TARGETED MOBILE PHONE INTERVENTION UTILIZATION IN ANTENATAL CARE AND ITS EFFECTS ON POSTNATAL OUTCOMES AMONG PREGNANT WOMEN IN A PASTORALIST COMMUNITY IN NAROK COUNTY, KENYA

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Targeted Mobile Phone Intervention Utilization in Antenatal Care and its Effects on Postnatal Outcomes among Pregnant Women in a Pastoralist Community in Narok County, Kenya

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DECLARATION

This thesis is my original work and has not been presented for a degree to any other University.

Signature ……..Date…….

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DEDICATION

This work is dedicated to my dear wife Salome Muvengei, my sons Nathan, Griffin, and Joseph, and my mother Pauline Mwende, for their unwavering support during my studies.

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ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Care
APGAR Score	Appearance, Pulse, Grimace/Reflex, Activity and Respiration Score
CAK	Communications Authority of Kenya
EID	Early infant diagnosis
FANC	Focused Antenatal Care
IPT	Intermittent Preventive Treatment
KDHS	Kenya Demographic Health Survey
LLITNs	Long Lasting Insecticide Treated Bed Nets
MCH	Maternal and Child Health
MMR	Maternal Mortality Ratio
NMR	Neonatal Mortality Ratio
OR	Odds Ratio
PMTCT	Prevention of Mother to Child Transmission
RCT	Randomized Controlled Trial
RR	Relative Risk
WHO	World Health Organization
WRA	Women of Reproductive Age

DEFINITION OF KEY TERMS

Key Term	Definition
A Pastoralist Community	Is a social group that relies primarily on livestock raising as its main economic activity and way of life. These communities are often characterized by their mobility, as they move with their herds to find fresh pastures and water sources, typically in regions where these resources are scarce or seasonally variable. Pastoralism is a traditional lifestyle found in various parts of the world, including Africa, the Middle East, Central Asia, and some parts of Europe and the Americas.
Antenatal Care	Also known as prenatal care, refers to the healthcare and support provided to pregnant women from the time of conception until the onset of labor. The goal of antenatal care is to ensure the health and well-being of both the mother and the developing fetus throughout the pregnancy. This type of care involves regular check-ups, screenings, and education to monitor and promote a healthy pregnancy.
Maternal Mortality	Is when a woman dies while expectant or within 42 days of the end of pregnancy, regardless of the site of the pregnancy and duration, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.
Mobile Phone Intervention	Refers to the use of mobile phone technology to deliver health-related services, information, and support to individuals. These interventions leverage the widespread availability and accessibility of mobile phones to promote health behaviors, manage

	health conditions, and improve health outcomes. They are particularly useful in areas with limited access to traditional healthcare services.
Postnatal Outcomes	Also known as postpartum or post-delivery outcomes, refer to the health and well-being of both the mother and the newborn in the period following childbirth. This period, often referred to as the postnatal or postpartum period, typically covers the first six weeks after delivery but can extend up to a year. Postnatal outcomes are crucial indicators of the effectiveness of maternal and newborn healthcare services and interventions.
Women of Reproductive Age	Typically refers to women who are biologically capable of conceiving and bearing children. This age range generally spans from the onset of menstruation (menarche) to the cessation of menstrual cycles (menopause), which is usually between ages 15 and 49. However, this range can vary slightly depending on individual health, genetics, and other factors.

ABSTRACT

Introduction Worldwide, complications that occur in pregnancy, at childbirth, and in the immediate postnatal period (puerperium) are the leading causes of mortality and morbidity among Women of Reproductive Age (WRA). Most women die because of complications occurring during and following pregnancy. This study was carried out to examine the effects of a mobile intervention use in antenatal care and the postnatal outcomes. **Methods** The study was conducted in four busy public hospitals in Narok County. A Randomized Controlled Trial (RCT) was conducted to determine the effect of a targeted mobile phone intervention on antenatal and postnatal clinic attendance, level of skilled attendant delivery, and the resultant postnatal outcomes. Two hundred and eighty mothers (280) were recruited. The intervention was bi-component, consisting of a standardized Short-message Service (SMS) sent fortnightly and a phone call reminder made one week (7 days) before the date the study mother had been booked to attend the ANC clinic. All study mothers were followed up from recruitment to 42 days post-delivery. Data were analyzed with Stata v14 using descriptive and inferential statistics. Ethical approval was obtained from SERU at KEMRI. **Results** Two hundred and sixty-two mothers completed the study giving a 93.6% completion rate. The mean age at enrolment of the study participants was 23.87 years (SD 5.22, 95% CI 23.23-24.50). **ANC Attendance** The intervention was associated with improved antenatal care clinic attendance amongst the study population with the mean number of antenatal visits being 4.099 visits for the 131 study participants in the intervention group while it was 2.843 visits for the 128 study participants in the non-intervention study arm giving a difference in means of 1.256 visits (95% CI 1.044-1.467, p-value < 0.0001). **Skilled Care deliveries** The intervention was associated with improvement in skilled care deliveries. The null hypothesis of there being no difference in the likelihood of a study mother being assisted to deliver by a healthcare worker by the study group, was rejected (X^2 16.810, p-value < 0.0001) indicating that the study mothers in the intervention study arm were more likely to be assisted by a healthcare worker to deliver than those in the non-intervention study arm. **Maternal Postnatal Outcomes** The intervention was associated with fewer maternal complications during and after delivery. The difference in proportion between the study participants who had a complication at birth was 17.23% (95% CI 6.51-27.94, p-value = 0.002) between the intervention (19.70%) and the non-intervention (36.92%) study arm which was statistically significant. **Neonatal Outcomes** A targeted mobile phone intervention was associated with fewer neonatal mortalities. The difference in proportion between the study participants who had neonatal mortality at birth was 9.32% (95% CI 1.91-16.74, p-value = 0.015) between the intervention (6.06%) and the non-intervention (15.38%) study arm which was statistically significant. In conclusion, a targeted mobile intervention used in antenatal care was associated with improved ANC and PNC attendance and better maternal and postnatal outcomes. We recommend utilization of this intervention in antenatal clinics in regions with pastoralist communities.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Worldwide, complications that occur in pregnancy, at childbirth, and in the immediate postnatal period (puerperium) are the leading causes of mortality and morbidity among Women of Reproductive Age (WRA) (World Health Organization WHO 2006). The trend of global burden of maternal deaths has been falling with a reported 45% reduction between 1990 and 2013 (WHO 2013). However, the burden still remains extremely high to date especially in the Lower-and-Middle-Income Countries (LMICs) despite this impressive reduction. In 2010, the World Health Organization (WHO) estimated that maternal deaths were 287,000 globally translating to almost 800 mothers dying daily (WHO 2012). In fact, every 90 seconds a woman dies of complications occurring during pregnancy and childbirth (Hogan MC et al 2010). The morbidity burden is also huge with millions of women suffering pregnancy-related illnesses or experiencing other severe consequences including infertility, obstetric fistulas, and various forms of incontinence (UNICEF 2009).

Most women die because of complications occurring during and following pregnancy that include but are not limited to hemorrhage (antepartum and post-partum), hypertension (pregnancy induced-pre-eclampsia/eclampsia and also pregnancy exacerbated), and infections. A global analysis of all the maternal mortalities between 2003 and 2009 found that 73% were due to direct obstetric complications and isolated the top three causes as hemorrhage which accounted for 27.1%, hypertensive disorders for 14% and sepsis for 10.7% (Say L et al 2014). The majority of these mortalities and morbidity are due to preventable causes and almost all of them (99%) occur in low and middle-income countries (LMICs) (WHO 2005).

Maternal Mortality Ratio (MMR) is an epidemiologic ratio used to measure maternal deaths and is defined as the number of resident maternal deaths occurring within 42 days of pregnancy termination due to complications of pregnancy, childbirth, and in the puerperium in a specified geographic area divided by total number of resident

live births for the same geographic area for a specified time period, usually a calendar year, factored by one hundred thousand (PRI 2010). The Kenya Demographic Health Survey 2022 estimated MMR for Kenya to be 355 deaths per 100,000 live births (KDHS, 2022). This was a drop from 488 deaths per 100,000 live births in 2008 and 362 deaths in 2014 (KDHS, 2014). World Bank models estimated MMR in Kenya to be 530 deaths per 100,000 live births in 2020 (World Bank, 2020). This same ratio was similarly estimated to be 687 deaths per 100,000 live births in 1990 in Kenya with a peak in 1998 at 741 deaths per 100,000 live births due to the HIV/AIDS pandemic (World Bank, 2020).

A majority of countries globally have registered a significant reduction in the MMR. It nevertheless remains high in Kenya and in some countries in Sub-Saharan Africa indicative of high maternal mortality and morbidity. The modeled global average MMR in 2015 was 223 deaths per 100,000 live births (World Bank, 2020) making the Kenyan 2022 MMR 1.6 times higher than the global average. The mean MMR in Lower and Middle Income countries (LMICs) was estimated to be 234 per 100,000 live births in 2020, again showing a major variation between Kenya's 2014 figure and other countries within this global group. These figures indicate that less than adequate progress has been made to tackle the challenge of maternal mortality and morbidity in Kenya since 1990 despite its prioritization in national policies (e.g., Linda Mama), the United Nations' Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDG's). Almost all the causes of this mortality and morbidity are preventable if expectant mothers are given adequate and quality medical care and timely interventions.

The Neonatal Mortality Rate (NMR) is another key epidemiologic indicator defined as the number of neonatal deaths per one thousand live births in a geographical area. A neonatal death is defined as the death of a baby during the first 28 days of life (0-27 days). Neonatal Mortality Rate (NMR) in Kenya was estimated by the KDHS 2014 to be 22 deaths per 1000 live births and 21 deaths per 1000 live births in 2022 (KDHS, 2022). This rate was 27 deaths per 1000 live births in 1990. Globally, the rate was estimated at 18 deaths per 1000 live births (World Bank, 2020). The Kenyan figures again indicate that less than significant progress has been made since 1990 in

its improvement and that Kenya still lags behind most countries in reduction of neonatal deaths.

These two health outcome indicators (MMR and NMR) are key and sensitive indicators of the quality of maternal and child healthcare being offered and by proxy also the general quality of healthcare delivery in a country. The NMR is a key outcome indicator for newborn care and directly reflects prenatal, intrapartum, and neonatal care (CPC ME, 2017). Early neonatal deaths (within the first 7 days of life) are more closely associated with pregnancy-related factors and maternal health, whereas late neonatal deaths (after the 7th day of life) are associated more with factors in the newborn‘s environment (CPC ME, 2017). While MMR is a measure of the risk of death once a woman has become pregnant and is considered a primary and important indicator of a geographic area’s (country, state, and county) overall health status or quality of life given that pregnancy should, as much as possible, be treated as a normal physiologic process (Lincetto et al., 2006).

Antenatal care (ANC) is one of the key high-impact strategies to improve maternal and child health globally (WHO, 2006). ANC comprises the health care services that an expectant mother receives during the course of pregnancy. World Health Organization (WHO) currently recommends at least 8 visits during the woman’s pregnancy (Lincetto, 2006, Villar 2001). These visits should be arranged based on the impact of each visit during the progress of the pregnancy and the overall cost-effectiveness. It is recommended that the first visit should occur at less than 12 weeks of gestation (first trimester of pregnancy), the second and third visits in the second trimester (20th and 26th Weeks), and the last five visits in the third trimester (at 30th, 34th, 36th, 38th and 40th week) (WHO, 2006, Villar, 2001, Pell, 2013, Lund 2012, Lund, 2014).

The purpose of these visits is to provide a package of essential services in the ANC clinics, which include; i) confirmation of pregnancy, ii) detection of any existing and/or pregnancy-related complications, iii) immunization against tetanus, iv) anemia screening and control through hemoglobin testing, v) health promotion and education on safe care at home, good nutrition, safe sex, breastfeeding, family

planning and maintaining healthy lifestyles, vi) birth and emergency preparedness vii) monitoring of pregnancy progress and assessment of materno-fetal wellbeing, viii) screening for syphilis and ix) monitoring and evaluation through data collection by recording and reporting for decision-making support (Villar, 2001). Some services are offered depending on the geographical location of the health facilities. These situational services include; i) HIV testing and counseling ii) intermittent preventive treatment (IPT) of malaria and promotion and provision of use of long-lasting Insecticide Treated bed-nets (LLITNs), iii) de-worming and iv) assessment for injuries occasioned by female genital mutilation (FGM) where it is practiced (Villar, 2001).

Women in developing countries face a lifetime risk of maternal death of 1 in 160 compared to 1 in 3700 for those in developed countries (WHO, 2014). These inequalities are driven by a myriad of causes, a major one being limited access to basic preventive services especially Antenatal Care services. In low and middle income countries, only about half of pregnant women receive the WHO recommended minimum ANC visits (WHO 2012). It is also recommended that women should have at least one or more postnatal visits within 28 days of delivery (Langlois, 2015, Mrisho, 2009).

Countries that have well-developed and quality antenatal and postnatal care services and where the ANC attendance by the population is very good have impressive maternal and neonatal outcomes. For example, in Finland where there is almost universal ANC attendance (99.8%) NMR is 1 death per 1000 live births and MMR is 3 deaths per 100000 live births (Hartikainen, 2003). Good quality ANC care can reduce maternal morbidity and mortality and perinatal morbidity (WHO, 2005, Adekanle, 2008). Early initiation of ANC and attendance of more visits are associated with higher infant birth weights and lower infant mortality rates (Cokkinides, 2001, Ochako, 2003).

Evidence exists to show that using technology in maternal health (mHealth) improves outcomes. The World Health Organization defines mHealth as “medical and public health practice supported by mobile devices, personal digital assistants

(PDA) and other wireless devices" (WHO, 2011, Agarwal, 2015). Studies show that mobile phone technology is effective at changing behaviour to improve antenatal care and postnatal care attendance. However, most of the studies in the literature are observational, and more rigorous evaluation of mHealth is necessary in a broader variety of settings.

The number of mobile subscriptions (SIM Cards) in Kenya was 53.2 million as at 30th September 2019 compared to the population of 47.5 million Kenyans according to the National Population Census of 2019 (CAK, 2019). This translated to mobile (SIM) penetration level of 112.0 percent (CAK, 2019). This penetration was 143% in the first quarter of the year 2025 (CAK, 2025). This high mobile SIM penetration is attributed to the increasing availability and access to mobile networks signal and a range of convenient mobile services available to the population. The reason why SIM penetration in the country was above 100 percent was due to multiple SIM ownership among users of cellular services given that only people who have reached the age of consent are legally allowed to own SIM cards. Leveraging on this high mobile phone penetration within the country to improve health care services and outcomes is critical.

1.2 Problem Statement

Across Sub-Saharan Africa, there is wide variation in ANC attendance (KDHS, 2014). Seventy four percent (74 %) of pregnant women attend formal ANC at least once during their pregnancy (KDHS, 2014). However, only 44% of women attend ANC four or more times (KDHS, 2014, World Bank 2015, CPC ME 2017). The Kenya Health Demographic survey (KDHS) 2014 reported that 9 in 10 mothers saw a skilled provider at least once for ANC for their most recent birth in the five-year period before the survey (Ochako, 2003). However, only 58% of women reported 4 or more visits. The proportions vary widely across counties with West Pokot County reporting a proportion of 18.2% for four or more ANC attendance while Nairobi County reported 73% (Ochako, 2003). Narok County reported 46.0% fourth ANC attendance (Ochako, 2003). It is worthwhile to note that this was a self-reported survey though, and recall bias likely to occur.

The low proportion of attendance of ANC has been correlated with poor prenatal and postnatal outcomes in Africa with maternal and infant morbidities and mortalities remaining high (Lozano, 2011; Ngabo, 2012). During scheduled ANC visits the health care providers are able to monitor the pregnant mothers well (materno-fetal wellbeing), advise on any danger signs and symptoms of pregnancy, and to pick and refer to higher levels of care complicated cases early for more specialized care (KDHS, 2014). Those mothers who attend more ANC visits are also more likely to deliver under a skilled healthcare attendant (KDHS, 2014).

Attending few ANCs also brings a challenge of being unable to perform the entire World Health Organization's recommended basic ANC package of care because some interventions require repeat visits e.g., tetanus immunization. Pregnant mothers attending ANC late in their pregnancy, which is quite common, also make it difficult to conduct those interventions such as syphilis and HIV/AIDS screening which are required to be done in early gestation and in cases of positive results, preventative interventions be instituted early such as Highly Active Anti-Retroviral Therapy (HAART).

These challenges coupled with inadequate services being offered in health facilities make the impact of antenatal services much less than would be expected. This is compounded by socio-cultural challenges and lower literacy levels in some parts of Kenya, making maternal and child health care delivery more complicated and the health outcomes less than favourable.

1.3 Study Justification

The field of mHealth and more specifically mobile technology is proposed as a potential solution to the many challenges facing low and middle countries in healthcare delivery (Watterson, 2015). Text messages have been shown to improve healthcare seeking behaviour, treatment adherence, data collection, and as a communication tool to improve patient follow-up and data reporting (Kannisto, 2014; Asangansi 2010; Chib, 2008). Given that mHealth tools have been promising in behaviour change broadly, potential exists to improve essential preventive maternal and child health services as well.

Most of the studies which have been done to examine causes of low ANC attendance and the solutions to the same have largely been observational and few interventional studies have been done especially in Kenya to examine low-cost and widely scalable innovative mobile interventions to improve ANC attendance (KDHS, 2014, World Bank, 2015, CPC ME, 2017, Pell, 2013). Many existing interventions also focus on a single component of maternal and child health preventive services instead of a design of an integrated system that follows women and children through the maternal, neonatal, and child health continuum (Tamrat, 2012).

This study was conducted in Narok County in Kenya, a majorly pastoralist community-occupied county. The county was selected firstly because the Kenya Demographic Health Survey listed the counties with mostly pastoralist communities to be among the counties with the lowest 4th ANC attendance with West Pokot County at 18.2%, Mandera at 20.2 %, Wajir 37.7%, Narok 46.0 %, Garissa 47.7% and Turkana County at 48.9% (KDHS 2014). These counties consequently have poor maternal and neonatal health outcomes (Mrisho, 2009). Secondly the counties also reported low skilled healthcare deliveries with the KDHS 2014 reporting that in Narok County, only 40% of the deliveries were assisted by a skilled healthcare attendant and only 39% of these deliveries were in a health facility, which was much lower than the mean national achievements of 62% and 61% respectively (KDHS, 2014). Thirdly, Narok County was also deemed to be representative enough given that the county also had other population groups rather than only the pastoralists, and thus the findings of the study would be applicable to other counties in Kenya as well.

There was hardly any study in literature which had been done to examine the effect of a targeted mobile phone intervention use in antenatal care and its effects on maternal and neonatal outcomes in Kenya with the few studies reported in literature focusing only on ANC attendance in and by itself without any follow-up and linkage to the postnatal outcomes. The current study aimed to build up on the pool of evidence of interventions that can improve ANC attendance and consequently help improve maternal and neonatal health outcomes with a focus on the pastoralist communities. With high mobile phone penetration in Kenya estimated at 9 in 10 Kenyans by the Communication Authority of Kenya in 2019, we could leverage on

this to improve maternal and child health indicators (CAK, 2019). The reminder system of the current intervention would also be welcome by the mothers given that they are usually quite pre-occupied with day-to-day activities taking care of their families and very easily forget the clinic dates given by the healthcare providers. This is worsened by the fact that their spouses spend a lot of time away from their families herding livestock.

The findings of this study would be useful to the County Government of Narok in designing its maternal, neonatal, and child health programs, especially in antenatal care. The Ministry of Health would also be able to use the findings to develop policy guidelines for maternal and neonatal healthcare. The mothers and the local community would also benefit from the findings of this study because they would be able to get better healthcare delivered during pregnancy and improved outcomes for the mothers' pregnancies e.g., more live babies and fewer complications for both mother and babies.

1.4 Research Questions

1. What is the effect of use of a targeted mobile phone intervention on antenatal (ANC) and postnatal (PNC) clinic attendance in a pastoralist community?
2. What is the effect of use of a targeted mobile phone intervention on the proportion of health facility-based and skilled deliveries in a pastoralist community?
3. What are the effects of use of a targeted mobile phone intervention on maternal and neonatal outcomes in a pastoralist community?

1.5 Study Objectives

1.5.1 Broad Objective

To investigate the association between the use of a targeted mobile phone intervention in the provision of antenatal care and its effect on maternal and neonatal postnatal outcomes among pregnant women in a pastoralist community in Narok County, Kenya.

1.5.2 Specific Objectives

i) To determine the mean number of visits in ANC and PNC attendance and their determinants among the study participants in the intervention group using a targeted mobile phone intervention and compare with those in the non-intervention group in a pastoralist community
ii) To determine the proportion of health facility-based deliveries in the study population and compare the study participants in the intervention and the non-intervention group
iii) To determine the postnatal maternal and neonatal outcomes and their determinants amongst the study population and compare the intervention versus the non-intervention group outcomes.

1.6 Study Hypotheses (Null)

i. A targeted mobile phone intervention use in antenatal care is not associated with improvement in ANC and PNC attendance among the intervention versus the non-intervention group in the study population.
ii. A targeted mobile phone intervention in antenatal care is not associated with improvement in proportion of health facility-based deliveries in the study population.
iii. A targeted mobile phone intervention use in antenatal care is not associated with improvement in maternal and neonatal outcomes in the study population.

1.7 Limitations and De-limitations

The study was focused on mothers in the reproductive age group who were expectant and attended the ANC in the first or second trimester. This was to allow time for follow up on the intervention. The main limitation was that this focus could have selected a group of mothers who were conscious of their health at the exclusion of others give the fact that mothers start ANC late in Kenya and across SubSaharan Africa.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the key conceptual and theoretical frameworks relating to this study and the applicable literature.

2.2 The Conceptual Framework

A targeted mobile phone intervention was utilized on the antenatal mothers attending Maternal and Child Health Clinics (MCH). The study aimed to examine the effect that would arise from using this mobile phone intervention at antenatal care on both the actual number of visits or attendance and also the postnatal outcomes for the mother and the neonate. The study hypothesized that an improvement in antenatal attendance occasioned by the mobile phone intervention would have a positive effect on postnatal outcomes. The uniqueness of the study was to study the effects of this intervention in antenatal care and the linkage of these effects to the postnatal outcomes. The recruited mothers were followed up from recruitment up to 6 weeks post-delivery. The postnatal outcomes were measured at delivery and the immediate postnatal period.

The key postnatal outcomes that were measured included:

i) Number of antenatal care visits
ii) Proportion of Postnatal clinic attendance
iii) Proportion of deliveries by skilled healthcare attendant
iv) Proportion of births delivered in a health facility
v) Modes of delivery of the mothers e.g., normal (spontaneous vertex deliveries), operational e.g., Caeserian sections
vi) Number and causes of referrals done in antenatal care clinic and the health facilities
vii) Postnatal/survival outcomes:

a) Neonatal outcomes: APGAR scores, Birth weight, Gestation at birth, Neonatal morbidities and mortalities, any congenital malformations
b) Maternal Outcomes: Admissions, type of delivery, maternal complications and other morbidities e.g., perineal tears, lacerations, episiotomies done etc., and maternal mortalities

Good postnatal outcomes were defined as those deliveries without any complications at birth or in the immediate postnatal period. Poor postnatal outcomes were those where the mother and/or the baby had complications at birth or immediate postnatal period. This is shown in the figures 1 and 2 below.

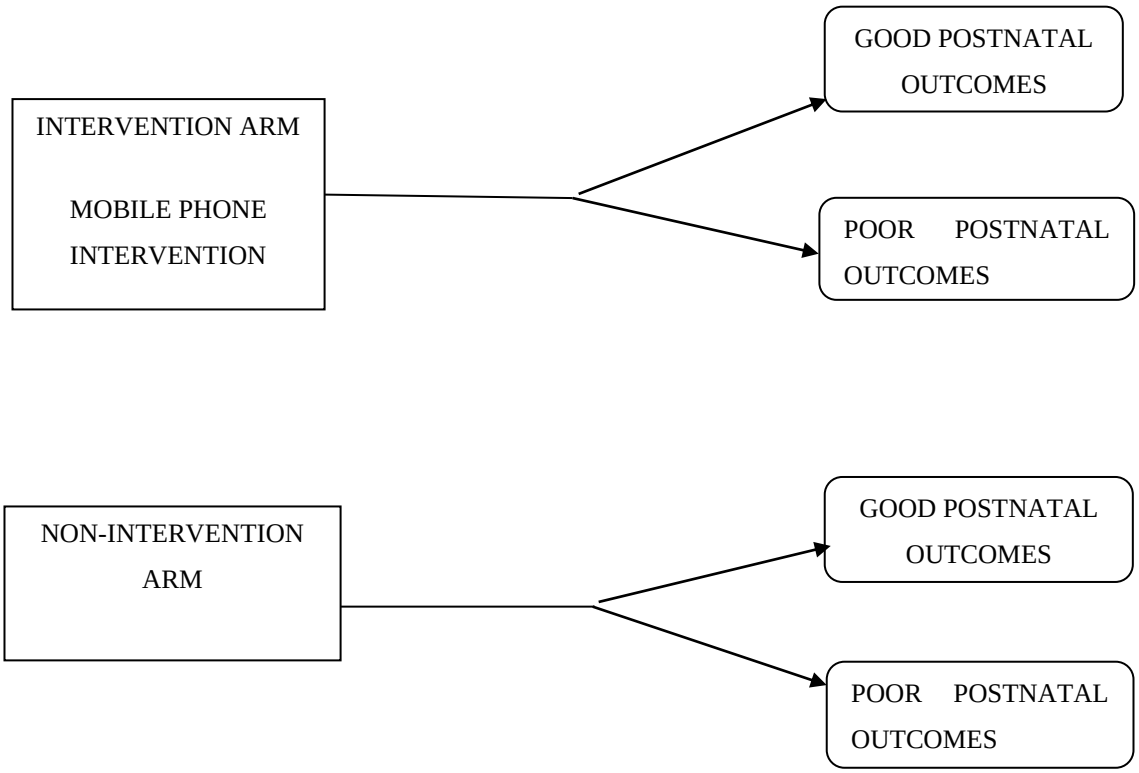


Figure 2.1: Study Arms

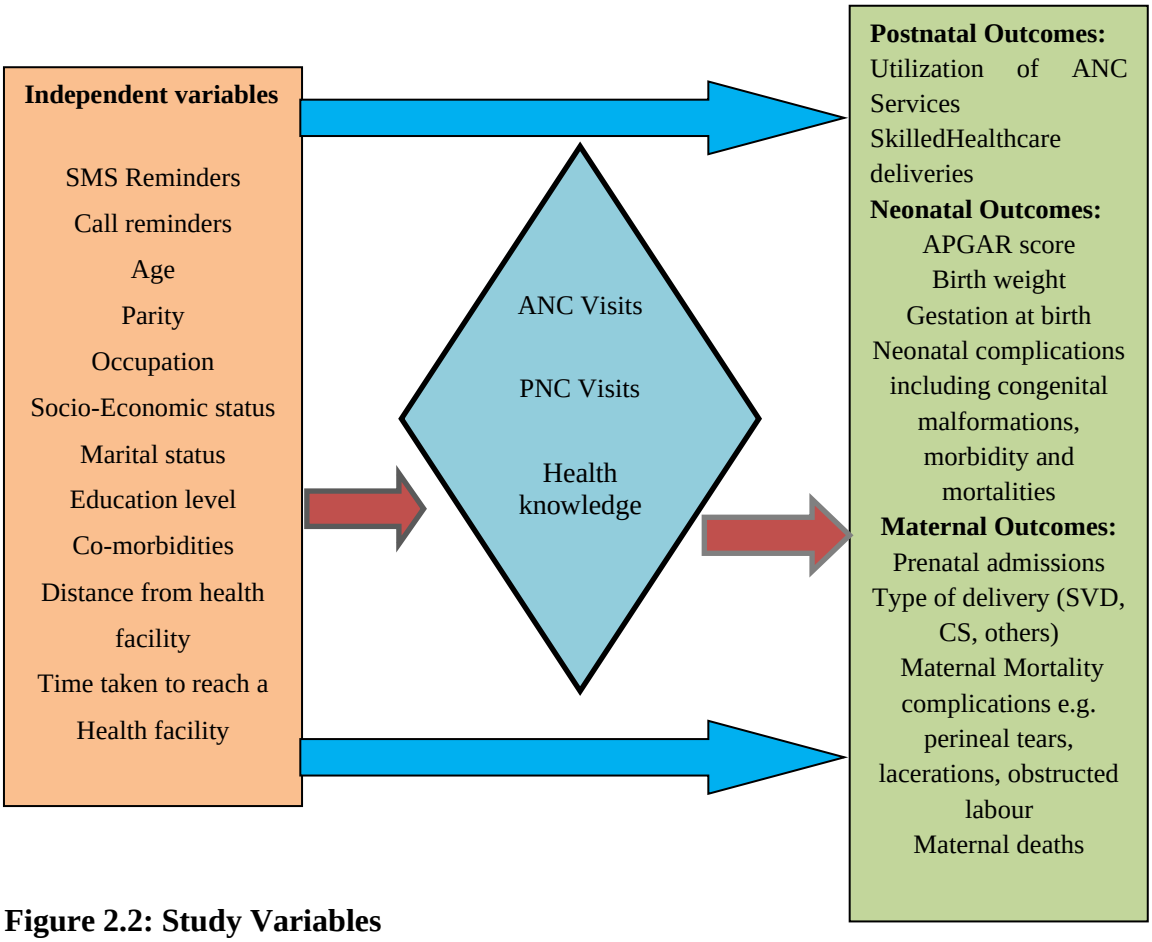


Figure 2.2: Study Variables

Source: Self

2.3 Theoretical Framework

This study was premised on three theoretical frameworks.

Health Belief Model

This theory proposes that people change behavior if they:

- *Perceive a threat*: They feel at risk for a disease – Maternal mortality and morbidity in the current study are risks
- *Perceive severity*: They think the consequences are serious – Failure to attend antenatal care can lead to death
- *Perceive benefits*: They see value in the new behavior – attending ANC care leads to safe delivery, healthy mother and baby
- *Perceive fewer barriers*: Obstacles are manageable – if people perceive that healthcare facilities are near to them they are likely to attend ANC.

- *Cue to action*: A trigger prompts them (e.g., SMS and call reminders were used in this study, doctor advice).
- *Self-efficacy*: They believe they can succeed. Attending ANC care does not involve a lot of requirements. This means any mother can attend. Some barriers like finances have been removed to make the services more accessible.

Theory of Planned Behavior (TPB)

This theory proposes that behavior is driven by:

- *Attitude toward the behavior* (is it good/bad?) – Women who believe that attending ANC clinic is good are likely to attend it.
- *Subjective norms* (what do others expect?) – Generally pregnant mothers are expected to attend the ANC clinic. The government has put mechanisms to encourage mothers to attend.
- *Perceived behavioral control* (do I have the ability/resources?) - ANC services are affordable especially in government facilities

Nudge Theory (Behavioural Economics) - This theory proposes that small changes in the environment or "choice architecture" can influence decisions without force e.g., making calls and sending SMS reminders used in this study.

2.4 Maternal Morbidity and Mortality

Women in developing countries face a huge lifetime risk of maternal death of 1 in 160 compared to 1 in 3700 for those in developed countries (WHO 2014). The inequalities causing this risk differential are driven by a myriad of causes, a major one being limited access to basic preventive services especially antenatal care services. In low and middle income countries, only about half of pregnant women receive the WHO recommended minimum ANC visits (WHO 2012). The recommendations also require that women should have at least one or more postnatal visit within 28 days of delivery (Langlois ÉV 2015, Mrisho M 2009).

2.4.1 Antenatal Care and Pregnancy-Related Outcomes

Good antenatal care (ANC) during a woman's pregnancy is very critical for the mother's health and the development of her unborn baby (WHO, 2006, WHO, 2016). A well-organized and adequately resourced quality antenatal care service provision acts as a link between the woman, her family, and the community with the formal health system. This linkage markedly increases a woman's chance of using a health facility and a skilled health attendant at delivery and this significantly contributes to her good health through her life-cycle with resultant good prenatal, antenatal, and postnatal outcomes for both the mother and her baby (WHO, 2005, PRI, 2010, WHO, 2016).

The World Health Organization and by policy adoption, the Government of Kenya currently recommends a minimum of eight visits during the course of a woman's pregnancy for non-complicated pregnancies. Antenatal care ensures that there is adequate screening for conditions that need to be screened for during pregnancy, which include malaria, HIV/AIDS, syphilis, anemia, and malnutrition, which are significantly associated with elevated maternal and neonatal morbidity and mortality. This screening leads to mothers with these conditions being picked and managed early during the pregnancy, especially in areas where these are highly prevalent (WHO, 2006).

Research has shown that adequate and quality antenatal care significantly optimizes the survival and health of babies directly through reduction of the stillbirths and neonatal deaths and indirectly by offering a vital entry point for health contact with the mother at a critical point in the continuum of care (WHO, 2005). Statistical analysis and modeling show that if 90% of expectant mothers received ANC, up to 14% or 160,000 additional newborns could be saved in Africa (WHO, 2006). Further statistical estimations through modeling have also shown that babies deaths before the onset of labour, referred to as antepartum stillbirths, account for 2/3 of the total still stillbirths in those countries which have neonatal mortality rates greater than 22 per 1000 live births - which is almost all African countries (WHO, 2006).

This means that focusing maternal care on antenatal care has a huge potential of significantly reducing these deaths.

The benefits of good ANC service provision are bigger than mortality reduction alone, and since ANC is a relatively low-cost intervention, an ANC package provides one of the most cost-effective high-impact public health interventions for women in the reproductive age group (WHO 2006). Focused ANC (FANC) services provide evidence-based interventions for all women, which are carried out at crucial time points of the pregnancy. The optimal number of ANC visits for resource-limited settings is dependent not only on its effectiveness, but also on costs and other hindrances to ANC supply and access (PRI, 2010). Encouraging mothers to attend the ANC at the earliest point in the pregnancy is critical but this remains a major challenge in developing countries with most women attending few ANCs and also quite late in the course of their pregnancy.

The quality of ANC received by mothers is also critical and can be measured by at least three dimensions; the number of actual visits done by mothers, the timing of the initiation of ANC care and the inclusion of all recommended components of antenatal care (Joshi, 2014). Users who perceive the quality of care in a health facility to be good are more likely to revisit, thereby increasing demand for services (Reerink, 1996, Dettrick, 2013). Women also rate interpersonal skills very highly in determining quality and identify 'being treated as a human being' as a clear benchmark of high quality maternal care across all socio-demographic units (Srivastava, 2015). This behooves the healthcare providers to ensure that they are sensitive in their handling of the mothers to ensure that mothers utilize these services.

There are numerous barriers to the access and uptake of ANC in Sub-Saharan Africa though the major ones are largely financial and socio-cultural (WHO, 2006). The cost of services is prohibitive in some areas making ANC attendance low. Where governments have reduced or even exempted payments for these services the healthcare facilities lack the requisite equipment to offer a full package of care as recommended by the World Health Organization. Socio-cultural factors influence

attendance with low literacy levels making communities not understand the importance of attending ANC clinics. Women including expectant mothers also remain the main workers in many households in some of these communities hence the opportunity cost of attending ANC is high. This is even more amplified in the pastoral communities where most of the men go herding livestock far distances and for prolonged periods of time leaving the woman to tend to the children and the home. A mother must of necessity make a judgment call on whether to visit the health facility for ANC or go look for food and other basic needs for the family. Distance to health facilities also contributes to these problems with mothers avoiding visiting those facilities that are deemed to be far from their areas of residence. Facility waiting times also affect service utilization with those facilities where the healthcare workers are few and service provision takes long time also contributing to mothers avoiding visiting these facilities.

Beliefs in traditional birth attendants (TBAs) also compound the problem because mothers will only visit these TBAs at birth with no prior care when they are expectant. The healthcare providers' behaviour and attitudes in maternal and child health clinics additionally compound the problem through failure to respect the privacy, confidentiality, and socio-cultural beliefs of the women negatively influencing the utilization of ANC as well as other maternal, neonatal, and child health services at large (WHO, 2006). Unfortunately, ANC coverage remains lowest among those women who need it the most i.e., the poor or low socioeconomic quintile, less educated, and those living in rural areas (WHO, 2005).

Concerted efforts should be made to encourage the utilization of ANC services by systematic reduction of the barriers to access such as user fees, limited health facility operating hours, long distance travel and waiting times and the dehumanization of care (WHO, 2005, WHO, 2006). As a crucial link in the continuum of care for women of reproductive age, ANC offers numerous opportunities to reach many women and communities with vital clinical and health promotion interventions (WHO, 2005).

Pregnancy also offers an essential window for promotion of healthy behaviours and parenting skills both to expectant mothers and their caregivers. Poor quality and inadequate care offered during this time breaks a pivotal link in the continuum of care and affects both the women and their babies (WHO, 2005, WHO, 2006). Estimates indicate that 25% of maternal deaths occur during pregnancy with high inter-country variability depending on the national prevalence of unsafe abortions, violence, and disease in that country (WHO, 2005, WHO, 2021). Between 30 and 50% of maternal deaths are attributed to causes such as hypertension (PET, Eclampsia) and hemorrhage (PPH and APH), which could be directly linked to insufficient care during pregnancy (WHO, 2013).

The social context and beliefs of the family and community positively or negatively affect health during pregnancy. It is believed in some African societies that a stillborn child should not be grieved for, making antepartum death of a baby, and especially during the last trimester of pregnancy difficult to process and accept. Some cultures encourage and promote special meals and rest for expectant mothers, but in others, pregnancy should not be acknowledged (WHO, 2021). Women thus continue to work hard in these cases, and nutritional taboos can deprive them of getting essential nutrients, exacerbating nutritional deficiencies, particularly of proteins, iron and other minerals, and certain vitamins.

An ANC package that's effective will depend on competent healthcare workers in a functional health system with laboratory support, adequate pharmacological and non-pharmacological supplies, and an optimal referral system (WHO, 2021). Women who have had at least one ANC visit are more likely to utilize a skilled birth attendant to give birth (Lincetto, 2006, WHO, 2021). The first ANC visit is required to be as early as possible in pregnancy, more suitably in the first trimester. The final visit should be as near as possible to the due date of delivery to assure that suitable advice and care have been offered to prevent and manage any complications that may be picked such as multiple pregnancy (e.g., twins), post-maturity (birth after 42 weeks of pregnancy), and abnormal presentations of the baby (e.g., breech).

2.4.2 ANC Coverage and Trends

Currently, globally, 71% of women receive some antenatal care (WHO, 2005). In industrialized countries, over 95% of expectant mothers access ANC care (WHO, 2005). In Sub-Saharan Africa (SSA), 69% of expectant women receive at least one ANC visit, more than in South Asia at 54% (WHO, 2021). Coverage for at least four ANC visits is lower at 44% (WHO, 2021). The trends show slower progress in SSA than in other regions with a reported increase of only 4% in the previous decade (WHO, 2005, WHO, 2011).

Inequity persists in Africa, with 80% of women in the highest economic quintile having access to 3 or more ANC visits while only 48% of the lowest economic quintile have the similar level of access. There is a similar disparity between rural and urban women. However, the gap is smaller between the poor and the rich in ANC than in skilled attendance during delivery within the care continuum, being available to only a quarter of the poorest women in SSA while reaching 81% of the richest (Agarwal, 2015, WHO, 2021). The proportion of expectant mothers who attended 4 or more visits in Africa increased by 6% over the last 10 years (WHO, 2021). Likewise, the proportion of mothers who received ANC in the first six months of pregnancy went up by 10% over the decade, which was faster than the overall ANC coverage increase (WHO, 2021).

Assessing coverage alone provides no information on the quality of healthcare provision and poor quality of services in African health facilities correlated with insufficient service utilization is common. This occurs due to an inadequate number of skilled health workers especially in rural and remote areas, lack of guidelines and protocols of care, few health products supplies, and poor behaviour and attitudes of health workers (Ngabo, 2012, WHO, 2021).

2.5 Telephone Interventions and Outcomes of Antenatal Care

Telephone interventions as part of health services and mHealth i.e., health services provision through mobile communication technologies, have grown in popularity reaching those who previously may not have been reached (Consulting, 2009). At the

closure of the last century (20th), the telephone was suggested as one of the most underutilized resources in health care (Oda, 1995, Lattimer, 1998). However, the use of telephone communication as a means of providing health care support was not new having been with us from the dawn of the 20th Century. In fact, the first report of its use appeared in an issue of the Lancet in 1897 when a healthcare provider used communication via telephone to diagnose croup in a child (Lavender, 2013, Fosarelli, 1983).

There are various forms of mobile phone support available. The support may be passive, whereby it is only available when requested, or it may be proactively offered (Lavender, 2013). The medium for the support may be text messaging, multimedia messages, or even verbal communication (Jareethum, 2008). Support may be offered by a healthcare professional or a layperson (Lavender 2013). Telephone support may target a particular subset of the population, with the commonality of a particular medical condition e.g., Diabetes or it may be used in health promotion e.g., to support weight loss programmes (Lavender, 2013).

Several outcome measures have been used. For maternal outcomes general health using the General Health Questionnaire has been used for surveys. Others include mortality and morbidity measures, health service utilization index, postpartum depression scores e.g., using the Edinburgh Postnatal Depression Scores (EPDS), and positive behavioural change measures e.g. smoking cessation (Lavender, 2013). Measured infant outcomes have included preterm births, birth weight, breastfeeding duration, developmental milestones (physical or cognitive), infant mortality rates and morbidity. Service utilization indices and costs have also been used to measure postnatal outcomes (Lavender, 2013, Fosarelli, 1983).

Different study designs have also been used to study these support systems including cohorts, Randomized Control Trials, and cross-sectional designs. The RCTs still give the highest validity of results though few have been done in the low resource settings. It is difficult to blind staff and participants to a randomization group for telephone-based type of interventions making it hard to control for some biases (Lavender, 2013). Blinding for the outcome assessment may be done to control for

detection bias but it largely depends on the outcome being measured. Another major challenge in most of these studies has been the completeness of data due to attrition and inadequate explanations on how exclusions of participants from analysis affected the study conclusions (Lavender, 2013, Fosarelli, 1983, Jareethum, 2008).

Various studies have investigated telephone support in pregnancy with a variety of outcomes being reported. A systematic review of the available studies concluded that the results have been inconsistent and inconclusive although evidence exists showing that telephone support offers a promising intervention. Studies by Boehm et al and Smith et al reported that there was no clear difference between women receiving and those not receiving telephone support regarding the proportion utilizing the health services, with a mean difference of 0.24, 95% confidence interval (CI) of -0.26 to 0.74 with both studies involving 563 women cumulatively (Boehm, 1996, Smith, 2008). Smith et al also found no clear differences between the study groups on antenatal admissions with a relative risk being 1.61, 95% CI of 0.95 to 2.75, and a sample size of 554 (Smith, 2008). These studies provided wide confidence intervals and crossed zero and one for confidence intervals and relative risk respectively, making p values likely to be greater than 0.05 and hence not statistically significant. In the Boehm et al study of 2008 which was a randomized controlled trial they also reported inadequate evidence on length of hospital stay by randomization group with a mean difference of 0.81 days, 95% CI of -1.51 to 3.18, again a large CI and crossing zero meaning that it was not statistically significant (Boehm, 1996).

A 2009 study on postpartum depression following a phone intervention by Dennis et al also found no clear difference between the groups with Relative risk (RR) of 0.65, 95% CI of 0.34 to 1.23 with a sample of 612 women (Dennis, 2009). Four trials also studied cotinine-validated smoking cessation in pregnancy and consolidated results did not indicate strong evidence of mothers being less likely to be smoking at the end of pregnancy, RR of 1.12, 95% CI of 0.87 to 1.44 (Lavender, 2013).

A telephone intervention on breastfeeding among women found that the women in the intervention group were more likely to be breastfeeding, RR of 1.21, 95% CI 1.06 to 1.38 with a sample of 691 women at 6 months postpartum (Bunik, 2007). A

further three trials examined exclusive breastfeeding at 3 and 6 months with pooled results indicating a statistically significant difference between the two groups, with women who had received the telephone support being more likely to be exclusively breastfeeding, with RR of 1.51, 95% CI of 1.19 to 1.93, total sample size of 411 women at third and sixth month (Lavender, 2013, Bunik, 2007, Bunik, 2007).

Studies that reported on admission to neonatal intensive care units found significant differences with fewer admissions in women who had received telephone support, RR of 0.71, 95% CI of 0.52 to 0.97 with a pooled sample of 2403 women (Smith, 2008, Bryce, 1991).

2.5.1 mHealth as a Tool for Human Resource Support

Phone support is a technological support tool that offers many advantages for health care support by providing efficiencies at work and reducing staff requirements, especially in Africa where the staffing levels are low. WHO estimates that based on population need, there is a shortage of about 7.2 million healthcare workers which is expected to rise to about 12.9 million globally by 2035 (WHO, 2005). Of the 57 countries facing shortages, 36 countries are in Sub-Saharan Africa (WHO 2010, UNICEF, 2012). Leveraging on technology to provide services becomes imperative. Some of the strategies for mHealth include using mobile phones to collect data, to train, to communicate, as job aids, and as decision support tools, and also for promotion of healthy behaviours within the community (Langlois, 2015).

Key challenges in the adoption and utilization of mobile tools by health workers have been identified as; poor network reception (World Bank, 2015, Andreatta, 2011, Lori, 2012, Cole-Ceesay, 2010), poor health system capacity to integrate the patient records into existing electronic health records (Macleod, 2012, Blank, 2013) and challenges in training health workers in implementing the mHealth interventions (World Bank, 2015, Cole-Ceesay, 2010, Chaiyachati, 2013, Chib, 2010). At the community level challenges such as poverty and low literacy levels also compound the problem. However, with the near ubiquity of mobile phones globally and improved literacy levels, these tools will become more and more useful for health care delivery.

The paucity of evidence on how mHealth strategies may improve health outcomes, health system inefficiencies, and cost-effectiveness of service delivery remains among the biggest knowledge gaps, especially in maternal, neonatal, and child health care services in low-resource setting countries (Langlois, 2015).

2.5.2 Other Areas of Application of Mobile Phone Technology (mHealth) in Healthcare Delivery

Mobile phone interventions have also been applied in other spheres of medical care. In Africa, several studies have found mobile phone interventions to be effective for various activities including; data collection (Reerink, 1996, Andreatta, 2011, Asiimwe, 2011, Chang, 2011, Grameen, 2011), managing Community Health Workers (CHWs) (Zurovac, 2011), providing alerts for adherence to drugs, appointments and test reminders (Crankshaw, 2010, Haberer, 2010, Kunutsor, 2010, Lester, 2010, Pop-Eleches, 2011), receiving and sharing information (L'Engle, 2009, Mitchell, 2011), and xfor knowledge promotion through interactive quizzes (Danis, 2010).

A study on using the HIV infant tracking system (HITSystem) to improve Early Infant Diagnosis (EID) quality and retention in Kenya found that retention at 9 months more than doubled at the 2 study sites involved, 45.1% vs 93.0% at the urban facility and 43.2 vs 94.1% at the peri-urban facility, both findings statistically significant with p values less than 0.0001 (Finocchario-Kessler, 2014). This study used text messages to encourage attendance at the comprehensive care clinics. The intervention also improved the proportion of HEI initiated on antiretroviral therapy. Other studies have also looked at adult HIV populations.

2.5.3 Community Vulnerabilities of mHealth Interventions

Any mHealth intervention to be implemented must strive to address the socio-cultural, informational, economic, and individual vulnerabilities in the community (Chib, 2013). Failure to address this results in the uptake and acceptability being low, making the intervention ineffective. SMS interventions in remote areas have some key advantages including; their low cost, their ability to deliver information during

network outages, and their ability to offer privacy and anonymity in delivering sensitive communication (, 2013).

To handle these vulnerabilities, interventions must include the local communities in the designing stage to ensure they are clear and communicate what is intended (Chib, 2009). Automated voice messages in local languages and other formats including multi-media messages could be used to reach people with low education levels (Chib, 13).

2.5.4 Safety Profile of Mobile Phone Usage during Pregnancy

Mobile phones are largely safe in pregnancy although research is still ongoing. A large cohort study using the Danish National Birth Cohort (DNBC) with 41,000 singleton live births found no evidence of association between prenatal cell phone use and motor or cognitive developmental delays among infants at 6 and 18 months of age (Divan, 2011). Their logistic regression model showed an adjusted OR of 1.1, 95% CI of 0.9 to 1.3 for cognitive/language, and 0.9, 95% CI of 0.8 to 1.0 for motor developmental delays (Divan, 2011).

Other studies in both human and animal subjects found mixed results with a majority reporting no effect or better effects on the intervention arms and some studies reporting impairment in the intervention arm (Fragopoulou, 2010).

In conclusion, most of the studies using mobile phone interventions that have been done have been conducted in high-resource settings and have been mostly non-interventional with few trials being done in low-resource settings or developing countries (World Bank, 2015, Plato, 2016, Rasmussen, 2011). This limits the external validity of these studies particularly since it is conceivable that telephone interventions have a potential for greater impact in environments where health services are unavailable or are hard to access (Plato, 2016). The findings of the studies have also been mixed. The majority of the studies have also not focused on examining low-cost interventions to improve the attendance of ANC and how this affects postnatal outcomes, especially in resource-limited settings. This study sought to fill these knowledge gaps and hopefully develop a scalable intervention for the

pastoralist communities, which could improve their postnatal outcomes that remain poor currently.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

This study was conducted in four public hospitals in Narok County, one of the 47 counties of Kenya. The county is situated in the southern part of the Great Rift Valley lying between latitudes 0° 50´ and 1° 50´ South and longitudes 35º 28´ and 36º 25´ East and bordering the Republic of Tanzania and six other Kenyan counties – Bomet, Kajiado, Kisii, Migori, Nakuru and Nyamira (Narok County 2020).

Table 3.1: Table Showing the Key Population Indicators for Narok County 2019

Indicator	Units of Measurement	2019 Census
Total Population	Persons	1,157,873
Population: Male	Persons	579,042
Population: Female	Persons	578,805
Land Area	Square Km	17,950
Population Density	Number per Sq. Km	65
Number of Households	Number	241,125
Average Household size	Number	5

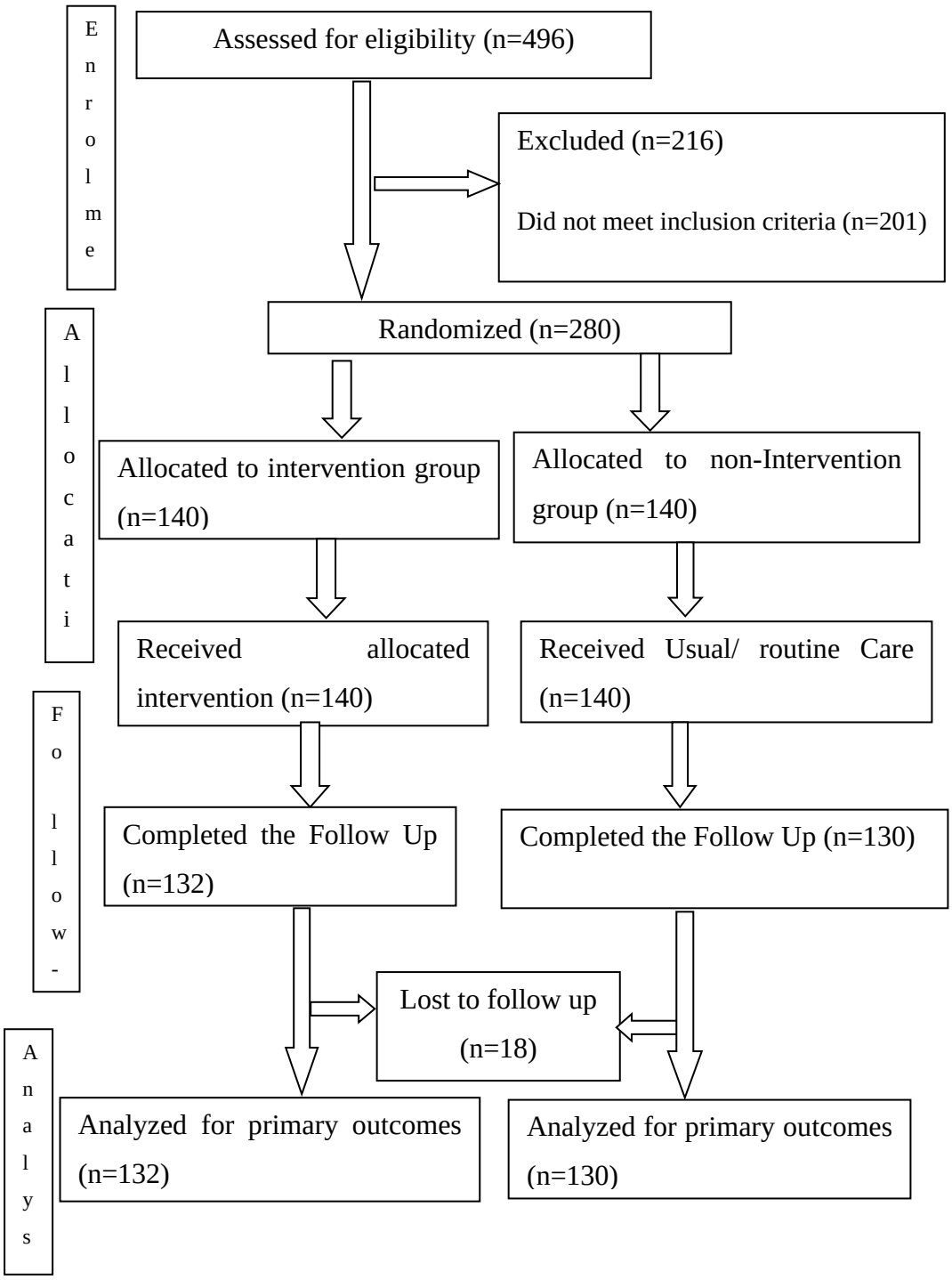
The total population in the county was 1,157,873 persons according to the 2019 Kenya National Household and Population Census. The main population indicators from the census are summarized in table 1 above. The County is composed predominantly of the Maasai ethnic group, which is a major pastoralist community. Other ethnic groups found there include the Kikuyus, Kalenjins, Kambas, and Kisiis, with these other tribes being concentrated mainly in the urban areas. The main economic activities in the county include farming, tourism, mining, and business. The agricultural activities carried out in the county include livestock rearing, wheat, barley, maize, beans, Irish potatoes, and horticultural farming.

The participating facilities in the study included the Narok County Referral Hospital (GPS Coordinate -1.08° South (Latitude), 35.87° East (Longitude) , a level 5

hospital; Ololunga Sub-County Hospital (GPS Coordinate Latitude: -1.00872 S, Longitude: 35.6611 E), a level 4 health facility; Ntulele Health Centre (GPS Coordinate -1.09223 S (latitude) and 36.09116 E (longitude) and Mulot Health Centre (GPS Coordinate Latitude -0.926217 S. Longitude 35.414879 E), both level 3 health facilities. These were picked for the study because they reported the highest workload compared to other facilities for maternal and child health according to the Kenya District Health Information System (DHIS) 2 in Narok County for the year preceding the start of the study (2017) and thus the data obtained would be representative of the county. They were also well distributed within the county with each facility being located in a different sub-county. Narok CRH is located in Narok North Sub-county, Ololunga SCH in Narok South Sub-county, Ntulele HC in Narok East Sub-county, and Mulot HC in Narok West Sub-county.

3.2 Study Design

This study used a quantitative methods approach. A Randomized Controlled Trial (RCT) was conducted to determine the effect of a targeted mobile phone intervention on antenatal and postnatal care attendance, level of skilled attendant delivery, and also the resultant postnatal outcomes. RCT was deemed the best design for this study because it would provide unbiased results given that this design balances biases across the study groups. The flow chart below (Figure 3) depicts how the quantitative study was designed and conducted.



The study was conducted on pregnant mothers recruited early in pregnancy within their first or second trimester who were enrolled on providing informed consent and followed up for up to 42 days after delivery at the ANC/Maternal and Child Health clinics (MCH). It had two arms, an intervention and a non-intervention arm. A

targeted mobile phone intervention was developed and administered to the women/mothers in the intervention study arm while those in the non-intervention arm were provided with routine or usual antenatal care.

The intervention consisted of two components; the first was a standardized Short-Message Service (SMS) designed to include health education on the importance of antenatal care attendance and a reminder to attend the ANC clinic regularly. This message was sent fortnightly (two-weekly) using an individualized messaging system immediately after the mother was recruited. The second component was a phone call reminder that was made one week (7 days) before the date the study mother had been booked to attend the ANC clinic. Bookings were done monthly from the date of recruitment.

Standardization of the intervention was done using panel discussions with key members of the team i.e., a clinician, antenatal care/MCH nurses, a social worker, and the expectant mothers in the participating county before the study began. This enabled the researcher to localize the intervention to the community participating in the research. The message was translated into Swahili language to enable it to reach all the ethnic groups within the county. A piloting of the intervention was done in March 2018 in Nairobi County (Mbagathi DH) before the study was rolled out to ensure consistency and that the message was well understood by the mothers. At least two research assistants (mostly nurses) were recruited at each participating facility and were trained on the study protocol and the study registers in April and May 2018. Where a nurse was unavailable, other cadres were also involved e.g., nutritionists. They were then tasked with the implementation of the study which involved recruitment, enrolment, timely sending of the standard text message to each mother in the intervention arm, and calling of these study participants at the scheduled times. This information was maintained in the study registers. They were also involved in the clinical follow-up of the patients and patient record management in the clinics during the study period.

Recruitment was done by the research assistants at their workstations, after which they would immediately call the principal investigator to inform him about the

recruited study mother. The principal investigator, who had developed study random numbers before the commencement of the study, would then allocate the newly recruited mother to their specific study arm i.e., intervention or non-intervention using this generated list of random numbers, and then relay this information to the research assistants. This would then be recorded in the study registers and depending on the study arm to which the mother fitted in, the intervention would be commenced immediately. Recruitment began in June 2018 and the study closed in March 2021.

The postnatal outcomes were measured at birth in the maternity wards. Clinicians were involved in the monitoring of the mothers during labour, delivery, and immediately post-delivery (labour and birth management). The outcomes of interest were recorded in the study questionnaire upon checking the facility postnatal registers in the maternity wards. For those study mothers not found in those registers, their data were collected from the antenatal booklets when the mothers came to the postnatal clinics for immunization. Those study mothers who did not deliver in any of the participating health facilities and did not come for the immunizations were called using the phone numbers that they had provided on recruitment and the outcomes of their pregnancies were recorded in the registers. Those mothers who delivered at home were advised to bring their babies for immunization. All study mothers were followed up to 42 days post-delivery.

This study also aimed to evaluate the adequacy and quality of services offered to the mothers at the participating facilities to find out any gaps that could be addressed later by the county health management teams. To evaluate the adequacy and quality of the health services offered, the available services at each facility were recorded and assessed. The study also examined the decision-making processes within this community.

3.3 Study Population

The study population comprised expectant women who were attending antenatal care at the Maternal and Child Health Clinics in the four participating health facilities.

3.4 Inclusion and Exclusion Criteria

The inclusion criteria were:

i) Any woman in the reproductive age (WRA) group (15-49 years)
ii) Expectant
iii) Must have been in the first or second trimester of pregnancy
iv) Must have owned a mobile phone or have access to one at the household level
v) Must have been resident in the county of Narok for at least 5 years prior to recruitment (to enable adequate follow up)
vi) Minors (under 18-year-olds) were required to have a caregiver who would give informed consent e.g., a parent or guardian

The exclusion criteria were:

i) Women in WRA who were pregnant and had co-morbidities e.g., hypertension or Diabetes mellitus at the time of recruitment

3.5 Sample Size Calculation

The alpha (Type 1 error) was assumed to be 0.05 while the power of the study was estimated at 80% with a Type 2 error of 0.2. The study arms were of equal size. The proportion of deliveries assisted by a skilled healthcare attendant in Narok was estimated at 0.40 by the Kenya Demographic Health Survey (KDHS) 2014). The study assumed a clinically significant improvement of 0.20 making this proportion 0.60 which was equivalent to the national mean for skilled healthcare deliveries. Using the Fleiss' formula, the sample size calculation gave a sample size of 107 ANC mothers in each study arm (Dell, 2002). To account for dropouts in the course of the study, a 10% adjustment was made to the sample size giving approximately 120 ANC mothers per study group.

$n = C * \frac{(p_c q_c + p_e q_e)}{} + \frac{2}{} + 2 = 7.85\ ((0.4*0.6) + (0.6*0.4))/0.2^2 + (2/0.2) + 2 = (7.85*12) +10+2$

d^2 d

= 94.2 + 12 = 106.2 = ~ 107

Where;

n is the sample size per group

p_c is the proportion in the control group

p_e is the proportion in the experimental group

$q_c = 1 – p_c$ and $q_e = 1 - p_e$

d is the difference between pc and pe expressed as a positive quantity

C is a constant that depends on the values alpha and beta chosen (0.05 and 0.8) giving 7.85

Contamination was also an anticipated challenge in this trial. Though cluster randomization has been suggested as a way to handle contamination, randomization by clusters introduces bias including recruitment bias. Studies in the area of oncology for cancer trials have found that the mean proportion of crossover from one treatment arm to the other is 18% (Dell 2002). This is analogous to contamination. Torgerson et al suggest that if normal trials increased sample size, then contamination could potentially be controlled (Torgerson 2001). This study made an adjustment of 18% to the sample size to account for contamination. This gave an additional 20 study participants per arm. Thus, the total sample size became 140 per study arm (n=280).

3.6 Recruitment

Recruitment of study participants was done on the basis of a mother being expectant and attending her first ANC within the first or second trimester. The four participating facilities were used as recruitment centres. Public notices about the study were prepared and placed at the hospitals' notice boards and common notice boards including at the public administration areas e.g., area chiefs' notice boards.

Notices to the local administrators were also used for sensitization of the community. The maternal and child health clinics (MCH) were used as the focal points of recruitment and enrolment. Permission to carry out the study was obtained from the Narok County Director of Health (CDH) and the Sub-County Medical Officers of Health (SMOHs) in each sub-county prior to starting the study.

All participating mothers were required to own mobile phones and in case they did not have a mobile phone, to have a contact within the household who owned a phone e.g., a spouse or parent. In cases where the study mother was not the primary owner of the mobile phone, the person owning the phone was contacted and together with the participating mother they were educated on the importance of antenatal care. The secondary phone contact was then informed and agreed to always promptly relay the messages and calls he or she received to the expectant mother.

Mobile phone numbers were used as the unique identifiers. Randomization was done at individual level. For allocation to the two study arms the mobile phone number was used. These numbers were serialized beginning from number 1 to 280 (determined sample size). A Random allocation list into the two arms of study was maintained centrally by the principal researcher.

3.7 Data Collection Tools

Data were collected using registers and questionnaires by the researcher and the research assistants. Simple random method was used. A pre-testing of the study data collection tools was conducted at Mbagathi County Referral Hospital in Nairobi before rolling out the study to test for ease of use of the questionnaire and consistency and flow of the questions. The questionnaire was divided into different sections with each section being filled at different times in the course of the pregnancy. On recruitment into the study, section A consisting of baseline data was filled. A baseline clinical examination was also carried out using the study clinical examination form (Section B). The questionnaire was then filed. Follow up examination was then done using the mothers' Ministry of Health approved Antenatal Booklet.

Section C of the questionnaire was administered at birth or at the first postnatal visit to collect data on the postnatal outcomes. Medical records i.e., the ANC and PNC registers were examined to extract information on the number of ANC visits/attendance by the study participant and also from the postnatal registers to obtain information on the postnatal attendance and outcomes using a generated checklist.

3.8 Reliability and Validity of Data Collection Tools

Validity

Content validity

Content validity was ensured by developing the data collection tools based on the study objectives, conceptual framework, and a review of relevant literature on mobile health interventions, antenatal care utilization, and postnatal outcomes. The questionnaire and SMS intervention content was reviewed by a few selected experts in public health, maternal and child health, and mHealth to assess the relevance, adequacy, and representativeness of the items.

Face validity

Face validity was assessed through pre-testing of the tools among pregnant women community with similar characteristics to the study population but outside the study area. The feedback obtained was used to refine question wording, sequence, and clarity, ensuring the tools were culturally appropriate, easily understood, and acceptable to respondents. SMS messages were also assessed for clarity, language suitability (Swahili/Maa), and appropriateness to the local context.

Construct validity

Construct validity was addressed by ensuring that key concepts such as antenatal care utilization, knowledge of maternal health, adherence to ANC schedules, and postnatal health-seeking behaviour were measured using multiple related indicators

rather than single items. Where possible, questionnaire items were adapted from previously validated tools used in maternal health and mHealth studies.

Criterion-related validity

Where feasible, self-reported data on antenatal visits and postnatal service utilization was cross-checked with available facility records or maternal health booklets to enhance accuracy and credibility of the findings.

Reliability

Pre-testing of tools

Reliability of the data collection tools was enhanced through pre-testing to identify ambiguous, inconsistent, or misleading items. Necessary revisions were made before commencement of the main study.

Internal consistency

Internal consistency of multi-item scales (e.g., knowledge, attitudes, and utilization measures) was assessed using Cronbach's alpha coefficient during data analysis. A Cronbach's alpha value of 0.8 was found to be acceptable.

Standardization of data collection procedures

To ensure reliability, standardized data collection procedures were used. Research assistants were trained on the study objectives, interviewing techniques, ethical considerations, and use of the data collection tools. Uniform SMS message content, timing, and frequency was maintained for all participants receiving the intervention.

Interviewer reliability

Interviewer bias was minimized through rigorous training, supervision, and routine field monitoring. Completed questionnaires were checked daily for completeness and consistency.

3.9 Data Analysis

Data were entered into MS Excel sheets and then exported to Stata. Data Analysis was done using Stata Statistical Software v14. The data were collected in various scales including nominal, ordinal, interval, and ratio scales. Results were presented in the form of tables, graphs, and charts. Descriptive and inferential statistics were used for analysis. Descriptive statistics using means, medians, and standard deviations was done while inferential statistics used Student t-tests and Chi-Square tests. Intent-to-Treat was the basis for analysis.

For the first secondary objective on determination of the mean number of visits of ANC attendance for both groups, a mean of the number of visits of ANC attendances was calculated for each group. The difference between the two means was calculated and then compared using Student t test to test for significance. For the second secondary objective on determination of the proportion of health facility-based deliveries in the study population, the proportion of deliveries conducted in a health facility was calculated for each group. The resulting proportions were then compared using the Student t-test to test for the significance. The third objective on determination of the postnatal maternal and neonatal outcomes amongst the study population, for each postnatal outcome, means and proportions were calculated for each group. These were also compared using the student t-test and Chi-Square to test for significance.

Associations were studied using Odds ratio and chi-square. Odds ratios were calculated for the two groups with each group's outcomes divided into good and poor postnatal outcomes. Further statistical analysis using bi-variate and multi-variate analysis was done using logistic and Poisson regressions.

3.10 Ethical Approval

Informed Consent

Participants were voluntarily recruited into this study after being informed about the study with the benefits and risks highlighted for them. No person was coerced to

participate in the study. Informed consent forms were signed. Participants were accorded confidentiality and privacy with data stored in well-secured places under lock and key. Participant personal identifiers were coded to avoid leakage during analysis. Data security was enforced through password protection and control of access to only the key research persons.

This study involved little risk of harm to participants hence any risk of harm to the study participants was minimal which was highlighted to the study participants.

Every mother who visited the health facilities whether involved in the study or not was accorded the right of service and thus no participant was denied service even if they opted out in the course of the study. The research assistants also ensured equity in service provision with no preferential treatment of the study participants. Adequate and appropriate referral mechanisms were instituted in consultation with the county leadership for those patients who needed them.

The study proposal was approved by the JKUAT Graduate School. Then ethical approval for the study was obtained from the Kenya Medical Research Institute's Scientific and Ethics Review Unit (SERU) protocol number KEMRI/SERU/001/3573. Research integrity was ensured by the researcher by avoiding malpractices like data falsification.

3.11 Expected Results

The researcher expected to find that the proportion of ANC and PNC attendances among the ANC mothers during their pregnancy would be higher in the intervention arm compared to those in the usual or routine care arm. It was also expected that the proportion of health facility-based deliveries would be higher in the intervention arm than in the routine care arm. The postnatal outcomes would also be expected to be better in the intervention study arm compared to the usual or routine care arm.

CHAPTER FOUR

RESULTS

4.1 Baseline Characteristics

Two hundred and sixty two participants completed the study giving a response rate of 93.5%. The tables below (Table 4.1A - C) show a summary of all the baseline characteristics.

Table 4.1A: Table showing the Baseline Demographic Characteristics of Study Participants by Study Group

Variable	Intervention Arm (N=132) [a]	Non-Intervention Arm (N=130) [a]
Age (Years)	24.29 ± 5.29	23.44 ± 5.12
Marital Status: n (%)		
Married	115 (87.12)	111 (85.38)
Single	16 (12.12)	19 (14.62)
Separated	1 (0.38)	
Parity (Number of children)	1 ± 1.03	0.88 ± 1.29
Level of Education: n (%)		
Never Attended		7 (5.38)
Primary	47 (35.61)	47 (36.15)
Secondary	53 (40.15)	47 (36.15)
Tertiary	32 (24.24)	29 (22.31)
Level of Education attained by Spouses: n (%)		
Never Attended	1 (0.76)	4 (3.08)
Primary	30 (22.73)	30 (23.08)
Secondary	47 (35.61)	48 (36.92)
Tertiary	38 (28.79)	29 (22.31)
Distance to a Health Facility: n (%)		
Less than 1 km	24 (18.18)	19 (14.62)
1 to 5 km	74 (56.06)	90 (69.23)
More than 5 km	34 (25.76)	21 (16.15)
Time taken to a Health Facility: n (%)		
Less than 15 minutes	20 (15.15)	12 (9.23)
15 to 30 minutes	38 (28.79)	35 (26.92)
30 to 60 minutes	56 (42.42)	74 (56.92)
More than 60 minutes	18 (13.64)	6 (6.92)

Values are Means ± SD unless otherwise indicated

[a] Numbers may not add up to 132 or 130 due to missing values

Table 4.1B: Table showing the Baseline Social Characteristics of Study Participants

Variable	Intervention Arm (N=132) [a]	Non-Intervention Arm (N=130) [a]
Spouses' Drinking/Smoking status: n (%)		
Didn't Drink or Smoke	95 (83.33)	92 (84.4)
Drank and/or smoked	19 (16.67)	17 (15.6)
Key Decision Maker at Family Level: n (%)		
Couple together	41 (31.06)	41 (31.54)
Husband	33 (25)	32 (24.62)
Study Participant	53 (40.15)	51 (39.23)
Parent and Others	4 (3.03)	5 (3.85)

Table 4.1C: Table showing the Baseline Anthropometric Measurements of Study Participants

Variable	Intervention Arm (N=132) [a]	Non-Intervention Arm (N=130) [a]
Mothers with Previous Scar: n (%)		
With Scar	13 (9.85)	8 (6.15)
Without Scar	119 (90.85)	122 (93.85)
Height (Metres)	1.578 ± 0.066	1.57 ± 0.061
Weight (Kg)	61.35 ± 10.48	60.45 ± 10.79
BMI	24.92 ± 4.52	24.62 ± 4.77
Systolic BP (mmHg)	116.90 ± 13.57	114.90 ± 12.38
Pulse Rate	78.81 ± 6.82	79.73 ± 7.75
Temperature (^{0})	36.63^0±0.37	36.61^0± 0.43
Gestation at Enrolment by Fundal Height (Weeks)	19.43 ± 4.94	20.09 ± 4.39
Gestation at Enrolment by Dates (Weeks)	19.53 ± 6.44	20.13 ± 4.87
Time of Follow (Weeks)	20.59 ± 6.02	19.78 ± 5.04
Hemoglobin (g/dl)	11.75 ± 1.71	11.57 ± 1.46

4.2 Baseline Demographic Data

4.2.1 Enrolment by Facility

Twenty-one percent (n=55) of the study participants were enrolled at Mulot Health Centre, whereas 50.76% (n=133) were enrolled at Narok County Referral Hospital (NCRH). Eighteen percent (n=47) of the mothers were enrolled at Ololunga Sub-county Hospital while 10.31% (n=27) were enrolled at Ntulele Health Centre. Narok CRH is an urban based level 5 health facility located in Narok Town while Ololunga SCH is a level 4 semi-urban based facility with Mulot and Ntulele HC being rural based level 3 facilities.

4.2.2 Age at Enrolment

The mean age at enrolment of the study participants was 23.87 years (SD 5.22, 95% CI 23.23 – 24.50). The median age was 23 years, with the youngest study participant being 14 years old and the oldest mother being 44 years old, which gave a range of 30 years.

The mean age at enrolment in the intervention study arm was 24.29 years (SD 5.29, 95% CI 23.38 – 25.21). The median age was 23 years, with the minimum age of study participants being 15 years and the maximum age being 44 years giving a range of 29 years. The mean age at enrolment in the non-intervention arm was 23.44 years (SD 5.12, 95% CI 22.55 – 24.33). The median age was 23 years, with the minimum age of the study mother being 14 years and the maximum age being 40 years giving a range of 26 years. The mean age between the two study groups was comparable.

To enable further statistical analysis, the age variable was classified into various groups as thus; 19 years and below (teens), 20 to 24 years, 25 to 29 years, 30 to 34 years, 35 to 39 years and those aged 40 years and above. The 119 study participants aged between 20 and 24 years formed the majority of the study mothers at 45.42% of all study participants, followed by the 59 study mothers aged between 25 and 29 years at 22.52%. The 50 study mothers aged 19 years and below (teens) were the

third highest, forming a proportion of 19.08%, indicative of teen pregnancy rate. The least proportion of study participants were the three study mothers aged 40 years and above forming only 1.13%.

4.2.3 Marital Status at Enrolment

Two hundred and twenty-six (86.26%) of the study participants were married while 35 (13.36%) of the study population were single. Only one study participant (0.38%) reported being separated. By marital status, one hundred and fifteen (87.12%) of the study participants in the intervention arm were married while sixteen of the study mothers (12.12%) in this group reported being single with one mother forming 0.76% reporting being separated. In the non-intervention arm, 85.38% (111) of the study mothers reported being married while 14.62% (19) of the mothers in this group reported being single. This again showed that the study participants were comparable by marital status between the two study arms.

4.2.4 Ethnicity

By ethnicity, 50.8% (133) of the study participants were of the Maasai ethnic group while 17.6% (46) were of the Kalenjin ethnic group. Thirty of the mothers forming 11.5% were of the Kikuyu ethnic group while fifteen (5.7%) of the study population were Kisiis. Thirteen of the study participants constituting 5% of the study population were of the Kamba ethnic group. All the study participants of the other ethnic groups including one Borana, eight Luhyias, four Luos, eight Merus, one Ndorobo, two Pokots and one Turkana cumulatively constituted 9.4% of the study population.

4.2.5 Parity at Enrolment

By parity at enrolment, 46.18% (121) of the study participants were primi gravidas i.e. they were carrying their first pregnancy whereas 53.82% (141) of the study mothers were non-primi gravidas i.e. carrying their subsequent pregnancies. The average parity (mean number of children) in the study population was 0.94 children (SD 1.17, 95% CI 0.796 – 1.082). The median parity was one child, with the

minimum number of children per study mother being zero (primi gravidas) and the maximum number of children per mother being five. The mean parity in the intervention arm of this study was one child (SD 1.03) while the mean parity in the non-intervention arm was 0.88 (SD 1.29).

4.2.6 Level of Education Attained

Seven of the mothers (2.67%) in the study population had never attended any formal school, while 35.88% (94) of the study mothers had attended school up to primary school level. One hundred of the study mothers forming 38.17% had attended up to secondary school level while 23.28% (61) of the study mothers had attended up to tertiary level (colleges and universities). Thus 97.3% (n=255) of the study participants had attained some level of formal schooling.

Comparing the level of education attained at enrolment by the study participants by study group showed that in the intervention arm, 35.61% (47) of the study participants had attained up to primary school level of education while 40.15% (53) of the study mothers had attained up to secondary level education with 24.24% (32) of the study mothers having attained up to tertiary level of schooling. In the non-intervention arm, seven of the study mothers (5.38%) had never attended any formal schooling while 36.15% (47) of the study mothers had attained up to primary school level education. Forty-seven (36.15%) of the study participants had attended up to secondary school level of education while 22.31% (29) of the study mothers had attained up to tertiary level of education. This information again showed that the two study groups were comparable by education level attained.

4.2.7 Distance Travelled by Study Participants to Access a Health Facility

One hundred and sixty-four (62.60%) of the participating mothers lived between 1 km to 5 km from the nearest health facility whereas 16.41% (43) study mothers lived within less than a kilometre from a health facility. Fifty-five of the study mothers (20.99%) lived at a distance longer than 5 km from a health facility. Seventy-nine percent (207) of the study participants therefore reported to be living within 5km

from the nearest health facility. The longest distance reported which a participating mother had to travel to access a health facility was 10km.

In the intervention study arm, 18.18% (24) of the study mothers travelled less than 1 km to access a health facility while 56.06% (74) of the study participants had to travel between 1 km and 5 km to reach a health facility. Thirty-four (25.76%) of the study participants reported having to travel more than 5 km to access a health facility. In the non-intervention, 14.62% (19) of the study mothers travelled less than 1 km to access a health facility whereas 69.23% (90) study mothers travelled between 1 km and 5 km to reach a facility. Twenty-one (16.15%) of the study mothers travelled more than 5 km to reach a health facility. This showed the two groups to be generally comparable by this variable.

4.2.8 Time Taken to Access a Health Facility

Examining time taken by study participants to reach a health facility showed that 49.62% (130) of the study mothers took between 30 minutes and one hour whereas 27.86% (73) of the mothers took between 15 to 30 minutes. Thirty-two of the study mothers (12.21%) took less than 15 minutes to reach the facility while 10.31% (27) of the study mothers took more than one hour to reach the facility. Hence 89.69% (235) of the study participants took less than an hour to access a health facility.

Thus, most of the health facilities were accessible to the study participants both spatially with 79%, (n=207) living within 5 km of a health facility and temporally, with 89.7% (n=235) of mothers living within an hour's travel to a health facility. In the intervention study arm, twenty of the study participants (15.15%) took less than 15 minutes to access a health facility, while 28.79% (38) of the mothers took between 15 and 30 minutes to reach a facility. Fifty-six of the study mothers (42.42%) took between 30 and 60 minutes to reach a facility in this study arm with 13.64% (18) of the mothers taking more than one hour to reach a health facility. In the non-intervention arm, twelve of the study mothers (9.23%) took less than 15 minutes to reach a health facility, while 26.92% (35) of the mothers took between 15 and 30 minutes to reach a facility. More than half (56.92% (n=74)) of the mothers

took between 30 minutes and one hour to reach the facility with only 6.92% (n=6) of the mothers taking more than one hour to reach a facility.

4.2.9. Health Risky Behaviour

The majority of the participating mothers in the study reported not to smoke cigarettes at 99.24% (n=260) and not to drink alcohol at 98.85% (n=259). Only two mothers (0.76%) of the study population smoked cigarettes and three mothers (1.15%) consumed alcohol. Among the spouses of the married study participants, 83.86% (187) of the spouses reported that they neither smoked cigarettes nor consumed alcohol. Only 16.14% (36) of the study participants' spouses reported being consumers of alcohol and/or smokers of cigarettes.

Ninety-five (83.33%) of the spouses of the study participants in the intervention arm neither drank alcohol nor smoked cigarettes. Only 16.67% (n=19) drank alcohol and/or smoked cigarettes. In the non-intervention arm, 84.4% (92) of the spouses of study mothers in the study population neither drank alcohol nor smoked cigarettes. Only 15.6% (n=17) drank alcohol and/or smoked cigarettes for this study arm. This information showed that the two study groups were quite comparable by this variable.

4.2.10 Study Participants' Occupation

Study participants engaged in various occupations to make a living. A third (n=87) of the study participants were housewives, while 32.57% (n=85) engaged in various types of businesses. Six percent (n=16) were small-scale farmers while 7.66% (n=20) worked as teachers. Nine per cent (n=23) of the mothers were students in various institutions of learning, with the rest of the professions namely cattle rearing, police officer, school cook, receptionist, security guard, pharmacist, social worker, tailor, storekeeper, waitress and salonist cumulatively constituting 11.5% of the study participants.

When those mothers who were housewives were examined by study group, it was found that 49.43% (n=43) were in the intervention arm while 50.57% (n=44) were in

the non-intervention arm at recruitment. The study participants who were business people were also examined and it was found that 51.76% (n=44) of the study mothers were in the intervention arm while 48.24% (n=41) of the mothers were in the non-intervention arm at recruitment. This showed again that the two study groups were comparable by this variable.

4.2.11 Decision Making at the Household Level

The study participants were asked about who made key family decisions including on key asset purchases, family size, and family visits/travels at the household level. The study participants reported that in 39.69% (n=104) of the households, the key decisions were made by the study participant (mother) herself, with the husband being the key decision maker in 24.81% (n=65) of the households. In 31.30% (n=82) of the households the couple (both wife and husband) was involved in key decision-making. Others including mother, father, and aunt of the study participants were also reported to be key decision makers especially for the study mothers who were students cumulatively constituting 4.2% (n=11) of the households.

Exploring the decision-making at the family level by study group showed that, in the intervention arm, in 31.06% (n=41) of the households the key decisions were made by the couple together, where else in 25% (n=33) of the households the key decisions were made by the husband. In 40.15% (n=53) of the households the key decisions were made by the woman (study participant) herself while in 3.03% (n=4) of the households the key decisions were made by either the mother or father of the study participant.

In the non-intervention study arm, in 31.54% (n=41) of the households the key decisions were jointly made by the couple, where else in 24.62% (n=32) of the households the key decisions were made by the husband. In 39.23% (n=51) of the households the key decisions were made by the study participant while in 3.85% (n=5) of the households the key decisions were made by either the mother or father of the study participant.

This information showed that for key decision making at the household level the two study arms were well comparable at enrolment.

4.2.12 Type of Housing for Study Participants' Households

The study participants were asked the kind of house the family lived in as a proxy indicator of their socio-economic status. Twenty two percent (n=56) of these study participants and their families lived in brick-walled, iron-sheet roofed house while 10.8% (n=28) lived in iron-sheet walled and iron-sheet roofed houses. Thirty-four percent (n=89) of the families of study participants lived in stonewalled and iron-sheet roofed house with 25.9% (n=67) living in mud-walled iron-sheet roofed houses. Only 1.2% (n=3) of the participant families reported living in manyattas and 1.9% (n=5) in timber-walled and iron-sheet roofed houses.

The families that reported to be living in stone-walled and iron-sheet roofed houses were also examined to find out the proportion that had been allocated to each study arm. It was found that 48.89% (n=44) were in the non-intervention group while 51.11% (n=46) were in the intervention group. Those families that reported living in mud-walled iron-sheet roofed houses were also examined to find out the proportion of families that had been allocated into each study arm and it was found that 47.76% (n=32) were in the intervention arm while 52.24% (n=35) were in the non-intervention arm. This showed that the allocation between the two study arms was also comparable by this variable.

The study participants who reported living in stone-walled iron-sheet roofed houses were also examined to find their level of education. It was found that 3.33% (n=3) had had no formal education, 21.11% (n=19) had reached primary school level, where else 45.56% (n=41) had studied up to secondary school level while 30% (n=30) had studied up to tertiary school level. The study participants who reported living in mud-walled iron-sheet roofed houses at enrolment were also explored to find out the level of education they had attained. It was found that 5.97% (n=4) had had no formal education, 46.27% (n=31) had reached up to primary school level, where else 32.84% (n=22) had studied up to secondary school level while 14.93% (n=10) had studied up to tertiary school level.

This showed that twice as many study participants' families of those who had attained up to tertiary level education at enrolment lived in stone-walled iron-sheet roofed houses compared to mud-walled houses (30% vs 14.93%). Additionally, twice as many of the study participants' families of those who had attained primary school level lived in mud-walled iron-sheet roofed houses compared to those that lived in stone-walled iron-sheet roofed houses (46.27% vs 21.11%).

4.2.13 Co-morbidities at Enrolment

The study participants were asked if they had any co-morbidity at the time of enrolment. Almost all i.e. 98.9% (n=259) of the study participants reported that they had no co-morbidity whereas only 1.1% (n=3) had co-morbidity. Of the three study participants who had co-morbidities, two study mothers reported that they had osteoarthritis while the third one reported having had pre-existing hypertension.

4.2.14 History of Previous Operation for Delivery

Ninety-two percent (n=241) of the study participants reported that they had had no previous Cesarean section delivery while 8.02% (n=21) of the study mothers had had a previous operation. Exploring the study mothers who had had a previous scar by facility showed that Narok County Referral Hospital had 11.28% (n=15) of their mothers with a previous scar, the highest proportion, Ntulele Health Centre had 7.41% (n=2), Ololunga Sub County Hospital had 4.26% (n=2) while Mulot Health Centre had 3.64% (n=2) of their mothers having had a previous Cesarean operation, the lowest proportion.

When the proportion of study participants with a previous scar at enrolment was explored by the study arm to which they had been allocated it was found that in the intervention arm, 9.85% (n=13) had had a previous operation for delivery while 90.15% (n=119) had no history of previous operation. In the non-intervention arm, 6.15% (n=8) had had a previous operation for delivery while 93.85% (n=122) had no history of previous operation for delivery. This showed that the two study arms were comparable by this variable.

4.2.15 Pregnancy Test Done

The study also sought to find out how many mothers had documentary proof of having had confirmatory pregnancy test done at the antenatal care clinics. Only 12.21% (n=32) of the study participants showed evidence of having done a pregnancy test to confirm the current pregnancy while 87.79% (n=230) had no evidence of this test having been done for confirmation. One mother had her test turn out negative but was later confirmed to be positive.

Table 4.2 below shows the summary statistics of the quantitative independent study variables at enrolment.

Table 4.2: Table Showing the Summary Statistics for Various Quantitative Variables

	Mean	Std Dev	Median	N	Min	Max	Range
Height (m)	1.57	0.63	1.58	207	1.35	1.76	0.41
Weight (Kg)	60.90	10.62	59	262	40	101.9	61.9
Systolic BP (mmHg)	116	13.01	115	262	83	150	67
Pulse Rate (beats/min)	79.26	7.29	80	259	58	110	52
Temperature (Deg. Celsius)	36.62	0.40	36.7	258	35.3	38.1	2.8
Fundal Height (Weeks)	19.75	4.68	20	254	8	28	20

4.3 Baseline Height of Study Participants in Metres

The average height of the 207 study participants at enrolment was 1.57m (SD 0.63, 95% CI 1.56 - 1.58m). The median height of study mothers was 1.58m with the shortest study mother being 1.35m and the tallest mother being 1.76m giving a range of 0.41m. When the distribution of the variable height was explored using a histogram (Figure 4.1 below) it showed that this variable was normally distributed around the mean height.

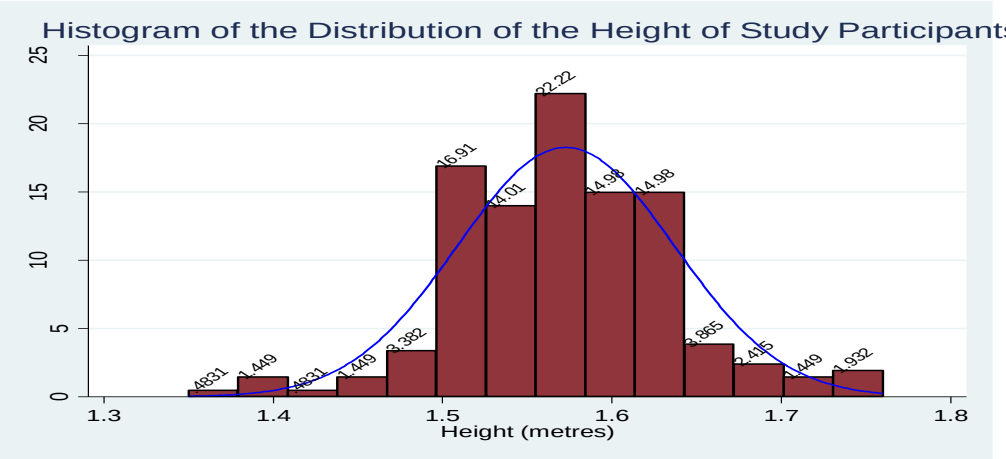


Figure 4.1: Histogram showing the Distribution of the Height of Study Participants in Metres

The mean height of the 105 study participants in the intervention arm of the study was 1.58m (SD 0.066m, 95% CI 1.565 - 1.591m). The mean height of the 102 study participants in the non-intervention arm of the study was 1.57m (SD 0.061m, 95% CI 1.555 - 1.579m). This information is depicted in the box plot below showing that the two groups were comparable by this variable (Figure 4.2).

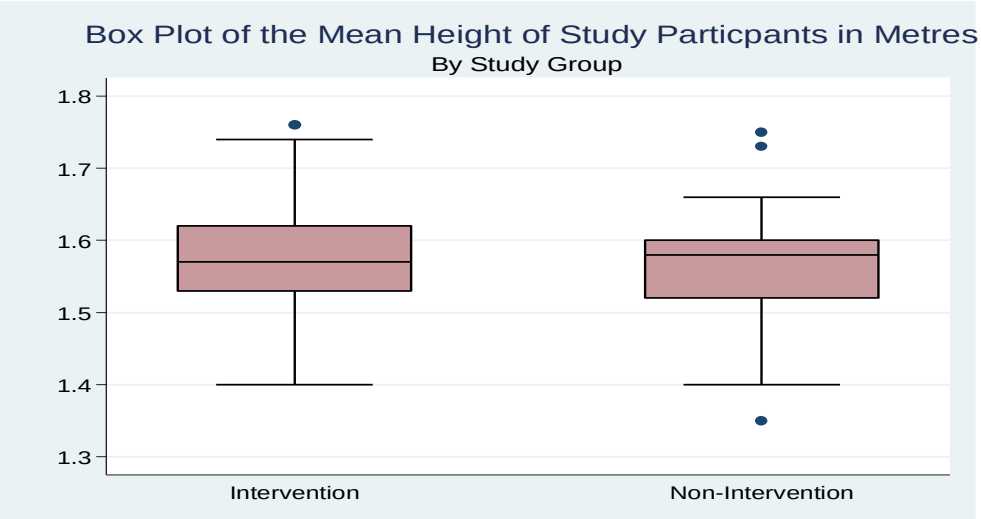


Figure 4.2: Box Plot showing the Mean Height of Study Participants in Metres by Study Group

4.4 Weight of Study Participants in Kilograms at Enrolment

The mean weight of the 262 study participants was 60.90 kg (SD 10.62, 95% CI 59.61 - 62.20 kg). The histogram below (Figure 6) shows the distribution of the weight in kilograms of the study participants. It shows that weight was a normally distributed variable around the mean.

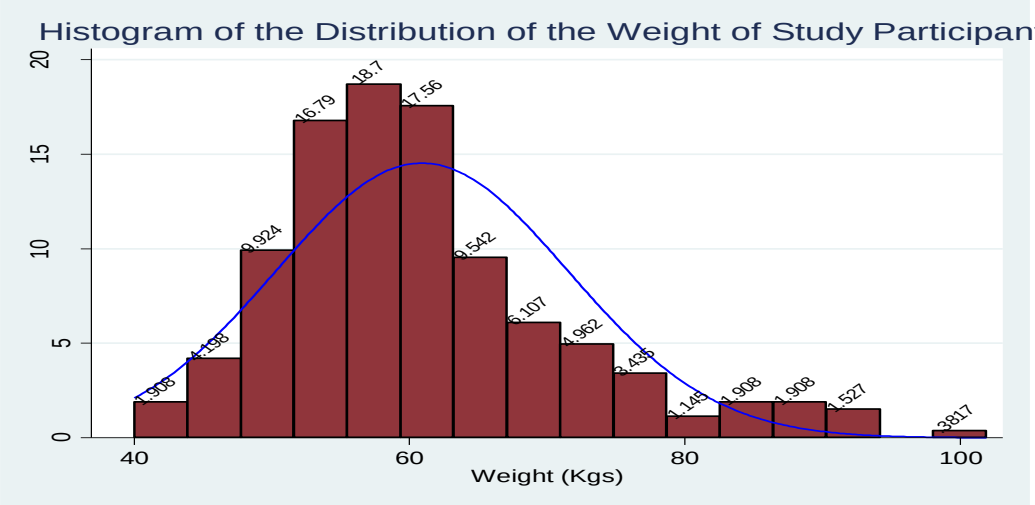


Figure 4.3: Histogram showing the Distribution of the Mean Weight

At enrolment, in the intervention arm, the mean weight of the 132 study mothers in this arm was 61.35 kg (SD10.48, 95% CI 59.55 - 63.16 kg). In the non-intervention arm, the mean weight of the 130 study mothers in this arm was 60.45 kg (SD 10.79, 95% CI 58.58 - 62.32 kg). This information is depicted in the box plot below indicating that the two groups were comparable by this variable (Figure 4.4).

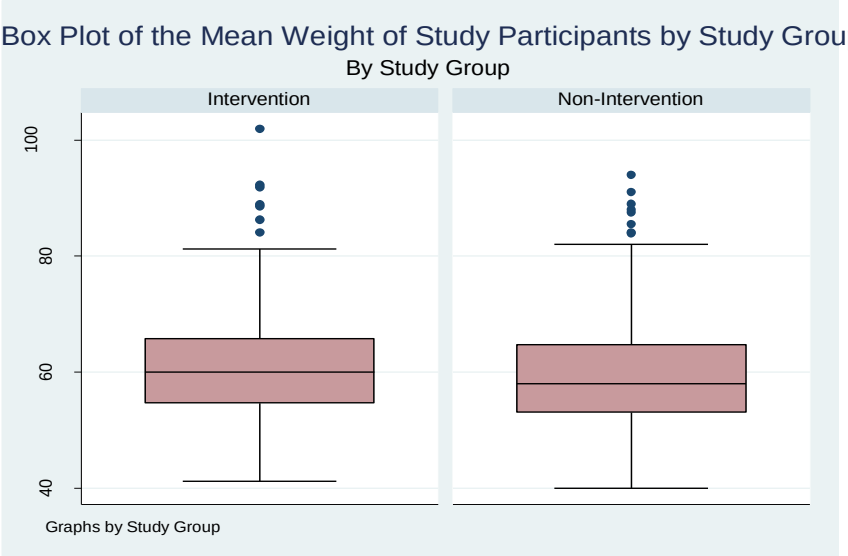


Figure 4.4: Box Plot of the Mean Weight of the Study Participants in Kg by Study Group

The mean weight in the 50 study mothers who were aged 19 years and below was 56.32 kg (SD 7.40) and a median weight of 55 kg. The minimum weight was 40 kg and the maximum weight was 77.7 kg giving a range in this age group of 37.7 kg. The mean weight of the 119 study mothers aged between 20 and 24 years was 59.95 kg (SD 9.37) and a median weight of 60.2 kg. The minimum weight was 43.5 kg and the maximum weight being 91 kg giving a range in this age group of 47.5 kg. The mean weight of the 59 study mothers aged between 25 and 29 years of age was 63.39 kg (SD 12.23) and a median weight of 60.2 kg. The minimum weight was 41.9 kg and the maximum weight was 94 kg giving a range in this age group of 52.1 kg. The mean weight of the 20 study mothers aged between 30 and 34 years was 64.57 kg (SD 11.49) and a median weight of 64.7 kg. The minimum weight was 40.9 kg and the maximum weight was 92.3 kg giving a range in this age group of 51.4 kg.

The mean weight of the 11 study mothers aged between 35 and 39 years was 65.54 kg (SD 8.46) and a median weight of 64.7 kg. The minimum weight was 51 kg and the maximum weight was 77.6 kg giving a range in this age group of 26.6 kg. The mean weight of the three study mothers aged 40 years and above was 84.63 kg (SD 19.75) and a median weight of 88.9 kg. The minimum weight was 63.1 kg and the

maximum weight was 101.9 kg giving a range in this age group of 38.8 kg. This information is depicted in the bar graph below (Figure 4.5).

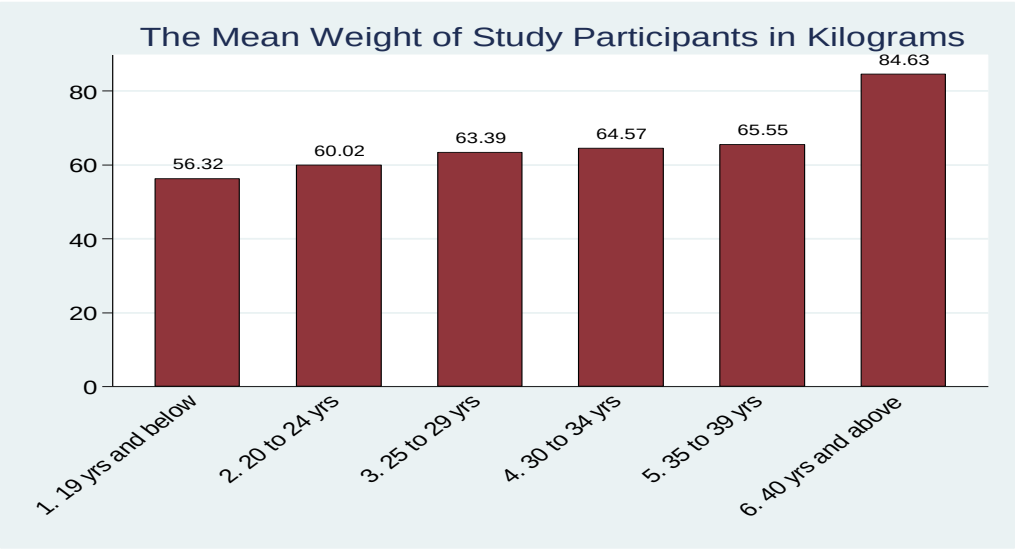


Figure 4.5: Bar Graph showing the Mean Weight of Study Participants by Age

4.5 Body Mass Index (BMI) at Baseline

The Body Mass Index (BMI) was calculated using the formula; BMI = Weight (kg)/Height (m) ^2. The mean Body Mass Index (BMI) in the study population was 24.77 (SD 4.63, 95% CI 24.14 - 25.41). The median BMI was 23.73 while the minimum BMI was 15.39 with the maximum BMI being 40.69 giving a range for the BMI of study mothers to be 25.29. There were 207 study mothers who reported both weight and height measurements enabling the BMI to be calculated. When the distribution of the Body Mass Index was explored, it was found to be normally distributed around the mean BMI of 24.77. This information is depicted in the histogram below (Figure 4.6).

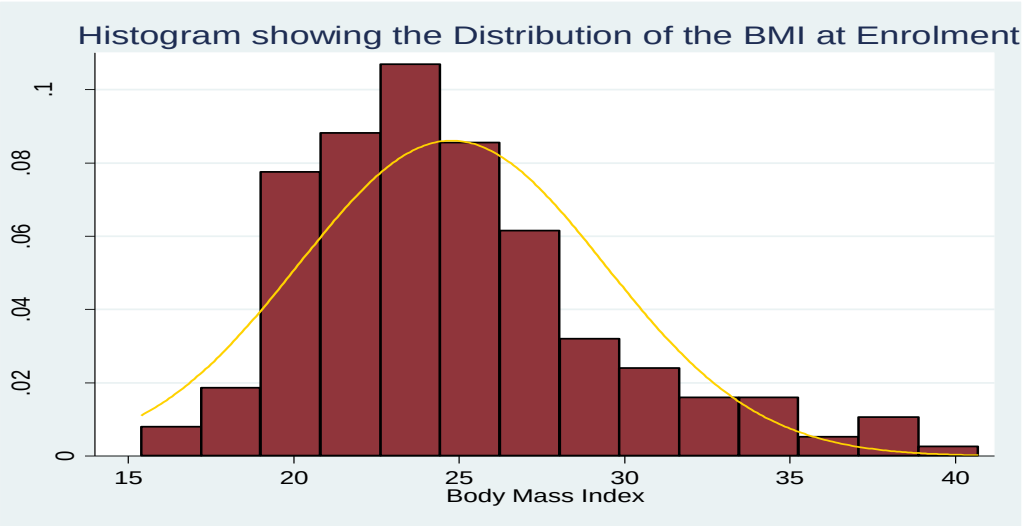


Figure 4.6: Histogram showing the Distribution of BMI for the Study Participants

The mean BMI for the 105 study participants in the intervention arm was 24.92 (SD 4.52, 95% CI 24.05 - 25.80). The mean BMI for the 102 study participants in the non-intervention arm was 24.62 (SD 4.77, 95% CI 23.68 - 25.55). This information is depicted in the box plot below showing that the two groups were comparable at baseline by this variable (Figure 4.7).

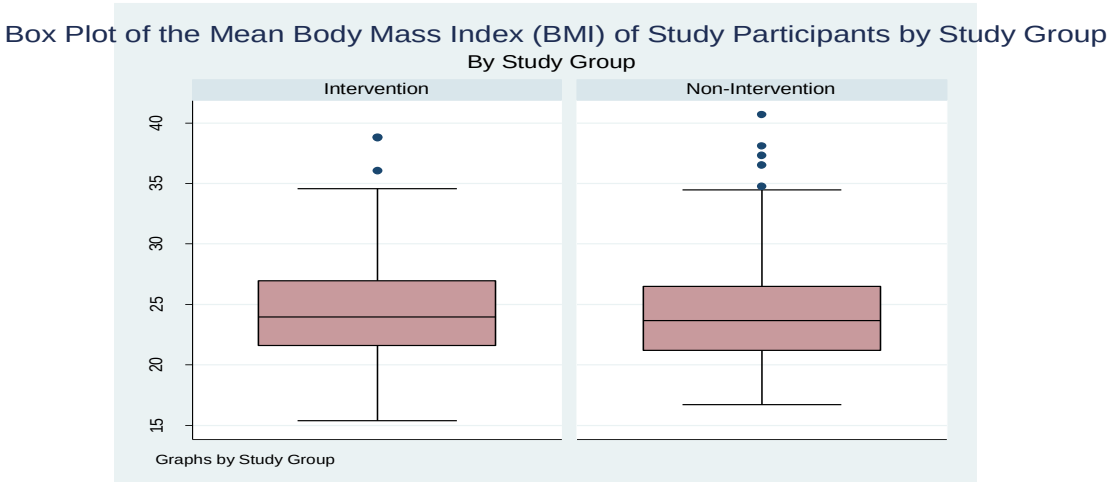


Figure 4.7: Box Plot showing the BMI of Study Participants by Study Group

The mean BMI for the 39 study participants who were aged 19 years and below was 22.61 (SD 2.59, 95% CI 21.77 - 23.45). The mean BMI for the 92 study participants who were aged between 20 and 24 years was 24.44 (SD 4.03, 95% CI 23.61 - 25.28). The mean BMI for the 47 study participants who were aged between 25 and 29 years was 25.61 (SD 5.87, 95% CI 23.89 - 27.34). The mean BMI for the 16 study participants who were aged between 30 and 34 years was 26.59 (SD 4.46, 95% CI 24.22 - 28.97). The mean BMI for the 10 study participants who were aged between 35 and 39 years was 26.80 (SD 4.81, 95% CI 23.36 - 30.25). The mean BMI for the 3 study participants who were aged 40 years and above was 33.18 (SD 5.58, 95% CI 19.33 - 47.04).

This is information summarized in the box plot below showing that the mean BMI at enrolment increased with the age of the study participant (Figure 4.8).

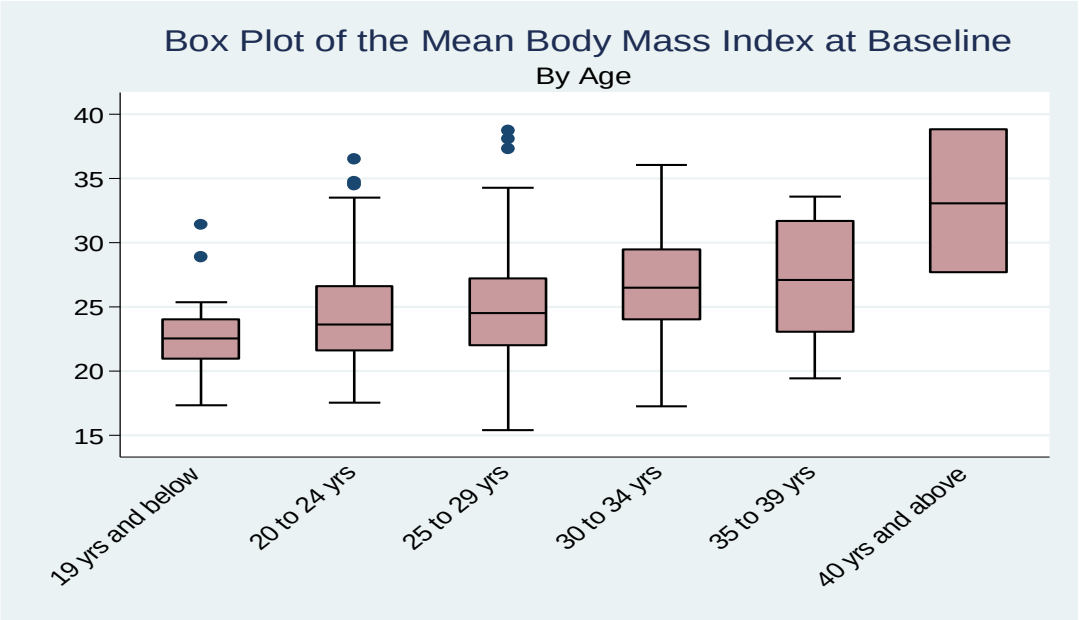


Figure 4.8: Box Plot showing the Mean BMI of Study Participants by Age

4.6 Systolic Blood Pressure in mmHg at Baseline

The mean Systolic Blood Pressure (SBP) of the study participants at baseline was 115.91 mmHg (SD 13.01, 95% CI 114.32 - 117.49). The median baseline systolic BP was 115 mmHg with a lowest SBP of 83 mmHg and a highest SBP of 150 mmHg

giving a range for the SBP of 67 mmHg. When the distribution of the systolic BP (SBP) was explored using a histogram, it was found to be normally distributed around the mean SBP of 115.91 mmHg. This is depicted in the histogram below (Figure 4.9).

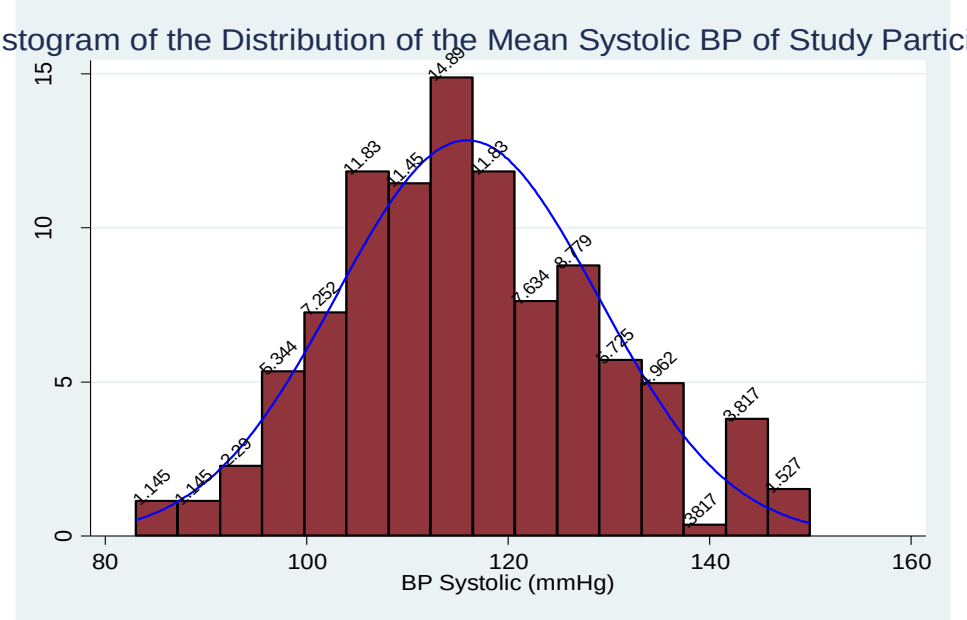


Figure 4.9: Histogram showing the Distribution of Systolic BP in mmHg at Baseline

4.6.1 The Mean Systolic Blood Pressure (SBP) at Baseline by Study Group

For the 132 study participants who were in the intervention study arm, the mean baseline SBP was 116.90 mmHg (SD 13.57, 95% CI 114.56 - 119.24 mmHg). For the 130 study participants who were in the non-intervention study arm, the mean baseline SBP was 114.90 mmHg (SD 12.38, and a 95% CI 112.75 - 117.05 mmHg). This information is depicted in the box plot below showing that the two study groups were comparable by this variable (Figure 4.10).

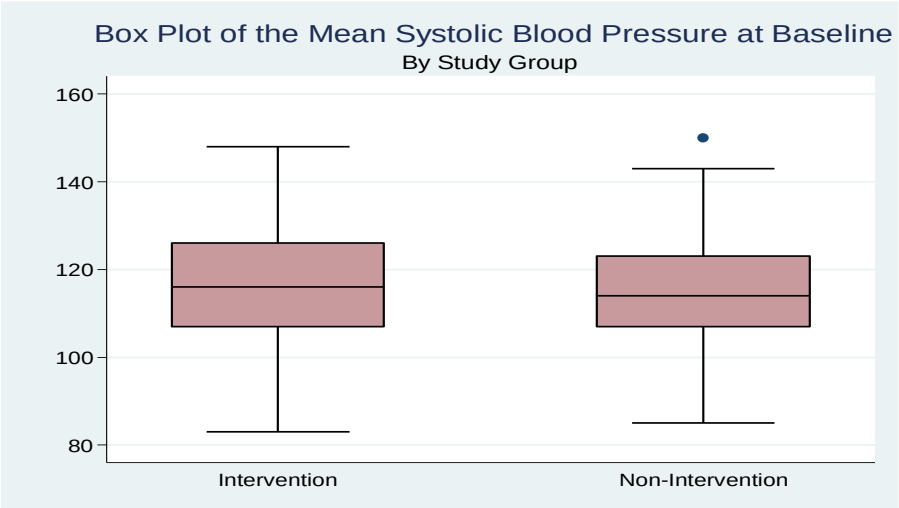


Figure 4.10: Box Plot showing the Mean Systolic BP of the Study Participants at Baseline by Study Group

4.6.2 The Mean Systolic Blood Pressure (SBP) at Baseline by Age

The fifty study participants who were aged 19 years and below had a mean SBP of 114.04 mmHg (11.99, 95% CI 110.63 - 117.45 mmHg). The 119 study participants who were aged between 20 and 24 years had a mean SBP of 114.68 mmHg (SD 12.28, 95% CI 112.45 - 116.91 mmHg). The 59 study participants who were aged between 25 and 29 years had a mean SBP of 117.89 mmHg (SD 14.13, 95% CI 114.22 - 121.58 mmHg). The 20 study participants who were aged between 30 and 34 years had a mean SBP of 117.1 mmHg (SD 13.82, 95% CI 110.63 and 123.57 mmHg). The eleven study participants who were aged between 35 and 39 years had a mean SBP of 121.45 mmHg (SD 12.46, 95% CI 113.08 - 129.83 mmHg). The three study participants who were aged 40 years and above had a mean SBP of 128.33 mmHg (SD 23.67, 95% CI 69.53 - 187.14 mmHg). This information is summarized by the bar graph below, which showed a gradual increase in mean SBP by age (Figure 4.11).

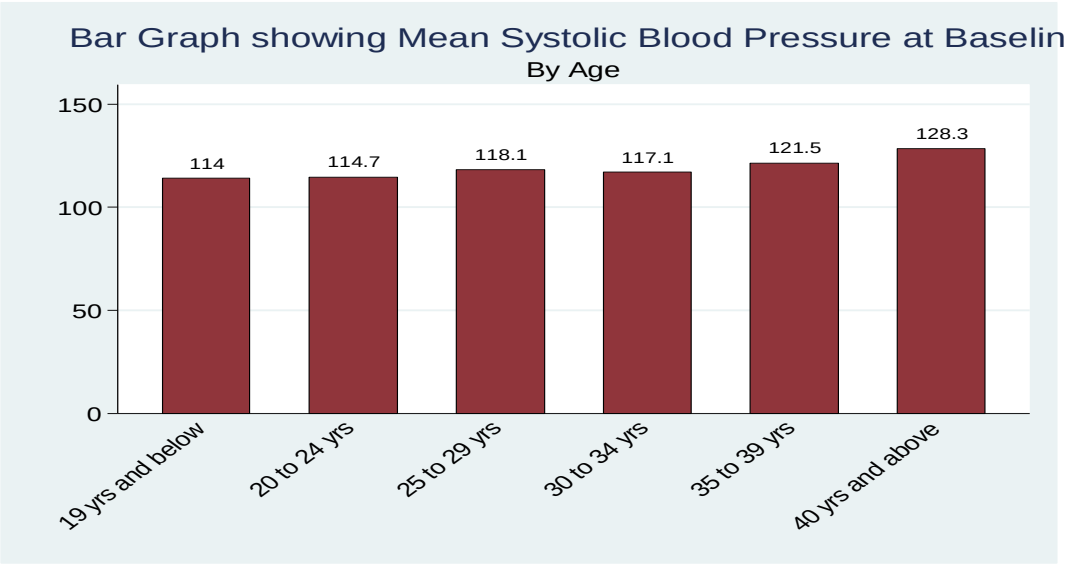


Figure 4.11: Bar Graph showing the Mean Systolic BP at Baseline by Age

4.6.3 Systolic Blood Pressure (SBP) in mmHg at Baseline by the Body Mass Index (BMI)

In the eight study participants who were classified as being underweight i.e., with a BMI less than 18.5, the mean SBP was 114.63 mmHg (SD 8.85, 95% CI 107.23 - 122.02 mmHg). In the 116 study participants who were classified to have normal weight i.e., with a BMI 18.5 - 24.9, the mean SBP was 113.46 mmHg (SD 11.82, 95% CI 111.28 - 115.63 mmHg). In the 55 study participants who were classified as being overweight i.e., with a BMI 25 - 29.9, the mean SBP was 118.33 mmHg (SD 14.55, 95% CI 114.39 - 122.26 mmHg). In the 21 study participants who were grouped as class I obese i.e., with a BMI 30 - 34.9, the mean SBP was 123.14 mmHg (SD 13.59, 95% CI 116.96 - 129.33 mmHg). In the six study participants who were grouped as class II obese i.e., with a BMI 35 - 39.9, the mean SBP was 127.33 mmHg (SD 17.30, 95% CI 109.17 - 145.49 mmHg). Only one study participant was classified as being obese class III i.e., BMI greater than 40 and she had a systolic BP of 105 mmHg. This information is summarized in the line graph below showing an increase in mean SBP by BMI (Figure 4.12).

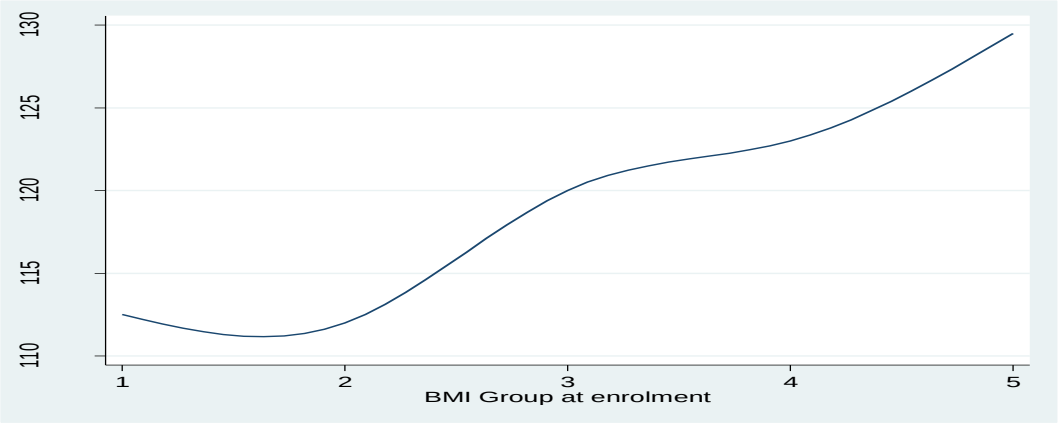


Figure 4.12: Line Graph showing the Mean Systolic BP by BMI

4.7 Pulse Rate in Beats per Minute at Baseline

The mean pulse rate in the study population was 79.26 beats per minute (SD 7.29, 95% CI 78.37 - 80.15 beats per minute). Exploring the distribution of the pulse rate in the study population using a histogram showed that the pulse rate was normally distributed around the mean pulse rate. The pulse rate of 110 beats per minute was an outlier.

4.7.1 Pulse Rate at Baseline for the Study Participants by the Study Group

The mean pulse rate at baseline for the 132 study mothers in the intervention study arm was 78.81 beats per minute (SD 6.82, 95% CI 77.64 - 79.98 beats per minute). The mean pulse rate at baseline for the 127 study mothers in the non-intervention study arm was 79.73 beats per minute (SD 7.75, 95% CI 78.37 - 81.09 beats per minute). This information is summarized in the box plot below (Figure 4.13), with the non-intervention group showing a higher level of variability than the intervention group though the two groups were comparable by this variable.

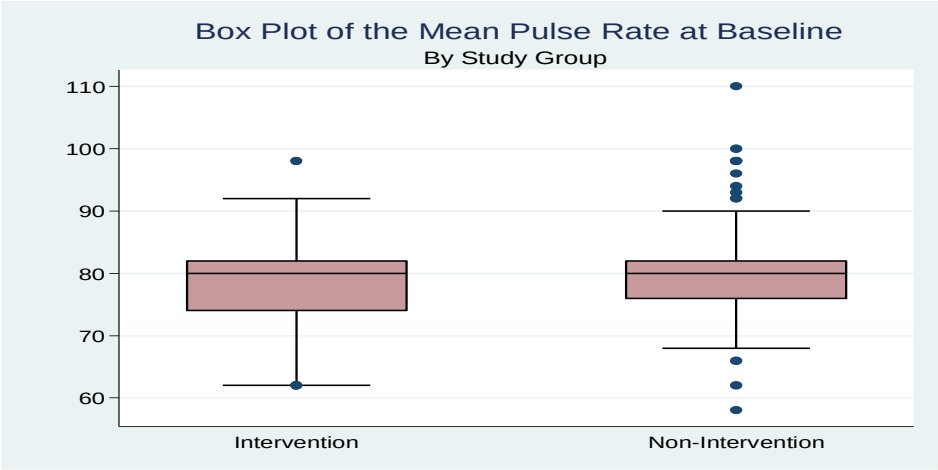


Figure 4.13: Box Plot of the Mean Baseline Pulse Rate by Study Group

4.7.2 Pulse Rate at baseline for the Study Participants by the Body Mass Index

For the seven study participants who were underweight, the mean pulse rate was 81.86 beats per minute (bpm) (SD 6.59, 95% CI 75.76 - 87.95 bpm). For the 115 study participants who were of normal weight, the mean pulse rate was 77.97 bpm (SD 8.03, 95% CI 76.49 - 79.46 bpm). For the 55 study participants who were overweight, the mean pulse rate was 78.13 bpm (SD 5.61, 95% CI 76.61 - 79.64 bpm). For the 21 study participants who were classified as class I obese, the mean pulse rate was 79 bpm (SD 4.88, 95% CI 76.78 - 81.22 bpm). For the six study participants who were classified as class II obese, the mean pulse rate was 82 bpm (SD 10.51, 95% CI 70.97 - 93.02 bpm). Only one study mother was classified as class III obese and she had a pulse rate of 76 bpm.

4.7.3 Pulse Rate at Baseline for the Study Participants by the Smoking Status

In the 257 study mothers who were not smokers, the mean baseline pulse rate was 79.21 bpm (SD 7.29, 95% CI 78.32 - 80.10 bpm). In the two study mothers who were smokers, the mean baseline pulse rate was 86 bpm (SD 5.66, a 95% CI 35.18 - 136.82 bpm). This information is summarized in the bar graph below showing that the study mothers who were smokers had on average a higher mean pulse rate compared to the non-smokers (Figure 4.14).

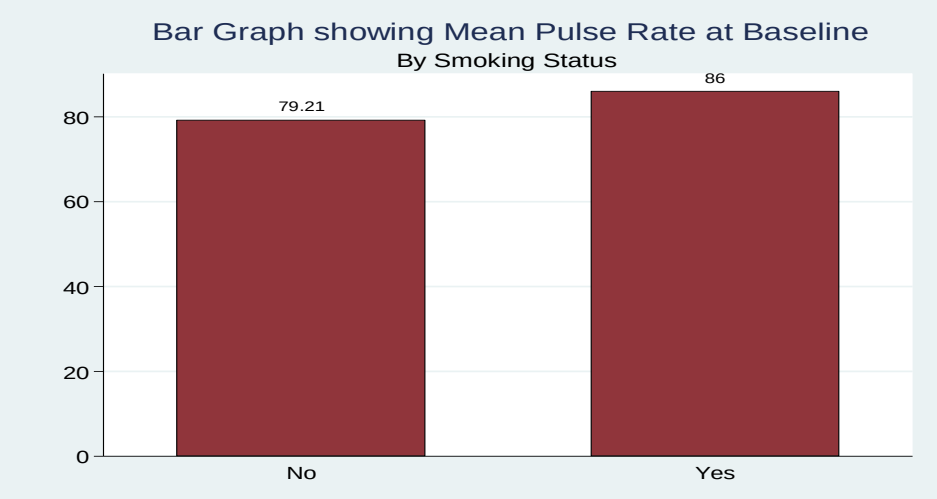


Figure 4.14: Bar Graph showing the Mean Baseline Pulse Rate by Smoking Status

4.8 Temperature in Degrees Celsius at Baseline

The mean body temperature in degree Celsius in the study population at enrolment was 36.62^0C (SD 0.40, 95% CI 36.57^0 Celsius - 36.67^0 Celsius). Examining the distribution of temperature at baseline using a histogram showed that this variable was normally distributed around the mean.

For the 132 study mothers who were in the intervention study arm the mean recorded temperature was 36.63^0 Celsius (SD 0.37, 95% CI 36.56^0 Celsius - 36.69^0 Celsius). For the 126 study mothers who were in the non-intervention study arm the mean recorded temperature was 36.61^0 Celsius (SD 0.43, 95% CI 36.53^0 Celsius - 36.69^0 Celsius). This information is depicted in the box plot below indicating that the two groups were comparable (Figure 4.15).

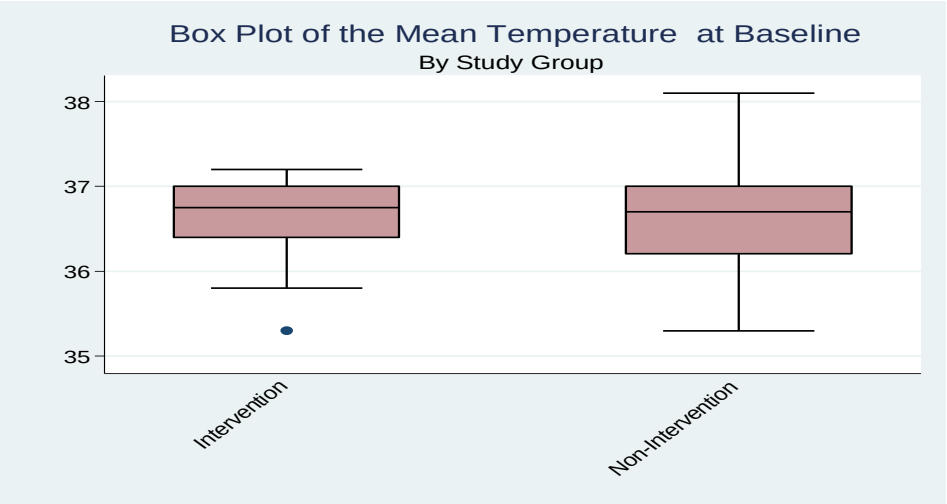


Figure 4.15: Box Plot showing the Mean Baseline Body Temperature by Study Group

4.9 Gestation by Fundal Height in Weeks at Baseline

The mean fundal height (gestation by fundal height) at enrolment was 19.75 weeks (SD 4.68, 95% CI 19.17 - 20.33). This mean fell within the second trimester. The median fundal height was 20 weeks with a minimum fundal height recorded as 8 weeks and a maximum fundal height recorded as 28 weeks giving a range of 20 weeks for baseline fundal height. The number of study mothers with recorded baseline fundal height was 254. The distribution of the gestation by fundal height at baseline was explored using a histogram (Figure 4.16) and it showed that the gestation in weeks by fundal height at enrolment was normally distributed around the mean fundal height.

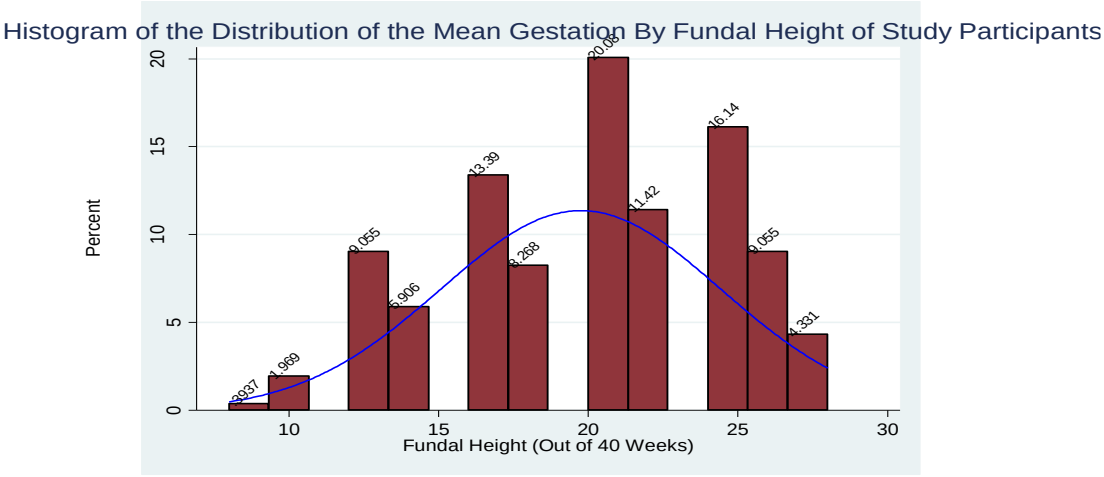


Figure 4.16: Histogram showing the Distribution of Baseline Gestation by Fundal Height in Weeks

4.9.1 Gestation in Fundal Height at Baseline by Study Group

The mean gestation by fundal height at baseline for the 130 study participants in the intervention study arm was 19.43 weeks (SD 4.94, 95% CI 18.57 - 20.29 weeks). The mean gestation by fundal height at baseline for the 124 study mothers in the non-intervention study arm was 20.09 weeks (SD 4.39, 95% CI 19.31 - 20.87 weeks). This information is depicted in the box plot below showing that the two groups were comparable by this variable (Figure 4.17).

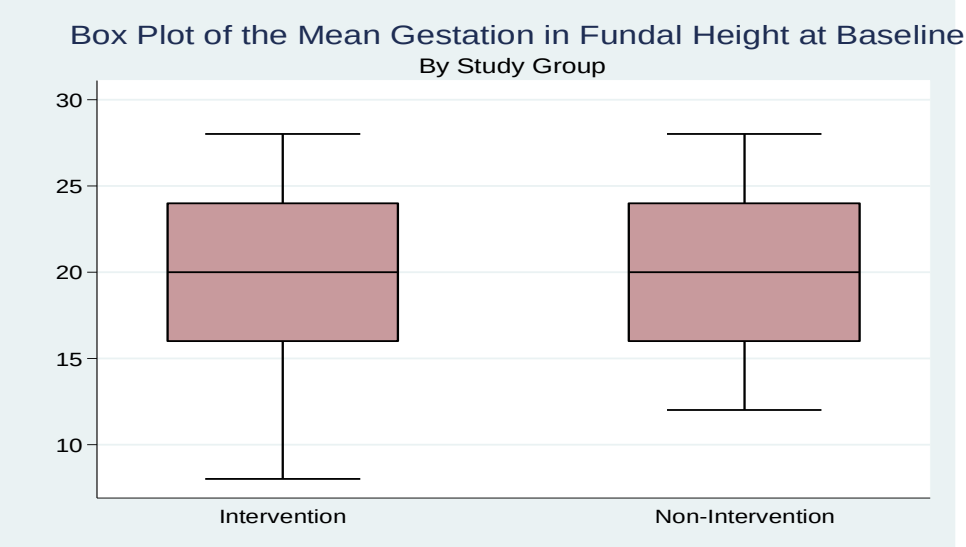


Figure 4.17: Box Plot of the Mean Baseline Gestation by Fundal Height by Study Group

4.9.2 Gestation in Fundal Height at Baseline by Age

For the 48 study participants who were aged 19 years and below, the mean gestation by fundal height at baseline was 19.92 weeks (SD 4.78, 95% CI 18.53 - 21.30 weeks). For the 117 study participants who were aged between 20 and 24 years, the mean gestation by fundal height at baseline was 19.46 weeks (SD 4.59, 95% CI 18.62 - 20.30 weeks). For the 55 study participants who were aged between 25 and 29 years, the mean gestation by fundal height at baseline was 20.04 weeks (SD 4.77, 95% CI 18.75 - 21.32 weeks). For the twenty study participants who were aged 30 and 34 years, the mean gestation by fundal height at baseline was 21.55 weeks (SD 3.71, 95% CI 19.82 - 23.28 weeks). For the eleven study participants who were aged between 35 and 39 years, the mean gestation by fundal height at baseline was 17.73 weeks (SD 5.83, 95% CI 13.81 - 21.65 weeks). For the three study participants who were aged 40 years and above, the mean gestation by fundal height at baseline was 18.67 weeks (SD 6.11, 95% CI 3.49 - 33.85 weeks).

4.9.3 Gestation in Fundal Height at Baseline by Education Level

For the six study participants who had not attended any formal schooling the mean gestation was 19 weeks (SD 4.86, 95% CI 13.90 - 24.10 weeks). For the 92 study participants who had attended up to primary school level of education the mean gestation was 20.56 weeks (SD 4.90, 95% CI 19.57 - 21.60 weeks). For the 97 study participants who had attended up to secondary level of education the mean gestation was 19.45 weeks (SD 4.70, 95% CI 18.51 - 20.40 weeks). For the 59 study participants who had attended up to tertiary level of education the mean gestation was 19.02 weeks (SD 4.18, 95% CI 17.93 - 20.10 weeks). This information is summarized in box plot below (Figure 4.18).

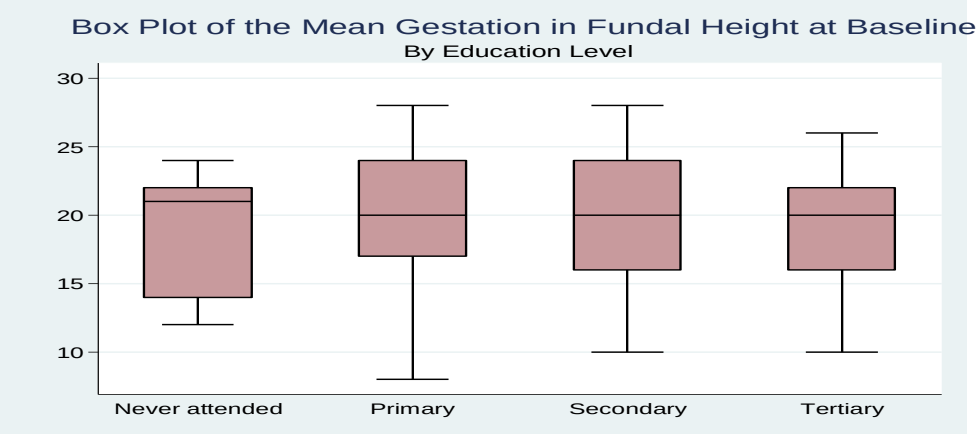


Figure 4.18: Box Plot showing the Mean Baseline Gestation by Fundal Height by Education Level

4.10 Gestation by Dates at Enrolment

To obtain gestation by dates, the date when the study mother was enrolled and her reported last normal menstrual period were used. The difference between these two dates constituted the total number of days the pregnancy was at baseline and these days were then divided by seven to obtain the gestation of study mothers in weeks by dates at enrolment. The mean gestation at enrolment for the study participants by dates was 19.82 weeks (SD 5.72, 95% CI 19.10 - 20.54 weeks). The median

gestation at enrolment was 20.57 weeks with a lowest gestation of 2.57 weeks and a highest gestation of 32.14 weeks giving a range of 29.6 weeks. The mothers who had information on their dates available were 242.

The distribution of the mean gestation at enrolment by dates was analyzed with a histogram (Figure 4.19 below) and it was found that this variable was normally distributed around the mean.

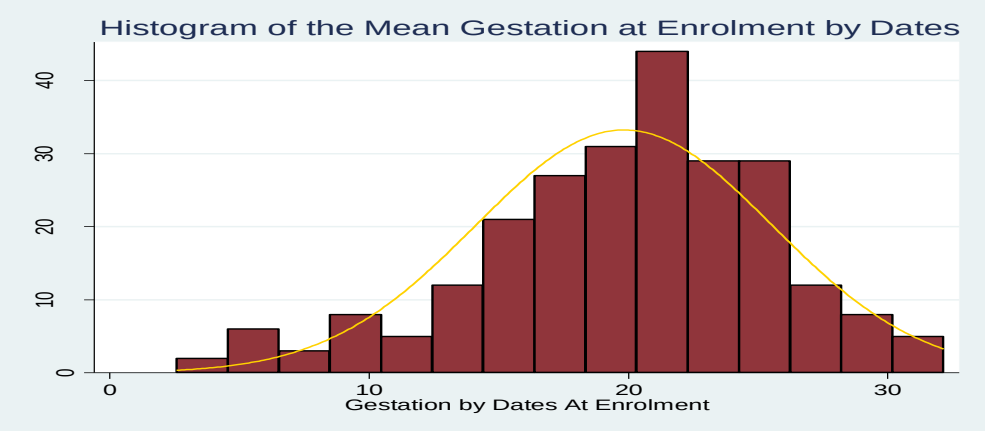


Figure 4.19: Histogram showing the Mean Gestation by Dates in weeks at Enrolment

4.10.1 Gestation by Dates at Enrolment by Study group

For the 124 study mothers with information on their dates and who were in the intervention study arm, the mean gestation at enrolment by dates was 19.53 weeks (SD 6.44, 95% CI 18.39 - 20.68 weeks. The median gestation was 20.5 weeks with a lowest gestation of 2.57 weeks and a highest gestation of 32.14 weeks giving a range of 29.57 weeks. For the 118 study mothers with information on their dates and who were in the non-intervention study arm, the mean gestation at enrolment by dates was 20.13 weeks (SD 4.87, 95% CI 19.24 - 21.02 weeks. The median gestation was 20.57 weeks with a lowest gestation of 5 weeks and a highest gestation of 32.14 weeks giving a range of 27.14 weeks.

This information is summarized in the box plot below and shows that the two groups were comparable by this variable (Figure 4.20).

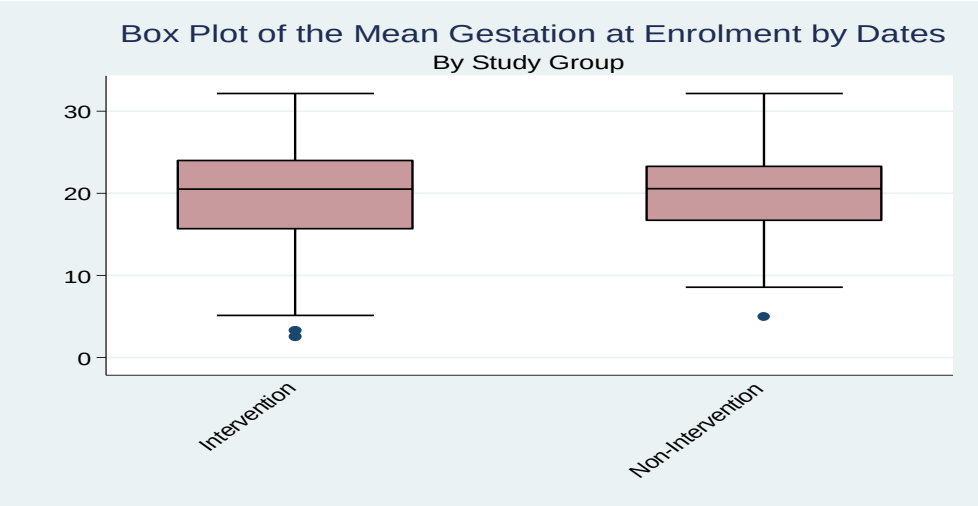


Figure 4.20: Box Plot of the Mean Gestation by Dates at Enrolment by Study Group

4.10.2 Gestation by Dates at Enrolment by Marital Status

For the 209 study mothers who were married, the mean gestation by dates at enrolment was 19.45 weeks (SD 5.80, 95% CI 18.65 - 20.24 weeks). For the 33 study mothers who were single, the mean gestation by dates at enrolment was 22.21 weeks (SD 4.62, 95% CI 20.57 - 23.85 weeks). This information is summarized in the box plot below which show that the study mothers who were married started their ANC slightly earlier on average compared to the mothers who were single (Figure 4.21).

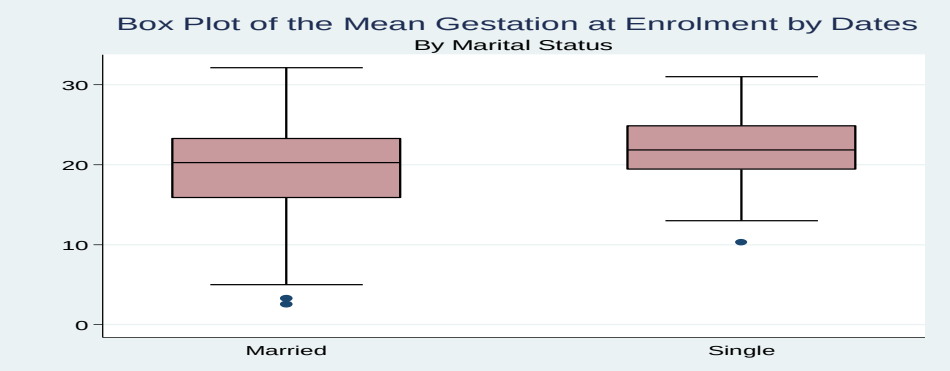


Figure 4.21: Box Plot showing the Mean Gestation by Dates at Enrolment by Marital Status

4.10.3 Gestation by Dates at Enrolment by Age

For the 48 study mothers who were aged 19 years and below, the mean gestation by dates at enrolment was 20.14 weeks (SD 4.70, 95% CI 18.76 - 21.50 weeks. For the 112 study mothers who were aged between 20 and 24 years, the mean gestation by dates at enrolment was 19.34 weeks (SD 6.07, 95% CI 18.20 - 20.48 weeks). For the 53 study mothers who were between 25 and 29 years, the mean gestation by dates at enrolment was 19.77 weeks (SD 5.97, 95% CI 18.12 - 21.41 weeks).

For the 19 study mothers who were aged between 30 and 34 years, the mean gestation by dates at enrolment was 23.32 weeks (SD 3.02, 95% CI 21.87 - 24.78 weeks. For the eight study mothers who were aged between 35 and 39 years, the mean gestation by dates at enrolment was 17.93 weeks (SD 6.53, 95% CI 12.47 - 23.39 weeks). For the two study mothers who were aged 40 years and above, the mean gestation by dates at enrolment was 15 weeks (SD 10.10, 95% CI -75.76 and 105.76 weeks).

4.10.4 Gestation by Dates at Enrolment by Education Level Attained

For the five study participants who had never attended any formal schooling, the mean gestation by dates at enrolment was 18.51 weeks (SD 2.99). For the 85 study participants who had attained primary school level of education, the mean gestation by dates at enrolment was 21.05 weeks (SD 5.51). For the 94 study participants who had reached up to secondary school level of education, the mean gestation by dates at enrolment was 19.35 weeks (SD 6.19). For the 58 study participants who had attained tertiary level of education, the mean gestation by dates at enrolment was 18.91 weeks (SD 5.21).

4.11 Time of Follow up in Weeks for the Study Participants

The mean time of follow up in weeks was calculated after obtaining the date of delivery for the study participants and subtracting the date on which the mother was

enrolled into the study from the date of delivery then dividing the number of days obtained by seven to get weeks of follow up.

Mean time of follow up in weeks = (Date of delivery – Date of enrolment)/7

The mean time of follow up in weeks for the study participants was 20.19 weeks (SD 5.56, 95% CI 19.42 - 20.95 weeks). The median time of follow up was 19.86 weeks with the minimum time of follow up being 5.43 weeks and the maximum time of follow up being 35.86 weeks, giving a range of 30.43 weeks. When the distribution of the mean time of follow in weeks was explored with a histogram it was found to be normally distributed around the mean (Figure 4.22).

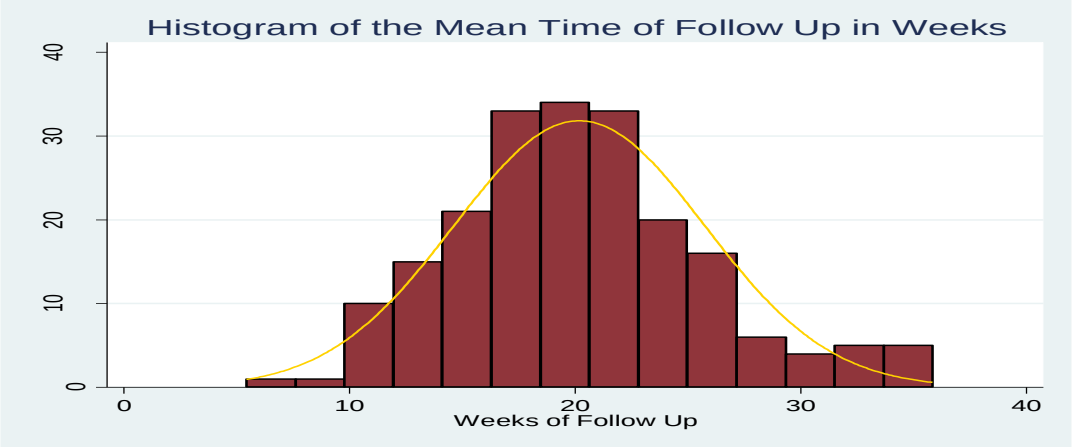


Figure 4.22: Histogram showing the Distribution of Time of Follow Up in Weeks for the Study Participants

4.11.1 Time of Follow up in Weeks by Study Group

For the 103 study mothers with information on dates and who were in the intervention study arm, the mean time of follow up was 20.59 weeks (SD 6.02, 95% CI 19.41 - 21.76 weeks). The median time of follow up was 19.43 weeks with the shortest follow up time of 10.71 weeks and the longest follow up time of 35.86 weeks, giving a range of 25.14 weeks. For the 101 study mothers with information on dates and who were in the non-intervention study arm, the mean time of follow up was 19.78 weeks (SD 5.04, 95% CI 18.79 - 20.78 weeks). The median time of follow

up was 20 weeks with the shortest follow up time being 5.43 weeks and the longest follow up time of 32.29 weeks, giving a range of 26.86 weeks.

This information is summarized in the bar graph below showing that the two groups were comparable by this variable (Figure 4.23).

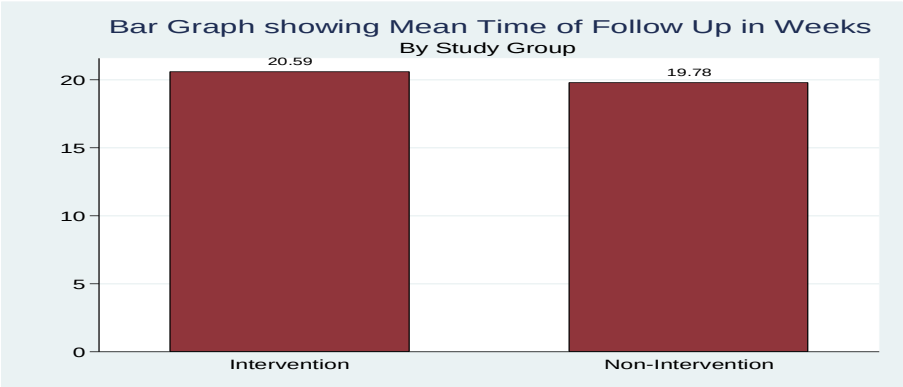


Figure4.23: Bar Graph of the Mean Time of Follow Up in Weeks by Study Group

4.11.2 Mean Time of Follow in Weeks by Education Level

For the five study mothers who had never attended any formal schooling the mean time of follow up was 23.14 weeks (SD 5.62). For the 69 study mothers who had attained primary schooling, the mean time of follow up was 19.13 weeks (SD 5.19). For the 76 study mothers who had attained secondary schooling, the mean time of follow up was 20.34 weeks (SD 6.04). For the 54 study mothers who had attained tertiary level of schooling, the mean time of follow up was 21.05 weeks (SD 5.17).

4.12 Antenatal Profile Tests

The study population was also examined to check for those study participants who had done as many ANC profile tests as possible in order to assess the quality of health services offered at the health facilities. Most of the ANC profile tests were done in the health facility of enrolment and for those facilities where not all tests were available, the mothers were sent to the nearest higher-level facility to get those done, for example, Mulot Health Centre referred mothers to Longisa Level 4

Hospital in Bomet county for the tests to be done while Ntulele Health Centre referred mothers to Narok County Referral Hospital for the tests.

4.12.1 Pregnancy Diagnostic Test

Only 12.21% (n=32) of the study participants had recorded proof of having done a confirmatory pregnancy test in the current pregnancy. Almost eighty-eight percent (87.79% (n=232) of the study mothers had no proof of having done this test. The low percentage of mothers with this test done was explained by the fact that most mothers only started attending ANC when they were obviously expectant with fetal kicks felt after having missed their periods for several months and thus there was no need to do the confirmatory pregnancy test. Alternatively, some who had done it did not present documentary evidence. Only those who came early for ANC at the health facility had this test done.

4.12.2 Blood Grouping

Eighty-nine percent (89%, n=234) of the study participants had proof of their blood groups having being done during the current pregnancy. Fifty-two percent (n=122) of them were blood group O positive while 0.43% (n=1) was blood group O negative. Twenty-two percent (n=52) of the study mothers were blood group A positive with 0.85% (n=2) of the mothers being blood group A negative. Six percent (n=15) of the study mothers were blood group AB positive. Eighteen percent (n=41) of the mothers were blood group B positive with 0.43% (n=1) being blood group B negative.

4.12.3 Hemoglobin Levels

Eight one percent (81.30%, n=213) of the study participants had their hemoglobin levels checked during the current pregnancy. The mean hemoglobin level was 11.66 g/dl (SD 1.59, 95% CI 11.45 - 11.88 g/dl. The median hemoglobin was 11.6 g/dl with the lowest hemoglobin recorded being 6 g/dl and the highest hemoglobin level being 16.5 g/dl giving a range of 10.5 g/dl. When the distribution of the hemoglobin was explored with a histogram it was found that the variable was normally distributed around the mean hemoglobin.

Hemoglobin Level in the Study Participants by Study Group

For the 109 study mothers in the intervention study arm the mean hemoglobin level was 11.75 g/dl (SD 1.71, 95% CI 11.42 - 12.08 g/dl). The median hemoglobin level was 11.9 g/dl with a minimum recorded hemoglobin level of 6g/dl and a maximum level of 16.5 g/dl giving a range of 10.5 g/dl. For the 104 study mothers in the non-intervention study arm the mean hemoglobin level was 11.57 g/dl (SD 1.46, 95% CI 11.29 - 11.85 g/dl). The median hemoglobin level was 11.35 g/dl with a minimum recorded hemoglobin level of 8.4 g/dl and a maximum level of 15.8 g/dl giving a range of 7.4 g/dl. This information is summarized in the box plot below depicting that the two groups were comparable by this variable (Figure 4.24).

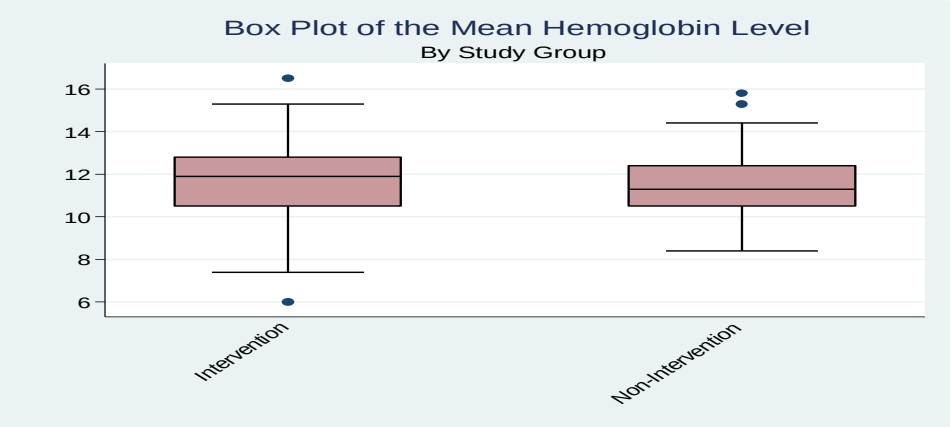


Figure 4.24: Box Plot showing the Mean Hemoglobin Level by Study Group

Hemoglobin Level in the Study Participants by Parity

For the 102 mothers who were primi gravidas i.e. had their first pregnancy, the mean hemoglobin level was 11.59 g/dl (SD 1.47 g/dl). For the 59 mothers who had one child, the mean hemoglobin level was 12.07 g/dl (SD 1.74 g/dl). For the 28 mothers who had two children, the mean hemoglobin level was 11.01 g/dl (SD 1.55 g/dl). For the 13 mothers who had three children, the mean hemoglobin level was 11.68 g/dl (SD 1.55 g/dl). For the seven mothers who had four children, the mean hemoglobin level was 11.3 g/dl (SD 1.71 g/dl). For the four mothers who were multiparous i.e., had five or more children, the mean hemoglobin level was 12.72 g/dl (SD 1.01 g/dl).

4.12.4 Blood Slide for Malaria

Only 12.59% (n=33) study participants had a blood slide done to screen for malaria in the study population. Almost eighty-eight percent (87.41%, n=229) study mothers did not have documentary proof of having done a blood slide to screen for malaria. Of the 33 mothers who did the test, 6.06% (n=2) reported a positive test for malaria while 93.94% (n=31) of the mothers reported a negative result for malaria.

4.12.5 VDRL Test

Ninety-two percent (92.75%, n=243) of the study participants had a VDRL test done to screen for syphilis. Only 7.25% (n=19) of the mothers did not have documentary proof of this test having been done. Of the 243 with a VDRL test result, 99.59% (n=242) tested negative while only one mother (0.41%) had a positive result.

4.13 Postnatal Outcomes

4.13.1 The Intervention

4.13.1.1 The Number of Short Text Messages (SMS) Sent

The first part of the intervention in this study involved sending standardized short text messages (SMS) every two weeks to the study participants in the intervention study arm. The mean number of SMS sent to the 132 study mothers in the intervention arm was 11.93 (SD 2.50, 95% CI 11.50 – 12.36) messages. The median number of SMS sent was 12 messages (Min 4, Max 19, R 15). Analysis of the mean number of SMS sent using a histogram below (Figure 4.25) to examine for the distribution of this variable indicated that it was normally distributed around the mean.

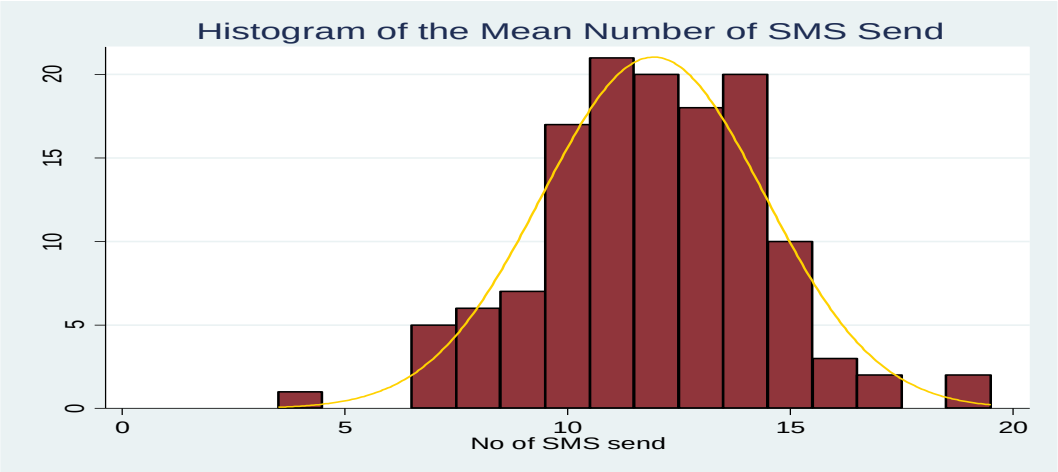


Figure 4.25: Histogram showing the Distribution of the Number of Short Text Message (SMS) Sent

The Number of Short Text Messages (SMS) Sent by the Age

For the 22 study participants who were aged 19 years and below, the mean number of SMS sent was 12 (SD 2.11, 95% CI 11.06 – 12.94) messages. For the 59 study participants who were aged between 20 and 24 years, the mean number of SMS sent was 12.22 (SD 2.53, 95% CI 11.56 – 12.88) messages. For the 33 study participants who were aged between 25 and 29 years, the mean number of SMS sent was 11.91 (SD 2.16, 95% CI 11.14 – 12.67) messages.

For the eleven study participants who were aged between 30 and 34 years, the mean number of SMS sent was 10.54 (SD 3.27, 95% CI 8.35 – 12.74) messages. For the five study participants who were aged between 35 and 39 years, the mean number of SMS sent was 10.8 messages (SD 3.49, 95% CI 6.46 – 15.14). For the two study participants who were aged 40 years and above, the mean number of SMS sent was 13.5 messages (SD 3.53, 95% CI -18.26 – 45.26).

The Number of Short Text Messages (SMS) Sent by the Education Level

For the 47 study mothers who had attained up to primary level of education, the mean number of SMS sent was 11.68 messages (SD 2.46, 95% CI 10.96 – 12.40). For the 53 study mothers who had attained up to secondary level of education, the

mean number of SMS sent was 11.70 (SD 2.48, 95% CI 11.01 – 12.38) messages. For the 32 study mothers who had attained up to tertiary level of education, the mean number of SMS sent was 12.69 (SD 2.53, 95% CI 11.77 – 13.60) messages.

4.13.1.2 Number of Calls Done

The second part of the intervention of this study included calling the study participants in the intervention study arm seven days (one week) before the scheduled date of return to the antenatal clinic. The mean number of calls done to the study mothers was 4.68 (SD 1.24, 95% 4.47 – 4.89) calls. The median number of calls was 4.5 messages (Min 2, Max 8, R 6). There were 132 study mothers in the intervention arm. Analysis of the mean number of calls done using a histogram (Figure 4.26) to examine for the distribution of this variable indicated that it was normally distributed around the mean.

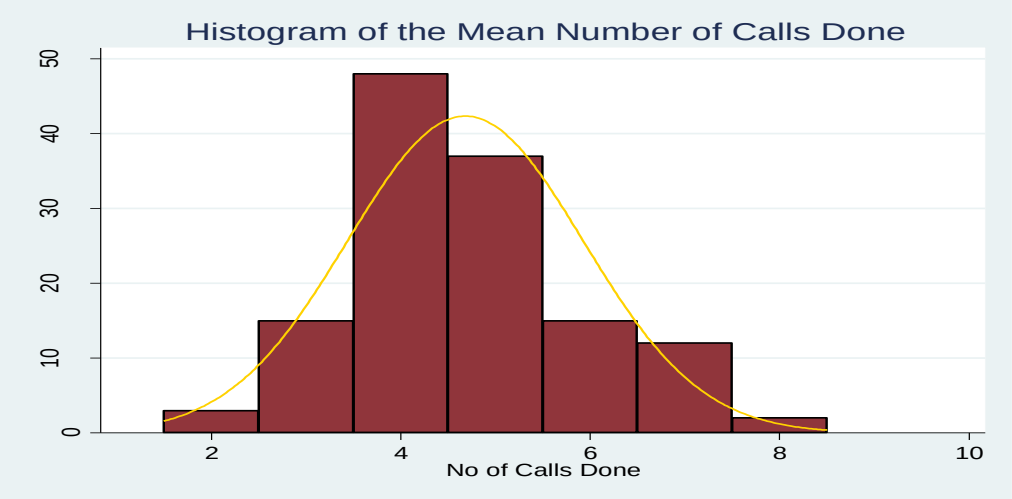


Figure 4.26: Histogram showing the Distribution of the Mean Number of Calls done to Study Participants

The Number of Calls Done to Study Participants by the Age

For the 22 study participants who were aged 19 years and below, the mean number of calls done was 4.82 (SD 1.30, 95% 4.24 – 5.39) calls. For the 59 study participants who were aged between 20 and 24 years, the mean number of calls done was 4.86 (SD 1.38, 95% CI 4.50 – 5.22) calls. For the 33 study participants who were aged

between 25 and 29 years, the mean number of calls done was 4.61 (SD 0.93, 95% CI 4.27 – 4.94) calls.

For the eleven study participants who were aged between 30 and 34 years, the mean number of calls done was 4.09 calls (SD 0.94, 95% CI 3.46 – 4.72). For the five study participants who were aged between 35 and 39 years, the mean number of calls done was four calls (SD 1.58, 95% CI 2.04 – 5.96). For the two study participants who were aged 40 years and above, the mean number of calls done was four calls.

The Number of Calls Done to Study Participants by the Facility of Enrolment

The mean number of calls done to the 24 study participants enrolled at Mulot Health Centre was 5.75 calls (SD 1.33, 95% 5.19 – 6.31). The median number of calls done was six calls (Min 3, Max 8, R 5). The mean number of calls done to the 66 study participants enrolled at Narok County Referral Hospital was 4.21 (SD 1.16, 95% CI 3.93 – 4.50) calls. The median number of calls done was four calls (Min 3, Max 7, R 4).

The mean number of calls done to the 14 mothers enrolled at Ntulele Health Centre was 4.93 (SD 1.14, 95% CI 4.27 – 5.59) calls. The median number of calls done was five calls (Min 3, Max 7, R 4). The mean number of calls done to the 28 study mothers enrolled at Ololunga Sub County Hospital was 4.75 (SD 0.75, 95% CI 4.46 – 5.04). The median number of calls done was five calls (min 4, Max 7, R 3). This information is depicted in the bar graph below (Figure 4.27).

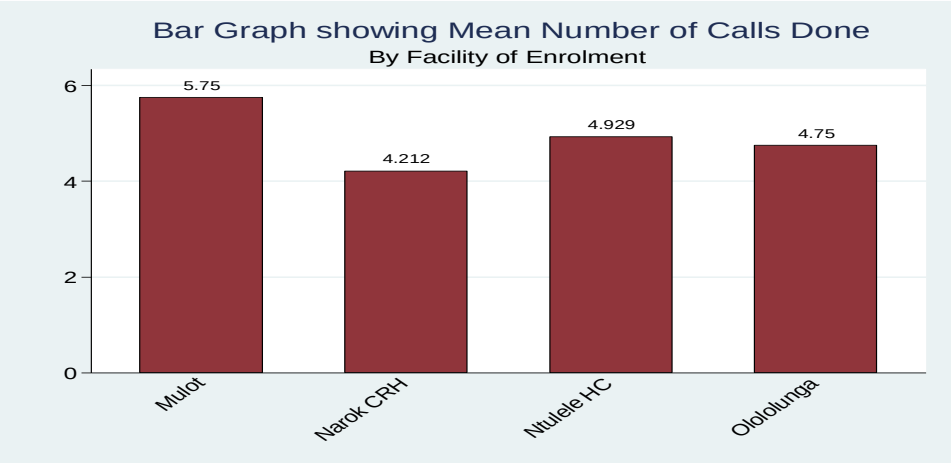


Figure 4.27: Bar Graph showing the Mean Number of Calls done to Study Participants by Facility of Enrolment

4.13.2 Objective 2: The proportion of health facility-based deliveries in the study population and compare the study participants in the intervention and the non-intervention group

4.13.2.1 The Place of Delivery for Study Participants

Over ninety-eight per cent (98.47% (n=258) of the study participants reported on the place at which they delivered. Of the ones who reported place of delivery, 79.84% (n=206) delivered in a health facility while 20.16% (n=52) delivered at home representing the prevalence of home deliveries of 20.16%. This figure of health facility-based deliveries was almost double the figure reported by the KDHS 2014 of 40% for Narok County. This is explained by the fact that the study recruited mothers from health facilities. This information is summarized in the pie chart below (Figure 4.28).

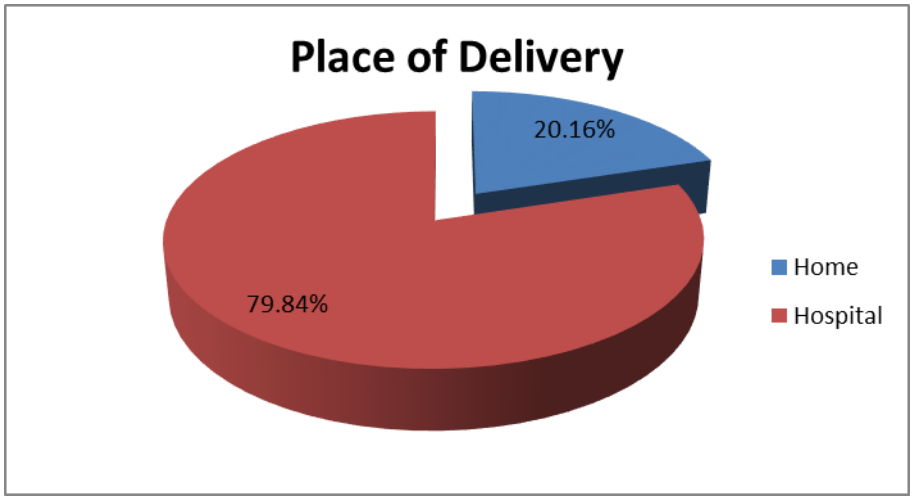


Figure 4.28: Pie Chart showing the Proportion of Place of Delivery for Study Participants

4.13.2.2 The Place of Delivery of the Study Participants by Study Group

The place of delivery reported by the mothers was analyzed according to the study arm to which the mothers had been allocated. For the study participants who were in the intervention study arm, 10% (n=13) had a home delivery while 90% (n=117) delivered in a health facility. For those study participants who were in the non-intervention study arm, 30.47% (n=39) had a home delivery while 69.53% (n=89) delivered in a health facility. The proportion of the study mothers who delivered at home was three times higher in the non-intervention group compared to the intervention group (30.47% vs. 10%). This information is summarized in the pie chart below (Figure 4.29).

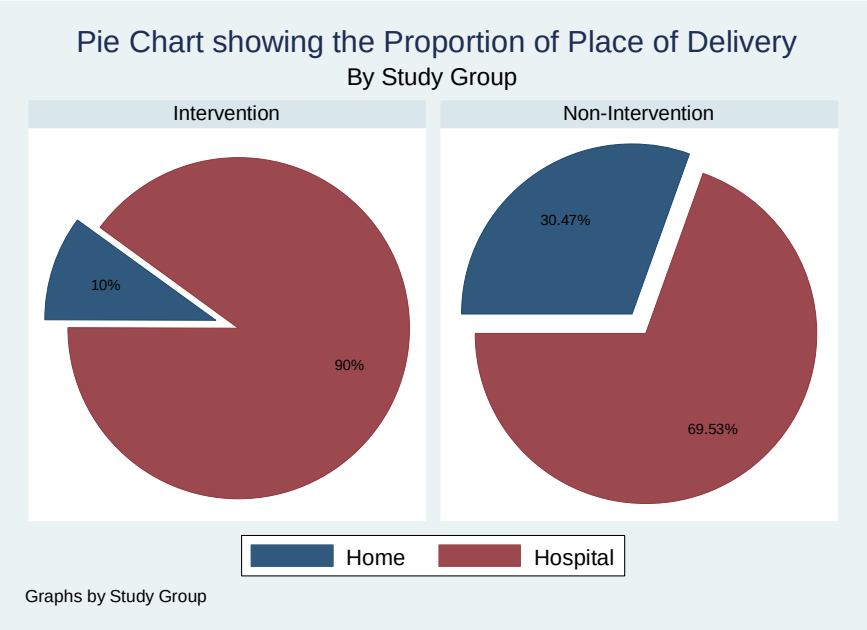


Figure 4.29: Pie Chart showing the Proportion of Place of Delivery by Study Group

The Study Participants' Home Deliveries by Education Level

The study participants who had a home delivery were analyzed further according to the level of education that they had attained. Almost eight per cent (7.69% (n=4) of these mothers had never attended any formal schooling, 53.85% (n=28) had attended up to primary school level, 26.92% (n=14) had attended up to secondary school level while 11.53% (n=6) had attended up to tertiary level of education. This information is summarized in the doughnut chart below (Figure 4.30), showing that almost two in three of them had attended only up to primary level of education.

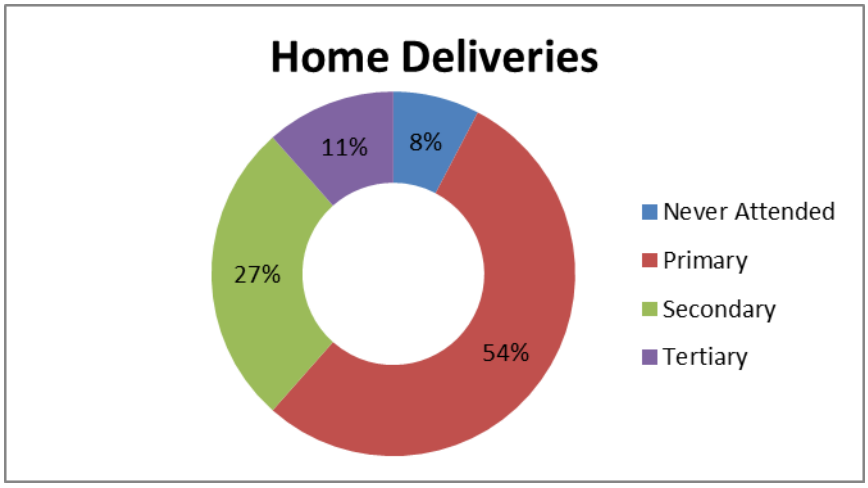


Figure 4.30: Doughnut Chart showing the Proportion of Home Deliveries by the Education Level

When the place of delivery was explored for each level of education attained by the study mothers it showed that 57.14% (n=4) of the study mothers who had never attended any formal schooling were likely to have home deliveries, compared to 30.43% (n=28) of those who had attended up to primary school level of education, 14% (n=14) of those who had attended up to secondary school level and 10.17% (n=6) of those who had attended up to tertiary level of education, showing a significant drop on the likelihood of home delivery with increase in level of education.

The Study Participants' Place of Delivery by Parity

For the 123 study mothers who were primi gravidas, 20.33% (n=25) of the mothers had home deliveries compared to 79.67% (n=98) of the mothers who had hospital deliveries. For the 73 study mothers who had one child, 16.44% (n=12) of them had home deliveries compared to 83.56% (n=61) who had hospital deliveries. For the 34 study mothers who had two children, 17.65% (n=6) of the mothers had home deliveries compared to 82.35% (n=28) of the mothers who had hospital deliveries. For the 16 mothers who had three children, 31.25% (n=5) of them had home deliveries while 68.75% (n=11) had hospital deliveries. For the eight study mothers who had four children, 12.50% (n=1) of the study mothers had home deliveries compared to 87.50% (n=7) who had hospital deliveries. For the four study mothers

who were multiparous, 75% (n=3) of them had home deliveries compared to 25% (n=1) who had hospital delivery. This information showed a gradual increase in the proportion of home deliveries as the parity of the study participants increased.

Place of Delivery of the Study Participants by Age

For the 49 study mothers who were aged 19 years and below, 28.57% (n=14) had a home delivery compared to 71.43% (n=35) who had hospital delivery. For the 119 study mothers aged between 20 and 24 years of age, 20.17% (n=24) of the mothers had home delivery compared to 79.83% (n=95) of the mothers who had hospital deliveries. For the 57 study mothers aged between 25 and 29 years, 15.79% (n=9) of the mothers had home delivery while 84.21% (n=48) of the mothers had hospital deliveries.

For the 20 study mothers aged between 30 and 34 years, 15% (n=3) of the mothers had home deliveries while 85% (n=17) of the mothers had hospital deliveries. For the 10 mothers aged between 35 and 39 years, 20% (n=2) of the mothers had home deliveries compared to 80% (n=8) of the mothers who had hospital deliveries. All the three mothers aged 40 years and above had hospital deliveries (100%). This information indicated that the higher the age the more likely that a study mother would deliver in a health facility.

4.13.3 Assistant at Delivery

Over ninety-eight per cent (98.47%, n=258) of the study participants reported on the person who assisted them at delivery. Almost four in five (79.84%, n=206) of these study mothers were assisted by a healthcare worker to deliver which indicates the level of skilled healthcare delivery of 79.84%. Ten per cent (10.47%, n=27) of the study participants were assisted to deliver by a relative at home whereas 9.69% (n=25) were assisted by a traditional birth attendant (TBA) to deliver. This information is depicted in the pie chart below (Figure 4.31).

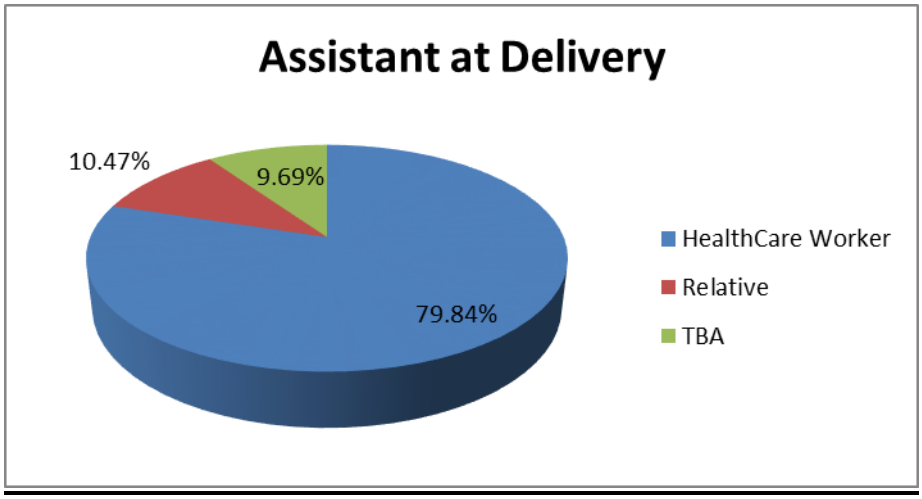


Figure 4.31: Pie Chart showing the Proportion of the Assistant at Delivery

The Assistant at Delivery by Study Group

In the intervention group with 130 study participants, 90% (n=117) of them were assisted by a healthcare worker to deliver. Five per cent (5.38%, n=7) of the study mothers were assisted by a relative to deliver, while 4.62% (n=6) were assisted by a traditional birth attendant to deliver. In the non-intervention study arm with 128 study participants, 69.53% (n=89) were assisted by a healthcare worker to deliver while 15.63% (n=20) were assisted by a relative, with 14.84% (n=19) being assisted by a traditional birth attendant to deliver. This information is summarized in the pie chart below (Figure 4.32) showing that the likelihood of using any other person apart from a healthcare worker to deliver was three times higher in the non-intervention group compared to the intervention group (30.47% vs. 10%).

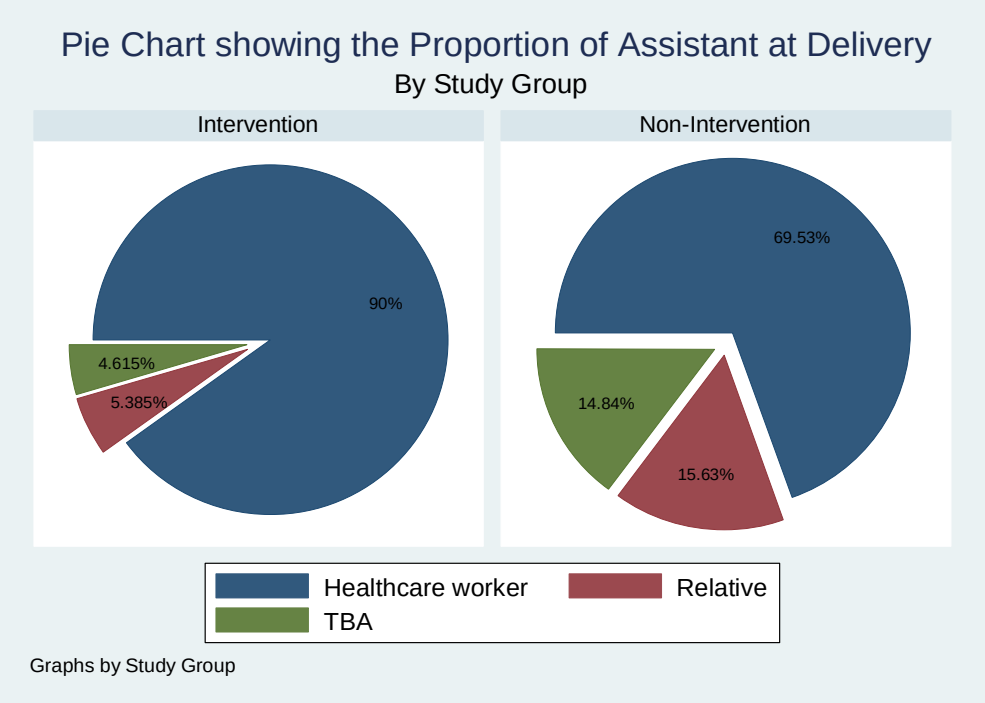


Figure 4.32: Pie Chart showing the Proportion of the Assistant at Delivery for Study Participants by Study Group

The Assistant at Delivery by the Age of Study Participant

For the 49 study participants who were aged 19 years and below, 71.43% (n=35) of them were assisted by a healthcare worker to deliver, while 18.37% (n=9) were assisted by a relative with 10.20% (n=5) being assisted by a traditional birth attendant to deliver. For the 119 study participants who were aged between 20 and 24 years, 79.83% (n=95) of them were assisted by a healthcare worker to deliver, while 9.24% (n=11) were assisted by a relative, with 10.92% (n=13) being assisted by a traditional birth attendant to deliver. For the 57 study participants who were aged between 25 and 29 years, 84.21% (n=48) of them were assisted by a healthcare worker to deliver, while 7.02% (n=4) were assisted by a relative with 8.77% (n=5) being assisted by a traditional birth attendant to deliver.

For the 20 study participants who were aged between 30 and 34 years, 85% (n=17) of them were assisted by a healthcare worker to deliver, while 10% (n=2) were assisted by a relative with 5% (n=1) being assisted by a traditional birth attendant to

deliver. For the 10 study participants who were aged between 35 and 39 years, 80% (n=8) of them were assisted by a healthcare worker to deliver, while 10% (n=1) were assisted by a relative with 10% (n=1) being assisted by a traditional birth attendant to deliver. There were only three study participants who were aged 40 years and above and they were all assisted by healthcare workers to deliver.

This information showed that the likelihood of using a healthcare worker at delivery increased with the age of the study participant.

Assistant at Delivery by the Marital Status of Study Participant

In the 222 study mothers who reported to be married, 80.18% (n=178) were assisted by a health care worker to deliver. Ten percent (10.36%, n=23) of the study mothers were assisted by a relative to deliver while 9.46% (n=21) were assisted by a traditional birth attendant to deliver. In the 35 study participants who were single, 77.14% (n=27) were assisted by a healthcare worker to deliver, with 11.43% (n=4) being assisted by a relative while a similar percentage i.e., 11.43% (n=4) were assisted by a traditional birth attendant to deliver.

The Assistant at Delivery by Education Level

Among the seven study mothers who had not attended any formal schooling, 42.86% (n=3) were assisted by a healthcare worker to deliver while 28.57% (n=2) were assisted by a relative to deliver with a similar percentage i.e. 28.57% (n=2) being assisted by a traditional birth attendant to deliver. Among the 92 study mothers who had attained primary school level of education, 69.57% (n=64) were assisted by a healthcare worker to deliver while 15.22% (n=14) were assisted by a relative to deliver with a similar percentage i.e., 15.22% (n=14) being assisted by a traditional birth attendant to deliver.

Among the 100 study mothers who had attained secondary school level of education, 86% (n=86) were assisted by a healthcare worker to deliver, while 7% (n=7) were assisted by a relative to deliver, with a similar percentage i.e., 7% (n=7) being assisted by a traditional birth attendant to deliver. Among the 59 study mothers who

had attained tertiary level of education, 89.83% (n=53) were assisted by a healthcare worker to deliver while 6.78% (n=4) were assisted by a relative to deliver, with 3.39% (n=2) being assisted by a traditional birth attendant to deliver.

This information showed that the likelihood of having a skilled healthcare delivery increased with increase in level of education with those study mothers who had attained tertiary level of education being more than twice likely to utilize a healthcare worker at delivery compared to those who had had no formal schooling (89.83% vs 42.86%). The likelihood of utilizing a TBA also decreased with increase in education with those who had attained a tertiary education 8 times less likely to utilize a TBA compared to those with no formal education (3.39% vs 28.57%).

Assistant at Delivery by the Facility of Enrolment

Seventy-one per cent (71.70%, n=38) of the 53 study mothers who were registered at Mulot Health Centre delivered being assisted by a healthcare worker while 13.21% (n=7) were assisted by a relative to deliver, with 15.09% (n=8) being assisted by a traditional birth attendant. Over eighty-seven per cent (87.79%, n=115) of the 131 study mothers who were registered at Narok County Referral Hospital delivered being assisted by a healthcare worker, while 7.63% (n=10) were assisted by a relative to deliver with 4.58% (n=6) being assisted by a traditional birth attendant.

Almost eighty-nine per cent (88.89%, n=24) of the 27 study mothers who were registered at Ntulele Health Centre delivered being assisted by a healthcare worker, while 3.70% (n=1) were assisted by a relative with 7.41% (n=2) being assisted by a traditional birth attendant. Sixty-one per cent (61.70%, n=29) of the 47 study mothers who were registered at Ololunga Sub County Hospital delivered being assisted by a healthcare worker, while 19.15% (n=9) were assisted by a relative to deliver with a similar percentage i.e., 19.15% (n=9) being assisted by a traditional birth attendant.

This information showed that Ololunga SDH had the lowest proportion of mothers who were assisted by a healthcare worker at delivery (61.7%), while Ntulele Health Centre had the highest proportion (88.89%).

Objective 3: Postnatal Neonatal Outcomes

4.13.4 Status of Baby at Delivery

Over ninety-eight per cent (98.47%, n=258) of the study participants reported on the status of the baby at delivery. Three quarters (75.58%, n=195) of the babies born to study participants cried immediately on delivery, while 21.32% (n=55) of the babies cried after a few minutes on delivery after neonatal resuscitation. Five babies (1.94%) did not cry at all while three babies (1.16%) did not move at all after delivery. This information is summarized in the pie chart below (Figure 4.33).

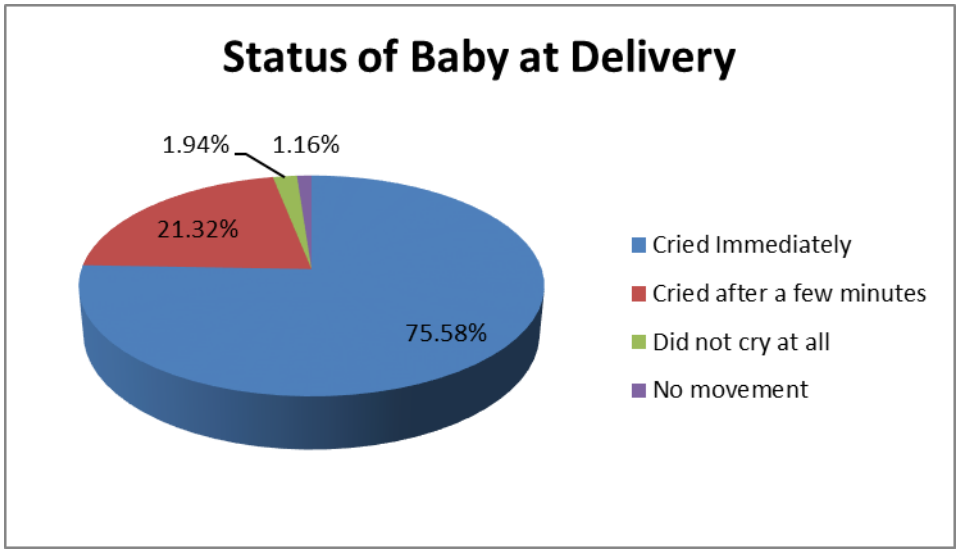


Figure 4.33: Pie Chart showing the Proportion of the Baby Status at Delivery

Status of the Baby at Delivery by Study Group

In the intervention group, 86.15% (n=112) of the babies born to study mothers cried immediately after delivery, while 12.31% (n=16) cried after a few minutes of neonatal resuscitation. One baby did not cry at all even on resuscitation (0.77%) while another baby did not move at all after delivery (0.77%). In the non-intervention group, 64.84% (n=83) of the babies cried immediately after delivery while 30.47% (n=39) of the babies cried after a few minutes of delivery. Four babies (3.13%) of the

babies did not cry at all after delivery while two babies (1.56%) did not move at all after delivery.

Status of the Baby at Delivery by Place of Delivery

For those mothers who delivered at home, 48.08% (n=25) of the babies cried immediately on delivery while a similar percentage of 48.08% (n=25) of the babies cried after a few minutes of delivery. Two babies (3.85%) did not cry at all. For the mothers who delivered in the hospital, 82.52% (n=170) of the babies cried immediately after delivery while 14.56% (n=30) of the babies cried after a few minutes of delivery. Three babies (1.46%) did not cry at all even with resuscitation while a similar number (1.46%) of the babies did not move at all. This information is summarized in the pie chart below (Figure 4.34).

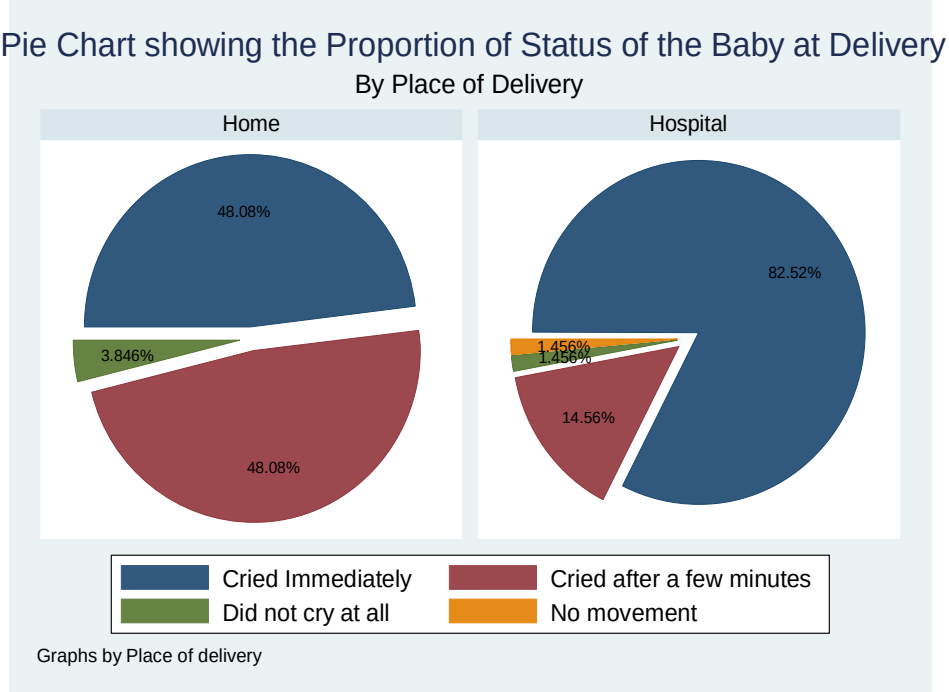


Figure 4.34: Pie Chart showing the Proportion of the Status of the Baby at Delivery by Place of Delivery

Status of the Baby at Delivery by Age

For the 49 mothers who were aged 19 years and below, 73.47% (n=36) of their babies cried immediately after delivery while 26.53% (n=13) cried after a few minutes of delivery. For the 119 mothers who were aged between 20 and 24 years, 76.47% (n=91) of their babies cried immediately after delivery. 20.17% (n=24) of the babies of these mothers cried after a few minutes of resuscitation. Two babies (1.68%) did not cry at all even with resuscitation while a similar number (1.68%) did not move at all.

For the 57 mothers who were aged between 25 and 29 years, 73.68% (n=42) of their babies cried immediately after delivery while 24.56% (n=14) of the babies cried after a few minutes of delivery. One baby (1.75%) did not cry at all even with resuscitation. For the twenty mothers who were aged between 30 and 34 years, 80% (n=16) of their babies cried immediately after delivery while two babies (10%) cried after a few minutes of delivery. One baby (5%) did not cry at all even with resuscitation while a similar number (5%) did not move at all.

For the ten mothers who were aged between 35 and 39 years, 80% (n=8) of their babies cried immediately after delivery while one baby (10%) cried after a few minutes of delivery. One baby (10%) did not cry at all even with resuscitation. For the three mothers who were aged 40 years and above, 66.67% (n=2) of their babies cried immediately after delivery while 33.33% (n=1) of the babies cried after a few minutes of delivery.

Status of the Baby at Delivery by Body Mass Index (BMI)

For the eight study participants who were underweight, 62.5% (n=5) of the babies cried immediately after delivery while 25% (n=2) cried a few minutes after delivery. One baby (12.5%) did not cry at all after delivery even with resuscitation. For the 115 mothers who were of normal weight, 73.04% (n=84) of their babies cried immediately after delivery while 25.22% (n=29) of the babies cried after a few minutes of delivery. One baby (0.87%) did not cry at all even with resuscitation and a similar number (0.87%) of the babies did not move at all after delivery.

For the 54 mothers who were overweight, 79.63% (n=43) of their babies cried immediately after delivery while 14.81% (n=8) of their babies cried after a few minutes. Two babies (3.70%) did not cry at all after delivery while one baby (1.85%) did not move at all at delivery. For the 20 mothers who were obese class I, 75% (n=15) of their babies cried immediately after delivery while 15% (n=3) of their babies cried after a few minutes of delivery. One baby (5%) did not cry at all after delivery while another baby did not move at all at delivery. For the five study mothers who were obese II, 60% (n=3) of their babies cried immediately after birth while two babies (40%) cried after a few minutes of birth. There was only one mother who was in obese class III with reported baby status at delivery whose baby cried after a few minutes of delivery.

Status of the Baby at Delivery by Parity

For the 120 mothers who were carrying their first pregnancy (Primi gravidas), 66.67% (n=80) of their babies cried immediately after birth while 30.83% (n=37) of their babies cried after a few minutes of delivery. Two babies (1.67%) did not cry at all after delivery even with resuscitation while one baby (0.83%) did not move at all after delivery. For those study mothers who were carrying a subsequent pregnancy, 83.33% (n=115) of their babies cried immediately after delivery while 13.04% (n=18) of their babies cried after a few minutes of delivery. Three babies (2.17%) did not cry at all after delivery even with resuscitation while two babies (1.45%) did not move at all after delivery.

Status of the Baby at Delivery by Facility of Enrolment

For the 53 study mothers enrolled at Mulot Health Centre, 77.36% (n=41) of their babies cried immediately after delivery while 22.64% (n=12) of their babies cried after a few minutes of delivery. For the 131 mothers enrolled at Narok County Referral Hospital, 71.76% (n=94) of their babies cried immediately after delivery while 22.14% (n=29) of their babies cried after a few minutes of delivery. Close to four per cent (3.82% (n=5) of their babies did not cry at all after delivery even with resuscitation while 2.29% (n=3) of their babies did not move at all after delivery.

For the 27 study mothers enrolled at Ntulele Health Centre, 92.59% (n=25) of their babies cried immediately after birth while 7.41% (n=2) of their babies cried after a few minutes of delivery. For the study mothers enrolled at Ololunga Sub County Hospital, 74.47% (n=35) of their babies cried immediately after delivery while 25.53% (n=12) of their babies cried after a few minutes after delivery.

Objective 3: Postnatal Maternal Outcomes

4.13.5 Complications at Birth for the Study Participants

All the study participants reported on whether they had any complications at birth. Seventy-one percent (71.76%, n=188) of them reported that they did not have any complication at birth while 28.24% (n=74) reported having had a complication at birth, which is equivalent to the prevalence of maternal complications at birth. This information is depicted in the pie chart below (Figure 4.35).

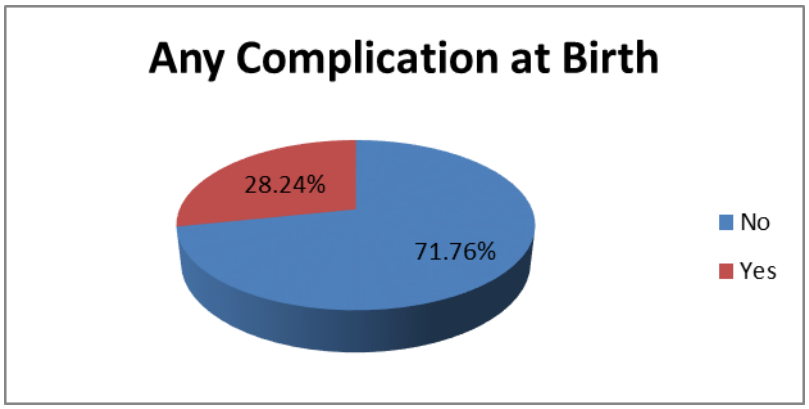


Figure 4.35: Pie Chart showing the Proportion of the Study Participants who had Complications at Birth

Types of Complications at Birth

The commonest type of complication at birth reported was prolonged labour, constituting 30.14% (n=22) of all the complications, followed by bleeding constituting 21.92% (n=16) of all the complications. Perineal injuries constituted 6.85% (n=5) of all reported complications while hypertension was at 5.48% (n=4). Miscarriages constituted 6.85% (n=5) while premature labour was at 5.48% (n=4).

Infections were reported in two mothers making 2.74% of all complications while three mothers reported having had a previous scar (4.11%). Cephalo-pelvic disproportion was reported in three mothers (4.11%) while one mother had cervical prolapse.

Any Maternal Complication at Birth by Study Group

For the 132 study mothers in the intervention arm, 80.3% (n=106) of the mothers had no complications at birth while 19.7% (n=26) of the study mothers in this group had complications at birth. For the 130 study mothers in the non-intervention arm, 63.08% (n=82) of the mothers had no complication at birth while 36.92% (n=48) of them in this group had complications at birth. This indicated that the prevalence of a complication at birth was 1.87 times higher for the study participants in the non-intervention group compared to the intervention group (36.92% vs 19.7%). This information is depicted in the pie chart below (Figure 4.36).

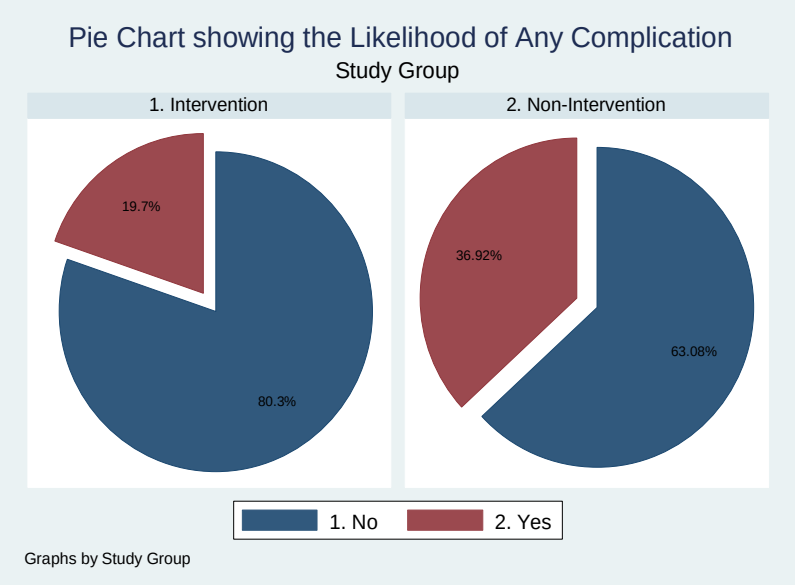


Figure 4.36: Pie Chart showing the Proportion of having Any Complication at Birth by Study Group

Any Maternal Complication at Birth by Place of Delivery

Examining the likelihood of having any complication at birth showed that for the 52 mothers who delivered at home, 38.46% (n=20) had no complication at birth while 61.54% (n=32) had a complication at birth. For the 206 mothers who delivered in the hospital, 81.55% (n=168) of them had no complication at birth while 18.45% (n=38) had a complication at birth. This indicated that the prevalence of having any complication at birth was 3.33 times higher in the mothers who delivered at home compared to those who delivered in a hospital (61.54% vs 18.45%).

Any Maternal Complication at Birth by Parity

For the 121 study mothers who were carrying their first pregnancy (primi gravidas), 67.77% (n=82) had no complication at birth while 32.23% (n=39) had a complication at birth. For the 141 study mothers who were carrying their subsequent pregnancies, 75.18% (n=106) of them had no complication at birth while 24.82% (n=35) had a complication at birth, indicating that the likelihood of having a complication at birth was higher in the primi gravidas compared to the mothers carrying their subsequent pregnancies.

The study participants carrying subsequent children (parity) were analyzed and the likelihood of a study participant having any complications calculated. For the 74 study participants who had one child, 83.78% (n=62) had no complication in the current delivery while 16.22% (n=12) had a complication. For the 36 study mothers who had 2 children, 72.22% (n=26) had no complication in the current delivery while 27.78% (n=10) had a complication. For the 16 study mothers with three children, 56.25% (n=9) had no complication at birth while 43.75% (n=7) had a complication. For the 8 study mothers with four children, 75% (n=6) had no complication at birth while 25% (n=2) had a complication. For the four multiparous study mothers i.e. having 5 or more children, 25% (n=1) had no complication at birth while 75% (n=3) had a complication.

This information showed that the likelihood of having any complication was higher in primi gravidas then decreased before gradually increasing as the parity of the study mother increased.

Any Maternal Complication at Birth by the Assistant at Delivery

Examining the likelihood of having any complication at birth by the assistant at delivery showed that for the 206 study participants who were assisted by a health care worker to deliver, 81.55% (n=168) of them had no complication at delivery while 18.45% (n=38) of them had a complication at birth. For the 27 mothers who were assisted by a relative to deliver, 40.74% (n=11) had no complication at birth while 59.26% (n=16) had a complication at birth. For the 25 study mothers who were assisted by a traditional birth attendant (TBA) to deliver, 36% (n=9) had no complication at birth while 64% (n=16) had a complication. This indicated that the prevalence of having any complication at birth was highest in the study mothers assisted by the traditional birth attendant to deliver (64%), which was 3.47 times higher than among the mothers who delivered assisted by the healthcare workers (18.45%). This information is summarized in the pie chart below (Figure 4.37).

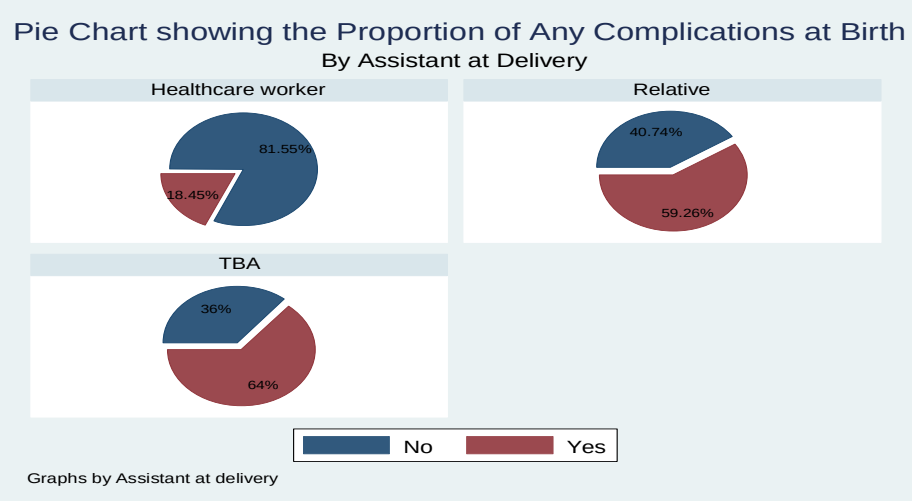


Figure 4.37: Pie Chart showing the Proportion of Any Complication at Birth by the Assistant at Delivery

Any Maternal Complication at Birth by Age

For the 50 study mothers aged 19 years and below, 66% (n=33) of them had no complication at birth while 34% (n=17) had a complication at birth. For the 119 mothers aged between 20 and 24 years, 75.63% (n=90) had no complication at birth

while 24.37% (n=29) had a complication at birth. For the 59 study mothers aged between 25 and 29 years, 72.88% (n=43) had no complication at birth while 27.12% (n=16) had a complication. For the 20 mothers aged between 30 and 34 years, 70% (n=14) of the study mothers had no complication at birth while 30% (n=6) had a complication. For the eleven mothers aged between 35 and 39 years, 54.55% (n=6) had no complication at birth while 45.45% (n=5) had a complication. For the three mothers aged 40 years and above, 66.67% (n=2) had no complication at birth while 33.33% (n=1) had a complication at birth.

This indicated that the prevalence of having a complication was higher in the teenage years then decreased in those in their early 20's before beginning to steadily increase with age.

Any Maternal Complication at Birth by the Body Mass Index (BMI)

For the eight mothers who were underweight, 37.5% (n=3) had no complication at birth while 62.5% (n=5) had a complication at birth. For the 116 study mothers who were of normal weight, 75% (n=87) had no complications at birth while 25% (n=29) had complications. For the 55 mothers who were overweight, 74.55% (n=41) had no complication at birth while 25.45% (n=14) had a complication. For the 21 mothers who were obese class I, 66.67% (n=14) of them had no complication at birth while 33.33% (n=7) had a complication. For the six mothers who were class II obese, 33.33% (n=2) had no complication at birth while 66.67% (n=4) had a complication at birth. Only one mother was obese class III and she had a complication at birth.

This indicated that the prevalence of having a complication at birth was higher in the study mothers who were underweight before decreasing in the mothers who were of normal weight then increasing steeply as the BMI increased.

Any Maternal Complication at Birth by Education Level

For the seven study mothers who had had no formal schooling, 42.86% (n=3) had no complication at birth while 57.14% (n=4) had a complication. For the 94 study mothers who had attained primary school level of education, 65.96% (n=62) had no

complication at birth while 34.04% (n=32) had a complication. For the 100 mothers who had attained secondary school level of education, 76% (n=76) had no complication at birth while 24% (n=24) had a complication. For the 61 study mothers who had attained tertiary level education, 77.05% (n=47) had no complication at birth while 22.95% (n=14) had a complication.

This indicated that the prevalence of having a complication at birth decreased steadily as the level of education attained increased.

Any Maternal Complication at Birth by Facility of Enrolment

For the 55 study mothers enrolled at Mulot Health Centre, 67.27% (n=37) had no complication at birth while 32.73% (n=18) had a complication. For the 133 study mothers enrolled at Narok County Referral Hospital, 72.18% (n=96) had no complication while 27.82% (n=37) had a complication. For the 27 study mothers enrolled at Ntulele Health Centre, 92.59% (n=25) had no complication at birth while 7.41% (n=2) had no complication at birth. For the 47 study mothers enrolled at Ololunga Sub County Hospital, 63.83% (n=30) had no complications at birth while 36.17% (n=17) had a complication at birth. Thus Ololunga had the highest prevalence of complications which ties well with the finding that more of those mothers also utilizing TBAs and relatives to deliver.

Any Maternal Complication at Birth by Distance to a Health Facility

For the 43 study mothers who had to travel less than one kilometer to reach a facility, 74.42% (n=32) had no complication at birth while 25.58% (n=11) had a complication. For the 164 study participants who had to travel between one and five kilometers to reach a facility 68.90% (n=113) had no complication at birth while 31.10% (n=51) had a complication at birth. For the 55 study mothers who had to travel more than five kilometers to reach a facility, 78.18% (n=43) had no complication at birth while 21.82% (n=12) had a complication.

4.13.6 Vaccination at Birth

Ninety-five percent (95.42%, n=250) of the study participants reported on the vaccination status of their babies at birth. Almost eighty percent (79.60%, n=199) of the mothers reported having had their babies vaccinated at birth. Twenty percent (20.40%, n=51) of the babies were not vaccinated at birth.

Vaccination at Birth by Study Group

For the 128 study participants in the intervention arm, 91.41% (n=117) of the babies were vaccinated at birth while 8.59% (n=11) were not vaccinated. For the 122 study mothers in the non-intervention, 67.21% (n=82) of the babies were vaccinated at birth while 32.79% (n=40) were not vaccinated at birth. This indicated that the children in the non-intervention arm were 3.82 times more likely not to be vaccinated at birth compared to those in the intervention arm (32.79% vs. 8.59%).

Vaccination at Birth by Place of Delivery

Babies' likelihood of vaccination was explored by the place at which the delivery took place. For the 49 study participants who delivered at home, 91.84% (n=45) did not receive vaccination at birth or in the immediate postnatal period while only 8.16% (n=4) received the vaccination. For the 201 study mothers who delivered at a hospital, 97.01% (n=195) of the babies were vaccinated at birth with only 2.99% (n=6) of the babies not receiving the vaccination.

4.13.7 Referral from the First Facility of Enrolment for Antenatal Care

Ninety-four percent (94.12%, n=240) of the study participants were not referred from the first facility that they started their ANC from, while 5.88% (n=15) were referred to higher level of care. All of the 15 study mothers referred were referred to the Narok County Referral Hospital from the lower level facilities.

Referral from the First Facility of Enrolment for Antenatal Care by Study Group

Of the 130 study mothers in the intervention study arm who had this data, 95.38% (n=124) were not referred while 4.62% (n=6) were referred. Of the 125 study mothers in the non-intervention study arm with this data available, 92.80% (n=116) were not referred while 7.20% (n=9) were referred to a higher level of care.

Referral from the First Facility of Enrolment for Antenatal Care by Parity

Out of the 15 study participants who were referred to a higher level of care, 53.33% (n=8) were having their first pregnancy (primi gravida) while 20% (n=3) were having their second child, while for mothers who were carrying their third, fourth, fifth and sixth child only one (6.67%) was referred to a higher level of care respectively.

Objective 1: The mean number of visits in ANC and PNC attendance among the study participants in the intervention group using a targeted mobile phone intervention compared with those in the non-intervention group in a pastoralist community

4.13.8 Number of Antenatal Visits

The mean number of antenatal visits done by each study participant was 3.48 (SD 1.06, 95% CI 3.35 – 3.61) visits. The median number of visits for the study mothers was four visits (Min 1, Max 5, R4). The distribution of the number of ANC visits was explored using a histogram. It was found to be slightly skewed towards the left as demonstrated in the figure below (Figure 4.38).

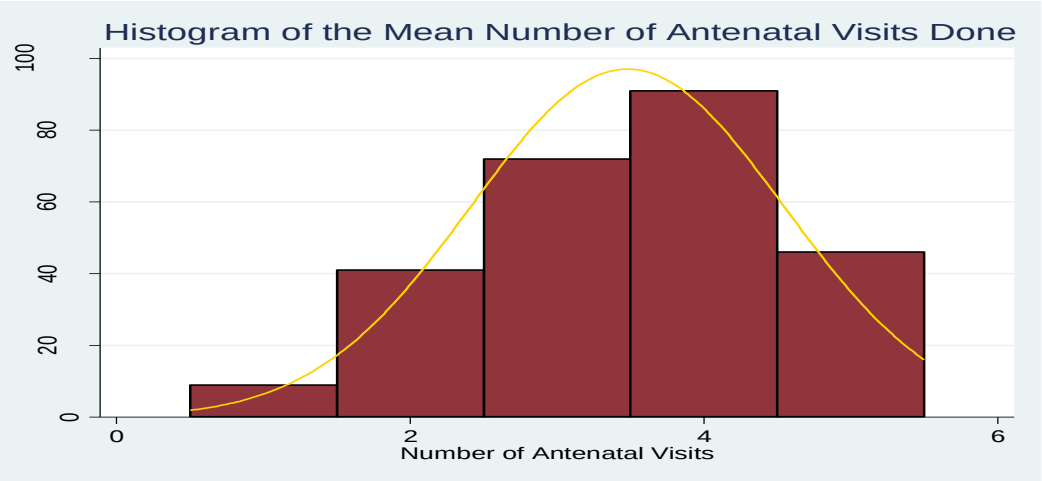


Figure 4.38: Histogram showing the Distribution of the Mean Number of ANC Visits

Because the mean number of ANC Visits was skewed to the left, the variable was transformed by getting the square of the number of ANC visits to allow for subsequent analysis and its distribution was examined. It was consequently found to be distributed normally around the mean as shown in the histogram below (Figure 4.39).

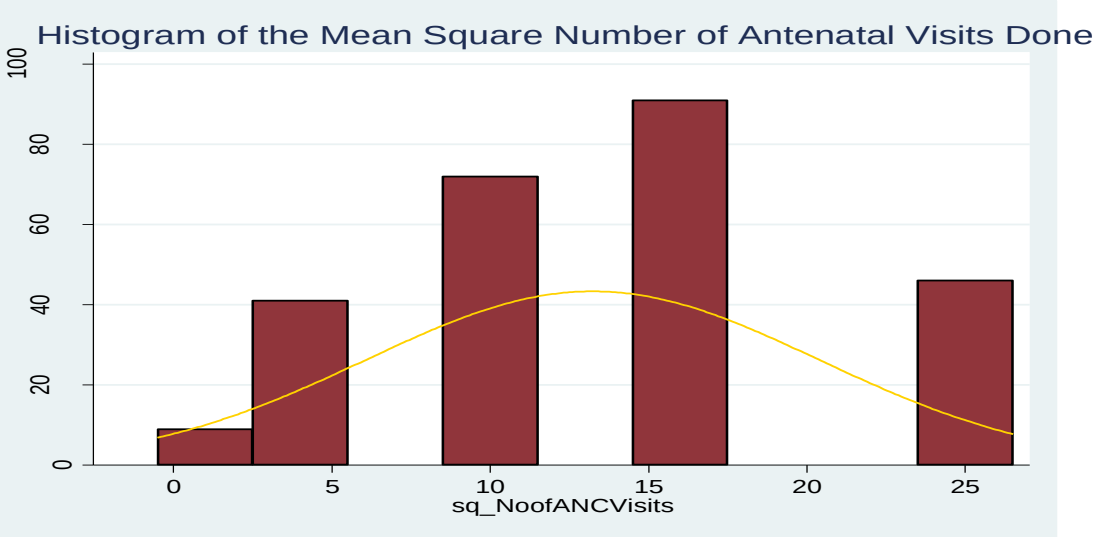


Figure 4.39: Histogram showing the Square of the Mean Number of ANC Visits

The Number of ANC Visits Done by Study Participants by Study Group

For the 131 study mothers who were in the intervention study arm, the mean number of visits was 4.10 (SD 0.76, 95% CI 3.97 – 4.23) visits. The median number of visits for this subgroup was four visits (Min 1, Max 5 R4). For the 128 study mothers who were in the non-intervention study arm, the mean number of visits was 2.84 (SD 0.95, 95% CI 2.68 – 3.01) visits. The median number of visits for this subgroup was three visits (Min 1, Max 5, R4). This information is summarized in the bar graph below (Figure 4.40).

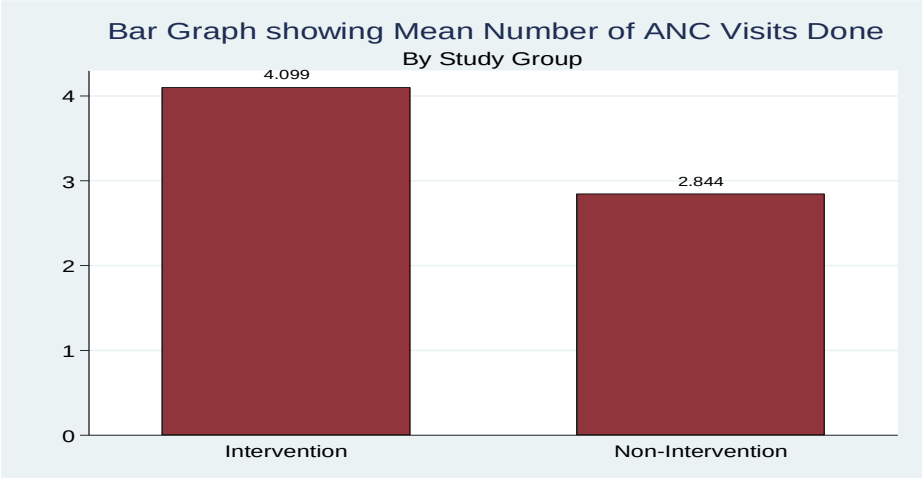


Figure 4.40: Bar Graph showing the Mean Number of ANC Visits done by Study Group

The Number of ANC Visits Done by Study Participants by Age

For the 50 study mothers who were aged 19 years and below, the mean number of visits was 3.26 (SD 1.17, 95% CI 2.93 – 3.59) visits. The median number of visits was three (Min 1, Max 5, R 4) visits. For the 118 study mothers who were aged between 20 and 24 years, the mean number of visits was 3.48 (SD 1.04, 95% CI 3.29 – 3.67) visits. The median number of visits was four (Min 1, Max 5, R 4) visits. For the 57 study mothers who were aged between 25 and 29 years, the mean number of visits was 3.70 (SD 0.89, 95% CI 3.47 – 3.94) visits. The median number of visits was four (Min 1, Max 5, R 4) visits.

For the twenty study mothers who were aged between 30 and 34 years, the mean number of visits was 3.35 (SD 1.35, 95% CI 2.72 – 3.98) visits. The median number of visits was four visits (Min 1, Max 5, R 4) visits. For the eleven study mothers who were aged between 35 and 39 years, the mean number of visits was 3.36 (SD 1.03, 95% CI 2.67 – 4.05) visits. The median number of visits was three visits (Min 1, Max 5, R 4) visits. For the three study mothers who were aged 40 years and above, the mean number of visits was four (4, SD 1, 95% CI 1.52 – 6.48) visits. The median number of visits was four visits (Min 3, Max 5 R 2) visits.

The Number of ANC Visits done by Study Participants by Education Level

For the three study mothers who had not attended any formal schooling, the mean number of visits was three (3, SD 1.15, 95% CI 1.93 – 4.07) visits. The median number of visits was three (3, Min 2, Max 5, R 3) visits. For the 93 study mothers who had attended up to primary schooling, the mean number of visits was 3.49 (SD 1.05, 95% CI 3.28 – 3.71) visits. The median number of visits was four (4, Min 1, Max 5, R 4) visits. For the 99 study mothers who had attained secondary level of schooling, the mean number of visits was 3.44 (SD 1.07, 95% CI 3.23 – 3.66) visits. The median number of visits was four visits (4, Min 1, Max 5, R 4) visits. For the 60 study mothers who had attained tertiary level of schooling, the mean number of visits was 3.57 (SD 1.08, 95% CI 3.29 – 3.85) visits. The median number of visits was four visits (4, Min 1, Max 5, R 4) visits.

The Number of ANC Visits Done by Study Participants by Facility of Enrolment

For the 54 study mothers who had been enrolled at Mulot Health Centre, the mean number of visits was 3.52 (SD 1.08, 95% CI 3.22 – 3.81) visits. The median number of visits was four (4, Min 1, Max 5, R 4) visits. For the 131 study mothers who had been enrolled at Narok County Referral Hospital, the mean number of visits was 3.42 (SD 1.12, 95% CI 3.23 – 3.61) visits. The median number of visits was three (3, Min 1, Max 5, R 4) visits. For the 27 study mothers who had been enrolled at Ntulele Health Centre, the mean number of visits was 3.67 (SD 0.78, 95% CI 3.36 – 3.98) visits. The median number of visits was four (4, Min 2, Max 5, R 3) visits. For the 47

study mothers who had been enrolled at Ololunga Sub County Hospital, the mean number of visits was 3.49 (SD 1.04, 95% CI 3.18 – 3.79) visits. The median number of visits was four (4, Min 1, Max 5, R 4) visits.

The Number of ANC Visits Done by Study Participants by Distance to a Health Facility

For the 43 study mothers who had to travel a distance of less than one kilometer to reach a health facility, the mean number of visits was 3.45 (SD 0.98, 95% CI 3.13 – 3.75) visits. The median number of visits was four (Min 1, Max 5, R 4) visits. For the 161 study mothers who had to travel a distance of between one and five kilometers to reach a health facility, the mean number of visits was 3.50 (SD 1.11, 95% CI 3.32 – 3.67) visits. The median number of visits was four (Min 1, Max 5, R 4) visits. For the 55 study mothers who had to travel a distance of more than five kilometers to reach a health facility, the mean number of visits was 3.44 (SD 1.01, 95% CI 3.19 – 3.72) visits. The median number of visits was four (Min 1, Max 5, R 4) visits.

The Number of ANC Visits Done by Study Participants by Smoking Status

The mean number of ANC visits was also explored by the study participants' smoking status as a proxy indicator for risk-taking behaviour. For the 257 study mothers who were non-smokers, the mean number of visits was 3.48 (SD 1.07, 95% CI 3.35 – 3.61) visits. The median number of visits was four (Min 1, Max 5, R 4) visits. There were two study mothers who were smokers and they had a mean number of visits of three visits. This information is summarized in the bar graph below (Figure 4.41).

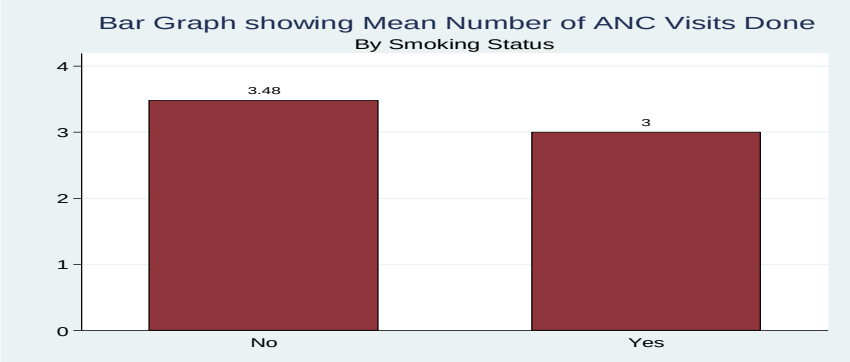


Figure 4.41: Bar Graph showing the Mean Number of ANC Visits by Smoking Status

The Number of ANC Visits Done by Study Participants by Alcohol Consumption Status

The mean number of ANC visits was also explored by the study participants' alcohol consumption status, a second proxy indicator for risk-taking behaviour. For the 256 study mothers who reported not to consume alcohol, the mean number of visits was 3.49 (SD 1.07, 95% CI 3.36 – 3.62) visits. The median number of ANC visits was four (Min 1, Max 5, R 4) visits. For the three study mothers who reported to consume alcohol, the mean number of visits was 2.67 (SD 0.58, 95% CI 1.23 – 4.10) visits. The median number of ANC visits was three (Min 2, Max 3, R 1) visits. This information is summarized in the bar graph below (Figure 4.42).

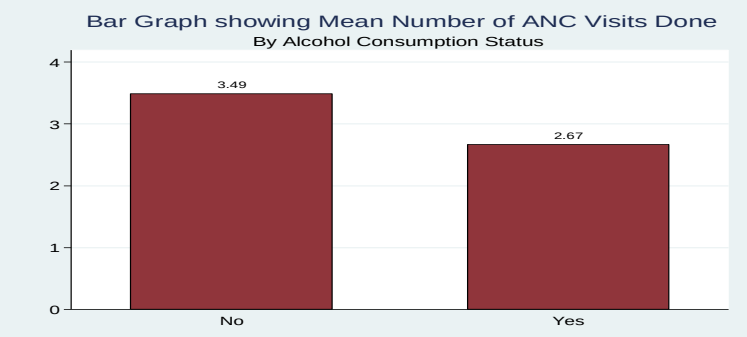


Figure 4.42: Bar Graph showing the Mean Number of ANC Visits by Alcohol Consumption Status

This indicated that the mothers who were smokers and were consumers of alcohol were more likely to attend fewer ANC visits compared to the non-consumers.

4.13.9 The Mode of Delivery

The mode of delivery for the study participants was reported for 98.09% (n=257) of the mothers. Eighty six percent (86.38%, n=222) of the study mothers delivered via Spontaneous Vertex Delivery (SVD) while 13.62% (n=35) delivered via a Cesarean Section (CS) (giving a 13.62% CS rate). This information is summarized in the pie chart below (Figure 4.43).

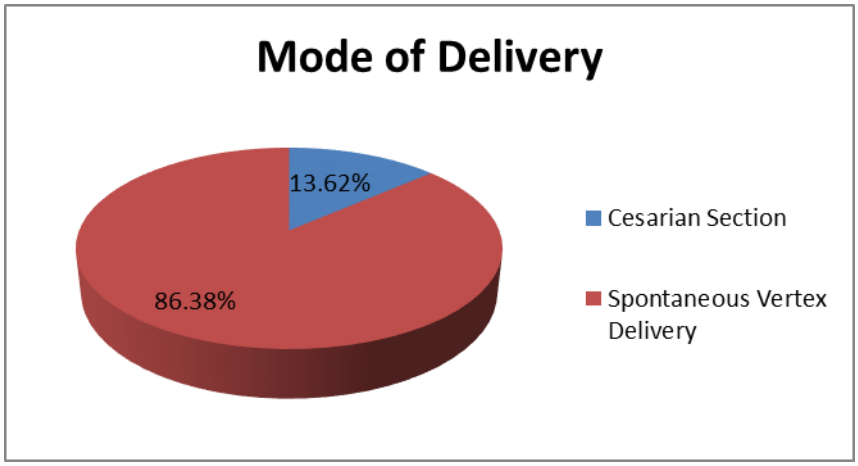


Figure 4.43: Pie Chart showing the Mode of Delivery for Study Participants

The Mode of Delivery by Study Group

For the 129 study mothers who were in the intervention arm, 82.95% (n=107) delivered by spontaneous vertex delivery while 17.05% (n=22) delivered via Cesarean Section. For the 128 study mothers who were in the non-intervention study arm, 89.84% (n=115) delivered via spontaneous vertex delivery while 10.16% (n=13) delivered via Cesarean Section.

The Mode of Delivery by Body Mass Index (BMI)

For the eight underweight study mothers, 62.5% (n=5) delivered via SVD while 37.5% (n=3) delivered via a Cesarean Delivery. For the 115 study mothers who were of normal weight, 92.17% (n=106) delivered via SVD while 7.83% (n=9) delivered via CS. For the 54 study mothers who were overweight, 75.93% (n=41) delivered via SVD while 24.07% (n=13) delivered via CS. For the 19 study mothers who were obese class I, 73.68% (n=14) delivered via SVD while 26.32% (n=5) delivered via CS. The five study mothers who were obese class II delivered via SVD while the one study mother who was obese class III delivered via CS.

The Mode of Delivery by Education Level

All the seven study mothers who had not attended any formal schooling delivered via SVD. Of the 92 study mothers who had attained primary school level of education, 90.22% (n=83) delivered via SVD while 9.78% (n=9) delivered via CS. Of the 99 study mothers who had attained up to secondary school level of education, 81.82% (n=81) delivered by SVD while 18.18% (n=18) delivered by CS. Of the 59 study mothers who had attained tertiary level of education, 86.44% (n=51) delivered by SVD while 13.56% (n=8) delivered by CS. This information showed a general increase in CS rates as the education level increased.

The Mode of Delivery by Facility of Enrolment

Of the 53 study mothers enrolled at Mulot Health Centre, 98.11% (n=52) delivered by SVD while only one mother delivered by CS (1.89%). Of the 130 study mothers that were enrolled at Narok County Referral Hospital, 78.46% (n=102) delivered by SVD while 21.54% (n=28) delivered by CS. Of the 27 study mothers that were enrolled at Ntulele Health Centre, 96.30% (n=26) delivered by SVD with only one mother delivering by CS (3.70%). Of the 47 study mothers enrolled at Ololunga Sub County Hospital, 89.36% (n=42) delivered by SVD while 10.64% (n=5) delivered by CS. This information showed an increase in the CS rates by an increase in the level of care of the health facility.

The Mode of Delivery by Parity

The mode of delivery was also explored based on whether this was the study participants' first pregnancy (Primi Gravida) or not. For the 120 primi gravidas, 85% (n= 102) delivered via SVD while 15% (n=18) delivered via CS. For the 137 study mothers who were carrying their subsequent pregnancies, 87.59% (n=120) delivered via SVD while 12.41% (n=17) delivered via CS.

Mode of Delivery by Age

For the 49 study mothers who were aged 19 years and below, 10.20% (n=5) had a Cesarean Delivery while 89.80% (n=44) had a spontaneous vertex delivery (SVD) while for the 118 study mothers who were aged between 20 and 24 years, 11.86% (n=14) had a Cesarean Delivery while 88.14% (n=104) had a spontaneous vertex delivery (SVD). For the 57 study mothers who were aged between 25 and 29 years, 17.54% (n=10) had a Cesarean Delivery while 82.46% (n=47) had a spontaneous vertex delivery (SVD) whereas for the twenty study mothers who were aged between 30 and 34 years, 15% (n=3) had a Cesarean Delivery while 85% (n=17) had a spontaneous vertex delivery (SVD).

For the ten study mothers who were aged between 35 and 39 years, 30% (n=3) had a Cesarean Delivery while 70% (n=7) had a spontaneous vertex delivery (SVD), while all the three study mothers aged 40 years and above had a spontaneous vertex delivery (SVD). This information showed a general increase in CS rates with increasing age.

4.13.10 The Apgar Score at 5 Seconds

The data for Apgar score at 5 seconds was available for 83.96% (n=220) study participants. The mean Apgar score at 5 seconds for these study mothers was 8.9 (SD 1.67, 95% CI 8.68 – 9.12). The median score was nine and the minimum score was zero while the maximum score was ten giving a range of ten.

The distribution of the Apgar score at 5 seconds was also examined using a histogram (Figure 4.44) and it showed that this variable was expectedly skewed towards the left.

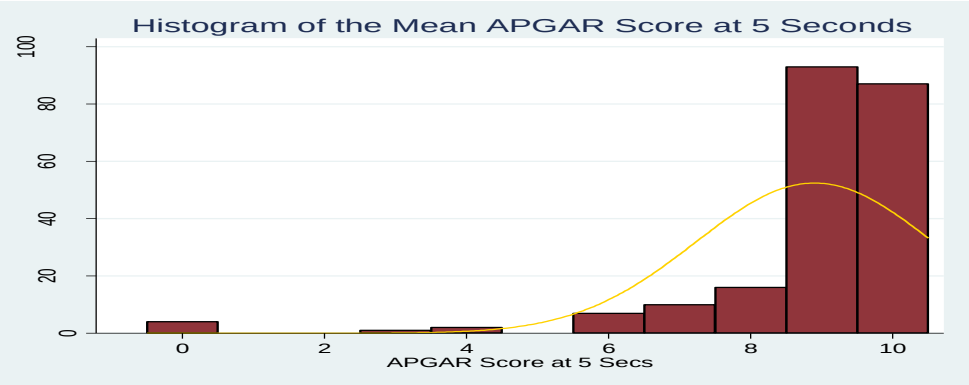


Figure 4.44: Histogram showing the Distribution of the Mean APGAR Score at 5 Seconds

The APGAR Score at 5 Seconds by Study Group

For the 121 study mothers who were allocated to the intervention study arm, the mean Apgar score at 5 seconds was 9.36 (SD 0.83, 95% 9.21 – 9.51). The median Apgar score was ten (Min 6, Max 10, R 4). For the 99 study mothers who were in the non-intervention study arm, the mean Apgar score was 8.33 (SD 2.20, 95% CI 7.89 – 8.77). The median Apgar score was nine (Min 0, Max 10, R 10). This showed that the study participants in the intervention arm had better mean and median APGAR Score than the mothers in the non-intervention arm.

The APGAR Score at 5 Seconds by Age

For the 39 study mothers who were aged 19 years and below, the mean Apgar score was 9.03 (SD 1.01, 95% CI 8.70 – 9.35). The median Apgar score was nine (9, Min 6, Max 10, R 4). For the 100 study mothers who were aged between 20 and 24 years, the mean score was 8.87 (SD 1.72, 95% CI 8.53 – 9.21). The median Apgar score was nine (9, Min 0, Max 10, R 10). For the 51 study mothers who were aged between 25 and 29 years, the mean score was 9.04 (SD 1.18, 95% 8.71 – 9.37). The median Apgar score was nine (9, Min 4, Max 10, R 4).

For the 18 study mothers who were aged between 30 and 34 years, the mean score was 8.39 (SD 3.09, 95% 6.85 – 9.92). The median Apgar score was nine (9, Min 0, Max 10, R 10). For the nine study mothers who were aged between 35 and 39 years, the mean score was 8.67 (SD 2.18, 95% CI 6.99 – 10.34). The median Apgar score was ten (10, Min 4, Max 10, R 6). For the three study mothers who were aged 40 years and above, the mean score was 9.67 (SD 0.58, 95% CI 8.23 – 11.10). The median Apgar score was ten with a minimum score of nine and a maximum score of ten giving a range of one.

The APGAR Score at 5 Seconds by Parity

For the 106 primi gravidas, the mean Apgar score was 8.72 (SD 1.69, 95% CI 8.39 – 9.04). The median Apgar score was nine (9, Min 0, Max 10, R 10). For the 61 study mothers carrying their second pregnancy, the mean Apgar score was 9.38 (SD 0.71, 95% CI 9.19 – 9.56). The median Apgar score was nine (9, Min 7, Max 10, R 3). For the 29 study mothers carrying their third pregnancy, the mean Apgar score was 9.28 (SD 1.19, 95% CI 8.82 – 9.72). The median Apgar score was ten (10, Min 4, Max 10, R 6).

For the 14 study mothers carrying their fourth pregnancy, the mean Apgar score was 7.57 (SD 3.48, 95% CI 5.56 – 9.73). The median Apgar score was nine (9, Min 0, Max 10, R 10). For the seven study mothers carrying their fifth pregnancy, the mean Apgar score was 9.57 (SD 0.53, 95% CI 9.08 – 10.07). The median Apgar score was ten (10, Min 9, Max 10, R 1). For the three study mothers carrying their sixth pregnancy (multiparous), the mean Apgar score was 6.67 (SD 3.06, 95% CI -0.92 – 14.26). The median Apgar score was six (6, Min 4, Max 10, R 6). This indicated that the multiparous women had the lowest mean Apgar score at five minutes.

The APGAR Score at 5 Seconds by Body Mass Index (BMI)

For the six study mothers who were classified as underweight, the mean Apgar score was 7.17 (SD 3.82, 95% CI 3.16 – 11.17). The median Apgar score was 8.5 (Min 0, Max 10, R 10). For the 102 study mothers who were classified as of normal weight, the mean Apgar score was 8.81 (SD 1.49, 95% CI 8.52 – 9.11). The median Apgar

score was nine (9, Min 0, Max 10, R 10). For the 49 study mothers who were classified as overweight, the mean Apgar score was 8.88 (SD 2.10, 95% CI 8.27 – 9.48). The median Apgar score was nine (9, Min 0, Max 10, R 10).

For the 16 study mothers who were classified as obese class I, the mean APGAR score was 9.19 (SD 0.98, 95% CI 8.66 – 9.71). The median Apgar score was nine (9, Min 6, Max 10, R 4). For the four study mothers who were classified as obese class II, the mean Apgar score was 9.25 (SD 1.5, 95% CI 6.86 – 11.63). The median Apgar score was ten (10, Min 7, Max 10, R 3). There was only one study mother classified as obese class III and she gave birth to a baby who scored seven. This information is depicted in the bar graph below showing that the mothers who were classified as underweight and obese class three had the lowest mean APGAR Scores at five minutes (Figure 4.45).

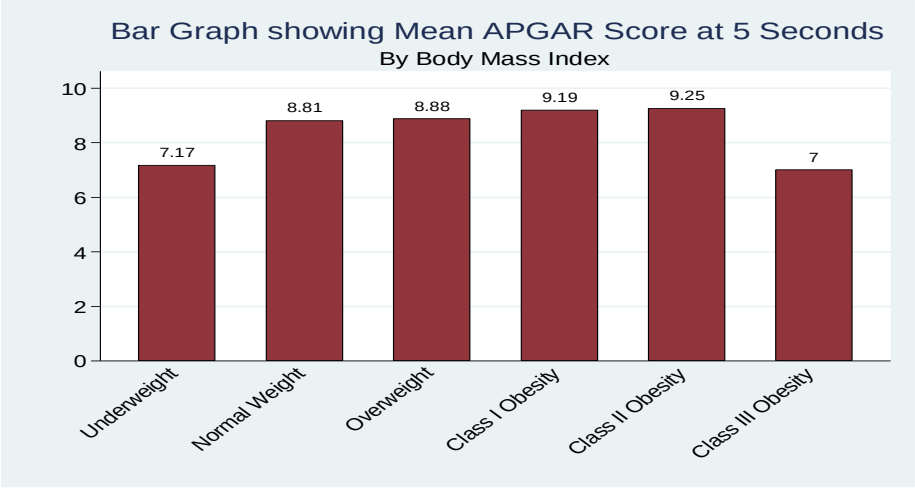


Figure 4.45: Bar Graph showing the Mean APGAR Score at 5 Seconds by BMI

The APGAR Score at 5 Seconds by Time to a Health Facility

For the 20 study mothers who took less than 15 minutes to reach a health facility, the mean Apgar score was 9.03 (SD 1.95, 95% CI 8.29 – 9.78). The median Apgar score was ten (10, Min 0, Max 10, R 10). For the 56 study mothers who took between 15 and 30 minutes to reach a health facility, the mean Apgar score was 9.09 (SD 1.55, 95% CI 8.67 – 9.50). The median Apgar score was nine (9, Min 0, Max 10, R 10). For the 111 study mothers who took between 30 and 60 minutes to reach a health

facility, the mean Apgar score was 8.79 (SD 1.56, 95% CI 8.50 – 9.09). The median Apgar score was nine (9, Min 0, Max 10, R 10). For the 24 study mothers who took more than 60 minutes to reach a health facility, the mean Apgar score was 8.79 (SD 2.11, 95% CI 7.90 – 9.68). The median Apgar score was nine (9, Min 0, Max 10, R 10).

4.13.11 Birth Weight

Data on birth weight were available for 88.55% (n=232) of the study participants. The mean baby weight at birth was 3,239 (SD 476, 95% CI 3178 - 3301) grams. The median birth weight was 3,185 grams (Min 1750, Max 4800, R 3050). The mean birth weight distribution was explored using a histogram. It was found to be normally distributed around the mean as shown in figure 4.46 below.

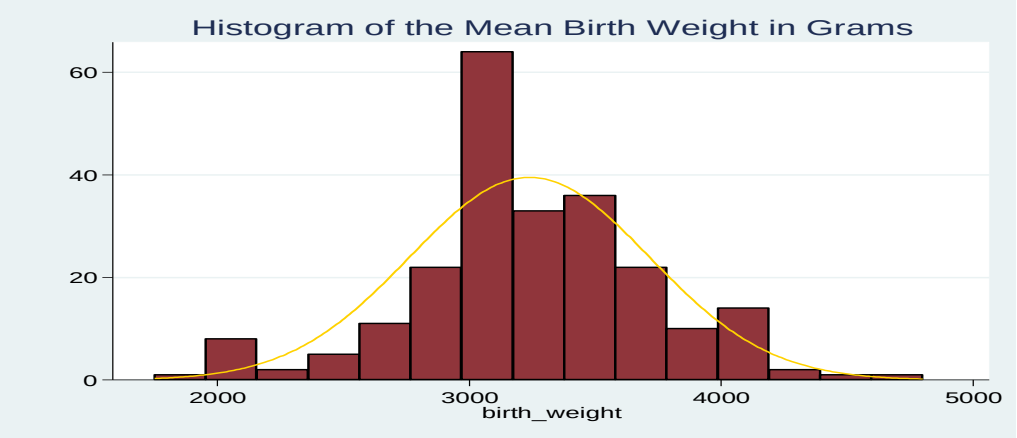


Figure 4.46: Histogram of the Mean Birth Weight in Grams

Birth Weight of the Study Participant Babies by Study Group

For the 123 study mothers who were in the intervention arm, the mean birth weight was 3,228 (SD 442, 95% CI 3149 - 3307) grams. The median birth weight was 3,180 grams (Min 2050, Max 4570, R 2520). For the 109 study mothers who were in the non-intervention arm, the mean birth weight was 3,252 (SD 514, 95% CI 3154 – 3350) grams. The median birth weight was 3,210 grams (Min 1750, Max 4800, R 3050). This information is depicted in the box plot below (Figure 4.47).

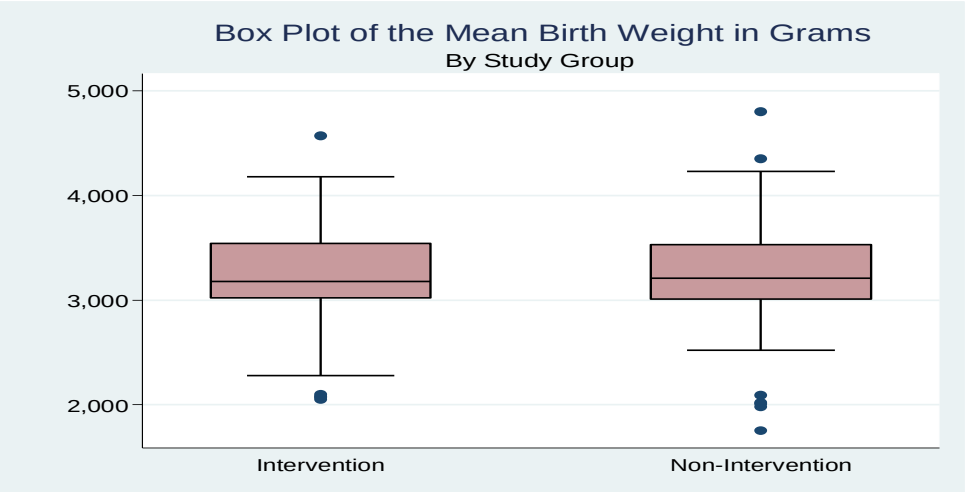


Figure 4.47: Box Plot showing the Mean Birth Weight in Grams by Study Group

Birth Weight of the Study Participant Babies by Maternal Age

For the 45 study mothers who were aged 19 years and below, the mean birth weight was 3,151 (SD 467, 95% CI 3011 - 3292) grams. The median birth weight was 3080 grams (Min 2,010, Max 4,110, R 2100). For the 105 study mothers who were aged between 20 and 24 years, the mean birth weight was 3,258 (SD 437, 95% CI 3173 - 3342) grams. The median birth weight was 3,260 grams (Min 1,980, Max 4,800, R 2820). For the 53 study mothers who were aged between 25 and 29 years, the mean birth weight was 3,322 (SD 491, 95% CI 3186 - 3457) grams. The median birth weight was 3,270 grams (Min 2,080, Max 4,350, R 2270).

For the 17 study mothers who were aged between 30 and 34 years, the mean birth weight was 3,274 (SD 581, 95% CI 2975 - 3572) grams. The median birth weight was 3,240 grams (Min 2050, Max 4570, R 2520). For the nine study mothers who were aged between 35 and 39 years, the mean birth weight was 2,926 (SD 639, 95% CI 2435 - 3417) grams. The median birth weight was 3,020 grams (Min 1750, Max 3620, R 1870). For the three study mothers who were aged 40 years and above, the mean birth weight was 3,187 grams (SD 263, 95% CI 2533 - 3840). The median birth weight was 3,140 grams (Min 2950, Max 3470, R 520).

Birth Weight of the Study Participant Babies by Body Mass Index (BMI)

For the six study mothers who were classified as being underweight, the mean birth weight was 3,040 (SD 589, 95% CI 2422 - 3658) grams. The median birth weight was 3,140 grams (Min 2010, Max 3780, R 1770). For the 107 study mothers who were classified as being of normal weight, the mean birth weight was 3,184 (SD 455, 95% CI 3097 - 3272) grams. The median birth weight was 3,140 grams (Min 1980, Max 4180, R 2200). For the 49 study mothers who were classified as being overweight, the mean birth weight was 3,344 (SD 470, 95% CI 3209 - 3479) grams. The median birth weight was 3,280 grams (Min 1759, Max 4570, R 2820).

For the 15 study mothers who were classified as being obese class I, the mean birth weight was 3,296 (SD 331, 95% CI 3112 - 3480) grams. The median birth weight was 3,240 grams (Min 2730, Max 3980, R 1250). For the four study mothers who were classified as being obese class II, the mean birth weight was 3,278 (SD 493, 95% CI 2493 - 4062) grams. The median birth weight was 3,255 grams (Min 2780, Max 3820, R 1040). Only one study mother classified as obese class III had data on BMI and she delivered a baby who weighed 4,350 grams. This information is depicted in the bar graph below (Figure 4.48).

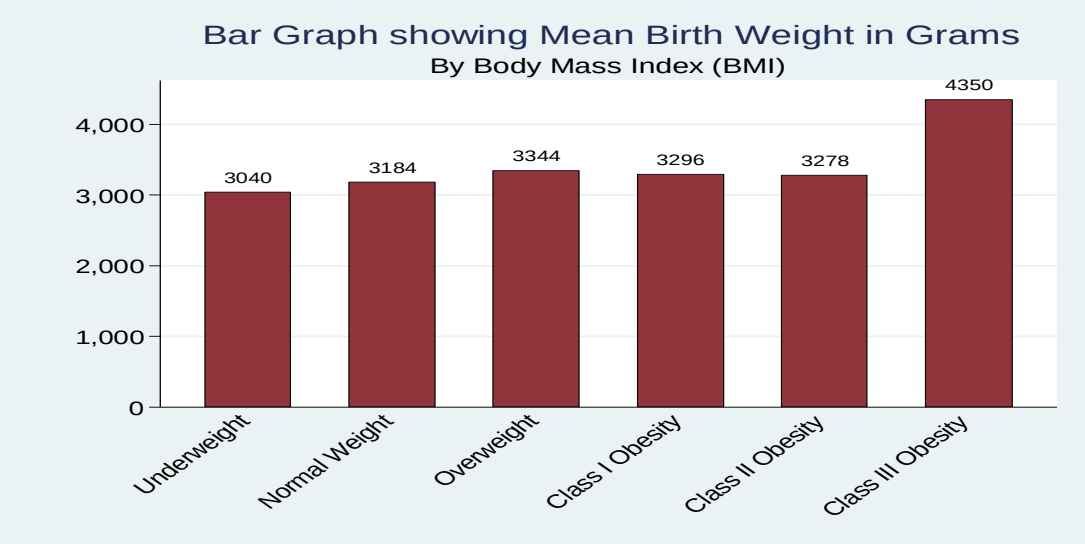


Figure 4.48: Bar Graph showing the Mean Birth Weight in Grams by BMI

Birth Weight of the Study Participants' Babies by Mother's Education Level

For the five study mothers who had not attended any formal schooling, the mean birth weight was 3,114 (SD 181, 95% CI 2889 - 3339) grams. The median birth weight was 3,170 grams (Min 2850, Max 3310, R 460). For the 80 study mothers who had attended up to primary level of schooling, the mean birth weight was 3,205 (SD 459, 95% CI 3103 - 3307) grams. The median birth weight was 3,150 grams (Min 1980, Max 4110, R 2130).

For the 90 study mothers who had attended up to secondary level of schooling, the mean birth weight was 3,264 (SD 511, 95% CI 3157 - 3371) grams. The median birth weight was 3,200 grams (Min 1750, Max 4800, R 3050). For the 57 study mothers who had attended up to tertiary level of schooling, the mean birth weight was 3,258 (SD 465, 95% CI 3135 - 3381) grams. The median birth weight was 3,250 grams (Min 2050, Max 4350, R 2300).

Birth Weight of the Study Participant Babies by Parity

For the 112 primi gravidas, the mean birth weight was 3,225 (SD 468, 95% CI 3137 - 3312) grams. The median birth weight was 3,180 grams (Min 1980, Max 4350, R 2370). For the 67 study mothers who were expecting their second babies, the mean birth weight was 3,225 (SD 448, 95% CI 3115 - 3334) grams. The median birth weight was 3,240 grams (Min 2080, Max 4800, R 2720). For the 31 study mothers who were expecting their third child, the mean birth weight was 3,388 (SD 542, 95% CI 3189 - 3587) grams. The median birth weight was 3,240 grams (Min 1750, Max 4570, R 2820).

For the ten study mothers who were expecting their fourth child, the mean birth weight was 3,115 (SD 304, 95% CI 2898 - 3332) grams. The median birth weight was 3,075 grams (Min 2490, Max 3560, R 1070). For the eight study mothers who were expecting their fifth child, the mean birth weight was 3,161 (SD 752, 95% CI 2532 - 3790) grams. The median birth weight was 3,350 grams (Min 2020, Max

4000, R 1980). For the four study mothers who were expecting their sixth child, the mean birth weight was 3,198 (SD 340, 95% CI 2657 - 3739) grams. The median birth weight was 3.161 grams (Min 2850, Max 3620, R 770).

Birth Weight of the Study Participant Babies by Facility of Enrolment

For the 51 study mothers enrolled at Mulot Health Centre, the mean birth weight was 3,126 (SD 478, 95% CI 2992 - 3261) grams. The median birth weight was 3,090 grams (Min 1980, Max 4180, R 2200). For the 118 study mothers enrolled at Narok County Referral Hospital, the mean birth weight was 3,288 (SD 469, 95% CI 3202 - 3373) grams. The median birth weight was 3,260 grams (Min 1750, Max 4570, R 2820). For the 26 study mothers enrolled at Ntulele Health Centre, the mean birth weight was 3,271 (SD 471, 95% CI 3080 - 3461) grams. The median birth weight was 3,100 grams (Min 2600, Max 4800, R 2200). For the 37 study mothers enrolled at Ololunga Sub County Hospital, the mean birth weight was 3,217 (SD 492, 95% CI 3053 - 3381) grams. The median birth weight was 3,260 grams (Min 2020, Max 4230, R 2210).

4.13.12 Neonatal Complications

Data were available for 99.23% (n=260) of the study participants on the state of their babies at delivery. Four fifths (79.62%, n=207) of these babies had no complications at birth while 20.38% (n=53) had complications, constituting a prevalence of complications of 20.38%. This is demonstrated in the pie chart below (Figure 4.49). The commonest reported neonatal complication was birth asphyxia at 60.38% (n=32), followed by low birth weight at 13.21% (n=7). Fetal distress, Fresh stillbirth (FSB), and miscarriage constituted 5.66% (n=3), respectively. Two babies had very low birth weight (VLBW), constituting 3.77% of all reported neonatal complications. One baby each had neonatal sepsis, post-datism, and prematurity, constituting 1.89% respectively.

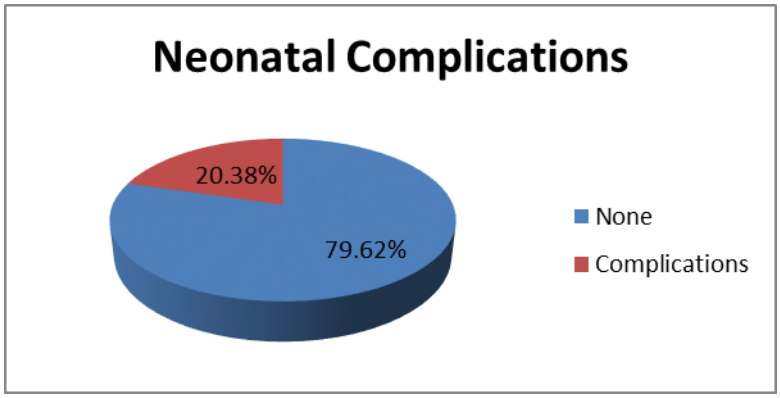


Figure 4.49: Pie Chart showing the Proportion of Study Participants' Babies with Complications at Birth

Neonatal Complications by Study Group

For the 131 study mothers who were in the intervention arm, 87.79% (n=115) had no neonatal complications, while 12.21% (n=16) had neonatal complications at birth. For the 129 study mothers in the non-intervention arm, 71.32% (n=92) had no neonatal complications at birth, while 28.68% (n=37) had complications at birth. This indicated that the likelihood of having a neonatal complication (prevalence) was 2.35 times higher in the non-intervention arm compared to the intervention arm (28.68% vs. 12.21%).

Neonatal Complications by Place of Delivery

For the 52 study mothers who delivered at home, 51.92% (n=27) reported no complications for the baby at delivery, while 48.08% (n=25) had a neonatal complication. These complications included birth asphyxia, constituting 40.38% (n=21), and fetal distress, low birth weight, prematurity, and very low birth weight each constituting 1.92% (n=1) respectively.

For the 206 study mothers who delivered in the hospital, 87.38%% (n=180) reported no complications for the baby at delivery, while 12.62% (n=26) had a neonatal complication at birth. These complications included birth asphyxia, constituting 5.34% (n=11), fetal distress 0.97% (n=2), low birth weight 2.91% (n=6), fresh stillbirth 1.46% (n=3) while neonatal sepsis, prematurity, and very low birth weight,

miscarriage, very low birth weight, and post-datism each constituting 0.49% (n=1) respectively.

This indicated that the likelihood of having a neonatal complication (prevalence) was 3.80 times higher in those study participants who delivered at home compared to those who delivered in the hospital (48.08% vs. 12.62%).

Neonatal Complications by Parity

For the 120 primi gravidas, 75.83% (n=91) had no neonatal complication at birth, while 24.17% (n=29) had complications. For the 140 study mothers who were expecting their subsequent babies, 82.86% (n=116) had no neonatal complication at birth, while 17.14% (n=24) had complications, indicating a higher likelihood of a neonatal complication for the primi gravidas compared to those carrying their subsequent pregnancies.

Neonatal Complications by Facility of Enrolment

For the 53 study mothers enrolled at Mulot Health Centre, 75.47% (n=40) had no neonatal complication at birth, while 24.53% (n=13) had neonatal complications. For the 133 study mothers enrolled at Narok County Referral Hospital, 78.95% (n=105) had no neonatal complication at birth, while 21.05% (n=28) had neonatal complications. All the 27 study mothers enrolled at Ntulele Health Centre reported no neonatal complications at birth. For the 47 study mothers enrolled at Ololunga Sub County Hospital, 74.47% (n=35) had no neonatal complications at birth while 25.53% (n=12) had neonatal complications. Ololunga SCH had the highest prevalence of neonatal complications.

Neonatal Complications by Study Participants' Age

For the 49 study mothers who were aged 19 years and below, 79.59% (n=39) had no neonatal complication at birth, while 20.41% (n=10) had a complication. For the 119 study mothers who were aged between 20 and 24 years, 80.67% (n=96) had no neonatal complication at birth, while 19.33% (n=23) had a complication. For the 58

study mothers who were aged between 25 and 29 years, 81.03% (n=47) had no neonatal complication at birth, while 18.97% (n=11) had a complication.

For the twenty study mothers who were aged between 30 and 34 years, 75% (n=15) had no neonatal complication at birth, while 25% (n=5) had a complication. For the eleven study mothers who were aged between 35 and 39 years, 63.64% (n=7) had no neonatal complication at birth, while 36.36% (n=4) had a complication. The three study mothers aged 40 years and above reported no neonatal complications at birth. This indicated a general increase in likelihood of neonatal complications with increase in the age of the mother.

Neonatal Complications by Body Mass Index (BMI)

For the eight study mothers who were classified as being underweight, 50% (n=4) had no neonatal complication at birth, while 50% (n=4) had a complication. For the 115 study mothers who were classified as being of normal weight, 80.87% (n=93) had no neonatal complication at birth, while 19.13% (n=22) had a complication. For the 54 study mothers who were classified as being overweight, 83.33% (n=45) had no neonatal complication at birth, while 16.67% (n=9) had a complication.

For the 21 study mothers who were classified as being obese class I, 76.19% (n=16) had no neonatal complication at birth, while 23.81% (n=5) had a complication. For the six study mothers who were classified as being obese class II, 50% (n=3) had no neonatal complication at birth, while 50% (n=3) had a complication. The one study mother who was classified as being obese class III had a neonatal complication at birth, which was birth asphyxia.

This indicated that the likelihood of having a neonatal complication was high in the mothers classified as underweight, then decreased in the normal weight mothers before increasing steeply as the BMI of the study mothers increased.

Neonatal Complications by Time to Access a Health Facility

For the 32 study mothers who took less than 15 minutes to access a health facility, 84.38% (n=27) had no neonatal complication at birth, while 15.62% (n=5) had a

complication. For the 72 study mothers who took between 15 and 30 minutes to access a health facility, 81.94% (n=59) had no neonatal complication at birth, while 18.06% (n=13) had a complication. For the 129 study mothers who took between 30 and 60 minutes to access a health facility, 77.52% (n=100) had no neonatal complication at birth, while 22.48% (n=29) had a complication. For the 27 study mothers who took more than 60 minutes to access a health facility, 77.78% (n=21) had no neonatal complication at birth, while 22.22% (n=6) had a complication.

This indicated a general increase in the likelihood of having a neonatal complication at birth as the time taken by the study participant to access a health facility increased.

Neonatal Complications by Education Level

For the seven study mothers who had not attended any formal schooling, 42.86% (n=3) had no neonatal complication at birth, while 57.14% (n=4) had a complication. For the 93 study mothers who had attended up to primary school level of education, 75.27% (n=70) had no neonatal complication at birth, while 24.73% (n=4) had a complication. For the 100 study mothers who had attained up to secondary school level of education, 84% (n=84) had no neonatal complication at birth, while 16% (n=16) had a complication. For the 60 study mothers who had attained up to tertiary level of education, 83.33% (n=50) had no neonatal complication at birth, while 16.67% (n=10) had a complication.

This indicated that the likelihood of having a neonatal complication decreased as the education level attained by the study mothers increased.

4.13.13 Neonatal Mortality

All the study participants reported on whether they had a live baby or not. Of the 262 study mothers, 89.31% (n=234) of them had live births, while 10.69% (n=28) of the study participants had neonatal deaths. This is depicted in the pie chart below (Figure 4.50).

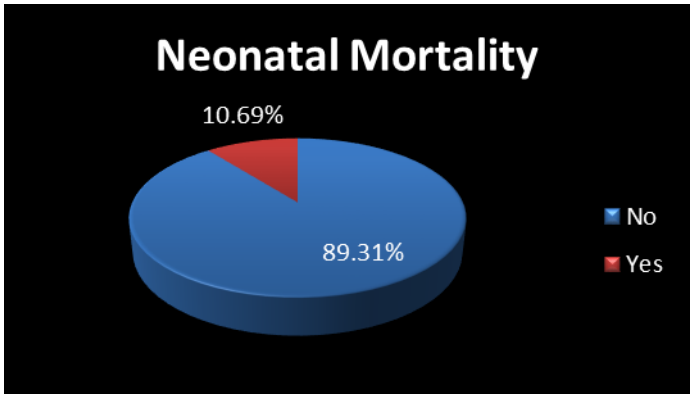


Figure 4.50: Pie Chart showing the Proportion of Study Participants who had Neonatal Mortality

Neonatal Mortality by Study Group

Of the 132 study mothers in the intervention study arm, 93.94% (n=124) had no neonatal mortality, while 6.06% (n=8) had a neonatal death. Of the 130 study mothers in the non-intervention study arm, 84.62% (n=110) had no neonatal mortality, while 15.38% (n=20) had a neonatal death. This indicated that the likelihood of a study mother having a neonatal mortality was two and half times higher in the non-intervention arm compared to the intervention study arm (6.06% vs. 15.38%). This information is depicted in the pie chart below (Figure 4.51).

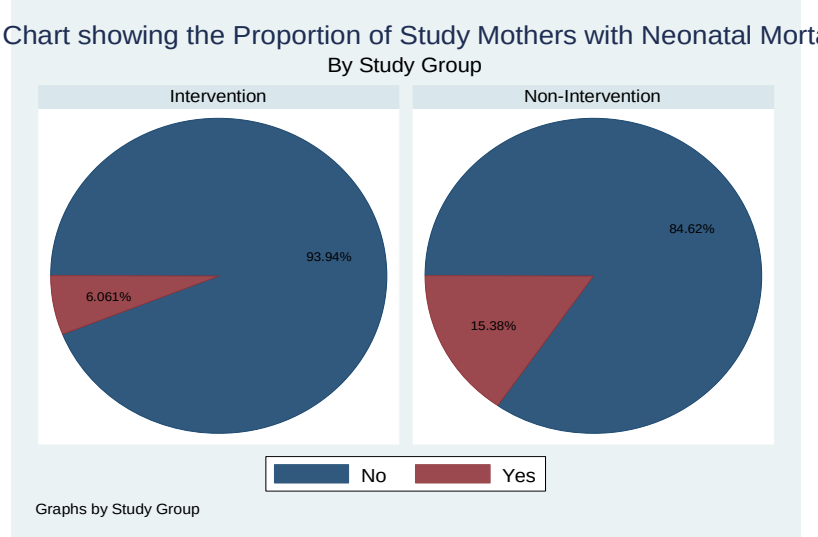


Figure 4.51: Pie Chart showing the Proportion of Study Mothers with Neonatal Mortality by Study Group

Neonatal Mortality by Place of Delivery

For the 52 study mothers who delivered at home, 69.23% (n=36) of the study mothers had no neonatal mortality, while 30.77% (n=16) had a neonatal death. For the 206 study mothers who delivered in hospital, 96.12% (n=198) of the study mothers had no neonatal mortality, while 3.88% (n=8) had a neonatal death. This indicated that the likelihood of having a neonatal mortality was eight times higher in the study mothers who delivered at home compared to those that delivered in the hospital.

Neonatal Mortality by Assistant at Delivery

For the 206 study mothers who delivered with the assistance of a health care worker, 96.12% (n=198) of them had no neonatal mortality, while 3.88% (n=8) had a neonatal death. For the 27 study mothers who delivered with the assistance of a relative, 70.37% (n=19) of them had no neonatal mortality, while 29.63% (n=8) had a neonatal death. For the 25 study mothers who delivered with the assistance of a traditional birth attendant, 68% (n=17) of them had no neonatal mortality, while 32% (n=8) had a neonatal death.

This information is depicted in the pie chart below indicating that the likelihood of having a neonatal mortality was 7.6 and 8 times higher in those who were assisted to deliver by relatives and traditional birth attendants respectively compared to those assisted by healthcare workers (Figure 4.52).

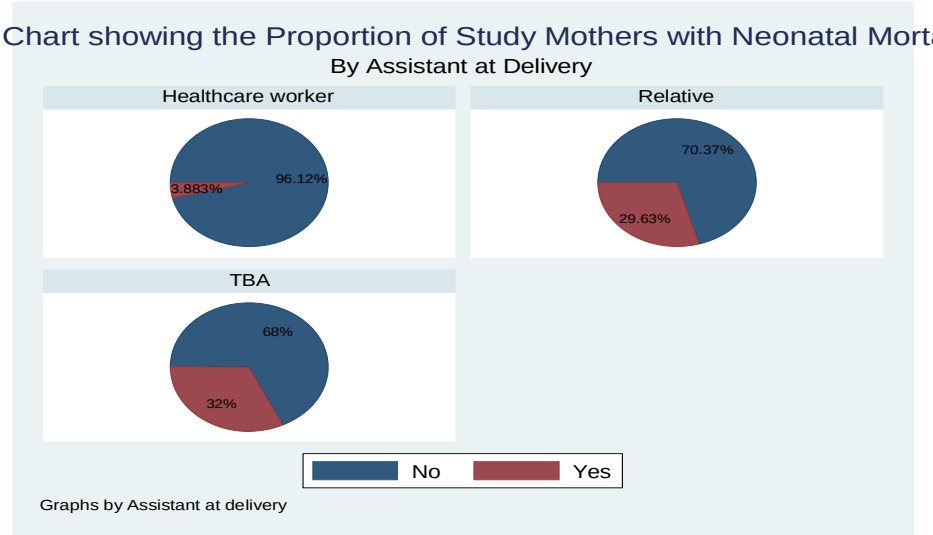


Figure 4.52: Pie Chart showing the Proportion of Study Mothers with Neonatal Mortality by Assistant at Delivery

Neonatal Mortality by Mothers' Age

For the 50 study mothers aged 19 years and below, 92% (n=46) of the study mothers had no neonatal mortality, while 8% (n=4) had a neonatal death. For the 119 study mothers aged between 20 and 24 years, 90.76% (n=108) of the study mothers had no neonatal mortality, while 9.24% (n=11) had a neonatal death. For the 59 study mothers aged between 25 and 29 years, 86.44% (n=51) of the study mothers had no neonatal mortality, while 13.56% (n=8) had a neonatal death. For the 20 study mothers aged between 30 and 34 years, 85% (n=17) of the study mothers had no neonatal mortality, while 15% (n=3) had a neonatal death. For the eleven study mothers aged between 35 and 39 years, 81.82% (n=9) of the study mothers had no neonatal mortality, while 18.18% (n=2) had a neonatal death. All the three study mothers aged 40 years and above had no neonatal mortality.

This indicated that there was a general increase in the likelihood of a neonatal mortality as the study participant's age increased.

Neonatal Mortality by Body Mass Index (BMI)

For the eight study mothers classified as underweight, 75% (n=6) of the study mothers had no neonatal mortality, while 25% (n=2) had a neonatal death. For the 116 study mothers classified as of normal weight, 93.10% (n=108) of the study mothers had no neonatal mortality, while 6.90% (n=8) had a neonatal death. For the 55 study mothers classified as overweight, 87.27% (n=48) of the study mothers had no neonatal mortality, while 12.73% (n=7) had a neonatal death. For the 21 study mothers classified as obese class I, 76.19% (n=16) of the study mothers had no neonatal mortality, while 23.81% (n=5) had a neonatal death. For the six study mothers classified as obese class II, 66.67% (n=4) of the study mothers had no neonatal mortality, while 33.33% (n=2) had a neonatal death. The one study mother classified as obese class III gave birth to a live baby.

This indicated that the likelihood of a neonatal mortality was high in the mothers classified as being underweight, then reduced for those who were of normal weight, before increasing steadily as the BMI increased. This information is summarized in the pie chart below (Figure 4.53).

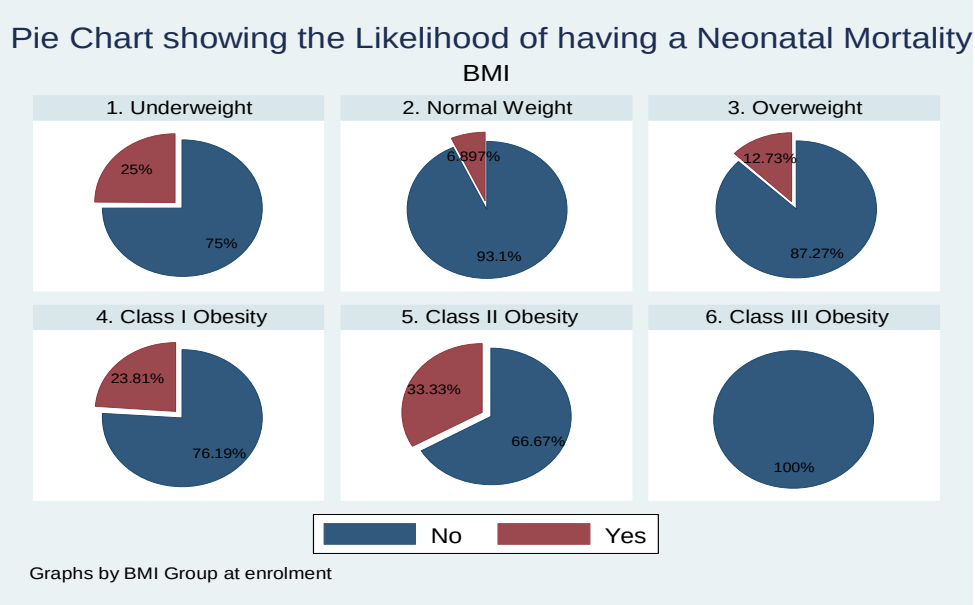


Figure 4.53: Pie Chart showing the Proportion of Study Mothers with Neonatal Mortality by BMI

Neonatal Mortality by Parity

For the 124 study mothers classified as primi gravidas, 90.32% (n=112) of the study mothers had no neonatal mortality, while 9.68% (n=2) had a neonatal death. For the 74 study mothers carrying their second pregnancy, 93.24% (n=69) of the study mothers had no neonatal mortality, while 6.76% (n=5) had a neonatal death. For the 36 study mothers who were expecting their third child, 88.89% (n=32) of the study mothers had no neonatal mortality, while 11.11% (n=4) had a neonatal death. For the 28 study mothers who were expecting their fourth child and above, 75% (n=21) of the study mothers had no neonatal mortality, while 25% (n=7) had a neonatal death.

This indicated that the likelihood of a neonatal mortality increased as the parity of the study participants increased. The primi gravidas also had a higher mortality rate compared to the mothers carrying their second babies.

Neonatal Mortality by Education Level

For the seven study mothers classified as never having attended any formal schooling, 42.86% (n=3) of the study mothers had no neonatal mortality, while 57.14% (n=4) had a neonatal death. For the 94 study mothers classified as having attained primary level of schooling, 89.36% (n=84) of the study mothers had no neonatal mortality, while 10.64% (n=10) had a neonatal death. For the 100 study mothers classified as having attained secondary school level of education, 91% (n=91) of the study mothers had no neonatal mortality, while 9% (n=9) had a neonatal death. For the 61 study mothers classified as having attained tertiary level of education, 91.80% (n=56) of the study mothers had no neonatal mortality, while 8.20% (n=5) had a neonatal death. This indicated that the likelihood of a neonatal mortality decreased as the educational level of the study participant increased.

Neonatal Mortality by Time to a Health Facility

For the 32 study mothers who took less than 15 minutes to access a health facility, 90.63% (n=29) of the study mothers had no neonatal mortality, while 9.38% (n=3) had a neonatal death. For the 73 study mothers who took between 15 and 30 minutes to access a health facility, 93.15% (n=68) of the study mothers had no neonatal mortality, while 6.85% (n=5) had a neonatal death. For the 130 study mothers who took between 30 and 60 minutes to access a health facility, 86.92% (n=113) of the study mothers had no neonatal mortality, while 13.08% (n=17) had a neonatal death. For the 27 study mothers who took more than 60 minutes to access a health facility, 88.89% (n=24) of the study mothers had no neonatal mortality, while 11.11% (n=3) had a neonatal death.

Neonatal Mortality by Facility of Enrolment

For the 55 study mothers who were enrolled at Mulot Health Centre, 90.91% (n=50) of the study mothers had no neonatal mortality, while 9.09% (n=5) had a neonatal death. For the 133 study mothers who were enrolled at Narok County Referral Hospital, 88.72% (n=118) of the study mothers had no neonatal mortality, while 11.28% (n=15) had a neonatal death. For the 47 study mothers who were enrolled at Ololunga Sub County Hospital, 82.98% (n=39) of the study mothers had no neonatal mortality, while 17.02% (n=8) had a neonatal death. All of the 27 study mothers enrolled at Ntulele Health Centre had live babies.

4.13.14 Maternal Morbidity and Mortality

Of the 86 study participants with reported maternal complications, the commonest complication was prolonged labour at 24.42% (n=21), while the second most common complication was postpartum hemorrhage (PPH) at 15.12% (n=13) of all the complications reported. The third most common complication was cephalopelvic disproportion (CPD) at 12.79% (n=11). All the maternal complications are summarized in the table below (Table 4.3).

Table 4.3: Table showing the List of Maternal Complications

Maternal Complication	Number of mothers	Percentage (%)
Prolonged labour	21	24.42
PPH	13	15.12
CPD	11	12.79
One Previous Scar	7	8.14
Perineal Injuries	7	8.14
PET	5	5.81
Miscarriage	5	5.81
Premature Labour	4	4.65
Preterm Labour	2	2.33
Twin Pregnancy	2	2.33
3 Previous Scar	1	1.16
Cervical Prolapse	1	1.16
Infection	1	1.16
Obstructed labour	1	1.16
Postdatism	1	1.16
Premature Labour in 1 PS	1	1.16
Maternal Deaths	3	3.48

There were 3 maternal deaths (3.48%) reported in this study population during the study period.

4.13.15 Attendance of Postnatal Clinic

Data on attendance of the Postnatal Clinic for this study was available for 51.91% (n=136) of the study participants. Amongst these, 30.15% (n=41) attended the postnatal clinic immediately after delivery or in the postpartum period, whereas 69.85% (n=95) of the mothers did not attend the postnatal clinic at all. This is summarized in the pie chart below (Figure 4.54).

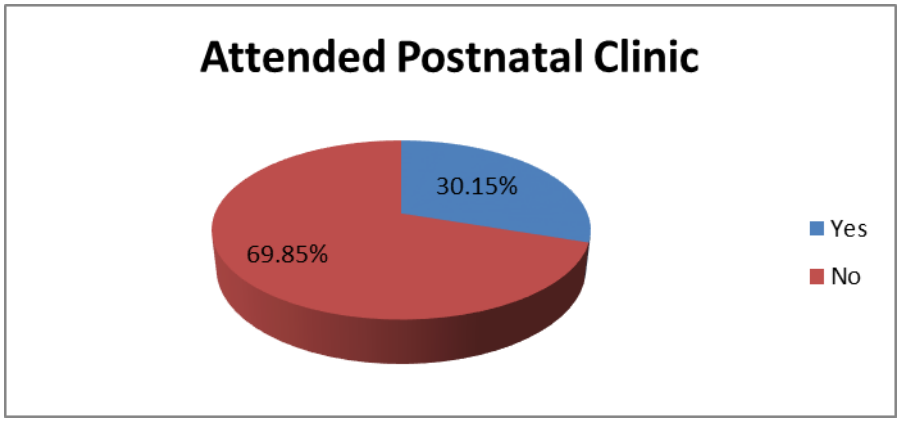


Figure 4.54: Pie Chart showing the Proportion of Study Participants who Attended Postnatal Clinic

Postnatal Clinic (PNC) Attendance by Study Group

For the 60 study participants who were in the intervention study arm, 41.67% (n=25) attended the PNC while 58.33% (n=35) did not attend. For the 76 study participants who were in the non-intervention study arm, 21.05% (n=16) attended the PNC while 78.95% (n=60) did not attend. This indicated that the likelihood of attending the postnatal clinic was 1.98 times higher for those study mothers in the intervention arm compared to the mothers in the non-intervention arm (41.67% vs. 21.05%).

Postnatal Clinic (PNC) Attendance by Place of Delivery

For the 37 study participants who delivered at home, only 8.11% (n=3) attended the PNC while 91.89% (n=34) did not attend while for the 97 study participants who delivered in hospital, 39.18% (n=38) attended the PNC while 60.82% (n=59) did not attend. This indicated that the likelihood of attending the postnatal clinic was 4.83 times higher for those study mothers who delivered in hospital compared to the mothers who delivered at home (39.18% vs. 8.11%). This information is depicted in the pie chart below (Figure 4.55).

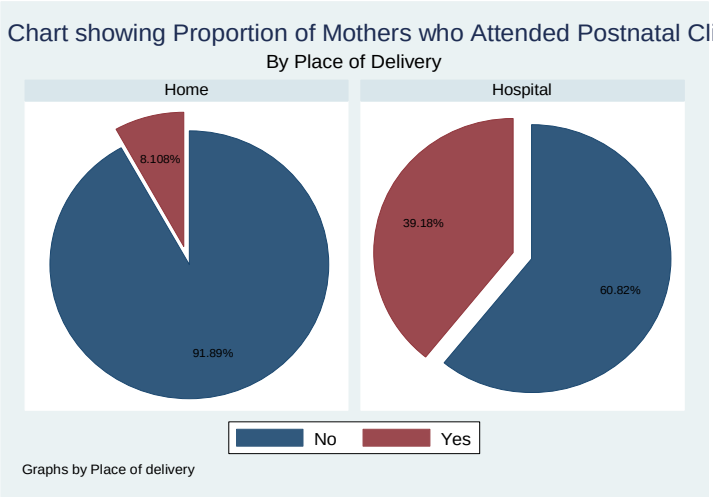


Figure 4.55: Pie Chart showing the Proportion of Study Participants who attended the Postnatal Clinic by Place of Delivery

Postnatal Clinic (PNC) Attendance by Assistant at Delivery

For the 97 study participants who were assisted by a health care worker to deliver, 39.18% (n=38) attended the PNC, while 60.82% (n=59) did not attend. For the twenty study participants who were assisted by a relative to deliver, 15% (n=3) attended the PNC, while 85% (n=17) did not attend whereas all the seventeen study participants who were assisted by the traditional birth attendant to deliver did not attend the PNC.

Postnatal Clinic (PNC) Attendance by Education Level

All the three study participants who had not attended any formal schooling did not attend the postnatal clinic. For the 52 study participants who had attended up to primary school level of education, 23.08% (n=12) attended the PNC while 76.92% (n=40) did not attend. For the 51 study participants who had attended up to secondary school level of education, 37.25% (n=19) attended the PNC while 62.75% (n=32) did not attend. For the 30 study participants who had attended up to tertiary level of education, 33.33% (n=10) attended the PNC while 66.67% (n=20) did not attend. This indicated that the likelihood of attending the PNC increased as the level of education increased.

Postnatal Clinic (PNC) Attendance by Marital Status

For the 120 study participants who were married, 31.67% (n=38) attended the PNC, while 68.33% (n=82) did not attend. For the 15 single study participants, 20% (n=3) attended the PNC while 80% (n=12) did not attend. The one study mother who was separated did not attend the postnatal clinic.

Postnatal Clinic (PNC) Attendance by Parity

For the 74 study participants who were primi gravidas, 33.78% (n=25) attended the PNC while 66.22% (n=49) did not attend. For the 29 study participants who were expecting their second child, 20.69% (n=6) attended the PNC, while 79.31% (n=23) did not attend. For the 18 study participants who were expecting their third child, 33.33% (n=6) attended the PNC, while 66.67% (n=12) did not attend. For the ten study participants who were expecting their fourth child, 20% (n=2) attended the PNC, while 80% (n=8) did not attend. For the three study participants who were expecting their fifth child, 66.67% (n=2) attended the PNC, while 33.33% (n=1) did not attend. The two study participants who were expecting their sixth child did not attend the PNC.

Postnatal Clinic (PNC) Attendance by Age

For the 36 study participants who were aged 19 years and below, 27.78% (n=10) attended the PNC, while 72.22% (n=26) did not attend. For the 60 study participants who were aged between 20 and 24 years, 26.67% (n=16) attended the PNC, while 73.33% (n=44) did not attend. For the 25 study participants who were aged between 25 and 29 years, 48% (n=12) attended the PNC, while 52% (n=13) did not attend. All the six study participants who were aged between 30 and 34 years did not attend the PNC. For the eight study participants who were aged between 35 and 39 years, 25% (n=2) attended the PNC, while 75% (n=6) did not attend. The one study mother aged 40 years and above attended the PNC.

Postnatal Clinic (PNC) Attendance by Facility Enrolled

For the 53 study participants who were enrolled at Mulot Health Centre, 30.19% (n=16) attended the PNC, while 69.81% (n=37) did not attend. For the 65 study participants who were enrolled at Narok County Referral Hospital, 35.38% (n=23) attended the PNC, while 64.62% (n=42) did not attend. The three study participants enrolled at Ntulele Health Centre did not attend the PNC. For the 15 study participants who were enrolled at Ololunga Sub County Hospital, 13.33% (n=2) attended the PNC, while 86.67% (n=13) did not attend.

Postnatal Clinic (PNC) Attendance by Time Taken to Access a Health Facility

For the twelve study participants who took less than 15 minutes to access a health facility, 16.67% (n=2) attended the PNC, while 83.33% (n=10) did not attend. For the 34 study participants who took between 15 and 30 minutes to access a health facility, 26.47% (n=9) attended the PNC, while 73.53% (n=25) did not attend. For the 76 study participants who took between 30 and 60 minutes to access a health facility, 30.26% (n=23) attended the PNC, while 69.74% (n=53) did not attend. For the 14 study participants who took more than 60 minutes to access a health facility, 50% (n=7) attended the PNC, while 50% (n=7) did not attend. This indicated that the likelihood of attending the PNC increased as the time taken to access the health facility increased.

Postnatal Clinic (PNC) Attendance by Maternal Complications

For the 88 study participants who did not have any maternal complication, 29.55% (n=26) attended the PNC, while 70.45% (n=62) did not attend. For the 48 study participants who had maternal complications, 31.25% (n=15) attended the PNC, while 68.75% (n=33) did not attend. This information is depicted in the doughnut chart below (Figure 4.56).

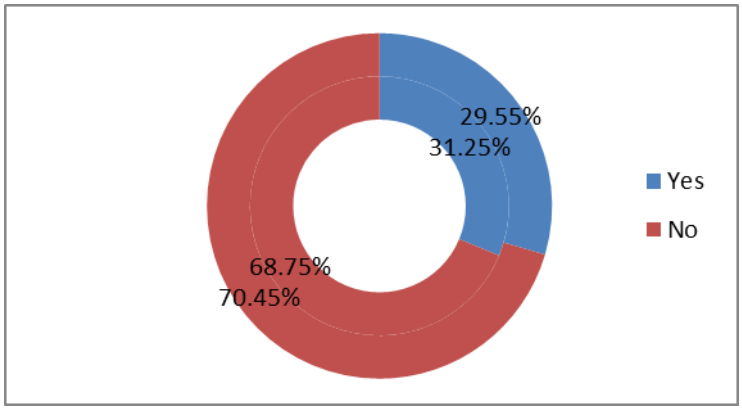


Figure 4.56: Doughnut Chart showing the Proportion of Postnatal Clinic Attendance by Maternal Complications

4.13.16 Epidemiological Ratios

Neonatal Mortality Rate (NMR)

The proportion of mothers with neonatal mortality was 10.69% in the study population. This was equivalent to a neonatal mortality rate of 106.87 deaths per 1000 live births. The proportion of mothers with neonatal death was 6.06% (n=8) in the 132 study mothers who were in the intervention study arm giving a neonatal mortality rate of 60.61 deaths per 1000 live births. The proportion of mothers with neonatal death was 15.38% (n=20) in the 130 study mothers in the non-intervention study arm giving a neonatal mortality rate of 153.85 deaths per 1000 live births.

The proportion of mothers with neonatal death was 3.88% (n=8) in the 206 study mothers who delivered in a health facility giving a neonatal mortality rate of 38.8 deaths per 1000 live births.

The prevalence of neonatal death was 30.77% (n=16) in the 52 study mothers who delivered at home giving a neonatal mortality rate of 307.7 deaths per 1000 live births.

Maternal Mortality Ratio (MMR)

The prevalence of maternal deaths was 1.145% in the study population. This is equivalent to a maternal mortality ratio of 1145 deaths per 100,000 live births. The proportion of maternal deaths was 0.758% in the 132 study mothers in the intervention study arm giving a maternal mortality ratio of 757.58 deaths per 100,000 live births. The proportion of maternal death was 1.538% in the 130 study mothers in the non-intervention study arm giving a maternal mortality ratio of 1538.5 deaths per 100,000 live births. This indicated that the MMR was twice as high in the non-intervention study arm compared to the intervention study arm. This was spread across the three year study period.

4.14 Hypothesis Testing, Tests of Significance, and Modeling

The following null hypotheses were tested in this study:

i. A targeted mobile phone intervention use in antenatal care was not associated with improvement in ANC and PNC attendance among the intervention versus the non-intervention group in the study population.
ii. A targeted mobile phone intervention use in antenatal care was not associated with improvement in skilled healthcare deliveries and facility-based deliveries in the study population.
iii. A targeted mobile phone intervention use in antenatal care was not associated with improvement in postnatal maternal outcomes in the study population.
iv. A targeted mobile phone intervention use in antenatal care was not associated with improvement in postnatal neonatal outcomes in the study population.

4.15 Number of Antenatal Visits

4.15.1 The Difference in the Means of the Number of Antenatal Visits

The Difference in the Means of the Number of Antenatal Visits by Study Group

The distribution of the mean number of antenatal visits by study group was explored using a histogram and was found to be normally distributed. The mean number of antenatal visits was 4.099 visits for the 131 study participants in the intervention

group while it was 2.843 visits for the 128 study participants in the non-intervention study arm. The difference in means was 1.256 (95% CI 1.044 – 1.467) visits.

Student T test was used to test for the significance of the null hypothesis that there was no difference between the mean number of antenatal visits between the intervention and the non-intervention study arm at 95% significance level. The alternate hypothesis was that there was a difference in the means of the number of antenatal visits between the two study groups. The mean difference in the number of visits between the two groups was found to be statistically significant at 95% confidence level with a p-value of less than 0.0001 (t value of 11.701). Thus, the null hypothesis was rejected.

The Difference in Means of the Number of Antenatal Visits between the Study Groups by Facility of Enrolment

Amongst the 54 study participants who were enrolled at Mulot Health Centre, the mean for the 24 study mothers in the intervention arm was 4.25 visits while it was 2.933 visits for the 30 study mothers in the non-intervention study arm. The mean difference was 1.317 visits, which was statistically significant at 95% confidence level with a p value of less than 0.0001. Amongst the 131 study participants who were enrolled at Narok County Referral Hospital, the mean for the 65 study mothers in the intervention arm was 4.108 visits while it was 2.742 visits for the 66 study mothers in the non-intervention study arm. The mean difference was 1.365 visits, which was statistically significant at 95% confidence level with a p value of less than 0.0001.

Amongst the 27 study participants who were enrolled at Ntulele Health Centre, the mean for the 14 study mothers in the intervention arm was 4 visits, while it was 3.308 visits for the 13 study mothers in the non-intervention study arm. The mean difference was 0.692 visits, which was statistically significant at 95% confidence level with a p value of 0.0222. Amongst the 47 study participants who were enrolled at Ololunga Sub County Hospital, the mean for the 28 study mothers in the intervention arm was 4 visits, while it was 2.737 visits for the 19 study mothers in the non-intervention study arm. The mean difference was 1.263 visits, which was

statistically significant at 95% confidence level with a p value of less than 0.0001. This information is summarized in the table below (Table 4.4).

Table 4.4: Table of the Mean Difference in Number of Visits between the Study Arms by Facility of Enrolment

Variable	Facility of Enrolment	Study Arm	N	Mean	Difference of Mean	t value	P Value
Number of ANC Visits	Mulot H C	Intervention	24	4.25	1.317	5.904	< 0.0001
		Non-Intervention	30	2.933			
	Narok CRH	Intervention	65	4.108	1.365	8.755	< 0.0001
		Non-Intervention	66	2.742			
	Ntulele HC	Intervention	14	4	0.692	2.476	0.0222
		Non-Intervention	13	3.308			
	Ololunga SCH	Intervention	28	4	1.263	4.879	< 0.0001
		Non-Intervention	19	2.737			

The Difference in Means of the Number of Antenatal Visits between the Study Groups by Distance to Access a Health Facility

Amongst the 43 study participants who had to travel less than one kilometer to access a health facility, the mean for the 24 study mothers in the intervention arm was 4.083 visits while it was 2.632 visits for the 19 study mothers in the non-intervention study arm. The mean difference was 1.452 visits, which was statistically significant at 95% confidence level with a p value of less than 0.0001. Amongst the 161 study participants who had travel between one and five kilometers to access a health facility, the mean for the 73 study mothers in the intervention arm was 4.178 visits while it was 2.932 visits for the 88 study mothers in the non-intervention study arm. The mean difference was 1.246 visits, which was statistically significant at 95% confidence level with a p value of less than 0.0001.

Amongst the 55 study participants who had travel more than five kilometers to access a health facility, the mean for the 34 study mothers in the intervention arm was 3.941 visits while it was 2.667 visits for the 21 study mothers in the non-intervention study arm. The mean difference was 1.275 visits, which was statistically

significant at 95% confidence level with a p value of less than 0.0001. This information is summarized in the table below (Table 4.5).

Table 4.5: Table of the Mean Difference in Number of Visits between the Study Arms by Distance Travelled to Access a Health Facility

Variable	Distance Travelled to a Health Facility	Study Arm	N	Mean	Difference of Mean	t value	P Value
Number of ANC Visits	Less than 1 Km	Intervention	24	4.083	1.452	6.607	< 0.0001
		Non-Intervention	19	2.632			
	1 to 5 Km	Intervention	73	4.178	1.246	8.687	< 0.0001
		Non-Intervention	88	2.932			
	More than 5 Km	Intervention	34	3.941	1.275	5.936	< 0.0001
		Non-Intervention	21	2.667			

4.15.2 The Difference in Means of the Number of Antenatal Visits by Age

The mean number of antenatal visits was 3.26 visits for the 50 study mothers aged 19 years and below while it was 3.48 visits for the 118 study mothers aged between 20 and 24 years. The mean number of visits was 3.70 visits for the 57 study mothers aged between 25 and 29 years while it was 3.41 visits for the 34 study mothers aged 30 years and above. One-way Anova was used to test the null hypothesis of there being no difference between the mean numbers of antenatal visits among the four age categories. The alternate hypothesis was that there was a difference in the mean number of antenatal visits among the four age categories.

The mean differences were found not to be statistically significant at 95% significance level with a p value of 0.1916 and an F value of 1.59. Thus, the null hypothesis was not rejected. This meant that age difference was not statistically significantly associated with the number of antenatal care visits done.

4.15.3 The Difference in Means of the Number of Antenatal Visits by Parity

The mean number of antenatal visits was 3.37 visits for the 124 study mothers who were primi gravidas while it was 3.625 visits for the 72 study mothers who were carrying their second child. The mean number of visits was 3.51 visits for the 35 study mothers who were carrying their third child while it was 3.54 visits for the 28 study mothers who were carrying their fourth child and above.

One-way Anova was used to test the null hypothesis of there being no difference between the mean number of antenatal visits among the four parity categories. The alternate hypothesis was that there was a difference in the mean number of antenatal visits among the four parity categories. The differences were found not to be statistically significant at 95% significance level with a p value of 0.4343 and an F value of 0.91. Thus, the null hypothesis was not rejected, meaning parity differences were not statistically significantly associated with the number of ANC visits.

4.15.4 The Difference in Means of the Number of Antenatal Visits by Education Level

The mean number of antenatal visits was three visits for the seven study mothers who had not attended any formal schooling while it was 3.49 visits for the 93 study mothers who had attained up to primary school level of schooling. The mean number of visits was 3.44 visits for the 99 study mothers who had attained up to secondary school level of schooling while it was 3.57 visits for the 60 study mothers who had attained up to tertiary level of education.

One-way Anova was used to test the null hypothesis of there being no difference between the mean numbers of antenatal visits among the four education categories. The alternate hypothesis was that there was a difference in the mean number of antenatal visits among the four education level categories. The mean differences were found not to be statistically significant with a p value of 0.5860 and an F value of 0.65. Thus, the null hypothesis was not rejected, meaning that education level was not statistically significantly associated with the number of antenatal visits.

4.15.5 The Difference in Means of the Number of Antenatal Visits by Distance to a Health Facility

The mean number of antenatal visits was 3.44 visits for the 43 study mothers who had to travel less than one kilometer to access a health facility, while it was 3.50 visits for the 161 study mothers who had to travel between one and five kilometers. The mean number of visits was 3.45 visits for the 55 study mothers who had to travel more than five kilometers to access a health facility.

One-way Anova was used to test the null hypothesis of there being no difference between the mean numbers of antenatal visits among the three categories of distance travelled to access a health facility. The alternate hypothesis was that there was a difference in the mean number of antenatal visits among the three categories. The differences were found not to be statistically significant with a p value of 0.9390 and an F value of 0.06. Thus, the null hypothesis was not rejected meaning that distance travelled to a health facility was not significantly associated with the number of antenatal visits.

4.15.6 The Difference in Means of the Number of Antenatal Visits by Time to Access a Health Facility

The mean number of antenatal visits was 3.31 visits for the 32 study mothers who took less than 15 minutes to access a health facility, while it was 3.54 visits for the 72 study mothers who took between 15 and 30 minutes to access a health facility. The mean number of visits was 3.5 visits for the 128 study mothers who took between 30 and 60 minutes to access a health facility, while it was 3.41 visits for the 27 study mothers who took more than 60 minutes to access a health facility.

One-way Anova was used to test the null hypothesis of there being no difference between the mean numbers of antenatal visits among the four categories of times taken to access a health facility. The alternate hypothesis was that there was a difference in the mean number of antenatal visits among the four categories. The differences were found not to be statistically significant with a p value of 0.7544 and an F value of 0.40. Thus, the null hypothesis was not rejected, meaning that time

taken to access a health facility was not statistically significantly associated with the number of antenatal visits.

4.16 Place of Delivery

One fifth (20.16% (n=52) of the study participants delivered at home while four fifths (79.84% (n=206) delivered in a health facility.

4.16.1 Place of Delivery by Study Group

For the 130 study mothers in the intervention study arm, 90% (n=117) delivered in a health facility, while 10% (n=13) delivered at home. For the 128 study mothers in the non-intervention study arm, 69.53% (n=89) delivered in a health facility, while 30.47% (n=39) delivered at home.

The null hypothesis that there was no difference between the proportion of study mothers that delivered in a health facility by study arm was tested with Chi square Test. The alternate hypothesis was that there was a difference in the proportion of the study participants who delivered in a health facility between the two study arms. The difference of proportions for the health facility-based deliveries between the intervention and non-intervention study arms was 20.47% (90% vs 69.53%, 95% CI 10.97% - 29.96%, p value < 0.0001). Thus, the null hypothesis was rejected indicating that the study mothers in the intervention study arm were more likely to deliver in a health facility compared to those in the non-intervention arm.

4.16.2 Place of Delivery by Age

The null hypothesis of the likelihood of there being no difference in the place of delivery of the study participant by age was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of the study participants' place of delivery by age. To do this test, the age was categorized into four categories i.e., 19 years and less, 20 to 24 years, 25 to 29 years and 30 years and above. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.341 and a Pearson Chi^2 statistic of 3.3453 and thus the null hypothesis was not rejected.

4.16.3 Place of Delivery by Parity

The null hypothesis of the likelihood of there being no difference in the place of delivery by parity of the study participant was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of the study participants' place of delivery by parity. To do this test the parity variable was categorized into four categories i.e., primi gravida, mothers with one child, mothers with two children and mothers with three children and above. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.353 and a Pearson Chi^2 statistic of 3.2621. Thus, the null hypothesis not was rejected.

4.17 Postnatal Outcomes

The overarching null hypothesis was that a targeted mobile phone intervention use in antenatal care was not associated with improvement in maternal and neonatal outcomes in the study population.

4.17.1 Birth Weight

The Birth Weight by Study Groups

The distribution of the mean birth weight for the two study groups (intervention and non-intervention) was explored using a histogram to check for normality. It was found to be normally distributed around the two means of 3227.8 and 3251.9 grams respectively (Figure 4.57 below).

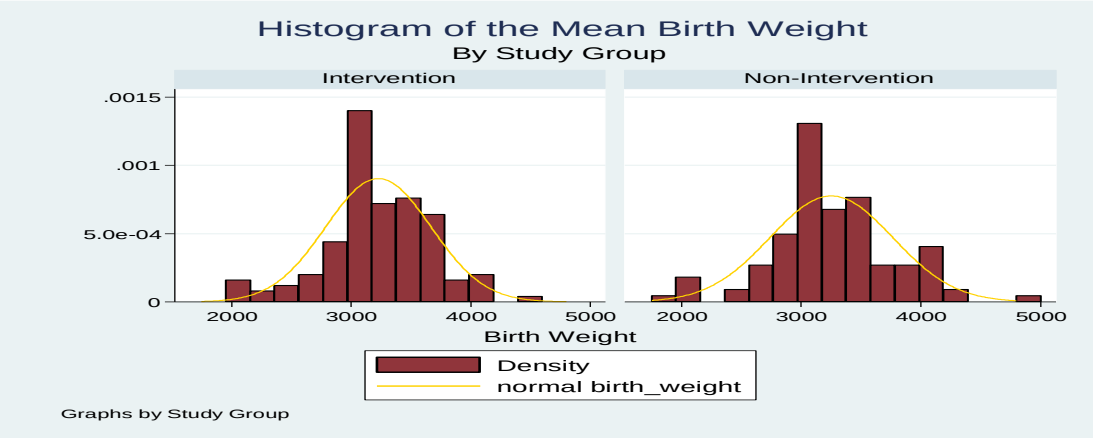


Figure 4.57: Histogram showing the Distribution of the Mean Birth Weight by Study Group

The mean birth weight was 3,227.8 grams for the 123 study participants in the intervention study arm while it was 3,251.9 grams for the 109 study participants in the non-intervention study arm. The difference in means between the birth weights in the two study arms was 24.13 (95% CI -148.98 to 100.71) grams.

A t-test test of significance was done for this difference in means with a null hypothesis of there being no difference between the mean birth weights of the two study arms. The alternate hypothesis was that there was a difference in the mean of birth weight by study arm. This difference was found not to be statistically significant at 95% confidence level (p value 0.7036, t value -0.3810) hence the null hypothesis was not rejected.

The Birth Weight by Place of Delivery

The distribution of the mean birth weight for the two places of delivery (home and hospital) was explored using a histogram to check for normality. It was found to be normally distributed around the two means of 3152.6 and 3252.5 grams respectively. The mean birth weight was 3,152.6 grams for the 31 study participants who delivered at home while it was 3,252.5 grams for the 201 study participants who delivered in a

health facility. The difference in means between the birth weights in the two places of delivery was 99.87 (95% CI – 281.32 to 81.57) grams.

A t-test test of significance was done for this difference in means with a null hypothesis of there being no difference between the mean birth weights of the two places of delivery. The alternate hypothesis was that there was a difference in the mean of birth weight by place of delivery. This difference was found not to be statistically significant at 95% confidence level (p value 0.2727, t value -1.1121). Thus, the null hypothesis was not rejected.

The Birth Weight by Age

To allow for analysis, the age of study participants was categorized into four i.e., those aged 19 years and below, those aged between 20 and 24 years, those aged between 25 and 29 years, and those aged 30 years and above. The mean birth weight was explored by the age of the study participants. The median birth weights were comparable across the age groups with the lowest median birth weight in those study participants aged 19 years and below. This is depicted in the box plot below (Figure 4.58).

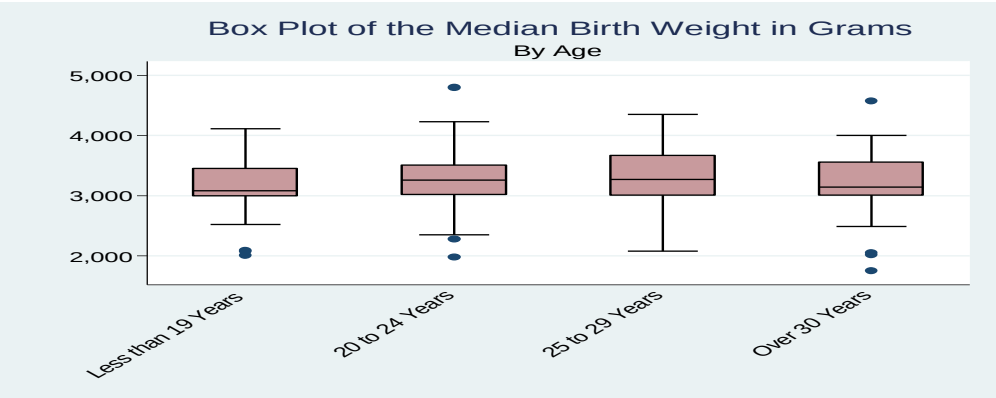


Figure 4.58: Box Plot showing the Median Birth Weight by Age

One-way ANOVA test was used to test for the null hypothesis of there being no difference in mean birth weight between the various age groups. The alternate

hypothesis was that there was a difference in the mean of birth weight by age. The mean birth weight was 3,151.3 grams for the 45 study participants who were aged 19 years and below, while it was 3,257.9 grams for the 105 study mothers aged between 20 and 24 years. The mean birth weight was 3,321.7 grams for the 53 study mothers aged between 25 and 29 years, while it was 3,156.6 grams for the 29 study mothers who were aged 30 years and above. The mean difference in birth weights by age was not statistically significant thus the null hypothesis of there being no difference in mean birth weights between the groups was not rejected (p value 0.2458, F value 1.39).

The Birth Weight by Body Mass Index (BMI)

To allow for analysis the BMI of study participants was categorized into three i.e., those classified as being of normal weight and below (BMI less than 24.999), those classified as overweight (BMI between 25 and 29.999), and those classified as obese (BMI above 30). The mean birth weight was explored by the BMI of the study participants. The median birth weights were comparable across the BMI groups with the lowest median birth weight in those study participants who were of normal weight and below. This is depicted in the box plot below (Figure 4.59).

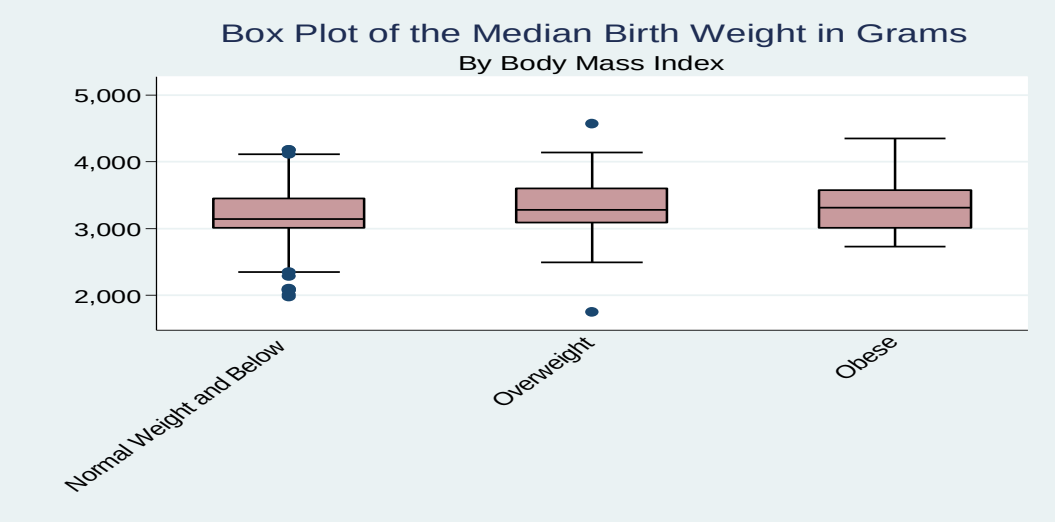


Figure 4.59: Box Plot showing the Mean Birth Weight by BMI

One-way ANOVA was used to test for the null hypothesis of there being no difference in mean birth weight between the various BMI groups. The alternate hypothesis was that there was a difference in the mean of birth weight by body mass index (BMI). The mean birth weight was 3,176.6 grams for the 113 study participants who were classified as having normal BMI, while it was 3,343.7 grams for the 49 study mothers classified as being overweight. The mean birth weight was 3,345 grams for the 20 study mothers classified as being obese.

The mean difference in the birth weight by BMI was not statistically significant thus the null hypothesis of there being no difference in mean birth weights between the BMI groups was not rejected (p value 0.0607, F value 2.85).

The Birth Weight by Parity

To allow for analysis the parity of study participants was categorized into four i.e., those who were primi gravidas, those carrying their second child, those carrying their third child, and those carrying their fourth child and above. The mean birth weight was explored by the parity of the study participants. The median birth weights were comparable across the parity groups with the lowest median birth weight in those study participants who were carrying their fourth child and above. This is depicted in the box plot below (Figure 4.60).

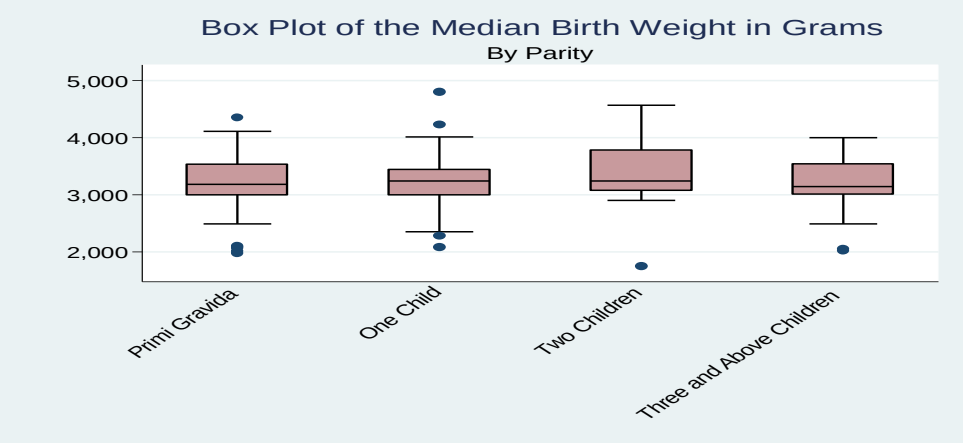


Figure 4.60: Box Plot showing the Median Birth Weight by Parity

One-way ANOVA was used to test for the null hypothesis of there being no difference in mean birth weight between the various parity groups. The alternate hypothesis was that there was a difference in the mean of birth weight by parity. The mean birth weight was 3,224.8 grams for the 112 study participants who were primi gravida, while it was 3,224.6 grams for the 67 study mothers who were carrying their second child. The mean birth weight was 3,388.1 grams for the 31 study mothers who were carrying their third child, while it was 3,146.9 grams for the 22 study mothers who were carrying their fourth child and above.

The mean difference in birth weights by parity was not statistically significant thus the null hypothesis of there being no difference in mean birth weights between the groups was not rejected (p value 0.2600, F value 1.35).

4.17.2 Any Maternal Complication at Birth

The likelihood of a study participant having any complication at birth was 28.24% (n=74) while that of a study mother having no complication was 71.76% (n=188).

Any Complication at Birth by Study Group

A test of significance using the Student t test of proportions of the difference in proportion between the two study arms i.e. intervention and non-intervention arms for the likelihood of a study participant having any complication at birth was done. The null hypothesis was that there was no difference in the proportions of study participants who had complications at birth between the two study arms. The alternate hypothesis was that there was a difference between the proportions of study participants who had a complication by study group.

The difference in proportion between the study participants who had a complication at birth was 17.23% (95% CI 6.51% - 27.94%, p value = 0.002) between the intervention (19.70%) and the non-intervention (36.92%) study arm and thus the null hypothesis was rejected. This meant that those mothers in the non-intervention study arm had a higher likelihood of having complications at birth compared to the mothers in the intervention study arm.

Any Complication at Birth by Place of Delivery

A test of significance using test of proportions of the difference in proportion between the two places of delivery i.e., at home and in hospital for the likelihood of a study participant having any complication at birth was done. The null hypothesis was that there was no difference in the proportions of study participants who had complications at birth between those who delivered at home and those who delivered in hospital. The alternate hypothesis was that there was a difference between the proportions of study participants who had a complication at birth by place of delivery.

The difference in proportion between the study participants who had a complication at birth was 43.09% (95% CI 28.85% - 57.34%, p value < 0.0001) between those who delivered at home (61.54%) and those who delivered in hospital (18.45%) which was statistically significant. Thus, the null hypothesis was rejected indicating that the likelihood of a study participant having a complication was higher among those who delivered at home compared to those who delivered in hospital.

Any Complication at Birth by Age

The null hypothesis of there being no difference in the likelihood of having any complication at birth for the study participant by age was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of study participants having complications at birth by age. It was found that the differences were not statistically significant at 95% confidence level with a p value of 0.463 and a Pearson Chi^2 statistic of 2.5694. Thus, the null hypothesis was not rejected. This is summarized in the table below (Table4.6).

Table 4.6: Table showing the Likelihood of a Complication at Birth by Age

Any Complication at Birth	Less than 20 years	20 to 24 years	25 to 29 years	Over 30 Years	Total
No	33	90	43	22	188
Yes	17	29	16	12	74
Total	50	119	59	34	262
	Pearson chi2 (3) 2.5694 Pr 0.463				

Any Complication at Birth by Parity

The null hypothesis of there being no difference in the likelihood of having any complication at birth for the study participants by parity was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of study participants having complications at birth by parity.

It was found that the difference was statistically significant at 95% confidence level with a p value of 0.026 and a Pearson Chi^2 statistic of 9.2222. Thus, the null hypothesis was rejected. This meant that parity was an important determinant of whether a mother had a complication at birth with the higher the parity the higher the likelihood of a mother having a complication at birth. This is summarized in the table below (Table 4.7).

Table 4.7: Table showing the Likelihood of a Complication at Birth by Parity

Any Complication at Birth	Primi Gravida	One Child	Two Children	Three Children and above	Total
No	84	62	26	16	188
Yes	40	12	10	12	74
Total	124	74	36	28	262
	Pearson chi2 (3) 9.2222 Pr 0.026				

Any Complication at Birth by Body Mass Index (BMI)

The null hypothesis of there being no difference in the likelihood of having any complication at birth for the study participant by Body Mass Index (BMI) was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of study participants having complications at birth by BMI. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.212 and a Pearson Chi^2 statistic of 3.0984. Thus, the null hypothesis was not rejected. This is summarized in the table below (Table 4.8).

Table 4.8: Table showing the Likelihood of a Complication at Birth by BMI

Any Complication at Birth	Normal Weight	Overweight	Obese	Total
No	90	41	16	147
Yes	34	14	12	60
Total	124	55	28	207
	Pearson chi2 (3) 3.0984 Pr 0.212			

Any Complication at Birth by Systolic Blood Pressure (SBP)

The null hypothesis of there being no difference in the likelihood of having any complication at birth for the study participant by Systolic Blood Pressure (SBP) was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of study participants having complications at birth by SBP. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.412 and a Pearson Chi^2 statistic of 1.7717. Thus, the null hypothesis was not rejected. This is summarized in the table below (Table 4.9).

Table 4.9: Table showing the Likelihood of a Complication at Birth by Systolic BP

Any Complication at Birth	Normal Systolic BP	Pre-Hypertensive	Hypertensive	Total
No	123	53	12	188
Yes	53	19	2	74
Total	176	72	14	262
	Pearson chi2 (3) 1.7717 Pr 0.412			

Any Complication at Birth by Distance to a Health Facility

The null hypothesis of there being no difference in the likelihood of having any complication at birth for the study participant by the distance traveled to a health facility was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of the study participants having complications at birth by distance traveled to a health facility. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.381 and a Pearson Chi^2 statistic of 1.9299. Thus, the null hypothesis was not rejected. This is summarized in the table below (Table 10).

Table 4.10: Table showing the Likelihood of a Complication at Birth by Distance Travelled to Access a Health Facility

Any Complication at Birth	More than 5 km	1 to 5 km	Less than 1 km	Total
No	43	113	32	188
Yes	12	51	11	74
Total	55	164	43	262
	Pearson chi2 (3) 1.9299 Pr 0.381			

Any Complication at Birth by Time Taken to Access a Health Facility

The null hypothesis of there being no difference in the likelihood of having any complication at birth for the study participant by the time taken to access a health facility was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of study participants

having complications at birth by time taken to access a health facility. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.930 and a Pearson Chi^2 statistic of 0.4466. Thus, the null hypothesis was not rejected. This is summarized in the table below (Table 4.11).

Table 4.11: Table showing the Likelihood of a Complication at Birth by Parity

Any Complication at Birth	Less than 15 Minutes	15 to 30 Minutes	30 to 60 Minutes	More than 60 Minutes	Total
No	23	54	91	20	188
Yes	9	19	39	7	74
Total	32	73	130	27	262
	Pearson chi2 (3) 0.4466 Pr 0.930				

4.17.3 APGAR Score at 5 Seconds

APGAR Score at 5 Seconds by Study Group

The distribution of the mean Apgar score at 5 seconds was explored by the histogram. It was found to be skewed to the left as shown in the histogram below (Figure 4.61).

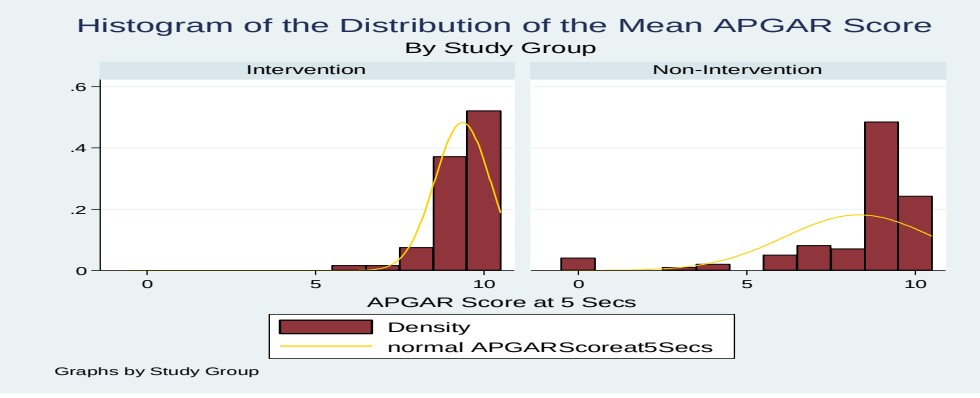


Figure 4.61: Histogram showing the Distribution of the Mean APGAR Score at 5 Seconds by Study Group

The mean Apgar score at 5 seconds for the 121 study mothers in the intervention study arm was 9.364, while it was 8.333 for the 99 study mothers in the non-intervention study arm. The median Apgar score at 5 seconds for the 121 study mothers in the intervention study arm was 10, while it was 9 for the 99 study mothers in the non-intervention study arm.

Mann Whitney U test of significance was used to test the null hypothesis that there was no difference between the median APGAR score at 5 seconds of the two study groups i.e., intervention and non-intervention groups. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds between these study groups. The difference between the medians was found to be statistically significant at 95% confidence level (z statistic 4.698, p value < 0.0001), thus the null hypothesis was rejected. This meant that the study participants in the intervention arm were more likely to have better APGAR scores at 5 seconds compared to those in the non-intervention arm.

APGAR Score at 5 Seconds by Place of Delivery

Mann Whitney U test of significance was used to test the null hypothesis that there was no difference between the median APGAR score at 5 seconds of the two subgroups i.e., those who delivered at home and those who delivered in hospital. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds between these two sub groups. The difference between the two medians was found to be statistically significant at 95% confidence level (z statistic 4.061, p value < 0.0001) thus the null hypothesis was rejected meaning that the study participants who delivered in hospital were likely to have better APGAR scores compared to those who delivered at home.

APGAR Score at 5 Seconds by Parity

Kruskal Wallis test of significance was used to test the null hypothesis that there was no difference between the median APGAR score at 5 seconds for the four categories of parity i.e., those who were primi gravidas, those expecting their second child, those expecting their third child and those expecting their fourth child and above.

The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds among these subgroups.

The difference between these medians was found to be statistically significant at 95% confidence level (Chi^2 statistic 9.306, p value = 0.0255), thus the null hypothesis was rejected, meaning that the study participants who had a higher parity were likely to have lower APGAR scores compared to those who had lower parity.

APGAR Score at 5 Seconds by Age

Kruskal Wallis test of significance was used to test the null hypothesis that there was no difference between the median APGAR score at 5 seconds for the four categories of age i.e., those who were aged 19 years and below, those aged between 20 and 24 years, those aged between 25 and 29 years, and those aged 30 years and above. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds among these four subgroups.

The difference between these medians was found not to be statistically significant at 95% confidence level with a Chi^2 statistic of 0.659 and a p value of 0.8827, thus the null hypothesis was not rejected.

APGAR Score at 5 Seconds by Facility of Enrolment

Kruskal Wallis test of significance was used to test the null hypothesis that there was no difference between the median APGAR scores at 5 seconds for the four enrolment facilities. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds among these four subgroups. The difference between these medians was found to be statistically significant at 95% confidence level with a Chi^2 statistic of 26.292 and a p value of 0.0001, thus the null hypothesis was rejected, meaning that the level of care affected scores with better scores among the higher levels compared to the lower levels.

APGAR Score at 5 Seconds by Body Mass Index (BMI)

Kruskal Wallis test of significance was used to test the null hypothesis that there was no difference between the median APGAR score at 5 seconds for the three categories of BMI i.e., those who were classified as normal weight, those classified as overweight, and those classified as obese. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds among these three subgroups. The difference between these medians was found not to be statistically significant at 95% confidence level with a Chi^2 statistic of 2.548 and a p value of 0.2797, thus the null hypothesis was not rejected.

APGAR Score at 5 Seconds by Distance to a Health Facility

Kruskal Wallis test of significance was used to test the null hypothesis that there was no difference between the median APGAR scores at 5 seconds for the three categories of distance traveled by study participants to access a health facility. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds among these three subgroups. The difference between these medians was found not to be statistically significant at 95% confidence level with a Chi^2 statistic of 4.480 and a p value of 0.1065, thus the null hypothesis was not rejected.

APGAR Score at 5 Seconds by Time to Access a Health Facility

Kruskal Wallis test of significance was used to test the null hypothesis that there was no difference between the median APGAR scores at 5 seconds for the four categories of time taken by study participants to access a health facility. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds among these four subgroups.

The difference between these medians was found not to be statistically significant at 95% confidence level with a Chi^2 statistic of 4.590 and a p value of 0.2044, thus the null hypothesis was not rejected.

4.17.4 Neonatal Mortality

Neonatal Mortality by Study Group

A test of significance using Student t-test of proportions of the difference in proportion between the two study arms for the likelihood of a study participant having a neonatal mortality at birth was done. The null hypothesis was that there was no difference in the proportion of study participants who had neonatal mortality at birth between the two study arms. The alternate hypothesis was that there was a difference in the proportion of the study participants who had a neonatal mortality at birth by study group. The difference in proportion between the study participants who had a neonatal mortality at birth was 9.32% (95% CI 1.91% - 16.74%, p value = 0.015) between the intervention (6.06%) and the non-intervention (15.38%) study arm which was statistically significant. Thus, the null hypothesis was rejected, meaning that study mothers in the non-intervention arm had a higher likelihood of having a neonatal mortality.

Neonatal Mortality by Place of Delivery

A test of significance using t-test of proportions of the difference in proportion between the two places of delivery i.e., at home and in hospital for the likelihood of a study participant having a neonatal mortality at birth was done. The null hypothesis was that there was no difference in the proportions of study participants who had neonatal mortality at birth between the two places of delivery. The alternate hypothesis was that there was a difference in the proportion of the study participants who had a neonatal mortality at birth by place of delivery.

The difference in proportion between the study participants who had neonatal mortality at birth was 26.89% (95% CI 14.07% - 39.70%, p value < 0.0001) between those who delivered at home (30.77%) and those who delivered in a health facility (3.88%) which was statistically significant. Thus, the null hypothesis was rejected hence, those study participants who delivered at home were more likely to experience a neonatal mortality compared to those who delivered in a hospital.

Neonatal Mortality by Parity

In order to allow for checking of the association between the likelihood of neonatal mortality and the parity of the study participants using Chi square Goodness of Fit test, the categorical variable parity category was re-coded into three new categories i.e. primi gravida, one to two children and three children and above. The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participant by parity was tested. The alternate hypothesis was that there was a difference in the likelihood of the study participants having a neonatal mortality at birth by parity.

It was found that the difference in the proportions was statistically significant at 95% confidence level with a p value of 0.032 and a Pearson Chi^2 statistic of 6.8653. Thus, the null hypothesis was rejected, meaning the mothers who had a higher parity were more likely to experience neonatal mortality at birth. The table below shows the numbers for each category for this outcome variable (Table 4.12).

Table 4.12: Table showing the Likelihood of Having Neonatal Mortality at Birth by Parity

Neonatal Mortality	Primi Gravida	One to Two Children	Three and above children	Total
	112	101	21	234
Yes	12	9	7	28
Total	124	110	28	262
	Pearson Chi2 (3) 6.8653 Pr 0.032			

Neonatal Mortality by Age

In order to allow for checking of the association between the likelihood of neonatal mortality and the age of the study participants using Chi square Goodness of Fit test, the categorical variable age category was re-coded into three new categories i.e. 24 years and below, 25 to 29 years and 30 years and above. The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participant by age was tested by use of the Chi square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of the study

participants having a neonatal mortality at birth by age. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.435 and a Pearson Chi^2 statistic of 1.6662. Thus, the null hypothesis was not rejected. This is shown in the table below (Table 4.13).

Table 4.13: Table showing the Likelihood of having Neonatal Mortality at Birth by Age

Neonatal Mortality	24 Years and Below	25 to 29 Years	30 Years and above	Total
No	154	51	29	234
Yes	15	8	5	28
Total	169	59	34	262
	Pearson Chi2 (3) 1.6662 Pr 0.435			

Neonatal Mortality by Body Mass Index (BMI)

The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participant by Body Mass Index (BMI) was tested by use of the Chi Square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of the study participants having a neonatal mortality at birth by BMI. It was found that the difference was statistically significant at 95% confidence level with a p value of 0.039 and a Pearson Chi^2 statistic of 6.4854. Thus, the null hypothesis was rejected. This meant that the higher the BMI, the higher the likelihood of a study participant experiencing a neonatal mortality. This is shown in the table below (Table 4.14).

Table 4.14: Table showing the Likelihood of having Neonatal Mortality at Birth by BMI

Neonatal Mortality	Normal Weight	Overweight	Obese	Total
No	114	48	21	183
Yes	10	7	7	24
Total	124	55	28	207
	Pearson Chi2 (3) 6.4854 Pr 0.039			

Neonatal Mortality by Systolic Blood Pressure (SBP)

In order to allow for checking of the association between the likelihood of neonatal mortality and the systolic Blood Pressure (SBP) of the study participants using Chi Square Goodness of Fit test, the categorical variable systolic BP was coded into two new categories i.e., normal BP and abnormal BP.

The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participants by Systolic Blood Pressure (SBP) was tested by use of the Chi Square Goodness of Fit test. The alternate hypothesis was that there was a difference in the likelihood of the study participants having a neonatal mortality at birth by SBP. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.441 and a Pearson Chi^2 statistic of 0.5936. Thus, the null hypothesis was not rejected. This is shown in the table below (Table 4.15).

Table 4.15: Table showing the Likelihood of having Neonatal Mortality by SBP

Neonatal Mortality	Normal Systolic BP	Abnormal Systolic BP	Total
No	159	75	234
Yes	17	11	28
Total	176	86	262
	Pearson Chi2 (3) 0.5936 Pr 0.441		

Neonatal Mortality by Distance to a Health Facility

In order to allow for checking of the association between the likelihood of neonatal mortality and the distance a study participant had to travel to access a health facility using Chi Square Goodness of Fit test, the categorical variable distance to access a health facility was re-coded into two new categories i.e., less than 5 kilometers and more than 5 kilometers. The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participant by the distance travelled to a health facility was tested. The alternate hypothesis was that there was a difference in the likelihood of the study participants having a neonatal mortality at birth by distance travelled to access a health facility.

It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.952 and a Pearson Chi^2 statistic of 0.0036. Thus, the null hypothesis was not rejected. This is shown in the table below (Table 4.16).

Table 4.16: Table showing the Likelihood of having Neonatal Mortality at Birth by Distance Travelled to Access a Health Facility

Neonatal Mortality	5 km and Less	More than 5 km	Total
No	185	49	234
Yes	22	6	28
Total	207	55	262
	Pearson Chi2 (3) 0.0036 Pr 0.952		

Neonatal Mortality by Time to Access a Health Facility

In order to allow for checking of the association between the likelihood of neonatal mortality at birth and the time it took a study participant to access a health facility using Chi Square Goodness of Fit test, the categorical variable time to access a health facility was re-coded into two new categories i.e., up to 30 minutes and more than 30 minutes.

The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participant by the time it took to access a health facility was tested. The alternate hypothesis was that there was a difference in the likelihood of the study participants having a neonatal mortality at birth by time taken to access a health facility. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.189 and a Pearson Chi^2 statistic of 1.7279. Thus, the null hypothesis was not rejected. This is shown in the table below (Table 4.17).

Table 4.17: Table showing the Likelihood of having Neonatal Mortality at Birth by Time Taken to Travel to a Health Facility

Neonatal Mortality	Up to 30 Minutes	More than 30 Minutes	Total
No	97	137	234
Yes	8	20	28
Total	105	157	262
	Pearson Chi2 (3) 1.7279 Pr 0.189		

Neonatal Mortality by Level of Facility of Enrolment

In order to allow for checking of the association between the likelihood of neonatal mortality and level of care of the facility of care of enrolment of the study participants using Chi Square Goodness of Fit test, the categorical variable facility of enrolment was re-coded into three new categories i.e., health centre, sub county hospital and county referral hospital. The null hypothesis of there being no difference in the likelihood of having a neonatal mortality at birth for the study participant by level of care of the facility of enrolment was tested. The alternate hypothesis was that there was a difference in the likelihood of the study participants having a neonatal mortality at birth by level of care of the facility of enrolment. It was found that the difference was not statistically significant at 95% confidence level with a p value of 0.147 and a Pearson Chi^2 statistic of 3.8339. Thus, the null hypothesis was not rejected. This is shown in the table below (Table 4.18).

Table 4.18: Table showing the Likelihood of having Neonatal Mortality at Birth by Level of Care of the Health Facility

Neonatal Mortality	Health Centre	Sub County Hospital	County Referral Hospital	Total
No	77	39	118	234
Yes	5	8	15	28
Total	82	47	133	262
	Pearson chi2 (3) 3.8339 Pr 0.147			

4.18 Multivariate Regression for the Dependent Variable - The Number of ANC Visits

4.18.1 Checking for the Statistically Significant Independent Variables

The dependent variable – the number of antenatal clinic (ANC) visits done by each study participant was converted to the square of the number of antenatal clinic visits to reduce skewness. The distribution for the new variable was found to be normal. To build a multivariate regression model to determine the predictors of the number of antenatal clinic visits that a study participant would make in the course of their pregnancy, this new dependent variable (square of the ANC visits), was regressed with each of the independent variables one at a time (bivariate) to check for those independent variables' statistical significance using Poisson regression since this variable was count data. Those variables that were found to be statistically significant formed the basis for subsequent multivariate regression.

This regression information is summarized in the table below with the statistically significant variables highlighted (Table 4.19).

Table 4.19: Table showing the Results of Bivariate Regression

Independent Variable	IRR	95% Confidence Interval	P value	Constant Term	McFadden's R^2
Age	0.01	0.004 - 0.016	0.0016	2.34	0.005
BMI	0.003	-0.005 - 0.011	0.500	2.503	0.0003
Parity	0.027	-0.001 - 0.055	0.059	2.557	0.0016
SBP	0.0012	-0.001 - 0.004	0.374	2.446	0.0004
Gestation by FH	0.015	-0.022 - -0.008	<0.0001	2.877	0.0077
Hemoglobin	0.008	-0.015 - 0.031	0.486	2.494	0.0003
No of SMS Sent	0.015	-0.003 - 0.032	0.071	2.671	0.0037
No of Calls done	0.022	-0.011 - 0.055	0.196	2.752	0.0019
Gestation by Dates	0.002	-0.003 - -0.001	<0.0001	2.844	0.0091
Mean Follow Up Time	0.001	0.001 - 0.003	<0.0001	2.301	0.0146
Study Group					
Non-Inter vs Intervention	0.660	-0.731 - -0.589	<0.0001	2.855	0.1618
Facility Level					
Subcounty Hos vs. Health Centre (HC)	0.034	-0.132 - 0.064	0.498	2.617	0.0010
County Referral vs. HC	0.056	-0.132 - 0.064	0.148		
Marital Status					
Separated vs. Married	0.403	-1.057 - 0.251	0.227	2.600	0.0035
Single vs. Married	0.127	-0.230 - -0.025	0.015		
Education Level					
Primary vs. Never Attended	0.271	0.032 - 0.510	0.026	2.317	0.0036
Secondary vs. Never Attended	0.248	0.009 - 0.487	0.042		
Tertiary vs. Never Attended	0.313	0.070 - 0.555	0.011		
Distance to Access a Health Facility	0.035	-0.118 - 0.048	0.410	2.590	0.0003
Time to Access a Health Facility	0.011	-0.057 - 0.079	0.751	2.576	0.000

The base model which did not have any independent variable showed that the mean number of ANC visits done by a study mother was 2.58 (95% CI 2.55 - 2.62, p value 0.000) visits, a McFadden's R^2 of 0.000. This was represented by the equation below;

Poisson (A) = $b0$ where A was the number of ANC visits

Age

When age as an independent variable was added to the base model, for every one-year increase in the age of study participants, the square of the number of ANC visits increased by a factor of 0.01 (95% CI 0.004 - 0.016, p-value 0.0016). This result was statistically significant at 95% confidence level. The constant term was 2.34 visits. The McFadden's R^2 was 0.0046. This association is represented by the equation below.

Poisson (A) = $b0+b1$*Age

Parity

Adding parity as an independent variable to the base model, for every extra child that a study participant had, the square of the number of ANC visits increased by a factor of 0.027 (95% CI -0.001 to 0.055, p-value of 0.059). This result was borderline statistically insignificant at 95% confidence level. The constant term was 2.557 visits. The McFadden's R^2 was 0.0016. This association is represented by the equation below.

Poisson (A) = $b0+b1$*Parity

Gestation by Fundal Height

Adding the gestation by fundal height as an independent variable to the base model, for every one-unit increase in the gestation of study participant by fundal height, the square of the number of ANC visits decreased by a factor of 0.015 (95% CI -0.022 to -0.008 p-value < 0.0001). This result was statistically significant at 95% confidence level. The constant term was 2.877 visits. The McFadden's R^2 was 0.008. This association is represented by the equation below.

Poisson (A) = $b0+b1$*Gestation_FH

Number of SMS Sent

When the number of SMS sent as an independent variable was added to the base model, for every one-unit increase in the number of SMS sent to the study

participant, the square of the number of ANC visits increased by a factor of 0.015 (95% CI -0.001 to 0.032, p-value of 0.071). This result was not statistically significant at 95% confidence level. The constant term was 2.671 visits. The McFadden's R^2 was 0.004. This association is represented by the equation below.

Poisson (A) = $b0+b1$*NoofSMSsent

Gestation by Dates at Enrolment

When the gestation by dates at enrolment as an independent variable was added to the base model, for every one-unit increase in the gestation by dates of the study participant, the square of the number of ANC visits decreased by a factor of 0.002 (95% CI 0.002 to 0.010, p-value < 0.0001). This result was statistically significant at 95% confidence level. The constant term was 2.844 visits. The McFadden's R^2 was 0.0091. This association is represented by the equation below.

Poisson (A) = $b0+b1$*Gestation_enrol

Mean Follow up Time

When the follow up time for each study participant as an independent variable was added to the base model, for every one-unit increase in the time of follow up of the study participant, the square of the number of ANC visits increased by a factor of 0.0014 (95% CI 0.001 to 0.003, p-value < 0.0001). This result was statistically significant at 95% confidence level. The constant term was 2.301 visits. The McFadden's R^2 was 0.015. This association is represented by the equation below.

Poisson (A) = $b0+b1$*days_followup

Study Group

When the study group to which a study participant had been allocated as an independent variable was added to the base model, for every mother in the non-intervention study arm compared to intervention study arm, the square of the number of ANC visits decreased by a factor of 0.660 (95% CI -0.731 to -0.589, p-value <

0.0001). This result was statistically significant at 95% confidence level. The constant term was 2.855 visits. The McFadden's R^2 was 0.162. This association is represented by the equation below.

Poisson (A) = $b0$+$b1$*i.study_grp

Marital Status

When the marital status as a independent variable was added to the base model, for study participants who were separated compared to those who were married, the square of the number of ANC visits decreased by a factor of 0.403, (95% CI -1.057 to 0.251, p-value of 0.227). This result was not statistically significant at 95% confidence level. For study participants who were single compared to those who were married, the square of the number of ANC visits decreased by a factor of 0.127, (95% CI -0.230 to -0.025, p-value of 0.015). This result was statistically significant at 95% confidence level. The constant term was 2.600 visits. The McFadden's R^2 was 0.0035. This association is represented by the equation below.

Poisson (A) = $b0$+$b1$*i.marital_status

Education Level

When the level of education attained by the study participant as an independent variable was added to the base model, for those study mothers who had attained primary school level of education compared to those who had not attended any formal schooling, the square of the number of ANC visits increased by a factor of 0.271, (95% 0.032 to 0.510, p-value of 0.026). This result was statistically significant at 95% confidence level.

For those study mothers who had attained secondary school level of education compared to those who had not attended any formal schooling, the square of the number of ANC visits increased by a factor of 0.248, (95% CI 0.009 to 0.487, p-value of 0.042). This result was statistically significant at 95% confidence level.

For those study mothers who had attained tertiary school level of education compared to those who had not attended any formal schooling, the square of the number of ANC visits increased by a factor of 0.313, (95% CI 0.0704 to 0.5550, p-value of 0.011). This result was statistically significant at 95% confidence level.

The constant term was 2.317 visits. The McFadden's R^2 was 0.0036. This association is represented by the equation below.

Poisson (A) = $b0+b1$*i.educ_level

4.18.2 Checking for Assumptions of Poisson Regression before Multivariate Regression: Variance and Dispersion

The mean of 13.23 of the squares of the ANC visits was found to be much lower than the variance of 51.15, hence the assumption that there should be equi-dispersion (i.e., that the mean is equal to variance) of the Poisson regression model was not met for multivariate regression. The large value for Pearson Goodness of Fit chi-square of 621.8 was also an indicator that the Poisson distribution would not be a good choice for multivariate regression. A significant test statistic of p value less than 0.0001 ($p<0.05$) from the goodness of fit also indicated that the Poisson model would be inappropriate.

The likelihood ratio test is a test of the over-dispersion parameter alpha. When the over-dispersion parameter is zero, the negative binomial distribution is equivalent to a Poisson distribution. In our case, the alpha was significantly different (621.8) from zero hence using Poisson distribution for regression would be inappropriate. Thus, the negative binomial regression method was chosen for multivariate regression.

The multivariate regression was done with the truncated negative binomial regression method because the lowest number of ANC visits done by each study participant was one, since study participants were recruited from the antenatal clinics (MCH), hence each mother had already attended at least one antenatal visit, making the possibility of a zero score for the number of ANC visits unlikely.

4.18.3 Multivariate Regression – Number of ANC Visits

Multivariate Regression Model with only the Statistically Significant Independent Variables from the Bivariate Regression

All the statistically significant independent variables from the bivariate regressions were incorporated into the first multivariate model. The variables, study group, and education level were excluded from the model due to collinearity. This regression is summarized in table 4.20 below. The resultant model is described below.

Table 4.20: Table Showing the Regression model with Statistically Significant Variables

Dependent variable	Covariate	IRR Incidence Rate Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Square of the Number of ANC Visits	Age	1.015	0.071	0.999 - 1.032	0.0098	0.030	1257.9
	Gestation by FH	1.005	0.686	0.980 – 1.031			1280.5
	Gestation at Enrol	1.002	0.424	0.998 – 1.006			
	Days of Follow up	1.005	0.017	1.001 – 1.009			
	Marital Status	0.927	0.519	0.735 – 1.168			
	Constant	3.545	0.046	1.026 – 12.25			

Holding all the other variables constant, for every one-year increase in the age of a study participant the square of the number of ANC visits increased by a factor of 1.015 (95% CI 0.999 - 1.032, p value 0.071), which was not statistically significant at 95% confidence level. Holding all the other variables constant, for every one-unit increase in the gestation by fundal height of a study participant the square of the number of ANC visits increased by a factor of 1.005 (95% CI 0.980 - 1.031, p value 0.686), which was not statistically significant at 95% confidence level.

Holding all the other variables constant, for every one-day increase in the gestation at enrolment of a study participant the square of the number of ANC visits increased by a factor of 1.002 (95% CI 0.998 - 1.006, p value 0.424), which was not statistically significant at 95% confidence level. Holding all the other variables constant, for every one-day increase in the days of follow up of a study participant the square of the number of ANC visits increased by a factor of 1.005 (95% CI 1.001 - 1.009, p value 0.017), which was statistically significant at 95% confidence level.

Holding all the other variables constant, for those study participants who were single compared to those who were married, the square of the number of ANC visits decreased by a factor of 0.926 (95% CI 0.735 - 1.168, p value 0.519), which was not statistically significant at 95% confidence level. The constant term was 3.55 visits and p value for this model was 0.030, which was statistically significant. The McFadden's R^2 of the model was 0.098. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) for the model were 1257.9 and 1280.5 respectively.

Model with Statistically Significant Independent Variables Excluding Gestation at Enrolment

Gestation at enrolment was excluded from this next model because it was represented by the gestation by fundal height and the days of follow up. The regression model summarized in table 4.21 below.

Table 4.21: Table of the Regression Model with Statistically Significant Variables Excluding Gestation at Enrolment

Dependent variable	Covariate	IRR	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Square of the Number of ANC Visits	Age	1.014	0.065	0.999 - 1.029	0.0096	0.012	1347.2
	Gestation by FH	1.009	0.429	0.987 – 1.032			
	Days of Follow up	1.004	0.007	1.001 – 1.007			1367
	Marital Status	0.926	0.490	0.744 – 1.152			
	Constant	5.004	0.000	2.115 – 11.84			

Holding all the other variables constant, for every one-year increase in the age of a study participant the square of the number of ANC visits increased by a factor of 1.014 (95% CI 0.999 - 1.029, p value 0.064), that was not statistically significant at 95% confidence level. Holding all the other variables constant, for every one-unit increase in the gestation by fundal height of a study participant the square of the number of ANC visits increased by a factor of 1.009 (95% CI 0.987 - 1.032, p value 0.429), that was not statistically significant at 95% confidence level.

Holding all the other variables constant, for every one day increase in the days of follow up of a study participant, the number of ANC visits increased by a factor of 1.004 (95% CI 1.001 - 1.007, p value 0.007), which was statistically significant at 95% confidence level. Holding all the other variables constant, for those study participants who were single compared to those who were married, the square of the number of ANC visits decreased by a factor of 0.926 (95% CI 0.744 - 1.152, p value 0.490) that was not statistically significant at 95% confidence level.

The constant term was 5.004 visits and p value for this model was 0.012, which was statistically significant. The AIC and BIC of this model were 1347.2 and 1367 respectively. The McFadden's R^2 was 0.0096.

Regression Model with the Statistically Significant Independent Variables and BMI (Body Mass Index)

BMI was included in the next multivariate regression because it was considered a clinically significant independent variable. The resultant model is summarized in table 4.22 below.

Table 4.22: Table of the Regression Model with Statistically Significant Variables and BMI

Dependent variable	Covariate	IRR	p-Value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Square of the Number of ANC Visits	Age	1.015	0.148	0.995 - 1.036	0.013	0.047	976.8
	BMI	0.995	0.650	0.972 – 1.018			
	Gestation by FH	0.993	0.639	0.962 – 1.024			1000.5
	Gestation at Enrol	1.003	0.256	0.998 – 1.007			
	Days of Follow up	1.006	0.019	1.0009 – 1.011			
	Marital Status	0.881	0.400	0.657 – 1.183			
	Constant	3.829	0.074	0.878 – 16.70			

Holding all the other variables constant, for every one-year increase in the age of a study participant the square of the number of ANC visits increased by a factor of 1.0151 (95% CI 0.995 - 1.036, p value 0.148) that was not statistically significant at 95% confidence level. Holding all the other variables constant, for every one-unit increase in the body mass index (BMI) of a study participant the square of the number of ANC visits decreased by a factor of 0.995 (95% CI 0.972 - 1.018, p value 0.650) that was not statistically significant at 95% confidence level.

Holding all the other variables constant, for every one-unit increase in the gestation by fundal height of a study participant the square of the number of ANC visits decreased by a factor of 0.993 (95% CI 0.962 - 1.024, p value 0.639) that was not statistically significant at 95% confidence level. Holding all the other variables constant, for every one-day increase in the gestation at enrolment of a study participant the square of the number of ANC visits increased by a factor of 1.003 (95% CI 0.998 - 1.007, p value 0.256) that was not statistically significant at 95% confidence level.

Holding all the other variables constant, for every one-day increase in the days of follow up of a study participant the square of the number of ANC visits increased by

a factor of 1.006 (95% CI 1.0009 - 1.011, p value 0.019), which was statistically significant at 95% confidence level. Holding all the other variables constant, for those study participants who were single compared to those who were married, the square of the number of ANC visits decreased by a factor of 0.881 (95% CI 0.657 - 1.183, p value 0.400) which was not statistically significant at 95% confidence level. The constant term was 3.829 visits, p value for this model was 0.0470, which was statistically significant. The McFadden's R^2 for the model was 0.013. The AIC and BIC of this model were 976.8 and 1000.5 respectively.

Regression Model with Statistically Significant Independent Variables Plus BMI and Excluding Gestation at Enrolment

Gestation at enrolment was removed from the next regression because it could be represented by the gestation by fundal height and days of follow up. This resultant model is summarized in table 4.23 below.

Table 4.23: Table of the Regression Model with Statistically Significant Variables and BMI Excluding Gestation at Enrolment

Dependent variable	Covariate	IRR	p-Value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Square of the Number of ANC Visits	Age	1.012	0.212	0.993 - 1.031	0.012	0.023	1055.4
	BMI	1.002	0.840	0.981 – 1.024			
	Gestation by FH	1.003	0.840	0.976 – 1.031			1076.7
	Days of Follow up	1.004	0.012	1.0009 – 1.007			
	Marital Status	0.879	0.356	0.669 – 1.156			
	Constant	5.068	0.005	1.649 – 15.574			

Holding all the other variables constant, for every one-year increase in the age of a study participant the square of the number of ANC visits increased by a factor of 1.012 (95% CI 0.994 - 1.030, p value 0.212) that was not statistically significant at

95% confidence level. Holding all the other variables constant, for every one-unit increase in the body mass index (BMI) of a study participant the square of the number of ANC visits increased by a factor of 1.002 (95% CI 0.981 - 1.024, p value 0.840) that was not statistically significant at 95% confidence level.

Holding all the other variables constant, for every one-unit increase in the gestation by fundal height of a study participant the square of the number of ANC visits increased by a factor of 1.003 (95% CI 0.976 - 1.031, p value 0.840) that was not statistically significant at 95% confidence level. Holding all the other variables constant, for every one day increase in the days of follow up of a study participant, the square of the number of ANC visits increased by a factor of 1.004 (95% CI 1.0009 - 1.007, p value 0.012), which was statistically significant at 95% confidence level. Holding all the other variables constant, for those study participants who were single compared to those who were married, the square of the number of ANC visits decreased by a factor of 0.879 (95% CI 0.669 - 1.156, p value 0.356) which was not statistically significant at 95% confidence level.

The constant term was 5.068 visits, p value for this model was 0.023, which was statistically significant and a McFadden's R^2 of 0.012. The AIC and BIC of this model was 1055.4 and 1076.7 respectively.

4.17.4 Model Selection Criteria and Checking for Interactions and Predictions

The model with statistically significant variables and BMI was selected because it was statistically significant and had a good AIC and BIC. The p value for this model was 0.047 which was statistically significant and a McFadden's R^2 of 0.013. The AIC and BIC of the model were 976.8 and 1000.5 respectively. The interaction between the independent variables was examined and all of the interaction terms were not found to be statistically significant. Days of follow up remained statistically significant in this model (Table 4.24).

Table 4.24: Table of the Regression Model with Statistically Significant Variables and BMI

Dependent variable	Covariate	IRR	p-Value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Square of the Number of ANC Visits	Age	1.015	0.148	0.995 - 1.036	0.013	0.047	976.8
	BMI	0.995	0.650	0.972 – 1.018			
	Gestation by FH	0.993	0.639	0.962 – 1.024			1000.5
	Gestation at Enrol	1.003	0.256	0.998 – 1.007			
	Days of Follow up	1.006	0.019	1.0009 – 1.011			
	Marital Status	0.881	0.400	0.657 – 1.183			
	Constant	3.829	0.074	0.878 – 16.70			

The predictive margin values of the dependent variable (square of the ANC visits) were calculated by the age of the study participant and it showed that for every unit increase in the age of the study participant, there was an increase in the square of the number of ANC visits done as shown in the marginal plot below (Figure 4.62).

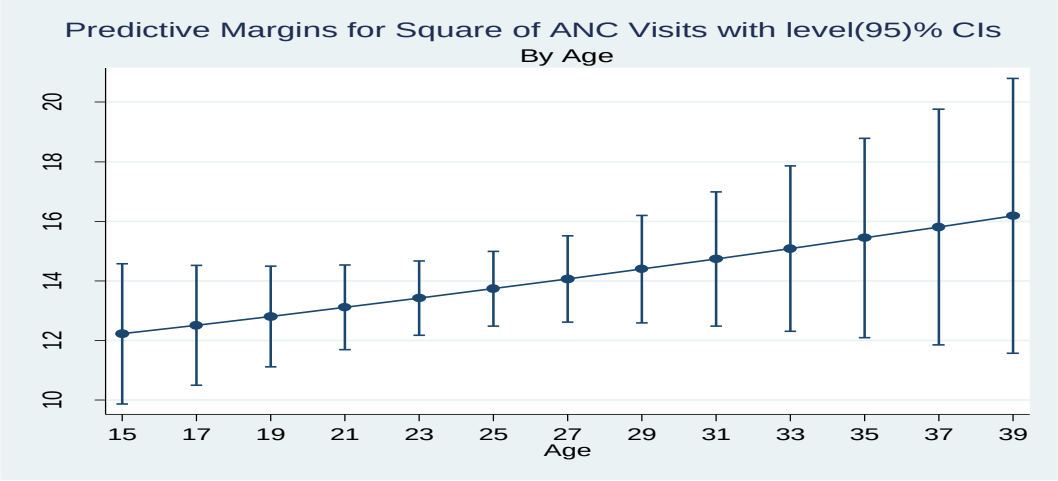


Figure 4.62: Marginal Plot showing the Square of ANC Visits by Age

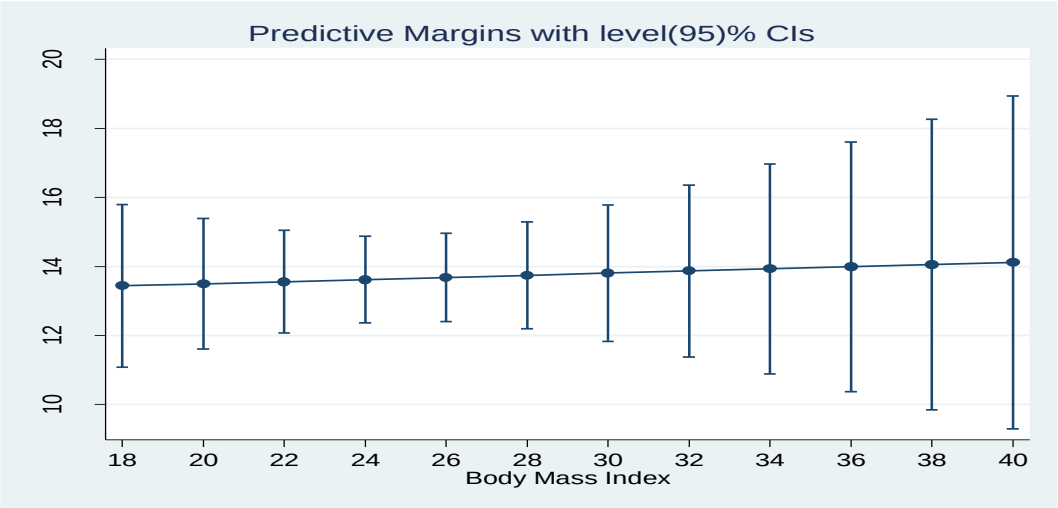


Figure 4.63: Marginal Plot showing the Square of ANC Visits by BMI

The predictive margin values of the dependent variable (square of the ANC visits) were calculated by the BMI of the study participant, and it showed that a unit increase in the BMI of the study participant had a mild effect on the number of ANC visits done (Figure 4.63 above)

4.18.5 Residual Plots

The three residual plots below, the Kernel Density Plot (Figure 4.63), Q-Q Plot (Figure 4.64), and the P Norm Plot (Figure 69) showed that the model was a good predictor of the dependent variable.

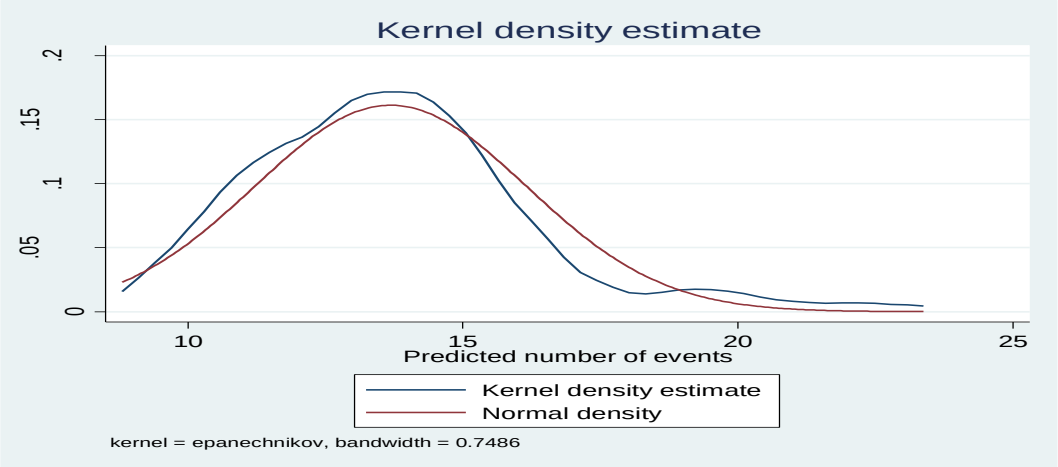


Figure 4.64: Kernel Density Plot

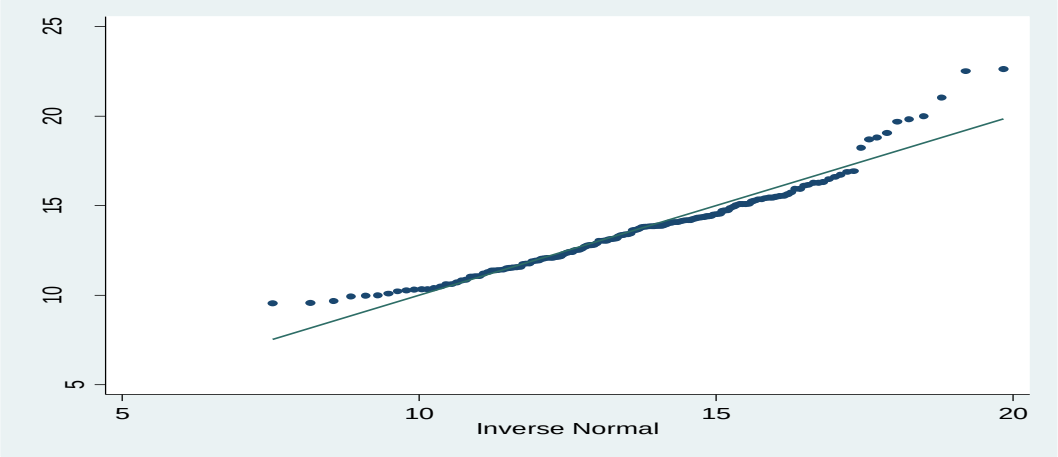


Figure 4.65: Q Norm Plot (Normal Quintile Plot)

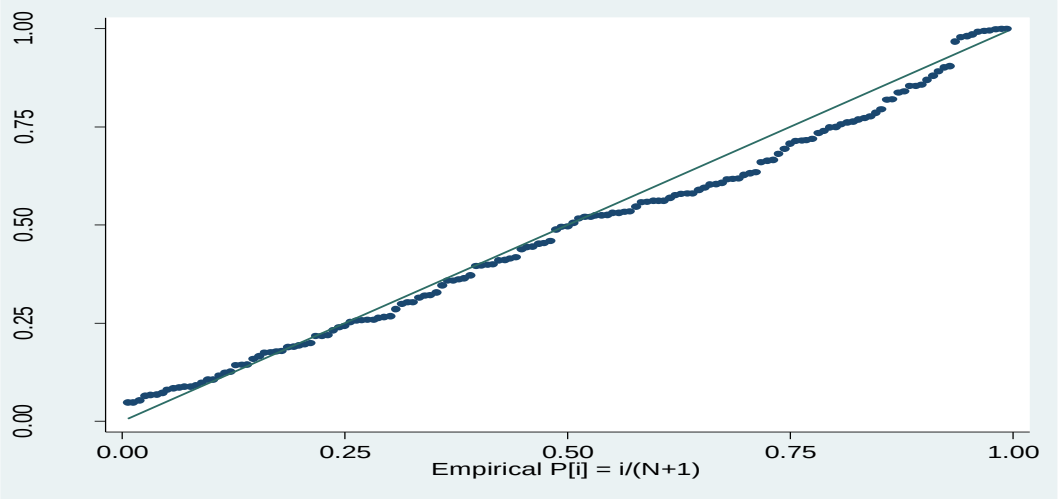


Figure4.66: P Norm Plot

4.19 Multivariate Logistic Regression for Dependent Variable - Any Maternal Complication at Birth

The dependent variable any maternal complication at birth – was a binary variable and thus logistic regression was used for multivariate regression.

4.19.1 Checking for Statistical Significance of Independent Variables

In order to do Multivariate logistic regression for this dependent variable (any maternal complication at birth), which represented the likelihood of a study participant having any type of complication at birth, bivariate regression was done sequentially with all the independent variables one at time to check for their statistical significance. Then the multivariate logistic regression modeling was done with the statistically significant independent variables as the basis.

This information is summarized in table 4.25 below highlighting the statistically significant variables.

Table 4.25: Table showing the Bivariate Results of the Dependent Variable and the Independent Variables

Dependent variable	Independent Variable	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2
Complic_birth	None	0.394	0.000	0.301 - 0.515	0.000
	Age	0.999	0.971	0.949 - 1.052	0.000
	Parity	1.091	0.446	0.872 - 1.365	0.002
	BMI	1.043	0.192	0.979 - 1.111	0.007
	SBP	0.986	0.205	0.966 - 1.008	0.005
	Gestation_FH	1.023	0.459	0.964 - 1.085	0.002
	Hemoglobin	0.902	0.286	0.746 - 1.090	0.005
	Place_del	0.141	0.0000	0.073 - 0.274	0.117
	Assist_Del-2	6.431	0.0000	2.764 - 14.964	0.118
	Assist-3	7.860	0.0000	3.230 - 19.126	
	NoofANCVisits	0.435	0.0000	0.324 - 0.585	0.117
	Mode_del	0.184	0.0000	0.087 - 0.389	0.067

NoofSMSsend	0.874	0.134	0.733 - 1.042	0.018
NoofCallsDone	0.613	0.018	0.409 - 0.920	0.049
Days at Enrol	1.008	0.036	1.0006 - 1.016	0.017
DaysofFollowup	0.995	0.235	0.986 - 1.004	0.007
Study Group	2.387	0.002	1.367 - 4.168	0.031
Hosp Level 1	1.757	0.157	0.805 - 3.831	0.007
	1.195	0.580	0.636 - 2.245	
Level 2				
Maritalstatus	0.857	0.710	0.381 - 1.929	0.0005
Educ_level2	0.387	0.232	0.082-1.836	0.019
	0.237	0.071	0.049-1.134	
level3	0.223	0.068	0.045-1.119	
level4				
Distance_Hosp	0.653	0.236	0.322-1.323	0.005
Time_Hosp	1.140	0.643	0.656-1.980	0.0007

The base model which did not have any of the independent variables showed an Odds ratio of 0.394, a 95% CI 0.301 - 0.515, a McFadden's R^2 of 0.000 and a p-value of 0.000. This is represented by the equation;

Logistic (C) = $b0$ where C is the complication

Place of Delivery

When the place of delivery as an independent variable was added to the base model, for every delivery that took place at the hospital compared to deliveries at home, the odds of having any complication at birth decreased by a factor of 0.141, (95% CI 0.073 - 0.274, p-value < 0.0001), which was statistically significant at 95% confidence level. The McFadden's R^2 was 0.117. This association was represented by the equation below.

Logistic (C) = $b0+b1$*i.place_del

Assistant at Delivery

When the assistant at delivery as an independent variable was added to the base model, for every delivery that was assisted by a relative compared to a healthcare worker, the odds of having any complication at birth increased by a factor of 6.431, (95% CI 2.764 - 14.96, p-value < 0.0001), which was statistically significant at 95% confidence level. For every delivery that was assisted by a traditional birth attendant (TBA) compared to a health care worker, the odds of having any complication at birth increased by a factor of 7.860, (95% CI 3.230 - 19.126, p-value < 0.0001), which was statistically significant at 95% confidence level.

The McFadden's R^2 was 0.118. This association was represented by equation below.

Logistic (C) = $b0+b1$*i.assist_del

The Number of Antenatal Visits

When the number of ANC visits as an independent variable was added to the base model, for every one-unit increase in the number of ANC visits done by study participants, the odds of having any complication at birth decreased by a factor of 0.435, (95% CI 0.324 - 0.585, p-value < 0.0001), which was statistically significant at 95% confidence level. The McFadden's R^2 was 0.117. This association was represented by the equation; Logistic (C) = $b0+b1$*NoofANCVisits

Mode of Delivery

When the mode of delivery as an independent variable was added to the base model, for every delivery that was done via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.184, (95% CI 0.087 - 0.389, p-value < 0.0001), which was statistically significant at 95% confidence level. The McFadden's R^2 was 0.067. This association was represented by the equation below.

Logistic (C) = $b0+b1$*i.mode_del

The Number of SMS Sent

When the number of SMS sent as an independent variable was added to the base model, for every one-unit increase in the number of SMS sent to study participants, the odds of having any complication at birth decreased by a factor of 0.874, (95% CI 0.734 - 1.042, p-value 0.134), which was not statistically significant at 95% confidence level. The McFadden's R^2 was 0.018. This association was represented by the equation below.

Logistic (C) = $b0+b1$*NoofSMSsent

The Number of Calls Done

When the number of calls done as an independent variable was added to the base model, for every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.613, (95% CI 0.409 - 0.920, p-value 0.018), which was statistically significant at 95% confidence level. The McFadden's R^2 was 0.049. This association was represented by the equation below.

Logistic (C) = $b0+b1$*NoofCallsdone

The Gestation in Days at Enrolment

When the gestation in days at enrolment as an independent variable was added to the base model, for every additional day in the gestation at enrolment of study participants, the odds of having any complication at birth increased by a factor of 1.008, (95% CI 1.001 - 1.016, p-value 0.036), which was statistically significant at 95% confidence level. The McFadden's R^2 was 0.017. This association was represented by the equation below.

Logistic (C) = $b0+b1$*GestationatEnrol

The Days of Follow up

When the days of follow up as an independent variable was added to the base model, for every one day increase in the days of follow up for the study participants, the odds of having any complication at birth decreased by a factor of 0.995, (95% CI 0.986 - 1.004, p-value 0.235), which was not statistically significant at 95% confidence level. The McFadden's R^2 was 0.007. This association was represented by the equation below.

Logistic (C) = $b0+b1$*Days_Follow_up

Study Group

When the study group to which the mother had been assigned as an independent variable was added to the base model, for every mother in the non-intervention study arm compared to intervention study arm, the odds of having any complication at birth increased by a factor of 2.387, (95% CI 1.367 - 4.168, p-value 0.002), which was statistically significant at 95% confidence level. The McFadden's R^2 was 0.031. This association was represented by the equation below.

Logistic (C) = $b0+b1$*i.study_grp

Education Level

When the level of education attained by the study participant as an independent variable was added to the base model, for those study mothers who had attained primary school level of education compared to those who had never attended any formal schooling, the odds of having any complication at birth decreased by a factor of 0.387, (95% CI 0.082 - 1.836, p-value 0.232), which was not statistically significant at 95% confidence level. For those study mothers who had attained secondary school level of education compared to those who had never attended any formal schooling, the odds of having any complication at birth decreased by a factor of 0.237, (95% CI 0.049 - 1.134, p-value 0.071), which was not statistically significant at 95% confidence level.

For those study mothers who had attained tertiary school level of education compared to those who had never attended any formal schooling, the odds of having any complication at birth decreased by a factor of 0.223, (95% CI 0.045 - 1.119, p-value 0.068), which was not statistically significant at 95% confidence level.

The McFadden's R^2 was 0.0187. This association was represented by the equation below.

Logistic (C) = $b0+b1$*i.educ_level

4.19.2 Multivariate Regression of the Dependent Variable – Any Complication at Birth

4.19.2.1 Multivariate Logistic Regression Modeling with only the Statistically Significant Independent Variables

All the statistically significant independent variables from the initial bivariate regressions were pooled together into the multivariate regression and the model that resulted is described below. The information is depicted in table 4.26 below.

Table 4.26: Table showing the Logistic Model for the Statistically Significant Independent Variables only

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Complic_birth	Place_Del	0.546	0.536	0.080 - 3.714	0.295	0.0000	85.94
	NoofANCVisits	0.582	0.222	0.244 - 1.387			
	Mode_Del	0.057	0.000	0.014 - 0.223			102.67
	NoofCallsDone	0.767	0.330	0.449 - 1.308			
	DaysatEnrol	1.015	0.065	0.999 - 1.031			
	Constant	8.158	0.402	0.0604 - 1102.5			

For every delivery that took place at the hospital compared to deliveries at home, the odds of having any complication at birth decreased by a factor of 0.546 (95% 0.080 - 3.714, p-value 0.536), holding all other variables constant which was not statistically significant at 95% confidence level in the resultant model. For every one-unit increase in the number of ANC visits by the study participants, the odds of having

any complication at birth decreased by a factor of 0.582 (95% CI 0.244 - 1.387, p-value 0.222), holding all other variables constant which was not statistically significant at 95% confidence level in this model.

For every delivery that was done via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.057 (95% CI 0.014 - 0.223, p-value < 0.0001), holding all other variables constant which was statistically significant at 95% confidence level in this model. For every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.767 (95% 0.449 - 1.308, p-value 0.330), holding all other variables constant which was not statistically significant at 95% confidence level in this model.

For every one-day increase in the gestation at enrolment of the study participants, the odds of having any complication at birth increased by a factor of 1.015 (95% CI 0.999 - 1.031, p-value 0.065), holding all other variables constant which was not statistically significant at 95% confidence level in this model. The variable study group was excluded from this model because of collinearity despite having being statistically significant in the bivariate regressions. The resultant model was statistically significant with a p-value less than 0.0001 and a McFadden's R^2 of 0.295. The AIC and the BIC for the model were 85.94 and 102.67 respectively.

4.18.2.2 Regression with the Statistically Significant Variables on Bivariate Regression and Clinically Significant Covariates

Some of the covariates that were not statistically significant in the bivariate regressions were examined and their clinical significance to the model determined. The ones that were deemed to have major clinical significance were added to the multivariate regression models sequentially, one variable at a time and the models that resulted are described below.

Adding Age to the Multivariate Regression

This model is summarized in table 4.27 below.

Table 4.27: Table showing the Logistic Model with Statistically Significant Covariates and Age

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Complic_birth	Age	0.889	0.121	0.765 - 1.032	0.321	0.000	85.23
	Place_Del	0.657	0.676	0.091 - 4.726			
	NoofANCVisits	0.589	0.220	0.253 - 1.372			104.74
	Mode_Del	0.047	0.000	0.011 - 0.197			
	NoofCallsDone	0.717	0.235	0.414 - 1.242			
	DaysatEnrol	1.017	0.048	1.000 - 1.033			
	Constant	124.99	0.120	0.2845-54912.5			

For every one-year increase in the age of study participants, the odds of having any complication at birth decreased by a factor of 0.887 (95% CI 0.765 - 1.032, p-value 0.121), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For every delivery that took place at the hospital compared to those deliveries at home, the odds of having any complication at birth decreased by a factor of 0.657 (95% CI 0.091 - 4.726, p-value 0.676), holding all other variables constant, which was not statistically significant at 95% confidence level in the resultant model.

For every one-unit increase in the number of ANC visits by the study participants, the odds of having any complication at birth decreased by a factor of 0.589 (95% CI 0.253 - 1.372, p-value 0.220), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For every delivery that occurred via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.047 (95% CI 0.011 - 0.197, p-value < 0.0001), holding all other variables constant, which was statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.717 (95% CI 0.414 - 1.242, p-value 0.235), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For every one-day increase in the gestation at enrolment of the study participants, the odds of having

any complication at birth increased by a factor of 1.017 (95% CI 1.000 - 1.033, p-value 0.048), holding all other variables constant, which was statistically significant at 95% confidence level in this model.

The resultant model was statistically significant with a p-value less than 0.0001 and a McFadden's R^2 of 0.321. The AIC and BIC for this model were 85.23 and 104.74 respectively.

Adding Age and Body Mass Index (BMI) to the Regression

The model information is summarized in table 4.28 below.

Table 4.28: Table showing the Logistic Model with the Statistically Significant Covariates and Age and BMI

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Complic_birth	Age	0.844	0.090	0.695 - 1.026	0.359	0.0001	68.69
	BMI	1.078	0.414	0.900 - 1.291			
	Place_Del	0.922	0.959	0.043 - 19.95			88.95
	NoofANCVisits	0.589	0.291	0.220 - 1.574			
	Mode_Del	0.044	0.000	**0.009 - 0.225**			
	NoofCallsDone	0.723	0.313	0.386 - 1.357			
	DaysatEnrol	1.015	0.113	0.997 - 1.033			
	Constant	59.51	0.338	0.014-251832			

For every one-year increase in the age of study participants, the odds of having any complication at birth decreased by a factor of 0.844 (95% CI 0.695 to 1.026, p-value 0.090), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the BMI of study participants, the odds of having any complication at birth increased by a factor of 1.078 (95% CI 0.900 - 1.291, p-value 0.414), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every delivery that took place at the hospital compared to those deliveries at home, the odds of having any complication at birth decreased by a factor of 0.922 (95% CI 0.043 - 19.950, p-value 0.959), holding all other variables constant, which was not statistically significant at 95% confidence level in the resultant model. For every one-unit increase in the number of ANC visits by the study participants, the odds of having any complication at birth decreased by a factor of 0.589 (95% CI 0.220 - 1.574, p-value 0.291), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every delivery that occurred via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.044 (95% CI 0.009 - 0.225, p-value < 0.0001), holding all other variables constant, which was statistically significant at 95% confidence level in this model. For every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.723 (95% CI 0.386 - 1.357, p-value 0.313), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every one-day increase in the gestation at enrolment of the study participants, the odds of having any complication at birth increased by a factor of 1.015 (95% CI 0.997 - 1.033, p-value 0.113), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

The resultant model was statistically significant with a p-value of 0.0001 and a McFadden's R^2 of 0.359. The AIC and BIC for this model were 68.69 and 88.95 respectively.

Adding Age, Body Mass Index (BMI), and Parity to the Regression

The model information is summarized in table 4.29 below.

Table 4.29: Table showing the Logistic Model with Statistically Significant Covariates plus Age, BMI, and Parity

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	Macfadden's R^2	Model p-value	AIC & BIC
Complic_birth	Age	0.815	0.083	0.647 - 1.027	0.363	0.0002	70.33
	BMI	1.075	0.426	0.900 - 1.284			
	NoofChildren	1.355	0.551	0.500 - 3.682			93.12
	Place_Del	0.776	0.872	0.036 - 16.96			
	NoofANCVisits	0.612	0.337	0.224 - 1.667			
	Mode_Del	0.039	0.000	0.007 - 0.218			
	NoofCallsDone	0.703	0.279	0.371 - 1.331			
	DaysatEnrol	1.014	0.136	0.996 - 1.032			
	Constant	156.47	0.269	0.020-1228166			

For every one-year increase in the age of study participants, the odds of having any complication at birth decreased by a factor of 0.815 (95% CI 0.647 to 1.027, p-value 0.083), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the BMI of study participants, the odds of having any complication at birth increased by a factor of 1.075 (95% CI 0.900 - 1.284, p-value 0.426), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For every additional child that a study participant had, the odds of having any complication at birth increased by a factor of 1.355 (95% CI 0.499 - 3.682, p-value of 0.551), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every delivery that took place at the hospital compared to those deliveries at home, the odds of having any complication at birth decreased by a factor of 0.776 (95% CI 0.036 to 16.96, p-value 0.872), holding all other variables constant, which was not statistically significant at 95% confidence level in the resultant model. For every one-unit increase in the number of ANC visits by the study participants, the odds of having any complication at birth decreased by a factor of 0.612 (95% CI 0.224 - 1.669, p-value 0.337), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every delivery that occurred via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.034 (95% CI 0.007 to 0.218, p-value < 0.0001), holding all other variables constant, which was statistically significant at 95% confidence level in this model. For every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.703 (95% CI 0.371 to 1.331, p-value 0.279), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every one-day increase in the gestation at enrolment of the study participants, the odds of having any complication at birth increased by a factor of 1.014 (95% CI 0.996 - 1.032, p-value 0.136), holding all other variables constant, which was not

statistically significant at 95% confidence level in this model. The resultant model was statistically significant with a p-value of 0.0002 and a McFadden's R^2 of 0.363. The AIC and BIC for this model were 70.33 and 93.12 respectively.

Adding Age, Body Mass Index (BMI), Parity and Education Level

The model information is summarized in table 4.30 below.

Table 4.30: Table showing the Logistic Model with Statistically Significant Covariates and Age, BMI, Parity and Education Level

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Complic_birth	Age	0.819	0.137	0.629 - 1.066	0.415	0.0002	70.04
	BMI	1.118	0.268	0.917 - 1.364			
	NoofChildren	1.008	0.990	0.270 - 3.759			97.90
	Educ Level 3	0.135	0.063	0.016 - 1.114			
	Educ Level 4	0.249	0.285	0.020 - 3.182			
	Place_Del	0.596	0.741	0.028 - 12.83			
	NoofANCVisits	0.526	0.213	0.191 - 1.446			
	Mode_Del	0.019	0.001	0.002 - 0.181			
	NoofCallsDone	0.714	0.311	0.372 - 1.371			
	DaysatEnrol	1.017	0.099	0.997 - 1.038			
	Constant	403.4	0.196	0.046-3573634			

For every one-year increase in the age of study participants, the odds of having any complication at birth decreased by a factor of 0.819 (95% CI 0.629 - 1.066, p-value 0.137), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the BMI of study participants, the odds of having any complication at birth increased by a factor of 1.118 (95% CI 0.917 - 1.364, p-value 0.268), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every additional child that a study participant had, the odds of having any complication at birth increased by a factor of 1.008 (95% CI 0.270 - 3.759, p-value 0.990), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For those study mothers who had attained up to secondary school level of education compared to those who had attained primary level of schooling, the odds of having any complication at birth decreased by a factor of 0.135 (95% CI 0.016 - 1.114, p-value 0.063), holding all other variables constant, which was not statistically significant at 95% confidence level.

For those study mothers who had attained up to tertiary level of education compared to those who had attained up to primary schooling level, the odds of having any complication at birth decreased by a factor of 0.249 (95% CI 0.020 - 3.182, p-value 0.285), holding all other variables constant, which was not statistically significant at 95% confidence level. For every delivery that took place at the hospital compared to those deliveries at home, the odds of having any complication at birth decreased by a factor of 0.596 (95% CI 0.028 - 12.83, p-value 0.741), holding all other variables constant, which was not statistically significant at 95% confidence level in the resultant model.

For every one-unit increase in the number of ANC visits by the study participants, the odds of having any complication at birth decreased by a factor of 0.526 (95% CI 0.191 - 1.446, p-value 0.213), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For every delivery that occurred via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.019 (95% CI 0.002 - 0.181, p-value 0.001), holding all other variables constant, which was statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.714 (95% CI 0.372 - 1.371, p-value 0.311), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For every one-day increase in the gestation at enrolment of the study participants, the odds of having

any complication at birth increased by a factor of 1.017 (95% CI 0.997 - 1.038, p-value of 0.099), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

The resultant model was statistically significant with a p-value of 0.0002 and a McFadden's R^2 of 0.415. The AIC and BIC for this model were 70.04 and 97.90 respectively.

Adding Age, Body Mass Index (BMI), Parity, Education Level, and Distance to Access a Health Facility to the Regression

The model information is summarized in table 431 below.

Table 4.31: Table showing the Logistic Model with Statistically Significant Covariates plus Age, BMI, Parity, Education Level and Distance Travelled to Acess a Health Facility

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Complic_birth	Age	0.838	0.194	0.642 - 1.094	0.439	0.0002	70.11
	BMI	1.098	0.360	0.899 - 1.342			
	NoofChildren	0.932	0.920	0.237 - 3.667			100.50
	Educ Level 3	0.136	0.073	0.015 - 1.208			
	Educ Level 4	0.163	0.206	0.010 - 2.713			
	Dist_AccessHosp	0.253	0.192	0.032 - 1.996			
	Place_Del	0.896	0.947	0.035 - 22.68			
	NoofANCVisits	0.466	0.188	0.150 - 1.452			
	Mode_Del	0.018	0.001	0.002 - 0.177			
	NoofCallsDone	0.627	0.191	0.311 - 1.263			
	DaysatEnrol	1.018	0.118	0.995 - 1.041			
	Constant	1010	0.154	$0.0749\text{-}1.36*10^7$			

For every one-year increase in the age of study participants, the odds of having any complication at birth decreased by a factor of 0.838 (95% CI 0.642 - 1.094, p-value 0.194), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the BMI of study participants, the odds of having any complication at birth increased by a factor of 1.098 (95% CI 0.899 - 1.342, p-value 0.360), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every additional child that a study participant had, the odds of having any complication at birth decreased by a factor of 0.932 (95% CI 0.237 - 3.667, p-value 0.920), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. For those study mothers who had attained up to secondary school level of education compared to those who had attained primary level of schooling, the odds of having any complication at birth decreased by a factor of 0.136 (95% CI 0.015 - 1.208, p-value 0.073), holding all other variables constant, which was not statistically significant at 95% confidence level.

For those study mothers who had attained up to tertiary level of education compared to those who had attained up to primary schooling level, the odds of having any complication at birth decreased by a factor of 0.163 (95% CI 0.010 - 2.713, p-value 0.206), holding all other variables constant, which was not statistically significant at 95% confidence level. For study participants who travelled more than 5 km to access a health facility compared to those who travelled less than 5 km, the odds of having any complication at birth decreased by a factor of 0.253 (95% CI 0.032 - 2.713, p-value 0.192), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every delivery that took place at the hospital compared to those deliveries at home, the odds of having any complication at birth decreased by a factor of 0.896 (95% CI 0.035 - 22.68, p-value 0.947), holding all other variables constant, which was not statistically significant at 95% confidence level in the resultant model. For every one-unit increase in the number of ANC visits by the study participants, the odds of having any complication at birth decreased by a factor of 0.466 (95% CI 0.150 - 1.452, p-value 0.188), holding all other variables constant, which was not statistically significant at 95% confidence level in this model.

For every delivery that occurred via spontaneous vertex delivery compared to a Cesarean section, the odds of having any complication at birth decreased by a factor of 0.018 (95% CI 0.002 - 0.177, p-value 0.001), holding all other variables constant, which was statistically significant at 95% confidence level in this model. For every one-unit increase in the number of calls done to study participants, the odds of having any complication at birth decreased by a factor of 0.627 (95% CI 0.311 to 1.263, p-value 0.191), holding all other variables constant which was not statistically significant at 95% confidence level in this model.

For every one-day increase in the gestation at enrolment of the study participants, the odds of having any complication at birth increased by a factor of 1.018 (95% CI 0.995 - 1.041, p-value 0.118), holding all other variables constant, which was not statistically significant at 95% confidence level in this model. The resultant model was statistically significant with a p-value of 0.0002 and a McFadden's R^2 of 0.439. The AIC and BIC for this model were 70.11 and 100.50 respectively.

4.19.3 Selection Criteria and Checking for Interactions, Predictions and Marginal Plots

The model with statistically significant independent variables plus age, BMI, parity, and education level (Table 4.32) was selected because it was statistically significant and had a good AIC and BIC. The p value for this model was 0.0002 which was statistically significant and a McFadden's R^2 of 0.415. The AIC and BIC of the model were 70.04 and 97.90 respectively. The interaction between the independent variables was examined and all of the interaction terms were found not to be statistically significant.

Table 4.32: Table showing the Logistic Model with Statistically Significant Covariates and Age, BMI, Parity and Education Level

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Complic_birth	Age	0.819	0.137	0.629 - 1.066	0.415	0.0002	70.04
	BMI	1.118	0.268	0.917 - 1.364			
	NoofChildren	1.008	0.990	0.270 - 3.759			97.90
	Educ Level 3	0.135	0.063	0.016 - 1.114			
	Educ Level 4	0.249	0.285	0.020 - 3.182			
	Place_Del	0.596	0.741	0.028 - 12.83			
	NoofANCVisits	0.526	0.213	0.191 - 1.446			
	Mode_Del	0.019	0.001	0.002 - 0.181			
	NoofCallsDone	0.714	0.311	0.372 - 1.371			
	DaysatEnrol	1.017	0.099	0.997 - 1.038			
	Constant	403.4	0.196	0.046-3573634			

4.19.4 Marginal Plots

The predictive margin values of the dependent variable (any complication at birth) were calculated by the age of the study participant, and it showed that for every unit increase in the age of the study participant, there was a decrease in the probability of having any complication at birth (Figure 4.67 below).

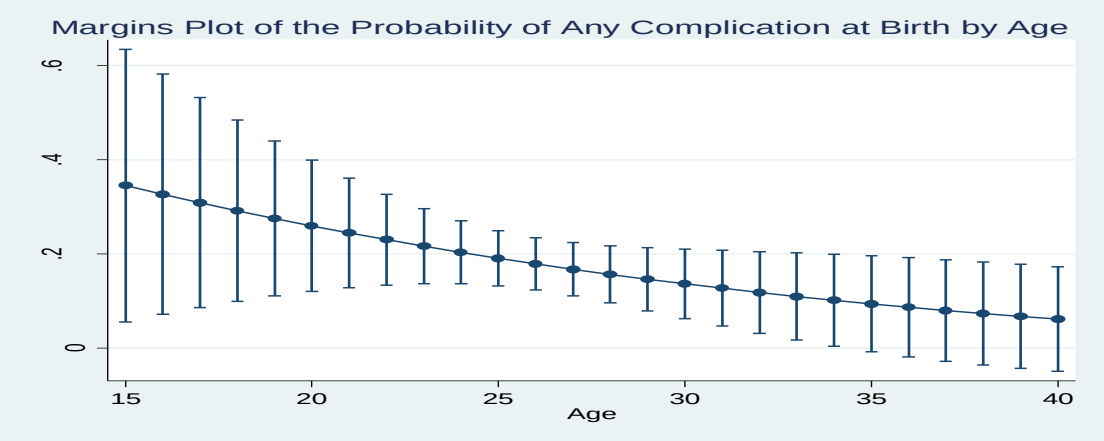


Figure 4.67: Marginal Plot of the Probability of having Any Complication at Birth by Age

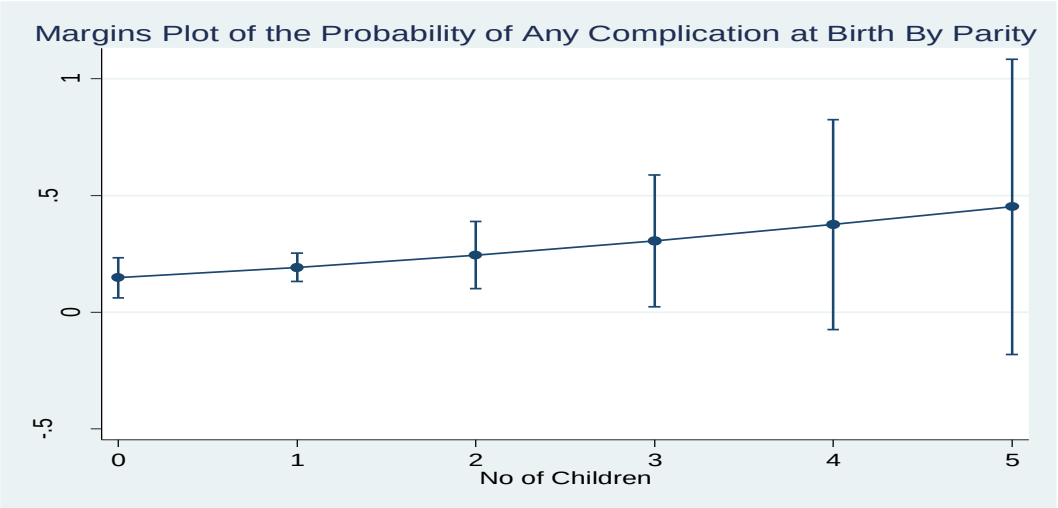


Figure 4.68: Marginal Plot of the Probability of having Any Complication at Birth by Parity

The predictive margin values of the dependent variable (any complication at birth) were calculated by the parity of the study participant and it showed that for every unit increase in the number of children that the study participant had there was an increase in the probability of having any complication at birth (Figure 71 above).

4.19.5 Residual Plots

The residual Q norm and P norm plots below (Figures 72 and 73) showed that the model was a good predictor of the dependent variable.

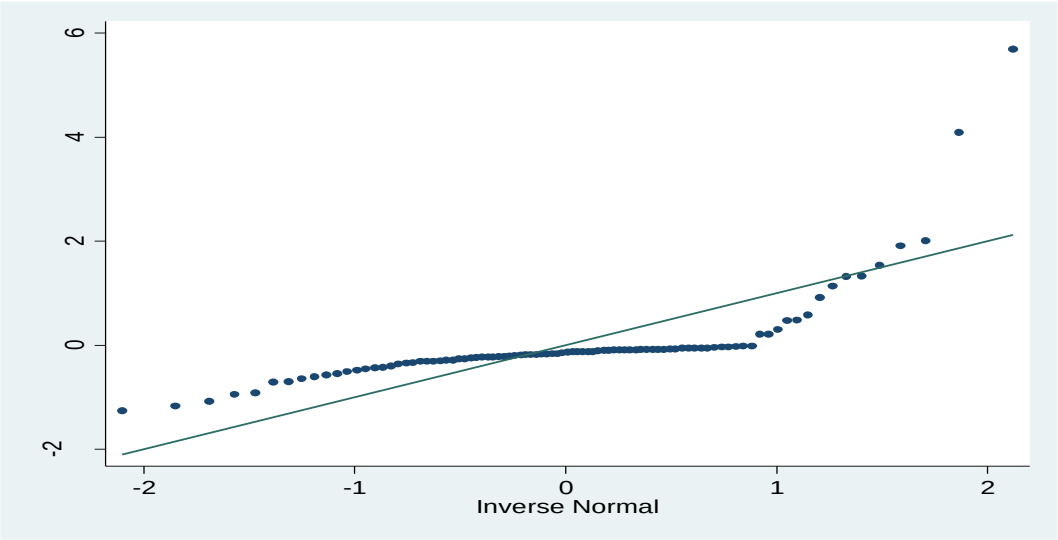


Figure 4.69: Q Norm Plot

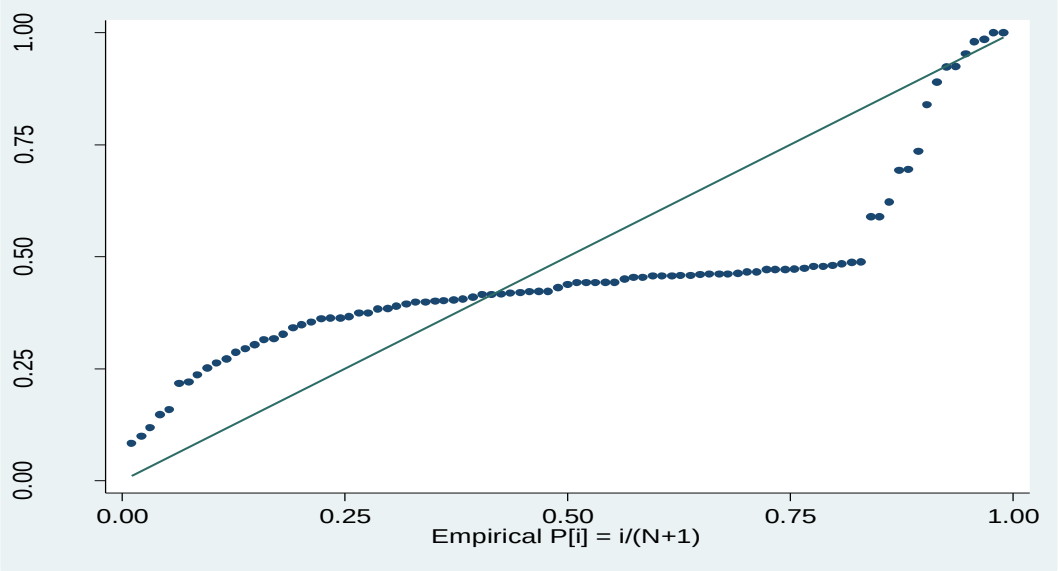


Figure 4.70: P Norm Plot

4.20 Multivariate Logistic Regression for Dependent Variable – Neonatal Mortality

Logistic regression was used to regress the dependent variable - neonatal mortality – because it was a binary variable.

4.20.1 Checking for Statistical Significance of Covariates

In order to do a multivariate logistic regression to determine the predictors of the likelihood of a study participant having a neonatal mortality at birth, the dependent variable (neonatal mortality), was regressed with all the independent variables one at a time (bivariate regression) in order to check for their statistical significance. Then the statistically significant independent variables were used for the subsequent multivariate regressions.

This information is summarized in the table 4.33 below highlighting the statistically significant variables.

Table 4.33: Table showing the Bivariate Regression Results of the Dependent Variable and the Independent Variable

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2
Neonatal Mortality	None	0.119	0.000	0.081 - 0.177	0.000
	Age	1.032	0.386	0.961 - 1.108	0.004
	Parity	1.338	0.050	1.00 - 1.790	0.020
	BMI	1.093	0.035	1.006 - 1.188	0.028
	SBP	1.0002	0.895	0.972 - 1.033	0.0001
	Gestation_FH	1.093	0.063	0.995 - 1.200	0.022
	Hemoglobin	1.101	0.495	0.835 - 1.453	0.003
	Place_del	0.090	0.000	0.036 - 0.228	0.174
	Assist_Del-2	10.42	0.000	3.514 - 30.91	0.174
		11.65	0.000	3.884 - 34.92	
	Assist-3				
	NoofANCVisits	0.255	0.000	0.153 - 0.425	0.234
	Mode_del	0.725	0.582	0.231 - 2.274	0.002
	NoofSMSsend	0.598	0.003	0.427 - 0.839	0.182
	NoofCallsDone	0.321	0.007	0.141 - 0.733	0.157
	Days at Enrol	1.007	0.216	0.996 - 1.019	0.010
	DaysofFollowup	0.989	0.228	0.973 - 1.007	0.018
	Study Group	2.818	0.018	1.193 - 6.654	0.034
	Hosp Level 1	3.159	0.056	0.969 - 10.29	0.023
		1.958	0.211	0.684 - 5.606	
	Level 2				
	Maritalstatus	0.217	0.140	0.028 - 1.649	0.019
	Educ_level2	0.089	0.004	0.017 - 0.458	0.055
		0.074	0.002	0.014 - 0.385	
	level3	0.067	0.003	0.017 - 0.387	
	level4				
	Distance_Hosp	1.030	0.952	0.396 - 2.679	0.000
	Time_Hosp	1.770	0.193	0.749 - 4.184	0.010

The base model which did not have any independent variables showed an Odds ratio of 0.1196 with a 95% confidence interval of between 0.0808 and 0.1771, a McFadden's R^2 of 0.000 and a p-value of 0.000. This is represented by the equation below.

Logistic (N) = $b0$ where N represents Neonatal Mortality

Parity

When parity as an independent variable was added to the base model, for every additional child that a study participant had i.e. her parity, the odds of having a neonatal mortality at birth increased by a factor of 1.338 (95% CI 1.0002 - 1.7, p-value 0.05). This result was statistically significant at the 95% confidence level. The McFadden's R^2 was 0.020. This association was represented by the equation below.

Logistic (N) = $b0+b1$*parity

Body Mass Index (BMI)

When BMI as an independent variable was added to the base model, for every one-unit increase in the BMI of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 1.093 (95% CI 1.006 - 1.188, p-value 0.035). This result was statistically significant at 95% confidence level. The McFadden's R^2 was 0.0285. This association was represented by the equation below.

Logistic (N) = $b0+b1$*bmi

Gestation by Fundal Height (GFH)

When gestation by fundal height as an independent variable was added to the base model, for every one-unit increase in GFH of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 1.093 (95% CI 0.995 - 1.200, p-value 0.063). This result was not statistically significant at 95% confidence level. The McFadden's R^2 was 0.0219. This association was represented by the equation below.

Logistic (N) = $b0+b1$*GFH

Place of Delivery

When the place of delivery as an independent variable was added to the base model, for every delivery that took place at the hospital compared to deliveries at home, the odds of having a neonatal mortality at birth decreased by a factor of 0.0909 (95% CI

0.036 - 0.228, p-value < 0.0001). This result was statistically significant at 95% confidence level. The McFadden's R^2 was 0.1743. This association was represented by the equation below.

Logistic (N) = *b*0+*b*1*i.place_del

Assistant at Delivery

When the assistant at delivery as an independent variable was added to the base model, for every delivery that was assisted by a relative compared to a health care worker, the odds of having a neonatal mortality at birth increased by a factor of 10.42, (95% CI 3.514 to 30.908, p-value < 0.0001). This result was statistically significant at 95% confidence level.

For every delivery that was assisted by a traditional birth attendant (TBA) compared to a health care worker, the odds of having a neonatal mortality at birth increased by a factor of 11.65 (95% 3.885 - 34.92, p-value < 0.0001). This result was statistically significant at 95% confidence level.

The McFadden's R^2 was 0.1745. This association was represented by the equation below.

Logistic (N) = *b*0+*b*1*i.assist_del

The Number of Antenatal Visits

When the number of ANC visits as an independent variable was added to the base model, for every one-unit increase in the number of ANC visits done by study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.255 (95% CI 0.153 - 0.425, p-value < 0.0001). This result was statistically significant at 95% confidence level. The McFadden's R^2 was 0.2340. This association was represented by the equation below.

Logistic (p) = *b*0+*b*1*NoofANCVisits

Mode of Delivery

When the mode of delivery as an independent variable was added to the base model, for every delivery that occurred via spontaneous vertex delivery compared to a Cesarean section, the odds of having a neonatal mortality at birth decreased by a factor of 0.725 (95% CI 0.231 - 2.274, p-value 0.582). This result was not statistically significant at 95% confidence level. The McFadden's R^2 was 0.0019. This association was represented by the equation below.

Logistic (N) = $b0+b1$*i.mode_del

The Number of SMS Sent

When the number of SMS sent as an independent variable was added to the base model, for every one-unit increase in the number of SMS sent to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.599 (95% CI 0.427 - 0.839 p-value 0.0009). This result was statistically significant at 95% confidence level. The McFadden's R^2 was 0.1817. This association was represented by the equation below.

Logistic (N) = $b0+b1$*NoofSMSsent

The Number of Calls Done

When the number of calls done as an independent variable was added to the base model, for every one-unit increase in the number of calls done to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.321 (95% CI 0.141 - 0.733, p-value 0.007). This result was statistically significant at 95% confidence level. The McFadden's R^2 was 0.1567. This association was represented by the equation below.

Logistic (N) = $b0+b1$*NoofCallsdone

Gestation at Enrolment in Days

When the gestation at enrolment in days as an independent variable was added to the base model, for every additional day in the gestation at enrolment of study participants, the odds of having a neonatal mortality at birth increased by a factor of 1.007 (95% CI 0.996 - 1.019, p-value 0.216). This result was not statistically significant at 95% confidence level. The McFadden's R^2 was 0.0103. This association was represented by the equation below.

Logistic (N) = $b0+b1$*GestationatEnrol

The Days of Follow up

When the days of follow up as an independent variable was added to the base model, for every one-day increase in the days of follow up for the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.989 (95% CI 0.973 - 1.007, p-value 0.228). This result was not statistically significant at 95% confidence level. The McFadden's R^2 was 0.0181. This association was represented by the equation below.

Logistic (N) = $b0+b1$*Days_Follow_up

Study Group

When the study group to which the mother had been assigned as a covariate was added to the base model, for every mother in the non-intervention study arm compared to the intervention study arm, the odds of having a neonatal mortality at birth increased by a factor of 2.818 (95% CI 1.194 - 6.654, p-value 0.018). This result was statistically significant at 95% confidence level. The McFadden's R^2 was 0.0344. This association was represented by the equation below.

Logistic (p) = $b0+b1$*i.study_grp

The Health Facility Level

When the level of the health facility as an independent variable was added to the base model, for every delivery that occurred at the sub county hospital compared to a health centre, the odds of having a neonatal mortality at birth increased by a factor of 3.159 (95% CI 0.969 - 10.30, p-value 0.056). This result was not statistically significant at 95% confidence level.

For every delivery that occurred at the county referral hospital compared to a health centre, the odds of having a neonatal mortality increased by a factor of 1.958 (95% CI 0.684 - 5.606, p-value 0.211). This result was not statistically significant at 95% confidence level.

The McFadden's R^2 was 0.0217. This association was represented by the equation below.

Logistic (N) = $b0+b1$*i.hosp_level

Education Level

When the level of education attained by the study participant as an independent variable was added to the base model, for those study mothers who had attained primary school level of education compared to those who had not attended any formal schooling, the odds of having a neonatal mortality decreased by a factor of 0.089 (95% CI 0.017 - 0.458, p-value 0.004). This result was statistically significant at 95% confidence level. For those study mothers who had attained secondary school level of education compared to those who had not attended any formal schooling, the odds of having a neonatal mortality at birth decreased by a factor of 0.074 (95% 0.014 - 0.385, p-value 0.002). This result was statistically significant at 95% confidence level.

For those study mothers who had attained tertiary school level of education compared to those who had not attended any formal schooling, the odds of having a neonatal mortality decreased by a factor of 0.067 (95% CI 0.012 - 0.387, p-value of 0.003). This result was statistically significant at 95% confidence level.

The McFadden's R^2 was 0.0547. This association was represented by the equation below.

Logistic (N) = $b0+b1$*i.educ_level

4.20.2 Multivariate Regression of the Dependent Variable – Neonatal Mortality

Regression with the Dependent Variable and the Statistically Significant Independent Variables

All the statistically significant independent variables from the bivariate regressions were pooled together into the multivariate regression and the model that resulted is described below.

This information is depicted in the table 4.34 below.

Table 4.34: Table of the Logistic Model of Neonatal Mortality with the Statistically Significant Covariates

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Neonatal Mortality	NoofChildren	0.849	0.829	0.192 - 3.756	0.512	0.008	30.48
	BMI	1.280	0.149	0.915 - 1.792			
	Place_del	0.381	0.692	0.003 - 45.15			48.85
	No of ANC Visits	0.454	0.285	0.107 - 1.929			
	No of SMS Sent	0.644	0.340	0.260 - 1.591			
	No of Calls done	0.433	0.498	0.038 - 4.886			
	Constant	5.628	0.804	$6.72*10^{-6}$ - $4.71*10^{6}$			

For every one-unit increase in the Body Mass Index of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 1.280 (95% 0.915 - 1.792, p-value 0.149), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every

additional child that a study participant had, the odds of having a neonatal mortality at birth decreased by a factor of 0.849 (95% 0.192 - 3.756, p-value 0.829), holding all other variables constant. This covariate was not statistically significant at the 95% confidence level in this model.

For every delivery that took place at the hospital compared to deliveries at home, the odds of having a neonatal mortality at birth decreased by a factor of 0.381 (95% CI 0.003 - 45.15, p-value 0.692), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in the resultant model. For every one-unit increase in the number of ANC visits by the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.454 (95% CI 0.107 - 1.929, p-value 0.285), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of SMS's sent to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.644 (95% CI 0.260 - 1.591, p-value 0.340), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the number of calls done to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.433 (95% CI 0.038 - 4.886, p-value 0.498), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

Covariates study group, education level and assistant at delivery were excluded during the regression due to collinearity despite having been statistically significant in the bivariate regressions. The resultant model was statistically significant with a p-value 0.008 and a McFadden's R^2 of 0.512. The AIC and the BIC for this model were 30.48 and 48.85 respectively.

Regression with the Statistically Significant Variables Excluding Parity

The covariate parity was excluded from this next regression model for parsimony because it was barely statistically significant in bivariate regression and the effect in the model examined.

The model information is depicted in table 4.35 below.

Table 4.35: Table of the Logistic Model of Neonatal Mortality with the Statistically Significant Covariates excluding Parity

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Neonatal Mortality	BMI	1.2623	0.132	0.932 - 1.709	0.510	0.004	28.53
	Place_del	0.2873	0.541	0.005 - 15.71			
	No of ANC Visits	0.4500	0.286	0.104 - 1.950			44.28
	No of SMS Sent	0.6442	0.351	0.256 - 1.622			
	No of Calls done	0.4148	0.481	0.036 - 4.781			
	Constant	10.536	0.711	0.00004 - $2.69*10^6$			

For every one-unit increase in the Body Mass Index of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 1.262 (95% CI 0.932 - 1.709, p-value 0.132), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every delivery that took place at the hospital compared to deliveries at home, the odds of having a neonatal mortality at birth decreased by a factor of 0.287 (95% CI 0.005 - 15.71, p-value 0.541) holding all other variables constant. This covariate was not statistically significant at 95% confidence level in the resultant model.

For every one-unit increase in the number of ANC visits by the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.450 (95% CI 0.1039 - 1.950, p-value 0.286), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the number of SMS's sent to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.644 (95% CI 0.256 - 1.622, p-value 0.351), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of calls done to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.415 (95% CI 0.036 - 4.781, p-value 0.481), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. The resultant model was statistically significant with a p-value of 0.004 and a McFadden's R^2 of 0.510. The AIC and the BIC for this model were 28.53 and 44.28 respectively.

Regression with Age Added to the Statistically Independent Variables and Parity Excluded

The independent variable age was added while parity was excluded from the regression model and the effect examined. The model information is depicted in table 4.36 below.

Table 4.36: Table of the Logistic Model of Neonatal Mortality with the Statistically Significant Covariates excluding Parity and Including Age

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Neonatal Mortality	Age	0.248	0.132	0.040-1.525	0.7003	0.0006	24.11
	BMI	5.011	0.131	0.618-40.64			
	Place_del	142361	0.187	0.003-$6.33*10^{12}$			42.49
	No of ANC Visits	0.0564	0.143	0.001-2.633			
	No of SMS Sent	0.051	0.137	0.001-2.569			
	No of Calls done	0.043	0.215	0.0003-6.181			
	Constant	$6.93*10^{10}$	0.170	0.00002-$2.07*10^{26}$			

For every one-year increase in the age of the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.248 (95% CI 0.040 - 1.525, p-value 0.132), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the

body mass index of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 5.011 (95% CI 0.618 - 40.64 p-value 0.131), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every delivery that took place at home compared to deliveries at hospital, the odds of having a neonatal mortality at birth increased by a factor of 142361.6 (95% CI 0.003 - 6.33 $*10^{12}$, p-value 0.187), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in the resultant model. For every one-unit increase in the number of ANC visits by the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.056 (95% CI 0.001 - 2.633, p-value 0.143), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of SMS's sent to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.051 (95% CI 0.001 - 2.569, p-value 0.137), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the number of calls done to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.043 (95% CI 0.0003 - 6.181, p-value 0.215), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

The resultant model was statistically significant with a p-value 0.0006 and a McFadden's R^2 of 0.7003. The AIC and the BIC for this model were 24.11 and 42.49 respectively.

Regression with Age and Distance Traveled to Access a Health Facility Added

The independent variables age and distance travelled to access a health facility were added while parity was excluded from the regression model and the effect examined.

The model information is depicted in table 4.37 below.

Table 4.37: Table of the Logistic Model of Neonatal Mortality with the Statistically Significant Covariates Excluding Parity and including Age and Distance to a Health Facility

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Neonatal Mortality	Age	0.2140	0.121	0.032-1.496	0.709	0.0012	25.83
	BMI	5.3837	0.126	0.625-46.39			
	Place_del	125604	0.187	0.003-$4.71*10^{12}$			46.83
	Distance to Hosp	3.3948	0.615	0.029-397.6			
	No of ANC Visits	0.0508	0.153	0.0008-3.023			
	No of SMS Sent	0.0350	0.135	0.0004-2.831			
	No of Calls done	0.0637	0.321	0.0003-14.71			
	Constant	$1.43*10^{12}$	0.164	0.00001-$1.95*10^{29}$			

For every one-year increase in the age of the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.218 (95% CI 0.032 - 1.496, p-value 0.121), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the body mass index of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 5.384 (95% CI 0.625 - 46.39, p-value 0.126), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For study participants who traveled more than 5 km to access a health facility compared to those who traveled less than 5 km, the odds of having a neonatal mortality at birth increased by a factor of 3.395 (95% CI 0.029 - 397.6, p-value 0.615), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every delivery that took place at home compared to deliveries at hospital, the odds of having a neonatal mortality at

birth increased by a factor of 125604.1 (95% CI 0.003 - 4.71 *10^{12}, p-value 0.187), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in the resultant model.

For every one-unit increase in the number of ANC visits by the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.051 (95% CI 0.0008 - 3.023, p-value 0.153), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the number of SMS's sent to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.035 (95% CI 0.0004 - 2.831, p-value 0.135), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of calls done to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.064 (95% CI 0.0003 - 14.71 p-value 0.321), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. The resultant model was statistically significant with a p-value of 0.0012 and a McFadden's R^2 of 0.709. The AIC and the BIC for this model were 25.83 and 46.83 respectively.

Regression with Age and Gestation by Fundal Height (GFH) Added

The independent variables age and gestation by fundal height were added while covariate parity was excluded from the regression model and the effect examined.

The model information is depicted in table 4.38 below.

Table 4.38: Table of the Logistic Model of Neonatal Mortality with the Statistically Significant Covariates excluding Parity and including Age and Gestation by Fundal Height

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Neonatal Mortality	Age	0.247	0.132	0.040-1.524	0.699	0.0014	26.11
	BMI	5.012	0.130	0.621-40.45			
	Place_del	139767	0.187	$0.003\text{-}6.22*10^{12}$			46.95
	Gestation by FH	0.991	0.973	0.578-1.698			
	No of ANC Visits	0.057	0.142	0.0012-2.615			
	No of SMS Sent	0.050	0.142	0.0009-2.729			
	No of Calls done	0.044	0.225	0.0003-6.844			
	Constant	$9.27*10^{10}$	0.213	$5.14*10^{-7}$-$1.67*10^{28}$			

For every one-year increase in the age of the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.247 (95% CI 0.040 - 1.524, p-value 0.132), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the body mass index of the study participants, the odds of having a neonatal mortality at birth increased by a factor of 5.012 (95% CI 0.621 - 40.45, p-value 0.130), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every one-unit increase in GFH of the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.991 (95% CI 0.578 - 1.698, p-value 0.973), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every delivery that took place at home compared to deliveries at hospital, the odds of having a neonatal mortality at birth increased by a factor of 139767.4 (95% CI 0.003 - $6.22*10^{12}$, p-value 0.187), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in the resultant model.

For every one-unit increase in the number of ANC visits by the study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.057 (95% CI 0.001 - 2.615, p-value 0.142), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. For every one-unit increase in the number of SMS's sent to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.050 (95% CI 0.0009 - 2.729, p-value 0.142), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model.

For every one-unit increase in the number of calls done to study participants, the odds of having a neonatal mortality at birth decreased by a factor of 0.044 (95% CI 0.0003 - 6.844, p-value 0.225), holding all other variables constant. This covariate was not statistically significant at 95% confidence level in this model. The resultant model was statistically significant with a p-value of 0.0014 and a McFadden's R^2 of 0.699. The AIC and the BIC for this model were 26.11 and 46.96 respectively.

4.20.3 Regression Model Selection Criteria and Checking for Interactions between the Independent Variables

The model with the lowest AIC and BIC at 24.11 and 42.49 respectively was the one which had the statistically significant covariates with the parity having been excluded and age added as shown in table 39 below. This model also had a high McFadden's R^2 of 0.7003 and was selected as the best model for showing the determinants of the likelihood of a study participant having a neonatal mortality at birth. The independent variables in the chosen model were assessed to check for any interactions between them and none of the interaction terms was found to be statistically significant.

Table 4.39: Table of the Logistic Model of Neonatal Mortality with the Statistically Significant Covariates excluding Parity and Including Age

Dependent variable	Covariate	Odds Ratio	p-value	Confidence Interval (95%)	McFadden's R^2	Model p-value	AIC & BIC
Neonatal	Age	0.248	0.13	0.040-	0.7003	0.000	24.1

Mortality			2	1.525	6	1
	BMI	5.011	0.131	0.618-40.64		42.49
	Place_del	142361	0.187	0.003-$6.33*10^{12}$		
	No of ANC Visits	0.0564	0.143	0.001-2.633		
	No of SMS Sent	0.051	0.137	0.001-2.569		
	No of Calls done	0.043	0.215	0.0003-6.181		
	Constant	$6.93*10^{10}$	0.170	0.00002-$2.07*10^{26}$		

4.20.4 Marginal Plots: Age

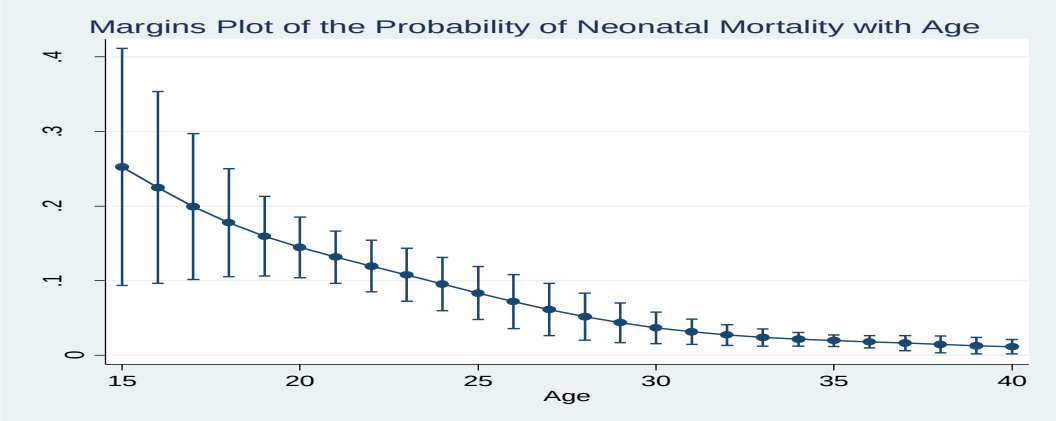


Figure 4.71: Marginal Plot of the Probability of having a Neonatal Mortality by Age

This marginal plot (Figure 4.71 above) showed that the probability of having a neonatal mortality decreased as the age of the study participant increased.

BMI (Body Mass Index)

This marginal plot (Figure 4.72 above) showed that the probability of having a neonatal mortality increased as the BMI of the study participant increased.

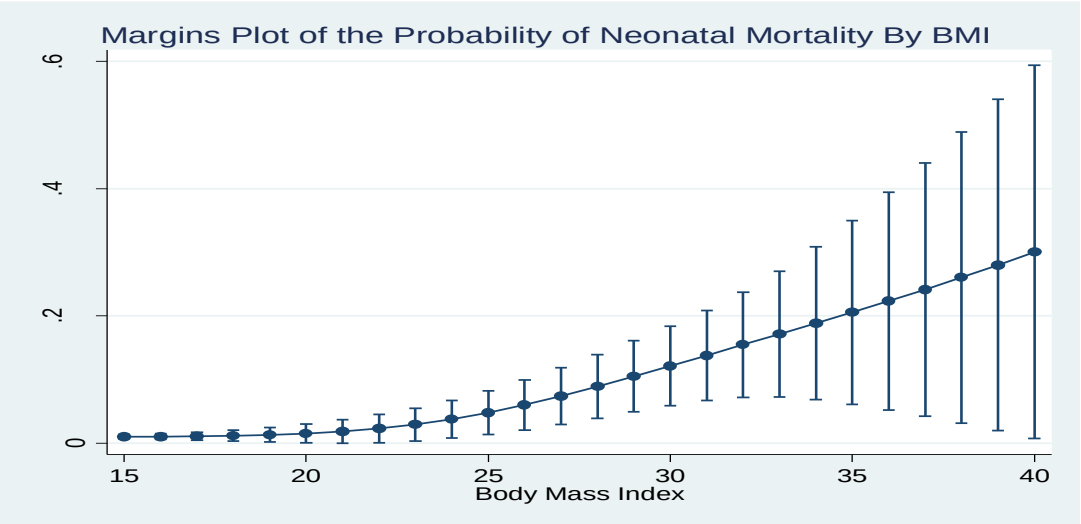


Figure 4.72: Marginal Plot of the Probability of having a Neonatal Mortality by BMI

Number of ANC Visits

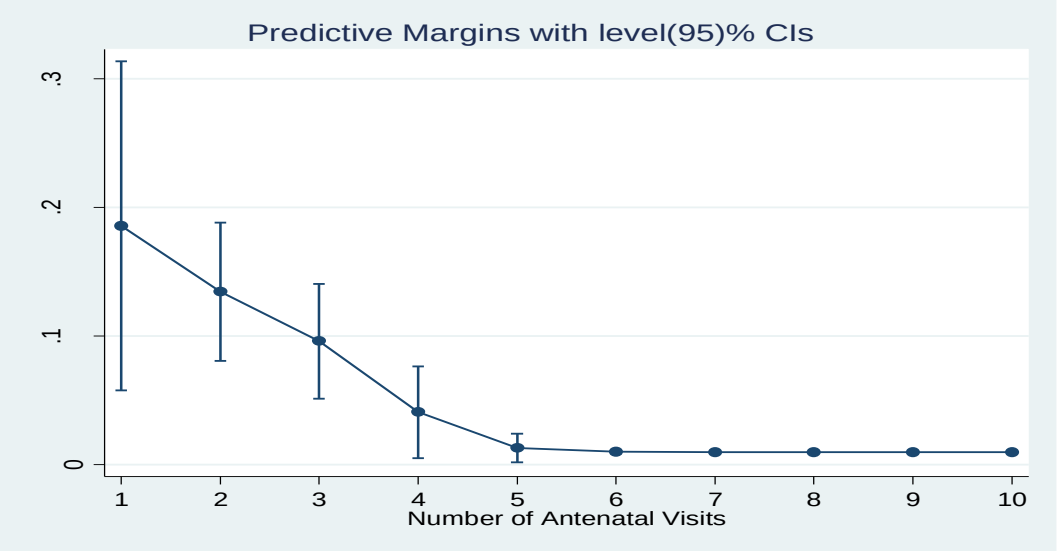


Figure 4.73: Marginal Plot of the Probability of having a Neonatal Mortality by Number of Visits

This marginal plot (Figure 4.73 above) showed that the probability of having a neonatal mortality decreased as the number of antenatal visits done by the study participant increased up to six visits and then remained fairly constant after that.

Number of Calls done

This marginal plot (Figure 4.74) showed that the probability of having a neonatal mortality decreased as the number of calls done to the study participant increased up to six calls and then remained fairly constant after that.

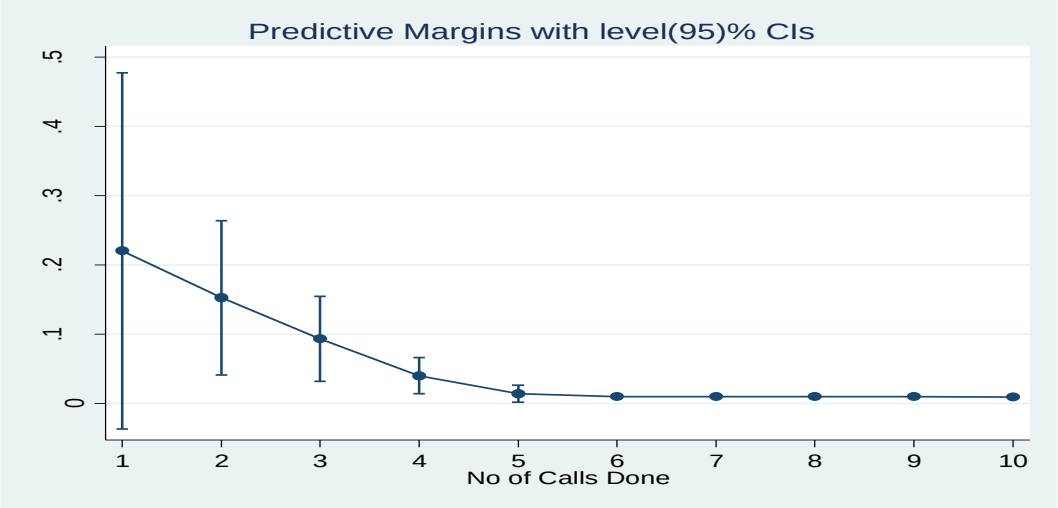


Figure 4.74: Marginal Plot of the Probability of having a Neonatal Mortality by Number of Calls Done to Study Participants

Number of SMS sent

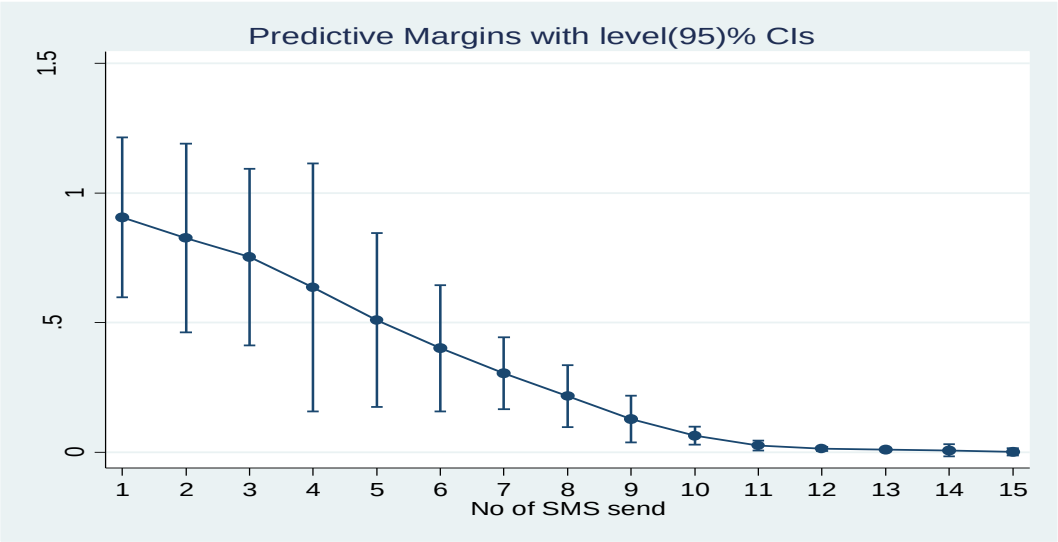


Figure 4.75: Marginal Plot of the Probability of having a Neonatal Mortality by Number of SMS Sent to Study Participants

This marginal plot (Figure 4.75) showed that the probability of having a neonatal mortality decreased as the number of SMS sent to the study participant increased up to twelve SMS and then remained fairly constant after that.

4.20.5 Prediction Plots

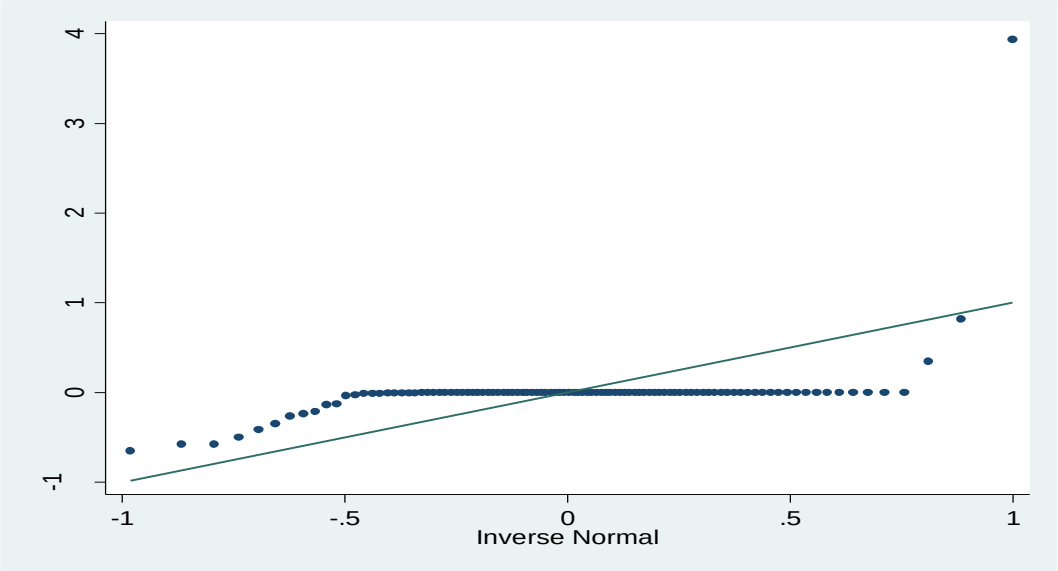


Figure 4.76: Q Norm Plot

The residual plot, Q norm Plot above (Figure 4.76) showed that the model was a relatively good one for the prediction of the determinants of the dependent variable.

CHAPTER FIVE

SUMMARY, DISCUSSION, AND CONCLUSIONS

5.1 Summary of the Main Findings and Discussion

The main study findings are summarized and the discussed here below.

The Intervention

The mean number of SMS sent to the study mothers in the intervention arm was 11.93 messages (SD 2.50, 95% CI 11.50-12.36). The median number of SMS sent was 12 messages with the lowest number of messages sent being four and the highest number sent being 19 messages giving a range of 15 messages. The mean number of calls done to the study mothers in the intervention study arm was 4.68 calls (SD 1.24, 95% CI 4.47-4.89). The median number of calls was 4.5 calls with the lowest number of calls done being two and the highest number done being eight calls giving a range of six calls.

Number of ANC Visits

The mean number of antenatal visits done by each study participant was 3.48 visits (SD 1.06, 95% CI 3.35-3.61). The median number of visits for the study mothers was four visits with the minimum number of visits being one visit and the maximum number being five visits giving a range of four visits.

Place, Assistant at and Mode of Delivery

Almost four in five (79.84% (n=206) of the study participants delivered in a health facility while a fifth (20.16% (n=52) delivered at home. This figure of health facility-based deliveries was nearly double the figure reported in the Kenya Demographic Health Survey (KDHS) 2014 of 40% for Narok County. A similar percentage (79.84% (n=206) of the study mothers were assisted by a healthcare worker to deliver translating to a skilled healthcare attendant at delivery. Ten percent (10.47% (n=27) of the study participants were assisted by a relative to deliver, whereas 9.69%

(n=25) were assisted by a traditional birth attendant (TBA) to deliver. Eighty six percent (86.38% (n=222) of the study mothers delivered via Spontaneous Vertex Delivery (SVD) while 13.62% (n=35) delivered via a Cesarean Section (CS).

Maternal Status at Birth

Two thirds (66.67% (n=172)) of study participants reported having had no maternal complication at birth while a third of the mothers (33.33% (n=86)) had a reported complication, giving a prevalence of complications of 33%. Three study participants suffered a maternal mortality.

Neonatal Status at Birth

Three quarters (75.58% (n=195) of the babies born to study participants cried immediately on delivery, while 21.32% (n=55) of the babies cried after a few minutes on delivery after neonatal resuscitation. Five babies (1.94%) did not cry at all. Three babies (1.16%) did not move at all at delivery. Four fifths (79.60% (n=199) of the study mothers reported having had their babies vaccinated at birth with 20.40% (n=51) of the babies not vaccinated at birth. Four in five (79.62% (n=207) of the babies had no complications at birth while 20.38% (n=53) had complications giving a neonatal complication prevalence rate of 20.38%. Of the 262 study mothers, nine in ten (89.31% (n=234) had live births while 10.69% (n=28) of the study participants had neonatal deaths.

The mean APGAR score at 5 seconds for the study mothers was 8.9 (SD 1.67, 95% CI 8.68-9.12). The median score was nine and the minimum score was zero while the maximum score was ten giving a range of ten. The mean baby weight at birth was 3,239 grams (SD 476, 95% CI 3178 - 3301). The median birth weight was 3,185 grams with the lowest weight being 1,750 grams and the highest weight being 4,800 giving a range of 3,050 grams.

ANC Attendance by Study Group

A targeted mobile phone intervention was associated with improved antenatal care clinic attendance amongst the study population. The mean number of antenatal visits

was 4.099 visits for the 131 study participants in the intervention group while it was 2.843 visits for the 128 study participants in the non-intervention study arm. The difference in means was 1.256 visits (95% CI 1.044-1.467). Student T test to test for significance for the null hypothesis showed that there was a difference between the mean number of antenatal visits between the intervention and the non-intervention study arm at a 95% confidence level which was statistically significant at 95% confidence level with a p-value of less than 0.0001.

Skilled Care Deliveries

A targeted mobile phone intervention was associated with improvement in skilled care deliveries. In the intervention group with 130 study participants, 90% (n=117) of them were assisted by a health care worker to deliver. Five percent (5.38%, n=7) of the study mothers were assisted by a relative to deliver while 4.62% (n=6) were assisted by a traditional birth attendant to deliver. In the non-intervention study arm with 128 study participants, 69.53% (n=89) were assisted by a health care worker to deliver while 15.63% (n=20) were assisted by a relative to deliver with 14.84% (n=19) being assisted by a traditional birth attendant.

The likelihood of a study mother being assisted by a healthcare worker at delivery by study group was tested with the Chi Squared statistic. The null hypothesis was that there was no difference in the likelihood of a study mother being assisted to deliver by a healthcare worker by study group. The alternate hypothesis was that there was a difference in the likelihood of a study mother being assisted by healthcare worker by study group. The null hypothesis was rejected with a Chi Square statistic of 16.810 and a p value of less than 0.0001 indicating that the study mothers in the intervention study arm were more likely to be assisted by a healthcare worker to deliver than those in the non-intervention study arm.

A targeted mobile phone intervention was associated with improved health facility-based deliveries. On exploration of the place of delivery by study group it was found that for the 130 study mothers in the intervention study arm, 90% (n=117) delivered in a health facility while 10% (n=13) delivered at home. For the 128 study mothers in

the non-intervention study arm, 69.53% (n=89) delivered in a health facility while 30.47% (n=39) delivered at home.

The null hypothesis that there was no difference between the proportion of study mothers in the intervention and non-intervention study arm that delivered in a health facility was tested. The alternate hypothesis was that there was a difference in the proportion of the study participants who delivered in a health facility between the two study arms. The difference of proportions for the health facility-based deliveries between the intervention and non-intervention study arms was 20.47% (95% CI 10.97-29.96), which was statistically significant with a p value of less than 0.0001. Thus, the null hypothesis was rejected. Hence mothers in the intervention arm were more likely to deliver in hospital compared to those in the non-intervention arm.

Postnatal Clinic Attendance

A targeted mobile phone intervention was associated with improved postnatal care clinic attendance. Amongst the 136 study participants who reported on this variable, 30.15% (n=41) attended the postnatal clinic immediately after delivery or in the postpartum period, whereas 69.85% (n=95) of the mothers did not attend the postnatal clinic at all. For the 60 study participants who were in the intervention study arm, 41.67% (n=25) attended the PNC while 58.33% (n=35) did not attend. For the 76 study participants who were in the non-intervention study arm, 21.05% (n=16) attended the PNC while 78.95% (n=60) did not attend. The likelihood of a study mother attending postnatal clinic by study group was tested with a Chi squared statistic. The null hypothesis was that there was no difference in the likelihood of a study mother attending postnatal clinic by study group. The alternate hypothesis was that there was a difference in the likelihood of attending the postnatal clinic. The null hypothesis was rejected with a Chi Squared statistic of 6.7658 and a p value of 0.009 indicating that the mothers in the intervention study arm were more likely to attend the postnatal clinic compared to those in the non-intervention study arm.

Postnatal Maternal Outcomes

A targeted mobile phone intervention was associated with less maternal complications during and after delivery. The likelihood of a study participant having

any complication at birth was 33.33% (n=86) while that of a study mother having no complication was 66.67% (n=172). The null hypothesis was that there was no difference in the proportions of study participants who had complications at birth between the two study arms. The alternate hypothesis was that there was a difference between the proportions of study participants who had complications by study group. The difference in proportion between the study participants who had a complication at birth was 17.23% (95% CI 6.51-27.94) between the intervention (19.70%) and the non-intervention (36.92%) study arm. This difference was statistically significant at 95% level of confidence with a p value of 0.002 and thus the null hypothesis was rejected indicating that the mothers in the intervention arm were less likely to have complications at birth compared to those in the non-intervention arm.

Neonatal Outcomes

A targeted mobile phone intervention was associated with fewer neonatal complications. The mean APGAR score at 5 seconds for the 121 study mothers in the intervention study arm was 9.364 while it was 8.333 for the 99 study mothers in the non-intervention study arm. The median APGAR score at 5 seconds for the 121 study mothers in the intervention study arm was ten while it was nine for the 99 study mothers in the non-intervention study arm. Mann Whitney U test of significance was used to test the null hypothesis that there was no difference between the median APGAR score at 5 seconds of the two study groups i.e. intervention and non-intervention groups. The alternate hypothesis was that there was a difference in the median APGAR Scores at 5 seconds between these study groups. The difference between the medians was found to be statistically significant at 95% confidence level with a z statistic of 4.698 and a p value of less than 0.0001 thus the null hypothesis was rejected indicating that the median APGAR Score was likely to be higher in the study mothers in the intervention study arm compared to the non-intervention arm.

A targeted mobile phone intervention was associated with less neonatal mortality. A test of significance using t-test of proportions of the difference in proportion between the two study arms i.e. intervention and non-intervention arms for the likelihood of a study participant having a neonatal mortality at birth was done. The null hypothesis

was that there was no difference in the proportion of study participants who had neonatal mortality at birth between the two study arms. The alternate hypothesis was that there was a difference in the proportion of the study participants who had a neonatal mortality at birth by study group. The difference in proportion between the study participants who had a neonatal mortality at birth was 9.32% (95% CI 1.91-16.74) between the intervention (6.06%) and the non-intervention (15.38%) study arm. This difference was statistically significant at 95% level of confidence with a p value of 0.015. Thus, the null hypothesis was rejected indicating a higher likelihood of a study participant to have a neonatal mortality if she was in the non-intervention arm compared to the intervention study arm.

Study participants who delivered at home were more likely to have neonatal mortality compared to those that delivered in the hospital. A test of significance using t-test of proportions of the difference in proportion between the two places of delivery i.e. at home and in hospital for the likelihood of a study participant having a neonatal mortality at birth was done. The null hypothesis was that there was no difference in the proportions of study participants who had neonatal mortality at birth between the two places of delivery. The alternate hypothesis was that there was a difference in the proportion of the study participants who had a neonatal mortality at birth by place of delivery. The difference in proportion between the study participants who had neonatal mortality at birth was 26.89% (95% CI 14.07-39.70) between those who delivered at home (30.77%) and those who delivered in a health facility (3.88%). This difference was statistically significant at 95% level of confidence with a p value of less than 0.0001. Thus, the null hypothesis was rejected which meant that those mothers who delivered at home had a higher likelihood of having a neonatal mortality.

Regressions for Predictors

The Number of ANC Visits

On bivariate regression for the number of antenatal visits, the following variables were found to be statistically significant hence predictors of the likelihood of ANC attendance; Age (IRR 0.01, 95% CI 0.004 - 0.0163, p-value of 0.0016,) Gestation by

Fundal height (IRR 0.015, 95% CI -0.022 to -0.008, p value <0.0001), Gestation by dates (IRR 0.002, 95% CI 0.003 - 0.001, p value <0.0001), Time of follow up (IRR 0.002, 95% CI 0.001 - 0.003, p value <0.0001), Study group (IRR 0.660, 95% CI -0.731 to -0.589, p value < 0.0001), Education level (Primary vs Never attended IRR 0.271, 95% CI 0.032 - 0.510, p value 0.026); (Secondary vs Never attended IRR 0.248, 95% CI 0.009 - 0.487, p value 0.042); (Tertiary vs Never attended IRR 0.313, 95% CI 0.070 -0.555, p value 0.011).

On multivariate regression using the truncated negative binomial regression method, the model with statistically significant variables and BMI was selected to be the best fit for this dependent variable because it was statistically significant (p value of 0.0225) and had a good AIC and BIC of 1055.4 and 1076.7 respectively and a McFadden's R^2 of 0.0124. The days of follow up remained statistically significant in the resultant model with an incidence rate ratio (IRR) of 1.004 (95% CI 1.0009 - 1.007, p-value 0.012), holding all the other variables constant.

Any Maternal Complication at Birth

On bivariate regression for any complication at birth, the following variables were found to be statistically significant hence predictors of the likelihood of complication; Place of delivery (Hospital vs home OR 0.141, 95% CI 0.073 - 0.274, p value < 0.0001), Assistant at delivery (Relative vs healthcare worker OR 6.431, 95% CI 2.764 - 14.96, p value < 0.0001), (TBA vs Healthcare worker Coefficient 7.860, 95% CI 3.230 - 19.13, p value < 0.0001), Number of ANC Visits (OR 0.435, 95% CI 0.324 - 0.435, p value < 0.0001), Mode of delivery (SVD vs CS OR 0.184, 95% CI 0.087 - 0.389, p value < 0.0001), Number of calls (OR 0.613, 95% CI 0.407 - 0.920, p value = 0.018), Gestation at enrolment (OR 1.008, 95% CI 1.0005 - 1.016, p value = 0.036), Study group (Non-intervention vs intervention (OR 2.387, 95% CI 1.367 - 4.168, p value = 0.002).

On multivariate logistic regression, the model with statistically significant independent variables plus age, BMI, parity, and education level was selected because it was statistically significant (p value of 0.0002) and had a good AIC and BIC of 70.04 and 97.90 respectively, and a McFadden's R^2 of 0.415. The mode of

delivery remained statistically significant with an odds ratio of 0.019, (95% CI 0.002 - 0.181, p-value of 0.001), holding all the other variables constant.

Neonatal Mortality

On bivariate regression for neonatal mortality, the following variables were statistically significant hence predictors; Parity (OR 1.338, 95% CI 1.0002 - 1.790, p value = 0.05), BMI (OR 1.093, 95% CI 1.006 - 1.188, p value = 0.035), Place of Delivery (Hospital vs home (OR 0.091, 95% CI 0.036 - 0.228, p value < 0.0001), Assistant at delivery (Relative vs Heath care worker (OR 10.42, 95% CI 3.514 - 30.91, p value < 0.0001), TBA vs healthcare worker (OR 11.65, 95% CI 3.885 - 34.92, p value < 0.0001), Number of ANC visits (OR 0.255, 95% CI 0.153 - 0.425, p value < 0.0001), Number of SMS sent (OR 0.599, 95% CI 0.427 - 0.839, p value = 0.0009), Number of calls done (OR 0.321, 95% CI 0.141 - 0.733, p value = 0.007), Study group (Non-intervention vs Intervention (OR 2.818, 95% CI 1.194 - 6.654, p value = 0.018), Level of education (Primary vs Never attended (OR 0.089, 95% CI 0.017 - 0.458, p value = 0.004; Secondary vs Never attended OR 0.074, 95% CI 0.014 - 0.385, p value = 0.002; Tertiary vs Never attended OR 0.067, 95% CI 0.012 - 0.387, p value = 0.003).

On multivariate logistic regression, the model with the lowest AIC and BIC at 24.11 and 42.49 respectively was the one which had the statistically significant covariates with the parity having been excluded and age added and it was picked as the best fitting for the dependent variable. None of the independent variables remained statistically significant though the model had a McFadden's R^2 of 0.700 and was statistically significant with a p value of 0.0006.

In this study, 79.84% (n=206) of the study mothers delivered in a health facility while 20.16% (n=52) delivered at home representing the prevalence of home deliveries of 20.16%. The figure of health facility-based deliveries was almost double the figure reported by the KDHS of 40% for Narok County (KDHS 2014). A similar percentage (79.84% (n=206) of the study mothers were assisted by a healthcare worker to deliver translating to skilled healthcare attendant at delivery. This was also much higher than 39% that was reported in the KDHS for Narok

County (KDHS 2014). This was explained by the fact that the study only recruited those mothers who had come to health facilities. Ten percent (10.47% (n=27) of the study participants were assisted by a relative to deliver, whereas 9.69% (n=25) were assisted by a traditional birth attendant (TBA) to deliver.

The proportion of mothers who had complications was highest among the mothers assisted by the TBA even higher than those assisted by relatives (64% vs 59.3%) and those assisted by HCWs (skilled deliveries) (64% vs 18.45%). This is interesting considering that TBAs are believed to be traditional carers. The explanation for the lower proportion in the relatives could be that the delivery occurred when they were transporting the mother to hospitals and thus the mothers were taken care of when they reached the hospital potentially reducing the prevalence of complications.

The prevalence of having a complication at birth also decreased steadily as the level of education attained increased. This was because the more educated a mother was the higher the likelihood of visiting a health facility for delivery and utilizing a healthcare worker for assistance. Among the facilities, Olulunga SCH had the highest staff turnover during the study which is reflected by the facility having the highest prevalence of both maternal and neonatal complications.

Several studies have studied effects of components of mHealth applications/tools on antenatal care, however most of the studies in literature have focused on single components (majorly SMS) and single endpoint - ANC attendance by itself (Lavender 2013, Jareethum 2008, Boehm 1996, Smith 2008, Dennis 2009, Bunik 2007, Bunik M 2007, Bryce 1991). A cluster RCT study done in Zanzibar by Lund S et al was similar to the current study because it was bi-component studying SMS and a voucher system to improve ANC attendance and found that this intervention improved ANC attendance (44% vs 31%) for intervention group and non-intervention group respectively (OR 2.39, 95% CI 1.03-5.55) (Lund s 2012, Lund S 2014). The current study found a higher attendance in the intervention group (4.099 visits) compared to the non-intervention group (2.843 visits) with a statistically significant difference between the two groups (1.256 visits (95% CI 1.044-1.467) with an OR 2.387, 95% CI 1.367-4.168, p value = 0.002), which was quite similar to

the findings of the Zanzibar Study. This indicated that the likelihood of the study participant attending more ANC visits was higher in the intervention study arm compared to the non-intervention arm.

The difference in proportion of the likelihood of a study participant having any complication at birth of 17.23% (95% CI 6.51-27.94%) between the intervention (19.70%) and the non-intervention (36.92%) study arm was also statistically significant at 95% confidence level (p value = 0.002). On bivariate regression, the number of calls done was statistically significant (p value = 0.018) while the number of SMS sent was not (p value = 0.134). Combining these two components of the intervention was useful to improve attendance and by extension the postnatal outcomes due to synergistic effects. Multiple logistic regression modeling showed that the model was statistically significant, had good McFadden's R^2 of 41.54% and AIC and BIC of 70.04 and 97.90, and was a good predictor of the postnatal outcomes.

Having attended more ANC visits was associated with lower odds of having any type of complication for study mothers and neonates (0.435, 95% CI 0.324 - 0.585, p-value < 0.0001) and this was statistically significant. Receiving more calls during the antenatal period was associated with lower odds of having any complication at birth (0.613, 95% CI 0.409 - 0.920, p-value 0.018), which was statistically significant.

Delivering in a hospital was associated with decreased odds of having any type of complication and also neonatal mortality compared to those mothers who delivered at home (0.141, (95% CI 0.073 - 0.274, p-value < 0.0001). Using a relative (6.431, 95% CI 2.764 - 14.964, p-value < 0.0001) or a traditional birth attendant (7.860, 95% CI 3.230 - 19.126, p-value < 0.0001) was also associated with having higher odds of having any type of complication at birth and also neonatal mortality. This is similar to the findings of other studies (Lund S 2014, Villar J 2001, Pell C 2014).

5.2 Conclusions, Recommendations, and Limitations of the Study

A targeted mobile phone intervention combining an SMS system sent fortnightly and a phone call done monthly was found to be effective in improving antenatal and

postnatal care attendance and also in improving postnatal outcomes in a pastoralist community in Narok County of Kenya. Our recommendation is that the intervention is effective and workable in this population and can be utilized by the County Government of Narok to improve its maternal and child health care especially the ANC attendance, postnatal clinic attendance and postnatal maternal and neonatal outcomes.

The main limitation of the study was that the study recruited its study participants from the antenatal clinic and thus the mothers who were recruited into the study could possibly be different from the general population since they had already come to start their ANC visits early bringing in selection bias. A community-based recruitment model would improve the study in this regard. The study aimed to recruit mothers early in their pregnancy. However, this was a challenge because mothers attend ANC relatively late in Kenya making the recruitment period to be very long.

The main challenges of the study were the frequent transfer of members of staff especially at some of the study healthcare facilities like Ololunga Sub-county Hospital causing a high staff turnover with each new set of staff having to learn the study anew, which led to study disruptions. During the period of the study there were also several strikes of the health care workers (nurses, clinical officers, and doctors) that also disrupted the study. The mobile network coverage was also poor in some areas resulting in the study assistants having to make several calls in order to reach the mothers. The COVID-19 Pandemic also disrupted this study when it started in the year 2020 due to major travelling restrictions and other prevention and control measures imposed by the Government of Kenya.

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MaternalMortalityRatios

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APPENDICES

Appendices I: Ethical Approval

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tell (254) (020) 2722541, 2713349, 0722-205901, 0733-400003, Fax: (254) (020) 2720030
E-mail: director@kemri.org, info@kemri.org, Website. www.kemri.org

KEMRI/RES/7/3/1 January 19, 2018

TO: DANIEL MWENDWA MUVENGEI,
PRINCIPAL INVESTIGATOR.

THROUGH: THE **DIRECTOR, CPHR,**
NAIROBI

waglod 23/1/2018

Dear Sir,

RE: KEMRI/SERU/CPHR/001/3573 *(RESUBMISSION II OF INITIAL SUBMISSION).* UTILIZATION OF A TARGETED MOBILE PHONE MESSAGING INTERVENTION IN **ANTENATAL CARE** AND ITS EFFECT ON POSTNATAL OUTCOMES IN **NAROK** COUNTY IN KENYA.

Reference is made to your letter dated January 15th, 2018. The KEMRI Scientific and Ethics Review Unit (SERU) acknowledges receipt of the revised documents on January 16, 2018.

This is to inform you that the Committee determines that the issues raised at the 268th Joint Committee B and C meeting of the KEMRI Scientific and Ethics Review Unit (SERU) held on October 18, 2017, have been adequately addressed.

Consequently, the study is granted approval for implementation effective this day, January 19th, 2018 for a period of one year. Please note that authorization to conduct this study will automatically expire on January 18, 2019. If you plan to continue data collection or analysis beyond this date, please submit an application for continuation approval by December 07, 2018

You are required to submit any proposed changes to this study to SERU for review and the changes should not be initiated until written approval from SERU is received. Please note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of SERU and you should advise SERU when the study is completed or discontinued.

You may embark on the study.

Yours faithfully,

THE HEAD,
KEMRI SCIENTIFIC AND ETHICS REVIEW UNIT.

Appendix II: Study Questionnaire

Introduction

I am Daniel Mwendwa Muvengei/Research Assistant, studying for a PhD at the Jomo Kenyatta University of Agriculture and Technology's Institute of Tropical Medicine and Infectious Diseases (ITROMID). I am doing research on attendance of antenatal care, which is low in some parts of Kenya, and its effect on the birth outcomes. I am studying whether a targeted mobile phone SMS intervention will improve the ANC attendance and thus improve the mother and baby outcomes.

I am going to ask you questions to help me answer my research questions. There may be some words/questions that you do not understand. Please ask me to stop as we go through the questionnaire and I will explain.

Purpose of the research

Antenatal care attendance is very crucial during the pregnancy period so that mothers are monitored. Attendance still remains poor in many parts of the country (Kenya). Mother and baby outcomes are also poor in Kenya with many mothers dying during pregnancy and at birth. We are doing this study to look for a way of improving the attendance to ANC clinics where mothers can be closely followed up and any complications picked early enough and managed. With this we hope to improve mother and baby birth outcomes.

SECTION A (SOCIO-DEMOGRAPHIC DATA)

1. What is your mobile phone number? _____
2. What is your marital status?
   - Single ☐
   - Married ☐
   - Separated ☐
   - Divorced ☐
3. How old are you (in years)? _____

4. What is your highest level of education?
   - Never attended formal schooling ☐
   - Primary school ☐
   - Secondary school ☐
   - Tertiary (College or university) ☐

5. What level of education did your husband/partner attain?
   - Never attended formal schooling ☐
   - Primary school and lower ☐
   - Secondary school ☐
   - College and university ☐

6. Which ethnic group do you belong to?
   - Maasai ☐
   - Kikuyu ☐
   - Kalenjin ☐
   - Kamba ☐
   - Luo ☐
   - Other (Specify) _____

7. Is this your first pregnancy?
   - Yes ☐
   - No ☐

8. If No, how many children do you have?
   - 1 ☐
   - 2 children ☐
   - 3 children ☐
   - 4 children ☐
   - 5 and Over children ☐

9. Do you smoke cigarettes or take tobacco? Yes/No _____
10. Do you drink alcohol? Yes/No _____

11. Does your husband smoke cigarettes/consume tobacco or alcohol? Yes/No ____

12. If yes, Specify

- Smokes Cigarettes ☐
- Consumes tobacco ☐
- Drinks alcohol ☐

13. How many kilometres do you travel to get to the hospital?

(*Estimate based on the village the respondent comes from)*

- Less than 1 km ☐
- 1-5 Km ☐
- More than 5 Km ☐ Specify_____

14. How long does it take you to travel to the hospital?

- 15 minutes and less ☐
- 15 to 30 minutes ☐
- 30 minutes to 1 hour ☐
- More than 1 hour ☐ Specify_____

15. What is your occupation?

- Housewife ☐
- Cattle rearing ☐
- Small scale farmer ☐
- Large scale farmer ☐
- Business person ☐
- Other (specify) _____

16. What is your husband's/Spouses' occupation (if married)

- Cattle rearing ☐
- Small scale farmer ☐
- Large scale farmer ☐
- Business person ☐
- Other (specify) _____

17. Who decides on when and where to attend the hospital, a major household purchase, or a visit to relatives?
    - The Woman ☐
    - The Husband ☐
    - Other relative (specify) ☐
18. Does your husband accompany you to the Antenatal clinic? Yes/No___ if Yes how often ☐
    - Always
    - Sometimes ☐
19. Does your family own any of the following (Assets)?
    - Radio ☐
    - Television ☐
    - Cattle (number if possible) ☐
    - Bicycle ☐
    - Motor bike ☐
    - Motor vehicle ☐
    - Business ☐
    - Land ☐
    - Others (specify) _____
20. What kind of a house does your family live in?
    - Own house ☐
    - Rented house ☐

21. What is the nature of the house where your family lives in?
    - Manyatta ☐
    - Grass thatched hut ☐
    - Iron sheet roofed house ☐
    - Mud-walled house ☐
    - Brick-walled house ☐
    - Stone-walled house ☐

SECTION B (ANTHROMETRICS, SYSTEMIC CLINICAL EXAM, TREATMENT AND FOLLOW UP EXAM)

(To be done by the clinician examining the mother)

22. When was your Last Menstrual period (LNMP) (Date) _____

23. Does the mother have any co-morbidity? Yes/no _____. If yes what is it?

- Hypertension ☐
- Diabetes ☐
- Anemia ☐
- Arthritis ☐
- Others (Specify) _____

24. Have you ever had an operation for delivery of a baby (CS)?

- Yes ☐
- No ☐

25. If yes when (month/year) _____

26. Baseline parameters for the expectant mother

- Height _____
- Weight _____
- Blood pressure _____
- Pulse rate _____
- Temperature _____
- Fundal Height _____

27. LABORATORY INVESTIGATIONS

a) PDT (Pregnancy test) Date done_____

- Positive ☐
- Negative ☐

b) Hemoglobin _____ in g/dl

c) Blood Slide for Malaria Parasites Date done _____

- Malaria Parasites seen ☐

- Malaria Parasites not seen

d) VDRL Date done _____

- Positive ☐
- Negative ☐

e) Blood Grouping Date done _____

- A ☐
- B ☐
- AB ☐
- O ☐
- Rhesus Positive ☐
- Rhesus Negative ☐

f) Gestation by Obstetric Ultrasound_____ Date done_____

SECTION C (POSTNATAL OUTCOMES)

1. What is your mobile phone number _____
2. Where did you deliver your baby
   - Hospital ☐
   - Home ☐
   - At Traditional Birth Attendant's home ☐
   - On the way to hospital ☐
3. If at home who assisted you to deliver?
   - Health care worker ☐
   - Traditional birth attendant ☐
   - Relative ☐
   - Other (Specify) _____
4. What was the status of the baby?
   - Cried immediately ☐
   - Cried after a few minutes ☐
   - Did not cry at all ☐

- No movement

5. Was there any complication during birth
   - Yes ☐
   - No ☐
6. If yes what was it?
   - Prolonged labour ☐
   - Bleeding ☐
   - Infections including Malaria (specify) ☐ _____
   - Perineal injuries ☐
   - Convulsions ☐
   - Others (specify) _____
7. What was the weight of your baby at birth? _____
8. Was the baby vaccinated after birth?
   - Yes ☐
   - No ☐
9. Were you referred from the first facility of care that you visited?
   - Yes ☐
   - No ☐
10. If yes, to which facility?
    - County Referral Hospital ☐
    - Elsewhere (Specify) _____

SECTION D (MEDICAL RECORD EXTRACTION INFORMATION FORM)

1. Mobile phone number _____
2. Number of Antenatal care visits _____
   - One ☐
   - Two ☐
   - Three ☐
   - Four ☐
   - Five and more ☐

3. Dates of ANC visits
   - First visit _____
   - Second visit _____
   - Third visit _____
   - Fourth visit _____
   - Fifth visit _____

4. What are the main activities conducted in Antenatal care at this facility
   - Confirmation of pregnancy ☐
   - Checking BP ☐
   - Hemoglobin levels ☐
   - Health education ☐
   - Immunizations ☐
   - IPT ☐
   - HIV testing ☐
   - VDRL ☐

5. Date of Delivery _____
6. Mode of delivery
   - Spontaneous Vertex Delivery (SVD) ☐
   - CS ☐
   - Others (Specify) _____
7. Neonatal Postnatal outcomes
   - APGAR scores _____
   - Birth weight _____
   - Neonatal complications (specify) _____
   - Neonatal Mortality _____
8. Maternal postnatal outcomes
   a) Normal delivery ☐
   b) Maternal complications:

- Prolonged labour ☐
- Postpartum Hemorrhage ☐
- Perineal tears ☐
- PET/Eclampsia ☐
- Maternal mortality ☐

Others (Specify)

Appendix III: Informed Consent Form

This Informed Consent Form is for women who attend antenatal care clinics in Narok County, and who I am inviting to participate in research on improving antenatal care. The title of my research project is "**UTILIZATION OF A TARGETED MOBILE PHONE MESSAGING INTERVENTION IN ANTENATAL CARE AND ITS EFFECT ON POSTNATAL OUTCOMES IN NAROK COUNTY IN KENYA"**

Name of Principal Investigator: Daniel Mwendwa Muvengei

Name of Organization: JKUAT Institute of Tropical Medicine and Infectious Diseases, Kemri

PART I: Information Sheet

Introduction

I am Daniel Mwendwa Muvengei, studying for a PhD at the Jomo Kenyatta University of Agriculture and Technology's Institute of Tropical Medicine and Infectious Diseases (ITROMID). I am doing research on attendance of antenatal care, which is low in some parts of this country Kenya, and its effect on the birth outcomes. I am studying a targeted mobile phone SMS intervention which could improve the ANC attendance and thus improve the mother and baby outcomes. I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me or the staff helping to conduct the study.

Purpose of the research

Antenatal care attendance is very crucial during the pregnancy period so that mothers are monitored. Attendance still remains poor in many parts of the country (Kenya). Mother and baby outcomes are also poor in Kenya with many mothers dying during pregnancy and at birth. We are doing this study to look for a way of improving the attendance to ANC clinics where mothers can be closely followed up and any complications picked early enough and managed. With this we hope to improve mother and baby birth outcomes.

Type of Research Intervention

This research will involve sending SMS messages to you and also calling you close to the booked clinic dates to inform you about the importance of attending clinic and also to remind you of the dates when you are supposed to attend. To enable us to find out if the intervention will be useful, there will be two groups. One group will have the intervention whereas the other group will be followed up using the usual routine care. Then I will make a comparison of the two groups to see whether the intervention will improve outcomes at birth.

Participant selection

We are inviting any pregnant woman in the second trimester of pregnancy in Narok County to participate.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. Whether you choose to participate or not, all the services you receive at the clinic will continue and nothing will change. If you choose not to participate in this research project, you will be offered the treatment that is routinely offered in this clinic/hospital, and we will tell you more about it later. You may also change your mind later and stop participating even if you had agreed earlier.

Procedures and Protocol

The study will be examining a mobile phone intervention to improve ANC attendance and thus the effect of this improvement on the outcomes at birth to both the mother and the baby. To understand if the intervention works there will be two study groups with one given this intervention and the other one given routine care. The results of the two groups will then be compared to see the effects. Study participants will be assigned to these groups by chance e.g. as if by tossing a coin.

It is important that information about the group to which you are assigned remains confidential. This information will be in our files and will be used after the study for comparison. This is the best way we have for testing without influencing the group results by what may be communicated between the groups. We will then compare which of the two groups.

The healthcare workers will be looking after you and the other participants very carefully during the study. If there is anything you are concerned about or that is bothering you about the research please talk to me or one of the other researchers.

Duration

The research takes place over 12 months in total (from recruitment to 6 weeks after delivery). During that time, it will be necessary for you to come to the clinic/hospital/health facility when informed by the health care providers to do so. We would also like to meet with you 6 weeks after delivery for a final check-up.

Risks

By participating in this research, the risks that will be involved are minimal.

Benefits

There may not be many direct benefits for you but your participation is likely to help us find the answer to the research questions. Some benefits include the monitoring that will occur to you during the pregnancy and prompt treatment of any

complications noticed. There may not be any benefit to the society at this stage of the research, but future mothers are likely to benefit by ensuring that if ANC attendance improves they will get fewer complications including deaths hence improving the overall community health.

Confidentiality

With this research, something out of the ordinary is being done in your community. It is possible that if others in the community are aware that you are participating, they may ask you questions. We will not be sharing the identity of those participating in the research.

The information that we collect from this research project will be kept confidential. Information about you that will be collected during the research will be put away and no-one but the researchers will be able to see it. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key system. It will not be shared with or given to anyone except the researchers and the university research supervisors.

Sharing the Results

The knowledge that we get from doing this research will be shared with you through community meetings before it is made widely available to the public. There will be small meetings in the community and these will be announced. After these meetings, we will publish the results in order that other interested people may learn from our research. Confidential information will not be shared at any point.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so and refusing to participate will not affect your treatment at the health facility/clinic in any way. You will still have all the benefits that you would otherwise have at this clinic. You may stop participating in the research at any time that you wish without losing any of

your rights as a patient here. Your provision of services at the clinic will not be affected in any way.

Who to Contact

If you have any questions you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact any of the following:

Daniel Muvengei 0722555210 muvengei.md@gmail.com

This proposal has been reviewed and approved by Kemri Scientific Ethics Research Unit (SERU), which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find about more about the SERU, contact 0711719447email seru@kemri.org, P.O. BOX 54840-00200 Nairobi.

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

PART II: Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

If illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness_____ AND Thumb print of participant

Signature of witness _____

Date _____

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. Recruitment will be done into the study in the second trimester of pregnancy and followed up to 6 weeks post delivery

2. Study participants will be randomly divided into two groups with one being the intervention and the other the routine care group

3. The intervention group will be given a targeted mobile phone intervention and then followed up to check whether this intervention will have better postnatal outcomes compared to the routine care group

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly

and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____

Day/month/year

Appendix IV: Swahili Translation

KIAMBATISHO C: HOJAJI YA UTAFITI

Utambulisho

Jina langu ni Daniel Mwendwa Muvengei/Msaidizi wa Utafiti, nasomea shahada ya PhD katika Taasisi ya Tiba ya Magonjwa ya Tropiki na ya Kuambukiza (ITROMID) huko Chuo Kikuu cha Kilimo na Teknolojia cha Jomo Kenyatta (JKUAT). Nafanya utafiti kuhusu mara ambazo kina mama wanahudhuria kliniki za wajawazito, na jinsi zinaathiri matokeo wakati wa kuzaa. Katika maeneo fulani hapa nchini Kenya, kina mama huwa wanahudhuria kliniki mara chache. Natafiti kama kuwatumia kina mama wajawazito SMS kwenye simu zao mkononi kunaweza kuongeza mara ambazo watahudhuria kliniki na hivyo kuboresha matokeo kwa mama na mtoto.

Nitakuuliza maswali ili unisaidie kujibu maswali ya utafiti wangu. Kama kuna maneno au maswali ambayo huelewi, tafadhali niulize tukiendelea kupitia maswali na nitakueleza.

Sababu ya kufanya utafiti huu

Ni muhimu sana kwa kina mama kwenda kliniki wakiwa wajawazito ili wafuatiliwe. Katika sehemu nyingi nchini Kenya, kiwango cha kwenda kliniki ya wajawazito bado kiko chini sana. Matokeo wakati wa kuzaa nchini Kenya bado si mazuri; kina mama wengi hufa wakiwa wajawazito na wakati wa kuzaa. Tunafanya utafiti huu kutafuta njia za kuongeza mara ambazo kina mama wajawazito wanakwenda kliniki ANC ambapo wanaweza kufuatiliwa kwa karibu, na kama kuna matatizo yoyote, yanaweza kugunduliwa mapema na kutibiwa. Kwa kufanya hivyo, tunatarajia kuboresha matokeo kwa mama na mtoto wakati wa kuzaa.

SEHEMU YA A (DATA YA KIJAMII NA DEMOGRAFIA)

1. Tafadhali nipe nambari yako ya simu _____
2. Je, hali yako ya ndoa ni gani?

   - Sijaolewa ☐
   - Nimeolewa ☐☐
   - Tumetengana na muwe wangu ☐
   - Tumeachana na mume wangu

3. Je, una miaka mingapi? (umri wako) _____

4. Umefika wapi katika elimu/masomo yako? ☐

   - Shule ya msingi au chini ya hapo
   - Shule ya Sekondari ☐
   - Chuo cha Elimu au Chuo Kikuu) ☐

5. Je, mume wako/mwenzi wako amefika wapi katika elimu/masomo yake?

   - Shule ya msingi au chini ya hapo☐☐
   - Shule ya Sekondari ☐
   - Chuo cha Elimu au Chuo Kikuu ☐

6. Je, kabila lako ni gani? ☐

- Maasai ☐
- Kabila Lingine (Taja) _____

7. Je, una watoto wangapi? (mara ambazo umezaa)

- 1Hii ni Mimba ya Kwanza (Primi –gravida) ☐
- Watoto 1 - 4 (Para 1,2,3,4) ☐
- Watoto 5 au zaidi (Para 5 +) ☐

8. Je, huwa unavuta sigara au kutumia tumbaku? Ndiyo/Hapana ----------
9. Je, wewe hunywa pombe? Ndiyo/Hapana _____
10. Je mume wako huvuta sigara/hutumia tumbaku au hunywa pombe? (Taja) ☐

- Huvuta sigara ☐
- Hutumia tumbaku ☐
- Hunywa pombe

11. Je, huwa unasafiri kilomita ngapi kufika hospitali (umbali unaosafiri)?

- Chini ya Kilomita 1 ☐
- Kilomita 1 - 5 ☐☐
- Zaidi ya Kilomita 5

12. Je, huwa inakuchukua muda gani kusafiri kuja hospitali?

- Dakika 15 au chini ☐
- Dakika 15 - 30 ☐
- Dakika 30 - Saa 1 ☐☐
- Zaidi ya saa 1

13. Je, unafanya kazi gani?

- Kufuga ng'ombe/mifugo ☐
- Mkulima wa shamba dogo ☐☐
- Mkulima wa shamba kubwa ☐
- Mfanyabiashara
- Nyingine (taja) _____

14. Kama ameolewa: Je, mume wako anafanya kazi gani?

- Kufuga ng'ombe/mifugo ☐
- Mkulima wa shamba dogo ☐☐
- Mkulima wa shamba kubwa
- Mfanyabiashara ☐
- Nyingine (taja) _____

15. Nani huamua wakati na mahali pa kwenda hospitali, kununua vitu muhimu nyumbani, au kutembelea familia?

- Mwanamke ☐☐
- Mume wake ☐
- Mwanafamilia mwingine (taja)

16. Je, mume wako huwa anakuja kwenye kliniki ya wajawazito na wewe? Ndiyo/Hapana ___ kama Ndiyo, mara ngapi? ☐

- Kila wakati
- Wakati mwingine ☐

17. Je, familia yako ina mali yoyote kati ya zifuatazo? (Raslimali)

- Redio ☐
- Televisheni ☐
- Ng'ombe/Mifugo (Taja idadi kama inawezekana) ☐
- Baiskeli ☐
- Pikipiki ☐
- Gari ☐
- Biashara ☐
- Shamba
- Zingine (taja) _____

18. Je, wewe na familia yako mnaishi katika nyumba ya aina gani?

- Manyatta ☐
- Nyumba ya kibanda yenye paa la nyasi ☐
- Nyumba yenye paa la mabati ☐
- Nyumba ya kukodi ☐

SEHEMU YA C (MATOKEO BAADA YA KUZAA)

1. Tafadhali nipe nambari yako ya simu _____
2. Je, ulimzalia mtoto wako wapi? ☐

- Hospitali ☐
- Nyumbani ☐
- Njiani kwenda hospitali

3. Kama ulizalia nyumbani; ni nani alikusaidia ulipokuwa ukizaa? ☐

- Mhudumu wa afya ☐
- Mkunga
- Mwanafamilia ☐
- Mtu mwingine (Taja) _____

4. Hali ya mtoto ilikuwa vipi?

- Alilia papo hapo ☐
- Alilia baada ya dakika chache ☐
- Hakulia kabisa ☐☐
- Hakuwa anasonga hata kidogo

5. Je, ulipata matatizo yoyote wakati wa kuzaa?

- Ndiyo ☐☐
- Hapana

6. Kama ndiyo, ulipata matatizo gani?

- Nilipata uchungu kwa muda mrefu kabla ya kuzaa ☐
- Kutokwa na damu ☐☐
- Maambukizi; ikiwa ni pamoja na Malaria (taja) _____
- Majeraha kwenye sehemu za siri/msamba ☐
- Dalili kama za kifafa ☐
- Mengine (taja) _____

7. Je, mtoto alikuwa na uzito gani alipozaliwa? _____
8. Je, mtoto alipata chanjo baada ya kuzaliwa? ☐

- Ndiyo ☐
- Hapana

9. Je, ulitumwa kwenye kituo kingine cha afya/hospitali nyingine kutoka kwenye kituo cha kwanza ulichotembelea? ☐

- Ndiyo ☐
- Hapana

10. Kama ndiyo, ulitumwa kwenye kituo kipi/hospitali ipi? ☐

- Hospitali ya Rufaa ya Kaunti
- Kwingineko (Taja) _____

SEHEMU YA E <u>KUKUBALIKA KWA HATUA ILIYOCHUKULIWA</u>

1. Je, uliewa SMS tulizokuwa tunakutumia?

- Ndiyo ☐
- Hapana ☐

2. Kama jibu ni hapana, je, ulikuwa na mtu wa kukuelezea? ☐

- Ndiyo ☐
- Hapana

3. Kama jibu ni ndiyo, mtu huyo alikuwa nani? ☐

- Mume wangu
- Mtoto wangu ☐
- Mwanafamilia ☐

- Jirani ☐

4. Je, SMS ulizokuwa ukitumiwa ulikufaa kwa kiasi gani wakati ulikuwa mjamzito?

- Zilinisaidia sana ☐
- Zilinisaidia ☐☐
- Hazikunisaidia

5. Kama hazikukusaidia, ni kwa sababu gani?

_____

6. Je, SMS tulizokuwa tunakutumia zilikuwa zinafaa?

- Zilifaa sana ☐
- Zilifaa ☐
- Hazikufaa

7. Kama hazikufaa, ni sehemu gani haikufaa?

- Jinsi ilivyoandikwa ☐☐
- Maana ☐
- Wakati SMS zilikuwa zikitumwa

8. Je, mume wako/mwenzi wako alihusika katika shughuli za kwenda kliniki? ☐

- Ndiyo ☐

- Hapana

9. Kama hakushiriki, ni nini kilifanya asishiriki? ☐

   - Alikuwa kazini ☐☐
   - Sababu za Kitamaduni/Kimila
   - Umbali wa kliniki ☐
   - Gharama ☐

10. Je, tunawezaje kufanya SMS hizo ziwe bora zaidi?

   - Kutumia picha (MMS) ☐
   - Kutumia ujumbe wa sauti ☐☐
   - Kutumia ujumbe wa video

NYONGEZA D FOMU YA KUTOA IDHINI KWA UFAHAMU

CHUO KIKUU CHA KILIMO NA TEKNOLOJIA CHA JOMO KENYATTA (JKUAT)

TAASISI YA TIBA YA MAGONJWA YA TROPIKI NA YA KUAMBUKIZA (ITROMID)

KEMRI

Fomu hii ya Kutoa Idhini kwa Ufahamu ni ya kutumika na wanawake ambao wanahudhuria kliniki ya wajawazito katika Kaunti ya Narok, na ambao nawaomba washiriki katika utafiti unaolenga kuboresha huduma kwa kina mama wajawazito. Kichwa cha mradi wangu wa utafiti ni "MATUMIZI YA MBINU YA SIMU ZA MKONONI KATIKA KLINIKI ZA WAJAWAZITO NA ATHARI ZAKE KWA

MATOKEO BAADA YA KUZAA KATIKA JAMII YA WAFUGAJI NCHINI KENYA"

Jina la Mtafiti Mkuu: Dkt. Daniel Mwendwa Muvengei

Jina la Shirika: JKUAT, Taasisi ya Tiba ya Magonjwa ya Tropiki na ya Kuambukiza (ITROMID), KEMRI

SEHEMU YA I: Kurasa za Maelezo

Utambulisho

Jina langu ni Daniel Mwendwa Muvengei, nasomea shahada ya PhD katika Taasisi ya Tiba ya Magonjwa ya Tropiki na ya Kuambukiza (ITROMID) huko Chuo Kikuu cha Kilimo na Teknolojia cha Jomo Kenyatta (JKUAT). Nafanya utafiti kuhusu mara ambazo kina mama wanahudhuria kliniki za wajawazito, na jinsi zinaathiri matokeo wakati wa kuzaa. Katika maeneo fulani hapa nchini Kenya, kina mama huwa wanahudhuria kliniki mara chache. Natafiti kama kuwatumia kina mama wajawazito SMS kwenye simu zao mkononi kunaweza kuongeza mara ambazo watahudhuria kliniki na hivyo kuboresha matokeo kwa mama na mtoto. Nitakupatia maelezo kisha nikuombe uwe mshiriki katika utafiti huu. Si lazima uamue leo kama utashiriki katika utafiti huu au la. Kabla hujamua, unaweza kuzungumza na mtu yeyote unayehisi sawa naye kuhusu utafiti huu.

Kama kuna maneno ambayo huelewi, tafadhali niulize tunapopitia maelezo na nitakueleza. Ukiwa na maswali hapo baadaye, unaweza kuniuliza mimi au wafanyakazi wa utafiti huu.

Sababu ya kufanya utafiti huu

Ni muhimu sana kwa kina mama kwenda kliniki wakiwa wajawazito ili wafuatiliwe. Katika sehemu nyingi nchini Kenya, kiwango cha kwenda kliniki ya wajawazito bado kiko chini sana. Matokeo wakati wa kuzaa nchini Kenya bado si mazuri; kina

mama wengi hufa wakiwa wajawazito na wakati wa kuzaa. Tunafanya utafiti huu kutafuta njia za kuongeza mara ambazo kina mama wajawazito wanakwenda kliniki ANC ambapo wanaweza kufuatiliwa kwa karibu, na kama kuna matatizo yoyote, yanaweza kugunduliwa mapema na kutibiwa. Kwa kufanya hivyo, tunatarajia kuboresha matokeo kwa mama na mtoto wakati wa kuzaa.

Aina ya Mbinu ya Utafiti

Utafiti huu utahusisha kukutumia ujumbe wa SMS na na pia kukupigia simu siku ulizowekewa kwenda kliniki zikikikaribia ili kukujulisha umuhimu wa kwenda kliniki na pia kukukumbusha tarehe unayotakiwa uende kliniki. Kutuwezesha kujua kama mibu hii itakuwa na manufaa, kutakuwa na vikundi viwili. Mbinu ya utafiti itatumika katika kikundi kimoja, na kikundi cha pili kitafuatiliwa kama kawaida. Kisha nitalinganisha vikundi hivyo viwili ili nione kama mbinu tuliyotumia itaboresha matokeo ya afya wakati wa kuzaa.

Kuchaguliwa kwa Washiriki

Tunamwalika mwanamke yeyote mjamzito aliye katika katika mwezi wa nne hadi wa saba wa ujauzito katika Kaunti ya Narok ashiriki.

Kushiriki kwa Hiari

Kushiriki katika utafiti huu ni kwa hiari kabisa. Ni chaguo lako kama utashiriki au hapna. Ukichagua kushiriki au kutoshiriki, huduma zote unazopokea katika kliniki zitaendelea bila mabadiliko yoyote. Ukichagua kwamba hutashiriki katika mradi huu wa utafiti, utapewa matibabu ya kawaida yanayotolewa katika kliniki/hospitali hii, na tutakuambia zaidi kuhusu baadaye. Unaweza pia kubadilisha uamuzi wako baadaye na uache kushiriki hata kama ulikuwa umekubali hapo mbeleni.

Utaratibu na Mpangilio

Utafiti utakuwa ukichunguza mbinu ya kutumia simu za mkononi kuboresha kiwango cha kuhudhuria kliniki ya wajawazito na athari yake kwenye matokeo kwa mama na mtoto wakati wa kuzaa. Ili kuelewa kama mbinu hiyo inafanya kazi

kutakuwa na vikundi viwili vya utafiti; mbinu itatumika kwenye kikundi kimoja na kingine kitapata huduma kama ilivyo kawaida. Matokeo ya vikundi hivi viwili yatalinganishwa ili kuona athari. Washiriki wa utafiti watawekwa katika vikundi hivi bila mpangilio maalum; kw mfano, kwa kurusha shilingi juu

Ni muhimu kwamba habari kuhusu kikundi utakachowekwa zibaki siri. Habari hii itakuwa katika faili zetu na itatumika baada ya utafiti kulinganisha matokeo. Hii ndiyo njia bora tuliyo nayo ya kufanya uchuguzi bila kuathiri matokeo ya vikundi kwa sababu ya habari zinazotolewa kati ya vikundi hivi viwili. Tutalinganisha matokeo ya vikundi hivyo viwili.

Wahudumu wa afya watakutunza wewe na washiriki wengine kwa makini sana wakati wa utafiti. Kama una wasiwasi kuhusu kitu chochote au unasumbuliwa na kitu chochote kuhusu utafiti huu, tafadhali zungumza na mimi au mmoja wa watafiti wenzangu.

Muda

Utafiti unafanyika katika kipindi cha miezi 12 kwa jumla (kuanzia unapoingia katika utafiti hadi wiki 6 baada ya kuzaa). Katika wakati huo, utahitajika kuja kliniki / hospitali / kituo cha afya wakati habari na watoa huduma za afya ya kufanya hivyo. Tungependa pia kukutana na wewe wiki 6 baada ya kujifungua ili upate uchunguzi wa mwisho.

Uwezekano wa Hatari

Kwa kushiriki katika utafiti huu, hatari zinazoweza kutokea ni ndogo sana.

Faida/Manufaa

Huenda usipate manufaa mengi ya moja kwa moja kwako lakini kwa kushiriki, unaweza kutusaidia kupata jibu la maswali ya utafiti. Baadhi ya faida utakazopata ni kama kufuatiliwa wakati wa ujauzito na kupata matibabu ya haraka matatizo yoyote yakigunduliwa. Huenda kusiwe na faida yoyote kwa jamii katika hatua hii ya utafiti, lakini hapo baadaye, kuna uwezekano kwamba kina mama watafaidika tukihakikisha

kwamba kiwango cha kuhudhuria kliniki za wajawazito kinaimarika, kwani watapata matatizo machache zaidi (ikiwa ni pamoja na vifo) na hivyo afya ya jamii kwa jumla itakuwa bora zaidi.

Usiri

Katika utafiti huu, jambo lisilo la kawaida linafanyika katika jamii yako. Watu wengine katika jamii wakijua kwamba unashiriki, wanaweza kukuuliza maswali. Hatutafichua ni kina nani wanashiriki katika utafiti huu.

Habari tutakazokusanya katika mradi huu wa utafiti zitakuwa siri. Habari kukuhusu zitakazokusanywa wakati wa utafiti zitawekwa mbali na hakuna mtu mwingine atakayeweza kuiona isipokuwa watafiti. Habari zozote kukuhusu zitakuwa na na nambari yake badala ya jina lako. Ni watafiti tu watajua nambari yako na habari hizo zitawekwa salama kwa kufuli. Habari hizo hazitafichuliwa wala kutolewa kwa mtu yeyote isipokuwa watafiti na wasimamizi wa utafiti katika chuo kikuu.

Kushiriki Matokeo

Maarifa ktutakayopata kutokana na utafiti huu yatatolewa kwako kupitia mikutano ya jamii kabla ya kutolewa kwa umma kwa jumla. Habari za siri itakuwa hazitatolewa. Tutatangaza mikutano midogo ya jamii ili tutatangaze matokeo. Baada ya mikutano hiyo, tutachapisha matokeo ili watu wengine waweze kujifunza kutokana na utafiti wetu.

Haki ya Kukataa au Kujiondoa

Si lazima ushiriki katika utafiti huu kama hutaki kufanya hivyo, na kukataa kushiriki hakutaathiri matibabu yako katika kituo cha afya/kliniki kwa njia yoyote. Bado utapata faida zote ambazo ungepata katika kliniki hii. Unaweza kuacha kushiriki katika utafiti wakati wowote unaotaka bila ya kupoteza haki zako zozote kama mgonjwa hapa. Huduma uanzopata katika kliniki hazitaathirika kwa njia yoyote.

Mawasiliano

Kama una maswali yoyote, unaweza kuuliza sasa au baadaye, hata baada ya utafiti kuanza. Ukitaka kuuliza maswali baadaye, unaweza kuwasiliana na:

Daniel Muvengei 0722555210 muvengei.md@gmail.com

Hati hii imekaguliwa na kuidhinishwa na Kamati ya KEMRI ya Maadili katika Utafiti (ERC), ambayo ni kamati iliyo na jukumu la kuhakikisha kwamba washiriki wa utafiti wanakingwa dhidi ya madhara. Ukitaka kupata maelezo zaidi kuhusu kamati ya ERC, wasiliana na Dkt. Rashid Juma kupitia simu +254-20-272-6781, barua pepe ercadmin@kemri.org, S.L.P 54840-00200 Nairobi]).

Ukitaka, unaweza kuniuliza maswali mengine uliyo nayo kuhusu sehemu yoyote ya utafiti huu. Je, una maswali yoyote?

SEHEMU II: Hati ya Kutoa Idhini

Nimesoma maelezo yaliyotangulia, au nimesomewa maelezo hayo. Nimepewa nafasi ya kuuliza maswali kuhusu maelezo hayo na maswali yoyote ambayo nimeuliza yamejibiwa nikaridhika. Nakubali kuwa mshiriki katika utafiti huu kwa hiari yangu.

Jina la Mshiriki kwa Herufi Kubwa_____

Sahihi ya Mshiriki _____

Tarehe _____

Siku/mwezi/mwaka

Kama hajui kusoma/kuandika

Nimeshuhudia mshiriki mtarajiwa akisomewa fomu ya kutoa idhini kikamilifu, na amepewa nafasi ya kuuliza maswali. Ninathibitisha kwamba ametoa idhini kwa hiari yake.

Jina la shahihidi kwa herufi kubwa_____ NA alama ya kidole gumba cha mshiriki

Sahihi ya shahidi _____ 

Tarehe _____

Siku/mwezi/mwaka

Thibitisho la mtafiti/mtu anayerekodi idhini

Nimemsomea mshiriki mtarajiwa kurasa za maelezo kwa usahihi, na kadri niwezavyo, nimehakikisha kwamba mshiriki anaelewa kwamba yafuatayo yatafanyika:

1. Washiriki watasajiliwa katika utafiti wakiwa katika katika mwezi wa nne hadi wa saba wa ujauzito na watafuatiliwa kwa wiki sita baada ya kuzaa.

2. Washiriki wa utafiti watawekwa katika vikundi viwili bila utaratibu maalum; mbinu ya utafiti itatumika kwenye kikundi kimoja na kingine kitapata huduma kama ilivyo kawaida.

3. Katika kikundi ambacho mbinu ya utafiti itatumika, washiriki watapata hatua inayowalenga inayotumia simu za mkononi, kisha watafuatiliwa kuona kama mbinu hii italeta matokeo bora zaidi baada ya kuzaa ukilinganisha na kikundi kitakachopata huduma kama kawaida.

Ninathibitisha kwamba mshiriki alipewa nafasi ya kuuliza maswali kuhusu utafiti huu, na nimejibu maswali yote aliyouliza mshiriki kwa usahihi na kadri ya uwezo

wangu.Ninathibitisha kwamba mtu huyu hajalazimishwa katika kutoa idhini, na ametoa idhini kwa uhuru na kwa hiari yake.

Mshiriki amepewa nakala ya fomu hii ya kutoa idhini kwa ufahamu.

Jina la Mtafiti / mtu anayerekodi idhini kwa herufi kubwa_____

Sahihi ya Mtafiti / mtu anayerekodi idhini_____

Tarehe _____

Siku/mwezi/mwaka

Appendix V: Maasai Translation

ESIAI NAITERUNYE A: ENKILIKUANISHORE

Enkiterunoto

Ore enkarna ai naa Daniel Mwendwa Muvengei olaleenoni/nara olaretoni loo loosita eleenore e engeno enkisuma eshumata e PhD te Jomo Kenyatta tenkishakino enkiremore oo esiai oolashumpa (JKUAT). Aasita eleenore oo mooyiaritin oo ntasati naanununta onyamalitin naatum teishoi enye te enkop ang E Kenya, ore ntasati naanuta naa katitin kuti oshi epuo kilinik. Ekagira aleen anaa ore teneiriwakini intasati naanuta olkilikuai too simui enye aitadamu pee etum ashom kilinik naa keretu entomononi nanuta o enkerai enye.

Ekaalo aikilikuanishore irorei ootie ene nikilo aret aliki naipirta,Ore tenetii irorei le miningu esidai nikiliki pee aigil enajeito.

Enkipirta Ena Leenore

Ore elototo e kilinik naa enetipat te rishata enutai.Eton etii elototo e kilinik abori te nkop e kenya. Ore natayioloki naa ore eramatata entomononi o enkerai neton etii abori, amu etii intasati naye ena kata enuta o teishoi. Kiasita ena leenore pee kiindim ataretu ntasati nanuta pee eidim ashom kilinik (ANC) nikirukurukore pee kiretu ena kata natum inyamalitin nesiokini ayiolou pee ebaikini. Ore tena nikisilig ajo kiretu biotisho entasat o enoonkera.

ENCHOTO EE A (MBAA NAAIPIRTA OLMAREI O LMANYISHO)

1. Nchooki Nampa esimu ino _____
2. Amaa kiama ino aji ikununo?
    - Maema ☐
    - Kaema ☐
    - Kitunguarote olpayian ☐
    - Kitoorote o lpayian lai ☐
3. Ti alo ari apa kitoiwuoki _____

4. Kaji itabaikia tenkisuma ino?
    - Itu alo sukuul katukul ☐
    - Sukuul oo ndarasani ee abori ☐
    - Sukuul e sekondari ☐
    - Sukuul eshumata ☐

5. Amaa, olpayian lino kai etabaikia tenkisuma enye?
    - Eitule elo sukuul katukul ☐
    - Sukuul eabori arashu abori enye ☐
    - Sukuul e sekondari ☐
    - Sukuul eshumata ☐

6. Amaa, Ira eniaalo osho/ ira eniaa kutuk?
    - Maasai ☐
    - Mme olmaasani (Tolimu) ☐_____
7. Amaa, kenkera aja itoiwuo?(naishu oo nitala)?
    - Ore ena naa enkerai ai edukuya ☐
    - Inkera 1-4 (Mara, nabo,are,uni,onguan) ☐
    - Inkera imiet arashu kumok (Mara imiet+) ☐
8. Amaa, impir oshi enkukuo arashu isug enkisugi? Eee/Aaa _____
9. Amaa, iwok oshi enaisho? Eee/Aaa _____
10. Amaa, kiipir olpayian lino enkukuo/ anaa eisug enaisugi anaa eok enaisho? (Tolimu)
    - Keipir oshi enkukuo ☐
    - Keisug enaisugi ☐
    - Keok enaisho ☐

11. Amaa,kebaa oshi elakuani e sipitali?
    - Abori enkilomita nabo ☐
    - Inkilomitani nabo-imiet ☐
    - Kegiroo inkilomitani imiet ☐Tolimu_____

(Musumusu elakuani anaa enkitokoji nainguaa o loolita)

12. Amaa, kebaa oshi enkata niya peyie ibaya sipitali?
    - Ildakikani Tomon o imiet arashu Kuti ☐
    - ldakikani Tomon o imiet aa tomon uni ☐
    - Ildakikani Tomon uni ometabaki esaa nabo ☐
    - Kegiroo esaa nabo ☐

13. Amaa, kaa siai iasita?
    - Eramatare oo nkishu/eramatare ☐
    - Olairemoni lolchamba kiti ☐
    - Olairemoni lolchamba sapuk ☐
    - Olbiasharai ☐
    - Nkulie ☐ Tolimu_____

14. Kamaa tenaa iama: aa esiai olpayian lino?
    - Eramatare oo nkishu ☐
    - Olairemoni lolchamba kiti ☐
    - Olairemoni lolchamba Sapuk ☐
    - Olbiasharai ☐
    - Nkulie ☐ Tolimu_____
15. Engai oshi nalimu enkata o eweji aa sipitali o enkinyanga oo ntokitin e ang arashu baikino olmarei?
    - Enkitok (nanu) ☐
    - Olpayian lai ☐
    - Likai tungani lolmarei (Tolimu)_____
16. Amaa, iriamariri oshi olpayian lino kilinik? Eee/Aaaa_____ Kamaa tenaa eee, too nkatitin aja?
    - Isaai pokin ☐
    - Too nkulie saai ☐
17. Amaa keeta olmarei lino kuna tokitin?
    - Redio ☐
    - Telepishon ☐
    - Empaisikil ☐
    - Entuktuk ☐
    - Engari ☐
    - Biashara ☐
    - Enkop ☐
    - Nkulie ☐ (tolimu)_____
18. Amaa, aabila enkaji imanyanya?
    - Enkaji nara enang ☐
    - Enkaji nikilakita ☐
19. Amaa enkaji nimanyanya naa kai ikununo?
    - Enkaji emodiei ☐
    - Enkaji oo nkujit shumata ☐
    - Enkaji oo mabatini shumata ☐
    - Enkaji esarngab ☐
    - Enkaji ematofali ☐
    - Enkaji esoit ☐

ENAIPUKO EE C (ENETIU TENEINDIP ATOISHO)

1. Nchooki nampai inonok esimu_____
2. Ketiai apa itoiwuo enkerai ino?
   - Tesipitali ☐
   - Ttiang ☐
   - Tenkoitoi aloito sipitali ☐
3. Amaa,ketiang apa itoshe;naa engai apa nikitaretuo igira aisho?
   - Ilaasak le sipitali ☐
   - Enkaitoyioni ☐
   - Oltungani lo marei ☐
   - Likai tungani ☐ (tolimu) _____
4. Ai ikunono enkerai pee eini?
   - Ishira teina kata ☐
   - Ishira peyie engiroo ilkuti daikani ☐
   - Eitu ishir pii ☐
   - Eitu ingunnugun katukul ☐
5. Amaa ,inoto apa enyamali igira aisho?
   - Eee ☐
   - Eitu ☐
6. Amaa tena eee,kakua nyamalitin inoto?
   - Anoto emion sapuk eton eitu aisho ☐
   - Ao/awo ☐
   - Kaata apa moyiaritin tenebo oo malaria (Tolimu)☐ _____
   - Atabee enkoitoi/eneimu enkerai ☐
   - Enkitodolunoto enkiteria ☐
   - Nkulie □ Tolimu_____☐
7. Kebaa apa enkiroshi enkerai pee eini?_____
8. Ketokordaki apa enkerai pee eini
   - Eee ☐
   - Eitu ☐
9. Eikiriwayie enapa sipitali e dukuya ai sipitali?
   - Eee ☐
   - Eitu ☐
10. Amaa tena eee,kaji apa ine nikiriwayioki/aaa sipitali nabo?

•Sipitali naa ene county □ ☐

•Ai wei (tolimu)_____ ☐

ENAIPUKOI EE E; AIRUKOKI ILOMON OIKILIKUANUAKI

1. Itoninguo apa ilomon likiriwakaki te simu?

•Eee ☐

•Eitu ☐

2. Ainyoo pee eitu? _____

3. Amaa teneitu inoto apa oltungani likisumaka?

•Eee ☐

•Eitu ☐

4. Amaa tena eee,eingai?

•Olpayian ☐

•Enkerai ☐

•Oltungani lo lmarei ☐

•Elatia ☐

5. Keeta tipat ilomon loiruwuaki tenasiai eleenore?

•Tipat sapuk ☐

•Le tipat ake ☐

•Mme le tipat ☐

6. Amaa tenaa mee letipat,ainyoo nimisho?

_____

7. Kenarikino ilo kilikuai likiriwakaki?

•Kenarikino Oleng ☐

•Kenarikino ☐

•Menarikino ☐

8. Amaa tene menarikino akua apa lemenarikino?

•Iroorei ☐

•Enkipirta ☐

☐

•Enkata ilo rorei

9. Ketii apa olpayian lino te nkata ekilinik?

•Ketii ☐

•Metii ☐

10. Amaa tenetii kainyioo apa etaasa etii ine?

•Atoriko apa kilinik ☐

•Aitadamua inkolongi ekilinik ☐

11. Amaa teneitu,kainyo naikuna pee eitu kiretu

•Esiai ☐

•Imbaa ang olkuak ☐

•Elakuani ☐

•Kegol ☐

12. Kanyoosa eesi pee esidanu irorei likiriwakini

•Pee eesishoreki ntokitin naalio ☐

•Airiu olkilikuai oinininingi ☐

•Airiu olkilikuai oingorie ☐ ☐

•Nkulie (tolimu) ☐

ENKALO E B EMPALAI NAISHORUNO

UNIVERSITY E ENKIREMORE O ESIAI OOLASHUMPA AA JOMO KENYATTA

TE INSTITUTE ESHUMATA OLKEEK O MOYIARITIN NASHURTAKINOI.

KEMRI CAMPUS

Ore enapalai naa enoontomonok napuo kilinik te county e narok, naitoomon iltungana oyieu naaret tena leenore pee kishet kilinik. Ore enkarna ena leenore naa "ENEIKONI PEE ESISHOREKI ESIMU TE KILINIK OONTUAN PEE

EYIOLOUNI ENAKATA EIDIPA ATOISHO TO LOSHO LOO LARAMATAK TE NKOP E KENYA".

Enkarna olaleenoni kitok_ Daniel Mwendwa Muvengei

Enkarna oltururr: JKUAT institute olkeek leshumata omoyiaritin nashurtakinoi

KEMRI

EOROTI 1: Empalai oo lomon

Enkiterunoto

Kaaji nanu Daniel Mwendwa Muvengei nagira aisuma te sukuul eshumata e Jomo Kenyatta aasita PhD teina sukuul enkiremore ombaa oolchambai te institute o lkeek o moyiaritin nashurtakinoi (ITROMID).kaasita eleenore napuoi kilinik, amu eton etii elototo e kilinik abori te nkop e kenya, o olpukunyie oipirta eishioi.Ekagira aitengenu too mbaa esimu nairiwaa olkilikuai pee eilepunyie elototo e kilinik neshet biotisho entasat o enkerai. Ekaisho intai ilikiliku naitoomon sii intai pee iyakuku tenebo tena leenore. Ore eton eitu inyoraa tanaa ijing aaku tenebo oo yiook te leenore. Naa iindim airorieoltungani liyieu naiipirta eleenore.

Te netii irorei lemiringu naa kaomon pee kintasheiyie pee atumoki aigila naa teniata sii iyie inkilikuanata niyieu ikinkilikuanaki arashu nikilikuan olaretoni lena leenore.

Enkipirta eleenore

Ore elototo e kilinik enakata enutai naa keyieu neirritai. Eton etii elototo e kilinik abori to losho le Kenya. Ore eishoi ENTOMONONI neton ake mesidai tenebo o ene nkerai naini tolosho le kenya neeku kee ntomonok kumok egira aisho. Ekiasita ena leenore pee kitum enkoitoi nikiretunyie elototo e kilinik nikisuj intomonok paa tenetii nyamalitin netumi atasioki atayiolo neingurari.

Empukunoto oo nkiasin e leenore

Ore ena leenore naa olkilikuai kiriwakini nikioshokini Sii esimu pee kitum atoliki iyie tipatisho elototo e kilinik nikitum Sii aitadamu iyie olkekun lilotie kilinik. Keji pee eyiolouni tanaa keesishoyu ena siai,keeku ketii sii luat are oo lturruri. Ore olturrur le dukuya naa etum aaku nince eesishoreki tena leenore. Ore olturrur le are naa esuji enooshi ake. Asi nalotu nanu aitanyanyuk kulo turruri pokira ayiolou tanaa ore inkiasin ena leenore naakeretu eishoi.

Enshilare oo naaponu eleenore.

Kintomonita intomonok pooki naanuta naati eiteru olapa le are te county e narok pee eponu enshilare.

Enkitaito e makeon pee kiasishoreki

Ore enkitaito naa ene makeon tena leenore naa ene pesho. Oltungani ogelu tanaa keesishoreki. Ore oloosishoreki naa ketum enoshiake huduma Meeta ai naibelekenyi. Teneitu sii kiasishoreki tena leenore naa itum naake enoshiake ngura te kilinik/sipitali naa ekiliki iyie ingumok ade. Iindim sii aibelekenyayu atejomeekure intai Keon te na leenore hoo nindipa apa atejo ias.

Iloitayu ate pesho peyie itaisheki

Ore enkitasheikino ino tenekingorunoto engeno naa enepesho pee yie igelu ta naa intasheki arashu iyany, teninyoraa arashu tenitanya naa ore imbaa naingurari intai te kilinik naa kepuo ake dukuya nemeeta entoki naibelekenya,Ekibaikin ake te sipitali pesho ena oshi ake. ana ekilki ake yie enkipirta enaa siai too nkulie olongi,Ebaki sii nibelekeny indamunot ajo meketure intayu keon tenasiai hoo nindipa apa atejo iyas.

Inkoitoi naasuji te leenore.

Ore ena leenore naa pee eesishoreki esimu naji pee eretu elototo e kilinik neitoki sii aretu entomononi o enkerai. Pee eyiolouni tanaa keesisho ena siai esimu naa ketii ilturruri are;aa ore olturrur le dukuya na nince eesishoreki ore oliare naa oloshiake kuak le kilinik esuj. Ore idipaki neitanyanyuki kiasin enye e kilinik. Ore intomonok naasishoreki te leenore naa egelakini ilturruri anaa aibelekeny enchilingi.____

Ore enakisuma naa peyie ingurari esimu weretunoto te kilinik oontomonk nanuta peyie etum aetu tenkumoyu naa ore esidano enye naa peyie eretu intomonok naanuta onkera naini.

Enetipat teniyiolou ajo ore ilomon loturrur litii naa letipat naa eisudori. Ore ilomon likitum naa keisudori too lfaili lang pee kintanyanyuk kulo omon. Ena enkoitoi sidai nikiata nikitemie eitu kiimbung iwalat naaji ebaiki netiakaki ilturruri. Nekintanyanyuk taa ilturruri pokira.

Ore ilaasak lesipitali naa ekirira iyie o lkulie tungana likiasishore abaraki. Naa tenetii aitoki a nimen arashu tiniata entoki nikigira nikintanyamal naipirta eleenore naa aomon tolikioki arashu iliki oboo lookulo aretok le leenore.

Enkata

Ore ena leenore naa ekeya ilapaitin Tomon are (tenkata enkiterunoto ometaba anaa iwiki ile eidipa entomononi atoisho) ore te inakata naa kesidai Oleng tenilotu kilinik arashu sipitali enkata nikijoki olaasani le sipitali.,ekiyieu Sii niikitumore iyie Indipa atoisho pee kinguraa iyie tenkata nabayie,

Inyamalitin

eikuti oleng inyamalitin nitum tena leenore.

Esidano ena siai

Ebaiki nemetii esidano nikimpirare iyie kake ore eretunoto ino ninye naisho iyiook mainoto iwalat oo nkilikuanat ee leenore. Ore esidano naa ekitumi airrira tena kata e nutai oo pee itum embaare tenetii enyamali. Ebaki nemetii dikir/esidano nalo emurua atum tenakata kake elo kenya ena leenore aretu intomok pee etum ashom kilinik neeku metum inyamalitin oo nkeyaritin.Naa ina naretu emurua.

Esudoroto oo lomon le leenore.

Ore ena leenore naa entoki etipat te murua inyi, eidimayu netii iltungana le murua ooyiolo ajo itii tenebo e leenore nebaki nikinkilikuanishore. Mikilikio iyiook inkarn oo lelelo oretu iyiiok te leenore.

Ore iwalat nikitum tena leenore naa ekisudoo. Ore ilomon linonok likinoto tena leenoore naa ekisudoo pee metii likai tungani odol meteleku olaleenoni. Neeku ore imbaa nikimpirta naa keeku keeta namba naitasheki enkarna ino. Ilaleenok ake oyiolou nampa ino neikenoo ilomon te nkikenet.Mengarieki kulo omon likai tungani meteleku ilaleenok o ilkituaak le leenore te university

Olgara loo walat

Ore engeno nikitum te leenore naa kengarieki intai too tumoritin e murua eton eitu eitayioli iltungana pooki.keeku keetai intumoritin kutiti emurua naa ekipuo alikioo.ore pee idipayu kuna tumoritin naa ekipuo aiger metaa ketum iltungana pooki oyieu negenu te leenore, ekisudoo Sii ilomon le tipat.

Esipata nianyie/Nipalie

Mikiarakini Taa pee iyaku nabo oo laasishoreki, te nimiyieu, arashu teniyieu nipuku mikimitikini nemeeta enaiko teneeku embaata te kilinik,Kake eton sii ake itum ereteto te kilinik ,iindim atapal ataa tenebo tiatu eleenore enkata pooki niyieu nemeimin esipata ino ira oltamweiyiai tene. Meimin/mekimitikini embaata ino e kilinik.

Oltungani lirorie

Ore teniata inkilikuanat naa iindim aikilikuanu tanakata entoki niyeu ninkilikwanu tenakata arashu ade, likai kekun,hoo iterua ena Siai ore teneiata nirorie kuna amba.

Enkarna, namba esimu,e-mail adress

Ore ena palai neimaitie kemri nenyoraa komitii e SERU, (SERU) ore ena komitii naa ninye naitasheshi ilaasak le leenore pee Metum inyamalitin,ore te niyieu niyolou inkumok naipirta ena SERU,nirorie

Enkarna,namba esimu 0711719447 email seru@kemri.org, P.O. BOX 54840-00200 Nairobi.

Ekiindim naikilikuanaentoki nabaa enaa eniyieu naipirta enasiai eleenore,iyata entoki niyieu ninkilikwanu?

ENCHOTO II: Empalai Natukunyi.

Aisuma kuna baa naatolimwoki,oo aisumakaki,naanoto sii erishata naikilikwanishore natoola ana enkidimata ai,atonyorayie pee aitai keon pee aaku nabo te leenore.

Enkarna oloitaiyio keon/oloosishoreki_____

Olkordata oloitaiyio keon/oloosishoreki_____

Entariki_____

Enkolong/Olapa/Olari

Ore te neitu isum

Aishakenoko e rorei ajo kesipa naa ara olaitayio keon ,neeta olaleenoni makeon erishata naikilikwanishore. Atonyorayie,ajo atoola makeon te lakunoto.

Enkarna oloishakenuo_____ Eweji nitukuny tolkimojino

Olkordata loloishakenoie_____

Entariki_____

Enkolong/olapa/olari

Enajo olaleenoni/oltungani oiita olningo.

Aisumaka kulo omon oingero tena palai oloikilikwanishoreki te nkariyiano oo te ngeno ai pooki aa kajo pee eyiolou oloikilikwanishoreki kuna baa pooki:

1. Ore engelare naa keeku enoontuan natii olapa le okuni nilep ometabai ewiki eile eidipa eishoi.

2. Ore loikilikwanishoreki keori negelakini olturrur ,metaa ekeetai ilurruri are obo oikilikwanishoreki likai oos naas oshi ake.

3. Ore olturrur oikilikwanishoreki naa kishori esimu i pee etumi atusujainguraa tena keretu intomonok naanuta alang kunda oshi ake nagira ainguraa enaa oshi ake.

Ekasip ajo eishooki olokilikwanishoreki erishata naikilikwanishore naipirta eleenore,naa ore pookinaikilikwanua natoola tesipata o enaa engeno naata.anyoraa ajo eitu earakini pee eikilikwanishoreki,kake keishorua iwalat pesho o te lakunoto enye Ore nyanyukie ena palai ee ICF naa keishori ilotaretutuo olootasishoreki/olaitaiyio keon.

Enkarna olaleenoni/olotonyorayie_____

Olkordata olaleenoni/olotonyorayie_____

Entariki_____

Enkolong/Olapa/Olari

Appendix VI: Study Budget

THESIS BUDGET			
ITEM	**Quantity**	**Unit Cost**	**TOTAL**
Stationery (Reams)	10	1000	10000
Stationery (packets of pens)	20	300	6000
Stationery (files)	20	1000	20000
Printing (Booklets/questionnaires)	300	200	60000
Allowances (8 Assistants @3000/month for 12 mnths 8*12)	96	3000	288000
Traveling costs (3000 for trip to and from Narok fortnightly for 12 mnths)	24	4000	96000
Airtime (5 per SMS per participant every two weeks 5*24)	120	140	16800
Airtime (10 for call for participants monthly 10*12)	120	140	16800
Airtime for the PI and assistants per facility (1000 per month 5*12)	60	1000	60000
Accommodation (5000 per night fortnightly for 12 months)	24	5000	120000
Translation costs (SMS and multimedia message translation)	1	30000	30000
Binding costs	40	500	20000
Equipment: BP machines (5 per facility)	20	5000	100000
Stethoscopes (5 per facility)	20	3000	60000
Neonatal weighing Scales (one per facility)	4	25000	100000
Fetoscopes (3 per facility)	12	3000	36000
Thermometers (5 per facility)	20	1000	20000
Lab costs: Pregnancy Diagnostic test (all participants)	280	200	56000
Full Hemogram (all participants)	280	500	140000
Internet (Modem) Connection per month for 24 months	24	3000	72000
DataBase design	1	50000	50000
Data clerks	8	5000	40000
Publishing	2	40000	80000
Total			**1,497,600**

Appendix VII: Geographical Map