ethiopia in the south, Sudan in the west and northwest, and Djibouti in the southeast. The Red Sea is at the east and north east coasts. The population of Eritrea is approximately 3.5 million. Administratively, the nation is divided into 6 zones (regions), 58 sub-zones, 704 administrative areas and 2,580 villages (Sharan, Ahmed, & Naimoli, 2010). This study is conducted in the Central Zone which includes the capital city of the country, Asmara. This region is a part of the highlands of Eritrea and mainly populated by the Tigrigna ethnic group which is the largest ethnic group in terms of population size.

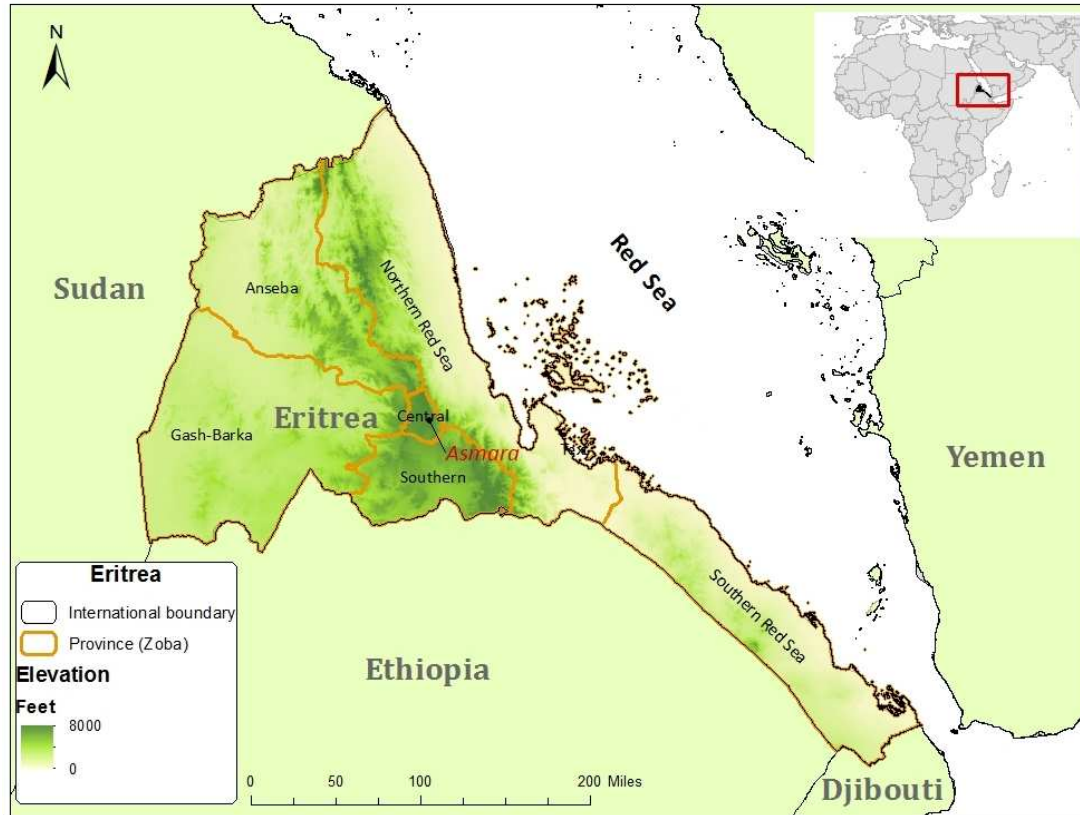


Fig 3: Map of Eritrea and location of the study area-Asmara (GADM, 2011)

Eritrea has a four-hierarchy health care system (Gottlieb & Lindmark, 2002). At the primary level, there are “health stations” i.e., facilities run by a nurse (3 years training) and 3-4 health care aides (18 months training). The care provided in those institutions includes mainly treatment of common illnesses and prevention (including vaccinations and antenatal care). Uncomplicated births are also managed at this level. At the secondary level are “health centers” which are run by a nurse or a midwife (3 years training as a nurse and additional 1 year training in midwifery) and provide assisted vaginal births as well as manual exploration and curettage of the uterus. At the third level, “regional hospitals” are located in each of the nation’s regions. Here, life-saving procedures including cesarean sections are done along with blood transfusions whenever needed. The highest level center, the “referral hospital,” is located in the capital Asmara

and provides consultation services along with handling complicated obstetric cases referred from the regional hospitals. The Ministry of Health (MoH) is the main health care provider in the nation, with a few private and Christian health care services. Eleven hospitals out of the 18 available provide cesarean section services (Sharan et al., 2010). In Eritrea, the majority of health care services in non-tertiary health facilities were free of any charge until 1996, when a nominal fee was introduced to cover about 20% of the health care expenditure.

In a study done to determine the maternal mortality level in Eritrea, Ghebrehwet and Morrow (2006) collected data by first identifying all deaths in females in 42 selected communities which represented the population and then separated maternal deaths through verbal autopsy. They used Reproductive-Age Mortality Studies (RAMOS) as a methodology to estimate maternal deaths. The authors used the 2002 data to estimate the ratio of maternal death, which was 752 per 100,000 live births. Maternal deaths decreased to 450 in 2005 (World Health Organization, 2007a), and to 280 in 2008 (World Health Organization et al., 2010), and to 240 in 2010 (World Health Organization et al., 2012). In addition, the WHO et al. (2012) reported an estimated reduction of the maternal mortality rate in Eritrea by 73% between 1990 and 2010. Further, the lifetime risk of maternal death was estimated to be 1 in 86 (World Health Organization et al., 2012).

Human resources in the maternity field in Eritrea.

Only seventeen obstetricians/gynecologists serve the whole nation. Those specialists work at the regional and referral hospitals. According to the WHO (2008a) report, a universally accepted standard for minimum human resources for health (HRH) density doesn't exist for any country or region. The WHO (2006) states that when a

nation has a density of physicians, nurses and midwives that is less than 2.28 per 1000 population, that nation fails to achieve the targeted 80% coverage rate for skilled birth attendance and child immunization.

The above estimates in Table 2 indicate the number of health professionals who are currently working under the health care system of that nation (World Health Organization, 2010). Overall, the WHO African Region is populated with the least number of health professionals while European nations have the highest densities. The report further shows that higher nurse/midwife densities are found in the more-developed parts of the world.

Causes of Maternal Mortality

According to a UNFPA report (UNFPA, 2003), the ‘first delay’ responsible for leading to maternal health problems occurs at the victim’s home when the decision to seek professional health care is delayed mostly due to lack of knowledge. Many complications of pregnancy begin before pregnancy when a woman lacks affordable access to primary care which might include family planning and other reproductive health services (Bingham, Strauss, & Coeytaux, 2011). Maternal death can result from either direct, indirect or incidental causes (Homer, Clements, McDonnell, Peek, & Sullivan, 2009). Direct causes, contributing to about 80% of maternal deaths, are secondary to obstetric complications including hemorrhage and eclampsia. Indirect causes are due to a pre-existing maternal health condition which might have been exacerbated by the pregnancy, such as chronic hypertension. Incidental causes refer to maternal deaths which are accidental and unrelated to the pregnancy (Shah & Say, 2007).

Table 2: Number and density of Health Professionals in designated countries (World Health Organization, 2010)

Country	Physicians		Nurses/ Midwives		Dentists		Pharmacists		Public Health Workers	
	N	D*	N	D*	N	D*	N	D*	N	D*
Eritrea	215	1	2,505	6	16	<0.5	107	<0.5	88	<0.5
Ethiopia	1,806	<0.5	19,158	2	93	<0.5	1,201	<0.5	1,109	<0.5
India	643,520	6	1,372,059	6	55,344	1	592,577	6	-	-
UK	126,126	21	37,200	6	25,914	-	-	-	-	-
USA	793,648	27	2,927,000	98	463,663	16	249,642	9	-	-

NB: N= number, D= density, *Density is calculated per 10,000 populations

In Africa, Falconer (2010) reports that the five major causes of maternal death are hemorrhage (34%), sepsis (10%), hypertension (9%), obstructed labor (4%), and complications of abortion (4%). Khan, Wojdyla, Say, Gulmezoglu, and Look (2006) support this finding, writing that hemorrhage and sepsis are the major causes of maternal death both in Africa and Asia, followed by Latin America.

Postpartum Hemorrhage

Postpartum hemorrhage is also known as obstetric hemorrhage and is the major cause of maternal death globally. It is defined as the excessive loss of blood via the vagina after the delivery of the baby and up to 42 days postpartum (Ajenifuja, Adepiti, & Ogunniyi, 2010). Postpartum hemorrhage can take the life of a healthy woman in less than 2 hours if no intervention takes place, making it the fastest cause of maternal death.

Sepsis

‘Puerperal sepsis’ is defined by the ICD-10 as “a temperature rise above 38.0°C (100.4°F) maintained over 24 hours or recurring during the period from the end of the first to the end of the 10th day after childbirth or abortion” (Van Dillen, Zwart, Schutte, & Van Roosmalen, 2010). More specifically, the WHO defines puerperal sepsis as “infection of the genital tract occurring at any time between the onset of rupture of membranes or labor and the 42nd day postpartum in which fever and one or more of the following are present: pelvic pain, abnormal vaginal discharge, abnormal smell/foul odor of discharge and delay in the rate of reduction of the size of the uterus” (Van Dillen et al., 2010). Puerperal sepsis is the second most important cause of maternal mortality which could be greatly reduced using aseptic techniques and through early identification and well-timed management of symptomatic postnatal women.

Hypertensive Disorders

Hypertensive disorders in pregnancy include pre-existing chronic hypertension and eclampsia, hypertension with hyper-reflexia, proteinuria, edema and seizures. Eclampsia starts as pre-eclampsia which is a common hypertensive disorder that is diagnosed during pregnancy. Three delays are responsible for maternal death from pre-eclampsia: delays in triage, transport and treatment occurring at the community, primary health center, and hospitals respectively (Firoz, Sanghvi, Merialdi, & Von Dadelszen, 2011). Low and middle income countries are challenged by the lack of sufficient health workers to diagnose and treat hypertensive disorders in pregnancy. Thirty-six of the 58 nations facing acute health worker shortages are found in sub-Saharan Africa (Ahmed, Hossain, RajaChowdhury, & Bhuiya, 2011; Save the Children, 2010).

Obstructed Labor

Labor is obstructed when there is a failure to progress due to mechanical problems. A mismatch between the presenting part of the fetus and the mother's pelvis may lead to short and long term disability or even death (Neilson, Lavender, Quenby, & Wray, 2003). Ruptured uterus or puerperal infection that results from obstructed labor can lead to maternal death or result in postpartum hemorrhage and infection that contribute considerably to maternal morbidity (Neilson et al., 2003).

Complications of Abortion

Unsafe abortion as a result of unprotected sex among teenagers is a major cause of maternal death in the African region (Rogo et al., 2006). The WHO defines unsafe abortion as the procedure of terminating an unintended pregnancy either by individuals lacking the necessary skills or in an environment that does not conform to minimum

medical standards or both (1992). Worldwide, from the estimated 42 million pregnancies ending in induced abortion every year, about 20 million are estimated to be unsafe (Haddad & Nour, 2009).

Hemorrhage, sepsis and eclampsia contribute to the majority of maternal deaths in Africa because some cases of abortion or obstructed labor eventually end in sepsis or hemorrhage (Rogo et al., 2006).

Khan et al. (2006) compared some causes of maternal death in Africa with other regions and found that hypertensive disorders are more common causes of death in the Caribbean contributing to 25.7% of maternal deaths, followed by the developed countries at 16.1%, while causing 9.1 % of deaths in Africa and Asia. In addition, hypertensive disorders contributed to 25.7% of maternal deaths in Latin America, followed by 12% of deaths due to abortion in the same region. Abortion contributes up to 30% of deaths in some countries located in the sub-Saharan region. In Eritrea, the top five causes of maternal mortality were pre-eclampsia/eclampsia, complications of abortion, postpartum sepsis, postpartum hemorrhage, anemia and obstructed/prolonged labor (Ghebrehiwet et al., 2009). Overall, the top five causes of maternal deaths are, more or less, the same globally.

Impact of Maternal Mortality

The death of a mother implies the death of the homemaker, technically defined as the nurturer and also the major producer of the family (World Health Organization et al., 1992). In many cases, maternal death usually leads to the death of the child as well, as the health of the mother is a contributing factor to neonatal survival (Lawn, Cousens, & Zupan, 2005). A woman's death, whether she is a mother or not, characterizes a major

loss both to the family and the community, as the productive human resource of a nation is affected due to loss of the working power and results in both economic and social suffering (Nanda, Switlick, & Lule, 2005; World Health Organization et al., 1992). Globally, for each woman who dies from pregnancy and related complications, about 20 more suffer due to consequences of childbirth (UNICEF, 2008). When a woman survives pregnancy and childbirth but suffers from complications, the woman's energy is exhausted and therefore her earning capacity reduced, having a negative effect on the entire family (Nanda et al., 2005).

Strategies to Reduce Maternal Mortality

The strategies to improve maternal health and reduce mortality are specific to the causes of maternal health problems and vary greatly from place to place (Campbell & Graham, 2006). The absence of the desired progress towards reducing maternal death indicates the urgency of the matter and the need for efforts to be intensified and implemented immediately and continue through and past 2015 (Obaid, 2007). Access to adequate reproductive health care in the antenatal, intranatal and postnatal periods significantly reduces maternal mortality instead of trying to lessen risk once the damage is done (Goodrum, 2001). As more than half of all maternal deaths occur at birth and the first 24 hours after birth, it is important that mothers receive skilled care specifically during those critical times (Campbell & Graham, 2006; Rogo et al., 2006; World Health Organization, 2007a). In addition, the report by Obaid (2007) states that family planning services could reduce mortality by one third and skilled attendance at birth, when accompanied by emergency obstetric care service, by as much as three quarters of maternal deaths. Areas with an insufficient number of skilled attendances at birth,

inadequate use of family planning methods and poor health systems are the ones suffering from the greatest number of maternal mortality (World Health Organization et al., 2010). As an example, the percentage of women using contraceptives in Eastern Asia is 86 compared to 22 in the sub-Saharan Africa (Bick & Sandall, 2010).

Maternal wellbeing is one of the main concerns of the World Health Organization (WHO) and through its department of Making Pregnancy Safer, it serves by supporting evidence-based data both at the practice setting and policy levels, the underpinning guidance being on provision of proficient, helpful and culturally acceptable services (World Health Organization, 2011b). The UNICEF is another organization focusing on changing the increased number of high maternal deaths by making the health of mothers a priority worldwide (Obaid, 2007). This will require political support, policy reform, and incorporation of reproductive health in development programs. The second focus is in bringing stakeholders together at national level together to raise financial support for local health plans to provide integrated and quality care. Education and participation of the community are the third focus of UNICEF's vision for upcoming efforts in maternal health. It is emphasized that supporting maternal health be a part of the continuing care provided to women of all ages.

Meeting the MDG-5 requires extensive joint venture among organizations as well as political and economic commitments for continuing efforts to improve current health care systems. Among the suggested services to improve maternal health are promoting the rights of women, use of family planning, ensuring skilled attendance during delivery through training of service providers to make skilled service available to all women and also access to quality emergency obstetric care. Further the World Health Organization

(2004c) report states that the majority of maternal mortality is preventable by affordable and effective methods even when resources are limited. According to Belizán, Buekens, Althabe, and Bergel (2006), affordable interventions that can be used at all health care levels in the developing nations are needed and therefore, researchers and health professional from those countries who are familiar with the situation and culture need to search for strategies that work best in their specific areas.

Skilled Care During Birth

Globally, an estimated four in ten of all childbirths are not attended by skilled health professionals (UNICEF, 2008); Sub-Saharan Africa and south Asia having the lowest levels of skilled birth attendance and, consequently have the highest maternal mortality rate. The report further states that only 46.5% of women get professional assistance during childbirth in the African region as a whole. Among the less developed regions of the world, the number of skilled workers (doctors, nurses, midwives and other trained personnel) account for 33.7% of skilled professionals for the Eastern Africa region followed by Western Africa (41.2%) and south-central Asia (46.9%). This indicates the east African region to have the lowest population of skilled professionals worldwide (UNICEF, 2008).

The world health statistics report shows that skilled birth attendance in the nation is only 28% (World Health Organization, 2010). Naturally, birth assisted by a skilled attendant reduces the risk of mortality associated with pregnancy and childbirth (World Health Organization, 2008a). The care provided by skilled health personnel is extremely important especially when complications occur.

Role of the traditional birth attendant (TBA).

The majority of traditional midwives are mothers themselves and a member of the same community as those who receive their services (World Health Organization et al., 1992). Most TBAs are uneducated but are highly respected by the community. According to the World Health Organization et al. (1992), in certain cultures, every family has its own TBA and anyone from outside the family isn't accepted to give delivery services. In other cultures, the popularity of a certain TBA might go beyond her community and she might be asked to provide service in nearby districts as well. Further, the report states that the function of the TBAs varies from place to place, from bathing and massaging to domestic chores and care provision even after birth, while the main role is delivering the baby. Traditional birth attendants typically get their reputation through word- of-mouth.

Being a TBA includes giving advice to the mother during pregnancy. Traditional birth attendants also act like traditional healers in some communities, giving advice on how to handle abortions, infertility or even performing procedures like circumcision (World Health Organization et al., 1992). Payment of TBAs differs from place to place and could be in-kind or cash or a privileged position in the community.

Similar to other low-resource countries, the majority of traditional birth attendants in Eritrea are elderly mothers living in the same community. Traditional birth attendants are highly respected by the Eritrean community and their service is not limited to the rural areas but also in the towns and the capital as well. Mothers in Eritrea are known to have regular antenatal follow up care at a health facility but then deliver at home with the help of these traditional midwives. Traditional birth attendants are responsible for the majority (72%) of childbirths in Eritrea (World Health Organization, 2010).

The study done by Ghebrehiwet and Morrow assessed the knowledge and practice of traditional birth attendants along with trained traditional birth attendants and the support and supervision they receive from the ministry of health (Ghebrehiwet & Morrow, 2010). Information was collected regarding the traditional birth attendants' practice pertaining to cord care, use of herbs, training and skills maintenance, knowledge about obstetric complications and advice provided to mothers. Their study showed that 42% of traditional birth attendants did not use appropriate or sterile equipment. Also the majority of participants did not recall signs and symptoms of complications during pregnancy or birth. More than half (54%) of the participants had not received any supervisory support six months prior to the study.

Antenatal (prenatal) Care

The antenatal period is the best time to provide women with the necessary health related information or even interventions if needed which promote their health and survival along with their infants (UNICEF, 2008). Antenatal care is defined as the care that a woman receives during childbearing that helps ensure healthy outcomes for women and their infants (WHO & UNICEF, 2003). The United Nations Children's Fund (UNICEF), United Nations Population Fund (UNFPA), and the WHO (UNICEF, 2008) recommend a minimum of four prenatal visits to provide basic services including infection screening, nutritional supplement provision and monitoring for pregnancy and related complications. Although the quality of the antenatal care is not stated, the UNICEF report (2008) further states that approximately 50% of women worldwide receive four antenatal visits, compared with only 42% in the sub-Saharan Africa. The

Eritrean demographic health survey (EDHS) reports that the national ANC care was at 70.1% in the year 2002 in Eritrea (NSEO & ORC-Macro, 2003).

Family Planning

Family planning assists families in preserving maternal and child health, prevents unwanted pregnancies and reduces women's exposure to the complications of childbirth and abortion (United Nations, 1995). It also offers women more time to care for their children and themselves. Education resources need to be available regarding contraception methods for both men and women (Shehu, 2000). It should also be noted that family planning cannot help reduce risk associated with pregnancy and delivery once a woman is pregnant and is strictly a prior-to-pregnancy strategy.

Postpartum Care

Mothers and their babies need to be cared for beyond the time of birth, but also throughout the postpartum period, which extends until the 42nd day after delivery, a period which, unfortunately, is ignored by many (UNICEF, 2008). The report additionally states that cultural or traditional practices might hinder women from seeking care during this period. In the Eritrean community, for example, after a woman gives birth, her post-partum care could include two months of bed rest in order for her body to heal. During this time, even if she encounters complications, the community will use home remedies before they seek professional help. A sick newborn is treated in the same manner. Considering that the majority of births take place at home, it is definitely important for the health care system to work with traditional birth attendants who supervise the mother and the baby closely.

Theoretical Framework

The theory of life course perspective (LCP) by Misra et al. (2003) was used in this study. This framework recognizes that outcome of pregnancy is affected by social, psychological, behavioral, environmental and biological forces. The authors state that the strongest influences on the health of a woman begin before she becomes pregnant. For instance, adequate nutrition needs to be a mainstay years before pregnancy occurs for certain nutrients to be available sufficiently in the body. In cases of infection, infectious organisms need to be treated long before pregnancy for successful prevention of poor outcomes. The period before and during pregnancy is known to have a significant impact (Public Health Service Expert Panel on the Content of Prenatal Care, 1989). Little attention has been given to pre-pregnancy health and it has not received its proper place in the perspective of the health of women across her lifetime (Misra et al., 2003). Preconception care includes ways that are used to explore and amend biomedical, social, and behavioral health risks to the health of women, birth, outcome of pregnancy and the postpartum period which need to be addressed prior to conception or early during pregnancy for a better outcome through prevention and management (Johnson et al., 2006).

Summary

Improving both maternal and child health are among the eight goals of the MDGs and its progress towards improving maternal health and reducing mortality is specifically lagging behind. Maternal mortality has been reduced by less than 1% worldwide while the desired target is a decrease by 5.5% per annum. This chapter presented an overview of the global, sub-Saharan, and Eritrean maternal mortality problems, an introduction to

the MDGs, a brief discussion of the causes of maternal mortality in developing countries and impact of maternal death. The theoretical framework of LCP which emphasizes the health of a woman before and during pregnancy and impact on birth outcome was used in this study.

CHAPTER THREE: METHODS

Introduction

This chapter describes the methods that were used in this study. This is a quantitative cross-sectional study of women in the reproductive age group of 18-49yrs in the Eritrean community. Data were collected via self-administered survey. Depending on the educational status of participants, two research assistants were involved in administering the survey questionnaires.

Study Design and Setting

This is an exploratory-quantitative, cross-sectional study. The study took place in the Central Zone of Eritrea. This specific zone was selected out of the 6 zones in the nation because of the convenience to recruit participants. The Central Zone covers 500 mi² area with an estimated population of 671,941 (World Health Organization, 2008b).

Participants and Sample

Two-hundred-and-one women in the reproductive age group (18-49yrs) were recruited in this study. Those women also fulfilled the inclusion criteria of having been pregnant or given birth in the past 5 years and understood Tigrigna (i.e., were able to speak with or without the ability to write). The sample size estimate (200 participants) was based on an alpha of .05, power of .80, and employed an effect size of $r = .20$. Two research assistants were involved to recruit participants, distribute questionnaires, and collect them after they were completed. Research assistants approached participants during the frequent gatherings for coffee ceremonies that are culturally done in the open

air among women living in close neighborhoods and recruitment flyers were also distributed among those women.

Instrument

An investigator-designed questionnaire prepared specifically for this group and community was distributed to women of reproductive age group living in the Central Zone in Eritrea. According to World Health Organization (2008a), a knowledge and practice questionnaire is used to represent a specific study population as to what is known and what is actually practiced in relation to a specific area of interest. This study used a questionnaire developed in the major local language ('Tigrigna') and designed to specifically assess the level of reproductive health knowledge and practice of women in the reproductive age living in the Central Zone. This survey questionnaire (see appendix A) had four sections: i.e., socio-demographic status, knowledge questions on reproductive health, questions on reproductive health practices, and questions on birth outcome/s within the past five years prior to this survey. The socio-demographic data included information regarding mothers' age, ethnicity, educational status, and marital status. Responses to questions under the knowledge section were scored as '1' for desirable (health promoting) answer or '0' for undesirable (non-health promoting) answer. On the practice questions, mothers were asked if they perform a certain reproductive health practice and responses were scored '1' for desired (health promoting) practice and '0' for undesired (non-health promoting) practice. The last section included information on birth outcome/s of pregnancy/ies within the past five years.

Procedure

Research Assistants

Two research assistants were involved in participant recruitment, questionnaire distribution and data collection at the convenient time and place for participants. The primary investigator (PI) made the decision to involve them in the study after several e-mail communications and phone conversations that took place at the beginning of the study process. The research assistants were selected because of their preferred status in academia (college level), desired communication skills, and were from the same region as the participants. The research assistants were given an orientation through a conference call regarding the study and expectations from participants. In addition, the orientation included inclusion criteria, tips on how to approach and recruit participants, the voluntary nature of participation, and regarding the need to confirm the completeness of questionnaires while collecting them back from participants (see Appendix C).

Ethical Review

Approval from the Institutional Review Board (IRB) of the University of South Florida (USF) was obtained before commencement of the study (see Appendix E). The two research assistants were involved in participant recruitment and questionnaire distribution/data collection and had credentialed themselves with the Collaborative Institutional Training (CITI) Basic Course in the Protection of Human Research Subjects, as per the regulation of the USF. They also were given an orientation through a conference call regarding the study and expectations from participants. Informed consent was obtained from all participants after briefing them on the purpose of the study prior to taking the survey.

Questionnaire Administration

The questionnaire was drafted in Tigrigna and then translated in to English for approval by experts in the field of maternal/child health from the dissertation committee members. Before doing the actual data collection, the questionnaire was tested on twenty participants for the purpose of identifying and modifying questions that appeared unclear. After confirming all questions were clearly understood by these participants, they were sent to research assistants via e-mail and were printed. The two research assistants recruited were responsible for participant recruitment and also distributing and collecting questionnaires from participants. The research assistants also assisted those participants who were unable to read and/or write by reading the questions and documenting their responses. Completed questionnaires were mailed periodically via DHL to the principal investigator. Data collected were kept confidential.

Analysis

Data analysis was done using SPSS package. The overall goal of analysis was to assess Eritrean women's awareness of reproductive health based on their responses to the knowledge and practice questions and determine any relationship existing between awareness and fetal pregnancy outcomes. Aim 1 was a process of developing the questionnaire by using literature, related questionnaires and personal experience. Aims 2 through 6 involved data analysis. More specifically, these analyses addressed the following aims:

Aim #2: Assess the level of reproductive health knowledge of Eritrean women living in the Central Zone of Eritrea.

This aim was addressed by calculating descriptive statistics for relevant variables studied.

Aim #3: Identify common health practices of Eritrean women during pregnancy, birth and postnatal periods.

This aim was addressed by calculating frequencies for relevant variables studied.

Aim #4: Examine the association between maternal reproductive health knowledge and reproductive health practices among Eritrean women.

This aim was addressed by calculating the correlation between the two variables to determine the strength and direction of the relationship (if any).

Aim #5: Investigate the variation in maternal reproductive health knowledge and practices among Eritrean women by demographic characteristics (age, occupation, and education).

This aim was addressed by using Chi-square tests for the categorical variables (i.e., educational status, occupational status, and, marital status). For the continuous variables, i.e., age, age at first birth, number of pregnancies and number of births, Analysis of Variance (ANOVA) was used to calculate any existing variations.

Aim #6: Investigate the association between a mother's level of knowledge and practice of reproductive health and fetal birth outcomes.

Logistic regression was done to predict the categorical fetal birth outcome (maturity status) from mothers' scores on knowledge and practice variables. For those mothers who had successful deliveries, linear regression analysis was used to predict differences in birth weight from knowledge/practice scores.

Summary

This chapter discussed the methodology of the study design. Women of reproductive age (18-49 years) who have been pregnant and/or gave birth in the past 5 years who live in the central part of the nation were approached. A total of 201 women were involved in this study. Two research assistants were involved in distributing and collecting questionnaires from participants and they also provided assistance to those who were not able to read/write by reading the questions and documenting it for them. The questionnaire included four sections: i.e., socio-demographic information, knowledge of reproductive health in women and also practices among those women in order to prevent or treat reproductive health issues. The last part of the questionnaire included questions on fetal birth outcome in the past five years. Institutional review board (IRB) approval was obtained prior to data collection. Data were later analyzed using SPSS package.

CHAPTER FOUR: RESULTS

This chapter summarizes the study findings after examining the reproductive health knowledge and practice of mothers of reproductive age group living in the Central Zone of Eritrea. The study results include description of socio-demographic characteristics of the participants, summary of knowledge and practice scores (minimum, maximum, mean and standard deviation), associations between socio-demographic characteristics and knowledge/practice items, and impact of socio-demographic characteristics and knowledge/practice scores on fetal birth outcomes. The study results are presented by each of the research aims.

Sample

Two-hundred-and-one eligible participants agreed to participate and were included in the study. Participants completed an investigator-developed demographics, knowledge, and practice questionnaire. Six participants had a missing value of one of our main outcome, birth weight, and were excluded from the final analysis. All participants were recruited from the Central Zone of the country, in the city of Asmara. Knowledge and practice questions were scored by counting the number of health promoting (desirable) and non-health promoting (undesirable) answers provided by each participant.

The demographic assessment of the study participants consisted of age, age at first marriage, age of first birth, religion, marital status, ethnicity, education and employment. The distribution by frequency and percentage of those women is presented

in Table 3. The majority of the participants were Christians (87.1%) from the Tigrigna ethnic group (86.6%). Married women represented 86.6%.

Table 3: Demographic Characteristics of the Study Sample; frequency and percentage

Demographics	Frequency (N)	Percentage (%)
Age at first marriage		
<20 yrs	66	32.8
≥20 yrs	135	67.2
Age at first birth		
<20yrs	42	20.9
20-34yrs	151	75.1
≥35yrs	7	3.5
Religion		
Christian	175	87.1
Other	25	12.4
Marital status		
Married	174	86.6
Single	22	20.9
Ethnicity		
Tigrigna	174	86.6
Other	27	13.5
Education		
None	12	6
Elementary/High school	162	80.7
Some college/College	27	13.5
Employment status		
Employed	53	26.4
Unemployed	140	69.7

Table 4 displays the demographic characteristic of the study sample as continuous variables. The mean age of participants was 30.24 years (*SD* 6.8). Mean age at first marriage and first birth were 21.99 and 23.23 respectively. About 36% of the participants had a single live birth. One hundred participants (49.8%) had had 2-5 live births, while 28 (14%) mothers had six or more.

Birth outcomes by fetal maturity, birth weight, and outcome are summarized in Table 5. For the purpose of uniformity and comparability of findings, the most recent

Table 4: Means and SDs of Demographic Characteristics of the Study Sample

Variable	N	Minimum	Maximum	Mean	SD
Current Age	200	18	47	30.24	6.80
Age at 1 st marriage	201	14	38	21.99	4.92
Age at 1 st birth	200	14	39	23.23	4.89
Pregnancy count	200	1	10	3.29	2.36
Live birth count	200	1	10	3.00	2.19

birth outcome is reported. The majority of recent pregnancies in the study sample resulted in live birth.

Table 5: Frequency and Percentage of Birth Outcome Variables

Variable	Frequency	Percentage
Maturity status		
Preterm	14	7
Full term	163	81.1
Birth weight		
Low weight	37	18.4
Normal	158	78.6
Outcome		
Abortion	1	0.5
Still birth	3	1.5
Live birth	193	96

A majority (78.6%) of the babies had normal birth weight, i.e., 2500gms or above (World Health Organization, 2011a). The lowest weight among this group was 2500gms and highest was 4500gms (M 3132gms; SD 0.42). Among the low birth weight, 1000gms was the lowest weight and 2400 the highest (M 1935gms; SD 0.41). Mean birth weight was 1935gms among low birth weight and 3100gms among normal weight babies.

In summary, the study sample included two-hundred-and-one women aged 18-49yrs, married, mainly from the Tigrigna ethnic group living in the Central Zone of Eritrea. The majority were unemployed and had elementary or high school education. Most pregnancies resulted in full term babies with normal birth weight.

Research Aim 1: Development of a Knowledge and Practice Questionnaire

The questionnaire was developed by reviewing the literature on aspects of maternal child health, other questionnaires used in similar published studies, and from the personal experience of the investigator. Experts in the maternal child health field then modified and approved the questionnaire. The questionnaire had four parts including: socio-demographic information, questions on knowledge of reproductive health, questions on practice of reproductive health, and questions on fetal birth outcomes. Major domains of maternal child health area including family planning methods, sexually transmitted illnesses, danger signs of pregnancy and birth were covered in the questionnaire. Knowledge and practice questions (14 and 4 respectively) were scored by counting the number of desirable/undesirable answers provided by each participant.

Research Aim 2: Assess the Level of Reproductive Health Knowledge of

Participants

The second aim of the study was to assess the total knowledge and practice scores for the participants which represent the reproductive age women's awareness of reproductive health in the Central Zone. Mean substitution was used to replace missing values for both variables. The minimum knowledge score was 3.23 and highest was 14 (M 10.50; SD 2.00). In the practice sub-scale, minimum score was 1 and maximum 4 (M 3.11; SD 0.84).

Research Aim 3: Describe Reproductive Health Related Knowledge and Practices of

Participants

The third aim of the study was to describe frequencies of desirable answers provided for the knowledge sub-scale (Table 6) and frequencies of answers provided for

the practice sub-scale (Table 7). Out of the 7 reproductive health practice questions, only less than 25 participants responded to three specific questions (i.e., if the participant had severe headache, leg swelling, and/or bleeding during her pregnancy in the past five years), and therefore, only 4 practice questions were included in analysis. Generally, participants provided desirable answers for the knowledge questions except for two items (knowledge of conception time in relation to menstrual cycle and identification of the time when birth anomalies most likely occur).

The majority of the participants provided desirable answers regarding their reproductive health practices during their most recent pregnancies except for physical activity during pregnancy, where the majority responded by stating that they did not have appropriate physical activity during their most recent pregnancy.

In summary, the majority of responses were desirable for items both under the knowledge and practice sub-scales except for knowledge of time of conception in relation to menstrual cycle, knowledge of the stage of pregnancy when fetal anomalies were more likely to happen, and appropriate physical activity during pregnancy.

Research Aim 4: Examine Associations Between Reproductive Health Knowledge and Practice

The fourth aim of the study was to describe any possible associations between reproductive health knowledge and practice. To investigate associations, responses to each knowledge items were cross-tabulated with each practice item. Because multiple Chi-square tests were run (14 knowledge items by 4 practice items giving 56 tests), Bonferroni adjustment was used by dividing the classic cutoff point for significance at a p value 0.05 to the total number of tests (56) and therefore, a p value of less than or equal

Table 6: Frequencies of Desirable Answers Provided for the Knowledge Sub-scale

Variable	N	Desirable responses N (%)
Are you aware of family planning methods?	201	104 (51.7)
Do you know any sexually transmitted illnesses (STDs)?	200	179 (89.1)
Do birth control pills prevent STDs?	200	178 (88.6)
Do birth control injections prevent sexually transmitted diseases?	200	174 (86.6)
Do condoms prevent sexually transmitted diseases?	201	161 (80.1)
In reference to the menstrual cycle, when is a woman most likely to get pregnant?	197	35 (17.4)
At what time, in your opinion, should a pregnant woman attend her first antenatal examination?	197	123 (61.2)
Should a pregnant woman count her fetal movement every day in the last three months of pregnancy?	197	167 (83.1)
Do you know the danger signs of pregnancy/birth?	200	168 (83.6)
Where would you seek help for the above mentioned problems?	201	194 (96.5)
Are you aware of the steps needed to be taken in case of labor/complications?	201	194 (96.5)
At what stage in pregnancy does fetal deformity most likely occur?	191	20 (10)
Does a baby need to receive vaccinations immediately after birth?	192	190 (94.5)
Do you think a pregnant woman needs more nutritious foods than a non-pregnant woman?	198	195 (97.0)

Table 7: Frequencies of Answers Provided for the Practice Sub-scale

Variable	Frequency	Number of desirable responses (%)
ANC visit		
Not adequate	42	20.9
Adequate	158	79.0
OTC use		
Used	12	6
Not used	189	94.0
Activity		
Not appropriate	104	51.7
Appropriate	92	45.8
Postpartum care		
Not received	15	7.5
Received	173	86.1

Note. ANC = antenatal care; OTC = over-the-counter drugs

to 0.001 was used instead. Table 8 displays correlations of the knowledge and practice items. The items that were significant at $p \leq 0.001$ are marked. Frequency of antenatal care was significantly related to knowledge status of the following knowledge items: prevention of STD with condoms ($\chi^2 = 13.9, df = 1, p < 0.001$), where to get help for problems ($\chi^2 = 18.3, df = 1, p < 0.001$), family planning methods ($\chi^2 = 33.4, df = 1, p < 0.001$), knowledge of STD ($\chi^2 = 18.3, df = 1, p < 0.001$), danger signs of pregnancy ($\chi^2 = 15.21, df = 1, p < 0.001$), and need to count fetal movement ($\chi^2 = 11.5, df = 1, p = 0.001$).

Postpartum care seeking behavior and knowledge about OTC (over-the-counter) drug use during pregnancy were assessed for their relationship with the 14 knowledge items and both practice items didn't show statistically significant relationship with any of the knowledge items after Bonferroni correction to the p -value. The last practice item, activity during pregnancy was found to be significantly related to knowledge status of the following items: first ANC timing ($\chi^2 = 8.16, df = 1, p = 0.004$), family planning methods ($\chi^2 = 24.1, df = 1, p < 0.001$), and knowledge of STD ($\chi^2 = 8.97, df = 1, p = 0.003$). Table 8 shows the correlations between the reproductive health knowledge and practice items.

In summary, adequate antenatal care visit was significantly associated with knowledge of family planning methods, STDs, role of condoms on STDs, need to count fetal movement, danger signs of pregnancy, and where to get help for complications of pregnancy as well as labor. Physical activity during pregnancy was significantly associated with knowledge of timing of first ANC visit, family planning methods, and STDs. Postpartum care seeking behavior was associated with knowing where to get help

for problems. The practice of consultation for OTC use did not have significant association with any of the knowledge items.

Table 8: Correlations of the Knowledge and Practice Items

Knowledge and practice items	ANC visit frequency	Activity status	Post-partum care	History of OTC
Family planning methods	0.413*	0.370*	0.126	0.090
Knowledge of STDs	0.284*	0.214*	0.005	0.038
Prevention of STDs with pills	0.016	0.002	-0.034	-0.089
Prevention of STDs with injections	-0.026	-0.002	-0.054	-0.100
Prevention of STDs with condoms	0.260*	0.040	0.026	0.016
Knows time of conception	0.127	0.025	-0.158	0.119
1 st ANC visit timing	0.115	0.144	-0.014	-0.038
Need to count fetal movement	0.210*	0.013	0.190	-0.109
Knows danger signs of pregnancy	0.267*	0.143	0.133	-0.028
Where to get help for problems	0.212*	0.074	0.244*	-0.041
Awareness of complication steps	0.139	0.057	0.180	0.092
Stage anomalies mostly happen	0.067	0.084	-0.135	0.083
Need for vaccination	0.155	0.077	-0.025	-0.020

Note. STD = sexually transmitted diseases; ANC = antenatal care; OTC = over-the-counter drugs. * $p \leq .001$

Research Aim 5: Variations in Maternal Reproductive Health Knowledge and Practice Across Demographic Characteristics

The fifth aim of the study was to investigate any existing variations in maternal reproductive health knowledge and practices among participants by demographic characteristics. There was a significant variation in participants' knowledge about family planning methods ($\chi^2 = 22.85$, $df = 1$, $p < 0.001$), correct time of conception ($\chi^2 = 8.82$, $df = 1$, $p = 0.003$), adequacy of ANC visits ($\chi^2 = 5.77$, $df = 1$, $p = 0.02$), and physical activity during pregnancy ($\chi^2 = 5.53$, $df = 1$, $p = 0.02$) across employment status.

Participants' knowledge about the role of three contraceptive methods on STDs (injections [$\chi^2 = 17.04$, $df = 5$, $p = 0.004$], pills [$\chi^2 = 17.33$, $df = 5$, $p = 0.004$], and

condoms [$\chi^2 = 15.66, df = 5, p = 0.008$]), knowledge of family planning methods ($\chi^2 = 39.92, df = 5, p < 0.001$), knowledge about STDs ($\chi^2 = 24.56, df = 5, p < 0.001$), and knowledge of where to get help for complications of pregnancy/birth ($\chi^2 = 24.20, df = 5, p < 0.001$) varied by their educational status. Moreover, participants' utilization of ANC ($\chi^2 = 41.12, df = 5, p < 0.001$) and pattern of physical activity during pregnancy ($\chi^2 = 16.69, df = 5, p = 0.005$) varied across different educational levels. Married women were more likely to receive adequate ANC ($\chi^2 = 4.05, df = 1, p < 0.04$), and report consultation of a professional for OTC use during pregnancy ($\chi^2 = 13.70, df = 1, p < 0.001$). Women with advanced maternal age (≥ 35 years) at time of data collection were more likely to have better knowledge of family planning methods ($F(1, 197) = 12.91, p < .001$), role of contraceptive injections on STDs ($F(1, 197) = 5.62, p = .02$), knowledge of danger signs ($F(1, 197) = 12.82, p < .001$), knowledge of appropriate nutrition during pregnancy ($F(1, 195) = 3.79, p = .05$), importance of vaccinations ($F(1, 189) = 6.53, p = .01$), knowledge of correct time of conception ($F(1, 195) = 7.17, p = .008$), and physical activity during pregnancy ($F(1, 194) = 5.75, p = .02$). Women who married late in their reproductive age had better knowledge on the role of condoms in preventing STDs ($F(1, 199) = 5.87; p = 0.02$), where to get help for complications of pregnancy/labor ($F(1, 199) = 6.84; p = 0.01$), family planning methods ($F(1, 199) = 8.39; p = 0.004$), need to count fetal movement during third trimester of pregnancy ($F(1, 195) = 3.84; p = 0.05$), and adequacy of ANC visits ($F(1, 198) = 6.6; p = 0.01$). Women who waited to latter age of their reproductive life for their first pregnancy were more aware of family planning methods ($F(1, 198) = 9.39; p = 0.002$), where to get help for complications of

pregnancy/birth ($F(1, 198) = 6.33; p = 0.01$), and adequacy of ANC visits ($F(1, 197) = 7.10; p = 0.009$).

In summary, the demographic characteristics higher educational status, being married, having a job, and maternal age at the time of first marriage, first child birth, and age at the time of data collection were related with better reproductive health knowledge and practice.

Research Aim 6: Associations Between Mothers' Level of Knowledge and Practice and Fetal Birth Outcomes

The sixth aim of the study was to explore possible associations between mother's level of knowledge and practice of reproductive health and fetal birth outcomes by controlling for potential confounders including: marital status, educational status, and maternal age (age at first marriage, age at first birth, and current age).

Logistic regression was done with maturity status as a dependent variable and knowledge items, selected practice items (adequacy of ANC visit, physical activity, and OTC use) and selected demographics including marital status, educational status, and current age as independent variables. Married women were about 6 times more likely to give birth to a term baby than unmarried women (adjusted odds ratio [AOR] = 5.96 and 95% CI [0.65 – 54.49]) after adjusting for potential confounders including individual knowledge items and adequacy of antenatal care visit. However, the association didn't reach statistical significance. Educational level, however, was significantly associated with maturity at birth with those at higher educational level almost 8 times more likely to give birth to a full term baby (adjusted odds ratio[AOR] = 7.82 and 95% CI [1.27, 48.03]).

Regression analysis was employed to investigate whether individual knowledge and practice items are predictors of birth weight. The analysis showed that one practice item, consultation of a professional for OTC use, was a significant predictor of birth weight ($t = 2.16$; $p = 0.03$). The impact of marital status, current age, and educational status on birth weight was examined by controlling for reproductive health knowledge. Marital status and educational status were significantly associated with birth weight ($t = 2.87$, $p = 0.005$; $t = 1.96$, $p = 0.05$) respectively.

In summary, women with higher level of education were more likely to give birth to a term baby than their counterparts with lower level of education. Married and more educated women were most likely to give birth to a baby with normal birth weight. Women who consulted professionals before OTC use during pregnancy were also more likely to have a baby with appropriate birth weight when compared to women who reported use of OTC without professional consultation during their last pregnancy.

CHAPTER FIVE: DISCUSSION, STRENGTH, LIMITATIONS, CONCLUSION AND IMPLICATIONS

Introduction

This final chapter presents the synthesis of the research results including the discussion of the findings, limitations, conclusion, implications and recommendations for future study. This study examined the reproductive health knowledge and practice of mothers of reproductive age group living in the Central Zone of Eritrea. The study provides an insight into the level of knowledge and practices related to reproductive health and its potential association with the most recent birth outcome. Assessing reproductive health status of women may provide valuable information on the level of awareness, practices, and gaps that require intervention. This is even more crucial when considering a resource poor country like Eritrea, where human and financial constraints exist to a larger degree (Prata, Sreenivas, Vahidnia, & Potts, 2009), making the need to plan targeted interventions extremely important in order to make the best of available resources. The findings of this study could serve as baseline data to maternal health program planners in Eritrea.

The death of a mother goes beyond just her death and greatly contributes to the 4 million neonatal deaths and the 3.2 million stillbirths every year (Holzgreve, Greiner, & Schwidtal, 2012). Strategies to lessen the high maternal deaths include, among other measures, the use of skilled professionals and provision of emergency obstetric care (World Health Organization, 2012). A study by Cham and colleagues reports that

among possible reasons for delay in seeking professional care include underestimation of severity of complication, prior negative incidents at health services or cultural beliefs (Cham, Sundby, & Vangen, 2005). A study done in Eritrea evaluated the effectiveness of community-based intervention that promotes maternal knowledge and improves behavior to promote safer motherhood and study results indicated that the intervention not only positively affected maternal knowledge but also their practices related to reproductive health (Turan, Tesfagiorgis, & Polan, 2011). Offering better opportunities of education for women and improving their status through empowerment and ability to make decisions are proven to be among integrated and holistic approaches to providing appropriate perinatal and neonatal care in developing nations (Bhutta, Darmstadt, Hasan, & Haws, 2005). In summary, all the above studies report the huge role that appropriate knowledge of reproductive health including health promoting activities during pregnancy, delivery and after birth have on promoting maternal and child health. This study is a step to explore the existing knowledge and practices related to reproductive health among women in the Central Zone and see their relationship with infant birth outcomes. In an effort to accomplish this, an investigator-designed questionnaire was used which represented a wide range of domains of reproductive health to capture reproductive health knowledge and practice of women in this specific community.

Sample Characteristics

Participants of this study were two-hundred-and-one women of reproductive age group (18-49 years at the time of study) living in the Central Zone of Eritrea, pregnant or had a child in the last five years. Inclusion of women who have been pregnant or gave birth in the past five months was preferred to avoid recall bias of events that happened

long time ago. Based on personal experience of the primary author of this study and other professional colleagues in Eritrea, often times, Eritrean women tend to discuss events that surround their pregnancy and delivery with family and friends, hence good memory of outcomes of recent births. This argument is evident from the relatively few “missingness” of birth outcome variables like birth weight. The Central Zone of Eritrea is mainly composed of the Tigrigna ethnic group with Christianity being the dominant religion. The majority of participants in this study were Christians (87.1%) dominantly from the Tigrigna ethnic group (86.6%).

Summary of the Study

Participant Demographic Data

Among women who took part in this study, 6% had no education, 80.7% had elementary, junior or high school education and 13.5% had some college or College education. The overall level of education among participants in this study was higher than the national literacy estimate among women, which was 44%. This is not surprising considering the fact that educational attainment is highest in the Central Zone compared to the other zones in the nation. Educational opportunity is equally available for both genders in Eritrea but national figures show the number of women in education dramatically decreases after elementary school and those who get to the level of higher education are far fewer than their male counterparts (NSEO & ORC-Macro, 2003).

Employed mothers represented 26.4% of the study sample. The remaining 69.7 were unemployed housewives. This is slightly lower than the national average estimate of 30% by EDHS among women aged 15-64 in 2002 (NSEO & ORC-Macro, 2003). This might be explained by the fact that the age range was wider in the EDHS study and

unlike this study, all women with or without history of pregnancy or child birth in the five years prior to their survey were included. Women who are not mothers are more likely to be employed possibly because they have less family related responsibilities that come with motherhood. As from the findings, a large percentage of employed women still reside in the Central Zone.

The current age of participants ranged from 18-47 years ($M = 30.24$). The majority, 86.6%, were married. This was expected because in the Eritrean community, marriage characterizes the time in a woman's life when childbearing is socially acceptable. Maternal age at first birth is one of the factors that determines fertility rate in a population. Women who marry early are exposed to early pregnancy and become mothers at an early age and also have increased fertility. In this study, the median age at first marriage was 21 years (14 youngest and 38 oldest), which is slightly higher than the national median- 18.2 years (NSEO & ORC-Macro, 2003). Marriage at younger age is more common in the lowlands and southern regions of Eritrea than the Central Zone, thus the observed variation between national reports and this study is expected. For example, the woman who married at age 14 in this study is a member of an ethnic group in the low-lands of Eritrea where early marriage is a common practice. The median age at first birth was 22 years (14 youngest and 39 oldest), the median for the nation in 2002 ranged from 20.6 to 22.5 years (NSEO & ORC-Macro, 2003). Not surprisingly, in this study, age at first marriage was inversely related with number of children. Generally, Eritrean women prefer to have a large family, the majority wanting four or more children and women residing in rural areas are more likely to have more children when compared to their counterparts in urban settings (NSEO & ORC-Macro, 2003). In this study, which

was situated in the urban setting, mean live birth count was three children. Maternal demographic characteristics are associated with fertility rates. An inverse relationship between maternal education and fertility was found in this study. It has been established in the literature that women with adequate education are more likely to experience better health practice behaviors (e.g., family planning, hygiene, nutrition), and employment status (Baker, Leon, Smith Greenaway, Collins, & Movit, 2011; Koch et al., 2012). Only 18% of study participants had a college education and the majority were unemployed, hence housewives (69.7%). Only 8.3% of those with no education, 24.1 % of those with elementary/junior education, and 27.5% of those with high school level education were employed.

Birth Outcome Characteristics

The majority of births were term (81.1%). Most infants born to study participants had normal birth weight (78.6%), with the remainder having low birth weight (18.4), and 3% undocumented birth weight. According to the 4th international statistical classification of diseases and related health problems, normal birth weight is defined as birth weight ≥ 2.5 kgs (WHO, 2010). In the absence of congenital anomalies, prematurity, low birth weight (LBW), and intra uterine growth retardation (IUGR) are the most common adverse birth outcomes and leading causes of neonatal deaths (Abu-Saad & Fraser, 2010; Bhutta et al., 2005). The number of low birth weight infants is doubled from 9.8% in the year 2002 to 18.4% in the current study. The current figure of LBW in Eritrea puts the country's ability to meet the millennium development goal (MDG-4) under question. Multiple reasons could explain the significant increase in the number of infants born with abnormal birth weight. First, it is possible that more women with

pregnancy related complications were recruited in this study. Unfortunately, we do not have enough data to test this hypothesis. Another reason might be that there was underestimation of low birth weight in the 2002 national survey. Low birth weight is conceptually composed of infants who are either born before term or those who had fetal growth restriction (Goldenberg & Culhane, 2007) and is an important indicator of infant health due to the strong association between birth weight and morbidity and mortality. Low birth weight can also put the infant at a greater risk of chronic medical conditions later in life. Therefore, policy makers and health professionals in Eritrea need to give this issue due attention to get the country back on track towards the attainment of the MDG-4.

Research Aim 1: Development of a Knowledge and Practice Questionnaire

This aim was a process of developing a questionnaire by using literature, related questionnaires and personal experience. This questionnaire was designed in a way to embrace major domains of maternal reproductive health including antenatal care, family planning, complications of pregnancy, labor and delivery; exercise and nutrition during pregnancy, skilled care, sexually transmitted illnesses, postnatal care and child immunizations.

Research Aims 2, 3, and 4: Level of Reproductive Health Knowledge, Common Reproductive Health Practices and Variation Between Knowledge and Practice Items

There were two sub-scales in the questionnaire; reproductive health knowledge and reproductive health practice. The items under the practice sub-scale and knowledge sub-scales (grouped in to 6 major categories for ease of presentation: Antenatal care (ANC) knowledge and utilization, knowledge of family planning methods, identification

of danger signs, skilled assistance at delivery, postnatal care, and child immunization) are discussed both individually and in relation to one another.

ANC knowledge and utilization.

According to the United Nations (United Nations, 2012), the antenatal period is a crucial moment to reach women with health promoting information and interventions that help enhance well-being and survival of mothers and their babies. The WHO recommends at least four ANC visits throughout pregnancy (WHO, 1999). A study in South Africa (Daponte, Guidozi, & Marineanu, 2000) reported a relationship between antenatal care utilization and maternal mortality. Women with documented ANC visit (at least two visits) during their pregnancy had relatively lower mortality rate (29.8 per 100,000 live births) when compared to women who had no antenatal care (348.5 per 100,000 live births). In the current study, 79% of the participants had at least four or more ANC visits during their last pregnancy. The national ANC coverage rate was only 40.9% in 2002 (NSEO & ORC-Macro, 2003), about 40% lower than the rate in the current study. This significant difference in antenatal care coverage could be due to the fact that participants in this current study were from the Central Zone which translates into better awareness and also better access to health care services.

The EDHS survey in 2002 found that women with some secondary school education are more likely to get adequate antenatal care (97%) when compared to women with no education (61%) (NSEO & ORC-Macro, 2003). Consistently with this finding, this study showed an increase in ANC frequency from 58.3% among those with no education to 78.7% among those with junior level education, to 85.4% among high school and 100% among those with college level education. Overall, findings of this

study point to the importance of education expansion programs among women in Eritrea. Governmental and other non-governmental organizations who work in the area of maternal and child health need to put emphasis in programs that provide education to women of reproductive age in an effort to combat maternal and child health co-morbidities.

Another critical issue while considering ANC and its effectiveness is timing of first visit (WHO, 1999). When initial ANC visit is delayed, the period for mothers to consider and make informed decisions concerning their care is lost. In this study, 61.2% of women believed that initial ANC should begin in the second trimester or beyond, indicating that a significant number of women do not know the appropriate time to seek antenatal care. This is of a great concern because the first trimester is a crucial time in pregnancy where organogenesis occurs. Failure to start antenatal care early in pregnancy may put the life of the mother and the fetus in risk by delaying identification of problems and important interventions. In addition to this, mothers will miss the first encounter with a health professional which could have provided the opportunity to discuss concerns and necessary and basic facts including estimation of correct time of conception and expected date of delivery, expected developmental changes of the fetus, and care that needs to be taken during pregnancy, birth and after birth. Only 17.4% of the participants knew when pregnancy can occur in relation to the menstrual cycle while more than 85% did not know the period of pregnancy at which most fetal anomalies are likely to occur, partly explaining the delay in seeking initial antenatal care seen in significant number of participants.

Information on nutrition is one of the vital components of ANC package (Shah & Say, 2007). Nutrition plays an important role in the health of the mother and her offspring and understanding this relation could help in designing interventions that could improve birth outcomes and further, the long-term quality of life of children (Abu-Saad & Fraser, 2010). The majority of participants in this study (97%) understood the need for balanced diet during pregnancy. It is optimistic that the majority of the participants consider nutrition to be an important concept during pregnancy. However, future studies should look at this at a deeper level as to the practicality of this awareness.

Knowledge of family planning.

Family planning is an important aspect of reproductive health which has a significant impact on maternal health through prevention of unintended pregnancies. Knowledge about family planning methods is essential to make informed decision about method of family planning that fits individual's condition. In this study, just above half of the participants (51.7%) were able to mention at least one method of family planning among those available in Eritrea, suggesting that more effort is needed to expand the knowledge and therefore, utilization of contraceptives. Such effort is vital because it has been documented in the literature that underutilization of contraceptives is a risk factor for unwanted or mistimed pregnancies which in turn are risk factors for adverse maternal and child birth outcomes (Graham et al., 2006). Participants who were more likely to mention family planning methods also had higher reproductive health practice scores than those who did not know at least one family planning method.

Seeking antenatal care, delivery at a health facility, and receiving postpartum care are associated with reduced maternal mortality. However, some countries like

Bangladesh have reduced the maternal mortality ratio without any change in those indicators. In Bangladesh, the reduction in mortality ratio among mothers was mainly attributed to the appropriate utilization of contraceptives (Shah & Say, 2007). Some argue that one third of maternal deaths worldwide could have been avoided just by expanding proper family planning methods (Smith, Ashford, Jay, & Donna, 2009).

In line with knowledge of family planning methods, awareness about sexually transmitted diseases (STDs) and their prevention is another essential component of reproductive health. When asked if birth control pills, injections and condoms were able to prevent STDs, 88.6%, 86.6% and 80.1% participants provided correct response regarding the role or absence of role of each in preventing STDs. Interestingly the percentage is lower for condom, suggesting that awareness about the benefits of condoms still remain relatively lower despite extensive local media campaigns in the past few years. A majority of participants (89.1%) were able to mention at least one STD. Future studies should consider measuring level of awareness about preventive measures and complications of untreated STDs.

Danger sign identification.

Identification of danger signs early by the pregnant woman is important as it helps the mother to seek help at the right time. Fortunately, 83.6% of the women in this study were able to mention at least one pregnancy/labor complication, while 96.5% stated at least an example of a step to be taken in such a situation (e.g., saving money for such times, knows who to contact at such times) and also stated that they would seek help from a skilled professional. As expected, those women who were able to identify danger signs had also higher practice scores, indicating that they had healthier reproductive

health practices (e.g., adequate ANC visits) when compared to those who failed to identify danger signs.

Skilled assistance during delivery.

Skilled delivery assistance and emergency obstetric care reduce obstetric complications and thereby maternal death (Shah & Say, 2007). Women with better economic status are more likely to give birth in a health facility than economically disadvantaged women (Montagu, Yamey, Visconti, Harding, & Yoong, 2011). In the Eritrean community, it is the norm for family and friends to decide from whom the pregnant woman should seek assistance during delivery. Even if help is sought from skilled professionals, traditional birth attendants are the first to be approached for their opinion. According to the 2002 EDHS findings, 71% of deliveries in the Central Zone were assisted by health professionals (NSEO & ORC-Macro, 2003). While in the current study 85.1% were assisted by a professional, a 14% increase. This could be explained by the fact that women in this study were from the urban place in the Central Zone who are more likely to be at a higher economic level, educated, and also aware of health related information. The fast-growing socio-economic development of urban places in the nation could possibly explain this positive change. Additionally, the ministry of health (MoH) in Eritrea, in collaboration with the WHO and other governmental and non-governmental agencies, has launched maternity waiting homes for women who live in remote areas so that they can stay close to health facilities before giving birth where eventually, they could deliver with the assistance of skilled professionals or get a referral service if needed (Wild, Barclay, Kelly, & Martins, 2012).

Postnatal care.

Care following birth is crucial both to the mother and the newborn infant as major transitions take place during this period and that the majority of deaths take place in the first few hours or days after birth (Lawn et al., 2005; Li, Fortney, Kotelchuck, & Glover, 1996; Matthews, Xylander, & Jelka, 2010; Rogo et al., 2006). The neonatal period, though only 28 days, contributes to 38% of under-five deaths (Lawn et al., 2005). The post-partum period starts after approximately one hour after birth of the placenta and extends until the next 6 weeks. Postpartum care, therefore, includes early identification and prevention of complications as well as provision of information related to breastfeeding, vaccinations, maternal diet and birth spacing (World Health Organization, 1999). The majority of the women in this study (86.1%) reported that they received postnatal care by a health professional. Women with higher levels of reproductive health knowledge as measured by the 14 knowledge items were more likely to receive post natal care from a professional. In a study done by Shah and Say (2007) in some developing countries, post-partum care was sought by as low as 28% in Nepal, 27% in Bangladesh and only 11% in Ethiopia. Further, the authors report that the majority sought post-partum care days after birth when in fact it should have been received within 24 hours following delivery. The current home visit program in Eritrea which provides basic postpartum care by visiting women who gave birth at their homes during the first 6 hours, then by 6 weeks, and lastly, by 6 months ('6-6-6 strategy'). The Central Zone is one of the regions to implement this strategy extensively because of the availability of skilled human resources. This could explain the relatively higher rate of postpartum care in this study.

Child immunization.

Immunization is a uniquely important public health intervention to reduce maternal and infant mortalities. In line with the current WHO guidelines, children under the age of 5 years in Eritrea get vaccines for the top six vaccine preventable diseases including: Tuberculosis, Diphtheria, Whooping cough, Tetanus, Poliomyelitis and Measles (NSEO & ORC-Macro, 2003). In recent years, vaccination coverage has been expanded and vaccine for Hepatitis B has been also added to the list of vaccines above. The current study showed that 94.5% of the women in this study agreed that vaccination is beneficial to their children. Since the data collection process to this study solely relied on recall by the mother, we didn't collect information about vaccines received and timing.

Research Aim 5: Variation of Knowledge and Practice Scores Across Demographics

Age, ethnicity, and religion.

The level of knowledge about reproductive health among participants was directly related to age. However, no significant correlations were seen between maternal age and reproductive health practices as measured by the four practice items in the questionnaire. These findings suggest that as maternal age increases, women are more likely to be aware of reproductive health but changing practice does not seem to improve at an equal pace with their knowledge status. Therefore, health care providers need to put more emphasis of educating younger women who have less experience and knowledge of reproductive health.

On the other hand, age of the mother at first marriage was associated with maternal knowledge on benefits of condoms, where to seek professional help, need to count fetal movement during the third trimester of pregnancy, family planning methods,

and practice of visiting antenatal care service providers. The study was done in the Central Zone which consisted majorly of Christians and the Tigryna ethnic group and hence we could not investigate if there is variation in the level of reproductive health knowledge and practice across diverse ethnic groups. The other zones in the nation are composed of a different ethnicities having a variety of cultural practices and it will be interesting to study the association of the culture of these zones and reproductive health knowledge and practice in the future.

Marital status.

A majority of women in this study were married. Interestingly, when considering adequacy of ANC visits, unmarried women were less likely to seek antenatal care than married women. The Eritrean community expects women to be married before becoming a mother and there is stigma against women who get pregnant out of wedlock. This might explain the above finding in that unmarried women might have less confidence to seek professional care or have no proper support system that encourages them to seek professional assistance.

Educational status.

Educational status of the mother was significantly associated with increased knowledge of family planning methods, knowing where to seek help for complications of pregnancy and knowledge of STDs and its prevention methods.

Awareness of family planning methods increased with increasing educational level. Among those with no education, none were able to state at least one method of family planning. Among those with junior, elementary, high school or college level education, the numbers increased (22.2%, 44.7%, 55.7% and 93%) respectively. Women

with less awareness about available methods of family planning are less likely to use family planning increasing their chance of having more children. According to the 2002 EDHS survey, family planning utilization among reproductive age women in Eritrea was only 8% with the highest utilization being in the Central Zone (10.5%) and the lowest 1.8% in Gash-Barka Zone. In the current study, more than 50% of participants were able to mention at least one method of family planning (NSEO & ORC-Macro, 2003). However, data on actual use of family planning is not addressed in this study. Lack of awareness and under utilization of family planning methods is a concern to Eritrea because it can lead to unplanned pregnancies, a risk factor for adverse maternal and infant birth outcomes. For example, a study in China found that maternal mortality among women with unplanned pregnancy was much higher than those with planned pregnancies (397.1/100,000 vs. 92/100,000). According to the authors of this study, their finding was partially explained by the lack of adequate prenatal care (Ni & Rossignol, 1994).

Women with higher education also tended to exercise regularly and completed antenatal care follow up requirements. Basic formal education in Eritrea provides reading and writing skills along with enlightening students with basic health related information. The positive influence of education on health related information and practice is also evidenced from previous studies (Amano, Gebeyehu, & Birhanu, 2012; Breman, 2001; Dike et al., 2006; Nigussie, Mariam, & Mitike, 2004). Specifically, the study done by Dike and colleagues (Dike et al., 2006) to explore the impact of education on practice found that higher levels of education were related with improved knowledge and healthy practice.

A significant association between employment and knowledge of family planning methods and knowledge of correct timing of conception was found. Adequate ANC visit and proper physical activity was also associated with employment status. This finding is expected considering the fact that the majority of participants in this study were educated. Further, healthier practices by mothers extended to include provision of proper care for their children, as is seen in this study by those mothers who provided desirable answers regarding child vaccinations. According to reports from the United Nations, maternal education even to the level of elementary schooling plays a dominant role in child survival (United Nations, 2012).

Research Aim 6: Associations Between Mother's Level of Knowledge and Practice of Reproductive Health with Fetal Birth Outcomes

Outcome measures investigated in this study included maturity status (term or preterm), and birth weight (underweight or normal weight). Among participants of this study, more educated women were more likely to give birth to a full term baby. This finding might be linked to the fact that more educated women are more likely to be aware of reproductive health and therefore, are more likely to have health-promoting behaviors than those who are less educated or not educated at all. Moreover, although not statistically significant, married women were more likely to have a mature baby than unmarried women. Multiple factors could explain this finding. First, married women are more likely to receive adequate social support from their husbands, family members and the society in general. Multiple studies have linked strong social support to improved physical and psychological well-being of the mother and hence better birth outcomes (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993; Orr, 2004; Page, 2004). The

second argument is that, unmarried women are more likely to experience unintended pregnancy, which is a known risk factor for adverse infant birth outcome (Bustan & Coker, 1994; Joyce, Kaestner, & Korenman, 2000). Thirdly, unmarried women might have had adverse behavioral or clinical conditions that impact birth outcome negatively. However, since data was not collected on prior behavioral and clinical conditions, this hypothesis cannot be supported in this study.

Adequate antenatal care during pregnancy has been linked with better maternal and infant outcomes (Banta, 2003). Pregnant women with higher education and reproductive health knowledge demonstrated better birth outcome than women with less education and less reproductive health awareness (Hailu, Gebremariam, Alemseged, & Deribe, 2011; Luo, Wilkins, & Kramer, 2006; Udofia, Obed, Calys-Tagoe, & Nimo, 2013). In this study, those who were married and more educated were more likely to give birth to a baby with normal weight. Women who were cautious of use of any medications during pregnancy were also associated with having a normal weight baby.

Conclusion

This study has provided valuable information to answer questions about the existing state of reproductive health knowledge and practice among women of reproductive age women in the Central Zone, Eritrea. A majority of respondents, if not all, could identify sources where they can access services related to reproductive health, recognize danger signs of pregnancy, recognize the importance of vaccinating children, and prevention methods of sexually transmitted diseases. It is fair to say that the campaigns, sensitization, and mass mobilization on the importance of antenatal care and family planning through the national media outlets have helped women to have a clearer

understanding of reproductive health issues and accepting interventions contributing to an increase in utilization of reproductive health services. However, the study has also revealed some important reproductive health knowledge gaps in some areas of the reproductive health domain.

Relatively, few respondents were able to identify the time when a woman could get pregnant in relation to her menstrual cycle. Those who were aware of the timing of possible conception were mostly among the highly educated group. The gap of knowledge about timing of conception that existed in this group of women is of particular concern especially in communities where family planning services are not easily accessible. Considering the extent of maternal and infant morbidities associated with unintended pregnancies, immediate and effective strategies that equip and empower women to be able to control their reproductive health is warranted. Another area of concern was the lack of awareness among a majority of respondents about important events that happen during the critical period in pregnancy, the first trimester. Women who are not aware of the important events that happen during this period are more likely to delay their initial antenatal care visit, which could result in costly pregnancy complications and poor health outcome for the mothers and infants alike.

Overall, particular attention is required to increase knowledge and motivate healthy practices of reproductive health. It is important to make sure that health care providers are equipped with culturally appropriate and feasible educational materials that could be used to disseminate vital reproductive health related information to women of reproductive age. The current policy of government owned educational institutions providing certain quota for minority students is commendable.

Implications for Nursing

Nurses contribute to more than 90% of Eritrea's health care workforce, and are providers of almost all antenatal health care services in the country. Therefore, as primary service providers, nurses in Eritrea are in constant contact with women seeking antenatal and family planning services. Moreover, nurses are responsible for the majority of deliveries of uncomplicated pregnancies that occur in health facilities. As key care providers to this vulnerable group of the population, nurses can use the findings of this study to re-frame their educational materials and strategies to address areas where there is a gap in terms of reproductive health knowledge and practice. Nurses should educate women on how events that surround their reproductive life can affect their life and the life of their newborns. Furthermore, nurses in Eritrea can use this study as a stepping stone to build on similar research in their catchment area to see if the findings of this study are closely similar among reproductive age women in their respective zone in the country. This study could also serve as a tool for nurses to discuss evidence based practice and come up with reproductive health related research questions to be addressed.

Strengths and Limitations

The primary limitation of this study is related to the data collection. Data were collected via self-report and there are no objective sources to confirm some of the information provided. Therefore, some variables might have been subject to recall bias. However, in order to minimize such bias, relevant questions were limited to reproductive history of participants in the past five years. Second, the study was conducted only in the Central Zone of the country. Therefore, the findings of this study might not represent the reproductive health knowledge and practice patterns in other zones of the country.

Despite these limitations, this study also has strengths that are worth mentioning. First, to the knowledge of the primary investigator, this study is the first to investigate the levels of reproductive health knowledge and practice in Eritrea and explore the association of these with birth outcomes. And secondly, the study laid a foundation for creation of an instrument that could be of use to measure reproductive health related knowledge and practice in the Eritrean community. Hopefully, this study will be just the first of many more such studies in the future, influencing the reproductive health of women and their birth outcomes.

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APPENDICES

Appendix A. Survey questions

Information for the participant:

The purpose of this research study is to identify the knowledge and practice of women between the ages 18-49 years in regard to reproductive health and its impact on birth outcome.

We wish to learn about your knowledge and practices in relation to reproductive health issues and we hope to understand your areas of need in order to plan the best way to provide appropriate information and care to improve the health of mothers and their babies.

If you wish to participate in this study, you will complete this questionnaire only once. The answers provided in this questionnaire will be kept confidential. Also, your name will not be recorded anywhere. Your participation in this survey is absolutely voluntary and you may stop participating at any time.

Thank you for your assistance.

PART 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age: _____
2. Religious status:
 - Christian
 - Islam
 - Other
3. Ethnicity:
 - Tigrigna
 - Tigre
 - Saho
 - Blen
 - Nara
 - Kunama
 - Rashaida
 - Hidareb
 - Afar
4. Marital status:
 - Single
 - Married
 - Widowed
 - Separated
 - Divorced
5. How old (in years) were you when you first married/got in the relationship from which the child/children in question were born?
6. How old were you when you had your first child? _____
7. Number of pregnancies throughout your lifetime _____
8. Number of births throughout your lifetime _____
9. Highest level of education attended:
 - None
 - Primary (1-5grade)
 - Junior (6-8grade)
 - Secondary (9-12grade)
 - Some college
 - College graduate

10. Occupational status:

- Housewife
 Employed

PART 2: KNOWLEDGE QUESTIONS

Instruction: Please answer the following questions by ticking in the appropriate box or filling the space provided.

A. Pre-pregnancy

1. Are you aware of family planning methods?
 No
 Yes (*Please list as many methods as possible*) _____
2. Do you know of any sexually transmitted diseases?
 No
 Yes (*Please list as many as you can*) _____
3. Do birth control pills prevent sexually transmitted diseases?
 No
 Yes
4. Do birth control injections prevent sexually transmitted diseases?
 No
 Yes
5. Do condoms prevent sexually transmitted diseases?
 No
 Yes
6. In reference to the menstrual cycle, when is a woman most likely to get pregnant? _____

B. Pregnancy and birth

7. At what time, in your opinion, should a pregnant woman attend her first antenatal examination? _____
8. Should a pregnant woman count her fetal movement everyday in the last three months of pregnancy?
 No
 Yes
9. Do you know the danger signs of pregnancy/birth?
 No
 Yes (*Please list as many as you can*) _____

10. Where would you seek help for the above mentioned problems? _____
11. Are you aware of the steps needed to be taken in case of labor/complications? *(Please list as many as you can)*
12. At what stage in pregnancy does fetal deformity most likely occur? _____
13. Does a baby need to receive vaccinations immediately after birth? _____
14. Do you think a pregnant woman needs more nutritious foods than a non-pregnant woman?
 No *please explain why:* _____
 Yes *please explain why:* _____

PART 3: PRACTICE QUESTIONS

Instruction: Please answer the following questions by ticking in the appropriate box or filling the space provided.

1. How many times did you go for ante-natal care during your pregnancy/ies **in the past five years?**

First pregnancy: Year _____ #of visit _____ care from traditional midwife only
 Second pregnancy: Year _____ #of visit _____ care from traditional midwife only
 Third pregnancy: Year _____ #of visit _____ care from traditional midwife only

2. Did you have bleeding during your pregnancy/ies **in the past five years?**

First pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

Second pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

Third pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

3. Did you have severe headache during your pregnancy/ies **in the past five years?**

First pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

Second pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

Third pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

4. Did you have swollen feet during pregnancy/ies **in the past five years?**

First pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

Second pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

Third pregnancy:

- No
 Yes

If yes, who did you seek care from?

- Skilled health professional
 Traditional midwife/personnel

5. Did you perform any different physical activity during pregnancy/ies **in the past five years** than when you were not pregnant?

First pregnancy:

- No
 Yes ---please specify: _____

Second pregnancy:

- No
 Yes----please specify: _____

Third pregnancy:

- No
 Yes---please specify: _____

6. Did you self-medicate yourself during any of your pregnancy/ies **in the past five years**?

- No
 Yes

If yes, who did you take advice from before self-medicating? :

- Skilled health personnel
 Traditional midwife/personnel

7. After your delivery/ies **in the past five years**, did you receive medical care ('postnatal care')?

First pregnancy:

- No
 Yes

If yes, care received from:

- Skilled health personnel
 Traditional midwife/personnel

Second pregnancy:

- No
 Yes

If yes, care received from:

- Skilled health personnel
 Traditional midwife/personnel

Third pregnancy:

No

Yes

If yes, care received from:

Skilled health personnel

Traditional midwife/personnel

PART 4: PREGNANCY OUTCOME

Instruction: Please answer the following questions by ticking in the appropriate box or filling the space provided.

Pregnancy #1	Pregnancy #2	Pregnancy #3	Pregnancy #4
<input type="checkbox"/> Abortion (death prior to 7 months), or	<input type="checkbox"/> Abortion (death prior to 7 months), or	<input type="checkbox"/> Abortion (death prior to 7 months), or	<input type="checkbox"/> Abortion (death prior to 7 months), or
<input type="checkbox"/> Still birth (death after to 7 months), or	<input type="checkbox"/> Still birth (death after to 7 months), or	<input type="checkbox"/> Still birth (death after to 7 months), or	<input type="checkbox"/> Still birth (death after to 7 months), or
<input type="checkbox"/> Live birth <input type="checkbox"/> singleton birth <input type="checkbox"/> multiple birth	<input type="checkbox"/> Live birth <input type="checkbox"/> singleton birth <input type="checkbox"/> multiple birth	<input type="checkbox"/> Live birth <input type="checkbox"/> singleton birth <input type="checkbox"/> multiple birth	<input type="checkbox"/> Live birth <input type="checkbox"/> singleton birth <input type="checkbox"/> multiple birth
Year of birth _____	Year of birth _____	Year of birth _____	Year of birth _____
Delivery took place at: <input type="checkbox"/> Health facility <input type="checkbox"/> Home (please state reason/s) _____ _____ _____	Delivery took place at: <input type="checkbox"/> Health facility <input type="checkbox"/> Home (please state reason/s) _____ _____ _____	Delivery took place at: <input type="checkbox"/> Health facility <input type="checkbox"/> Home (please state reason/s) _____ _____ _____	Delivery took place at: <input type="checkbox"/> Health facility <input type="checkbox"/> Home (please state reason/s) _____ _____ _____
<input type="checkbox"/> Term (birth at 9 months), or	<input type="checkbox"/> Term (birth at 9 months), or	<input type="checkbox"/> Term (birth at 9 months), or	<input type="checkbox"/> Term (birth at 9 months), or
<input type="checkbox"/> Preterm (birth before 9 months)	<input type="checkbox"/> Preterm (birth before 9 months)	<input type="checkbox"/> Preterm (birth before 9 months)	<input type="checkbox"/> Preterm (birth before 9 months)
Birth weight _____	Birth weight _____	Birth weight _____	Birth weight _____
If multiple birth: Birth weight of twin: _____	If multiple birth: Birth weight of twin: _____	If multiple birth: Birth weight of twin: _____	If multiple birth: Birth weight of twin: _____

Questionnaire completed by:

Participant

research assistant

Appendix B. Scoring Instructions

PART 2: KNOWLEDGE QUESTIONS

The following are two sections of the survey questionnaire designed for this specific community and will be scored as follows: '1' for desirable answer and '0' for undesirable answer. There are 21 questions (14 –knowledge related and 7- practice related) in the questionnaire. Possible maximum score will therefore be 21.

1. Are you aware of family planning methods? _____ Yes No ('yes' if she mentions one or more of the following)—*please encourage participant to name as many as possible*
 - Condoms
 - Pills
 - IUD
 - Injections
 - Abstinence
 - Diaphragm
 - Spermicides
 - Withdrawal
 - Norplant
 - Other
2. Do you know of any sexually transmitted diseases? Yes No ('Yes' if she mentions one or more of the following)—*please encourage participant to name as many as possible:*
 - AIDS
 - Syphilis
 - Gonorrhea
 - Herpes
 - Chlamydia
 - Other
3. Do birth control pills prevent sexually transmitted diseases?
 - Yes
 - No
4. Do birth control injections prevent sexually transmitted diseases?
 - Yes
 - No
5. Do condoms prevent sexually transmitted diseases?
 - Yes
 - No
6. In reference to the menstrual cycle, when is a woman most likely to conceive? (desirable: between two periods)

7. At what time, in your opinion, should a pregnant woman attend her first antenatal examination? _____
- A. (Desirable): During the first three months
- B. (undesirable): After three months
8. Should a pregnant woman count her fetal movement everyday in the last three months of pregnancy? _____
- A. (Desirable): Yes
- B. (Undesirable): No
9. Do you know the danger signs of pregnancy/birth? Yes No ('yes' if she mentions one or more of the following)-*please encourage participant to name as many as possible:*
- Anemia
- Premature rupture of membranes (the bag of water breaks, and the woman has no birth pains)
- Meconium staining (waters are brown, yellow, or green)
- Prolonged labor (strong birth pains last more than a day and a night and baby is not born)
- Obstructed labor (pushing with strong birth pains for more than 1 hour and baby is not born)
- Hemorrhage (too much bleeding)
- Fits/convulsions
- Fever
- Cord prolapsed (cord comes down in front of baby)
- Retained placenta (placenta does not come out by 60 minutes after the baby is born)
- Other
10. Where would you seek help for the above mentioned problem/s? _____
- A. (desired): Skilled health professional
- B. (undesired): Traditional midwife/family/friends
11. Are you aware of the steps needed to be taken in case of labor/complications? Yes No
(Check list for awareness: 'yes' if checked one or more of the following)—*please encourage participant to name as many as possible:*
- Identified nearest health care facility to which she could go if there were problems
- Found out how to arrange transportation if necessary to go to a health care facility
- Set aside money to pay for transportation and/or medical care
- Decided who would go along if she had to go to a health care facility
- Talked with the nearest trained health worker about the upcoming birth
- Decided who would assist with the birth)
- Other

12. At what stage in pregnancy does fetal deformity most likely occur? (desirable: <12 weeks)
13. Does a baby need to receive vaccinations immediately after birth? _____
A. (desirable): Yes
B. (undesirable): No
14. Do you think a pregnant woman needs more nutritious foods than a non-pregnant woman?
A. (desirable): Yes
B. (undesirable): No

PART 3: PRACTICE QUESTIONS

1. How many times did you go for ante-natal care during your pregnancy/ies in the past five years?
 - A. Desirable – at least four times
 - B. Undesirable – less than four times
2. Action taken if bleeding occurs during pregnancy
 - A. Desirable – seek professional help
 - B. Undesirable – rest, traditional healing, herbs, OTC
3. Action taken if severe headache occurs during pregnancy
 - A. Desirable – seek professional help
 - B. Undesirable – rest, traditional healing, herbs, OTC
4. Action taken if you had swollen feet during your pregnancy
 - A. Desirable – seek professional help
 - B. Undesirable -- rest, traditional healing, herbs
5. Activity during pregnancy
 - A. Desirable – doing chores, preparing meals, walking
 - B. Undesirable – total bed rest
6. Self medication during pregnancy
 - A. Desirable – checks with skilled professional first
 - B. Undesirable – advice from traditional healer
7. After your delivery, who did you receive medical care from?
 - A. Desirable – skilled professional/traditional birth attendant
 - B. Undesirable – traditional midwife

Appendix C: Instructions for Research Assistants

General advice:

The purpose of this study is to assess the knowledge and practice of reproductive health among reproductive-age women living in Asmara, and its impact on birth outcome. In order to do this, we plan to distribute a survey questionnaire to be completed by eligible mothers.

Before approaching eligible participants:

1. Please remember that the potential participants for this study are ('inclusion criteria'):
 - a. Women in the reproductive age group (18-49years) living in Asmara
 - b. Those who were pregnant or gave birth in the past 5 years
 - c. Those women who speak/understand Tigrigna
2. Please try to reach the potential participants at social gatherings (e.g. coffee ceremonies) at your neighborhoods. In addition, you can approach those that someone from your neighborhood brings to you who fulfill the inclusion criteria.
3. Please remember **NOT** to approach women at organizations (e.g. clinics/hospitals, church...) as we are required by law to approach the directors/leaders of such places for official support letters to approach anyone who is served by them at the moment of the data collection. Due to time constraints, we will be skipping this stage and collect data from neighborhood events/social gatherings only.
4. Please explain the purpose of the study to the volunteer participant **BEFORE** you give out the questionnaire and make sure the participant understands the content. Also, give chance to the participant to ask questions.

During a conversation with a potential participant:

1. Please approach each potential participant with utmost respect and sensitivity. Please see the following instruction ('My name is xxx. We are doing a study regarding knowledge and practice of reproductive health among mothers who gave birth or have been pregnant in the past 5 years. Have you been pregnant or have given birth in the past five years? Are between the ages 18-49yrs? And understand Tigrigna? Then, if you are willing, we would like to give you a questionnaire that you can complete. It will probably take you 15-20 minutes to complete the questionnaire. I could even read it for you and note your answers if you need assistance). You do not have to say it word for word but it will give you an idea of how to start a conversation. If a potential participant is willing, ask if 'now' is an appropriate time or if you could come back later. Please confirm timing that is convenient for the participant.
2. Please put your initials (e.g. WA) on the individual data sheets (questionnaires) you collected on the top right corner. This will help me contact the individual research assistant if questions come up regarding information on a specific questionnaire.

After approaching a participant:

1. PLEASE make sure the 'completed' questionnaire is **actually complete**. Try to collect completed questionnaires from the participant directly and check it **three times** before leaving. Remember, the questionnaire is anonymous and once you leave the participant, there is no way of knowing who the incomplete questionnaire belongs to. As a consequence, new participants will need to be recruited to replace the incomplete data sheets. Please let's try to avoid making mistakes that could be prevented easily.
2. If you decide to go on a group of two, please check one another's completed questionnaires instead of your won **TWICE**, just as a precaution.

If you have any questions or comments, please e-mail me: [**contact address**]

Appendix D. Healthy Mommy Healthy Baby flyer



This is a research study (eIRB #9156) entitled 'Knowledge and practice of reproductive health among Eritrean mothers and its impact on birth outcome'

Healthy mommy healthy baby!

Are you:

-Tigrigna speaking?

-Pregnant in the past five years?

Then you could be eligible to take part in our study. This will help us come up with better ways to help mothers and their babies have a healthier life.

Let's make life better together!

For more information, please call: 07134432 or email: winta_a@yahoo.com

Appendix E. Approval from Institutional Review Board



DIVISION OF RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-5618

January 31, 2013

Winta Araya
College of Nursing
Tampa, FL 33612

RE: **Exempt Certification** for IRB#: Pro00009156
Title: Knowledge and practice of reproductive health among mothers and its impact on fetal birth outcome: A case of Eritrea

Dear Ms. Araya:

On 1/30/2013, the Institutional Review Board (IRB) determined that your research meets USF requirements and Federal Exemption criteria as outlined in the federal regulations at 45CFR46.101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

As the principal investigator for this study, it is your responsibility to ensure that this research is conducted as outlined in your application and consistent with the ethical principles outlined in the Belmont Report and with USF IRB policies and procedures. Please note that changes to this protocol may disqualify it from exempt status. Please note that you are responsible for notifying the IRB prior to implementing any changes to the currently approved protocol.

The Institutional Review Board will maintain your exemption application for a period of five years from the date of this letter or for three years after a Final Progress Report is received, whichever is longer. If you wish to continue this protocol beyond five years, you will need to submit: 1) a continuing review with Final Report selected and 2) a new application. Should you complete this study prior to the end of the five-year period, you must submit a request to close the study.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John Schinka, PhD, Chairperson
USF Institutional Review Board