FACTORS AFFECTING IMMUNIZATION OF CHILDREN (12-24 MONTHS) IN NYATIKE SUB-COUNTY, MIGORI COUNTY KENYA

BY

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DECLARATION

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

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DEDICATION

I dedicate this thesis to my children Stephanie and Sean, my loving wife Liz, my dad and my siblings whose words of encouragement and push for tenacity ring in my ears, this work is a fruit of countless and arduous sacrifices they made.

ABSTRACT

Despite increasing worldwide immunization coverage, most under five children globally especially in low-income countries are not vaccinated. Poor immunization coverage remains an issue in less developed countries. In Kenya, about 8 out of 10 children (79%) aged 24 months have received all basic vaccinations (BCG, measles, and three doses each of DPT and polio vaccine, excluding polio vaccine given at birth). In 2018, Migori County immunization coverage stood at 57%. This study aimed to assess factors influencing the immunization of children aged between 12 and 24 months in Nyatike Sub–County Migori County, Kenya. Specifically, the study sought to determine immunization coverage of children, missed opportunities for immunization, and predictors of complete child immunization in Nyatike Sub-County, Migori County, Kenya. A descriptive cross-sectional study design was used while stratified random sampling was used to sample the ward. Using community unit household registers, simple random sampling was employed to select a sample size of 415 households with children (12-24 months). The target population were children aged between 12-24 months, while data was collected using a structured questionnaire. Data was pretested in Awendo Sub-County. Chi-square and Logistic regression were used to determine predictors of complete child immunization while descriptive statistics were analyzed using means, standard deviation, and confidence interval set at a $p \leq 0.05$ level of significance. Immunization coverage stood at 281 (67.7%). On missed opportunities, measles (at 18 months) was the most defaulted (28.2%). Predictors which were found to be significant about immunization coverage were health system and socio-demographic factors. The health system factors included distance to the health facility, (p=0.001), and presence of the facility (p=0.001), There was a significant relationship between place of delivery and immunization coverage of children (p=0.000, CI=95%) with those who delivered at the health institution likely to immunize their children (OR=1.360 CI=95% [1.070-2.496]., health care providers attitude (p=0.001), availability of immunization service (p=0.001). The socio-demographic factors included cultural/religious practices (p=0.001), There was a significant relationship between level of income and immunization coverage (p=0.0001, CI=95%)., age of mother/caregiver (p=0.001 there was a strong relationship between the level of education and immunization coverage (x^2=4.113, df =1, p=0.001, CI=95%) with respondents of minimum level of education more likely to complete immunization (OR=0.693 CI=95% [1.876-1.322]. The study findings are significant and can be used to design intervention programs to improve immunization coverage, this study further recommend additional effort by community health workers to promote skills among pregnant mothers, provision of more mobile clinics to increase community reach with immunization services, there is also need for national and county department of health to scale up health education and training on maternal and child health matters while ensuring community participation to promote community ownership and sociocultural consideration which will lead to promotion of child survival and development through reduction in child morbidity and mortality.

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LIST OF ABBREVIATIONS

ANC	Antenatal Care/Clinic
CHU	Community Health Unit
CI	Confidence Interval
BCG	BacilleCalmette-Guérinvaccine
DPT	Diphtheria, Tetanus and Pertussis Vaccine
EPI	Extended Program on Immunization
FGD	Focus Group Discussion
GAVI	Global Alliance for Vaccines and Immunization
HCW	Health Care Worker
IMR	Infant Mortality Rate
IDI	In-Depth Interviews
IREC	Institutional Research and Ethics Committee
KDHS	Kenya Demographic Health Survey
KEPI	Kenya Expanded Program on Immunization
KHIS	Kenya Health Information System
MCH	Mother Child Health Clinic
MDG	Millennium Development Goals
OPV	Oral Polio Vaccine
OR	Odds Ratio
SPSS	Statistical Package for Social Scientists
VPD	Vaccine-Preventable Diseases
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Household	The entity in which respondents live together and have a meal from a common cooking
Cause of a disease	An external factor like a pathogen in a respondent, negatively affects his or her function.
Confidence interval	Gives an estimated range of values so defined that there is a specified probability that the value of a parameter lies within it.
Odds Ratio	a measure of association between an exposure and an outcome
Immunization	The process of giving a vaccine to a person to protect them against disease. Immunity
Immunization Coverage	The proportion of a population that has received specific vaccines as recommended within a specified time frame.
Herd immunity	A level of immunization within a population that provides indirect protection to unvaccinated individuals, reducing the spread of infectious diseases
Immunization schedule	The recommended timeline and sequence of vaccinations for different age groups.
Socioeconomic status	Economic and social factors, such as income, education, and employment, can influence immunization rates.
Cultural/Religious beliefs and practices	Cultural and Religious factors that may influence vaccine acceptance or hesitancy within specific communities.
Vaccination	Also known as immunization, is a medical process of giving a vaccine to a person to stimulate their immune system and protect them against disease.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Immunization is where an individual's immune system is boosted artificially using attenuated/toxoid or live vaccines. Immunizations are a public health intervention that protects individuals from infectious diseases. For a long period, immunizations have prevented many outbreaks of common infectious diseases such as measles, mumps, and whooping cough (WHO, 2015). Routine immunization coverage in less developed countries is below the WHO and UNICEF target of 80% (UNICEF, 2014).

Globally, vaccination coverage remains at 85% with no significant changes during the past few years (WHO 2015). There are 30 million children who are not routinely immunized every year and 5.9 million children under five years of age died in 2015, more than half of these early child deaths are due to conditions that could have been prevented or treated with access to simple, affordable interventions like child immunization (WHO, 2015).

About 130 million children are born annually of which, 91 million are from third world countries. Unfortunately, 10 million under five children die annually and over 27 million infants don't get full immunization. In 2018, 129 countries attained 90% coverage of DTP3 vaccine. However, in 2018, about 19.4 million infants did not receive routine immunization services such as 3 doses of DTP vaccine (WHO, 2015).

The complete immunization coverage in Kenya in 2003 was 57 % and this rose gradually in 2007 to 77%. However, an estimated 35% of new-borns had not been immunized in 2006, translating to 0.5million unvaccinated children in the country. Notwithstanding, very low

immunization coverage remains a challenge in some Counties such as Migori County at about 57% and factors influencing low coverage are unknown

According to WHO (2015), it is required that children be immunized at every contact with a healthcare facility offering immunization services (Borus, 2014). Missed immunization opportunity (MOI) arises when a health worker does not vaccinate a child who attends a clinic, for which s/he is eligible (Borus, 2014). Demographic factors influencing vaccination coverage include the age of the caregivers of the children, marital status of the caregivers, occupation and knowledge of childhood immunization (Fredrickson, et. al., 2014). Health system factors affecting immunization coverage include place of delivery of the children, distance to the nearest health facility and availability of immunization records have been reported to positively influence vaccine uptake, (Mutua, et al, 2011, D'Onofrio et al, 2020).

Social-cultural factors affecting immunization coverage include religious affiliations and cultural beliefs.

Supply factors are important although, adequacy of vaccine supply does not directly lead to improved immunization coverage. It has been noted that factors associated with immunization demand/uptake and acceptance are even more complex (Newell, 2018) emphasizing the need to eliminate the unnecessary inequities associated with norms and structural factors that may prevent a rise in vaccination uptake. Maternal characteristics, sex of the child and birth sequence of the child, location of delivery and ANC follow-up, wealth index, awareness about immunization and location of residence can affect immunization coverage among children (New and Senior,2021).

According to Borus, (2014), missed immunization opportunities have been associated with health system factors among them unavailability of vaccines, failure to vaccinate daily throughout the week, or parental cultural belief that children to be vaccinated About 98% of

the incompletely immunized children are from third world countries. The risk factors associated with delay in immunization include family size, number of children<5 years, birth sequence, gender, religion, and couples' level of education (Smilu et. al., 2016).

Immunization is very important in raising the level of community herd immunity hence leading to improved child development and survival. Moreover, the timing of immunization is crucial because if children are immunized early/ and very closely spaced, it can shorten the period of protection or affect immune response. Delayed immunization causes prolonged potential exposure to vaccine-preventable disease infections.

Illness and fatalities in children are mainly due to preventable conditions like measles, poliomyelitis, tuberculosis, whooping cough, diphtheria, and tetanus (Thorpe, 2016, WHO, 2018). Though there is a rise in immunization coverage globally, in third-world countries many children are left unvaccinated Approximately 27 million in 2007, five children worldwide were not vaccinated against common childhood diseases and 2-3 million children died of vaccine-preventable infections (WHO, 2020). Immunization coverage has tremendously improved in the past decade to 78% for diphtheria–tetanus–pertussis-3 (DTP-3), but in Africa including Kenya, it is about 69% (CDC, 2020).

The Kenya Expanded Program on Immunization recommends that children receive Bacillus Calmette-Guerin (BCG) and Oral Polio Vaccine (OPV) at birth; 3 doses of Pentavalent vaccine and OPV at 6, 10 and 14 weeks of age; and measles vaccine at 9 months of age. Immunization coverage in Migori County in 2014 was 57% (KDHS, 2014). The reasons for this low coverage rate are unknown. Variations in immunization coverage exist and have been attributed to social, economic demographic and health system factors.

1.2 Statement of the Problem

Globally, vaccination coverage remains at 85% with no significant changes during the past few years (WHO 2015). There are 30 million children who are not routinely immunized every year and 5.9 million children under five years of age died in 2015, more than half of these early child deaths are due to conditions that could have been prevented or treated with access to simple, affordable interventions like child immunization (WHO, 2015).

Full Immunization coverage for children between 12 and 24 years in Migori County is still very low at 57% with Nyatike Subcounty having the lowest coverage among the 8 sub-counties at 43% (KHIS, 2019) Nyatike Sub-County, as evidenced by recent publications, presents a critical public health concern. According to KNBS (2017), immunization rates in Migori significantly dropped by 6% in 2017 from 2016 to 53% which is way below the national and county targets of 90% and 80% respectively in this specific region. This decline in immunization coverage has been associated with an increased susceptibility of children under 24 months to preventable communicable diseases, thus jeopardizing their health and well-being. Despite the documented evidence of low immunization rates, there is a notable absence of comprehensive research exploring the underlying causes and potential solutions specific to Nyatike Sub-County in Migori County.

This study aims to address this gap by conducting an in-depth assessment of the recent factors contributing to low immunization coverage in Nyatike Sub-County. By leveraging up-to-date data and insights, we intend to determine Immunization coverage, missed opportunities for immunization, and the predictors of immunization of children aged 0-24 months in this region. The findings of this research will serve as a valuable resource for public health officials, policymakers, and healthcare providers in designing targeted interventions and strategies to improve immunization rates and ultimately enhance the overall health outcomes of children in Nyatike Sub-County, Migori County.

1.3 Study Objectives

1.3.1 Main Objectives

To assess factors affecting the immunization of children (12-24 months) in Nyatike Sub-County, Migori County Kenya.

1.3.2 Specific Objectives

1. To determine immunization coverage for children aged 12 to 24 months in Nyatike Sub County, Migori County, Kenya
2. To determine missed opportunities for immunization of children aged 12 to 24 months in Nyatike Sub-County, Migori County, Kenya.
3. To determine predictors of immunization of children aged 12 to 24 months in Nyatike Sub County, Migori County, Kenya.

1.4 Research Questions

1. What is the immunization coverage among children aged 12 to 24 months old in Nyatike Sub County, Migori County, Kenya?
2. What are the missed opportunities for immunization of children aged 12 to 24 months in Nyatike Sub-County, Migori County, Kenya?
3. What are the predictors of immunization in children aged 12 to 24 months in Nyatike Sub-County, Migori County, Kenya?

1.5 Study Justification

Annually, over 10 million children in less developed countries die before attaining fifth birthdays. The majority die due to inadequate access to effective public health interventions that would prevent common and preventable childhood infections. Infant immunization is considered essential for improving infant and child survival. Although global immunization coverage has improved in the past decade, only 43% of the children in Nyatike Sub-County receive all the recommended vaccines that is one dose of BCG and measles and three doses each of DPT and polio (KDHS, 2014). Routine vaccination coverage against Polio and other vaccine-preventable diseases in Nyatike Sub–County are below target (KDHS, 2014; KHIS, 2019). Given the protective effect of immunization and the observed low vaccination coverage in Nyatike Sub-County, it is important to assess these factors influencing complete child immunization in Nyatike Sub-County, so that child mortality and morbidity arising from these preventable diseases can be minimized. Moreover, determining the factors influencing immunization will help, in coming up with targeted interventions to improve immunization coverage.

1.6 Limitations of the Study

Recall bias was a limitation for respondents without child record cards on immunization for they could not remember the actual dates the child was immunized; this was solved by checking immunization scars.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature based on specific objectives about the study topic. The chapter also provided the study gap of the study.

2.2 Immunization Coverage

Globally, vaccination coverage remains at 85% with no significant changes during the past few years (WHO 2015). There are 30 million children who are not routinely immunized every year and 5.9 million children under five years of age died in 2015, more than half of these early child deaths are due to conditions that could have been prevented or treated with access to simple, affordable interventions(WHO, 2015).

The complete immunization coverage in Kenya in 2003 was 57 % and this rose gradually in 2007 to 77%. However, an estimated 35% of new-borns had not been immunized in 2006, translating to 0.5million unvaccinated children in the country. Notwithstanding, very low immunization coverage remains a challenge in some Counties such as Migori County at about 57% and factors influencing low coverage are unknown.

In sub-Saharan Africa, access to vaccines remains a challenge, Vaccine preventable diseases contribute 2.5% of morbidity in Migori County. In (1999) Nyatike was the least populated Sub County in Migori County with a total population of 136,450 persons but was the most densely populated with immunization coverage of 37%, which is still below the national target of 85% in rural areas (Fotso et al 2017)

Singh (2007), in his study on immunization coverage in rural Nepal India, indicated that 94.8% of eligible children who were immunized had received BCG (94.8%), OPV/DPT (91.6%), and Measles (72.6%). However, 39 (5.2%) of the children had not completed BCG, DPT, Polio and Measles due to temporary/permanent migration to rural or back home to their parents.

A study by Nuwaha *et. al.* (2017) in Uganda, established the immunization coverage of 95% for BCG, 82% for DPT, 81% for Polio and 77% for Measles. According to the study, coverage was a result of awareness of immunization and social-cultural influence on parents. The parents noted that routine immunization was important in eliminating childhood infections. The study also established that men were the decision about immunization.

A study in Nigeria, on determinants of immunization status, indicated that highly knowledgeable mothers, and their children had completed the immunization schedule. Moreover, more than half of the mothers correctly identified vaccine-preventable symptoms. The majority, 99%, of the mothers were in agreement that immunization was a good prevention measure for childhood infection. (Olumuyiwa *et al*. 2018). Another related study by Tadesse *et al*. (2021) conducted in Ethiopia, showed that mothers who were poorly knowledgeable about the importance of vaccination were 6 times more likely to default compared to highly knowledgeable mothers. Also, mothers who had negative perceptions towards health facilities support were 2.3 more likely to have defaulter children compared with positive attitude mothers. The study concluded was important to default on immunization.

2.3 Missed Immunization Opportunities

A study by Abdul (2020) in Bangladesh on failure by mothers/caregivers to immunize children, established that inadequate awareness of immunization benefits, schedules, institution-related

problems, and social-cultural, maternal and children's diseases were identified as reasons for defaulting or failure to immunize the children. In a related study done in Nigeria on the reason for defaulting, child diseases and perceived contraindications by the health care workers are the main reasons cited by the caregivers for defaulting (Onyiriuka, 2016). Another prospective hospital-based study by Anah et al. (2016) on eliminating missed opportunity as a barrier to immunization established reasons for missing scheduled immunization were a sick child at the vaccination time, ignorance about revisits for immunization, change of residence and fever side effects following previous immunization.

A cross-sectional study by Borus (2014) on missed opportunities established reasons for not fully being vaccinated were inadequate/out-of-stock vaccines, lack of booking of next immunization day, sick or under-weight child, under age and syringe stockouts.

Vaccine stockout is also a major predictor of immunization uptake, in sub-Saharan Africa in which 38% of the WHO member countries report national-level stock-outs (Lyndon et.al, 2017). The most commonly affected antigens are BCG and DPT which account for 43% of the vaccine stockouts. When vaccine stockout occurs at the district level, then there is a 96% chance that it will lead to vaccination interruptions, (Lyndon et. al., 2017). Datar et al. (2007) established that the availability of healthcare infrastructure significantly increased immunization coverage. The study also noted that large and better-equipped healthcare facilities had a higher effect on immunization coverage.

2.4 Predictors of Child Immunization

2.4.1 Social-demographic Factors Influencing Immunization Coverage

While some social and cultural beliefs promote good health, some have adverse effects on health promotion (The College of Physicians of Philadelphia, 2016). Caregiver characteristics such as religion, age, marital status, birth order (number of older siblings), gender of the child,

and place of birth are demographic factors influencing the immunization of children. According to a Zewdie et. al., (2016), study, Muslim children were 3% less likely to complete the immunization scheduled vaccines compared to their Roman Catholic children. The study further noted that unproven beliefs that vaccines could be harmful/laced with toxic chemicals like family planning drugs also lead to parents refusing to immunize their children (Zewdie et. al., 2016).

According to Chidiebere (2014), young mother's children were less likely to be fully immunized. Another similar study by Mutua et al., (2011), showed that an increase in maternal age increased the likelihood of full childhood vaccination by 1.7 times. In a similar study carried out in Ethiopia, to determine factors influencing immunization coverage for children between 12-23 months, the proportion of fully vaccinated children increased with maternal age. Precisely, mothers and caregivers aged 30 and above were 3.79 times more likely to have their children completely immunized compared to caregivers under 30 years (Mohamud et al., 2014). Kamau & and Esami (2017) agreed that maternal age is associated with high immunization coverage.

A study done in Ghana (Anokye et al., 2018) showed that children of divorced mothers were 3 times less likely to be fully vaccinated in comparison to children of married mothers and living together or cohabiting. However, a population-based survey done in Mozambique, (Shemwel et al., 2017) and a cross-sectional survey done in Nigeria, (Oyefara, 2014) to determine mother's characteristics and under-five immunization status showed that maternal marital status had no significant influence on childhood vaccination. According to (EDHS, 2016) vaccination coverage reduces as birth order rises (Central Statistics Agency, ORC Macro, 2016).

Daniel, 2021 indicated that the gender of the child may influence the immunization of the child in societies where gender inequality is high. Girls have been found to have lower immunization coverage than boys in India (Daniel, 2021). In a consistent study in Bangladesh, girls were 0.84 times less likely to be vaccinated in comparison to boys (WHO, 2018). However, another study done in Nigeria in 2003 showed no significant gender difference (Diddy, 2021). A study by Kidane et al., (2006), indicated there was no significant difference between boys and girls about vaccination status.

Maternal uptake of health services like ANC, TT status of the mother, and place of child delivery factors have been associated with the vaccination status of children (Chhabra et al., 2007). Chhabra et al., (2007) noted that mothers following ANC and giving birth at a health facility were more likely to fully immunize their newborn children. A similar study by Rafiqul et al. (2007), consistent with Chhabra et al., (2007), in which it was established that mothers delivering in healthcare facilities were more likely to have their newborn babies receive polio vaccine on delivery than those giving birth at home. The coverage levels were associated with the education of mothers and fathers, the father's occupation, residential status, and place of delivery. A comparative study on vaccination status among children born in health facilities and at home by Odiit & Amuge (2003) showed that a child born in a healthcare facility was more up to date with their immunization than children born at home. Being born at home was found to be a risk factor for incomplete or non-vaccination. The Odiit & Amuge (2003) study further noted the continuation of immunization was poor in children born at home and Etana (2012), found out that children born in a healthcare facility were 2.6 times more likely to complete their vaccination than children born at home.

According to Nath et al. (2012), the incomplete and unvaccinated status of the children was related to poor socio-economic status, which prevents parents from taking children for immunization as scheduled.

A comparative study by Kidane et. al. (2006) among slum and non-slum dwellers in Bangladesh established that a mother's level of education, income, and living conditions was associated with the immunization status of children. Mothers with the lowest education level, low income, and living in slum areas were less likely to complete immunization. A study by Rafiqul et al. (2007) indicated that high immunization coverage in the higher ages of 24+ months was linked to the mother's education, husband's occupation, and family's monthly income. Socioeconomic status often dictates information access in the community. Economically stable community members are more likely to access mass media information. Mothers and caregivers with access to any mass media are more likely to have their newborns immunized compared to mothers not access to mass media (Rafiqul et al. 2007). Forshaw et al. (2017) established that mothers with assert children of mothers with secondary/tertiary education were 2.3 times more likely to be fully immunized compared to children of mothers of primary education or below. Vaahtera et. al. (2020) established that poor vaccination coverage was associated with living in villages with no access to outreach immunization facilities like clinics. Kidane and Tekie (2000) revealed that higher awareness in the community was linked with effective community mobilization for immunization.

2.4.2 Health Care System Factors Influencing Immunization

The healthcare system comprises of organization of people, policies, institutions and resources organized to provide healthcare services (CDC, 2016). The expertise of the health service provider, knowledge and advice offered to the clients influence the uptake of health services by the target population (CDC, 2016). Accessibility to health services is a multidimensional process that incorporates quality healthcare services, accessibility, affordability and availability of the right healthcare service (Peters *et al.,* 2007). The poor people in the society have less access to health services compared to well to do in the society. Geographical accessibility has a direct influence on healthcare services consumption.

Accessibility to health care has a positive influence on health-seeking behaviour and practices including vaccine uptake.

Baluka (2003) study established that decentralized health services were important in improving accessibility to health care services. as indicated by community members. Ndiritu *et al*. (2006) study established that immunization coverage reduces with increased distance from the immunization health facilities.

Health facility as a factor was found to be associated with full immunization of the children in households nearer to the health care facility were found to be more likely to complete the vaccination schedule than those far away from the facility (Rup *et al*., 2018). In contrast, Jagrati, (2018) a study in Mozambique showed that accessibility to healthcare facilities distance and transport to immunization sites did not significantly influence complete immunization.

A study by Ibnouf *et al.*, (2007), noted that attendance at birth influenced the vaccination status of children. Partha, (2019) reported that mothers who received ANC services were 2-3 times more likely to immunize their children. The study further showed caregivers who received ANC service from a professional or traditional birth attendant were more aware of immunization services. According to Mosiur & Sarker, (2020), mothers who were immunized TT during pregnancy were likely to ensure their children completed full immunization. Sebahat & and Nadi (2016) established that distance from the health facility and immigration from less developed regions to economically developed areas were significantly associated with immunization coverage. Singh & Yadav (2017) found that slum dwellers did not demand immunization services due to weak community organization and low collective confidence, known to increase utilization of health services in public healthcare facilities.

Ibnouf, *et al*. (2007) reported that there was a significant difference in immunization coverage among children in rural and urban areas. The access to immunization health facilities in urban

was higher than in rural areas. Ibnouf, *et al*. (2007) further affirmed that immunization coverage increased with an increase in children's age and education level of the mother. The study also confirmed that vaccination coverage increased with an increase in the age of the children and the education level of the mother.

2.5 Kenya Expanded Program on Immunization Schedule (KEPI)

Kenya Expanded Program on Immunization (KEPI) was initiated in 1980 by the Kenya government to ensure that all children in Kenya are vaccinated against infectious preventable diseases. The immunizable diseases as per KEPI include:

Table 1: Kenya Expandable program on the immunization schedule

Visit	Age	Vaccines
1	Birth, or first 2 weeks	BCG, OPV0
2	6 weeks	OPV1, Rota1, DPT-HepB-Hib1, PCV1
3	10 weeks *(or 4 weeks after visit 2)*	OPV2, Rota2, DPT-HepB-Hib2, PCV2
4	14 weeks *(or 4 weeks after visit 3)*	OPV3, IPV, DPT-HepB-Hib3, PCV3
5	9 months	MR1, Yellow Fever
6	18 months	MR2
7	10 years	HPV1
8	10.5 years	HPV2

According to the World Health Organization, A child can be defined as completely or fully immunized if they have received a Bacillus Calmette-Guerin (BCG) vaccination; three doses of the Diphtheria, Pertussis, and Tetanus (DPT) vaccine; three doses of the polio vaccine; and a measles vaccine, and should be fully immunized within the first year of life

2.6 Conceptual framework

A model consisting of independent and dependent variables where independent variables determine the outcome of the dependent variable. The conceptual framework for this study consists of the utilization of immunization services (dependent variable) social-demographic factors (independent variable) and health service factors (intermediate variable) as shown in Figure 2.1

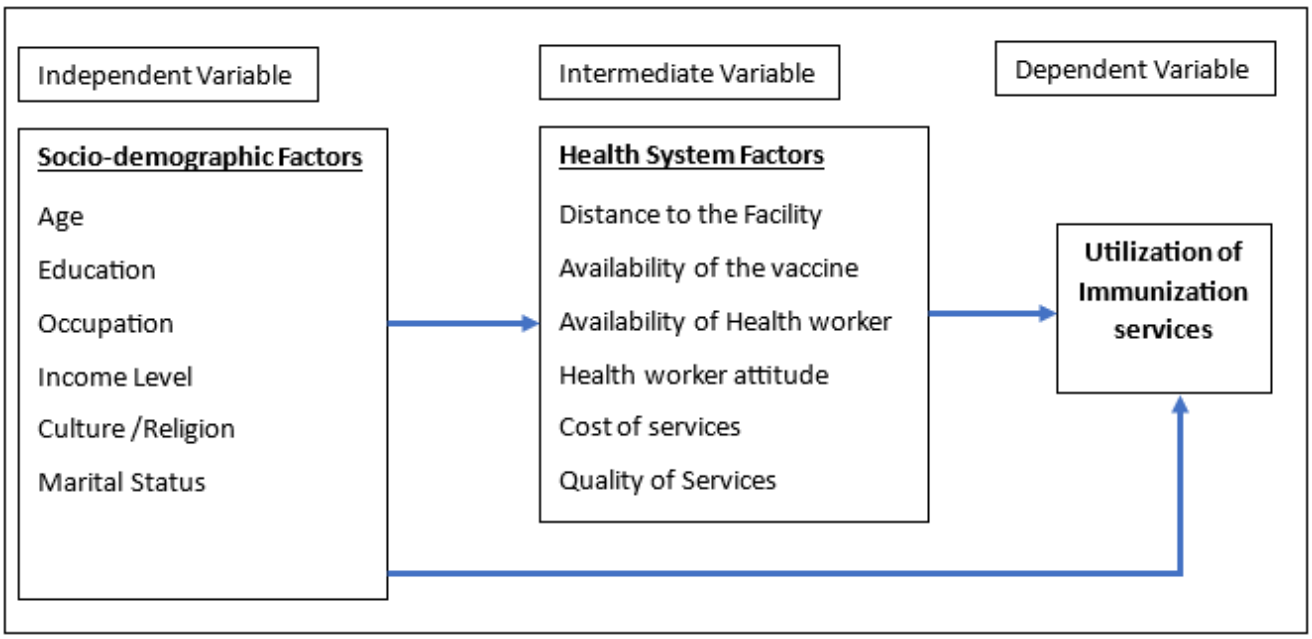

Figure 2.1: Conceptual Framework

CHAPTER THREE

METHODOLOGY

3.1 Study site

Nyatike Sub-County is one of the eight sub-counties in Migori County Kenya, the other 7 sub-counties include Rongo, Awendo, Suna East, Uriri, Suna West, Kuria East, Kuria West. Administratively Nyatke sub-county is divided into eight wards namely Macalder, Muhuru, Kanyasa, Kanyarwanda, Kaler, Kachieng, Got Kachola, and North Kadem. The Sub-County has a total population of 162, 857 with approximately 46,443 children aged between 12 and 24 months (KNBS, 2019) and a land mass of 332.50 sq. Km. The Sub–County is located between latitudes 0^{θ} 24^{θ} and 0^{θ} 40^{θ} south and longitudes 34^{θ} and$34^{\theta}50''$ East. The main economic activity is subsistence farming, Fishing in Lake Victoria is also a significant economic activity for communities living along the lakeshore. Nyatike has 37 government health facilities, 6 private clinics, and 1 mission hospital serving the healthcare needs of the population.

3.2 Study Design

A descriptive cross-sectional study design was adapted to assess factors affecting immunization of children in Nyatike Migori County. Both qualitative and quantitative data approaches were used in the study.

3.3 Study variables

The independent variables were immunization coverage, missed opportunity for immunization and predictors of immunization (socio-demographic factors and social-demographic factors while the dependent variables were immunization coverage of children.

3.4 Target population

The target population included 46,443 children (aged 12 to 24 months) and post-natal care health workers. Caregivers/mothers in Nyatike Sub-County were automatically included in the study because children aged 12 to 24 months could not consent to their participation in the study.

3.5 Sampling design

3.5.1 Sample size determination

Nyatike Sub-County has an average of approximately 46,443 children aged 12 to 24 months.

The sample size was calculated using the Fisher *et al*., (2018) formula based on the proportion of complete immunized children aged between 12-24 months being 43% with a 95% confidence interval and precision level of 5%. The study sampled 5 of the 8 wards in the Nyatike Sub–County. The sample size was distributed proportionately based on population per ward.

$$n=\frac{z^2\, p\,(1-p)}{d^2}$$

n= Sample size where the population is more than 10,000.

z= Standard normal deviation (1.96), which corresponds to 95% confidence interval.

d^2= Degree of accuracy 0.05 (5% sampling error)

p= Proportion of the target population estimated to have particular characteristics, in this case

43% of the target population (See table 2)

Using Fishers' formula:

$$n = \frac{1.96^2 \times 0.43(1-0.43)}{0.05^2}$$

=377+10% of the sample size to cater for non-response.

=377+38

= 415 Respondents

Table 2: Sample size distribution

Nyatike sub-county wards	Total population of children per ward	Total sample proportion per ward
Muhuru	3,564	80(19.3%)
Kaler	3,051	68(16.4%)
Kachieng	4,212	94(22.7%)
Kanyasa	3,596	81(19.5%)
Kanyarwanda	4,110	92(22.1%)
Total	**18,533**	**415(100.0%)**

3.5.2 Sampling Procedure

Five out of eight wards in Nyatike Sub–County were purposively selected for study because of their low immunization coverage, Muhuru, Macalder, Kaler, Kachieng, Kanyasa, Kanyarwanda, North Kadem, Got Kachola at 37%, 52%,43%, 36%, 35%, 41%, 54% and 49% respectively (KHIS, 2019). The wards were stratified based on the administrative boundaries. Based on community unit Household registers, the respondents were selected using simple random sampling where every child below 24 months in the population has an equal and independent chance of being selected as part of the sample and proportionately based on the total population per selected ward to achieve 415 respondents for the study. Using the register numbers a computer random number generator was used to select the households, one child who was deemed eligible for immunization was selected per household. However, if there was more than one child eligible for immunization, the older one was selected for the study. The mothers/caregivers of the selected children were included in the study. Key Informants who were healthcare workers in immunization clinics or post-natal care clinics were also reached,

one key informant who had worked in the immunization clinic or post-natal care clinic for a longer duration was selected per ward, hence a total of 5 key informants were interviewed.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion Criteria

1. Mothers or caregivers of 12-24 month children because the children could not consent to the study
2. Children of 12-24 months this was the best age range to also determine the immunization coverage
3. Health care workers in immunization clinic or post-natal care clinic

3.6.2 Exclusion criteria

1. Those mothers or caregivers who had not resided in the study for more than 6 months because they lack Contextual knowledge of the local environment and may not have deep understanding of local customs, practices, and challenges
2. Those Mothers or Caregivers with sick children because presence of sick children in the study may introduce bias, as it could affect the mothers' responses or behavior in ways that are not directly related to the research questions

3.7 Pretesting of data collection tools

Data collection tools were pre-tested at Awendo Sub-County which had the same socio-demographic characteristics as the study area. The tools were pre-tested on 10% (42) of respondents who were omitted from the actual study. The test-retest method was adopted in which some tools were administered to the same respondents twice at an interval of one week, the pre-test data was only used to refine the questionnaire to ensure that it is valid, reliable, and effectively measures the intended variables and finally discarded it was never shared anywhere.

3.8 Data Collection Tools and Procedure

A structured questionnaire was employed to collect primary data from households and healthcare providers. Primary data that was collected included immunization coverage, missed opportunities, and predictors of children's immunization.

For secondary data, the researcher reviewed mother and child immunization cards. To collect data on immunization coverage, the researcher interviewed mothers/caregivers using a structured questionnaire to determine if the child was immunized or not. The caregiver was required to produce a mother and child immunization card for review. To establish missed opportunities for immunization, the researcher collected both secondary and primary data. Data collected included; missed vaccines and reasons for missing the vaccines. A structured questionnaire was used to collect data on predictors of children's immunization (socio-demographic and health system factors)

Key informant guide: The health workers working in the post-natal care clinic were interviewed to shed more light on predictors of immunization and reasons for missed opportunities.

3.9 Validity and Reliability of data collection tools

3.9.1 Validity of Data Collection Tools

To ensure validity research assistants were trained on the rigors of the study. Also, data collection tools were pre-tested at Awendo Sub-County.

3.9.2 Reliability of data collection tools

To test for reliability, Cronbach's alpha (α) was computed by relating the score for each of the scale items with the total score for each item using the data collected during pretesting. Cronbach's alpha is a measure used to assess the reliability and internal

consistency of a set of test items. According to Polit and Beck, (2013), a reliable data collection tool should have Cronbach's alpha (α) of at least 0.6 to 0.9. Data was reliable with a Cronbach's alpha of 0.79. To ensure reliability, the data collected was, checked for completeness, and accuracy and coded for analysis in SPSS.

3.10 Data analysis and presentation

Univariate analysis of some selected characteristics was performed and Crude Odds Ratio (OR) and 95% Confidence interval (CI) were calculated. The significance level was taken at p =<0.05. Multivariate analysis was performed to assess the independent role of factors associated with immunization status.

Multivariate Analysis: Multiple logistic regression was done to assess the independent association of factors associated with the partially immunized and unimmunized status of immunization. Adjusted Odds ratio (AOR) and 95% confidence intervals (CI) were calculated by multiple logistic regression analysis, starting with all the variables in the study, using SPSS package version 21

Qualitative data from key informant interviews were also analyzed by systematically organizing, coding i.e., manually labelling categorizing, and interpreting the information gathered during the interviews

3.11 Ethical consideration

Ethical approval was sought from the Jaramogi Oginga Odinga Teaching and Referral Hospital Institution and Research Committee (JOOTRH IRC). Permission to conduct the study was obtained from Maseno University and NACOSTI.

The respondents were informed that participation in the study was entirely voluntary. They had the right to participate in the interview or to terminate their participation at any time whenever

they wanted. Consent forms were signed by the respondents who agreed to participate in the study. The respondents were also informed that the interviews would be conducted in privacy. Caution was maintained to ensure that the identity of respondents from whom the information was obtained would be kept strictly confidential and would be referred to their words, pseudonyms or invented names which they had chosen. They were also assured that at the end of the study, any information that revealed the identity of individuals who were subjects of the study would be destroyed. No information, revealing the identity of any participant was included in the final report or any other communication prepared in the course of the study, Adherence to strict confidentiality and safeguards was therefore ensured. Careful measures were taken for the safety of all collected data and stored in the computer database that was accessible only to the student and the supervisor and was password protected.

CHAPTER FOUR

RESULTS AND FINDINGS

4.1 Introduction

The findings of the study are presented in this section according to the study objectives. The response rate was 415(100.0%).

4.2 Socio-Demographic Characteristics of the Respondents

The study population comprised of children aged between 12 to 24 months. As such, mothers/caregivers were automatically enrolled to respond to an array of factors attributable to their children. A large proportion, 181 (43.6%) were aged between 20-24 months while 113 (27.3%) age range was 16-19 months (Table 3). On the other hand, 133(32%) of mothers/caregivers were aged 20-24 years, while 16(3.9) were 40-44 years (Table 3). Slightly more than half, 216(52%) were male (Table 3). Majority of the respondents were married 339 (81.7%), only a paltry 11(2.7%) were separated/divorced (Table 3). Almost all the respondents, 411 (99.1%) were Christians. About two-thirds 272 (65.5%), possessed a primary level of education, while only 10 (2.4%) had no education (Table 3). A majority, 355(85.5%) of the respondents earned a monthly income of less than KES 5000 while 322 (77.6%) were not employed (Table 3).

Table 3: Socio-demographic characteristics of the respondents

Parameter	Frequency	Percentage (%)
Age: Children (Months)		
12-15	121	29.1
16-19	113	27.3
20-24	181	43.6
Age: Mothers/caregivers (Years)		
15-19	38	9.2
20-24	133	32***
25-29	123	29.6
30-34	73	17.6
35-39	32	7.7
40-44	16	3.9
Children's Gender		
Male	216	52.0
Female	199	48.0
Mother's/Caregivers Marital status		
Single	45	10.8
Married	339	81.7***
Separated/Divorced	11	2.7
Widow	20	4.8
Mother's/ Caregivers Religion		
Christian	411	99.1**
Muslim	3	0.7
Other	1	0.2
Mother's/Caregivers level of education		
None	10	2.4
Primary	272	65.5
Secondary	94	22.7
Tertiary	39	9.4
Mother's/Caregivers Monthly income (KES)		
<5000	355	85.5
5001-10000	46	11.1
100001-200000	8	1.9
Above 20000	6	1.5
Mother's/Caregiver's occupation		
Not employed	322	77.6
Formal employment	19	4.6
Self-Employed	74	17.8

4.2.1 Cultural/religious practices

The study noted that 154 (37.1%) of the respondents had certain socio-cultural factors affecting child immunization. There was a significant relation between cultural/religious practices and immunization coverage (x^2=5.902, df =1, p=0.001, CI=95%).

About a third, 126 (30.4%) of the mother respondents indicated that their spouses often accompany them to the facility while visiting for immunization services.

Indeed, the study established that respondents 309(74.4%) sought permission to attend immunization services. Half of the respondents, 209 (67.6 %%), indicated that the decision to take the child for immunization was vested in the mothers/fathers-in-law, 100 (32.4) from the husband. There was significance between seeking permission and immunization coverage (x^2=6.352, df =1, p=0.001, CI=95%).

> ‘*’Yes, it is true some cultures affect the immunization coverage like depending on the father to make decisions as to when the child should be taken for immunization. In most cases, they provide money for transport. So, if they don't have then no immunization especially when the parents stay far from the facility''*
>
> *K.I.I 4*

4.2.2 Mothers/Caregivers age, level of education and immunization coverage

Slightly a third, 133(32%), of mothers/caregivers were 20-24 years of age (Table 3). The chi-square test indicated, that there was a significant relationship between mothers/caregivers' age and immunization coverage. (x^2=8.783, df =1, p=0.001, CI=95%). With caregivers/mothers of 20-24 years likely not to complete immunization (OR=1.393 CI=95% [1.336- 3.147].

Most, 272 (65.5%), had a primary level of education (Table 3). There was a strong relationship between the level of education and immunization coverage (x^2=4.113, df =1, p=0.001,

CI=95%) with respondents of a minimum level of education more likely to complete immunization (OR=0.693 CI=95% [1.876-1.322].

4.2.3 Mothers/caregivers occupation and level of income

A majority, 322 (77.6%), respondents were not in any form of employment (Table 3). There was a significant relationship between occupation and missed opportunities (x^2=6.181, df =1, p=0.001, CI=95%). A majority, 355 (85.5%), were earning a monthly income of less than KES 5000. There was a significant relationship between the level of income and immunization coverage (p=0.0001, CI=95%).

4.3 Immunization Coverage

4.3.1 Children immunized

Most 281(67.7%) of the respondents reported to have immunized their children. This was confirmed by requesting mothers/caregivers to physically produce the mother and child immunization card (Figure 2). A further 36(8.7%) indicated they attended vaccination but had misplaced mother/child immunization cards hence we could not ascertain the claim.

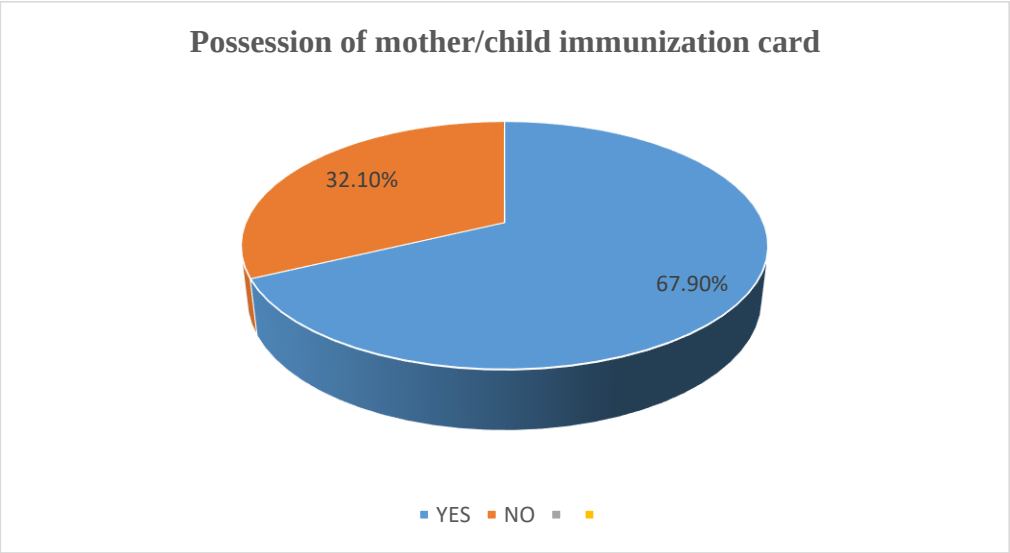

Figure 1 Possession of mother-child immunization card

This being a rural area with poor housing due to poverty, some children may have attended immunization but misplaced the cards. Moreover, some don't attend at all …K.I.I 4

Indeed, we are not doing well in terms of immunization coverage. More needs to be done to improve the coverage. Creating awareness is key and to some extent doing house-to-house vaccination might help

K.I.I 5

4.3.2 Reasons for not vaccinating children

From study findings, 29(29.9%) didn't vaccinate children due to cultural/religious beliefs while 5(5.2%) didn't see the need for immunization.

Table 4: Reason for not Vaccinating Children

Parameter	Frequency	Percentage (%)
Religious/cultural beliefs	29	29.6
Facility located far	21	21.4
No transport fare	17	17.3
Not aware of vaccination	7	7.1
Health workers absent	10	10.2
No vaccines	9	9.2
Vaccination has no use	5	5.2

4.3.3 Antenatal Care (ANC) Attendance during Pregnancy

Antenatal care attendance during pregnancy marks the inception of immunization, which should continue until later stages after the child has been born. In the current study, 353 (85.1%) of the respondents reported having attended antenatal care during their pregnancy period (Figure 3).

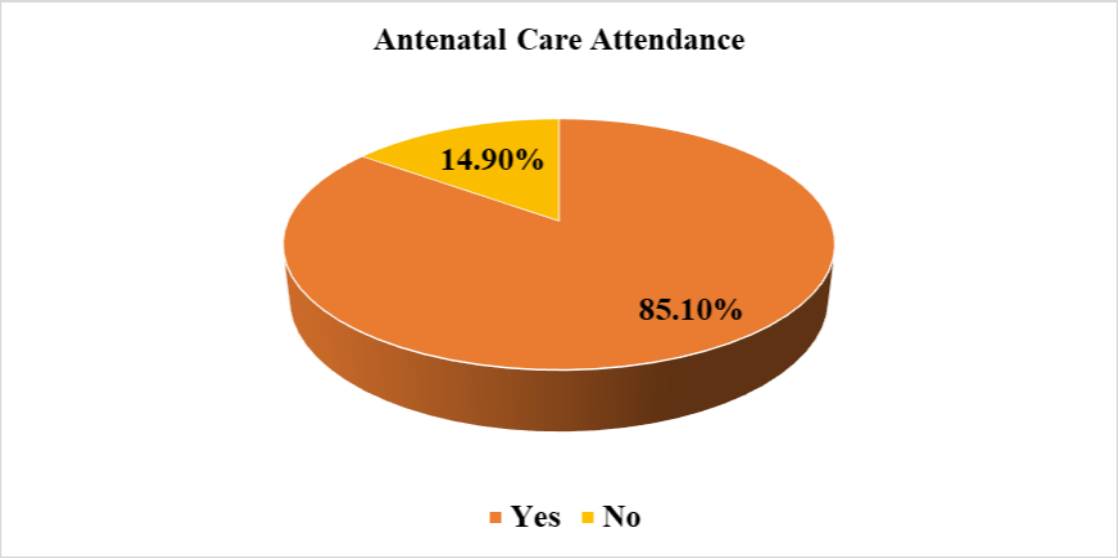

Figure 2 Antenatal Care Attendance

4.3.4 Number of Times Attended Clinic for Antenatal Care

The number of times pregnant mothers attend antenatal clinics for immunization and other forms of treatment and care determines the chances of immunization completion for their children. In the current study, the mean number of times of clinic attendance was 2.25±0.90 (Table 5). There was a significant relation between ANC attendance and immunization coverage (x^2=6.829, df=1, P=0.000, CI=95%) with those who attended at least one ANC clinic more likely to complete immunization (OR=0.564, CL=95% [0.547-3.589]

Table 5: Number of times attended ANC

Number of times of clinic attendance	Frequency	Percentage (%)
0	62	14.9
1	126	30.4***
2	73	17.6
3	49	11.8
4	40	9.6
5	42	10.1
6 and more	23	5.6
Total	**415**	**100.0**
Mean	**2.25±0.90**	

Table 6: Tetanus Vaccination in Last Pregnancy and Number of Times Received

Number of Times	Frequency	Percentage (%)
0	163	39.3
1	137	33.0
2	92	22.2
3	15	3.6
4	7	1.7
5	1	0.2
Total	**415**	**100.0**
Mean	**Mean=0.97±0.49**	

Tetanus vaccination is crucial during pregnancy as it cushions the newborn from whooping cough (pertussis). The study observed that 252 (60.7%) of the mothers had received the vaccine during their last pregnancy. However, most of the respondents, 137 (33.0%) received the tetanus vaccine once, during their last pregnancy

4.3.5 Place of Last Delivery

Place of delivery is critical in determining the mother's uptake of adequate immunization practices. Mothers who deliver at the hospital are more likely to engage in recommended child immunization practices. In the study, 295 (71.1%) of the respondents reported having had their last delivery at a health institution (Figure 4). There was a significant relationship between place of delivery and immunization coverage of children (x^2=5.216, df=1,

p=0.000, CI=95%) with those who delivered at the health institution likely to immunize their children (OR=1.360 CI=95% [1.070-2.496].

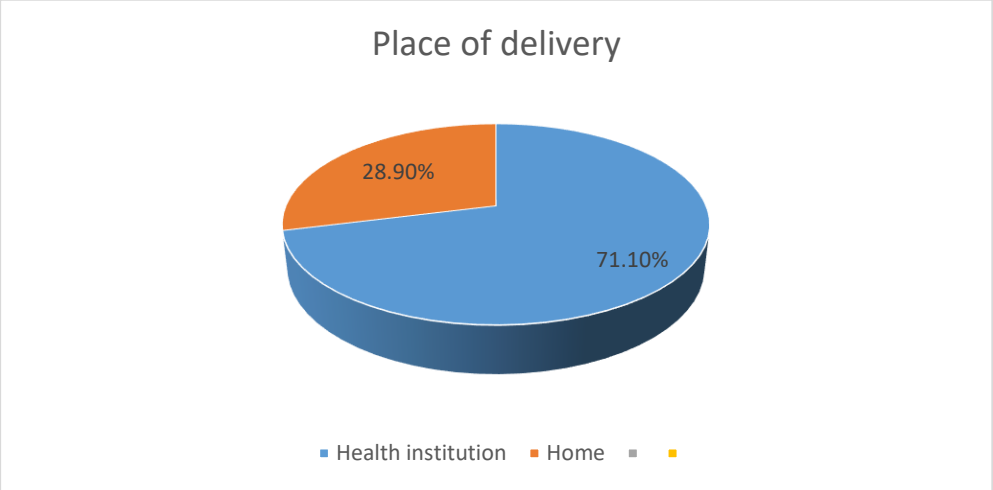

Figure 3 Place of delivery

4.4 Missed Immunization Opportunities

4.4.1 Commonly missed vaccines

While it is expected that children are supposed to complete the requisite immunizations at various stages, the study observed that not all had completed their immunization schedules. Study findings show that the most commonly missed vaccines were measles at 18 months, 298 (71.8%), OPV at birth' 110 (26.5%), PCV at 10 weeks; 107 (25.8%), PCV at 6 weeks; 103 (24.8%), PENTA at 6 weeks; 94 (22.7%), PENTA at 14 weeks; 90 (21.7%), and OPV at 14 weeks; 87 (21.0%).

Table 7: Immunization completion and commonly missed vaccines

Vaccine	Yes (%)/Vaccinated	No (%)/Not vaccinated
BCG (at birth)	400(96.4%)	15 (3.6%)
OPV (at birth)	305 (73.5%)	110 (26.5%)
OPV (at 6 weeks)	365 (88.0%)	49 (11.8%)
OPV (at 10 weeks)	337(81.4%)	77 (18.6%)
OPV (at 14 weeks)	328 (79.0%)	87 (21.0%)
PENTA (at 6 weeks)	321 (77.3%)	94 (22.7%)
PENTA (at 10 weeks)	346 (83.4%)	69 (16.6%)
PENTA (at 14 weeks)	325 (78.3%)	90 (21.7%)
PCV (at 6 weeks)	312 (75.2%)	103 (24.8%)
PCV (at 10 weeks)	308 (74.2%)	107 (25.8%)
PCV (at 14 weeks)	341 (82.2%)	74 (17.8%)
Measles (at 9 months)	365 (88.0%)	50 (12.0%)
Measles (at 18 months)	117 (28.2%)	298 (71.8%)

It was confirmed that indeed some children miss or delay coming for the scheduled vaccination

‘*’Yes, there are some cases in which although, they attended the first BCG vaccine, due to giving birth in hospital, there are those children who miss due to various reasons like being sick, parents forgetting, lack of means of transport due to distance among other reasons’’*

K.I.I 1

4.4.2 Vaccinations not Recorded in Child Immunization Card

Failure to record vaccines offered to children makes it difficult to assess the completion of child immunization schedule. In the current study, only 55 (13.3%) respondents reported that some vaccinations were not recorded on the cards.

4.4.3 Reasons for defaulting vaccines

Study findings show 65(15.7%), had inadequate time for taking the child for vaccination while 10(2.4%) were discouraged by previous side effects the child experienced (Table 8)

Table 8: Reasons for defaulting

Reason	Frequency	Percentage (%)
A far distance from the facility	55	13.2
Absent vaccinator/ Health worker	44	10.6
Not knowing the vaccination time	60	14.5
Not aware of returning for booster	64	15.4
Inadequate time for taking child for vaccine	65	15.7
No transport fare	21	5.1
Previous side effects	10	2.4

4.5 Predictors of Immunization

4.5.1 Health Systems Factors

4.5.1.1 Presence of Facility Offering Immunization Services

Residence near health facilities offering vaccination services influences the uptake and completion of child immunization. Most, 359 (86.5%) of the respondents reported the presence of a facility offering vaccination services near their area(s) of residence (Figure 5). There was a strong relationship between the presence of a vaccination facility and immunization children (x^2=5.616, df=1, p=0.001, CI=95%) with those near health facilities more likely to complete immunization (OR=1.360 CI=95% [1.150-3.496].

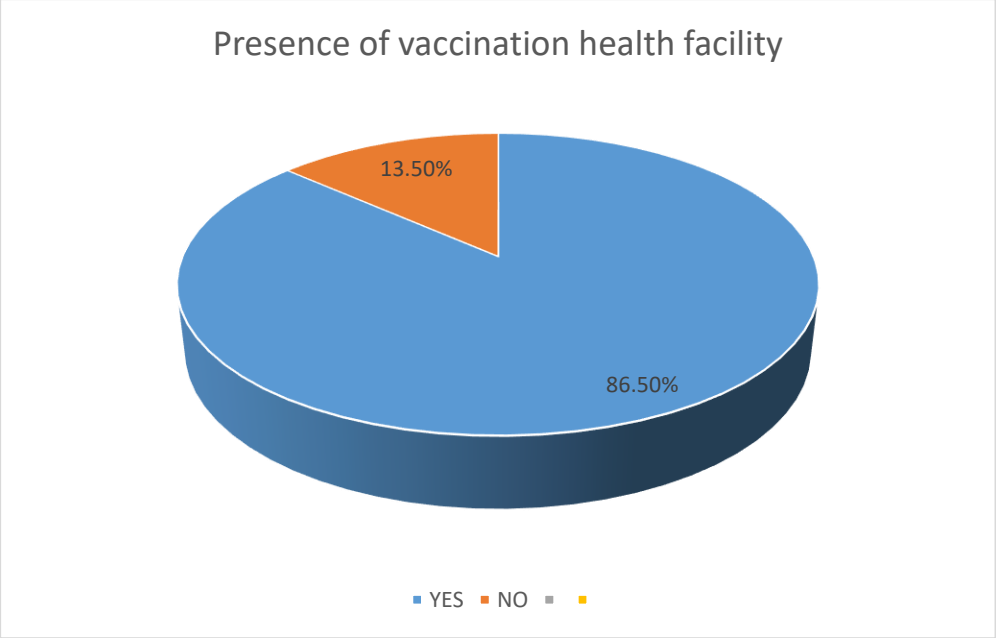

Figure 4 Presence of Vaccination Health Facility

4.5.1.2 Type of Health Facility Nearby

The type of facility within the population's reach may determine the range of immunization and vaccination services available. Higher-level healthcare facilities are more likely to provide a wider range of immunization services than lower-level facilities. The study reports that most of the study respondents, 171 (41.2%) resided close to a health centre (Table 9)

Table 9: Type of health facility nearby

Facility	Frequency	Percentage (%)
Health Centre	171	47.6
County/sub-county hospital	48	13.4
Outreach post/clinic	115	32.0
Private clinic	25	7.0
Total	**359**	**100.0**

4.5.1.3 Distance to Health Facility and Average Waiting Time

The distance to a facility offering immunization services is a core determinant of the population's uptake and completion of immunization services. A high proportion of the respondents, 254 (61.2%) resided less than five (5) kilometres away from a health facility

(Table 10).

The respondents further indicated; that 360(86.7%) roads are not accessible. The chi-square test established a significant relationship between distance to health facility and immunization coverage for children (x^2=6.352, df =1, p=0.001, CI=95%). With those who are 0-5 KM likely to complete immunization OR=0.693 CI=95% [1.376-1.4791].

Slightly more than half, 186 (58.8%) of respondents waited between 1-2hours for their children to be vaccinated (Table 10). There was no relationship between waiting time and immunization completion (p=0.061, CL=95%).

> *The county faces a high shortage of nurses hence there is a delay in MCH. The number of mothers and children is overwhelming……..*
>
> K.I.I 3

> *Those who stay far from the facility default a lot. It forces us to follow them up but we don't have means of transport. No facilitation sometimes*
>
> K.I.I 5

Table 10: Distance to health facility and waiting time

Distance to health facility (Kilometers)	**Frequency**	**Percentage (%)**
0-5	254	61.2***
5-10	137	33.0
More than 10	24	5.8
Total	**415**	**100.0**
Average Waiting time for vaccination service		
< 1 hour	32	10.1
1-2 hours	186	58.8
>2hours	99	31.1
Total	**317**	**100.0**

4.5.1.4 Rating of quality of immunization service

Quality services at health facilities are likely to result in high client retention; hence, increased uptake and completion of immunization schedules. About 133 (42%) of the respondents rated the quality of services received at health facilities visited for immunization services as good (Figure 6). There was a significant difference between rating of immunization service and immunization coverage (p=0.000, CI=95%)

> *The quality of service is low compared to other countries. This is a marginalized sub-county. But we are trying our best to improve health services.* K.I.I 2 and 5

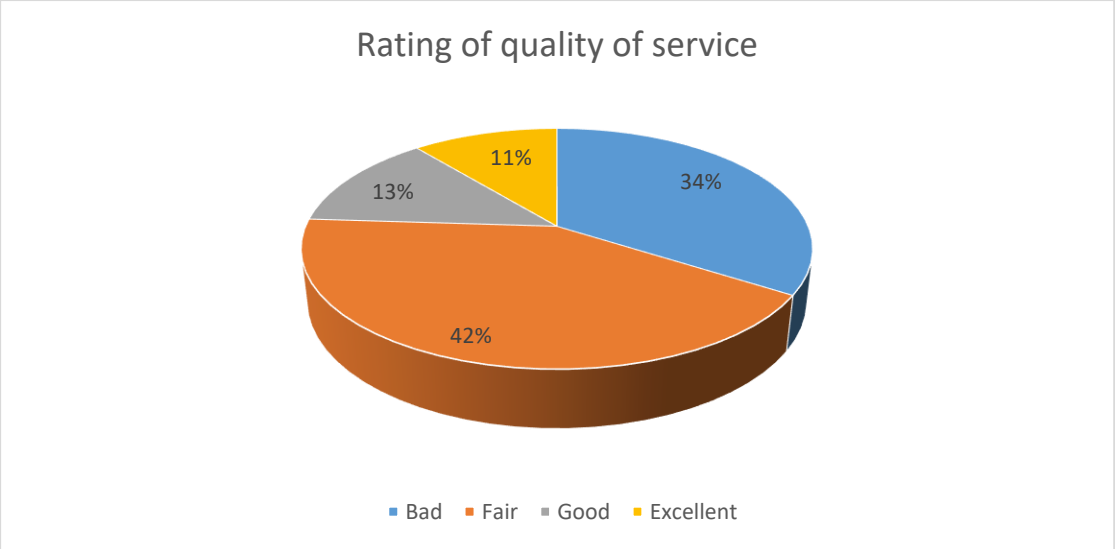

Figure 5 Rating of quality of service

4.5.1.5 Payment for Immunization Service

The incurrence of particular charges for immunization services is a core factor that determines access, uptake, and completion of immunization schedules. In the current study, 209(66.2%) of the respondents reported that they did not incur any charges to get immunization services at the health facilities visited. Those who incurred indicated that the charges were for the registration fee to open the patient file. There was no significance between payment for

immunization and immunization coverage 5.112, df =1, p=0.001, p=0.0621, CI=95%).

4.5.1.6 Health Care Providers Attitude and provision of health education

The study sought to understand mothers' notions on the attitude of health care providers at the facilities they visited for child immunization services. More than half, 172 (54.2%) of the respondents indicated that the health care providers portrayed a good attitude (Figure 7). Furthermore, 250 (79.0%) of the respondents reported that the health care providers provided health education on the need and benefits of immunization services. There was a significant difference between health workers attitude and immunization coverage (x^2=8.151, df =1, p=0.001, CI=95%).

Respondents further indicated that the majority, 305 (73.5%) of health workers in the MCH clinic were friendly and ready to assist.

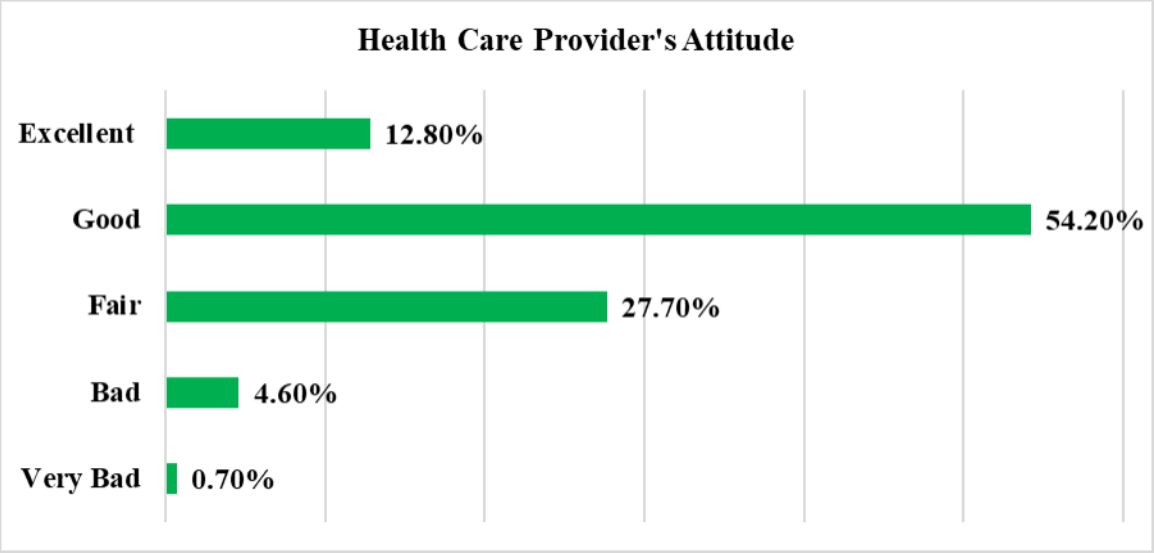

Figure 6 Health Care Providers Attitude

4.5.1.7 Availability of immunization service when Respondents visited the health facility

Most, 281(67.7%) indicated that immunization services were available when they visited the facility.

Reasons given why immunization services were unavailable included 49(50%) no health workers, and 60(58.8) no vaccines. There was a significant difference between the availability of immunization services and missed immunization opportunities 8.235, df =1, p=0.001, CI=95%).

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussions

5.1.1 Immunization Coverage

From the study findings, immunization coverage is still low (67.7%) compared to the KEPI national target of 90% of the respondents reported to have immunized their children. Children who are not vaccinated can transmit vaccine-preventable diseases at schools and in the community. Herd immunity is only attained when immunization coverage is about 80% which protects the community from vaccine-preventable diseases from transmission. The findings are consistent with a study done by Lillian, *et al,* (2021) in which they established that the immunization coverage in Kenya stands at 77%. The low coverage might be attributed to low levels of education, unemployment and high poverty level, inaccessibility to the facility and cultural factors (KDHS, 2021).

Despite the benefits of childhood immunization, routine vaccination coverage for all recommended EPI vaccines has remained poor in some African countries such as Nigeria (31%; 2018), Ethiopia (43%; 2019), Uganda (55%;2016) and Ghana (57%; 2014). The coverage is higher in some of the African countries, such as in Tanzania in the year 2016 and Kenya in 2021, 77%, respectively (KDHS, 2021). However, these coverages are still below the targets endorsed by WHO in the 2012 Global Vaccine Action Plan, which aimed to ensure delivery of universal access to immunization with associated targets reaching 90% of the national vaccination coverage and at least 80% vaccination coverage in every county (WHO, 2021).

5.1.2 Missed Immunization Opportunities

Missed immunization opportunities arise from instances where mothers had the chance to have their children immunized, but for one reason or another could not visit the clinic to get the respective vaccine. Certain factors elicit the occurrence of missed opportunities in matters of child immunization. Abdul, (2020) attributes missed opportunities to a lack of knowledge on the essence of immunization by the mothers, health facility-related factors, and cultural and religious. For the current study, it was observed that reasons for not receiving any vaccine included nearness to a health facility, perception that vaccination is of no use, no transport fare, no vaccine and religious and cultural factors.

Missed opportunities pose detrimental effects in that they often result in partial immunization, which limits the intended role of vaccination aligned to prevent the occurrence of various childhood illnesses that could progress to adulthood. Vaccines work best when they are completed fully; hence, missed opportunities may lead to partial effectiveness. The reasons given for missed opportunities in the current study are almost similar to those reported by other studies. A study by Anah *et al.* (2016) argues that reasons for missing vaccination schedules include sickness by the child, movement or migration to another locality, ignorance of scheduled vaccination visits, and effects, especially fever arising from initial vaccination. Other probable reasons for missing immunization in the current study include vaccine stockouts, which were reported by a study by Borus (2014). For this purpose, there is a need to aggregate and contextualize all the reasons for missed opportunities reported by various studies as means of developing sensitive (context-specific) interventions that would address them effectively.

5.1.3 Predictors of Child Immunization

5.1.3.1 Socio-Demographic Factors

Occupation, household income, and education levels are some of the critical socio-economic parameters that influence the uptake of health care services including child immunization. A reflection on modern-day society shows that higher educational attainments result in more stable and sustainable livelihood engagements (formal and non-formal), which influence household income. Education offers opportunities to engage in diverse livelihood activities resulting in resilience to economic shocks and guarantees access to health care when needed. In the current study, most of the respondents had a primary level of education. More so, there was a strong relationship between the level of education and immunization coverage (x^2=4.113, df =1, p=0.001, CI=95%) with respondents of a minimum level of education more likely to complete immunization (OR=0.693 CI=95% [1.876-1.322]. This study's findings were similar to a study done in Turkey, (Sebahat & Nadi, 2016) revealed that children whose mothers had at least primary school level education had higher immunization coverage levels. These findings affirm notions expressed by Kidane & Tekie (2000) that high immunization coverage arises due to mother's literacy. A study by Putri and Abdel, (2016) noted that as parents' educational attainment increased, the likelihood of being unimmunized decreased (p<0.000). Hence, children from uneducated parents had the highest odds of being unimmunized. Those whose mothers had no education were at least six times more likely to be unimmunized (OR 6.14; CI 95% 4.41 to 8.53).

Study findings indicated that the majority of the respondents earned a monthly income of less than Kshs 5000. As noted by Nath *et al*. (2012), income is a critical determinant of immunization coverage whereby higher income ensures surplus income, which enhances healthcare access. The low-income levels of the respondents are most likely a result of their occupations. There was a significant relationship between occupation and missed

opportunities (p=0.001, CI=95%). The majority of the respondents were earning a monthly income of less than KES 5000. There was a significant relationship between the level of income and immunization coverage (p=0.0001, CI=95%). The study was consistent with a study by Putri and Abdel, (2016), which established that as the household level of income increased, the likelihood of being unimmunized decreased (p<0.000). Hence, children from the poorest households had the highest odds of being unimmunized (OR 2.95; 95% CI 2.63 to 3.31). The study findings were similar to a study by Galadima *et.al.* (2021) in which they established that if the income of a family is greater than 52 USD, it increases the tendency of having children fully vaccinated in that family by approximately three times when compared to a poor family with a lesser income. The family with a higher income may have easier access to Immunization health facilities due to accessible effective transportation options and would have fewer financial challenges compared with families with a lower income.

Slightly a third, of mothers/caregivers were 20-24 years of age. The chi-square test indicated, that there was a significant relationship between mothers/caregivers' age and immunization coverage. (p=0.001, CI=95%). With caregivers/mothers of 20-24 years likely not to complete immunization (OR=1.393 CI=95% [1.336-1.147]. The findings are inconsistent with a study by, Mohamud *et., al*., (2014), maternal age was revealed to be a factor influencing childhood immunization uptake in a case-control study conducted in Ethiopia, in which mothers over 19 years of age were approximately 10 times more likely to have their children fully immunized compared to mothers under 19 years of age. They attributed this outcome to knowledge gained overtime on the importance of immunization by mothers over 19 years of age, combined with the negative impact on children due to lack of immunization.

The marital status of a mother was also reported to influence childhood immunization according to Anokye *et. Al.*, (2018). In a descriptive cross-sectional study conducted in Ghana involving 280 mothers, it was found that divorced mothers were 3 times less likely to complete

the immunization schedules of their children compared to mothers who were married. In a cross-sectional study conducted in Nigeria involving 232 mothers (children aged 12–23months), married women were observed to have a significantly adequate knowledge of immunization which may increase the likelihood of achieving a higher rate of immunized children compared with their counterparts who were either single/divorced/widowed or separated (Chris-Otubor, 2015). The study findings were inconsistent with the current study in which there was no association between marital status and immunization coverage.

The study noted that respondents had certain religious/cultural factors affecting child immunization (p=0.001). In Mozambique, cultural/Religious belief was revealed to be one of the social factors influencing childhood immunization uptake. Mothers who considered immunization as unacceptable in their religion were less likely to have their children fully immunized compared with mothers who did not consider immunization as unacceptable in their religion (Jani et., al., 2018). In Nigeria, cultural beliefs against immunization are found to be destructive towards childhood immunization uptake (Kio *et. Al*., 2016). Traditional and religious leaders are highly respected and are generally regarded and accepted as the custodians of traditions entrusted to them to provide traditional guidance to their respective communities. Therefore, their involvement in immunization activities will help increase immunization acceptance and uptake since the community trust their views on various matters.

About a third, 126 (30.4%) of the mother respondents indicated that their spouses often accompany them to the facility while visiting for immunization services. Indeed, the study established that the majority of the respondents seek permission before seeking immunization services. The majority of the respondents indicated that the decision to take the child for immunization was vested in the mother/father-in-law from the husband. There was significance between seeking permission and immunization coverage (p=0.001, CI=95%).

5.1.3.2 Healthcare System Related Factors

Adequate child immunization coverage is tenable only if healthcare access is guaranteed for the population. Access to health ensures timely access to health services including child immunization, which assures attainment of good health outcomes. The current study explored several healthcare-related factors including; distance to health facility, presence of vaccinating health facility, type of health facility nearby, healthcare worker attitude, average waiting time at the facility, quality of services offered, availability of vaccination service and cost (payment for immunization service).

The distance to a health facility determines the frequency at which a person seeks health care. People living near the health facilities are likely to seek health services even for minor ailments compared to those residing far from health facilities who are less likely to visit health facilities for treatment except for serious ailments. Empirical studies by Mosiur & Sarker (2020), Ndiritu *et al.* (2006), and Rup *et al.*, (2018) found a significant relationship between distance to healthcare facilities and child immunization. The latter study reported a significantly higher child immunization status for children whose households reside less than five kilometres away from a health facility. The current study findings collaborate with Mosiur & Sarker (2020), Ndiritu *et al.* (2006), and Rup *et al.*, (2018) findings. Children belonging to mothers or caregivers who travelled a short distance to the health facility for immunization were 18 times more likely to be fully vaccinated compared with children whose mothers or caregivers travelled further to a health facility for their children's immunizations (Adedire *et. Al*., 2016).

Antenatal care (ANC) visits are a positive predictor of adequate immunization. Mothers attending ANC are likely to be enlightened on child immunization (Partha, 2019), which prepares them to commit to ensuring positive uptake and completion of immunization. In the current study, there was a significant relation between ANC attendance and immunization

coverage (P=0.000, CI=95%) with those who attended at least one ANC clinic more likely to complete immunization (OR=0.564, CL=95% [0.547-3.589]. The findings are similar to a study conducted in Nigeria in which mothers who frequently attend ANC during their pregnancy were about four times more likely to have their children fully vaccinated compared with mothers who did not attend ANC regularly (Legesse and Dechasa, 2015). Mothers who frequented health facilities during pregnancy may have received counselling on childhood immunization where the importance of timely childhood immunization uptake may be prioritized regularly (Kio, 2016).

Residence near health facilities offering vaccination services influences the uptake and completion of child immunization. Most, of the respondents reported the presence of a facility offering vaccination services near their area(s) of residence. In the current study, there was a strong relationship between the presence of a vaccination facility and immunization coverage (p=0.001, CI=95%) with those near health facilities more likely to complete immunization (OR=1.360 CI=95% [1.150-3.496].

The type of facility within the population's reach may determine the range of immunization and vaccination services available. Higher-level healthcare facilities are more likely to provide a wider range of immunization services than lower-level facilities.

Slightly more than half of the respondents waited for 1-2 hours for their children to be vaccinated. There was no relationship between waiting time and immunization completion (p=0.061, CL=95%).

Quality services at health facilities are likely to result in high client retention; hence, increased uptake and completion of immunization schedules. Slightly less than half of the respondents rated the quality of services received at health facilities visited for immunization services as good. There was a significant difference between the rating/quality of immunization

service and immunization coverage (p=0.000, CI=95%). The current study finding was similar to a study carried out in Tanzania in which satisfaction with vaccine services was also found to influence childhood immunization coverage. Mothers who are satisfied with vaccine services were about three times more likely to have their children vaccinated compared with mothers who were unsatisfied with vaccine services. The way vaccine providers behave could either enhance or discourage mothers from taking their children for vaccinations (Chambongo, 2016).

The incurrence of particular charges for immunization services is a core factor that determines access, uptake, and completion of immunization schedules. Those who incurred indicated that the charge was for the registration fee to open the patient file. There was no significance between payment for immunization and immunization coverage.

The study sought to understand mothers' notions on the attitude of health care providers at the facilities they visited for child immunization services. Slightly more than half, of the respondents indicated that the healthcare providers portrayed a good attitude. There was a significant difference between health workers' attitudes and immunization coverage (p=0.001, CI=95%).

Most of the respondents indicated that immunization services were available when they visited the facility. There was a significant difference between the availability of immunization services and missed immunization opportunities (p=0.001, CI=95%). The findings were similar to a study carried out in Nigeria in which, the unavailability of vaccines when required was also found to be another reason for defaulting on childhood immunization uptake (Akwataghibe, 2019).

Place of delivery is critical in determining the mother's uptake of adequate immunization practices. Mothers who deliver at the hospital are more likely to engage in recommended child immunization practices. In the study, the majority of the respondents

reported having had their last delivery at a health institution. There was a significant relationship between place of delivery and immunization coverage of children (p=0.000, CI=95%) with those who delivered at the health institution likely to immunize their children (OR=1.360 CI=95% [1.070-2.496].

5.2 Conclusion

In conclusion, immunization services in Nyatike Sub-County, Migori County require urgent improvement in the areas by expanding service delivery points through outreach services to reduce the accessibility gap, recruitment and training of more health workers, transportation and implementation of tailored mechanisms to ensure adequate communication between health care workers and mothers/caregivers through community sensitization. There is a need for future studies to test specific interventions in Nyatike Sub County whose findings can cover more counties and the entire country with similar immunization inequities. More effort needs to focus on mothers /caregivers in middle age and much attention on mothers with more children, which will play a big role in improving Immunisation coverage

5.3 Recommendations

5.3.1 Recommendations for Practice

1) The Ministry of Health at national and county levels alongside other stakeholders should scale up health education and training on matters of maternal and child health to consider and include more socio-demographic, socio-economic, and health institution-related features relevant to different mothers as a means of optimizing adequate maternal and child health practice
2) To enhance immunization coverage for mothers with children aged 12 to 24 months, the Government of Kenya (Gok), county governments and maternal child health program implementers should decentralize health service facilities offering

immunizations through the adoption of more mobile clinics that can enhance access by the mothers and caregivers.

3) Counties should invest more resources in strengthening the community health systems so that CHVs are motivated and retained to carry out demand creation, deliver community services, and that communities continue to demand and utilize health services among them immunization
4) There is a need to adopt a community-based approach to deal with cultural practices that affect immunization of children.

5.3.2 Suggestion for Further Research

There is a need to assess the effects of community strategy on child immunization and its associated factors.

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APPENDICES

APPENDIX I: CONSENT FORM

PROJECT TITLE: ASSESSMENT OF FACTORS AFFECTING IMMUNIZATION OF CHILDREN IN NYATIKE SUB- COUNTY, MIGORI COUNTY, KENYA.

PURPOSE OF RESEARCH

I am Stephen OKONG'O, a student at Maseno University pursuing a Master's degree in Public Health. The study will aim to understand the factors influencing immunization in Nyatike Sub–County, Migori County, Kenya. The research findings will be used to increase immunization coverage and uptake in the Sub-County.

PROCEDURES:

After signing the consent form, the research assistant will ask you questions about contraceptive uptake and services. You may be requested to participate in either the survey or the Key Informant Interview. The survey and Key informant interview will take 40 minutes.

CONFIDENTIALITY

We will do our best to protect the information we collect from you. This questionnaire will collect data strictly for learning and shall not be used for any other purpose whatsoever. The information obtained from respondents shall be treated with ultimate confidentiality and shall not be diverged to anybody or any other use than the intended.

RISKS

There are no risks involved in this study. It has been approved by the Jaramogi Oginga Odinga Teaching and Referral Hospital Institutional and Research Committee and Maseno University School of Graduate Studies.

BENEFITS

There are no direct benefits to you but the results of this study will be used to inform stakeholders on the need to improve demand and access of family planning services. It will also inform the study population on the need to adopt and promote services that support and meet the needs of reproductive health women.

PARTICIPATION

Participation in this study is voluntary and you may withdraw from it at any time and without any adverse consequences.

CONTACTS

For any questions or concerns about this study please contact the study Investigator Stephen OKONG'O Telephone No. 0720 581962. For any questions about your rights as a research participant, t h e contact person is The secretary, Maseno University Ethics Review Committee, Private Bag, Maseno; Telephone numbers: 057-51622, 0722203411, 0721543976, 0733230878; Email address: muerc-secretariate@maseno.ac.ke; muerc-secretariate@gmail.com.

WRITE YOUR SIGNATURE OR THUMBPRINT MEANS

PARTICIPATION IN THIS RESEARCH IS VOLUNTARY. You have the right to say 'NO' to participation in this study. Your signature or thumbprint below means you agree to participate in the study and that everything about this study has been explained to you and you have had the opportunity to ask questions and get answers. A copy of this consent form will be given to you.

Respondents:

Signature……Date……...

Researchers:

Signature……Date……...

APPENDIX II: QUESTIONNAIRE

Questionnaire's Code……Date…….

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

1. Age of child in months_____

   1=12-15Months 2=16-19 Months 3=20-24 Months

2. Sex of the child 1= male 2= female

3. Number of children's older siblings_____

4. Mother's/ Caretaker's age

   1= 14-24 yrs. 2=25-35yrs 3= 36-46 4=47-57yrs 5=Above 57yrs

5. Mother's/Caretaker's marital status

   1= single 2= married 3= separated 4= divorced 5= widowed

6. Mothers/ Caretaker's educational status

   1=No formal education

   2=Primary School Education

   3=Secondary/high school education

   4= Middle College or University

7. Number of children ever born by the mother_____

8. Number of children alive _____

9. What is the occupation of the mother/Caretaker?

1= Formal 2=Informal 3= others, specify_____

10. What is your family's monthly income per month?

1= 0-5,000 2=5,000-10,000 3=10,000-20,000 4=20,000 and above.

11. What is your religion?

1= Christian 2= Muslim 3= other specify_____

SECTION B: IMMUNIZATION COVERAGE FOR CHILDREN

11. Has your child been immunized? 1=Yes 2=No

12. If yes in 11, do you have the mother and child immunization card? (Request the mother to give you the mother and child immunization card) 1=Yes 2=No

13. If No, in 11, why haven't you taken the child to immunization (Tick more than one)? 1=Religious/cultural beliefs 2= The health facility is far, no transport 3= I am not aware of vaccination 4=Health workers were absent when you visited 5=Vaccination is of no use 6= Fear of side effects 7=No vaccines

8= others, specify_____

14. Did the mother attend the ANC clinic (Confirmed by the mother-to-child immunization card)?

1= Yes 2= No

15 If yes in 14, how many times did she attend (Confirm from the mother to child immunization card)?

1=None 2=ones 3=Twice 4=Thrice 5=Four 6=Five 7=More than six

16. If No, in 14 who was attending to you during the pregnancy period? 1=Traditional birth

attendant 2= Herbalist 3=None

17. Did the mother receive tetanus vaccination during her last pregnancy (Confirmed from the mother-to-child immunization card)? 1=Yes 2= No

18. If yes in 17, how many times? 1= Ones 2=Twice 3=Thrice 4=Four 5=Five 6=Six

18. Where was the child delivered?

1= at home 2= at health institution 3=other_____

SECTION C: MISSED OPPORTUNITY

19. Fill the information from the mother and child immunization card.

VACCINES	AT BIRTH	6 WEEKS	10WEEKS	14WEEKS	6MONTHS	9MONTHS	18MONTHS
B.C.G(AT BIRTH)							
OPV (<2/52,6/52,10/52, 14/52)							
PENTA (6/52,10/52,14/52)							
PCV10(6/52,10/52, 14/52)							
MEASLES (6/12,9/12)							

20. Has the child had any vaccinations that are not recorded on this card, including vaccinations given in a national immunization day campaign?

1=Yes 2= No

21. Has the child missed any vaccine as per the KEPI immunization schedule (Confirmed from the immunization card)? 1=yes 2=No

22. What are the reasons for defaulting (Tick more than one)?

1=Vaccination site is far-away 2=Vaccination time is inconvenient 3= Absenteeism of vaccinators 4=Lack of awareness on the importance of vaccination 5=Not knowing vaccination time and site 6=Not knowing whether to come back for a booster vaccine

7= Lack of time to take child for immunization 9=No transport 8= Others _____

SECTION D: PREDICTORS OF IMMUNIZATION

Health system factors

23. Is there any health facility which provides vaccination services near you?

1=Yes 2=No

24. If yes to the above (23) question which health facility is near to you?

1=health center 2=County/sub-county hospital 3=Outreach post/clinic

4=private clinic/hospital

25. If yes in 23, how long does it take you to reach there in minutes?

1=Less than 15 minutes 2=15-30 minutes 3= 30-1 hour 4=> 1 hour

26. Are the roads to health facilities accessible 1=Yes 2=No

27. What is the distance to the health facility 1=0-5KM 2= 6-10KM 3= Over 10KMS

28. Were the immunization services available by the time you visited 1=Yes 2=No

29. If no in 28, what was the reason given for the lack of immunization service? 1=Inadequate/No health workers 2=No vaccine 3=Came late when they had closed the MCH clinic 4= others, specify…….

30. If yes in 28, what was the waiting time to be served 1= less than 1 hour 2= 1-2 hours

3= More than 2 hours

31. Rate the attitude of health service providers 1=Good 2=Fair 3=Bad

32. Rate the quality of immunization services received in the health facility 1= Excellent 2=Good 3=Fair 4=Bad

33. Did the health service provider give education on immunization services and their importance?

1=Yes 2=No

34. Were the health workers friendly to you 1=Yes 2=No

35. Did you pay for the immunization services? 1=Yes 2=No

Which services did you pay for? Specify…….

Social cultural/Religious Factors

36. Do you have any cultural factors affecting you in immunizing your child 1=Yes 2=No

If yes, specify…….

37. Does your husband accompany you to the clinic? 1=Yes 2= No

38. Do you seek permission from anyone to take the child to immunization? 1=Yes 2=No

39. If yes in 38, who decides to take the child for immunization? 1=mother/father-in-law 2= Husband 3= Traditional birth attendant 4=other, specify

38. Are there things that make you not take your child for immunization? 1=Yes 2=No.

If yes, specify……...

APPENDIX III: KEY INFORMANT INTERVIEW GUIDE

1. Name……...Occupation……

2. How long have you worked in the MCH clinic? 1= less than 1-year 2=1-3 years 3=4-5 years

4=over 5 years

3. Do you have specific days and times for immunization?

4. Do mothers/caretakers come with mother-child booklets and do they understand its content?

5. Do you conduct health education for mothers seeking ANC services?

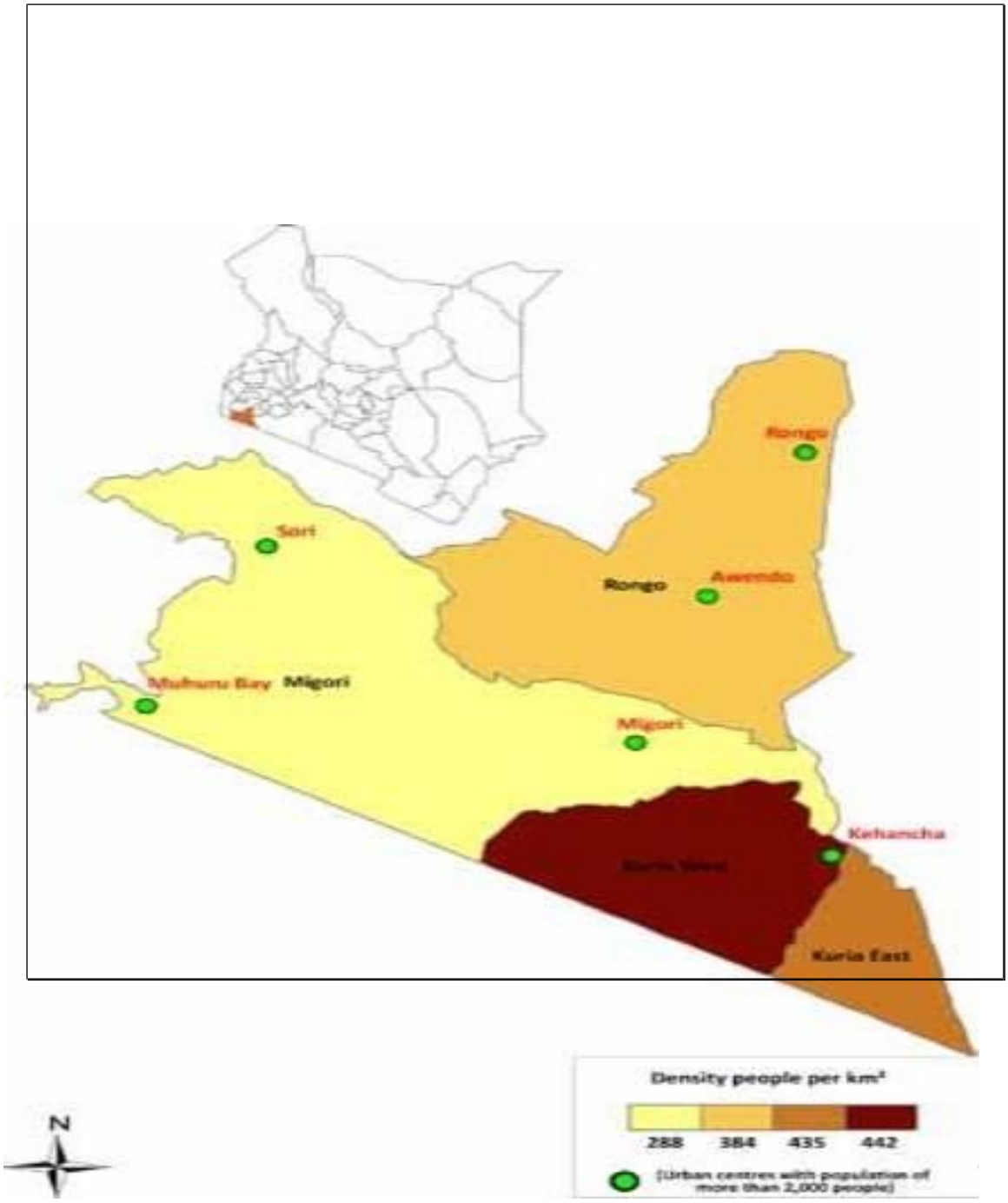
6. Are immunization supplies adequate?

7. Do you have adequate staff?

8. Do children default on immunization schedules?

9. In your opinion, rate the immunization coverage in your locality 1= High 2=Low

APPENDIX 1V: STUDY AREA MAP



APPENDIX V: RESEARCH PROPOSAL APPROVAL

MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: MPH/PH/6023/014

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 13th March, 2020

TO WHOM IT MAY CONCERN

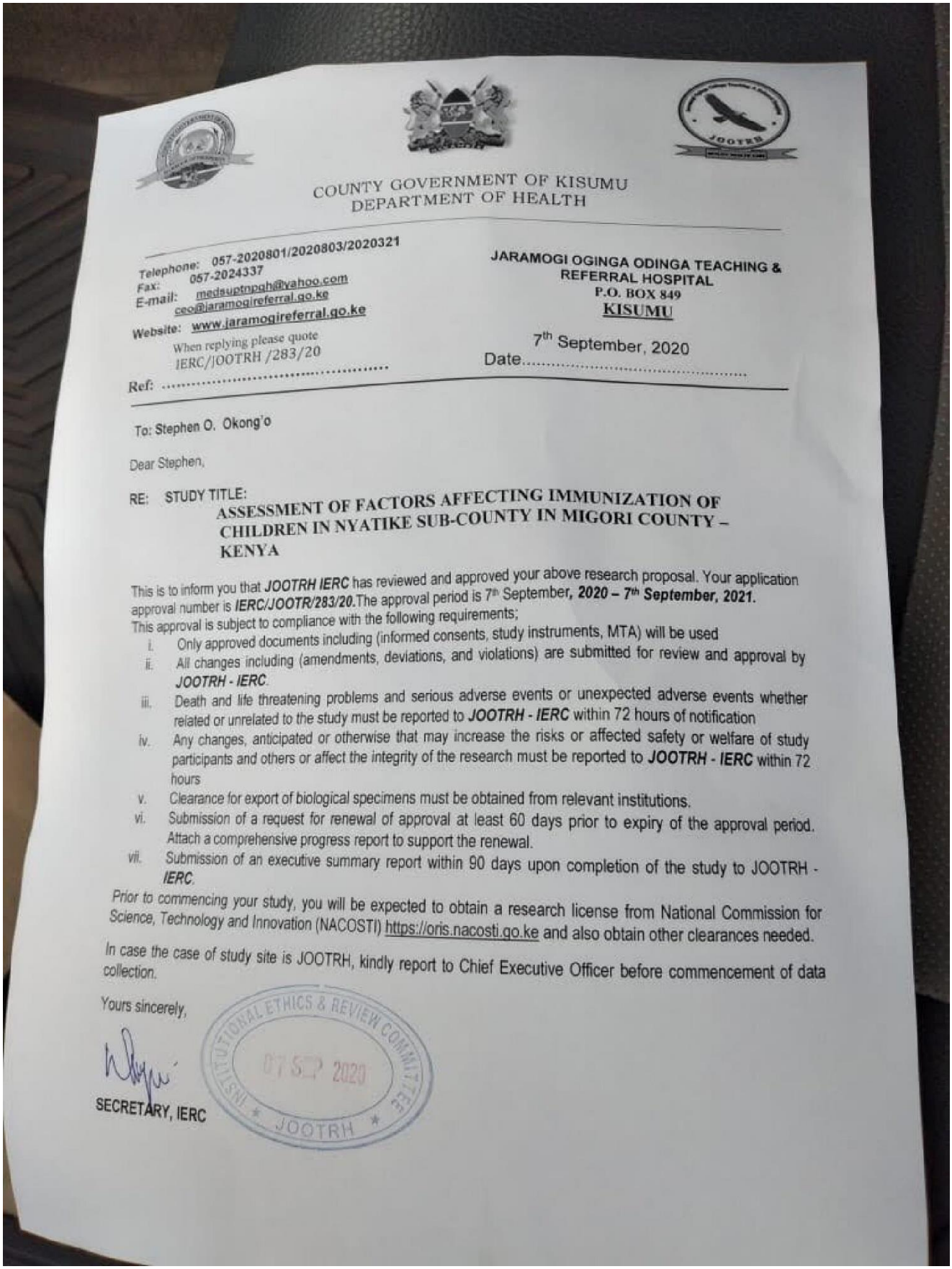
RE: PROPOSAL APPROVAL FOR STEPHEN OCHIENG OKONG'O — MPH/PH/6023/014

The above named is registered in the Master of Public Health degree programme in the School of Public Health and Community Development, Maseno University. This is to confirm that his research proposal titled "Assessment of Factors Influencing Immunization of Children Aged between 12-24 Months Old in Nyatike Sub County,Migori County, Kenya" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

SCHOOL OF GRADUATE STUDIES
MASENO UNIVERSITY
17 MAR 2020
P.O. BOX PRIVATE BAG, MASENO

Prof. J.O. Agure
DEAN, SCHOOL OF GRADUATE STUDIES

APPENDIX VI: IREC APPROVAL



COUNTY GOVERNMENT OF KISUMU
DEPARTMENT OF HEALTH

Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
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Website: www.jaramogireferral.go.ke

JARAMOGI OGINGA ODINGA TEACHING & REFERRAL HOSPITAL
P.O. BOX 849
KISUMU

When replying please quote
JERC/JOOTRH /283/20

Ref: .....

Date 7th September, 2020

To: Stephen O. Okong'o

Dear Stephen,

RE: STUDY TITLE:
ASSESSMENT OF FACTORS AFFECTING IMMUNIZATION OF CHILDREN IN NYATIKE SUB-COUNTY IN MIGORI COUNTY – KENYA

This is to inform you that ***JOOTRH IERC*** has reviewed and approved your above research proposal. Your application approval number is ***IERC/JOOTR/283/20.***The approval period is 7th September, ***2020 – 7th September, 2021.***
This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***JOOTRH - IERC***.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***JOOTRH - IERC*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***JOOTRH - IERC*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to JOOTRH - ***IERC***.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

In case the case of study site is JOOTRH, kindly report to Chief Executive Officer before commencement of data collection.

Yours sincerely,

SECRETARY, IERC

INSTITUTIONAL ETHICS & REVIEW COMMITTEE
07 SEP 2020
JOOTRH