

**HOSPITAL OUTCOMES OF NEWBORNS ADMITTED  
AFTER INTRODUCTION OF FREE MATERNITY  
SERVICES AT MOI TEACHING AND REFERRAL  
HOSPITAL, ELDORET, KENYA.**

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**Thesis Submitted in Partial Fulfillment of the Requirements for the  
Award of the Degree of Masters of Medicine in Child Health and  
Pediatrics, School of Medicine, Moi University**

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## DECLARATION

### Declaration by candidate:

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**DEDICATION**

I dedicate this dissertation work to my parents the late Everlyne Amanyana, Samuel Ayaya, fillings of gratitude to my lovely husband Jared Sala, and my son Edrian Sala.

## **ACKNOWLEDGEMENT**

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**ACRONYMS AND ABBREVIATIONS**

<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>ALOS</b>	Average Length of Stay
<b>CPAP</b>	Continuous Positive Airway Pressure
<b>CS</b>	Caesarean Section
<b>EmONC</b>	Emergency Obstetric and Newborn Care
<b>HIV</b>	Human Immunodeficiency Virus
<b>JOOTRH</b>	Jaramogi Oginga Odinga Teaching and Referral Hospital
<b>KDHS</b>	Kenya Demographic and Health Survey
<b>MDG</b>	Millennium Development Goals
<b>MTRH</b>	Moi Teaching and Referral Hospital
<b>MR</b>	Mortality Rate
<b>NBU</b>	New Born Unit
<b>NMR</b>	Neonatal Mortality Rate
<b>RMBH</b>	Riley Mother and Baby Hospital
<b>SBD</b>	Spontaneous Breech Delivery
<b>SDG</b>	Sustainable Development Goals

<b>STATA</b>	A general-purpose statistical software package
<b>SVD</b>	Spontaneous Vertex Delivery
<b>UN</b>	United Nations
<b>UNICEF</b>	United Nations Children's Emergency Fund
<b>WHO</b>	World Health Organization

## DEFINITION OF TERMS

1. **Neonatal period**- First 28 days of life.
2. **Neonate** -A baby who is less than 28 days old.
3. **Low birth weight**-Weight at birth between 1500g and 2449 g.
4. **Very low birth weight**- Weight at birth between 1000g and 1499 g.
5. **Extremely low birth weight** - Weight at birth 999g and below.
6. **Large for gestational age**-Weight at birth of more than 4000g.
7. **Normal birth weight** - Weight at birth of 2500g -3999g.
8. **Neonatal mortality**-Death occurring within the first 28 days of life per 1,000 live births.
9. **Hospital outcomes**-length of stay, discharge, death or referral out.
10. **Length of stay**-Period from admission to the newborn unit to discharge, referral to another facility, continued stay or death.
11. **Term baby**-Baby born after 37 completed weeks or less than 42 weeks gestation.
12. **Preterm baby** -Baby born at less than 37 weeks gestation.
13. **Postdates**-Baby born after 42 weeks gestation.
14. **Spontaneous vertex delivery**-Baby spontaneously delivered vaginally head first.
15. **Spontaneous breech delivery**-Baby spontaneously delivered vaginally with bottom first.
16. **CS**-An abdominal incision made to aid in delivery of a baby when vaginal route is contraindicated or has failed.
17. **Assisted vaginal delivery**- Use of vacuum or forceps at delivery.
18. **Free maternity services**-These are free services offered in public hospitals to all mothers and neonates during puerperium and first 28 days of life respectively.

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## ABSTRACT

**Background:** Kenya has had dynamic changes in health care since independence. In the quest to attain the then Millennium Development Goal 4 by 2015 to reduce under 5 mortality by two thirds, a fee exemption on maternity and neonatal services in public health facilities was unveiled in June 2013 by the Government of Kenya. The Neonatal Mortality Rate (NMR) in Uasin Gishu county was 52/1000 live births in 2012 and patient staff ratio was 270:1 which points to the need for more clinical staff. Sustainable Development Goals stipulate that we need to reduce NMR to less than 12/1,000 live births by 2030. The study aims to identify the gaps in the implementation of this new free maternity policy so as to improve on it for the future.

**Objective:** To evaluate hospital outcomes of neonates 1 year pre-and post-implementation of free maternity services at Moi Teaching and Referral Hospital newborn unit and their relationship to clinical staff in the newborn unit and maternity ward.

**Methods:** Mixed methods cross sectional study whose site was the Newborn unit at MTRH Eldoret, Kenya. A data form for patient admission, morbidity and mortality was abstracted from archived records for 1 year pre-and post-implementation. Monthly clinical staff return records were used for patient staff ratio. Self-administered questionnaires with open and closed ended questions were issued to staff while key informant interviews were done to assess their perception of free maternity services and challenges faced. Quantitative data analysis was done by STATA version 13 while qualitative data was coded and analysed by thematic content analysis. Data were presented in graphs and frequency tables. Outcomes assessed were: number of patients discharged, referred, neonatal mortality and length of stay.

**Results:** A total of 3953 babies were admitted (1700 pre-and 2253 post implementation of free maternity services). There was a 5% reduction in number of babies discharged home alive; 5% higher mortality rate while no neonates were referred. Average length of stay post implementation ranged from 4-7 days. Post implementation, case fatality rate of gastroschisis decreased by 10.3%, while there was an increase in the following: extremely low birth weight 17.5%, neonatal sepsis 0.5%, birth asphyxia 2.7% and respiratory distress syndrome 3.8%. There was a positive correlation between the patient staff ratio and death rate whereby, the higher the patient staff ratio, the higher the death rate ( $r=0.6$ ,  $p=0.002$ ). Staff cited the following advantages after the change: equity; more patients were treated post implementation especially surgical cases and they had better outcomes, while the challenges cited were that staff were overworked due to overcrowding; lack of adequate resources and inadequate emergency equipment. The key informants also cited delayed reimbursements; inadequate funds to improve infrastructure and fewer clinical staff as factors affecting successful implementation.

**Conclusion:** Post implementation, there was a higher mortality rate that was correlated with a higher patient to clinical staff ratio while inadequate infrastructure and inconsistent supplies were cited as a major challenge.

**Recommendation:** We recommend employment of more clinical staff to be able to contribute to better outcomes.

## CHAPTER ONE

### 1.1 Background

Kenya has undergone a series of dynamic changes in health care since independence. User fees for all were initially removed in 1965 until 1988 when they were re-introduced. The re-introduction was said to be due to inadequate financial resources and declining budget then (GOK 2001; MOH Kenya 2007). Several attempts have been made to improve health care for the common man until most recently when the current government manifesto included provision of free maternity services in all public facilities.

On June 1<sup>st</sup> 2013, the President of Kenya announced that there was a new policy of free maternity services in all public facilities that was effective immediately. Pumwani Maternity hospital (the largest public maternity hospital in Kenya based in Nairobi) delivered 100 births (from 60-80 deliveries per day) on the day of announcement. An estimate of 10% increase in deliveries across the country and 50% in some counties was reported by the Director of Public Health and sanitation by July 2013 (Bourbonnais et al 2013). An estimated 511,721 deliveries occurred in public health care facilities in the 12 months prior to the removal of deliveries fees. Of these, 90.5% were normal deliveries and 9.5% were through Caesarean section. In 2012, the Neonatal Mortality Rate (NMR) of Uasin Gishu county was **52/1000** live births with a patient to staff ratio of **270:1** which pointed to the need for more health workers to better the outcomes of these neonates including doing monitoring and evaluation of the policy implementation. (Uasin Gishu strategic plan 2012-2018).

Since the introduction of the policy for free maternity services, no prior arrangements were made in terms of funding, staffing and equipment supply at the public hospitals

before they were rolled out. Adjustments were made as patients arrived depending on the resources that the hospital had at the time. This was a great challenge to many facilities especially at MTRH but the magnitude had not yet been assessed.

The Kenya Health Sector Strategic & Investment Plan (2012-2018) states that 36% of public health facilities offering delivery services had the basic equipment and infrastructure with lower level facilities being unequipped and that current staff levels meet only 17% of minimum requirements needed for effective operation of the health system. Kenya has only seven nurses per 4,000 patients, half the number (14 per 4,000) recommended by the World Bank (KHSSIP 2012-2018).

The world lost 2.8 million newborn babies in 2013 and approximately 1 million children in 2015; within the first 24 hours (UNICEF 2016). According to the UNICEF (2013), under 5 mortality rate reduced from 90 to 46 deaths per 1,000 live births in 2013; Millennium Development Goal 4 seemed elusive then as the aim to reduce the under 5 mortality rate by 2/3 between 1990 and 2015 was not realized and if we continue with the current trends, it will not be achieved until 2026 (hence we are 11 years behind schedule). Currently there is a shift to using the Sustainable Development Goals as a yard stick towards achievement of quality health care for all by 2030 and the one which directly affects neonatal health is SDG 3 target 2 (SDG 2015).

In 2009, there were 42,013 neonatal deaths in Kenya, increasing the proportion of under-5 mortality due to neonatal deaths. It was estimated that 60% of infant deaths and 40% of all under-5 deaths occurred in the neonatal stage (Aluvaala et al 2015) The 2014 Kenya Demographic and Health Survey reports that the under-five

mortality rate was 52 per 1,000 live births; infant mortality rate of 39 per 1,000 live births and neonatal mortality rate of 22 per 1,000 live births (KDHS 2014).

This study aims to describe the events in MTRH NBU before and after the introduction of free maternity services and the outcomes thereof.

## **1.2 Problem Statement**

There is a high proportion of under-five mortality due to neonatal deaths in Kenya. 56% of deaths in infants happen during the first 28 days of life (KDHS, 2014). Currently, the NMR of 22/1000 live births in Kenya shows that we need more effort to meet the Every Newborn Action Plan's goal of a NMR below 10/1000 live births by 2035 (UNICEF, 2014). Globally, out of the 6.3 million children who died before age five years in 2013, 16 % took their first and final breaths on the day they were born. Altogether, 44 % died during the first 28 days of life (WHO 2014).

Free maternity has brought to light some issues that we face in the health sector especially with staffing, availability of resources and quality of care due to the increasing number of deliveries seen. MTRH maternity ward has had an increased number of deliveries since July 2013 and the NBU capacity remains the same. MTRH NBU has a 60 bed (14 incubators and 46 cots) capacity but has recently been having occupancy of up to 80 babies at a time. Number of admissions per month is currently at 160-200 babies per month (MTRH records).

Despite the introduction of free maternity services in Kenya, in 2013, the 2014 KDHS survey estimated neonatal mortality rate in the five-year period before the survey was still 22 deaths per 1,000 live births and 10 years before that it was 26 deaths per 1,000



live births. No survey has been published to estimate the effect of the introduction of the free maternity services on neonatal mortality rates in Kenya (KDHS 2014).

It is estimated that universal coverage of skilled delivery care and access to EmONC could result in up to 74% fewer maternal deaths and 30–45% fewer neonatal deaths (Wagstaff and Claeson 2004; Darmstadt et al. 2005). This emphasizes on the importance of providing high quality maternal care and subsequently a reassuring neonatal outcome.

It is for that reason that the study seeks to evaluate the outcomes of newborns admitted at MTRH NBU and assess whether the resources available are still adequate despite increase in admissions and whether there is any association with neonatal outcomes.

### **1.3 Justification**

The first 28 days of life, (neonatal period) is the time when children are most vulnerable and their overall survival is highly dependent on the quality of care provided at this time. It was estimated that 2.8 million babies died globally during the neonatal period in 2013 due to preventable causes. We must prioritize on the quality of neonatal health services to sustain the progress made in the overall under five mortality rates. Globally preterm and intrapartum complications account for 60% of neonatal deaths hence the need to provide high quality of care for both mother and baby (UNICEF 2016).

Admissions in MTRH NBU have increased as reflected in the bed capacity which was initially 60 but nowadays there are up to 100 patients at a time. This study will help

evaluate the magnitude of how stretched the human resource is and whether there were differences in neonatal outcomes pre-and post-implementation which may help us solve the problem. Failure to do the study may impact greatly on the newborns as we may not have an objective way to evaluate whether we are well equipped with human resources.

Neonatal mortality in MTRH NBU has been fluctuating over several months since the introduction of free maternity services; in 2012 it was 39.04/1,000 live births while that of 2013 was 39.22/1,000 live births (MTRH records). NMR in Uasin Gishu County was **52/1000** live births in the year 2012 (Uasin Gishu Strategic plan 2012-2018) compared to the national one at 22/1000 live births (KDHS 2014). Sub-Saharan Africa and South Asia together account for 4 out of 5 under-five deaths globally. Sub-Saharan Africa continues to shoulder the greatest burden: 1 in 11 children born here still die before age 5, nearly 15 times the average in high-income countries (1 in 159) as per the UNICEF (2016). The recent momentum achieved in sub-Saharan Africa needs to be sustained and accelerated. For 1 million babies every year, their day of birth is also their day of death. More than a third of neonatal deaths take place on the day of birth, and close to 2 million newborns die in the first week of life (UNICEF 2016). Investments in maternal care, specifically labor and delivery care and other high-impact interventions focused on the 24 hours around the time of birth, hold the greatest potential for reducing neonatal mortality. Neonatal mortality rate is reducing at a much slower rate than in the other stages of childhood hence the need to improve on outcomes of these babies.

Very few studies had been carried out to determine the effect of removal of user fees on the neonatal outcomes. No such study had been done at the MTRH NBU since the

introduction of free maternity services. This study aims to inform policy on possible gaps in the neonatal care system at MTRH NBU and how better we can provide quality services in Kenyan public hospitals and improve neonatal outcomes in view of the free maternity services.

#### **1.4 Research Question**

How has free maternity affected the outcomes of newborns at the NBU of MTRH?

#### **1.5 Objectives**

##### **1.5.1 Broad Objective**

To evaluate hospital outcomes of neonates admitted 1 year pre-and post-implementation of free maternity services at NBU of MTRH.

##### **1.5.2 Specific Objectives**

1. To compare the admission rates at NBU of MTRH one year pre-and post-implementation of free maternity services
2. To describe morbidity and mortality rates at NBU of MTRH pre-and post-implementation.
3. To evaluate the relationship between neonatal mortality and human resource at the unit.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1.1 Epidemiology**

According to the KDHS 2014 the infant mortality rate is 39 deaths per 1000 live births, while under five mortality rate is 52 deaths per 1000 live births, implying that at least 1 in every 19 children born died before their 5<sup>th</sup> birthday. Neonatal mortality in the 5-year period before the survey was 22 deaths per 1000 live births (KDHS 2014).

The under-five mortality rate fell from 75 to 52 deaths per 1000 live births between 1990 and 2014. Progress has been made in reducing deaths from birth asphyxia and birth trauma (intrapartum-related complications) (-29%) and complications due to prematurity -14% (KDHS 2014). There is room for more effort to improve and increase access to lifesaving interventions to save more newborns. Globally, the leading causes of under-five deaths in 2012 were preterm delivery complications (17.3% of deaths), pneumonia-15.2%, birth asphyxia and birth trauma-11.4%, non-communicable diseases-10.8% and diarrhea-9.5% (KDHS 2014). According to previous studies in Taiwan, the prevalence of neonatal sepsis ranged from 3.0% to 9.3% (UNICEF 2013).

Globally, the main causes of neonatal deaths are preterm birth complications (35%), Intrapartum-related complications 24% and sepsis 15%. These account for almost 75% of all neonatal deaths (UNICEF 2016). We need renewed effort to build better health services to provide high-quality prenatal care, skilled birth attendants and postnatal care for babies and mothers (UNICEF 2016).

### **2.1.2 Millennium Development Goals**

In September 2000, 189 leaders from different countries UN in New York and endorsed the Millennium Declaration. It was a commitment to work together to build a safer, more prosperous and equitable world. It was translated to set out eight time-bound and measurable goals to be reached by 2015 titled the Millennium Development Goals, (UN REPORT 2000) and the ones which affect the neonates mostly are the following:

#### **4. Reduce child mortality**

- Reduce by two thirds the mortality of children under five.

#### **5. Improve maternal health**

- Reduce maternal mortality by three quarters.
- Achieve universal access to reproductive health.

Rwanda is one of the 11 African countries including Uganda and South Sudan that are on track to meet MDG 4. Despite the increase in population by 35%, child mortality has fallen by 63% (Emery 2013) Maternal mortality ratio in 2010 was 340 per 1,000 live births while NMR is 21 per 1,000 live births and perinatal mortality rate 2010 was 35 per 1,000 live births (WHO, UNFPA, UNICEF, World Bank 2010). The people of Rwanda were not discouraged by the effects of the genocide; they picked up their pieces and moved forward. They focused on making their systems better; discipline was reinforced in all people from the lowest to the highest cadres of society. The health system was such that they introduced free maternity services, trained the community health workers, provided them with specially programmed phones for communication, increased availability of waiting wards for pregnant women to reduce accidental home deliveries, encouraged citizens to get a national

health insurance, ensured regular supervision of hospitals with results based financing and forbade the public health workers to run private facilities (Chambers and Booth 2012).

In Ethiopia, there was a decline over the past decade in under-5 mortalities from 166 per 1000 in 2000 to 88 per 1000 live births in 2011 an average decline of 47% (Mekonnen et al, 2013) According to the MDG report 2014, Ethiopia was one of the 6 African countries including Tanzania and Egypt who have already achieved MDG 4 while Kenya was among the countries with insufficient progress (MDG 2014).

During the proposal development of this study, the MDGs were still in place but in September 2015 new goals were set in the UN countries so as to improve the quality of life by ending poverty, protect the environment and ensure prosperity for all.

### **2.1.3 Sustainable Development Goals**

Countries with the United Nations adopted the 2030 agenda for SDGs that calls for action for all countries to improve the lives of people everywhere. There are 17 goals most of which affect child survival and the one which is measured by neonatal outcomes directly is goal number 3; (ensure healthy lives and promote well-being for all at all ages (UN SDG 2017) whose targets aim by 2030:

- a) to reduce the global maternal mortality ratio to less than 70/1,000 live births
- b) to end preventable deaths of newborns and children under 5, with all countries aiming to reduce NMR to at least as low as 12/ 1,000 live births and under 5 MR at least as low as 25/1,000 live births.

#### **2.1.4 Current Progress in Child Indicators**

Child mortality has almost been halved, but more needs to be done. Worldwide, the mortality rate for under-fives dropped almost 50%, from 90 deaths per 1,000 live births in 1990 to 48 in 2012 (MDG 2014).

Neonatal survival is determined by good quality perinatal care. The high proportion (70%) of neonates dying during the first week of life, strengthen the fact that less optimum obstetric and inadequate neonatal care prevail (MDG 2014).

Free Maternal Health Policy and Abolition of the 10/20 User Fees, which came into effect June 2013 under a Ministerial Circular, needs to be carefully implemented to achieve their stated objectives and have maximum positive impact (Chuma et al, 2009).

Evaluations have shown that fee removal is effective within the first few months, but that the majority of facilities re-introduce fees later for various reasons, including lack of supplies and medicines, delay in funds reimbursement, and need for additional support staff (Chuma et al, 2009).

#### **2.1.5 The African Situation: Maternity Fee exemption vs neonatal outcomes**

Removal of user fees for maternity and neonatal services has been ongoing in several Sub Saharan countries. This however has faced many challenges due to limited resources and sometimes poor implementation. Some studies have been done on utility of free maternity services but very few of them focus on the neonatal outcomes of the same. In a study done in 10 African countries, the team estimated the causal effect of removing user fees on the proportion of births delivered in facilities, the proportion of births delivered by CS and NMR. They concluded that removing user fees increased facility based deliveries and possibly contributed to a reduction in NMR (Ridde 2010; Yates 2009).

Lagarde and Palmer (2011) found that abolishing user fees generally increases utilization of health services, although the quality of current evidence was deemed very low.

Burkina Faso, Ghana, Niger, Kenya, Burundi and Senegal, have adopted policies that remove or reduce user fees for delivery services (Ridde 2010; Yates 2009).

There have been no population-based evaluations of the impact of a delivery fee exemption policy on maternal or neonatal outcomes. Short-term increases in facility deliveries after a policy change may not necessarily translate into improvements in maternal and neonatal survival (Dzakpasu 2014, 2012; De Allegri et al, 2012).

#### **2.1.6 Other Factors Affecting Neonatal Outcomes**

Infectious diseases were found to be the single most common killer of newborns especially sepsis, pneumonia and meningitis. These deaths can be prevented by providing quality antenatal care, hygienic deliveries, post-natal care and early exclusive breastfeeding (Baiden et al, 2006). Tetanus accounts for 165,000 newborn deaths globally which is preventable (Blancowe et al, 2009). It was observed that intrapartum related (birth asphyxia) 904,000 deaths occurred globally and this was worse in the least developed countries. Babies born in third world countries have a high risk of birth asphyxia and intrapartum stillbirths (Ministry of Health Kenya, 2007). Globally, 14% of babies were born with LBW. Preterm babies have a 13 times higher risk of death than full term babies (Yasmin et al, 2001).

In an 18-month hospital based intervention study in Kenya, it was reported that hospitals were, lacking 30-56% of items considered necessary for the provision of care to the very sick child or newborn (English et al 2009).

The neonatal mortality rate in the US has been found to be lower in regions with 4.3 neonatologists per 10,000 births than in those with 2.7 per 10,000 births. Further



increase in number of neonatologists was not associated with greater reduction in the risk of deaths (Neogi et al, 2012).

### **2.1.7 Preventive Measures to Improve Neonatal Outcomes**

Primary prevention through skilled birth attendants and emergency obstetric care is the most cost effective solution (Adam et al, 2005; Darmstadt et al, 2005).

Babies born between week 33 and 37 should survive if well fed, kept warm and if infections, respiratory issues jaundice are sorted out in time (Conde, Diaz and Belizan 2003). Babies less than 33 weeks old of 1500g need advanced care especially for respiratory support, feeding and if possible kangaroo mother care to be provided (Conde, Diaz and Belizan 2003)

Neonatal resuscitation in facilities should reduce percentage of term intrapartum related neonatal deaths by 30% and reduce preterm deaths. Resuscitation measures are important to save up to 190,000 lives a year (Lawn et al, 2009).

A missed opportunity in settings where skilled attendance and obstetric care are being strengthened is the lack of simple essential newborn care or skilled resuscitation for the estimated 10 million babies a year that require attention at birth (Lawn et al, 2009).

For the babies delivered at home, a study in Bangladesh found that a visit within the first 48 hours of life is associated with significantly lower neonatal deaths compared with those who did not receive postnatal visit or care (Baqui et al, 2009).

According to the Lancet survival series, up to 3 million newborn lives could be saved each year if all mothers and babies were reached with essential care (Darmstadt et al, 2005).

The estimated cost of increasing intervention for neonatal survival to 90% coverage in 75 countries is US dollars 4.11 billion, half of which goes to maternal care,

particularly obstetric services (Darmstadt et al, 2005; MacFarlane, Johnson and Mugford 1999).

### **2.1.8 Lessons from Countries That Have Implemented Fee Exemptions on Maternity Services**

In Ghana, emphasis was on the need for adequate funding and an agency with clear responsibility and expertise on effective management of the free maternity scheme hence potential for a positive impact on utilization. Maternal mortality will not be reduced unless quality of care is assured, including and understanding of how policy will affect health worker patterns and incentives (Witter 2009).

In Senegal, it was noted that reimbursement in some higher-level facilities was overpaid and the lower level ones underpaid. Planning, budgeting, cash flow systems and accounting were poor. There is need to have proper specification of the package benefits: caesareans and normal deliveries were covered at specified facility types, but assisted deliveries of other types were not catered for. The above setbacks and patchy implementation of the policy added to price uncertainty for users (Witter 2009).

Broad pre-conditions for success that was common across the two countries, Ghana and Senegal were (Witter 2009):

- 2) Proper understanding of the scheme by all senior and junior staff
- 3) Adequate budgeting and planning.
- 4) Monitoring and evaluation of the scheme.
- 5) Reimbursement schemes which cover the real costs of services rendered
- 6) Control supply-induced demand and inappropriate treatments (e.g. unnecessary caesareans)
- 7) Provide available and acceptable quality services (including Comprehensive and Basic Emergency Obstetric Care)

- 8) Proper staffing with the right skills and attitude.
- 9) Hardship allowance for workers to accept to work in marginalized areas.
- 10) Avail appropriate resources.
- 11) Ensure functional referral systems are in place.

Noted from the above preparation, Kenya did not undergo such hence the outcomes we found were greatly affected by the pre-implementation conditions.

The most appropriate contexts for free maternity services are where (Witter 2009):

- i. maternal mortality, fertility and poverty rates are high
- ii. official user fees for health care and/or inequalities are high
- iii. skilled attendance and caesarean rates are low
- iv. financial barriers are a major constraint for skilled attendance
- v. women lack financial or decision-making autonomy

The above context is the typical scenario in Kenya and hence free maternity services can be tailored to suit our needs based on the above context.

In a study done in 751 health facilities in Ethiopia it was found that providing emergency obstetric care at no cost to poor women is a step forward in reducing maternal mortality. If providers are not compensated for the loss of revenue the quality of care provided will eventually be compromised. Health economists advice that low cost insurance schemes, increasing user fees to patients better able to pay, installment payments, and voucher schemes are thought to be better at sorting out this problem. Alternative sources of revenue to providers should be sought when considering mandates to provide free care to a part of the population (Luwei et al, 2011).

Owing to very limited literature about fee exemption on neonatal outcomes, a study done in ten Sub-Saharan countries deduced that with the fee exemptions there was a 9% reduction in neonatal mortality (McKinnon et al, 2014).

The Cuban health care system is a force to reckon with. It has 498 polyclinics, serving 22,000 patients; 14,078 family doctors' offices in the above clinics hence 1 physician per 159 people and 1 nurse per 79.5 people (Cuba Public Health 2007; Keon 2009).

The maternity care focuses on planned conception; categorization of women into various risk clusters pre and post conception; strict use of partograms for monitoring of labor; referral of high risk pregnancies to a maternity home for outpatient follow up or admission as per the severity (Cuba Public Health 2007). According to the UNICEF report 2015 on Cuba, NMR 2012 was 3 per 1,000 live births and the most recent updates on Cuba are that their NMR has remained around 4.2 per 1,000 live births same as last year (Whitney 2015). Public health interventions that were carried out in 2014 to ensure a reduced neonatal mortality were: prevention of preterm births including use of progesterone in high risk pregnancies; a more efficient use of beds in maternity homes; enhanced protocols in perinatology to increase newborn survival and development of perinatal care services, pediatric and neonatal intensive care, pediatric cardiology network consolidation and improvement of neonatal surgery (Martiner 2015). The Cuban Physician is the highest paid employee in the country (Whitney 2015). The Cuba example is used to show how a state has utilized its limited resources to make the best of her health care system and reduce infant, maternal and neonatal mortality rates. We can learn a few lessons from the above on how to improve our primary health care services and reduce maternal and neonatal mortality rates. To sum it all up; the Center for Disease Control stated, "Infant

Mortality Rate is the most sensitive indicator of overall societal health” (Whitney 2015).

There was a study done in Nepal which concluded that the free maternity service was characterized by high out of pocket expenditures and they had to cater for some essential drugs and other supplies hence local facilities had to provide the basic drugs, food, clothes and water to improve hospital attendance (Acharya 2016).

In Kenya, there have been studies done on free maternity services but most focus on governance, policy making and implementation of the same. In a study in 6 counties where key stakeholders in the health sector were interviewed, they recommended that enforcement mechanisms be put in place, timely disbursements and payment of health workers salaries to ensure that the policy has been implemented successfully (Thidar, Smith and Nynke, 2017).

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Study Design**

It was a mixed method descriptive research pre-and post-implementation cross sectional study, implementation date being July 1<sup>st</sup> 2013. Pre-implementation period was July 1<sup>st</sup> 2012 to June 30<sup>th</sup> 2013 and post-implementation period was July 1<sup>st</sup> 2013 to June 30<sup>th</sup> 2014.

#### **3.2 Study Site**

The study was conducted at the NBU and labor wards of Riley Mother and Baby Hospital which is a constituent of MTRH. MTRH is located in Eldoret town, about 300km from Nairobi, in Uasin Gishu County, Kenya. This is an agricultural region with both large and small-scale farming and is a fast-growing highway metropolitan town.

MTRH is a tertiary hospital and one of the only two National hospitals in Kenya that also serves as a referral facility for other health institutions around Eldoret. It has a total bed capacity of 800 and it serves as a referral hospital for the western part of Kenya. MTRH catchment population is about 13 million people - 33% of Kenyan population. The hospital also serves patients from the Eastern African countries.

The newborn unit is located in the ground floor of the Riley Mother and Baby hospital which is a constituent of MTRH that was opened in 2009. The NBU has a capacity of 60 (14 are incubators and 46 baby cots) and it provides basic neonatal services and incubator nursing. There are 10 phototherapy units, 5 resuscitates, 4 Continuous Positive Airway Pressure ventilation machines and 1 emergency kit. Nurse to patient ratio is approximately 1:20. The RMBH lab carries out tests like random blood sugar, calcium, electrolytes, complete blood count and blood cultures. Radiological tests like x-ray and echocardiogram can be performed but not within the unit, they are in the radiological department of the hospital.

The staff allocated to the unit are 6 pediatricians, 1 pediatric cardiologist, 2 pediatric surgeons, 29 nurses, 2 nutritionists, at least 4 pediatrics resident doctors, at least 1

medical officer intern and 2-3 clinical officer interns (only the consultants, nurses and nutritionists are full time employees while the residents, medical officers and clinical officers are there for a short duration of time).

Neonates admitted to the NBU either born in the maternity ward in RMBH, referred from other health facilities from level I to IV or home deliveries.

### **3.3 Study Population**

1. Neonates admitted at the NBU of MTRH
2. NBU and labor ward staff at MTRH
3. Respective senior administrators at the NBU, labor ward (both in RMBH) and MTRH.

### **3.4 Inclusion Criteria**

- 1) All neonates admitted to the MTRH NBU.
- 2) All staff and key informants (senior staff) that had worked in NBU/ labor ward both pre-and post-implementation of free maternity services.

### **3.5 Exclusion Criteria**

- 1) Staff who were not present in the NBU/ labor ward between July 2012- June 2014.

### **3.6 Study Period**

We extracted archived patient and staff records from July 2012 to June 2014.

Data collection was carried out from January 2016 to November 2016

### **3.7 Sample Size**

The aim of the study was to compare neonatal outcomes (death, discharge, average length of stay) pre and post implementation of free maternity services. We assumed the mortality rate as the main outcome. The sample size was estimated using sample size formula by Fleiss (Fleiss JL, 1981).

$$n \geq \frac{(1+r) \bar{p}(1-\bar{p})(Z_{\beta} + Z_{\frac{\alpha}{2}})^2}{r(p_1 - p_2)^2}$$

Where;

$n$  = minimum sample size for one group

$r$  = ratio

$\bar{p}$  = pooled prevalence

$Z_{\beta}$  = critical value corresponding to 80% power

$Z_{\frac{\alpha}{2}}$  = critical value corresponding to 0.05 type I error

$p_1$  = neonatal mortality rate after introduction of free maternity services

$p_2$  = neonatal mortality rate before introduction of free maternity services

Using this formula, with an expected difference of 5% and a mortality rate of 15% (P2) before introduction of free maternity services (MTRH, Information System 2012), the minimum sample size would be 1812 (906 for each group).

After calculating the sample size above, we chose to do census which recruited more numbers than the sample calculated which would have allowed us to capture all the outcomes. The sample size allows for probabilistic sampling which was not done in this study.

### **3.8 Sampling Technique**

A census for all the admissions was done for the period of study.

Purposive sampling of all the staff (who had worked between July 2012-June 2014) available at the NBU, labor ward and senior administrators was done.

We issued the questionnaires (had demographic data and open ended questions) until we reached saturation, no new information was being captured from the respondents.



### 3.9 Study Procedure

**Quantitative data: Archival research** –the principal investigator with the help of two research assistants (2 records clerks that were trained on study objectives, data collection and confidentiality prior to the study) obtained data from existing aggregate data (electronic medical records and also hard copies to complement missing data) about patient characteristics age, gender, mode of delivery, birth weight, length of stay, outcomes (**Appendix V**) and demographic data and open ended questions from the staff questionnaires (**Appendix III**).

We also collected data from the monthly staff returns from the nursing department and administrators ( this contained data on staff available every day as per their cadre).

**Qualitative:** A pilot study was conducted at JOOTRH to test the questionnaires which were later modified based on the study objective three which was to evaluate the relationship between neonatal mortality and human resource at the unit. We then collected qualitative data by use of self-administered questionnaires to available and consenting staff members who were present pre-and post-implementation. The questionnaires had both closed and open ended questions for the staff to respond to. They included the staff demographic data, tenure at NBU or labor ward, their perception of free maternity services, challenges faced by staff during this period and whether they were trained on EmONC (**Appendix III**). Key informant interviews (**Appendix IV for Key informant interview guide**) about the strengths and challenges faced by senior management since the introduction of free maternity services were also conducted. We selected the key informants based on their eligibility and whether they were in charge of a unit or a deputy in the absence of the in charge. The principal investigator carried out the interviews in the office of the key informant (senior administration) and the others were conducted in a procedure room in the unit which was not in use then. The interviews were recorded by the key informant using an audio recorder application on the mobile phone Lenovo S1La40. The interviews would last between 15-30 minutes depending on the issues that would need clarification.

### **3.10 Data Processing and Analysis**

#### **3.10.1 Data Analysis**

Data entry was performed on SPSS version 22, cleaned and thereafter analysis was done on STATA version 12. We used descriptive statistics in this study using measures of central tendency like median and mean for patient and staff demographics.

The availability of human resources was measured by using the staff patient ratio. A correlation coefficient was used to describe the relationship between the clinical staff ratio and neonatal mortality. A student's T test was used to analyze the means of admissions, deaths and discharges pre-and post-implementation. P values of  $<0.05$  were statistically significant. The key informant interviews were recorded on audio recorders, transcribed and typed into scripts, thematically coded and analyzed by thematic content analysis manually.

Qualitative data from questionnaires were coded according to the specific themes like employee perceptions of free maternity services, challenges faced, and advantages then analyzed thematically by the principal investigator and two biostatisticians who assisted in verifying the coding.

#### **3.10.2 Data Presentation**

Data will be presented using linear (graphs) for the outcomes and nonlinear forms like frequency tables for patient and staff demographic data.

### **3.11 Ethical Considerations**

The pilot study was performed at Jaramogi Oginga Odinga Teaching and Referral Hospital Kisumu which has similar characteristics to MTRH as a teaching hospital and whose proximity was convenient for the principal investigator. We sought approval from the JOOTRH management before carrying out the pilot study and later made slight changes to the questionnaires before conducting the study at MTRH.

Approval was sought from Institutional Research and Ethics Committee and MTRH management before carrying out the study. Informed written consent was sought from

the interviewees and the data was handled with utmost confidentiality. The questionnaires were coded, de-identified and kept in a secure, lockable cabinet while the soft copy of the data stored in a secure email accessible to the principal investigator.

## CHAPTER FOUR

### RESULTS

#### 4.1 Cohort Characteristics

There were **3953** babies admitted during the study period (**1700** pre-implementation while **2253 babies** were admitted post-implementation).

The mean age of the neonates pre-implementation was **7.2 days**  $\pm$  10.88 while post implementation was **4.2 days**  $\pm$  8.820.

Male to female ratio was 1.1:1 during the period of study.

#### 4.2: Admission Rates in the NBU Pre and Post Implementation

**Table 1: Admission Rates in the NBU Pre and Post Implementation**

<b>ADMISSIONS</b>	<b>Pre implementation</b>	<b>Post implementation</b>
July	159 (44.41%)	199(55.58%)
August	122 (42.50%)	165 (31.39%)
September	81(40.39%)	177(68.6%)
October	124(40.39%)	183(60.1%)
November	122(39.86%)	184(55.12%)
December	127(44.87%)	156(55.12%)
January	168(46.92%)	190(53.07%)
February	150(47.46%)	166(52.53%)
March	152(40.86%)	220(59.15%)
April	164(45.17%)	199(54.82%)
May	165(43.88%)	211(56.11%)
June	166(44.98%)	203(55.02%)
<b>TOTAL</b>	<b>1700(43%)</b>	<b>2253(56.99%)</b>

The table above shows the admission rates during the study period. There was a higher admission rate post implementation 56.99%.

**Table 2: Modes of Delivery**

<b>Mode of delivery</b>	<b>Pre implementation (n/%)</b>	<b>Post implementation (n/%)</b>
Spontaneous vertex delivery	1289 (48.11%)	1390 (51.88%)
Caesarean section	561 (47.75%)	615 (52.29%)
Spontaneous Breech Delivery	33 (42.3%)	45 (57.69%)
Assisted Vaginal delivery	11 (55%)	9 (45%)
<b>TOTAL</b>	<b>1894 (47.91%)</b>	<b>2059 (52.08%)</b>

There was a higher rate of SVD, CS and SBD post implementation but a decreased rate of assisted vaginal deliveries (45%)

**Table 3: Place of Birth**

<b>Place of birth</b>	<b>Pre implementation (n/%)</b>	<b>Post implementation (n/%)</b>
RMBH LABOR WARD	775 (48.55%)	821(51.44%)
RMBH THEATRE	811 (52.66%)	729(47.33%)
HOME DELIVERY	163(32.21%)	343(67.78%)
Others	115(36.97%)	196(63%)
<b>TOTAL</b>	<b>1864 (47%)</b>	<b>2089 (53%)</b>

Others included lower level public health facilities and private hospitals.

The above table depicts that majority of the NBU admissions were from RMBH (a constituent of MTRH) theatre and labor ward while home deliveries doubled post implementation.

**Table 4: Bed Occupancy**

<b>Percentage bed occupancy</b>	<b>Pre implementation (%)</b>	<b>Post implementation (%)</b>
July	60.1	90.5
August	70.8	71.1
September	50.4	76.6
October	53.4	69.5
November	50.4	84.2
December	37.9	50.3
January	56.7	37.4
February	77.1	86.7
March	89.7	98.9
April	74.6	92.9
May	75.2	96.7
June	66.3	93.5
<b>TOTAL</b>	<b>63.5</b>	<b>78.9</b>

Table 4 shows the bed occupancy of the NBU admission during the study period. Bed occupancy= (occupied beds daily/available beds daily) x 100%. Bed occupancy increased post implementation to 78.9%.

**Table 5: Average Length of Stay**

<b>Average length of stay</b>	<b>Pre implementation</b>	<b>Post implementation</b>
July	7.4	8.9
August	9.1	7.2
September	11.5	7.8
October	7.9	7.2
November	6.9	8.2
December	6.2	5.3
January	6.7	3.7
February	9.1	9.5
March	11.1	8.4
April	7.6	8.7
May	8.2	8.6
June	7.5	7.9
<b>TOTAL</b>	<b>8.2</b>	<b>7.6</b>

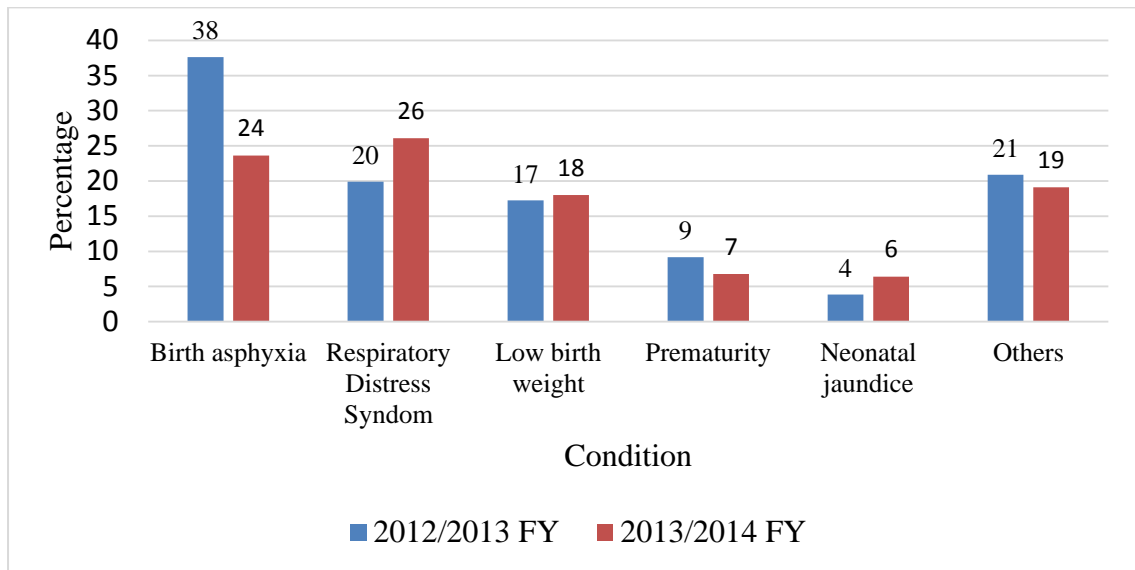
The above table depicts the average number of days taken to discharge, mortality or referral out. The average length of stay was 8.2 and 7.6 respectively.

**Table 6: Discharge Rates Pre and Post Implementation**

<b>MONTH</b>	<b>Pre implementation (n/%)</b>	<b>Post implementation (n/%)</b>
July	131 (47.46%)	145 (52.53%)
August	130(47.61%)	143(52.38%)
September	64(32.1%)	135(67.83%)
October	112(43.24%)	147(56.75%)
November	110(42.96%)	146(57.04%)
December	93(39.07%)	145(60.92%)
January	136(48.74%)	143(51.25%)
February	114(50.22%)	113(49.77%)
March	134(46.85%)	152(53.14%)
April	149(50.68%)	145(49.31%)
May	138(46.77%)	157(53.22%)
June	126(46.77%)	159(53.22%)
<b>TOTAL</b>	<b>1437(44.21%)</b>	<b>1730(55.78%)</b>

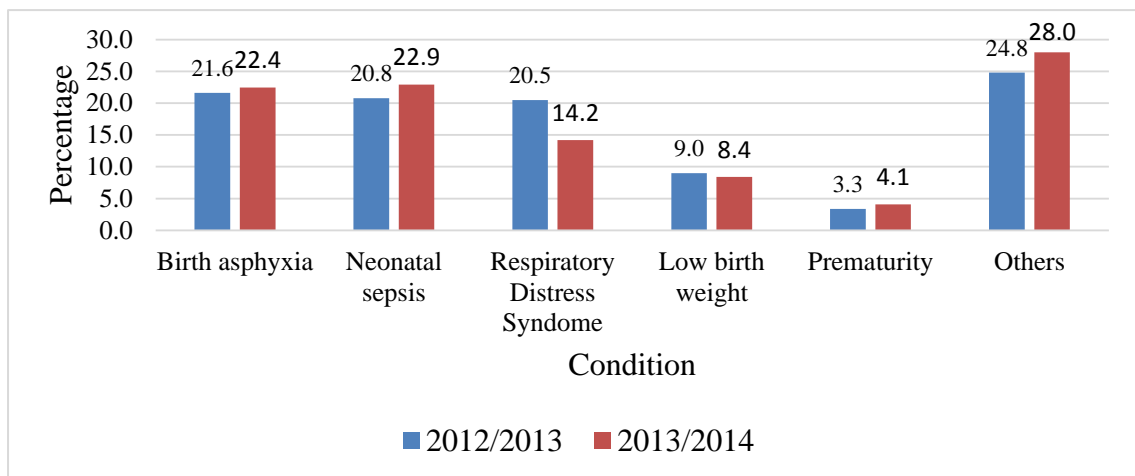
Table 6 represents the discharge rates during the study period. There was a higher discharge rate post implementation (55.78%). These are the patients who were discharged home alive and well. There were no patients who were referred out of the facility during the study period.





**Figure 1: Top 5 Causes of Morbidity Pre and Post Implementation**

Birth asphyxia admissions were higher pre implementation but cases of RDS, LBW and NNJ increased post implementation.



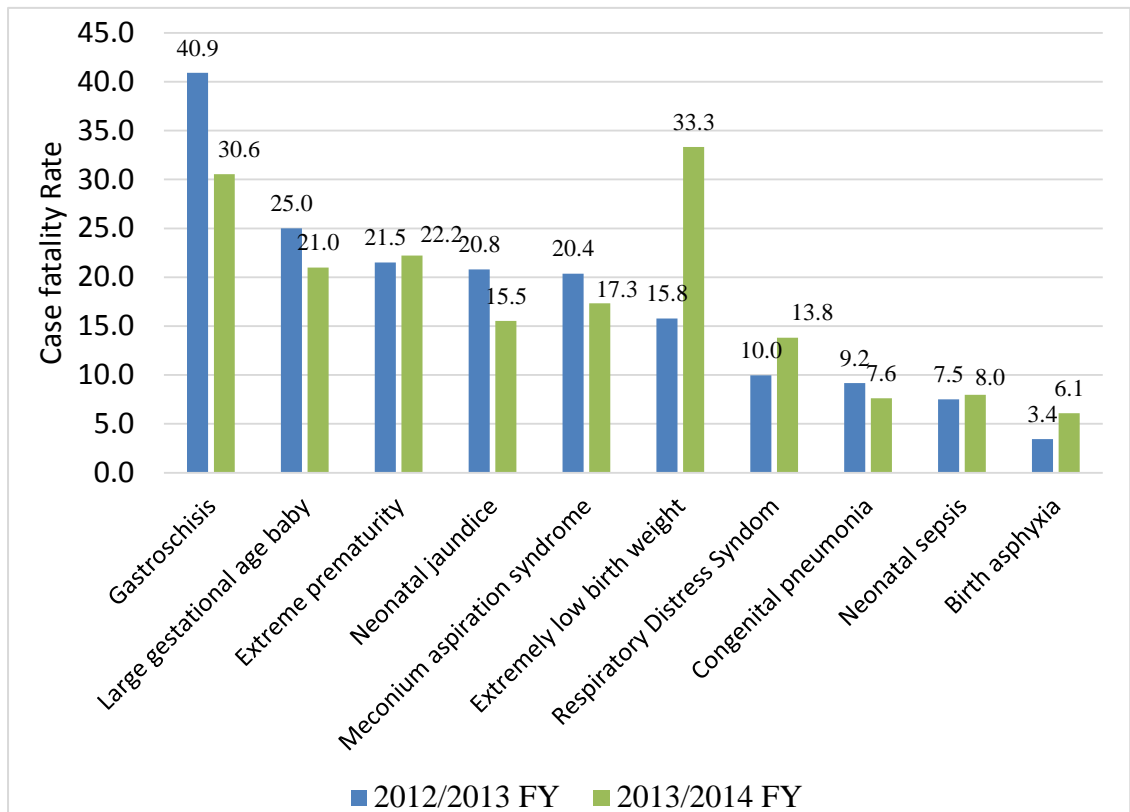
**Figure 2: Top 5 Causes of Mortality Pre- and Post-Implementation**

Figure 2 shows that cases of birth asphyxia, prematurity and neonatal sepsis were higher post implementation while mortality of respiratory distress syndrome and low birth weight were slightly lower.

**Table 7: Frequencies of Top 10 Condition for the Case Fatality Rate**

<b>Condition</b>	<b>Pre implementation (n/%)</b>	<b>Post implementation (n/%)</b>
Gastroschisis	775(58.31%)	554 (41.68%)
LGA Baby	476 (55.47%)	382(44.5%)
Extreme Prematurity	407(50.3%)	402(49.69%)
Neonatal Jaundice	394(58.37%)	281(41.62%)
MAS	387 (55.28%)	313(44.72%)
ELBW	300(33.22%)	603(66.77%)
RDS	198(44.19%)	250(55.81%)
Congenital Pneumonia	178(56.32%)	138(43.67%)
Neonatal Sepsis	142(49.47%)	145(50.53%)
Birth Asphyxia	64(36.78%)	110(63.21%)

The above table shows the top ten conditions in the NBU that were used to assess the case fatality rate in the pre and post implementation period.



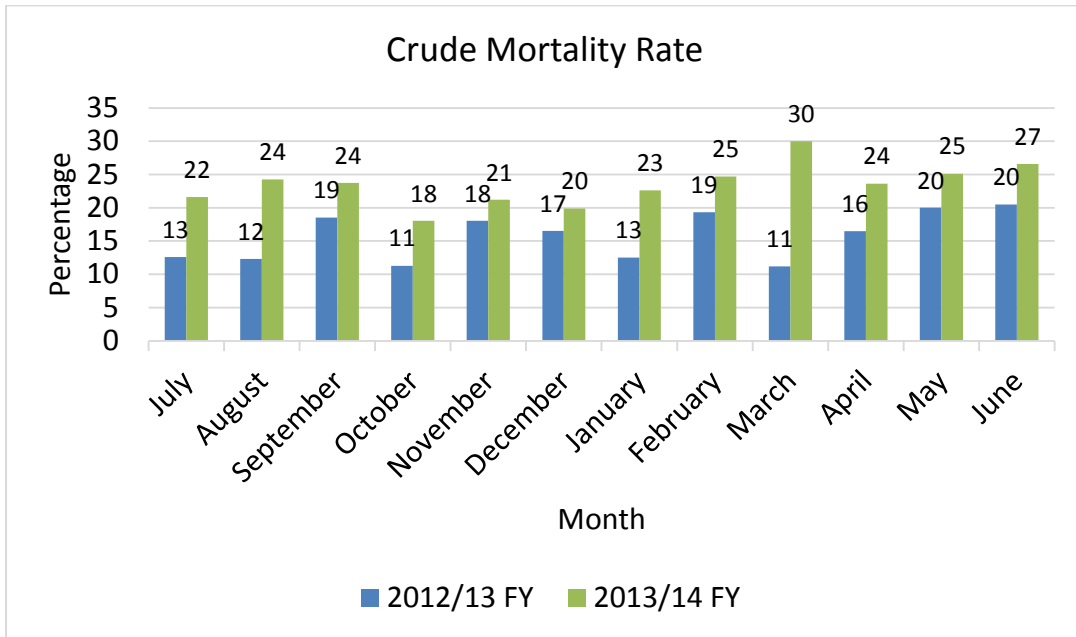
**Figure 3: Case Fatality Rate**

Table 7 and Figure 3 show case fatality rates of the top 10 conditions. Cases of gastroschisis were higher pre implementation, however their case fatality rate decreased by 10%. RDS case fatality rate also increased by 3.8% post implementation.

**Table 8: Frequency of Deaths in the NBU**

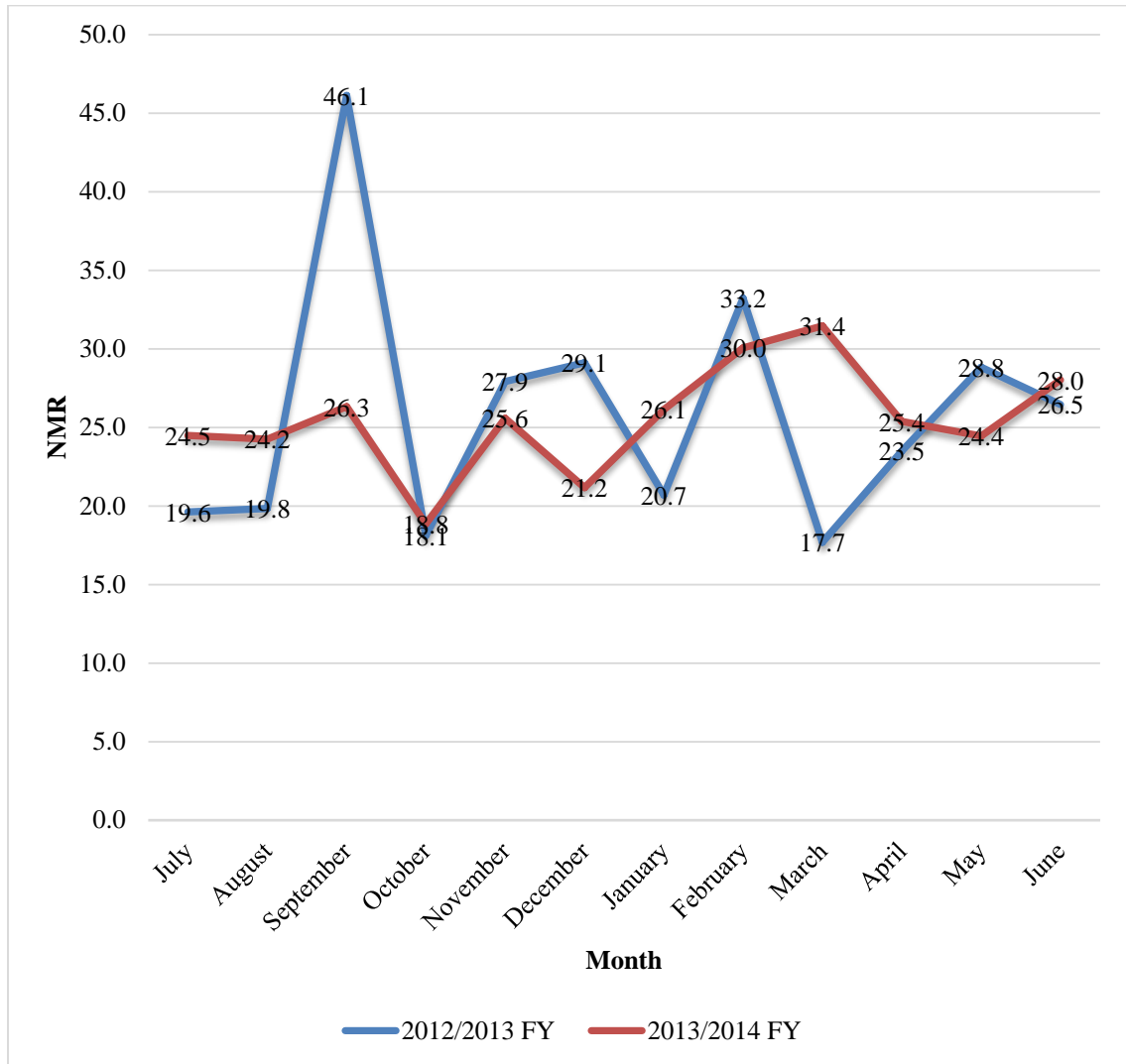
<b>MONTH</b>	<b>Pre implementation</b>	<b>Post implementation</b>
July	30	43
August	29	40
September	17	42
October	14	33
November	20	40
December	17	31
January	21	43
February	29	41
March	17	66
April	27	47
May	33	45
June	34	54
<b>TOTAL</b>	<b>288</b>	<b>525</b>

There was a higher number of patients who died post implementation.



**Figure 4: Crude Mortality Rate**

There was a higher crude mortality rate recorded post implementation ranging from 20-30% while pre implementation ranged from 11-20%.



**Figure 5: Neonatal Mortality Rate**

The above figure is representative of the NMR in NBU and labor wards. It has taken into account all the live births in MTRH and the deaths reported in RMBH maternity wards, theatre and NBU during the study period.

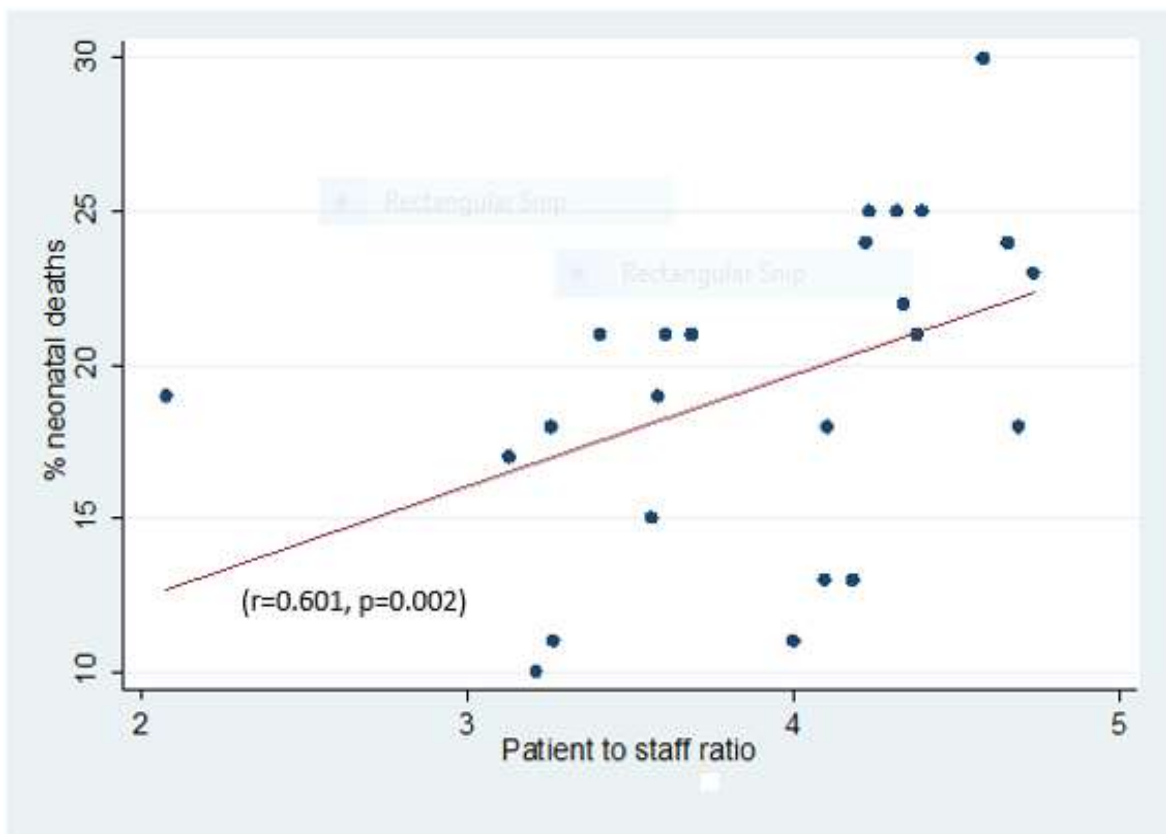
**Table 9: Demographic Characteristics of the Staff (n=35)**

<b>Age in years</b>	<b>Frequency/percentage</b>
20-25	8.6%
26-29	22.9%
<b>30-35</b>	<b>40.0%</b>
36-40	22.9%
41-45	<b>2.9%</b>
46-50	2.9%
<b>Academic qualification</b>	
Certificate in respective cadre	2.9%
Diploma	<b>45.7%</b>
First degree	<b>40.0%</b>
Post graduate	11.4%
<b>Cadre</b>	
Nurse	<b>20</b>
Pediatrics consultant	2
Obstetrics and gynecology consultant	2
Records department	6
Nutrition	2
Biomedical engineer	3
<b>Years worked</b>	
2-3	<b>45.7%</b>
4-5	34.3%
More than 5years	20.4%
<b>EmONC trained staff</b>	
Less than 4 years ago	<b>25%</b>
More than 4 years ago	5%
Not trained	70%

The above table shows that show that majority of the staff were of the age 30-35 years (40%), nurses were 20, most of the staff (45.7%) had worked 2-3years and only 25% had received EmONC training recently.

### 4.3 Evaluation of the Relationship between Neonatal Outcome and Human Resource.

The ratio of patients to clinical staff (doctors and nurses) ranged from 2 to 4.7 patients per staff, while percentage death rate ranged from 10 - 30%. The mortality rate varied on a monthly basis and seemed to increase with time. Lowest mortality recorded in August 2012 and the highest was recorded in March 2014. Same as the mortality rate, patient to staff ratio also increased with time though gradually.



**Figure 6: Association between Patients to Staff Ratio and Neonatal Death Rate**

There was a positive correlation between patients to staff ratio and neonatal death rate ( $r = 0.601$ ,  $p=0.002$ ), as the ratio increased the neonatal death also increased.



**Table 10: T Test Comparing the Means of the two Periods of Study**

Variable	period	Mean	SD	95% CI of mean	p-value
NBU admission rates	Pre	141.67	7.68	[124.9, 161.6]	<0.001
	post	187.75	5.65	[175.3, 200]	
NBU deaths	Pre	22.33	2.00	[18.6, 27.6]	<0.001
	post	44.33	2.77	[38.2, 50.5]	
Discharge rates	Pre	142.08	7.70	[125.1, 162.0]	<0.001
	Post	193.17	6.82	[178.2, 208.2]	
Mortality rate	Pre	15.67	1.15	[13.5, 18.7]	<0.001
	Post	23.00	0.96	[20.9, 25.1]	
Number staff	Pre	41.00	1.00	[38.8, 43.2]	0.191
	Post	43.08	1.17	[40.5, 45.7]	
% bed occupancy	Pre	63.55	4.22	[54.2, 72.8]	0.036
	Post	79.03	5.53	[66.8, 91.2]	
Average length of stay	Pre	8.27	0.47	[7.2, 9.3]	0.344
	Post	7.62	0.47	[6.5, 8.6]	
t-test					

There was a significant difference ( $p < 0.001$ ) in the discharge rates, admission rates, crude death rates, mortality rate between the two periods of reference. In all the variables, the period before the introduction of free maternity services had a significantly lower mean value compared to the period after introduction of free maternity services. The number of staff remained the same ( $p > 0.05$ ) between the two periods. Shapiro Wilk W test was used to test for normality of data.

#### 4.4 Themes Deduced From the Staff Responses in the Questionnaires

##### Advantages of free maternity services:

- i. Availability of services to all.

*“It is a good thing that these services can be accessed by the poorest clients”*

(Health worker 1).

- ii. Customer satisfaction.

*“We saw mothers leaving the facility happier with healthy babies and we were encouraged”* (Health worker 2).

- iii. Better services.

*“There was prompt management of some surgical cases like gastroschisis”*

(Health worker 5).

##### Disadvantages of free maternity services:

- i. Fewer staff.

*“Despite the higher admission numbers, the nursing staff remained the same”*

(Health worker 10).

- ii. Increased workload.

*“There are days when we admitted almost double the capacity we could handle, yet the staff numbers were the same. We were overwhelmed as the NBU is like an ICU”* (Health worker 15).

- iii. Fewer /inconsistent supplies.

*“We sometimes had more than a hundred babies at a go yet we could only accommodate 60 comfortably. We didn’t have enough incubators for the premature babies.”* (Health worker 20).

*“We had resuscitation kits which were not well stocked, sometimes there was no adrenaline or we had drugs but had no ambubags or correct sizes of masks”* (Health worker 5).

*“We received many premature babies but some died of apnea and other complications for lack of caffeine, sometimes we had no second line antibiotics for cases of sepsis”* (Health worker 16).

iv. Overcrowding at the labor wards.

*“There were many mothers who came to deliver at a go, some had to keep walking outside as they waited for others to deliver to get a bed in the labor room”.* (Health worker 22)

v. Overcrowding in NBU.

*“Too many admissions were recorded, we sometimes admitted babies on the cold cement slabs for lack of cots and incubators”* (Support staff 1).

## **HOW THE STAFF MANAGED THE INADEQUACIES**

i. Borrowing.

*“We used to borrow some consumables from other wards like cotton wool, surgical spirit, gloves, branulas, needles etc.”* (Health worker 7).

*“There were times when we borrowed oxygen cylinders from neighboring hospitals”* (Health worker 12).

ii. Improvising.

*“Sometimes we have had to use the inside part of diapers as cotton wool”* (Health worker 15).

iii. Express order.

*“The nurse manager was informed to make an express order of the consumables”* (Health worker 20).

- iv. Out of pocket purchases by the clients.

*“When there were inadequate supplies, we asked parents to buy some surgical items like the ventriculoperitoneal shunts for hydrocephalus” (Health Worker 10).*

#### **RESPONSES FROM THE KEY INFORMANT INTERVIEWS (5)**

- i. Sudden shortage of staff post implementation.

*“There was a sudden influx of mothers delivering at RMBH, but with the same number of staff. We were grossly understaffed” (Key informant 1)*

- ii. Delays in reimbursement of funds.

*“At times the hospital would incur losses when the funds for free maternity services were delayed” (Key informant 5).*

- iii. Inadequate infrastructure to cater for the rising numbers.

*“We could only meet the needs of slightly above half the patients admitted since we had fewer cots and incubators”. (Key informant 3).*

- iv. Lack of spare parts for donated machines.

*“Servicing some of these machines was challenging as they were donations whose spare parts were not locally available, nor the technicians experienced enough to repair them”( Key informant 2).*

- v. Inconsistency in availability of essential supplies.

*“We sometimes had no antibiotics at the unit or the second line drug supply would be erratic hence affecting the outcomes of the babies. There were times we had cotton wool, no surgical spirit, or we would lack clean gloves” (Key informant 4).*

**RECOMMENDATIONS FROM STAFF ON HOW TO IMPROVE THE SERVICES.**

- i. Increase staff numbers.

*“We need more staff to cater for the high numbers of admissions we have. If possible, we can encourage staff to take up locums in the short term as we await a long-term solution”* (Health worker 5).

- ii. Ensure adequate essential supplies.

*“The hospital management needs to make sure that there are adequate supplies as the needs have increased”* (Health worker 7)

- iii. Consistency in supplies

*“We have to offer the same standards to patients year in year out hence consistency in supplies is necessary”* (Health worker 15).

- iv. Improve infrastructure.

*“There is need for more incubators and baby cots”* (Health worker 10).

- v. Emergency preparedness.

*“Better stocked emergency kits should be availed and replacements done daily after use. Regular checks should be done”* (Health worker 8).

- vi. Special unit allowance for the staff.

*“It would be good to give RMBH staff a special allowance for the work that we do every day, it will encourage us to work better”* (Health worker 11).

## CHAPTER FIVE

### DISCUSSION

A total of 3953 admissions were recorded in the 24 months. There were 13% more admissions post- implementation. Based on the responses from the questionnaires this could be attributable to the fact that there was better service utilization because of free maternity healthcare and there were more mothers delivering at the hospitals and not at home. These services were being offered to both mother and baby. As much as the home deliveries doubled post-implementation, the mothers brought the babies to hospital for care which could be attributed to the fact that the services were free and available for all. In a study that was carried out in several hospitals in Ghana, they found that since 2008 when they introduced free maternal health care, there was an increase in facility-based deliveries about 300,000 in 2007 to about 500,000 in 2011 (WHO 2012). The same finding was also reported in another study done in Burkina Faso where the rate of skilled deliveries was 45% higher post-implementation (De Allegri et al, 2012).

In a study done by Bosu et al (2007) reported reductions in delivery associated complications in neonates after fee exemptions. However, Daponte et al, (2000) found that in a facility in South Africa, institutional MMR increased with the fee exemptions. It was speculated that quality of care worsened as higher patient numbers were not accompanied by more staff and other facility resources (Dzakpasu et al 2014).

Male to female ratio was 1.1: 1 post- implementation. We may not have a scientific reason why this happened apart from a postulation that more males were born during

that time. However, in a study done in Ethiopia they reported that male children had a 38% higher risk of dying than females during the neonatal period (Mekonnen et al 2013). This was also similar to our study however, no scientific explanation was found.

The month of March 2014 marked the highest number of mortality cases; this may be because that month had the highest number of admissions ever recorded at 220. Based on the feedback from the questionnaires, it was noted that during such months, babies would sleep even on the cold cement slabs in the NBU due to lack of baby cots. As much as the bed occupancy during the study period never reached 100%, it was reported that patients had to share cots due to faulty ones and inadequate incubators for the extreme pre terms. The periods where babies had to be admitted on the slabs were explained by the fact that sometimes the cots were less than the expected hence inadequate. These were intermittent instances and once repaired could be accommodated comfortably. The interviewees also cited poor supervision, as there were too many patients with the same number of staff taking care of them. There was a significant difference in average number of admissions, discharges and mortality rate between the two periods of reference. The number of staff remained the same between the two periods. There were higher admission rates, shorter length of stay while there was a lower discharge rate and higher death rates post implementation. This may be attributed to the fact that most admissions were from MTRH labor ward and theatre hence the overcrowding and inadequate infrastructure may be a contributing factor.

Mekonnen et al, (2013) did a study in Ethiopia where they reported that there was an increased risk of neonatal death associated with births in winter. In this study, there

was almost double an increase in the mortality rate recorded in the months of July and August post implementation. These are considered to be the months with the lowest temperatures in the country.

In a study done in Ghana by Gbenga et al, (2016) they found that the rate at which the mortality rates for neonatal, infant and under-fives were declining were far beyond expectation. They attributed it to inconsistency in standard practice in policymaking and implementation (Meesen et al, 2011; Baiden et al, 2011) inconsistent funding (Witter et al 2009; Witter and Adjei 2007); inadequate community involvement (Nyonator et al, 2005); insufficient monitoring and evaluation (Anoonor et al, 2013; Witter, Garshbong and Ridde 2013) ; inadequate human and other resources<sup>56,61</sup> as the major challenges towards a more pronounced decline in mortality.

The top five causes of mortality pre- implementation were; birth asphyxia, neonatal sepsis, respiratory distress syndrome, low birth weight and prematurity while post implementation they were: neonatal sepsis, birth asphyxia, respiratory distress syndrome, low birth weight and prematurity. Post implementation, case fatality rate of neonatal sepsis, birth asphyxia, Respiratory distress syndrome and ELBW increased. This was attributed to the fact that there were more babies admitted than the unit could support (46 baby cots and 14 incubators), there was overcrowding hence higher risk of sepsis. The respondents also cited that when there were too many admissions and the babies developed nosocomial infections due to overcrowding and poor hygiene due to depletion of personal protective equipment and hand sanitizers. There was reported erratic availability of antibiotics and caffeine during the study period. The preterm babies who needed caffeine due to apneic attacks would succumb due to hypothermia too because in some instances, they had to admit babies on the cold



cement slabs in the NBU due to lack of cots and incubators. In a study done in a Ghanaian Teaching hospital after the implementation of free maternity services, it was reported that the top five causes of neonatal mortality were low birth weight; birth asphyxia; neonatal sepsis; neonatal jaundice and respiratory distress due to poor resources and infrastructure to support the rising numbers (Dickson et al, 2014).

The case fatality rate of babies with gastroschisis reduced by 10%. This may be attributed to the fact that there was prompt management of surgical cases as reported by the staff hence better outcomes.

In this study, there was a weak positive correlation between patients to staff ratio and neonatal death rate ( $r= 0.601$ ,  $p=0.002$ ), as the ratio increased the neonatal death also increased. This may be attributed to the number of staff remaining relatively the same when the number of patients increased. A multinational study done in 13 countries with the highest NMR in the UN region, including Malawi, Peru, Nepal, Kenya, Uganda among others showed that insufficient formulation and implementation of policy; inadequate funds; inadequate human resource, medical products and technologies and lack of staff retraining as major challenges in improving early life survival (Dickson et al, 2014).

There were challenges faced by the staff in RMBH and NBU in particular especially human resource, inadequate infrastructure compared to high admissions and other consumables. In a study done in Rift Valley Provincial General Hospital and Bondeni in Nakuru, 92% of the respondents cited staff shortage as a major challenge (Wamalwa 2015).

The respondents during the key informant interviews cited that the reimbursements for free maternity services would sometimes delay, the hospital had to chip in but there are times when there were distributors who would not agree to supply the same to the hospital as they were still in debt. In the Nakuru study, the key informant interviewees reported that there were delays in reimbursement of the funds from the government in the provincial general hospital while Bondeni had not yet received any (Wamalwa 2015).

There were several studies done that cited shortage of supplies and infrastructure after the fee exemptions, as was reported in Madagascar and South Africa in a multinational study (Ridde, Emilie and Bruno 2012), while the same was also reported in the Nakuru study (Wamalwa 2015).

A similar study that was done in Senegal and another done in Tanzania reported that health centers had to charge for certain services so as to compensate for income lost in the exempted services (Witter, Armar-Klemesu and Dieng 2008; Kruk et al 2008).

The RMBH staff gave several suggestions on how to improve the quality of free maternity services thus ensuring good outcomes of the neonates thus; adequate funding of the free maternity program, improve the infrastructure to accommodate more mothers and babies, ensure consistency in provision of antibiotics, caffeine and other consumables in addition to special remuneration for the staff working in the unit. They hoped that the above measures if taken were likely to improve the outcomes of the babies born and or admitted to the RMBH and NBU. This was also echoed by the staff from the Nakuru study (Wamalwa 2015), another one from Uganda which cited that the decline in morale, negative attitude towards the fee

exemption program, heavier workload and feeling of inadequacy among the staff needed to be sorted out for it to be a success (Burham et al, 2004).

Similarly, in a Ghanaian study they recommended that the government improve free delivery services policy implementation, have regular funding for the same, improve the working environment for staff, ensure adequate resources, training and recruitment of more staff (Witter, Anthony and Atkins 2007).

A study in Uganda by Nabyonga et al, 2008 found that the following conclusion was made in view of the quality of user fee exemptions ‘The policy change was aimed at limiting financial constraints to users, but is not the only option available for countries. These other financing options, such as community based insurance schemes have the potential to achieve similar aims, if they are able to have equitable involvement of vulnerable persons.’

## CHAPTER SIX

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion

- Since the introduction of free maternity services there were statistically significant higher admission rate with a shorter length of stay while there was a lower discharge rate and higher death rate post implementation
- As the patient staff ratio increased, neonatal death also increased.
- Inadequate infrastructure and essential supplies was cited by the staff as a major challenge.

#### 6.2 Recommendations

- To employ more clinical staff to be able to better the outcomes of newborns in the MTRH NBU.
- To acquire more cots, incubators and other supportive equipment to accommodate more babies and have consistency in supplies to ensure better outcomes as per the staff questionnaires and interviews.

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## APPENDICES

### **Appendix I: Consent Form**

#### **Consent Form**

##### **Background**

You are being requested to participate in a research study. Before you agree and sign the consent, it is important for you to understand, why it is being done and what it will involve. Read the following carefully and ask for clarification if there is anything that is not clear or if you would like more information. Once you have understood you can then sign the form and fill the questionnaire accordingly.

The purpose of the study is to assess the effects of free maternity services on the outcomes of newborns at the Riley Mother and Baby Hospital and your participation will help to answer some critical questions in the study. This will help us to improve our standards if need be once the study is completed.

##### **Study**

The study involves filling out a questionnaire which will be used to collect data on several aspects individual and institutional.

##### **Risks**

There are no risks involved in this study. This study will be anonymous. Your views will be treated with utmost confidentiality and there will be no repercussions for sharing your opinion.

##### **Benefits**

There are no direct benefits to the interviewees but a foreseeable one will be improved healthcare service delivery based on the findings and recommendations of this study.

##### **Alternative options**

You may choose not to participate in the study and there will be no repercussions.

##### **Confidentiality**

This study will be conducted in accordance with the Kenyan laws and regulations that protect rights of human research subjects. All information obtained will be kept strictly confidential. All data collection tools will be identified by number or coded to ensure discretion. Results of this study may be published, but no identifying information will be released.

### **Person to Contact**

If you have questions or concerns about this study, you are free to contact the investigator from Moi University, School of Medicine, department of Child Health and Pediatrics, Postgraduate program; **Dr. Joy Muyonga 0721-277524 or email me at muyonga.joy@gmail.com.**

### **Voluntary Participation**

You are free to accept or refuse to participate in the study. Refusal or the decision to withdraw from this research will involve no penalty and will not affect your relationship with the investigator.

### **Costs and Compensation to participants**

There is no cost to you, and there is no compensation for participation in this study. Thank you for your participation in this research and we truly appreciate your help.

### **CONSENT**

By signing this consent form, I confirm that I have read the information, understood it and have had the opportunity to ask questions. I will be given a signed copy of this consent form. I voluntarily agree to take part in this study.

Name.....Signature/Mark.....Date.....

Name of investigator.....

Signature..... Date.....

## **Appendix II: Study Procedure**

**Quantitative data:** electronic records of all the admissions, morbidity and mortality trends were obtained from the health records department and stored appropriately in flash drives and on email awaiting analysis.

**Qualitative data:**

1. A pilot study was done to pre-test the questionnaires and changes were made accordingly. The pilot study will be performed at JOOTRH Kisumu.
2. The RMBH/JOOTRH staff that verbally consented to participate in the study was given an overview of the study, the objectives and the implications.
3. They then signed a written consent form and were issued with a questionnaire to fill.
4. Any questions or clarifications arising from the questionnaires were directed to the principal investigator or the research assistants responded accordingly.
5. Self-administered questionnaires were distributed by the principal investigator and the research assistants to the staff who consented to participate in the study.
6. Once the questionnaires had been filled, they were collected by the research assistants and the principal investigator and they were recorded in a file and stored in a lockable cabinet awaiting analysis.
7. All the information obtained from the participants was treated with utmost confidentiality and had an option to opt out of the study if they so wished without any implications.

**Appendix III: Questionnaire to the Staff at RMBH****1. Serial Number -----****2. Gender: tick as appropriate****a) Male [ ]****b) Female [ ]****3. Age -----**

a) 20-25[ ]

b) 26-29[ ]

c) 30-35[ ]

d) 36-40[ ]

e) 41-45 [ ]

f) 46-50[ ]

g) 51-55 [ ]

h) 56-60[ ]

i) Other(specify)-----

**4. Academic qualification (tick as appropriate):**

a) First degree [ ]

b) Diploma [ ]

- c) Post graduate [ ]
- d) Certificate [ ]
- e) Ongoing master's degree (specify) -----
- f) Others (specify) -----

**5. What is your cadre or responsibility in the RMBH? (Tick as appropriate):**

- a) Nurse [ ]
- b) Registrar or Resident (Specify Specialty).....
- c) Pediatrics consultant[ ]
- d) Surgeon(please specify specialty)[ ].....
- e) Senior management [ ]
- f) Medical officer [ ]
- g) Support staff [ ]
- h) Clinical officer [ ]
- i) Records department [ ]
- j) Nutrition[ ]
- k) Biomedical staff [ ]

**6. Number of years worked in RMBH NBU, maternity or labor ward?**

a) 2-3 years [ ]

b) 4-5 years [ ]

b) More than 5 years [ ]

**7. What are the advantages of free maternity that you have witnessed? (Tick appropriately)**

a) Better services [ ]

b) Better infrastructure [ ]

c) Availability of resources [ ]

d) Customer satisfaction [ ]

e) Others -----

**8. What are the disadvantages of free maternity that you have witnessed? (Tick appropriately)**

a) Fewer resources [ ]

b) Fewer staff compared to patient numbers [ ]

c) Inadequate emergency equipment [ ]

d) Increased work load [ ]

e) Others-----

**9. Has the free maternity service improved the outcomes of neonates admitted at RMBH NBU? (Tick appropriately)                      Yes [ ] No [ ]**

**I do notknow [ ]**

Explain as per your response above -----

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 -----  
 -----

**10. Have you had periods of inadequate supplies within the unit?**

Yes  No

If yes, how did you handle it? -----

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 -----  
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**11. Which supplies does the unit run out of most often if any? (Tick appropriately).**

- a) Personal protective equipment (like gloves)
- b) Hand sanitizer
- c) Soap
- d) Drugs
- e) Surgical spirit
- f) Others -----

**12. Which supplies never run out in the unit?**

- a) Water
- b) Personal protective equipment
- c) Drugs
- d) IV fluids

e) Others-----  
-----  
-----

**13. What are the challenges you have faced as a staff since the introduction of free maternity services?**

- a) Increased workload [ ]
- b) Inadequate resources [ ] please specify-----  
--
- c) Inadequate staff for increasing patient numbers [ ]
- d) Underequipped emergency kits [ ]
- e) Inconsistent drug supplies [ ]
- f) Others-----

**14. Do you think the implementation of the free maternity services is satisfactory?**

Yes [ ]      No [ ]      I do not know [ ]

If no, how better can we provide the service to ensure good neonatal outcomes?-----  
-----  
-----  
-----

**14. If you are a doctor, nurse or clinical officer (please tick appropriately).**

- a) I was trained on Emergency Obstetric and neonatal care in the past five years [ ]
- b) I have not been trained on EmONC [ ]
- c) I was trained on EmONC more than five years ago [ ]

**Appendix IV: Key Informant Interview Guide**

**1) What adjustments did the hospital have to make to allow for service delivery to continue since the introduction of free maternity services?**

(a) In human resource-----

(b) Infrastructure-----

(c) Finances-----

(d) Others-----

-----

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**2) Are the free maternity reimbursement funds adequate for the needs of the patients seen at the RMBH? Yes [ ] No [ ]**

If no how does the hospital support service delivery when there is a delay in funds?

-----

-----

-----

**3) Which equipment was bought after the introduction of free maternity services for labor ward and the NBU?-----**

-----

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-----  
-----

4)        **Have there been any shortages in supplies?        Yes [ ]        No [ ]        If  
yes, how do you deal with that in your area?-----**

-----  
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5)        **How often are maintenance checks done in your unit and what is the  
source of the funding?**

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-----

**Appendix V: Patient Biodata**

Serial number	Variable
Gender: <ul style="list-style-type: none"> <li>i. Male</li> <li>ii. Female</li> </ul>	
Gestation by dates: <ul style="list-style-type: none"> <li>i. Preterm</li> <li>ii. Term</li> <li>iii. Postdates</li> <li>iv. Missing data</li> </ul>	
Mode of delivery: <ul style="list-style-type: none"> <li>i. SVD</li> <li>ii. SBD</li> <li>iii. CS</li> <li>iv. Assisted vaginal</li> <li>v. Missing data</li> </ul>	
Place of delivery: <ul style="list-style-type: none"> <li>i. RMBH labor ward</li> <li>ii. RMBH theatre</li> <li>iii. MTRH ward 7</li> <li>iv. Home delivery</li> <li>v. Dispensary</li> <li>vi. Health center</li> <li>vii. Provincial general hospital</li> </ul>	

<ul style="list-style-type: none"> <li>viii. Mission hospital</li> <li>ix. Sub district hospital</li> <li>x. District hospital</li> <li>xi. Private hospital</li> <li>xii. Missing data</li> </ul>	
<p>Birth weight:</p> <ul style="list-style-type: none"> <li>i. ELBW</li> <li>ii. VLBW</li> <li>iii. LBW</li> <li>iv. Normal</li> <li>v. LGA</li> </ul>	
<p>APGAR SCORE at five minutes:</p> <ul style="list-style-type: none"> <li>i. &gt;7</li> <li>ii. 6-7</li> <li>iii. 4-5</li> <li>iv. 0-3</li> <li>v. No score indicated</li> </ul>	
<p>Outcome:</p> <ul style="list-style-type: none"> <li>i. Discharge home</li> <li>ii. Death</li> <li>iii. Referred to Kenyatta National hospital or other facility</li> </ul>	
<p>Diagnosis at discharge, death or referral to another facility</p>	

**Appendix VI: Mortality by Birth Weight**

Birth weight	1st July 2012- 30 <sup>th</sup> June 2013	1 <sup>st</sup> July 2013-30 <sup>th</sup> June 2014
ELBW		
VLBW		
LBW		
Normal birth weight		
LGA		

**Appendix VII: Mortality by Diagnosis**

DIAGNOSIS	1st July 2012- 30 <sup>th</sup> June 2013	1 <sup>st</sup> July 2013-30 <sup>th</sup> June 2014
Prematurity		
Prematurity and RDS		
Birth asphyxia		
Neonatal sepsis		
Anemia		
Hypothermia		
Hypoglycemia		
Hyperglycemia		
Neonatal meningitis		
Neonatal jaundice		
Acute kidney injury		
Encephalocele		
Cleft lip/palate		
Birth related trauma		
Anorectal malformation		
Jejunal atresia		
Ileal atresia		
Duodenal atresia		
Anterior abdominal wall defects		



### Appendix VIII: Human Resource at RMBH


STAFF	1st July 2012- 30 <sup>th</sup> June 2013	1 <sup>st</sup> July 2013-30 <sup>th</sup> June 2014
Nurses in NBU		
Clinical officers in labor ward		
Nurses in labor ward		
Clinical officers in labor ward		
Medical officer interns in NBU		
Medical officer interns in labor wards		
Residents from CHAP in NBU		
Residents form Obstetrics and Gynecology		
Consultant Pediatricians		
Consultant Obstetricians		
Pediatric Surgeons		
Neurosurgeons		
Plastic surgeons		
Urologists		
Nutritionists		
Social workers		
Support staff		
Billing clerks		
Records clerks		
Public relations		
Public health officers		

### Appendix IX: Human Resource


The team comprised of the following personnel:

PERSONNEL	STATION
2 Supervisors	Department of Child Health and Pediatrics, Moi University, School of Medicine
1 Biostatistician and 1 Epidemiologist	Moi University, School of Public Health, Department of Epidemiology and Preventive Medicine.
Two research assistants	New born unit at RMBH

## Appendix X: IREC Approval



**MOI TEACHING AND REFERRAL HOSPITAL**  
P.O. BOX 3  
ELDORET  
Tel: 3347112/3




**MOI UNIVERSITY  
SCHOOL OF MEDICINE**  
P.O. BOX 4606  
ELDORET

**INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)**

Reference: IREC/2015/134  
**Approval Number: 0001479**

31<sup>st</sup> August, 2015

Dr. Joy Muyonga,  
Moi University,  
School of Medicine,  
P.O. Box 4606-30100,  
**ELDORET-KENYA.**



Dear Dr. Muyonga,

**RE: FORMAL APPROVAL**

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-


***"Hospital Outcomes of Newborns Admitted to NBU, after Introduction of Free Maternity Services in Moi Teaching and Referral Hospital, Kenya".***

Your proposal has been granted a Formal Approval Number: **FAN: IREC 1479** on 31<sup>st</sup> August, 2015. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 30<sup>th</sup> August, 2016. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,



**PROF. E. WERE**  
**CHAIRMAN**  
**INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE**

cc	Director - MTRH	Dean - SOP	Dean - SOM
	Principal - CHS	Dean - SON	Dean - SOD



MOI TEACHING AND REFERRAL HOSPITAL  
P.O. BOX 3  
ELDORET  
Tel: 33471/2/3



MOI UNIVERSITY  
FACULTY OF HEALTH SCIENCES  
P.O. BOX 4606  
ELDORET  
Tel: 33471/2/3

**INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)**

Reference: IREC/2015/134  
**Approval Number: 0001479**

30<sup>th</sup> November, 2015

Dr. Joy Muyonga,  
Moi University  
School of Medicine,  
P.O. Box 4606-30100,  
**ELDORET-KENYA.**

Dear Dr. Muyonga,

**RE: RATIFICATION OF THE DECISION TO GRANT FORMAL APPROVAL**

Please note that in the IREC meeting of 28<sup>th</sup> October, 2015 the full Committee did not ratify your Formal Approval for study titled; *"Hospital Outcomes of Newborns Admitted to NBU, after Introduction of Free Maternity Services in Moi Teaching and Referral Hospital, Kenya"* However, after addressing the concerns raised by the Committee your Formal Approval is now ratified. You may continue with your study.

Sincerely,

**MS. CATHERINE OKWIRI  
HUMAN SUBJECT'S ADMINISTRATOR  
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE**

## Appendix XI: Hospital Approval



### MOI TEACHING AND REFERRAL HOSPITAL

Telephone: 2033471/2/3/4  
 Fax: 61749  
 Email: director@mtrh.or.ke  
**Ref: ELD/MTRH/R.6/VOL.II/2008**

P. O. Box 3  
 ELDRET  
 31<sup>st</sup> August, 2015

Dr. Joy Muyonga,  
 Moi University,  
 School of Medicine,  
 P.O. Box 4606-30100,  
ELDRET-KENYA.

**RE: APPROVAL TO CONDUCT RESEARCH AT MTRH**

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

*"Hospital Outcomes of Newborns Admitted to NBU, after Introduction of Free Maternity Services in Moi Teaching and Referral Hospital, Kenya".*

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.

**DR. JOHN KIBOSIA**  
**DIRECTOR**  
**MOI TEACHING AND REFERRAL HOSPITAL**

CC - Deputy Director (CS)  
 - Chief Nurse  
 - HOD, HRISM