ASSESSMENT OF HEALTH WORKERS PERINATAL KNOWLEDGE AND PRACTICES RELATED TO SERVICE DELIVERY IN MAKUENI COUNTY, KENYA

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DECLARATION & RECOMMENDATION

Declaration

I declare that this thesis is my original work and has not been presented in any other university.

_____ _____

Signature *Date*

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Recommendation

We confirm that the work reported in this thesis was carried out by the candidate under our supervision.

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DEDICATION

This thesis work is dedicated to my children, David, Kelvin and Ryan, who have been a constant source of support and encouragement during the challenges of school and life. I am truly thankful for having you in my life. This work is also dedicated to my parents, the late David Kakuku and Ann Mainga, who always loved me unconditionally and whose good example taught me to work hard for the things that I aspire to achieve.

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ABSTRACT

A health system has six interdependent and interrelated pillars: health workforce; service delivery; information; financing; medical products, vaccines and technologies; leadership and governance. This study addressed health workforce pillar in order to strengthen maternal and new born services delivery in Makueni County. Globally, new born (neonatal) mortality remains unacceptably high. Neonatal mortality accounts for 60% of infant mortality rate in Kenya. In Makueni County, 1 in 22 children does not live to his or her first birth day. This unacceptable high mortality is despite existence of cost-effective evidence-based interventions which could reduce up to 70% of current deaths. Review of client complaints in Makueni has revealed gross medical mismanagement raising concerns whether health workers attending to them are knowledgeable. This study assessed perinatal knowledge and practices among health workers in Makueni County. It specifically established prenatal care knowledge and practices, pre-eclampsia knowledge, postnatal care knowledge, home visits and hand hygiene knowledge among health workers in Makueni County. The study was cross sectional in design where 163 health workers selected randomly were interviewed using a structured questionnaire and a checklist used to observe antenatal care consultation practices. Data analysis was done using SPSS v25 and chi-square statistic test used to examine associations within variables. On prenatal care, 89 (54.6%) of health workers were rated as having good knowledge. However, practice did not conform to guidelines since 10 (30.3%) and 23 (69.7%) of mothers didn't have full history taken and general physical examination done respectively. On pre-eclampsia 78 (49.4 %) had poor knowledge while on use of recommended drugs for pre-eclampsia, 70 (42.9%) had moderate knowledge and 39 (23.9%) poor knowledge. On postnatal care, 132 (80%) had good knowledge on young infant feeding while 35 (21.5%) had poor knowledge on new born care. On management of neonatal infections, 58 (37.4%) had good knowledge while on home visits 80 (48.5%) knew the importance of home visits but 88 (80.4%) did not know the optimal time for the visits. On hand hygiene 127 (77%) of health workers knew the four critical times for washing hands with soap under running water. The study concluded that workers had good knowledge on prenatal care, young infant feeding and hand hygiene. There were critical gaps in knowledge on pre-eclampsia, use of recommended drugs for pre-eclampsia, new born care, management of neonatal infections and home visits. Prenatal care practice did not conform to guidelines. The study recommended refresher courses and continuous medical education in focused antenatal care, management of pre-eclampsia, newborn care, management of neonatal infections and home visits. It also recommended strengthening of supportive supervision to ensure guidelines are available and adhered to in practice.

ABBREVIATIONS AND ACRONYMS

AIDs	Acquired Immune Deficiency Syndrome
ANC	Antenatal Clinic
BCE	Before Common Era
BFHI	Baby Friendly Hospital Initiative
BEOC	Basic Emergency Obstetric Care
CME	Continuous Medical Education
CHEW	Community Health Extension Worker
CHV	Community Health Volunteer
CO	Clinical Officer
DOH	Department of Health
FANC	Focused Antenatal Care
FP	Family Planning
HIV	Human Immune deficiency Virus
IMR	Infant Mortality Rate
KeMU	Kenya Methodist University
KNBS	Kenya National Bureau of Statistics
LBW	Low Birth Weight
MB. Ch. B	Bachelor of Medicine and Surgery
MCH	Maternal Child Health
MDG	Millennium Development Goal
MO	Medical Officer
MOH	Ministry of Health
OJT	On the Job Training
PLWHIV	Persons Living With HIV
SCHMT	Sub-County Health Management Team

SPSS	Statistical Package for Social Sciences
TBA	Traditional Birth Attendant
UNICEF	United Nations Children's Fund
U5MR	Under Five Mortality Rate
UTI	Urinary Tract Infection
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

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CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Every day, the outcome of lives of many individuals is determined by healthcare systems. From the safe birth of a healthy new born to the care with dignity of physically weak elderly people, healthcare systems have an important and continuous responsibility to individuals throughout their lives. Health systems are extremely important to the healthy development of people, families and societies everywhere in the world. A healthcare system comprises all organizations, institutions, individuals and activities whose primary goal is to promote, restore or maintain health (World Health Organization [WHO], 2007). This includes actions that address determinants of health and those that directly improve health situation. According to WHO framework for action, a health system has six building pillars (health workforce; service delivery; information; financing; medical products, vaccines and technologies; leadership and governance) which are interdependent and interrelated making a complex whole.

This study focused on health workforce pillar. A productive health workforce is one that works in ways that are responsive to client needs, fair and efficient to realize optimal outcomes considering available resources and circumstances i.e. there are adequate staff, equitably distributed; they are effective and proactive (WHO, 2007). The study set to establish health workers perinatal knowledge and practices in order to ensure healthcare workers are competent, responsive and productive in maternal and neonatal service delivery. Often, expectant mothers and their families expect a healthy pregnancy, safe delivery, and a healthy new born who thrives well. Unfortunately, this is not always the

case as many mothers and neonates suffer morbidity and mortality during the period of pregnancy and delivery. A mother's death is a tragedy unlike others, because of the deeply held belief that no mother should lose her life due to the normal process of pregnancy and child birth and because of the damaging effects on her family and the community. Considering current state of knowledge and technology, majority of the problems that trouble our mothers and new born children can be stopped from occurring or managed successfully. Most of the millions of untimely deaths that occur including the suffering that accompanies ill health are avoidable. Therefore, we need to consider the inseparable duo of mother and baby in terms of time, causes and places of death, and the ability of the healthcare system to deliver optimal and equitable services to mothers and new born children. For many years, care for pregnancy, safe delivery and young children was thought of to be a domestic issue, the interest of mothers and midwives. However, in the 20th century the health of mothers and new born children changed from being a domestic issue to a public health concern with matching duties for the state (MOH, 2012).

Globally, about four million newborns die every year during the first twenty-eight days of life while more are still born. Seventy-five percent of new born mortality occurs within seven days of life and the highest probability of mortality is during the first day of life. Nearly all (99%) new born mortality happens in poor countries. In Africa, the first three causes of neonatal deaths are severe infections (28%), birth asphyxia (27%) and prematurity (29%) (Lawn, Cousens, & Zupan, 2005). In Kenya, asphyxia, birth trauma, prematurity and neonatal sepsis combined account for 80% of newborn deaths (Ministry of Health [MOH], 2012). Even though current trends show that infant (IMR) and under five mortality rates (U5MR) in Kenya are declining, the neonatal mortality rate has

stagnated (31 per 1,000 live births) and accounts for 60% of all infant mortality rate (Kenya National Bureau of Statistics [KNBS], 2008). In Makueni County, 1 in 22 children do not live to their first birthday. The U5MR and IMR rates are 56/ 1,000 and 45/1,000 live births respectively (KNBS, 2009). In the County Referral Hospital, the facility based IMR and neonatal mortality rates are 17% and 22 % respectively (Department of Health [DOH] Makueni, 2013). Over 70% of neonatal deaths can be averted through cost effective evidence-based interventions, and which include equipping health workers with necessary knowledge and skills to provide effective prenatal and immediate postnatal services. To this end, Kenya developed basic pediatric protocols and obstetric guidelines meant to provide health workers with knowledge on neonatal, infant and pregnant mothers care. The WHO has been publishing and regularly updating international guidelines on child and maternal health (e.g. integrated management of childhood illnesses guidelines) aimed at capacity building health workers with knowledge on how to provide effective and efficient maternal and child health services.

Kenya was a signatory to the millennium development goals (MDGs) set by the United Nations General Assembly (UNGA) on sustainable development in September 2000 (MOH, 2007). MDG 4 targeted to reduce under-five mortality by two thirds by end of 2015. It is widely acknowledged that MDG 4 could not be realized without a distinct concentration on neonatal health especially during the first week of life (Lawn et al, 2005 and Ganatra & Zaidi, 2010). Even though Kenya has made remarkable progress towards reducing child mortality, she was unable to meet the millennium target by end of 2015. In 2015, the United Nations General Assembly build on the successes of the MDGs and set 17 Sustainable Development Goals (SDGs) to be realized by 2030. SDG 3 partly aims to

reduce the global maternal mortality ratio to less than 70 per 100,000 live births and end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births by the year 2030. Definitely these are ambitious targets which cannot be realized if health workers are not knowledgeable, skilled and responsive to client needs. The efforts to improve maternal and neonatal health in Kenya got into greater heights in recent times. The sitting president in June 2013 introduced free antenatal, natal and postnatal services in all government facilities to enable as many pregnant women to access skilled maternity services. Similar efforts are being spearheaded by her Excellency the first lady in her campaign "beyond zero". Even though all these efforts are aimed at improving the health of pregnant mothers and consequently ensure good child health outcomes, it is impossible to realize them if health workers providing services lack essential knowledge on maternal and neonatal care. This study therefore sought to establish healthcare workers perinatal knowledge and practices related to mother and child health in Makueni County in order to identify gaps that negatively affect maternal and neonatal outcomes.

1.2 Statement of the Problem

Every day globally, about 830 mothers lose their lives due to stoppable causes surrounding pregnancy and childbirth. Out of these, 99% happen in poor countries and the deaths are more among mothers who reside in rural areas and also among poorer communities. Similarly, 7000 new-born deaths occur every day and based on current trends more than 60 countries will not realize the SDG target of lowering neonatal mortality to less than 12

deaths per 1000 live births by 2030. Kenya's maternal mortality has remained approximately 488 per 100,000 live births; and a neonatal mortality of 22 per 1,000 live births. Lack of skilled birth attendance and poor access to services has been linked to this poor state of affairs (WHO, 2018). The international community has responded to this through various initiatives like the United Nations commitment in SDGs for which Kenya is a signatory. In the country, various initiatives are in place to address the matter. These include training of certificate nurses by Kenya Medical Training College (KMTC) to ensure arid regions have adequate numbers of skilled workers, agenda 4 of the presidency aimed at achieving universal healthcare and maternity financing through National Health Insurance Fund (NHIF) which ensures no financial limitation to care and treatment of expectant mothers. Health workers who attend to mothers and children therefore should have requisite knowledge and skills to provide effective, efficient and safe services that are evidence based.

Training programmes meant for health workers in low resource contexts have shown improvements in both worker knowledge and health service outcomes (WHO, 2010). Publications on health workers mostly describe the supply, distribution, retention, motivation and attrition of health workers. Knowledge on specific issues is rarely assessed yet effective implementation of programs, among other things, is dependent upon levels of knowledge (Lutwama, Roos, & Dolamo, 2012). In Makueni County, delivery of maternal and neonatal services has faced numerous challenges. In the year 2013, out of 1,667 babies born alive at the County Referral Hospital, 29 died before discharge, a situation that could have been avoided. In the same year, 55 still births were also documented in the hospital (MOH, 2014). The hospital management has documented various complaints from clients,

most of them raising issues of mismanagement of their health problems and negligence on the part of service providers. Most of the documented complaints relate to poor and unsafe maternal and neonatal service delivery where mothers lose pregnancies, neonates and or complicate during antenatal and perinatal periods. A case in point for example is a known hypertensive middle-aged lady who lost three consecutive pregnancies while on follow up at the facility. On reviewing her last pregnancy medical records, there was conspicuous evidence of poor management of her condition in all the hospital departments she had been attended to. This ranged from wrong prescription of antihypertensive drugs, wrong dosage and failure to conduct laboratory investigations. This and other reported cases raise the question whether such occurrences are due to negligence, poor attitude or inadequate knowledge thereof among caregivers. Unacceptable high new born mortality continues to occur despite the availability of cheap evidence-based interventions that could prevent majority of these deaths.

During the first month of life, more than 70% of deaths that occur can be averted through evidence-based practices like early beginning of breastfeeding, exclusive breastfeeding and management of hypothermia (Martines, et al., 2005). Health educational messages and health care offered to mothers during antenatal and postnatal period is important in lowering the level of morbidity and mortality among neonates (Bhutta, et al., 2008). Knowing the status of knowledge is important in choosing the most effective method of delivering effective and efficient maternal and neonatal services. This study therefore established healthcare worker knowledge and practices on mother and new-born health that would enable health managers in decision making regarding better strategies of maternal child health service delivery.

1.3 Objectives of the Study

1.3.1 Broad Objective:

To assess the status of health workers perinatal knowledge and practices related to service delivery in Makueni County.

1.3.2 Specific Objectives:

I. To establish health workers knowledge and practices on prenatal care related to service delivery in Makueni County

II. To assess health workers knowledge on diagnosis and treatment of pre-eclampsia related to service delivery in Makueni County

III. To assess health workers knowledge on postnatal care related to service delivery in Makueni County

IV. To assess health workers knowledge on home visits and hand hygiene related to service delivery in Makueni County

1.4 Research Questions

The study answered the following questions:

I. How is health workers knowledge and practices on prenatal care related to service delivery in Makueni County?

II. How is health workers knowledge on diagnosis and treatment of pre-eclampsia related to service delivery in Makueni County?

III. How is health workers knowledge on postnatal care related to service delivery in Makueni County?

IV. How is health workers knowledge on home visits and hand hygiene related to service delivery in Makueni County ?

1.5 Justification of the Study

The hospital management of Makueni County Referral Hospital has dealt with various complaints from clients related to poor and unsafe maternal and neonatal care service delivery outcomes as discussed in Hospital Management Committee. A review of hospital medical records has found numerous deficits in service provision including wrong diagnosis, improper prescription of drugs, unsafe procedures and failure to take appropriate measures in patient care (DOH, 2013). Caregivers who provide new-born health services should have requisite knowledge on different procedures and evidence-based practices to assure effective outcomes. Indeed, health workers who serve pregnant and postnatal mothers should have requisite knowledge and skills in preventive, curative and promotive health care for both mothers and neonates (Ayiasi, Criel, Orach, Nabiwemba, & Kolsteren, 2011).

Health workers who care for new born children should have adequate knowledge on different procedures and evidence-based practices for their optimal and successful implementation. Learning activities targeting health workers in resource poor settings have demonstrated improvements in both worker knowledge and healthcare outcomes (WHO, 2010). This study set to establish whether health workers in Makueni County have adequate knowledge and sound practices in maternal and neonatal care, required to ensure good service delivery outcomes. Study findings helped highlight areas of knowledge and practice gaps, and which if addressed would lead to competent, responsive and productive

health workforce. This would support both National and County governments efforts of combating mother and new born child morbidity and mortality. It would also support the Country's international obligations contained in treaties and commitments like the SDGs.

1.6 Limitations and Delimitations of the Study

1.6.1 Limitations of the Study

Some primary health facilities were too difficult to access due to transport problems. This was overcome through use of motor cycles. Having worked in the County Referral Hospital, selective bias could occur in the choice of respondents. This was overcome through engaging workers who were found at work during the time of study, and not looking for staff who were familiar or friends. Some potential respondents were unavailable during study period for various reasons. This was addressed through random sampling of staff who were available during study period.

1.6.2 Delimitation of the Study

The setting and extend of the study was limited to establishing health worker knowledge and practices on mother and new-born health service delivery. The target population was primary care givers (medical officers, clinical officers and nurses) who attend to the majority of mothers and neonates seeking care. Specialist doctors and clinical officers were left out since they do not handle bulk of the clients and their services are limited to their areas of specialization. The study also focussed on public health facilities within the County and under the management of Makueni County government. The study adopted a structured questionnaire and observation checklist with questions well chosen to adequately cover areas of study interest.

1.7 Significance of the Study

The Ministry of health over the years has been developing and regularly reviewing practice guidelines meant to equip health workers and learners in health training institutions with the necessary knowledge required in managing maternal and neonatal morbidities effectively e.g. basic pediatric protocols and Obstetric guidelines. At the County Referral Hospital and other hospitals, continuous medical education (CME) forums are held every week, and where challenging cases managed in the hospitals from different departments are discussed. Hospitals also conduct maternal audits every week to discuss maternity department outcomes. Some hospitals also have in place computers with internet access where medical reference can be made.

All these efforts are aimed at equipping health workers and medical students with adequate knowledge for better outcomes. Despite all these efforts, hospital administrations continue to receive complaints of client mismanagement leading to poor outcomes. Of particular concern are the mothers who lose their pregnancies or newborns out of manageable conditions. Findings from this study would help policy makers adopt strategies that ensure availability of responsive, competent and productive health workforce. Makueni County health managers would get resourceful information for planning for health (especially in prioritizing topics for continuous medical education (CME), on the Job training (OJT) and in-service training in order to strengthen maternal child health services delivery. They should also help in strengthening provision of integrated services, application of evidence-based interventions and in planning community health interventions. Findings will indirectly ensure that clients get effective and safe maternal and neonatal health services.

1.8 Assumptions of the Study

This study assumed that responses from study subjects were honest and truthful, and that they reflected knowledge on maternal and neonatal care. The study also assumed that omissions or incorrect entries in documents reviewed were a surrogate marker of knowledge deficit and or improper practice. Professional guidelines, be they national or international, are meant to be used by all cadres; this study assumed that all health workers in the County have come across and are aware of guidelines from which study questions and observations were based on.

1.9 Operational definition of Terms

Perinatal Care Health services provided to mothers during pregnancy, around birth and after birth. It includes all prenatal/antenatal and postnatal services.

Prenatal care: Health services offered to pregnant mothers. They include routine physical checkups, laboratory tests, screening and treatment of diseases, health education on danger signs and complications during pregnancy.

Pre-eclampsia: A disorder occurring after 20 weeks of pregnancy diagnosed by the presence of hypertension (>140/90 mmHg) during two occasions more than four hours apart in previously normal person & presence of proteins in urine

Postnatal care: Health services given to a mother and newborn after delivery. Such services include and are not limited to newborn care, identification and treatment of maternal complications, identification and treatment of newborn infections, prophylaxis against infections, cord care, newborn feeding and health education.

Community interventions: Health services that target a group of individuals or a geographic community meant to identify and address health problems; support and health educate individuals to adopt healthy living styles including maintaining hygiene and sanitation. The study focused on home visits and hand hygiene.

Knowledge: The information, understanding and skills gained through education and experience.

Health worker: Medical officers, clinical officers and nurses involved in the care of mothers and neonates in public hospitals, health centers and dispensaries

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Ideally, literature review identifies, evaluates and synthesises the relevant pieces of writing within a particular field of research. It makes it clearer how knowledge has developed gradually within the field, pinpointing what has been done, what in most cases is accepted, what is coming to existence and the present state of knowledge on the topic. Literature review also helps identify a research gap (i.e. unexamined or under-researched areas) and explains how a particular research work addresses this gap. Literature generally conotes a collection of published work, information or materials on a particular area of study or topic, such as books and articles of academic value.

Review of pieces of writing produces much more than a summary of important sources. Examination of writings involves assessing individual works as well as synthesising these sources in order to gain a wide understanding of the field. At this field level, literature examination produces summaries of common and upcoming approaches, revealable patterns and trends, areas of arguments and controversies, and gaps within the important publications. When you can obviously notice these things, you are able to place your own study and add to ongoing discussions within the area of research. Scholarly works on care giver knowledge and pracitces on mother and child health are presented in this chapter. Additionally, the conceptual and theoretical frameworks that were adopted for the study are also included.

2.2 Health Workforce Perinatal Knowledge and Practices

The problem of under performance of healthcare workers in poor and middle income countries needs to be dealt with urgently. Many children and adults lose their lives prematurely each year despite the fact that numerous interventions are available which can stop such deaths. Health workers are ertremely necessary for providing these life-saving interventions. However, health workers performance (described as sticking firmly appropriate standards and guidelines) is almost always inadequate, as demonstrated in studies of child health, sexually transmitted illnesses, reproductive health and non-communicable disorders. Governments and non-governmental organisations utilize a lot of resources on health workers and on auxilliary subsystems that support them. Such investments could lead to greater benefits to communities than they currently do.

Undesirable health-worker practices are responsible for low utilization of health services by vulnerable individuals, and improved performance may increase utilization of health facilities. In addition, health workers practices can be harmful (for example, administration of sedative drugs to children suffering from pneumonia or prescribing unuseful antimicrobials), and such errors of commission must be eliminated. Health workers practices are behaviours that are difficult to understand and which may have many potential influences. Examination of intervention studies in poor and middle income countries suggests that the simple distribution of written guidelines often fails to achieve desired results, that supportive supervision and audit with feedback produces positive results, and that multipronged interventions might be better than single interventions (Rowe, Don, Claudio, & Cesar, 2005).

According to WHOs framework for action, health workforce must be responsive, competent, productive, unbiased and resource savvy so as to realize optimal outcomes considering work environmental situation (WHO, 2007). The former executive director of United Nations Children's Fund (UNICEF), James Grant, once remarked that the priority activity before Nations was to ensure those who needed medical knowledge had it because over two thirds of the over 50 million people who were dying each year in the late 1980s could have been saved through the application of that knowledge. Years after Grant's statement, the utilization of requisite knowledge remains a world issue especially in child health service provision. Even though a number of issues specific to particular environments influence the functioning of a healthcare system, staff knowledge regarding evidence based practice is key.

Many studies have been done regarding health worker knowledge in various aspects of practice. A good example concerns breast cancer which is among the most dreaded gynaecological diseases. Globally, breast cancer is one of the most common cancers afflicting women and is reported to be the second leading cause of mortality among victims. It has been shown that breast cancer has poorer outcomes among African women compared with caucasian women, partly because most african patients get diagnosis when the condition is too advanced. Breast cancer is curable but this is only possible if detected early. Numerous studies have looked at the role of caregivers such as physicians and nurses in promoting breast cancer awareness and detection. Studies have demonstrated that recommendation by physicians for example leads to increase in number of women who seek mammography screening. It has also been shown that female health workers can play an important role in creating an environment supportive of screening behaviors

through role modelling. In developed countries, research has shown that attitude and orientation of care givers are essential determinants of breast cancer screening service utilization. Additionally, it has been demonstrated that health workers with appropriate knowledge, attitude and beliefs make good health educators and are effective in promoting targeted behaviours. Despite this, a study on knowledge, attitudes and practice of breast cancer screening among female health workers in a Nigerian urban city established that majority of respondents (55%) had very poor knowledge on breast cancer risk factors. Knowledge on mammography as a diagnostic tool was very high (80.7%), but extremely low on use of mammography as a screening tool. Utilization of mammography among those over 40 years and who needed routine annual screening was only 3.1%. The study established low knowlegde (45.5%) on breast self examination as a screening method (Adenike & Vivian, 2009).

It is widely asserted that you cannot preach water and take wine. Indeed health workers should be good role models of their “live healthy” teachings. Without adequate knowledge and positive attitude, this cannot be done successfully. In a study in the republic of Zambia where health workers were evaluated on their knowledge, attitudes, beliefs, and practices regarding epilepsy, it was established that gaps on knowledge existed especially on emergency treatment and diagnosis of partial epilepsy. Graduates who had completed education recently were found more knowledgeable, indicating that curriculum changes instituted in 2000 might have improved care. Health workers showed both personal and professional misgivings regarding epileptic persons marrying. Additionally, with regard to improving management of epilepsy skills, the study recommended that educational programs address identified attitudes which could worsen existing stigma on epilepsy

(Elwyn, Alan, Masharip, Edward, & Gretchen, 2007). Ayiasi et al (2011) established health workers providing primary services in Uganda were not knowledgeable especially in treatment of new-born infections. A related cross sectional study involving obstetrician gynaecologists, neonatologists and paediatricians showed that only a marginal number of the workers recommended use of influenza vaccine during pregancy and among children. More over, the study showed that workers lacked knowledge on prevention of influenza and most of them were not vaccinated against the disease (Esposito et al., 2007). Underperformance is a very widespread problem among health workers in poor countries. Review of intervention studies suggests that provision of guidelines is ineffective most of the times, that supportive supervision and service verification are effective, and that multiple approaches could be more beneficial in building health worker knowledge (Rowe, Savingy, Lanata, & Victoria, 2005).

Aisien and Shobowale (2005) established that health workers in Nigeria lacked adequate knowledge on HIV transimission and the recommended precautions. They determined that over 25% of workers thought the virus could be transimitted through body fluids like saliva, vomit, and excreta like faeces and urine. They also determined that workers highly felt they could acquire the virus through needle stick injury, exposure of mucocutaneous membranes and unbroken skin to blood and body fluids that had the virus. From the preceding literature reviews, it is evident that healthworker performance and hence desired health outcomes are very much dependent on level of knowledge in the respective service delivery field. Multifaceted approaches (and which include addressing attitude, resource availability and work environment) are therefore important to ensure continuous medical education and timely adoption of evince based interventions. Dissemination of guidelines

alone as embraced by many low income countries is not effective alone in ensuring better health outcomes.

2.3 Prenatal care Knowledge and Practices

The care given to a pregnant mother is mostly preventive in nature, and is known as antenatal or prenatal care. Antenatal care aims at providing frequent check-ups in order to enable health providers identify, manage and prevent possible health problems during the course of pregnancy and to enhance healthy lifestyles that are beneficial to both mother and child. During check-ups, expectant mothers get health information regarding the physiological changes that occur during gestation and antenatal nutrition including vitamins, trace elements and other forms of supplementation. Mothers also get recommendations on treatment of common problems and on healthy lifestyles that promote wellbeing of mother and baby. The provision of routine antenatal care, including antenatal evaluations and diagnosis, has contributed immensely towards lowering the incidence of maternal deaths, pregnancy loses, birth deformities, low birth weight, new born infections and other stoppable health problems.

The WHO advices that expectant mothers receive at least four ANC attendances in order to help identify and manage health problems, and to administer vaccinations. Even though ANC is necessary in improving the wellbeing of both mother and new born, many mothers rarely make the recommended four visits. There are several methods of changing healthcare systems to ensure mothers get ANC services such as enacting new policies, educating care givers and addressing organization of health services. Public health interventions targeting behavior change are also useful. Examples of such interventions

include media advocacy to reach as many people, enabling individuals to be responsible of their own health, health education and financial incentives. Research works concerning these interventions has established that one intervention can improve the number of expectant mothers seeking ANC services. Additionally, combined interventions can lower new born mortality and intrauterine fetal deaths, reduce incidence of low birth weight babies and increase the number of expectant mothers getting ANC services (WHO, 2018).

During ANC, mothers attend appointed clinics monthly in the first 26 weeks of pregnancy with the number of clinic visits increasing to weekly visits as the expected date of delivery nears. During the clinic visits, several services are offered including laboratory tests, physical and radiological examinations to ensure mother and baby are safe, and to prevent complications (Mathole, Lindmark, Majoko, & Ahlberg, 2004 and Simkhada, Edwin, Maureen, & Padam, 2007).

According to FANC in Kenya, a pregnant woman should attend her first ANC visit immediately she discovers she is pregnant and not later than 16 weeks of gestation. During the first visit, a battery of services is offered to her and include personal history, history related to current pregnancy, obstetric history, perinatal complications, medical history, physical examination and laboratory investigations to determine antenatal profile (MOH, 2012). During the course of pregnancy, a mother should make at least four personalized ANC visits. Quality assessment of ANC services provided to expectant mothers has led to concerns whether caregivers have requisite knowledge. Provision of services most times differs from guideline recommendations. Simkhada et al (2007) established that in Tanzania, more than half of all expectant mothers were not advised on danger signs during

pregnancy, did not have urinalysis done and neither were they given Malaria preventive treatment. Other researchers have established that provision of clinical, laboratory and administration of medicines to pregnant mothers is ineffective and of poor quality. For instance, the provision of ANC services in both public and private clinics in Dar es Salaam did not follow guidelines and diagnostic evaluations were not done by care givers (Boller, Wyss, Mtasiwa, & Tanner, 2003). Similarly, consultation times were found short and different from what is recommended in FANC guidelines. Failure to accord adequate consultation time makes the client experience unsatisfactory and may lead to failure to detect health complications. In addition, inadequate consultation time does not allow effective counselling and health education to expectant mothers (Mathole et al, 2004). Care givers acceptance, perception and attitude are important in determining demand and consumption of ANC services.

Mathole et al., (2004) explained that negative attitude of caregivers towards expectant mothers led to low demand and consumption of ANC services in Zimbabwe. He further contended that most of the pregnant women would opt to be delivered by unskilled caregivers like traditional birth attendants. Similarly, in Tanzania, Uganda and Burkina Faso it was noted that caregivers did not follow FANC guidelines leading to low demand of ANC services (Conrad, Schmid, Tientrebeogo, Moses, & Kirenga, 2011). In contrast, Yengo (2007) observed that caregiver attitude did not affect service demand in Tanzania. She argued that caregivers found FANC guidelines important and useful to expectant mothers and their unborn babies but inadequate availability of workers and other resources affected effective and efficient delivery of services. In a study where mothers delivering in hospitals were assessed for knowledge on new born care in Sri Lanka, it was established

that 21.7% knew that surgical/white spirit is not recommended for application on the umbilical cord stump. Almost all (> 90%) mothers knew the importance of more frequent breastfeeding, the advantages of colostrum and the recommended period of breastfeeding exclusively. Mothers showed remarkable know how in identifying danger signs of the neonate, apart from for a few conditions. The study showed that unemployed women and those with delayed antenatal booking visits were more likely to have poor knowledge (Upul, Dulitha, Graham, & Ishani, 2007). This clearly indicated that timely ANC bookings and health education confer advantage to maternal and new born health. This advantage can only be conferred by knowledgeable and skilled health workers.

Just like majority of native people, the rate of smoking among Aboriginal Australians is significantly higher compared to those of the non-Indigenous population. About half of native women smoke while expectant, a period during which mothers are motivated to stop smoking. Prenatal care service providers are potentially significant change agents for lowering the harmful effects that result from smoking. Megan, Catherine and Robert (2012) established that majority of health providers thought that examination of smoking situation was an integral part of ANC service delivery and a professional assignment. Majority (79%) reported that they evaluated smoking state in all clients. The study showed that Knowledge of risks was generally good, but that of smoking cessation was poor. In a controlled study by Larissa, Adre, Jean and Marthe (2010), and which assessed the effect of job aids focused intervention on quality of counseling and maternal knowledge regarding care for mothers and neonates; it was established that the mean percent of recommended messages given to expectant mothers meaningfully improved in the intervention arm as compared to the control arm in birth preparedness, identification of

danger signs, clean births, and neonatal care. Meaningful improvements were also established in the mean percent of communication methods used and duration (minutes) of antenatal consultations. No comparable rise was established for messages concerning general antenatal care. The percentage of expectant mothers with the right knowledge also meaningfully improved for birth preparedness, danger sign recognition, and clean delivery. There were no meaningful variations in maternal knowledge of general antenatal or newborn care. Job aids were positively regarded by care givers and expectant mothers, even though time challenges remained for care givers with other clinical responsibilities.

The majority of maternal and newborn deaths and stillbirths occur around the time of birth. However, there are many opportunities during pregnancy to reduce these risks. While traditional antenatal care (ANC) is understood mainly to focus on obstetrical issues, contacts with pregnant women also provide important opportunities to deliver other preventive clinical interventions as well as counseling and health education on birth preparedness, danger signs and appropriate response, key practices at household level during and after pregnancy, and family planning.

The prioritization of specific ANC interventions should vary by setting. For example, in areas of high malaria risk, intermittent presumptive treatment and use of insecticide-treated mosquito nets are very important. How we reach pregnant women with services and messages must also vary by setting. There are certainly advantages to having fully-qualified health professionals like nurses or nurse-midwives provide services; however, many aspects of the needed services could be provided by cadres of health auxiliaries with less training. In some settings, greater reach is achieved by providing services on an

outreach basis. Over the past 15 years, the standard model for ANC has been "focused ANC," a four-visit schedule. During ANC, certain interventions are undertaken to ensure good outcome for mother and baby. These include iron and folic acid supplementation to mother, testing and treating of syphilis, administration of tetanus toxoid to prevent neonatal tetanus, de-worming, intermittent preventive therapy in Malaria prone zones and management of antenatal complications like anemia and antepartum hemorrhage (MOH, 2012). Knowledge about antenatal care guides caregivers in making informed choices. Research findings have shown the immunization rates of nurses to be comparably lower than physicians, and that nurses who correctly answer basic ANC knowledge questions have higher immunization rates compared to the ones who answer incorrectly (Mathole et al., 2004). Evidence has shown that caregiver attitudes affect client immunization decisions. Noting the frequent and complex nature of ANC visits, expectant mothers spend significant time in consultation clinics and interact a lot with obstetric staff (Simkhada et al., 2007).

Studies have established that reduced ANC packages or antenatal care provided by care givers other than obstetricians for low risk mothers can be as effective as standard models of prenatal care. In a Cochrane systematic review, Jose, Guillermo, Dina, Gilda, and Ametin (2001) found that a low number of ANC visits was not associated with rise of any of the negative maternal and perinatal outcomes examined. In contrast, trials from developed countries suggest that mothers can be less satisfied with the reduced number of visits and feel that their expectations with care are not fulfilled. ANC services provided by a midwives or general practitioners was associated with improved perception of care by

mothers. The clinical effecacy of midwife or general practitioner provided care was the same as that of obstetrician led service delivery.

2.4 Pre-eclampsia Knowledge

Pre-eclampsia is an illness of widespread blood vessel (internal lining) dysfunction and vasospasm that occurs after 20 weeks' gestation. The disease can occur during the puerperal period (4-6 weeks after delivery). It is clinically defined as high blood pressure and presence of proteins in urine, with or without abnormal swelling of lower limbs and or face. The global occurrence of the disease is approximated at 5-14% of all pregnancies. In poor nations, hypertension in pregnancy was the second commonest cause of stillbirths and early new born deaths. The disease is the third leading maternal cause of death, after bleeding and blood stream infections. The illness occurs commonly in women at the extremes of reproductive age. Younger mothers (less than twenty years of age) have somehow raised risk and mothers having their first pregnancy appear more predisposed. Aged mothers (over 35 years of age) have higher risk. The cause of pre-eclampsia is not well known. However, genetics are thought to play a role and studies have shown that 20-40% of daughters and 11-37% of sisters of pre-eclamptic mothers also develop the problem. There is a high correlation among twins, which is approximated at 40% (MOH, 2012). Health workers therefore need to have adequate knowledge to diagnose and manage pre-eclampsia, recognize a mother with impending eclampsia, control blood pressure and prevent seizures, manage intake of fluids and most important know when and how to conduct a safe delivery.

One of the difficulties of managing pre-eclampsia and stopping further worsening of the condition is establishing how best to make early detection possible. If mothers or their spouses and families are able to report early warnings about possible signs and symptoms of pre-eclampsia during pregnancy, delivery and in the puerperal period, mothers may be able to get timely interventions to prevent severe pre-eclampsia from occurring. In a study aimed at improving understanding of factors influencing the potential of mothers to recognize symptoms and signs of pre-eclampsia and seek relevant medical care and factors affecting health workers response to mothers and their families who report early warning signs and symptoms; Wendy, Debra, Nicola and Jane (2017) established that there was an extensive lack of knowledge and understanding of signs and symptoms of pre-eclampsia among mothers and their families, with some mothers not showing signs and symptoms of pre-eclampsia or unable to differentiate them from normal pregnancy changes. They concluded that mothers and their families not only deserve awareness of signs and symptoms of pre-eclampsia but also need knowledge on the best and efficacious ways to seek timely medical evaluation and care. Some mothers did not experience prodromal signs and symptoms. This led to concerns about how mothers and families could detect early onset, and was an issue which required additional exploration. It was shown that very limited study exploring clinical staff response to mothers who raised concerns about their health when experiencing symptoms and signs of pre-eclampsia existed. The study recommended further research if safety and quality of services were to be improved.

2.4.1 Diagnosis of Pre-eclampsia

Pre-eclampsia is diagnosed both clinically and through laboratory parameters. The diagnosis requires presence of hypertension and presence of proteins in urine. Most

patients will have slowly progressing or sudden edema of face, upper and lower limbs (MOH, 2012). Mild to moderate forms of the disease may have no symptoms. Most cases are diagnosed through routine ANC blood pressure monitoring. Pre-eclampsia affects many organ systems in the body including the liver, kidney and blood coagulation. It also affects the unborn baby by causing growth restriction and preterm deliveries. The disease can complicate to eclampsia where the patient develops convulsions and or unexplained coma (Sana, et al., 2016). Pre-eclampsia is among the commonest causes morbidity and mortality in mothers and fetuses globally. Timely identification and management have been key in lowering case fatality in developed nations. To realize this in a poor country, community health workers (CHWs) who run primary health care need adequate knowledge and skills to diagnose and offer emergency treatment to mothers suffering from the condition.

In contrast, a study purposed to determin CHWs knowledge and practice in the diagnosis and management of pre-eclampsia in Nigeria (a poor Country), Sotunsa, et al., (2016) established that CHWs had knowledge that pre-eclampsia was dianosed through finding high blood pressure and presence of proteins in the urine of expectant mothers. The CHWs showed good understanding of the signs and symptoms of the disease and were able to recognize mothers at risk, initiate treatment, and in referring mothers with the disease. However, a significant number of CHWs were not comfortable treating the disease due to restrictions contained in their working regulations. These guidelines did not clearly grant authority to CHWs to manage pre-eclampsia among mothers where they were working.

2.4.2 Treatment of Pre-eclampsia

The goal of managing pre-eclampsia is to reduce blood pressure to avert brain blood circulation and heart complications while keeping adequate utero-placental blood flow. The management of mildly raised blood pressure has not been shown to improve perinatal sickness or death. Medical/drug treatment is recommended for those with blood pressure above 160/105 mm Hg, though those with existing high blood pressure may tolerate higher pressure values. Mothers with severe disease and whose blood pressure is below 160/105 mm Hg may benefit from drugs since unpredictable deterioration or sudden rise of blood pressure is possible. The aim of treatment is to keep blood pressure between 140/90 and 155/100 mmHg. The primary recommended drugs are Labetalol, Nifedipine, Hydralazine and Methyldopa (MOH, 2012).

In a qualitative case study that entailed examining of policy process, literature examination, policy document review, timeline of key events and the collection and analysis of 15 interviews with policy makers and academic clinicians involved in policy processes in South Africa, Karen and Simon (2008) found that Prior to independence of the nation (1994) there was no national maternal care policy in South Africa. Due to that, each tertiary level health facility developed its own treatment guidelines which contained a range of methods to treatment of pre-eclampsia and eclampsia. Afterwards, the production of new national policies for maternal care, including for the management of pre-eclampsia and eclampsia, was informed by evidence from randomised controlled trials and systematic reviews. This resulted from a number of factors especially the change to a democratic state in the mid 1990s, and the healthcare reforms that followed; which created the space for maternal health policy enactment. However, Olugbenga, et al., (2015) notes

that even though eclampsia remains a major cause of morbidity and mortality among mothers globally; several factors determined the use of magnesium sulphate in the treatment of pre-eclampsia/eclampsia in health facilities in Bauchi and Sokoto States in Nigeria. The majority of healthcare workers recognized magnesium sulphate as the drug of choice for preventing and treating convulsions in severe pre-eclampsia. In the study, two thirds of the health facilities had service provision registers available. Almost half (45 %) of health workers had been trained on the use of magnesium sulphate for the treatment of pre-eclampsia. With respect to care givers practices, 45% of respondents reported that magnesium sulphate was used to prevent and manage fits in severe pre-eclampsia in their work stations. Barriers to the treatment of pre-eclampsia included low numbers of skilled health workers, frequent stockouts of magnesium sulphate, non-availability of essential equipment and commodities, unreliable supply of electric power and water, and lack of guidelines and standard operating procedures at the health facilities. Technical assistance to health workers was also found inadequate.

2.5 Postnatal Care Knowledge

Postnatal period is the period commencing immediately after birth to 6 weeks afterwards. During this period, follow up of mother and baby is important to identify and address various challenges, concerns and complications e.g. breast engorgement, breastfeeding difficulties, postpartum bleeding, neonatal jaundice, sepsis etc. The first 48 to 72 hours have been found to be the most critical in saving the lives of mothers and neonates since most complications will have occurred by then.

2.5.1 Knowledge on New-born care

A research conducted in Masindi, Uganda to assess caregiver knowledge on immediate new-born care established that majority of caregivers (over 30%) could not tell the correct treatment of a bleeding cord. Only 10.4% could correctly identify a baby born with unsatisfactory weight and suggest appropriate treatment (Ayiasi et al., 2011). According to WHO, approximately one to five percent of neonates will require resuscitation at birth with majority of them likely to die or suffer from long-term disabilities. In an international controlled trial study, it was established that 80 percent of neonates requiring resuscitation needed only an Ambu bag at room air (Saugstad, Rootwelt, & Aalen, 1998). The significant challenges to effective resuscitation were lack of skilled staff and non-availability of essential equipment. Avoiding development of low body temperature in a neonate is critical to avoid sickness and death. Babies born too small are especially prone to becoming cold and the probability of losing temperature and getting cold is highest when the baby is wet.

To stop or reduce body temperature loss, it is recommended one dries the baby and wraps him/her in clean, dry cloth or by ensuring body contact with mother (Kangaroo care). Observed practice is however different and in the South Asian countries it was observed that there was delay in preventing cold due to delayed time of separation of cord after birth (Saugstad et al, 1998). Abadi, Fitiwi and Gebremedhin (2017), in a study aimed at assessing knowledge and practice of immediate new born care and associated factors among health care providers in the Eastern zone public health facilities, Tigray, Ethiopia found that by and large, among the health care providers involved in the study, over two thirds (74.65%) were rated as having adequate knowledge on new born care and 72.77%

of the respondents demonstrated good new born care practices. Among the study respondents, 70.9% reported getting access to new born care national guideline. Additionally, 46% of the study participants had been trained on new born care within a period of two years preceding the study. Presence of national guidelines, adequate commodity supplies, the duration of in-service training and type of health institution were meaningful predictors for the health care providers new born care practices. The study concluded that even though some improvement was observed in the knowledge and practice of health care providers on new born care, there were still knowledge and practice gaps and recommended that regional health bureau and district health offices provide refresher courses on immediate new born care, equipping all health facilities with essential commodities and national guidelines of new born care. It also recommended sharing of experience between hospital and health centre staff caring for new born babies through mentorship.

Similarly, in a study aimed at evaluating the effects of a large scale mother and new born quality improvement interventions and the quality of provision of essential new born care and new born resuscitation in Tanzania, Christina, et al., (2014) noted that initial scores for quality of observed essential new born care showed meaningful overall improvement following the quality of care intervention, from 39% to 73%. Health workers know how using a case study meaningfully increased as well, from 23% to 41% but skills in resuscitation (using a new born mannequin) were persistently low. Presence of essential new born care commodities (which was high at the beginning in the regional hospitals) increased at the primary health facilities. They concluded that during the two years, the quality improvement program had succeeded in improving the quality of essential new

born care services in the target facilities. Some inadequacies in new born care were unrelenting, especially on practical skills in new born resuscitation.

2.5.2 Knowledge on Young Infant Feeding

According to Esmai and Songa, (1994) breastfeeding is an incomparable and the most important way of ensuring a new born baby gets the ideal and natural nutrients to guarantee proper growth and development. Breastfeeding is also important to the health of the mother and strengthens psychosocial bond between the mother and baby. Evidence has shown that exclusive breastfeeding is the most beneficial way of providing babies with optimal nutrients. In order to ensure effective breastfeeding, WHO and UNICEF advocate for initiation of breastfeeding within the first hour of life, breastfeeding on demand, exclusive breastfeeding for at least six months and continued breastfeeding till the baby is two years old (Adetugbo, 1997).

Initiation of breastfeeding within the first hour after birth was one of strategies promoted in Kenya for reducing under-five mortality rate so as to realize MDG 4 by December 2015. Recent data shows that breastfeeding is universal in Kenya. However, only 46.1% of infants are breastfed within one hour of birth which is below the national target of 80% for reducing infant mortality rate. Improved health care delivery systems and adequate health support such as breastfeeding counselling services to mothers could be the possible reason for higher early initiation of breastfeeding rates compared to inadequate health services in many developing countries (WHO, 2009). In a study where health workers were assessed regarding breastfeeding knowledge at KwaZulu Natal in South Africa, a high HIV prevalence area with a population of 220,000 people, and where results were

compared to recommendations in WHO's breastfeeding counselling course; it was established that even though 93% of doctors knew that breastfeeding should be started within 30 minutes of delivery, 71% would recommend water and 50% solids to breastfed infants under 6 months of age (Shah, Rollins, & Bland, 2005). Similarly, Okolo & Ogbonna (2002) established there was a general lack of awareness of important recommendations on baby friendly hospital initiative (BFHI) among heath care workers in Nassarawa state, Nigeria. According to their findings, a fifth of health workers knew importance of initiating breastfeeding within 30 minutes of birth with significant differences in status of awareness between doctors and other cadres of staff. Though a great interest and willingness to nutrition therapy, there is an insufficient practice compared to the proposed European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines for nutrition therapy.

In a study aimed at studying doctors and nurses' self-reported knowledge in nutritional practice, with focus on ESPEN's guidelines in nutritional screening, assessment and treatment; Morten, et al., (2007) noted that the commonest cause of inadequate nutritional practice was insufficient nutritional know how. A quarter of respondents found it challenging to recognize clients in need of nutritional treatment, 39% did not have techniques for diagnosing malnourished clients, and 53% found it challenging to calculate the clients energy needs. additionally, 66% did not have national guidelines for clinical nutrition. Twenty-eight percent of respondents reported that unsatisfying nutritional practice could result in complications and extended hospital stay. Those who reported that their nutritional know how was good had also better nutritional practices.

Elvis and Amos (2016) in a study to assess the status of exclusive breastfeeding (EBF) and factors influencing the practice among professional working mothers in one of the ten regional capitals of Ghana established a near universal awareness of exclusive breastfeeding among respondents (99%). Even though most mothers initiated breastfeeding within an hour of delivery (91%), the EBF rate at six months was low (10.3 %). The study identified three elements as determinants of EBF:- getting infant feeding recommendation from healthcare workers, shorter period of maternity leave and the method of delivery. Those who delivered normally for example were almost 10 times likely to practice EBF. The study concluded that revising policies on maternity leave and work environments with day care centres to facilitate breastfeeding were needed to support the success of EBF.

Similarly, Mary, et al., (2015) in a study aimed at describing feeding practices and nutritional status among infants and young children (IYC) in two districts in Zambia: Kafue and Mazabuka, established that about 54.0% of caregivers knew the definition and recommended duration of exclusive breastfeeding (EBF) and when to introduce complementary feeds. Majority of respondents had acquired this knowledge from the health workers. Only a third of mothers reported having practiced exclusive breastfeeding for the recommended six months, with 8.9% of the mothers giving prelacteal feeds. Even though almost all (94.8%) respondents reported that a new born needed nothing else other than breast milk in the initial three days of life, only 50% of them regarded colostrum to be beneficial. Complimentary food was started before the age of six months and were frequently inadequate and of poor quality. Two thirds of mothers understood that exclusive breastfeeding up to six months was harmless to the child. Majority of the infants

had good nutritional status with 4.2% being shorter for age, 1.7% being light for age and 0.5% severely wasted. The study concluded that even though caregivers in the communities knew about the recommended feeding practices, the knowledge did not translate into good practices.

2.5.3 Knowledge on Management of Neonatal Infections

While post-partum bleeding and sepsis are the greatest risk to a mother's life, preterm delivery, birth asphyxia and neonatal sepsis carry the greatest risk to the new born. About 60% of neonatal deaths occur due to such complications, while unrecommended feeding and cultural practices over the immediate post-delivery period may pose further risks to the life of the new born. All these problems could be reduced if mothers get the requisite and timely post-delivery care. Research has established that half of maternal deaths and 40% of new born deaths occur during the first day after birth. It is evident that the immediate post-delivery period is a critical time to identify and address any potential problems to avert morbidity and mortality.

Due to this, the World Health Organisation (WHO) recommends that post-delivery check-ups be done during the immediate post-delivery period, forty-eight or seventy-two hours, and then on the seventh day after birth. The postnatal care period allows care givers to promote exclusive breastfeeding, personal hygiene, maternal nutritional practices, birth control options and health education services. Additionally, caregivers are able to offer uninterrupted vitamin A supplementation to the mother and vaccination of baby to start them off in the right footing for a healthy life. The fact that new born babies have their immune systems still developing exposes them to significant mortality and morbidity.

Neonatal sepsis and jaundice are problems responsible for significant mortality. Prudent and timely management of these conditions is key in reducing this high mortality. Health workers managing neonatal infections should have requisite knowledge and skills to ensure comprehensive history taking, physical examination and appropriate investigations (both laboratory and radiological) before appropriate treatment can be instituted. They need to be precautious of the many differences between children and adults when it comes to drug use e.g. eligibility, dosage, frequency of administration, monitoring (MOH, 2013). Mortality in the first 28 days of life is responsible for almost two-thirds of all infant deaths and two fifths of under-five mortality. Majority of the loses of life could be stopped through evidence based low cost interventions.

In a study to examine the attitudes, beliefs and practices of community and health workers on birth and new born care with the ability to inform chlorhexidine (CHX) trial in Pemba, Tanzania; Usha, et al., (2014) established that unreliable transport, delivery fees in health facilities, high number of clients and poor attitude of staff were part of the reasons for not realizing high levels of skilled delivery. Traditional birth attendants (TBAs) and health workers knew the importance of infection control in reducing the risks of infection to mothers and their babies during birth. In contrast, use of sterile gloves during birth and washing of hands with soap under running water before conducting delivery were rarely reported. Timely initiation of breastfeeding including giving colostrum was universally practiced. Health workers and trained TBAs knew the necessity of keeping new born babies warm after birth and delayed first bath. The community knew the importance of cord care very well and almost all TBAs encouraged mothers to protect umbilical cord stumps from dust, flies and mosquitoes or other potential disease vectors by covering it

with cloth. All respondents were in agreement that CHX could be successfully implemented in the community guided by requisite health education and advocacy. In a study to evaluate health workers effectiveness in maternal and neonatal (MNCH) health services in the public health sector of Pakistan, specifically to assess their training needs, Shabina, et al., (2010) observed the rating of lady health workers in their know how of MNCH was good with a third scoring more than 70%. Their medical counterparts (MOs) performed comparativelly poorly in their understanding of MNCH with less than 10% scoring more than 70%. All health worker cadres (lady health workers, lady health visitors and physicians/doctors) achieved poor rating scores in resuscitation skills and only half were able to demonstrate steps of immediate new born care. The MOs performed in counselling skills was much better compared to the lady health workers. Only half of lady health workers could manage competency scale in this important part of skills assessment.

2.6 Knowledge on Community Interventions

Home visits and hand hygiene are a critical component of new born health. Effective home visits are those made during the initial 3 days and meant to assess the mother and baby for complications like breast engorgement, neonatal jaundice, psychosocial support and breastfeeding challenges among other interventions. Maintaining proper hygiene by washing hands with soap under running water safeguards baby from diarrhoeal diseases. UNICEF advocates washing of hands around four critical events: Before preparing food, after visiting toilet, before eating and after changing baby's diapers. Mothers are also encouraged to wash their breasts with clean water before any breastfeeding session, and not moist nipples by applying saliva (MOH, 2012).

2.6.1 Home Visits

The use of home visitors has long been supported as a method to improve preventive child health services, particularly in lower income urban communities. Recently it has been suggested that these visitors should give particular attention to the parent-child relationship, as well as advice on common well-child problems. The timing of home visits could be an important factor in the responsiveness and effectiveness of home visit programs. It has been shown that mothers and infant pairs who receive home visits starting from antenatal period clearly benefit while those who only receive home visits after 6 weeks post-delivery seem to gain little when compared to control pairs (Larson, 1980).

Evidence has shown that a package of practices that are easy to implement such as clean births, keeping warm, new born resuscitation, timely initiation of breastfeeding and exclusive breastfeeding can significantly transform new born health.

Further, evidence has shown that combining such practices with other services rendered in community health systems is an important and effective way to provide services. Similarly, enormous evidence exists that behaviour change communication (BCC), home visits, and community days can reduce delays in health care seeking and also encourage demand for skilled deliveries (Bahl, Qazi, Darmstadt, & Martines, 2010). Numerous studies have shown that community-based approaches save the lives of new-borns, and help in timely recognition of maternal complications and referral coordination for skilled care. These efforts have entailed approaches such as home visits by care givers, capacity development of TBAs and other untrained community health providers (Midhet & Becker, 2010). Other studies have shown excellence in utilizing local mothers to increase utilization of maternal services and the importance of involving men in promoting safe

delivery. A study in rural Ethiopia on health family meetings established that mothers who attended 2 or more meetings had comprehensive care (89%) than mothers who attended fewer meetings (76%) (Danika, Aynalem, & Hajira, 2014). In a research project meant to examine the effects of an educational intervention through home visits, including offering of free mammography service payment vouchers, on changing women's breast health know how and screening practices for timely diagnosis of breast cancer in a poor region of Jordan, Hana, et al., (2014) found the average rate of understanding improved meaningfully from 11.4 in the baseline to 15.7 in the after test. After six months of follow-up, the after test showed meaningful increment of women's perceived self breast examination (SBE) know how, reported SBE practices and utilization of mammography testing services. Of all women who received payment vouchers for mammography screening, 73% utilized the service and only two women without a payment voucher sought mammography testing at the study facility. The study established that women who got a follow up visit had a higher likelihood of utilizing free mammography services compared to those who did not get such a visit.

Similarly in a study to explore if home based life saving skills education by community health workers improved knowledge of danger signs, birth preparedness and complication recognition and health facility births in a rural community in Tanzania, Furaha, Adrea, Rose, Pia and Eslisabeth (2016) found a meaningful increment in the understanding of three or more danger signs during gestation period with an overral intervention effect of 29.0 % compared to the comparison district. There was meaningful effect on the understanding of three or more danger signs during delivery with an overral intervention effect of 18.3 % and postnatally for those who mentioned three or more danger signs with

an overral effect of 9.4 % . Child delivery planning practices improved for those who did three or more actions with an overral intervention effect of 10.3 % between the intervention and control district before and after the intervention. Use of ANC with the recommended four visits improved meaningfully with an overral effect of 25.3 %. Utilization of skilled birth services rendered at health facilities improved in the intervention area but there was no significant net effect compared to comparison district.

2.6.2 Hand Hygiene

Improved hand hygiene is associated with reduced burden of infectious illnesses especially diarrhoeal diseases and some respiratory infections. The most beneficial intervention has been shown to be washing of hands with ordinary soap under running water. The use of medicated soaps has not shown added benefit compared to ordinary soap (Allison, 2008). Public health experts advocate for washing of hands with soap under running clean water during four critical times (after visiting toilet, before cooking, after changing diapers and before eating) in order to reduce the burden of infectious diseases associated with fecal contamination of food or drinking water.

In order to promote healthy life styles, preventive and promotive health behaviours among her citizens, Kenya initiated community strategy in 2006. In this strategy, community groups are organized into units of 1000 households under the care of 50 community health Volunteers (CHVs). The CHVs are supervised by primary care givers (Health workers) in their respective referral facilities. The success of community strategy is therefore dependent on health workers who have adequate knowledge on the strategy, public health approach to primary interventions and on community diagnosis (MOH, 2006). Health care related infections are more rampant in poor and developing countries where hand hygiene compliance is determined by so many issues. In a study to determine hand hygiene

compliance and related factors among health workers in Gondar University Hospital, Gondar, North West Ethiopia; Nura, et al., (2014) established that proper hand hygiene compliance of health workers was 16.5% and that having good understnding on hand hygiene compliance, being trained, availability of personal towel/tissue paper, availability of alcohol based hand rubs for hand hygiene and being aware of the existence of infection prevention committees were important determinants of hand hygiene compliance.

2.7 Service Delivery

Good health services are those which deliver effective, safe, quality personal and non-personal health interventions to those that need them, when and where needed, with minimum waste of resources (WHO, 2007). Globally, morbidity trends have changed significantly and non-communicable diseases (NCDs) especially hypertension, diabetes and cancer are on the rise. In Kenya, NCDs are a recognized challenge and the nation is grappling with policy direction to address them. Health workers today must be proactive and responsive to the needs of clients if these worrying trends are to be addressed effectively.

2.7.1 Health Workers Responsiveness

Health workers' productivity relates to availability of adequate numbers of staff, in the right cadre mix, with requisite skills and knowledge. Performance of health workers is an interrelated function of several factors including their attitude, competence, motivation, knowledge, skills and job satisfaction. Responsive health workers not only ensure client satisfaction but also reduce admission rates and nosocomial infection transmission. They reduce case mortality rates and are proactive in providing quality services (Marjolein Dieloman, 2006). In this study, health worker responsiveness was measured using

consultation time- a surrogate marker of proactivity and client satisfaction in providing services.

2.7.2 Health Workers Motivation

Health workers shortage in poor countries especially sub-Saharan Africa endangers success of programs such as HIV/AIDS, malaria and tuberculosis. With respect to existing human resources, low staff motivation has most times been shown to be a key problem in service provision. From the view point of health professionals, the important issues are lack of equipment, supply shortages and high workload. In spite of decentralization efforts, critical human resource management functions still remain highly centralized. There has been a lot of interest in human resources for health. However, what can be done to address staff motivation especially in poor and developing countries has not received significant focus (Inke Mathaeur, 2006). In this study, motivation to attend to mothers and new born children was measured using likert scale.

2.8 Theoretical Framework

The study was anchored in systems theory of organizations. The theory was first introduced by Van Bertalanffy in 1950 and later brought into organisational setting by Kataz and Khan in 1966. Systems theory is an approach which likens the whole organization to an organism with interdependent parts, each with its specific function and interrelated responsibilities. The system may be the whole organisation, a unit or department. Whether viewed in totality or in parts, it is crucial to understand how the system works, and how the parts that make the system are related (Foster, 2012). Social systems are open to and are affected by their environments, making them acquire new

characteristics through emergence, ultimately leading to progressive evolution. This study was modelled on systems theory because health systems are always in continuous exchange with the environment. Health workers are required to have knowledge on various aspects of patient care. Different cadres are tasked with the duty to address various steps in the process of patient care. For example, whereas doctors prescribe medicines, it is the duty of nurses to administer them. It is this interdependence of health workers that makes healthcare services delivery to have the resemblance of a system.

Most important, human beings are the most important aspect of any organization. This is because people are the ones who run the organization and determine how other resources are utilized. Health workers therefore are the most essential part of a health system since they not only ensure the system operates but also how other resources (commodities, finances, infrastructure etc) are aligned and utilized. Health workers should therefore have necessary knowledge and skills for optimal functioning of a health system.

2.9 Conceptual Framework

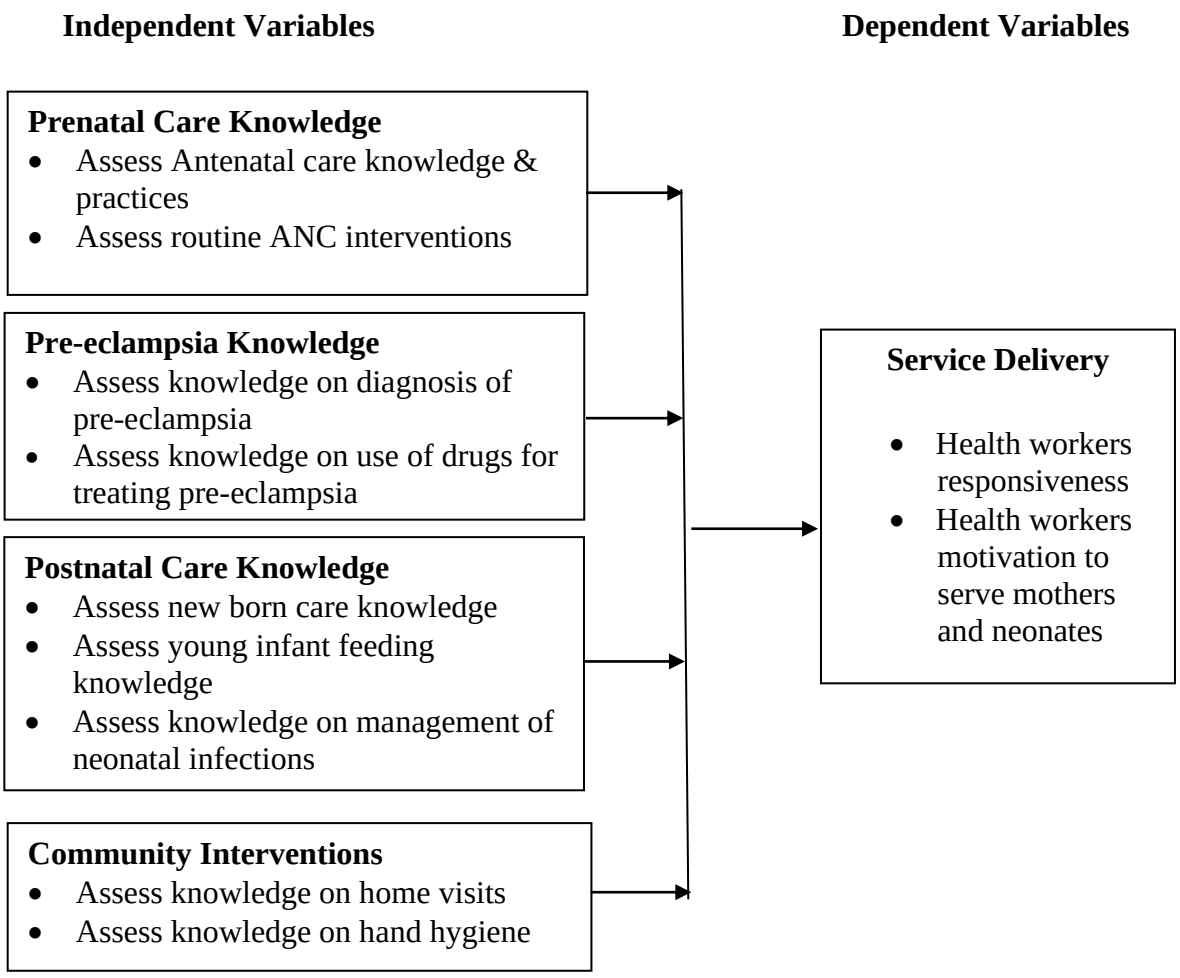

Figure 2.1: Conceptual framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

A detailed description of the procedure used in answering the research questions is presented in this chapter. It includes research design, sampling techniques, variables, instrumentation and data analysis techniques which were used.

3.2 Research design

A research design is an informative description of how a study project will be undertaken. It usually entails deciding how data will be collected, the instruments to be deployed, how the instruments will be utilized and the planned method of analyzing data collected. This process is involves making a blueprint of the activities to be carried out in order to acceptably answer the research questions. It includes choosing a research method, operationalizing important constructs, and reasoning out the requisite sampling strategy. This was a cross sectional study design (one that establishes the status of different variables at the time of the study) to establish health workers perinatal knowledge and practices in Makueni County. It utilized both quantitative and qualitative approaches in administering a structured questionaire and an observation checklist to establish routine practices during antenatal services delivery. ANC services consultation is usually done by nurses but clients found to have issues are referred to clinical officers and medical officers for diagnosis and management.

3.3 Study Variables

A variable is any entity that can take on different values or attributes. Four composite independent variables were used to measure knowledge in three domains: prenatal care,

pre-eclampsia, postnatal care and community interventions. The dependent variable was analyzed from two aspects: health worker responsiveness and motivation.

3.4 Location of study

This study was carried out in Makueni County. The County is largely semi-arid covering an estimated 8,000 square kilometers in land surface area. She is located in the southern part of former Eastern province bordering Machakos County to the North, Kitui County to the East, Taita-Taveta County to the South and Kajiado County to the West. She has a projected population of 958,197 with women of reproductive age estimated to be 229,967. Children under five years of age are about 134,148. In the year 2013, about 28,746 babies were born (DOH MaKueni, 2013). The county had 11 hospitals, 22 health centers, 123 dispensaries and 52 community units. Approximately 91% of health facilities offer integrated maternal child health (MCH) and family planning (FP) services. Whereas 58 % of health facilities can offer basic emergency obstretric care (BEOC) services, only 33 % are able to provide comprehensive emergency obstetric care (MOH, 2013).

3.5 Target Population

A target population includes all persons, individuals or items bearing the characteristics one intends to study. The target population for the study was all health workers working in public health facilities in the County, and who are primary contacts with pregnant mothers and neonates. The County had 8 specialist doctors, 27 doctors, 89 clinical officers and 564 nurses spread across 11 hospitals, 22 health centers and 123 dispensaries (DOH Makueni, 2013). Excluding specialist doctors, the number of clinicians (medical officers, clinical officers and nurses) who are primary contacts with mothers and children total to 680 and was target population for the study. In the health facilities, all staff change rotations

regularly and therefore any worker at a certain time rotates in MCH and pediatric departments, making all health workers eligible for the study.

3.6 Sample Size Determination and Sampling techniques

Sampling is the statistical process of choosing a section of a population of interest with the intention of making observations and statistical inferences about that population. Sampling makes it feasibility and cheaper to conduct social science research and hence one should choose a representative sample from the target population for observation and analysis.

3.6.1 Sample Size Determination

According to Mugenda A.G and Mugenda O.M (2003), a sample size of between 10-30% is a good representation of the target population. Due to time and resource constraints, 47 (30% of 156) health facilities were selected for the study. Through sequential cluster, proportionate and random sampling, 3 hospitals, 6 health centers and 38 dispensaries were selected for the study and primary care givers (medical officers, clinical officers and nurses) working in them made the sampling frame for the study.

The 47 facilities were selected through sequential proportionate and random sampling i.e. using Microsoft excel, all facilities were allocated random numbers and a sample selected representative of the level of care contribution to total number of facilities. The number of primary caregivers in selected facilities totaled to 291(15 doctors, 48 clinical officers and 228 nurses) and was the sampling frame for the study. Assuming that a population of health workers is infinite, a necessary sample (NS) size would be given by the modified Cochran (1977) formula: $NS=Z^2- S (1-S)/e^2$

Where:

- Z is confidence level,
- S is standard deviation and
- e is the margin of error

With a 95% confidence level, 0.5 standard deviation and a 5% (+/-) margin of error; then a necessary sample would be 385. Correcting this for a finite population, sample size n=NS/(1+(NS-1)/P) where p is the population (Smith, 2013). In this study, n=385/(1+(385-1)/291), and which is 166. Thus a sample of 166 health workers was randomly selected for the study. Through random sampling, 10% of ANC clients found attending MCH during study period and willing to participate in the study were subjected to observation checklist during ANC consultation. The number of observations were done proportionate to the level of care contribution of study respondents.

3.6.2 Sampling Technique

Through sequential stratified, proportionate and simple random sampling, 9 doctors, 28 clinical officers and 129 nurses were selected for the study. That is, an initial step where 47 health facilities were randomly selected proportionalte to level of care (dispensaries, health centres and hospitals) contribution to health facility population after stratification/level of care grouping. The primary health workers working in the selected facilities (291) made the sampling frame. The second step involved selecting a random sample from the sampling frame and a total of 166 primary caregivers was selected (9 doctors/medical officers, 28 clinical officers and 129 nurses) randomly for the study. To

facilitate simple random sampling, a list of names of health workers working in study facilities was obtained from records office and computer generated random numbers used to select study respondents.

Table 3.1: Sampling of health facilities

Health Facility Level	Sampling Frame	Sample
Hospitals	11	3
Health centers	22	6
Dispensaries	123	38
Total	**156**	**47**

Table 3.2: Sampling of health workers

Cadre	Sampling Frame			Sample			
	Hosp	**HC**	**Disp**	**Hosp**	**HC**	**Disp**	**Total**
Medical officers (Doctors)	15	0	0	9	0	0	**24**
Clinical Officers	42	6	0	24	4	0	**76**
Nurses	155	23	50	88	13	28	**357**
Total	**212**	**29**	**50**	**121**	**17**	**28**	**457**

Routine practice observations during ANC consultation were done proprotionate to level of care contribution of study respondents (73% in hospitals, 10% health centers and 17%

in dispensaries) over the study period. A total of 33 observation checklists were administered (25 in hospitals, 3 in health centres and 5 in dispensaries)

3.7 Data Collection Tool

The study used a structured questionnaire (Appendix ii) for health worker knowledge and a checklist (Appendix iii) for ANC consultation observations. Document review in checklist aimed at identifying documented inconsistencies attributable to knowledge gaps, for example, prescription of wrong medication to treat certain conditions or lack of provision of basic services like monitoring of blood pressure during pregnancy. Specifically, it aimed at confirming whether appropriate action was taken for mothers with abnormal urinalysis results and low hemoglobin levels. Process observation determined adequacy and appropriateness of services offered during service delivery encounter e.g. consultation time, physical examination and health education.

3.7.1 Data Collection Techniques

Data was collected using a structured questionnaire which contained questions covering the four domains of knowledge. Respondents who consented to study were given study questionnaire to answer questions without making any reference. They were also required not to share study questions information with colleagues. Confidentiality of both tool and interviewees was ensured so that results were a true reflection of knowledge situation among workers. An observation check list was used to observe and review service delivery process during ANC consultation. Service providers were informed of the observation and consent sought. However, they were notified that the actual exercise would be done without their awareness to avoid bias. This ensured that observed practice conformed to what is routine and not influenced by the research exercise. Documentation in ANC booklets of mothers whose consultation experience was observed was reviewed to

find out whether recording was done well including documentation of appropriate actions taken to address issues identified.

3.8 Data Analysis and Presentation

Sequential stratified, proportionate and simple random sampling was adopted for selecting study sample. Data quality issues were addressed by ensuring completeness and accuracy of data collected at the end of each interview as well as at the end of each day of field work. Gaps identified were addressed by the interviewer and the respective participant to ensure that the data generated was reliable. In this study, the SPSS statistical package, version 25.0, was used to analyze data captured. The data was initially summarized in Microsoft excel, then coded in SPSS before univariate and bivariate analysis. Data was presented using tables. The frequencies obtained were tested for their goodness of fit and correlations using the chi-square statistic test.

3.9 Pre-testing

The research tools were pre-tested among ten health workers (selected randomly) in Mukuyuni Sub-County hospital, and which is not among health facilities selected for the study. This highlighted irregularities that needed correction before the actual study. The captured irregularities were corrected and final version of questionnaire retested before actual study. The observational checklist, derived from FANC, was also pre-tested and corrected to suit study environment.

3.9.1 Validity

The study tool was a modified version from Eriksson *et al* (2009) who used it in Vietnam to assess health worker knowledge regarding newborn care and therefore reproducible. It was modified to fit study environment and current national guidelines. An adequate number of questions under each domain of knowledge was included to make the tool a

sufficient surrogate for establishing knowledge on maternal and neonatal care among healthcare workers.

3.9.2 Reliability

The study tool and method of administration is akin to examination tests administered to students in institutions of learning. It is therefore a good surrogate in measuring levels of knowledge. A reliability coefficient of 0.80 had been set for the study but a value of 0.65 was obtained and this was deemed reliable to make inferences on the total population.

3.10 Logistical and ethical considerations

The cost of producing study tools was borne by the researcher. He also administered study tools during the study, and did not engage any study assistant. Study approval was sought from Kenya Methodist University Research and Ethical review committee (Appendix iv), the National Commission for Science, Technology and Innovation (Appendix vi) and from the County Director of Health Services (Appendix v), Participation in the survey was voluntary. Respondents were informed of the purpose of the survey and their consent sought before engagement (Appendix i). Data was handled with confidentiality.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

Details of analysis, presentation and interpretation of study findings are presented in this section. The study aimed at establishing health workers perinatal knowledge and practices in Makueni County. The study specifically looked at status of prenatal care, pre-eclampsia, postnatal care and community interventions knowledge and practices among health workers and how such knowledge related to mother and child health (MCH) service delivery. The study collected primary data from respondents selected through sequential stratified, proportionate and simple random sampling where 9 doctors, 28 clinical officers and 129 nurses were selected for the study. A total of 163 respondents (98% response rate) filled the self-administered structured questionnaire. A total of 33 ANC observation checklists were administered. Tools were checked for completeness and consistency before data entry in SPSS v25. Data was initially cleaned up and summarized in Microsoft excel before transfer to SPSS. This allowed for primary stratification of quantitative data before analysis. The data was then coded and entry made in SPSS v25. Both descriptive analysis and nonparametric tests were done. Re-stratification of knowledge scores, appropriate consultation time and level of motivation was done during cross tabulations for inferential statistics.

4.2 Socio Demographic Characteristics

Table 4.1: Socio Demographic Characteristics

		Frequency	Percent
Age	Less than 25 years	17	10
	26-35 years	92	56
	36-45 years	31	20
	More than 46 years	23	14
Total	**4**	**163**	**100**
Education Level	Certificate	16	10
	Degree	13	8
	Diploma	119	73
	Higher diploma	15	9
Total	**4**	**163**	**100**
Years in Current station	Less than 1year	48	29
	1-5 years	81	50
	6-10 years	12	7
	Over 10 years	22	14
Total	**4**	**163**	**100**
Years worked in MCH	Less than 1year	72	44
	1-5 years	72	44
	6-10 years	11	7
	Over 10 years	8	5
Total	**4**	**163**	**100**

Table 4.1 presents data on socio demographic characteristics. Majority of respondents were within 26-35 years age bracket, 92 (56%) while the minority were in aged <25 years, 17 (10%). On education level, majority were holders of diploma, 119 (73%) while the minority were degree holders, 13 (8%). Majority of respondents had worked in their current station between 1 and 5 years, 81 (50%) while minority had worked between 6 to 10 years, 12 (7%). Most respondents, 144 (88%), had worked in MCH for less than 5 years. These results mean that over two thirds of health workers in the County are young

(less than 35 years of age) and that health managers should focus on capacity development to equip them with necessary knowledge and skills. This can be done for example by attaching mentors who are more experienced and at verge of retirement. Study findings are in agreement with sample selected since most respondents were nurses (whose entry level is diploma) and the minority being doctors (graduates). Only 5% of respondents had worked in MCH for over 10 years. This indirectly means that the pool of potential mentors is too small and health managers need to strategize in identifying and utilizing them before exit from service.

4.3 Prenatal Care Knowledge

Table 4.2: First ANC Visit

		Level of care				Chi-square	Asymp sign.
		Dispensary	Health Centre	Hospital	Total		
First ANC visit	Immediately she misses menstrual period	2	0	24	26	11.79	0.161
	After missing period for 2 consecutive months	0	0	6	6		
	After 3 months	3	3	14	20		
	When she discovers she is pregnant	23	13	70	106		
	I have no opinion	0	1	4	5		
Total		28	17	118	163		

Table 4.2 presents data on when an expectant mother should make her first ANC visit. Majority of respondents, 106 (64%) indicated that initial ANC visit should be when the mother discovers she is pregnant. Some respondents 5 (3%) had no opinion about it while 26 (16%) thought it should be immediately she misses her menstrual period. There was no association between responses and the level of care where respondent was working (χ^2=11.79, p=0.161), meaning that it did not matter whether one was working in a dispensary, health centre or hospital and the kind of response they gave .i.e. level of care did not influence current knowledge on ANC visit.

According to FANC, the first ANC visit should be made when an expectant mother discovers she is pregnant but not later than 16 weeks of gestation. With 35% of health workers lacking knowledge as to when a mother should make first ANC visit, health managers should be worried since good outcomes are heavily dependent on effective health education and advice to clients. This would mean that a good number of mothers would not know when to start ANC if their source of information was solely health workers. That would be in agreement with Ivan (2013) who found that that 72.7% of mothers attending ANC at Mulago hospital in Uganda didn't know the gestational age at which an expectant mother should start ANC clinic visits.

Table 4.3: Prenatal Care Knowledge scores

		Cadre of health workers						
		Clinical officers	Medical officers	Nurses	Total	%	Chi-square	Asymp. Sign.
Level of Prenatal care knowledge	Less than 50 (poor knowledge)	1	0	18	19	11.7	7.70	0.103
	Between 51-69 (Moderate Knowledge)	10	0	45	55	33.7		
	More than 70 (Good knowledge)	17	6	66	89	54.6		
Total		28	6	129	163	100		

Table 4.3 presents data on prenatal care knowledge scores. Majority of respondents (89, 54.6%) had good knowledge, (55, 33.7%) moderate knowledge while 19 (11.7%) had poor knowledge. There was no association between level of prenatal care knowledge and the cadre of respondent (χ^2=7.70, p=0.103). Since majority of respondents were rated as having good knowledge in Prenatal care, it means mothers seeking ANC services are likely to receive satisfactory services.

Prenatal care services are important in determining pregnancy outcomes for both mother and baby. Screening for problems, providing appropriate interventions and good health education make pregnancy experience bearable for the mother and ultimately lead to joy when a healthy newborn is delivered. Gortmaker (1979) established that white mothers who gave birth on a general service, and all black mothers, experienced significantly more risks after getting inadequate antenatal care services. Health workers play a critical role during pregnancy and having good knowledge on the subject significantly determines outcomes. Larissa, et al., (2010) in a controlled study to examine the quality of counselling

and maternal understanding established that the average recommended messages given to expectant mothers meaningfully improved in the intervention arm compared to the control arm regarding delivery preparedness, identification of danger signs, hygienic birth, and care of the new born. Meaningful improvements were also realized in the average percent of communication methods used and duration (minutes) of antenatal consultations. The percentage of expectant mothers with the right understanding meaningfully improved for birth preparedness, danger sign recognition, and clean delivery. There were no meaningful changes in maternal understanding of general antenatal or newborn care. In contrast, Megan, et al., (2012) established that majority of health providers serving Aboriginal Australians thought that evaluation of smoking situation was part of prenatal care and a professional obligation. Majority (79%) reported they evaluated smoking status in all expectant mothers. Even though understanding of smoking risks was generally good, the understanding of smoking behavior stoppage was poor.

Table 4.4: ANC Practices and Interventions

		Frequency	Percent
History Taking			
Level of Care	Dispensary	5	15.2
	Health Centre	3	9.1
	Hospital	25	75.8
Attendant	Nurse	33	100.0
History taking	Complete	23	69.7
	Incomplete	10	30.3
Assistance to lie on couch	No	23	69.7
	Yes	10	30.3
Client Assessment			
Height	No	26	78.8
	Yes	7	21.2
Weight	Yes	33	100.0
Temperature	No	27	81.8
	Yes	6	18.2
Pulse	Yes	33	100.0
Respiration	No	29	87.9
	Yes	4	12.1
Blood Pressure	Yes	33	100.0
Exposure of area of interest	No	17	51.5
	Yes	16	48.5
Physical Examination			
General examination	No	23	69.7
	Yes	10	30.3
Signs of anemia	No	16	48.5
	Yes	17	51.5
Breast exam	No	31	93.9
	Yes	2	6.1
Heart Auscultation	No	33	100.0
Fundal Height	Yes	33	100.0
Fetal Presentation	Yes	33	100.0
Fetal Heart Sounds	No	1	3.0
	Yes	32	97.0
Inspection of external Genitalia	No	31	93.9
	Yes	2	6.1
Laboratory Examination			
HIV Testing	Yes	33	100.0
Urinalysis	No	3	9.1
	Yes	30	90.9
VDRL	No	6	18.2
	Yes	27	81.8
Blood Group	No	3	9.1
	Yes	30	90.9
Hemoglobin level	Yes	33	100.0
Appropriate Action-Urinalysis	No	9	27.3
	Yes	2	6.1
Appropriate Action-Hb	No	3	9.1
	Yes	3	9.1

Table 4.4 presents data on ANC practices and interventions captured using ANC checklist for observing consultation experience. All ANC consultations were done by nurses,

irrespective of level of care. However, clinical officers and medical officers (in hospitals and health centers) were engaged in cases requiring review. History taking was completely done in 23 (69.7%) of cases and incomplete in 10 (30.3%) of cases. Similarly, 23 (69.7%) mothers were assisted to lie on couch while 10 (30.3%) were not. On client assessment, majority of mothers did not have height 26 (78.8%), temperature 27 (81.8%), and respiration 29 (87.9%) assessment; whereas 17 (51.5%) were examined without regard to personal privacy i.e. areas of no interest were not covered. Regarding physical examination, majority of mothers 23 (69.7%) did not have general examination done while 16 (48.5%) mothers did not have signs of anemia looked for. Majority of mothers 31 (93.9%) did not have breast examination and a similar number 31 (93.9%) did not have examination of external genitalia. All mothers 33 (100%) were not assessed for heart disease.

With reference to laboratory investigations (ANC profile) and appropriate action for those with abnormal urinalysis results and low hemoglobin levels, majority of mothers had ANC profile investigations done apart from a few who did not have urinalysis 3 (9.1%), VDRL 6(18.2%) and blood group 3 (9.1%) checked. It is of concern that no appropriate action was taken for 9 (27.3%) mothers who had urinary tract infections and 3 (9.1%) mothers who had low hemoglobin levels requiring treatment and not iron supplementation. The study findings raise glaring issues on ANC practices. A significant number of expectant mothers did not have complete history taken, were not assisted to lie on examination couch and did not have privacy considered in exposing area of interest only. On client assessment, majority of mothers did not have height checked, temperature taken and

respiration assessment done. Similarly, majority of mothers did not have general physical examination, breast examination, cardiovascular examination and examination of external genitalia done. In almost half of mothers, signs of anemia were not checked. On laboratory testing, majority of mothers had HIV and Hemoglobin testing done. However, a few mothers did not have VDRL, urinalysis and blood group tests done. This kind of practice is inadequate and leaves a gap in possibility of early identification of potential problems during pregnancy. It also denies the client right to know and address potential problems like short nipples during breastfeeding. Study findings are related to other research findings elsewhere. Simkhada et al (2007) established that in Tanzania, more than half of all expectant mothers were not advised on danger signs during pregnancy, did not have urinalysis done and neither were they given Malaria preventive treatment. Other researchers have established that provision of clinical, laboratory and administration of medicines to pregnant mothers is ineffective and of poor quality. For instance, the provision of ANC services in both public and private clinics in Dar es Salaam did not follow guidelines and diagnostic evaluations were not done by care givers (Boller et al, 2003).

4.4 Pre-eclampsia Knowledge

Table 4.5: Pre-eclampsia Knowledge scores

		Cadre of health workers						
		COs	MOs	Nurses	Total	%	Chi-square	Asymp Sign.
Pre-eclampsia	Less than 50 (poor knowledge)	15	1	62	78	49.4	3.75	.440
	Between 51-69 (moderate knowledge)	7	3	44	54	34.2		
	More than 70 (good knowledge)	5	2	19	26	16.5		
Use of Recommended drugs	Less than 50 (poor knowledge)	6	0	33	39	23.9	7.89	.096
	Between 51-69 (moderate knowledge)	14	1	55	70	42.9		
	More than 70 (good knowledge)	8	5	40	53	32.5		

Table 4.5 presents data on management of pre-eclampsia. Majority of respondents (78, 49.4%) had poor knowledge on pre-eclampsia while 26 (16.5%) had good knowledge. There was no association between level of pre-eclampsia knowledge and cadre of health worker (χ^2=3.75, p=0.440). On the use of drugs recommended for pre-eclampsia (Hydralazine, Nifedipine, Labetalol, Methyldopa), majority (70, 42.9%) had moderate knowledge while 39(23.9%) had poor knowledge. There was no association between knowledge on use of recommended drugs and the cadre of health worker (χ^2=7.89, p=0.096). As indicated in the statement of the problem, the County health facilities receive numerous complaints on mismanagement of pre-eclampsia mothers leading to poor outcomes. The study results confirmed majority of health workers had poor understanding of pre-eclampsia and a significant number would even prescribe un-recommended drugs. Study findings are related to other research findings elsewhere. A study done by Sana et

al. (2016) in Pakistan on healthcare provider understanding and treatment of pre-eclampsia established numerous shortcomings in understanding concerning the cause, diagnosis and management of pre-eclampsia among health workers. Findings implied that inadequate knowledge could have been a result of lack of refresher courses and standard operating procedures for treatment of the disease; and to lack of experience since very few clients sought care in primary and secondary health institutions. During ANC, it is the obligation of healthcare workers to health educate expectant mothers on danger signs during pregnancy. This includes imparting knowledge to mothers so that they could detect signs of pre-eclampsia.

In a surrogate study meant to improve knowledge of factors affecting the ability of mothers to identify symptoms and signs of pre-eclampsia and seek requisite medical assistance and factors affecting health care workers responses to mothers and their families who report early warning signs and symptoms; Wendy, et al., (2017) established that there was widespread lack of knowledge and understanding of signs and symptoms of pre-eclampsia among mothers and their families, with some mothers not showing signs and symptoms of pre-eclampsia or unable to distinguish them from normal physiological changes in pregnancy.

4.5 Postnatal Care Knowledge

Table 4.6: Young infant feeding, New born care and Neonatal infections

		Cadre of health workers						
		COs	MOs	Nurses	Total	%	Chi-Square	Asymp. Sig.
Young Infant feeding	Less than 50 (poor knowledge)	9	2	20	31	18.8	0.712	.950
	More than 70 (good knowledge)	19	4	109	132	80.0		
Newborn care	Less than 50 (poor knowledge)	9	0	26	35	21.5	8.702	.069
	Between 51-69 (moderate knowledge)	15	2	58	75	46.0		
	More than 70 (good knowledge)	4	4	45	53	32.5		
Management of neonatal infections	Less than 50 (poor knowledge)	2	0	22	24	15.5	5.480	.242
	Between 51-69 (moderate knowledge)	11	5	57	73	47.1		
	More than 70 (good knowledge)	12	1	45	58	37.4		

Table 4.6 presents rating of knowledge on young infant feeding, new born care and management of neonatal infections. The responses on young infant feeding indicated that majority (132, 80%) of respondents had good knowledge and there was no association between rated knowledge and cadre of health worker (χ^2=0.712, p=0.950). Majority of respondents (75, 46%) had moderate knowledge in new born care while 35 (21.5%) had poor knowledge. There was no association between rated knowledge and cadre of health worker (χ^2=8.702, p=0.069). Regarding management of neonatal infections, majority 73 (47.1%) had moderate knowledge while 24 (15.5%) had poor knowledge. There was no association between rated knowledge and cadre of health workers (χ^2=5.480, p=0.242). The study observations showed that majority of health workers were knowledgeable on

young infant feeding and therefore would provide good services including health education. However, knowledge on new born care and management of neonatal infections was average, with more than a fifth of workers lacking knowledge on new born care. The findings also mean that postnatal care knowledge is independent (has no association) of the cadre of health worker. This situation means a remarkable number of new born children would not get appropriate new born care or management of neonatal infections in the County's health facilities and therefore staff capacity development may be required.

Table 4.7: Stabilizing the temperature of a newborn

		Frequency	Percent
Stabilizing Temperature of Newborn	Bath in water of appropriate temp	14	8.6
	Have baby close to heat e.g. radiator	4	2.5
	I have no opinion	2	1.2
	Keep in room with temperature of 28-30 degrees Celsius	25	15.3
	Put on clothes and cover head	38	23.3
	Skin to skin contact with mother	74	45.4

Table 4.7 presents data on stabilizing the temperature of a newborn. Majority 74 (45.4%) of health workers indicated they would stabilize the temperature of a new born by ensuring skin to skin contact with the mother; 38 (23.3%) would put on clothes and cover head; 14 (8.6%) would bath newborn in water of appropriate temperature whereas 2 (1.2%) had no opinion on what to do. Hypothermia (loss of body temperature) is a top leading cause of new born deaths, especially immediately after birth. It is notable that more than half of the respondents would not encourage kangaroo mother care (skin to skin contact) in stabilizing the temperature of a new born. Kangaroo care is the best method of

preventing hypothermia and is advocated by WHO for resource poor settings like Kenya. In recent times, this approach has been publicized by Kenyan media with Bungoma County Referral Hospital recognized as the best example. Though not to the same magnitude or aspect, the study observations are in agreement with similar research observations established elsewhere. In a study conducted in Masindi, Uganda to assess health worker knowledge on immediate new-born care, it was established that majority (over 70%) of caregivers could not tell the right treatment of a bleeding cord and only 10.4% could correctly identify a baby born with abnormally low weight and suggest appropriate treatment (Ayiasi et al., 2011).

In a study where health workers were assessed regarding breastfeeding knowledge at KwaZulu Natal in South Africa, a high HIV prevalence area with a population of 220,000 people, and where results were compared to recommendations in WHO's breastfeeding counselling course; it was established that even though 93% of doctors knew breastfeeding should start within 30 minutes after delivery, 71% would recommend water and 50% solids to breastfed infants under 6 months of age (Shah et al, 2005). Abadi, et al., (2017), in a study aimed at assessing knowledge and practice of immediate new born care and associated factors among health care providers in the Eastern zone public health facilities, Tigray, Ethiopia found that by and large, among the health care providers involved in the study, over two thirds (74.65%) were rated as having adequate knowledge on new born care and 72.77% of the respondents demonstrated good new born care practices. Among the study respondents, 70.9% reported getting access to new born care national guideline. Additionally, 46% of the study participants had been trained on new born care within a period of two years preceding the study. Presence of national guidelines, adequate

commodity supplies, the duration of in-service training and type of health institution were meaningful predictors for the health care providers new born care practices. Similarly, in a study aimed at evaluating the effects of a large scale mother and new born quality improvement interventions and the quality of provision of essential new born care and new born resuscitation in Tanzania, Christina, et al., (2014) noted that initial scores for quality of observed essential new born care showed meaningful overall improvement following the quality of care intervention, from 39% to 73%. Health workers know how using a case study meaningfully increased as well, from 23% to 41% but skills in resuscitation (using a new born mannequin) were persistently low. Presence of essential new born care commodities (which was high at the beginning in the regional hospitals) increased at the primary health facilities.

In a study aimed at studying doctors and nurses' self-reported knowledge in nutritional practice, with focus on ESPEN's guidelines in nutritional screening, assessment and treatment; Morten, et al., (2007) noted that the commonest cause of inadequate nutritional practice was insufficient nutritional know how. A quarter of respondents found it challenging to recognize clients in need of nutritional treatment, 39% did not have techniques for diagnosing malnourished clients, and 53% found it challenging to calculate the client’s energy needs. Additionally, 66% did not have national guidelines for clinical nutrition. Twenty-eight percent of respondents reported that unsatisfying nutritional practice could result in complications and extended hospital stay. Those who reported that their nutritional know how was good had also better nutritional practices. Elvis and Amos (2016) in a study to assess the status of exclusive breastfeeding (EBF) and factors influencing the practice among professional working mothers in one of the ten regional

capitals of Ghana established a near universal awareness of exclusive breastfeeding among respondents (99%). Even though most mothers commenced breastfeeding within an hour of delivery (91%), the EBF rate at six months was low (10.3 %). The study identified three elements as determinants of EBF: - getting infant feeding recommendation from healthcare workers, shorter period of maternity leave and the method of delivery. Those who delivered normally for example were almost 10 times likely to practice EBF. Similarly, Mary, et al., (2015) in a study aimed at describing feeding practices and nutritional status among infants and young children (IYC) in two districts in Zambia: Kafue and Mazabuka, established that about 54.0% of caregivers knew the definition and recommended duration of exclusive breastfeeding (EBF) and when to introduce complementary feeds. Majority of respondents had acquired this knowledge from the health workers. Only a third of mothers reported having practiced exclusive breastfeeding for the recommended six months, with 8.9% of the mothers giving prelacteal feeds.

Even though almost all (94.8%) respondents reported that a new born needed nothing else other than breast milk in the initial three days of life, only 50% of them regarded colostrum to be beneficial. Complimentary food was started before the age of six months and were frequently inadequate and of poor quality. Two thirds of mothers understood that exclusive breastfeeding up to six months was harmless to the child. Majority of the infants had good nutritional status with 4.2% being shorter for age, 1.7% being light for age and 0.5% severely wasted.

4.6 Community Interventions

Table 4.8: Home visits and Hand hygiene

		Frequency	Percent
Importance of Home visits	Ask and examine mother and baby on physical and psychological health	80	48.5
	Ask and examine mother on physical and psychological health	38	23.0
	Ask and examine baby on physical and psychological health	39	23.6
	I have no opinion	5	3.0
Optimal Time for Home Visits	Between day 3 & 7	73	44.8
	Between day 8 & 14	47	28.8
	During first 3 days	32	19.6
	I have no opinion	5	3.1
	Not Important	4	2.5
Hand washing	All 4 recommended times	127	77.0
	3 of 4 recommended times	24	14.5
	2 of 4 recommended times	2	1.2
	1 of 4 recommended times	3	1.8
	None of recommended times	6	3.6

Table 4.8 presents data on health workers community interventions knowledge over three key issues. Community strategy is anchored on competency of community health extension workers (CHEW). At the health facility of attachment, the health workers play the role of CHEWs in supervising the activities of community health volunteers. They should therefore have requisite community health knowledge and public health approach to management of community health problems. According to table 4.8, majority of respondents, 80 (48.5%) knew the importance of home visit is to ask and examine both baby and mother on both their physical and psychological health. However, majority (73,

44.8%) did not know the optimal time for home visits since they indicated they would do so between day 3 and 7 after delivery. Regarding hand washing, majority (77%) of respondents correctly indicated the four key times recommended for hand washing i.e. before cooking, before eating, after visiting the toilet and after changing baby's diapers. It has been demonstrated that diarrheal diseases are caused by human waste contamination of food and drinking water. For that reason, hand washing with soap under running water has been shown to be a cost-effective way of addressing the prevalence and incidence of diarrheal diseases among young children and even adult population. The study findings indicated that health workers were knowledgeable on the importance of home visits and hand hygiene. However, knowledge on appropriate time for home visits was inadequate. This means a significant number of health workers would not effectively support community strategy, which is the lowest and most important level of care in preventive and promotive health.

Numerous studies have shown that community-based approaches save the lives of neonates and early detection of maternal complication and referral for skilled care safeguards the lives of mothers. Such efforts have entailed approaches like home visits by care givers, training of TBAs and other lay providers (Midhet & Becker, 2010). The MOH Kenya adopted community strategy in 2006 aimed at making the people responsible for their health. Community units are manned by trained community health volunteers (CHVs) and each unit serves 500 to 1000 households. Health workers in catchment areas serve as community health extension workers to supervise and equip CHVs with adequate knowledge for primary interventions. In this study however, only 19.6% of health workers would insist on home visits carried out within the first three days after delivery as

recommended. This is because 75% of new born mortality will occur during the first seven days, with highest risk of dying being within initial 72 hours (Lawn et al, 2005). The initial 72 hours are a golden opportunity to identify and mitigate risks of neonatal death. Health workers without adequate knowledge on community interventions cannot support the success of community strategy as envisaged. In a research project meant to examine the effects of an educational intervention through home visits, including offering of free mammography service payment vouchers, on changing women's breast health know how and screening practices for timely diagnosis of breast cancer in a poor region of Jordan, Hana, et al., (2014) found the average rate of understanding improved meaningfully from 11.4 in the baseline to 15.7 in the after test. After six months of follow-up, the after test showed meaningful increment of women's perceived self breast examination (SBE) know how, reported SBE practices and utilization of mammography testing services.

Of all women who received payment vouchers for mammography screening, 73% utilized the service and only two women without a payment voucher sought mammography testing at the study facility. The study established that women who got a follow up visit had a higher likelihood of utilizing free mammography services compared to those who did not get such a visit. Similarly in a study to explore if home based life saving skills education by community health workers improved knowledge of danger signs, birth preparedness and complication recognition and health facility births in a rural community in Tanzania, Furaha, et al., (2016) found a meaningful increment in the understanding of three or more danger signs during gestation period with an overral intervention effect of 29.0 % compared to the comparison district. There was meaningful effect on the understanding of three or more danger signs during delivery with an overral intervention effect of 18.3 %

and postnatally for those who mentioned three or more danger signs with an overral effect of 9.4 % . Child delivery planning practices improved for those who did three or more actions with an overral intervention effect of 10.3 % between the intervention and control district before and after the intervention. Use of ANC with the recommended four visits improved meaningfully with an overral effect of 25.3 %. Utilization of skilled birth services rendered at health facilities improved in the intervention area but there was no significant net effect compared to comparison district. Similarly, in a study to determine hand hygiene compliance and related factors among health workers in Gondar University Hospital, Gondar, North West Ethiopia; Nura, et al., (2014) established that proper hand hygiene compliance of health workers was 16.5% and that having good understnding on hand hygiene compliance, being trained, availability of personal towel/tissue paper, availability of alcohol based hand rubs for hand hygiene and being aware of the existence of infection prevention committees were important determinants of hand hygiene compliance.

4.7 Inferential Statistics

Table 4.9: Level of Knowledge and Appropriate ANC consultation Time

		Appropriate ANC Consultation Time			Chi-Square	Asymp. Sig.
		Less than 10 minutes	Above 10 minutes	Total		
Prenatal Care	Inadequate knowledge	62	12	74	120.342	0.000
	Adequate knowledge	0	89	89		
Pre-eclampsia	Inadequate knowledge	55	77	132	8.486	0.004
	Adequate knowledge	3	23	26		
Use of Recommended drugs	Inadequate knowledge	55	54	109	23.286	0.000
	Adequate knowledge	6	47	53		
Young Infant feeding	Inadequate knowledge	21	24	45	1.964	0.161
	Adequate knowledge	41	77	118		
Newborn care	Inadequate knowledge	51	59	110	9.952	0.002
	Adequate knowledge	11	42	53		
Neonatal Infections	Inadequate knowledge	35	62	97	0.198	0.656
	Adequate knowledge	23	35	58		
Community Interventions	Inadequate knowledge	26	21	47	8.570	0.003
	Adequate knowledge	35	79	114		

Appropriate consultation time was used as a surrogate measure of health worker responsiveness in providing MCH services. There was a strong association between appropriate ANC consultation time and level of prenatal care (χ^2=120.34, $p<0.05$), pre-eclampsia (χ^2=8.48, $p<0.05$), use of recommended drugs (χ^2=23.28, $p<0.05$), new born care (χ^2=9.95, $p<0.05$) and community interventions (χ^2=8.57, $p<0.05$) knowledge. This

means that appropriate consultation time would result in better outcomes in prenatal care, management of pre-eclampsia, new born care and community interventions. However, there was no association between appropriate ANC consultation time and level of young infant feeding (χ^2=1.96, p>0.05) and management of neonatal infections (χ^2=0.198, p>0.05) knowledge. How long consultation time is appropriate and effective remains a subject of big debate worldwide. Long consultation times have been highly associated with better diagnosis and care of psychosocial problems and with better patient outcomes.

A study in 1998 showed that majority (87%) of clients were satisfied by the duration of their most recent consultation experience and that satisfaction was related to how expectations were met. Client future expectations are however influenced by previous experience but patients are likely to be satisfied by what they are used to (George, John, Apali, & Alsion, 2002). Mathole et al (2004) found that consultation times were short and different from what is recommended in FANC guidelines. This made the clients experience unsatisfactory and missed detection of health complications. Inadequate consultation time did not allow effective counselling and health education to expectant mothers.

Table 4.10: Level of Knowledge and Motivation to Serve Clients

		Motivation to serve mothers and newborns			Total	Chi-Square	Asymp. Sig.
		Motivated	Neutral	Not Motivated			
Prenatal Care	Inadequate knowledge	38	18	18	74	55.571	0.000
	Adequate knowledge	89	0	0	89		
Pre-eclampsia	Inadequate knowledge	99	16	17	132	8.216	0.016
	Adequate knowledge	26	0	0	26		
Use of Recommended drugs	Inadequate knowledge	76	15	18	109	15.337	0.000
	Adequate knowledge	51	2	0	53		
Young Infant feeding	Inadequate knowledge	35	3	7	45	2.224	0.329
	Adequate knowledge	92	15	11	118		
Newborn care	Inadequate knowledge	79	14	17	110	8.445	0.015
	Adequate knowledge	48	4	1	53		
Neonatal Infections	Inadequate knowledge	74	12	11	97	1.175	0.556
	Adequate knowledge	47	4	7	58		
Community Interventions	Inadequate knowledge	32	5	10	47	6.850	0.033
	Adequate knowledge	93	13	8	114		

There was significant correlation between staff motivation to serve ANC mothers and new born babies and level of prenatal care (χ^2=55.57, $p<0.05$), pre-eclampsia (χ^2=8.21, $p<0.05$), use of recommended drugs (χ^2=15.33, $p<0.05$), new born care (χ^2=8.44, $p<0.05$) and community interventions (χ^2=6.85, $p<0.05$) knowledge. This means that prenatal care, pre-eclampsia, new born care and community interventions outcomes are highly dependent on motivation on motivation of health workers. However, there was no association between staff motivation to serve ANC mothers and new born babies and level

of young infant feeding (χ^2=2.22, p>0.05) and management of neonatal infections (χ^2=1.17, p>0.05) knowledge. These findings are not unique to Makueni County. Robert (2013) found a significant association between staff satisfaction with their work environment and their efforts towards continuous quality improvement inititiaves. Indeed continuous quality improvement of healthcare services cannot be realized if health workers are not motivated and the work environment does not support improvement inititiaves.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The optimal functioning and productivity of a health system is highly dependent on the smooth and complimentary functioning of all components that make up the system. Health workforce is one of such components and the most important pillar of a healthcare system. This is because human beings determine the success of processes and also how other resources are utilized. A good, effective and efficient health system should therefore ensure availability of the right mix of health workers, equitably distributed, provided with essential equipment and commodities; and most important having adequate knowledge and skills to assure effective and safe health services delivery. This study looked at the critical aspect of health worker knowledge on maternal and neonatal health and how it influenced MCH service delivery in Makueni County.

On prenatal care, the study established that 35.8% of health workers did not know when a pregnant woman should make her first ANC visit. It also established that majority of respondents (54.6%) had good knowledge while 11.7% had poor knowledge on prenatal care. There was no association between first ANC visit and the level of care. Similarly, there was no association between prenatal care knowledge and cadre of health worker. This means that mothers seeking ANC services are likely to receive satisfying and quality services since most health workers had adequate knowledge on prenatal care. The level of care or cadre would not determine quality of services rendered. All ANC consultations were done by nurses irrespective of level of care. However, clinical officers and medical officers (in hospitals and health centers) were engaged in cases requiring review. History

taking was completely done in 69.7% of cases and incomplete in 30.3% of cases. Similarly, two thirds of mothers were assisted to lie on couch while a third were not. On client assessment, majority of mothers did not have height, temperature, and respiration assessed; whereas half were examined without regard to personal privacy i.e. areas of no interest were not covered. Regarding physical examination, two thirds of mothers did not have general examination done and almost half did not have signs of anemia looked for. Almost all mothers did not have breast and external genitalia examination done. All mothers were not assessed for heart disease. With respect to laboratory investigations (ANC profile) and appropriate actions taken for those with abnormal urinalysis results and low hemoglobin levels, majority of mothers had ANC profile investigations done apart from a few who did not have urinalysis (9.1%), VDRL (18.2%) and blood group (9.1%) checked.

No appropriate action was taken for 27.3% mothers who had urinary tract infections and 9.1% of mothers who had low hemoglobin levels requiring treatment and not iron supplementation. On pre-eclampsia, majority of respondents had poor knowledge while 16.5% had good knowledge. On use of drugs recommended for pre-eclampsia (Hydralazine, Nifedipine, Labetalol, Methyldopa), majority of health workers were rated as having moderate knowledge. There was no association between pre-eclampsia knowledge (including knowledge on use of recommended drugs) and the cadre of health workers. As indicated in statement of the problem, Makueni County Referral Hospital management has received numerous complaints on mismanagement of pre-eclampsia mothers and poor outcomes. The study results confirmed majority of health workers had poor knowledge on pre-eclampsia and a significant number would even prescribe un-

recommended drugs. With reference to postnatal care, majority of respondents had good knowledge on young infant feeding. Majority of respondents had moderate knowledge in new born care, while 21.5% had poor knowledge. Regarding management of neonatal infections, majority had moderate knowledge while 15.5% had poor knowledge. There was no association between postnatal care knowledge and the cadre of health workers. The study findings indicate that majority of health workers are knowledgeable on young infant feeding and therefore would provide good services including health education on infant nutrition.

However, knowledge on new born care and management of neonatal infections was average, with more than a fifth of workers lacking knowledge on new born care. Majority of health workers indicated they would stabilize the temperature of a newborn through skin to skin contact with mother but more than half would not. Hypothermia (loss of body temperature) is a top leading cause of new born deaths, especially immediately after birth. It is notable that more than half of the respondents would not encourage kangaroo mother care in stabilizing the temperature of a new born. On home visits, majority of respondents knew the importance of home visit is to ask and examine both baby and mother on both their physical and psychological health. However, majority did not know the optimal time for home visits since they indicated they would do it between day 3 and 7 after delivery. Regarding hand washing, majority (77%) of respondents correctly indicated the four key times recommended for hand washing with soap under running water i.e. before cooking, before eating, after visiting the toilet and after changing baby's diapers. The study findings indicated that respondents are knowledgeable on home visits and hand hygiene. However, knowledge on appropriate time for home visits was lacking.

5.2 Conclusion

The study concluded that majority of health workers were knowledgeable on prenatal care. However, over a third of workers did not know when a pregnant mother should make her first ANC visit. It also concluded that ANC consultation practices did not follow FANC guidelines since there were many omissions touching on incomplete history taking, incomplete client assessment, incomplete physical examination and laboratory evaluation. There was failure to ensure client privacy and also failure to take appropriate action for all clients who had low hemoglobin or abnormal urinalysis results. As regards diagnosis and treatment of pre-eclampsia, the study concluded that majority of health workers had poor knowledge in diagnosing the condition and only a third had good knowledge in use of recommended drugs.

On postnatal care, the study concluded that majority of health workers had good knowledge on young infant feeding. However a significant number of health workers had poor knowledge in new born care and management of neonatal infections. More than half of health workers did not recommend skin to skin contact (Kangaroo mother care) as the best method of stabilizing the temperature of a new born. Regarding home visits and hand hygiene, majority of Health workers had good knowledge on importance of home visits but did not know the optimal time for such visits. Majority of workers had good knowlegde on the recommended times for hand washing to maintain hygiene and sanitation. The study established a significant association between prenatal care, pre-eclampsia, new born care, home visits, hand hygiene and appropriate time for ANC consultation; used in this study to be a surrogate measure of health worker responsiveness to MCH service delivery. An association was also established between level of knowledge

on prenatal care, pre-eclampsia, new born care, home visits and hand hygiene with health worker motivation to provide MCH services.

5.3 Recommendations

On prenatal care knowledge, there is need to have a refresher course on focused antenatal care (FANC) for all primary care givers, ensure that all health facilities have a copy of FANC manual and that antenatal service delivery is based on the guidelines. This will ensure that mothers are provided with effective, safe and appropriate ANC services including responsive health education. It will also ensure that ANC services are provided according to FANC and that evidence based best practices are adopted. An emphasis on integrated ANC services is required to ensure that all expectant mothers get all ANC services, including laboratory tests, under one roof. This will bridge gaps in taking appropriate action in case of identified problems. Complete history taking, comprehensive physical examination and proper documentation of findings in MCH booklets should be emphasized as outlined in FANC guidelines.

Strengthening of supportive supervision will also ensure adherence to guidelines. All health facilities should have targeted CMEs on diagnosis and treatment of pre-eclampsia, including use of recommended drugs. A standard operating procedure on management of pre-eclampsia should be made and availed to all health facilities. This will guide health workers and assure a standard approach to patient care. Refresher CMEs on National Obstetric and Neonatal care guidelines, specifically focusing on new born care and management of neonatal infections should be done across all health facilities. A training of trainers would also help in having best practice champions in every hospital and sub-

counties. Health workers need more training on community strategy, specifically targeting on home visits and public health interventions. This will assure a more robust network of community units with empowered community health extension workers. In this study, very few workers had worked in MCH for over 10 years. This means the County has a very small pool of experienced and almost retiring workers who need to be utilized as mentors before they exit service. The study did not answer questions on factors (other than knowledge and practices) that could affect maternal and neonatal outcomes and therefore further research could be done to look at health workers attitude towards CMEs; their practices and behavior towards reading available guidelines, application and sharing of knowledge acquired; and health worker awareness about availability of clinical guideliness. It could also be insightful to study health worker motivation towards personal skills improvement and factors in work environment that negativelly influence practice and consequently outcomes e.g. availability of essential equipment, commodities and technologies.

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APPENDICES

Appendix i: CONSENT FORM

Kenya Methodist University

P. 0 Box 267-60200

MERU, Kenya

SUBJECT: INFORMED CONSENT

Dear Respondent,

My name is ***Benard Kasanga***. I am a M.Sc. student from Kenya Methodist University. I am conducting a study titled: ***status of maternal and neonatal knowledge among health workers in Makueni County***. The findings could be utilized to strengthen the health systems in Kenya and other Low-in- come countries in Africa. As a result, countries, communities and individuals will benefit from improved quality of healthcare services. This research project is critical to strengthening health systems as it will generate new knowledge in this area that will inform decision makers to make decisions that are research based.

Procedure to be followed

Participation in this study will require that I ask you some questions and also access all the hospital's department to address the six pillars of the health system. I will record the information from you in a questionnaire check list.

You have the right to refuse participation in this study. You will not be penalized nor victimized for not joining the study and your decision will not be used against you nor affect you at your place of employment.

Please remember that participation in the study is voluntary. You may ask questions related to the study at any time. You may refuse to respond to any questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences to the services you are rendering.

Discomforts and risks

Some of the questions you was asked are on intimate subject and may be embarrassing or make you uncomfortable. If this happens; you may refuse to answer if you choose. You may also stop the interview at any time. The interview may take about 40 minutes to complete.

Benefits

If you participate in this study you will help us to strengthen the health systems in Kenya and other Low-in- come countries in Africa. As a result, countries, communities and individuals will benefit from improved quality of healthcare services. This field attachment is critical to strengthening the health systems as it will generate new knowledge in this area that will inform decision makers to make decisions that are research based.

Rewards

There is no reward for anyone who chooses to participate in the study.

Confidentiality

The interviews was conducted in a private setting within the hospital. Your name will not be recorded on the questionnaire and the questionnaires was kept in a safe place at the University.

Contact Information

If you have any questions you may contact the following supervisors:

1. ***Eunice Muthoni***
2. ***Musa Oluoch*** or ***Dr Wanja,*** Head of Department of Health Systems Management of Kenya Methodist University, Nairobi campus.

Participant's Statement

The above statement regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records was kept private and that I can leave the study at any time. I understand that I will not be victimized at my place of work whether I decide to leave the study or not and my decision will not affect the way I am treated at my work place.

Name of Participant…….

Date…….

Signature…….

Investigator's Statement

I, the undersigned, have explained to the volunteer in a language s/he understands the procedures to be followed in the study and the risks and the benefits involved.

Name of Interviewer……Date…….

Interviewer Signature……

Appendix ii: HEALTH WORKER QUESTIONNAIRE

HEALTHCARE WORKER KNOWLEDGE RELATED TO MATERNAL AND NEONATAL HEALTH IN MAKUENI COUNTY

SECTION A: Demographic Information

1. **What is your age bracket?** *(Tick appropriate response)*

Less than 25 years	[ ]
Between 26-35 years	[ ]
Between 36-45 years	[ ]
More than 46 years	[ ]

2. **What is your highest education level?** *(Tick appropriate response)*

Certificate level	[ ]
Diploma level	[ ]
Higher Diploma level	[ ]
Graduate/Degree level	[ ]

3. **For how long have you worked in your current station?** *(Tick appropriate response)*

Less than 1 year	[ ]
1-5 years	[ ]
6-10 years	[ ]
Over 10 years	[ ]

4. **For how long have you worked in MCH before?** *(Tick appropriate response)*

Less than 1 year	[ ]
1-5 years	[ ]
6-10 years	[ ]
Over 10 years	[ ]

5. **What is your Cadre of health worker** *(Tick appropriate response)*

Nurse	[ ]
Clinical officer	[ ]
Medical officer	[ ]

6. **Which facility level are you currently deployed in?** *(Tick appropriate response)*

Hospital	[ ]
Health centre	[ ]
Dispensary	[ ]

SECTION B: Technical questions

Prenatal care:

7. **When should a woman make the first antenatal care visit?** *(Tick correct response)*

Immediately she misses her menstrual period	[ ]
After she has missed her period for two consecutive months	[ ]
After three months	[ ]
When she discovers she is pregnant	[ ]
I have no opinion	[ ]

8. **How many minutes should ANC consultation take? ……**

9. **Rate your motivation level when serving mothers and new born children at MCH.**

Very motivated [ ]
Somehow motivated [ ]
Neither motivated Nor demotivated [ ]
Somehow demotivated [ ]
Very demotivated [ ]

10. **What are the recommended routine interventions during antenatal clinic?** *(Tick all correct answers)*

History taking	[ ]
Physical examinations	[ ]
Laboratory examinations	[ ]
Health education	[ ]
Assessment for referral	[ ]
Routine prophylaxis	[ ]

11. **With regard to pre-eclampsia during pregnancy:** *(Tick all correct statements)*

Pre-eclampsia is clinically defined as hypertension and proteinuria with or without pathologic oedema [ ]
A mother with BP within normal range can have pre-eclampsia [ ]
Pre-eclampsia can occur before 20 weeks of gestation [ ]
Pre-eclampsia can affect a known hypertensive mother [ ]

At least two readings 4-6 hours apart of BP greater than 140/90 mm Hg are needed to diagnose [ ]
Vitamin D deficiency is a known risk factor [ ]

12. **The following are recommended drugs for management of high blood pressure during pregnancy** (*Tick all appropriate choices*)

Losartan	[ ]
Hydralazine	[ ]
Lasix/ frusemide	[ ]
Nifedipine	[ ]
Labetalol	[ ]
Methyldopa/ Aldomet	[ ]

13. **When a pregnant woman makes her first visit to the ANC clinic, what are some of the important danger signs related to pregnancy that you will explain to her?** (*Tick all appropriate responses)*

Swelling of the feet and face	[ ]
Excessive vomiting	[ ]
Severe headache	[ ]
Increased appetite for food	[ ]
Per vaginal bleeding	[ ]
Reduced foetal movement	[ ]

14. **In the management of preterm premature rupture of membranes, the following is true:** (*Tick all correct responses*)

Maternal pulse and temperature should be monitored and recorded 4 hourly [ ]
A sterile pad should be used to monitor drainage of liquor [ ]
Augmentin and erythromycin are the preferred prophylactic antibiotics[ ]
Tocolysis and steroids indicated if gestation less than 34 weeks [ ]
Parenteral antibiotics are not necessary for chorioamnionitis [ ]

<u>Young Infant feeding</u>

15. **When is it most appropriate to initiate breastfeeding after birth?** *(Tick correct response)*

Within the first hour	[ ]
1-6 hours after birth	[ ]
6-12 hours	[ ]
More than 12 h after birth	[ ]

16. **If the mother experiences that she has not enough breast milk during the first few days after delivery, what advice do you give her?** *(Tick correct response)*

To give formula while waiting for milk production to start [ ]
To breastfeed more frequently [ ]
To give rice water, glucose or honey water while waiting for milk production to start [ ]
Advice the mother to ask someone else to breastfeed her baby: for example, a sister who has enough breast milk [ ]
I have no opinion [ ]

17. **For how long should a mother continue to exclusively breastfeed her child?** *(Tick appropriate response)*

1 month [ ]
2 months [ ]
4 months [ ]
6 months [ ]
More than 6 months [ ]
I have no opinion [ ]

18. **According to you, after how long should a mother stop breastfeeding her child completely?** *(Tick appropriate response)*

6 months [ ]
12 months [ ]
18 months [ ]
24 months [ ]
More than 2 years [ ]
I have no opinion [ ]

New born care

19. **Shortly after birth a healthy new born baby should be able to: cry loud, have a pink colour to the skin, breathe evenly and have a respiratory rate of 40 – 60 breaths per minute. How would you take care of a baby that does not have these signs shortly after birth?** (*Tick all correct statements)*

Dry baby with cloth [ ]
Use bag and face mask to help baby with respiration [ ]
Suction of nose and mouth if necessary [ ]
Slapping baby [ ]
Give mother baby to breastfeed [ ]
I have no opinion [ ]
Other [ ]

20. What can be done to prevent new-born children from bleeding? *(Tick appropriate answer)*

Breastfeeding the child [ ]
Not necessary to give any drugs [ ]
Give Vitamin K [ ]
Give Vitamin K_1 [ ]
I have no opinion [ ]

21. Do you know what dose of Vitamin K_1 to give to a new born baby according to recommendations in the National Guidelines? *(Tick appropriate answer)*

0.5 mg [ ]
1 mg [ ]
2 mg [ ]
5 mg [ ]
10 mg [ ]
I have no opinion [ ]

22. Regarding neonatal care of new-borns exposed to HIV, the following is correct *(Tick all correct statements)*

Wipe mouth and nostrils with gauze at delivery of head [ ]
Avoid suctioning unless there is meconium or excess secretions [ ]
Avoid beating or turning baby upside down [ ]
It is recommended to delay rupture of membranes during labour [ ]
Nevirapine syrup should be started within 12 hours & not later than 72 hours [ ]
Skin contact with mother should be avoided [ ]
A DBS should be collected for PCR testing at 6 weeks of age or first contact after [ ]

23. The following is correct with regard to TB and the new born *(Tick all correct statements)*

A mother on Anti-TB for >2 months before EDD should have 2 sputum smears done before delivery [ ]
New-borns of smear positive mother should get Isoniazid 5mg/kg OD for 6 months[ ]
Do not give BCG to a new born of a smear positive mother [ ]
Exposed new-borns should be re-evaluated at 6 weeks for TB [ ]
Delay BCG until two weeks after isoniazid prophylaxis [ ]

Neonatal Infections

24. **A new born child can get eye infections after delivery. Which of the following alternatives would you use to prevent this from occurring?** *(Tick appropriate response)*

    Do not apply anything [ ]
    Apply breast milk in the babies' eyes [ ]
    Clean eyes with sterile water [ ]
    Apply eye drops (silver nitrate) or tetracycline ointment after cleaning eyes [ ]
    I have no opinion [ ]

25. **Taking care of the umbilical cord of a new born after delivery is important. Which of the following alternatives would you consider as important?** *(Tick appropriate response)*

    Always clean your hands before touching the cord [ ]
    Cut the cord with a clean instrument (for example, a razor blade) [ ]
    Use any sharp instrument for cutting the cord [ ]
    After cutting the cord, apply traditional herbs/medicines [ ]
    Always put a bandage around the cord [ ]
    I have no opinion [ ]

26. **What approach would you use to handle an umbilical cord that has any of the following signs: bad smell, oozing blood, small rashes around the umbilical area?** (*Tick appropriate response)*

    Leave to dry [ ]
    Clean with water and soap [ ]
    Clean with iodine solution [ ]
    Apply antibiotic powder [ ]
    Refer to hospital [ ]
    I have no opinion [ ]

27. **What is, in your opinion, the best way to stabilize the temperature of a new born baby?** (*Tick appropriate answer*)

    Bathing the baby in water of appropriate temperature [ ]
    By putting on clothes and cover head [ ]
    Having the baby skin-to-skin with her/his mother [ ]
    Keep the baby in a room with a temperature of 28-30°C [ ]
    Have the baby close to heat (radiator, fire, etc.) [ ]
    I have no opinion [ ]

28. **What is the definition of low birth weight for new-born child?** *(Tick correct answer)*

    Weight is less than 3000 grams [ ]
    Weight is less than 2500 grams [ ]
    Weight is less than 1500 grams [ ]
    Weight is less than 1000 grams [ ]
    I have no opinion [ ]

29. **What alternatives are important when taking care of a low birth weight baby?** (*Tick appropriate answer)*

    Bath the baby often [ ]
    Start breastfeeding early and frequently [ ]
    Keep the child warm [ ]
    Prevent infection from developing [ ]
    I have no opinion [ ]

Community interventions

30. **Why is it important to conduct home visits to mothers and their new born babies after delivery?** (*Tick all correct statements*)
    To ask and examine the mother about her physical and psychological status [ ]
    To ask the mother about the baby's behaviour (feeding, stools and urination, umbilical cord condition, etc.) [ ]
    Examine the baby regarding icterus, weight, umbilical cord, temperature, etc. [ ]
    I have no opinion [ ]

31. **When is the optimal time for health care personal to conduct the first home visit to a mother and her baby after delivery?** *(Tick appropriate answer)*

    Not important with home visits [ ]
    During the first 3 days [ ]
    Between day 3 and day 7 [ ]
    Between day 8 and day 14 [ ]
    I have no opinion [ ]

32. **What are the appropriate times for washing hands with soap under running water?** (*Tick all correct responses)*
    Before eating [ ]
    After eating [ ]
    Before changing baby's diapers [ ]
    After changing baby's diapers [ ]
    Before cooking/ food preparation [ ]
    Before visiting toilet [ ]
    After visiting toilet [ ]

Appendix iii: ANC OBSERVATION CHECKLIST

Serial number …….

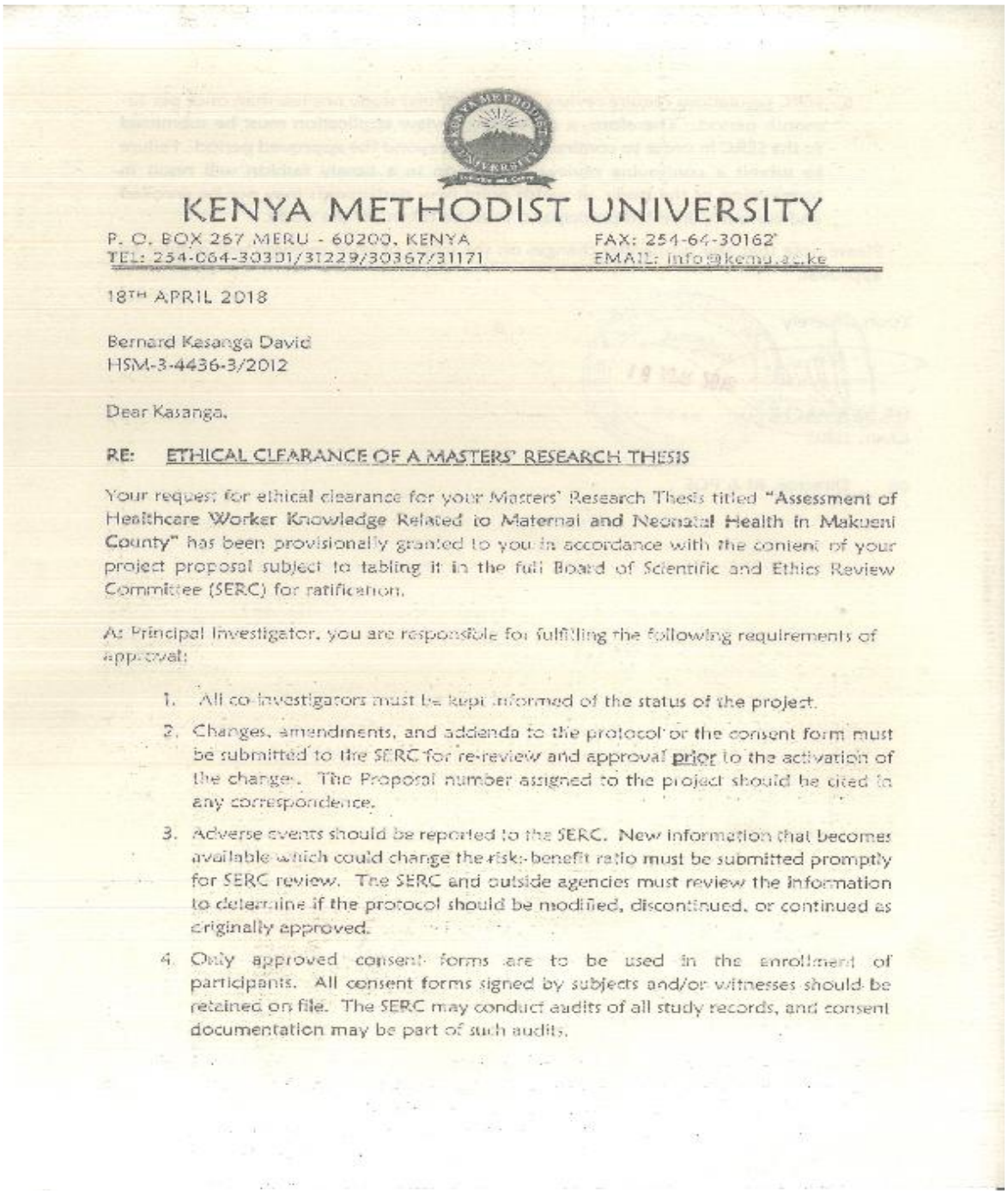
Level of care: [ ] Hospital [ ] Health Centre [ ] Dispensary

Cadre attending client: [ ] Doctor [ ] Clinical officer [ ] Nurse

S/NO	Procedure	Done (Y/N)	Appropriate action taken (Y/N)
1	***History taking***		
	Personal history		
	Present pregnancy		
	Obstetric history		
	Perinatal complications		
	Medical history		
2	Client assisted to lie on Couch (Left lateral position)		
3	***Client assessment***		
	Height		
	Weight		
	Temperature		
	Pulse		
	Respiration		
	Blood pressure		
4	Client covered to only expose part of interest		
5	***Physical examination***		
	General physical examination		
	Signs of anaemia looked for		

	Breast exam		
	Heart auscultation		
	Fundal height determination		
	Foetal presentation		
	Foetal heart sounds		
	Inspection of external genitalia		
6	***Testing/ Investigations***		
	Counselling and testing for HIV		
	Urine analysis		
	VDRL/RPR		
	Blood grouping		
	Haemoglobin		
	Appropriate action taken on abnormal urinalysis		
	Appropriate action taken on low Hb		
7	***Consultation time in Minutes***		

Appendix iv: KEMU RESEARCH AND ETHICAL REVIEW COMMITTEE APPROVAL



KENYA METHODIST UNIVERSITY

P. O. BOX 267 MERU - 60200, KENYA
TEL: 254-064-30301/31229/30367/31171
FAX: 254-64-30162
EMAIL: info@kemu.ac.ke

18TH APRIL 2018

Bernard Kasanga David
HSM-3-4436-3/2012

Dear Kasanga,

RE: ETHICAL CLEARANCE OF A MASTERS' RESEARCH THESIS

Your request for ethical clearance for your Masters' Research Thesis titled "Assessment of Healthcare Worker Knowledge Related to Maternal and Neonatal Health in Makueni County" has been provisionally granted to you in accordance with the content of your project proposal subject to tabling it in the full Board of Scientific and Ethics Review Committee (SERC) for ratification.

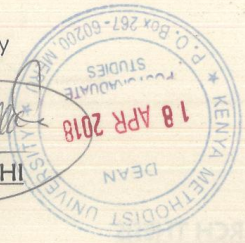
As Principal Investigator, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the project.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the SERC for re-review and approval prior to the activation of the change. The Proposal number assigned to the project should be cited in any correspondence.
3. Adverse events should be reported to the SERC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for SERC review. The SERC and outside agencies must review the information to determine if the protocol should be modified, discontinued, or continued as originally approved.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The SERC may conduct audits of all study records, and consent documentation may be part of such audits.

5. SERC regulations require review of an approved study not less than once per 12-month period. **Therefore, a continuing review application must be submitted to the SERC in order to continue the study beyond the approved period.** Failure to submit a continuing review application in a timely fashion will result in termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.

Please note that any substantial changes on the scope of your research will require an approval.

Yours sincerely



DR. WAMACHI
Chair, SERC

cc: Director, RI & PGS

Appendix v: COUNTY ETHICAL APPROVAL

REPUBLIC OF KENYA

GOVERNMENT OF MAKUENI COUNTY

OFFICE OF THE CHIEF OFFICER HEALTH SERVICES
PO BOX 89-90300 MAKUENI
Email: countyhealthmkn@gmail.com contact@makueni.go.ke
Website: www.makueni.go.ke

GMC/DOH/CDH/GEN.IV(69) 20th April, 2018

Dr. David Kasanga
P/NO. 20080161160

RE: AUTHORIZATION TO UNDERTAKE RESEARCH IN MAKUENI COUNTY

Reference is made to a letter dated 18th April, 2018 (from Kenya Methodist University) on the above subject matter.

Permission is hereby granted to undertake research on ***"healthcare worker knowledge in Maternal and Neonatal health"*** in Makueni County. By a copy of this letter all Med Supts and SCMOHs are requested to give you the necessary support to ensure the research is successful.

Yours

COUNTY DIRECTOR OF HEALTH
MAKUENI COUNTY
20 APR 2018
P. O. Box 89 - 90300, MAKUENI.
Email: countyhealthmkn@gmail.com

David Kiuluku
Director Health Planning
Makueni County

Appendix vi: NACOSTI CLEARANCE

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
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Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/60476/29344**

Date: **6th May 2019**

Dr. Benard Kasanga David
Kenya Methodist University
P.O. Box 267- 60200
MERU.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Assessment of Healthcare worker knowledge related to maternal and neonatal health in Makueni County."*** I am pleased to inform you that you have been authorized to undertake research in **Makueni County** for the period ending **3rd May, 2020.**

You are advised to report to **the County Commissioner, the County Director of Health Services and the County Director of Education, Makueni County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Makueni County.

The County Director of Education
Makueni County.