EFFECT OF MATERNAL AND CHILD HEALTH SERVICE UTILIZATION AND FEEDING PRACTICES ON MORBIDITY AND NUTRITIONAL STATUS OF INFANTS IN KWALE COUNTY, KENYA

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Effect of Maternal and Child Health Service Utilization and Feeding Practices on Morbidity and Nutritional Status of Infants in Kwale County, Kenya

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DECLARATION

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

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DEDICATION

First and foremost, this work is dedicated to God, to whom all the glory and honour belongs. Second to my hardworking parents, Joseph and Perittah Mumeme, to my late uncle, Joseph Masika who laboured and denied themselves leisure to educate me. Last but not least to my children Seth Baraka, Naomi Neema and Keillah Kibali for moral support - you too can make it.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome.
ANC	Antenatal care
CF	Complementary Feeding
EBF	Exclusive Breastfeeding
FITS	Feeding Infants and Toddlers
HIV	Human Immunodeficiency Virus
HDSS	Health and Demographic Surveillance System
IDDS	Individual Dietary Diversity Scores
IFPs	Infant Feeding Practices
KDHS	Kenya Demographic Health Survey
KNBS	Kenya National Bureau of Statistics
LAZ	Length for Age Z scores
MCH	Maternal and Child Health
MDGS	Millennium Development Goals
MUAC	Mid Upper Arm Circumference
PNC	Postnatal care
SOWC	State of the world's children
SPSS	Statistical Package for Social Scientists
TBA	Traditional Birth Attendant
UNICEF	United Nations Children's Fund
WHO	World Health Organization

OPERATIONAL DEFINITIONS OF TERMS

Breast-feeding practices Initiation of breastfeeding within one hour after birth, Exclusive breastfeeding to the age of six months

Complementary feeding practices Time of first initiation of foods other than breast milk, frequency of complementary feeding, and dietary diversity of the foods.

Maternal and Child Health Services The health care dimensions taught to mothers during antenatal care clinics. i.e. Skilled delivery (hospital delivery) and postnatal care, immunization during infancy and family planning

Morbidity Malaria and diarrhea episodes / frequencies.

Nutritional status Stunting, Underweight and anemia status of infant

Optical measuring instrument (Masimo radical 7 pulse co oximeter) It is a noninvasive monitoring platform enabling the assessment of multiple blood constituents and physiologic parameters that previously required invasive (bleeding) or complicated procedures.

Prelacteal feeding Any food given to the newborn baby before initiation of breastfeeding

ABSTRACT

Availability, access and appropriate utilization of maternal and child health services remain a major challenge in most developing countries including Kenya. This hinders Kenya's achievement of Sustainable Development Goal number three. Proper care during pregnancy, delivery and nursing periods is important for a mother and her baby. Kwale County has a higher fertility, malaria and stunting rates among children under five years and a lower hospital delivery in comparison to national levels. After introduction of free maternity care, it has not been established if there is an improvement in antenatal care utilization and its health outcomes. This study sought to determine maternal and child health service utilization and infant feeding practices among mothers and their effect on morbidity and nutritional status of infants in Kwale County, Kenya. A prospective cohort approach was used. Purposive sampling was applied in picking health facilities. Systematic random sampling technique was used to select expectant mothers at a pregnancy of 20 weeks and above. Recruitment was based at health facilities while follow up was at facilities and home visits. Upon recruitment, a follow up was done at an interval of four months. At baseline, socio-demographics, and first antenatal care visit were taken while targeted study variables were measured during follow-ups. Chi square tests were used to test for significance between variables of interest. Logistic regression tests were used to test the odds of early or late antenatal care initiation against different study indicators. Two hundred and eighty mothers were recruited. All mothers made at least one ANC visit with 19.6% starting in the first trimester. The proportion of mothers who attended ANC clinics for four or more times during their entire pregnancy was 34.3%. Majority (78.4%) believed exclusive breastfeeding until six months is not sufficient to provide all nutrients for proper growth. There was a significant statistical association between maternal level of education and ANC initiation ($p = 0.001$), high parity ($p = 0.0001$), place of delivery ($p = 0.012$) and use of modern family planning methods ($p = 0.0001$). Mothers without formal education were four times (OR = 4.687; CI 1.765 – 12.447) more likely to initiate ANC clinics later compared to those with secondary or tertiary education. Multiparous mothers were three times (OR = 2.775; CI 1.107 – 6.960) more likely to initiate ANC later as compared to those without children. Mothers without any formal schooling were seven times (OR = 6.982; CI 1.527 – 31.926) more likely to deliver away from health facilities as compared to those with primary or secondary education. Stunting ($p = 0.001$) and underweight (0.009) were significantly associated with gender. Boys were 1.7 times (RR = 1.690; CI, 1.240 – 2.304) more likely to be stunted as compared to girls. Age of infant at introduction of complementary food ($p = 0.032$) and breast-feeding initiation ($p = 0.02$) were significantly associated to infant anemia. Infants who were weaned early were 1.7 times (RR = 1.735 CI 1.111 – 2.707) as high as the of risk of anemia among those who were weaned at the right time. The risk of anemia among infants who were fed on less or equal to three types of foods was 1.6 times (RR = 1.579 CI, 1.408 – 1.772) high as compared to those fed on more than three types of foods. Dietary diversity was significantly associated to stunting ($p = 0.0001$; RR = 1.902 CI; 1,310 – 2.761) and underweight ($p = 0.009$; RR = 2.364 (1.172 – 4.769). The risk of being stunted or underweight among infants whose diets were not diversified was 1.9 and 2.4 times as compared to infants whose diets were diversified. There was no significant association between MCH service utilization

and morbidity as well as nutritional status. Timely initiation and appropriate ANC attendance was low. Knowledge and practice of infant feeding was poor. Educating the community on the importance of timely and optimal ANC and infant feeding practices would be vital in improving maternal and child health outcomes in Kwale County.

CHAPTER ONE

INTRODUCTION

1.1: Background Information

Poor access and utilization of health services has been one of the causes for high maternal, fetal and neonatal mortality in low-income countries including Kenya (Esamai *et al.,* 2017; Nuamah *et al.,* 2019). Kenya was not able to achieve the Millennium Development Goals (MDGs) four, five and six. Accessing quality Maternal and Child Health (MCH) services has been a challenge in many parts of Kenya. The inequities among different groups and regions in the population partly contributed to not achieving the MDGs (MOH, 2016). Maternal and child mortality and morbidity is highest in low-income regions where there are more barriers to accessing and utilization of healthcare (Cheptum, 2014). Maternal and child health services include modern family planning (FP), antenatal care, skilled birth attendance delivery care and postnatal care services. Access and appropriate utilization of maternal and child health services is an effective means of reducing risks of maternal and infant morbidity and mortality in low income set ups (Ochako *et.al.,* 2011).

When modern family planning is utilized optimally, it allows mothers to space their children and regain their health in between pregnancies. This also prevents induced abortions and unwanted pregnancies. Modern family planning limits HIV transmission from mother to child hence reducing maternal morbidity and mortality. Modern family planning methods when adopted well boosts the health of a mother the way immunization boost the health of a child (WHO, 2014).

Antenatal care (ANC) has been reported as the panacea to the challenge of maternal and child mortality (Haruna et al., 2019). Antenatal care is an access point to other programs that provide integrated health. The multiple programs supported include Malaria, tetanus, maternal anemia, malnutrition, and STI prevention (WHO, 2006). It also includes micronutrient supplementation, education on exclusive breastfeeding practices and prevention of mother-to-child transmission of HIV and AIDS. Proper medical attention during ANC and hygienic conditions during delivery reduce risks of complications, infections, or death of a mother and baby (KDHS, 2014; UNICEF, 2014). Skilled birth attendance delivery care provided at health facilities not only

reduces maternal and infant risks to mortality in case of emergencies but also ensures that they get postpartum care after delivery (Okedo Alex *et al.*,2019).

Infant feeding practices like early (before six months) introduction of foods other than breast milk can be disadvantageous for infants as it replaces nutrient-dense breast milk resulting in inadequate nutrients and energy for growth (Issaka *et al.*, 2015). Health benefits of exclusive breastfeeding of infants are widely known while early introduction of complementary feeds is associated with poor nutritional status, diarrhea and respiratory infections in infants (Scott *et al.*, 2009). Studies have found exclusive breastfeeding to be critical and adequate for the first six months of life (Black *et al.,* 2013). Exclusive breastfeeding is linked to reduced risks of diarrhea, lower respiratory infections, asthma, stunting, and mortality as well as improved motor development for infants in resource-poor settings (Yarnoff *et al.,* 2013). After six months breast milk alone is not sufficient to meet an infant's nutritional requirements therefore timely introduction of nutritionally adequate, safe, age-appropriate complementary feeds from sixth month of age is recommended for optimal health and development (Black *et al.,* 2013; Dominguez *et al.,* 2014). Complementary foods are often introduced before or after the recommended age of 6 months and are often nutritionally inadequate and unsafe (Tessema *et al.,* 2012), contributing to malnutrition both in low and high-income countries (Haroon *et al.,* 2013).

Although there is increased availability and cost-effective maternal and child health services in resource-poor areas of the world including Kenya, its utilization remains low (UNICEF, 2014) and this could affect negatively on both the mother and child (Lambert *et al.,* 2011). Estimates show that around 303,000 women died in 2015 due to complications during pregnancy or childbirth, most of which could be avoided as medical interventions are well known (WHO, 2016). Ninety nine percent of the deaths occurred in developing countries. Over seven million children under the age of five die every year from preventable and treatable conditions. More than 1/3 of all deaths are due to nutrition-related factors. (UNICEF, 2014). An estimated 35% of global under-five deaths and 50-70% of diarrheal diseases, measles, malaria, and lower respiratory infections in resource-poor settings are attributable to child under

nutrition. This is common in resource- poor setups where appropriate breastfeeding and complementary feeding (CF) practices are suboptimal (Gyampoh *et al.,* 2014).

In sub-Saharan Africa, maternal and infant mortality ratios are very high and less than 50% of women are attended to by a trained midwife, nurse or doctor during childbirth (WHO, 2014). In Kenya over 40 % of infants are not breastfed within the first one hour after birth making late initiation of breast-feeding an issue of significant public health concern as infants miss the benefits of colostrum (Matanda *et al.,* 2014). Infant mortality rate in Kenya has improved tremendously in the last five years from 52/1000 live births in 2008-09 to 39/ 1000 live births in 2014 (KDHS, 2014) but more needs to be done to reduce regional gaps in infant mortality and morbidity and to attain sustainable development goals numbers one, two and three.

The Kenya government has several national initiatives to improve the health status of mothers and children and reduce infant and maternal mortality but more interventions are needed at County governments' levels particularly in relation to appropriate utilization of maternal health services and infant feeding practices in both food dense and food insecure regions. Although service availability and quality standards are being upgraded in different areas, it is necessary to make maternal care more responsive and culturally acceptable, to lead to enhanced utilization and improved outcomes (Srivastava *et al.,* 2015). The importance of health care and good nutrition practice in the first 1,000 days of life (during pregnancy and the first two years) has been widely recognized with regard to child growth, health and survival (Kimani-Murage *et al.,* 2014). There is therefore need for further research into the effect of maternal and child health service utilization on morbidity and nutritional status of children (Abuya *et al.,* 2012).

1.2: Statement of the Problem

Kwale County has a fertility rate of 4.7 and a home delivery rate of over 50% (KDHS 2014), while only a third of the mothers received postpartum care (PPC) within seven days after childbirth (Duysburgh *et al.,* 2015). The number of mothers who deliver at health facilities (49%) in Kwale County is lower than the national level (62%) (KDHS, 2014). In Kwale 6.3 % of home deliveries, seek postnatal

checkup for the first time after 3-41 days while 50% do not seek for postnatal checkup (KDHS, 2008 - 2009). The stunting rate of children under five years in Kwale County (29.7%) is higher than the national rate (26%). A study in Kwale (Matsuyama, 2013) reported that nursing mothers are concerned about nutritional and health problems of their babies but they take action in ways that are at odds with biomedicine. This may have negative effects on infants in later years as mothers' attitudes and beliefs influence their health service utilization. Some mothers may find it difficult to practice conventional breastfeeding due to messages with less attention to their culture and household conditions (Gyampoh *et al.,* 2014). This increases risks in case of emergencies and reduced post-partum care for both the mother and infant (Matanda *et al.,* 2014). Kwale County has high malaria (37.7%) rates among children less than five years (KDHS, 2014). The uptake of maternal and child health (MCH) services in Kwale is generally low as compared to the coastal region and nationally. (Table1.1). Low uptake of maternal and child health services increases risks of maternal and child morbidity and mortality. When expectant mothers do not attend MCH clinics optimally, they miss early pregnancy examination that is a precaution for a risky pregnancy. This calls for awareness of appropriate maternal and child health care, including breastfeeding practices with emphasis for first time and teenager mothers. Determining MCH services utilization and linking them to infant outcomes can make services more acceptable to women hence increase utilization and improve outcomes (Srivastava *et al.,* 2015). Community – participatory interventions have been reported to enhance uptake of maternal and child health services and to influence their health outcomes (Mochache, 2018). The health care that a mother and child receive during antenatal care, at birth and up to 40 days after delivery is critical for the well-being and survival of both mother and child. Antenatal care is a window of identification and management of pregnancy complications.

Table 1.1: Comparison of Maternal Health services utilization in Kwale County and nationally

	Kenya	Coast	Mombasa	Kwale
Fertility rate	3.54	4.3	3.2	4.70
Teenage pregnancy and motherhood	15	20.8	16.6	24.2
Use of modern FP	53	38.3	43.6	38.2
ANC from skilled attendant	96	97.5	99.2	95.7
ANC visits (> /= 4 visits)	57.6	62.3		
Place of delivery (Health facility)	61	57.7	81.8	49.0
Skilled provider assistance during delivery	62	58.2	82.8	50.1
Postnatal care checkup in the first two days	53	51.5		
Skilled PNC checkup in the first two days	36	39		
No postnatal care in 1st six weeks	43	46.3		
Vaccination (All basics)	79	80.5	84.6	85.9
Prevalence of diarrhea among <5	15	17.6	11.8	14.6
Stunting rates for < 5 yrs.	26	30.8	21.1	29.7
Use of ITNs among children	77	74.3	67.2	74.6

Source: KDHS, 2014

1.3: Justification of the Study

The first two years of a child's life are very critical for growth. Poor health and nutrition care during this period results in poor growth, development, and increases risks of infant morbidity and mortality. It is Important to determine maternal and child health services provided and utilized during pregnancy, delivery as well as nursing periods and their potentially associated risks to help develop intervention strategies for communities (WHO, 2016). This will enhance strategies of attaining Sustainable Development Goal (SDGs) number three, which is to enhance good health and well-being. Sustainable Development Goal three target 3.1 is to reduce maternal mortality while target 3.2 is to end preventable deaths of children under five years old. This can be done through developing community centered intervention programs to reduce maternal and infant morbidity and mortality. Maternal and child

health care should be responsive and culturally acceptable to enhance utilization and improve outcomes hence it's important to identify practices that place infants in Kwale at risk of malnutrition, diarrhea and malaria. It is necessary to determine factors that can be modified and be amenable to intervention. The study seeks to know if MCH services are appropriately utilized by mothers and what are the outcomes of that utilization. The outcome of the study will help improve policy to make MCH services more culturally appropriate for the community.

1.4: Research Questions

i. What is the proportion of expectant mothers utilizing antenatal care services optimally in Matuga Sub County, Kwale County?

ii. What are the effects of MCH services utilization on morbidity (malaria and diarrhea) patterns among infants in Matuga Sub County, Kwale County?

iii. What are the effects of MCH services utilization on nutritional status (Stunting, underweight) of infants in Matuga Sub County, Kwale County?

iv. What are the effects of infant feeding practices on diarrhea patterns among infants in Matuga Sub County, Kwale County?

v. What are the effects of infant feeding practices on nutritional status (Stunting, underweight and anemia) of infants in Matuga Sub County, Kwale County?

1.5: Hypothesis

Ho: Antenatal care utilization and infant feeding practices have no effect on morbidity and nutritional status of infants in Kwale County, Kenya.

Ha: Antenatal care utilization and infant feeding practices have an effect on morbidity and nutritional status of infants in Kwale County, Kenya.

1.6: Objectives

1.6.1: Broad Objective

To determine the effect of maternal and child health services utilization and infant feeding practices on morbidity and nutritional status of infants in Kwale County, Kenya.

1.6.2: Specific Objectives

i. To determine the proportion of mothers appropriately utilizing antenatal care services in Matuga Sub County, Kwale County.

ii. To determine the effect of maternal and child health service utilization on malaria and diarrhea episodes of infants in Matuga Sub County, Kwale County.

iii. To determine the effect of maternal and child health service utilization on nutritional status (stunting, underweight) of infants in Matuga Sub County, Kwale County.

iv. To determine the effect of infant feeding practices on diarrhea patterns of infants in Matuga Sub County, Kwale County.

v. To determine the effect of infant feeding practices on nutritional status (stunting, underweight and anemia) of infants in Matuga Sub County, Kwale County.

CHAPTER TWO

LITERATURE REVIEW

2.1: Introduction

This chapter reviewed literature by different scholars in maternal and child health as well as infant and child nutrition. The first part covers the different aspects of maternal and child health services and maternal mortality as one of the negative outcomes of poor MCH utilization. The second part covers aspects of infant feeding practices and nutritional status. It includes infant morbidity and mortality as a negative outcome of inappropriate nutrition. The last part covers the conceptual framework, a review of variables and a summary.

2.2: Maternal and Child Health Services

These are often referred to as Pillars of Safe Motherhood; include antenatal care, safe delivery, postnatal care, family planning services and child vaccination (Wanjira *et al.,* 2011). Access and utilization of maternal and child health services, has been linked to improved maternal and neonatal health outcomes (Babalola and Adesegun, 2009). Most Maternal deaths are preventable through services offered during antenatal care clinics (Wairoto, 2020). The problem of high maternal and infant mortality rate is partially caused by poor or lack of access to maternal and child health services, including family planning services, ante-natal care, delivery, and post-natal services (UNICEF, 2014). In Kenya a study by Maina showed limited progress in monitoring of maternal and child health (Maina, 2017). Another study in Western Kenya reported that expectant mothers know the risks of home delivery and benefits of hospital delivery but they are hindered by other factors like poverty, transport challenges and bad treatment by health facility workers (Hirai, 2020). A study in Kenya to determine the effective coverage of maternal and child health services between 2003 and 2014 reported that, despite improvements having been made, services remain inequitable in many parts of the country (Nguhiu, 2017).

2.2.1: Antenatal Care

Antenatal care (ANC) is defined as care provided by skilled health-care professionals to pregnant women and adolescent girls to ensure the best health conditions for both

mother and baby during pregnancy. The components of ANC include: risk identification; prevention and management of pregnancy-related or concurrent diseases; and health education and health promotion (WHO, 2016). Focused antenatal care (FANC) recommends that all health pregnant women should have a minimum of four scheduled comprehensive antenatal visits during pregnancy. Focused antenatal care aims at providing advice, education, reassurance and support for the mothers as well as addressing and treating minor problems during pregnancy (WHO, 2008; Haruna *et* al., 2019).

Antenatal care is guided by five principles. The principles include; quality of care rather than quantity of visits; individualized care; disease detection contrary to risk categorization; evidence-based practices and birth/complication readiness (Gitonga, 2017). The minimum package of ANC services recommended by World Health Organization (WHO) include: checking pre-existing health conditions of a pregnant mother, early detections of complications, health promotion and disease prevention as well as birth preparedness and complication planning. It involves monitoring the health of a mother as well as fetus (the unborn child) and giving the mother preventive care during her pregnancy such as the tetanus vaccine, micronutrient supplements, and preventing malaria (WHO, 2008). The WHO recommends that adequate care for a normal pregnancy that has no complications should comprise four ANC visits, with the first occurring within the first trimester (WHO, 2016). The first visit should occur before 12 weeks of gestation and not later than 16 weeks, and afterwards at 24 - 28 weeks, 32 weeks and 36 weeks (Exavery *et al.,* 2013). Coverage of early antenatal care visits was defined in this study as the proportion of women aged 15 - 49 years with a livebirth in a given time period who initiated their first antenatal care visit in the first trimester (<12 weeks' gestation) in the same period (Moller, 2017). Timely initiation of the first ANC visit allows more time for other visits hence guarantees early detection and management of potential complications associated with pregnancy, and consequently reduces potential maternal and newborn morbidity and mortality (Lassi *et al.,* 2014). Women also receive counseling on and promotions of good nutrition, skilled attendance at birth, postpartum care for women, newborns, and prevention of mother-to-child transmission (PMTCT) of human immunodeficiency virus (HIV). Studies in

Ethiopia, Tanzania, Nigeria and Indonesia reported that when antenatal care is appropriately utilized, it reduces pre lacteal feeding, colostrum avoidance, increases early initiation of breast feeding and exclusive breastfeeding prevalences (Teshale, 2021; Weldesamuel *et al.,* 2018; Kiwango, 2020; Ogundele, 2019; Berde, 2017 and Rahmartani, 2017). Studies that have been carried out have not compared gestational age specific ANC use and birth outcomes.

2.2.1.1: Proportion of mothers utilizing ANC Services globally

Worldwide coverage of early ANC visits increased in the recent past from 40.9% in 1990 to 58.6% in 2013. (Moller *et al.,* 2017). The number of women who attended at least one ANC with a skilled provider between 2010 and 2015 was 85% globally (Kuhnt 2017). Although there is progress in coverage of early ANC visits, it is still far from universal due to inequities existing both within regions and income groups (Moller *et al.,* 2017). Coverage of ANC in low-income countries has been reported at 24%. In low- and middle-income countries (LMICs) ANC offers women an opportunity to access preventive care and protect against maternal and neonatal mortality (Doku, 2017, Ataguba, 2018). Most women in LMICs receive ANC services but the patterns of coverage differ from country to country as well as region to region. Globally a lower proportion of expectant mothers initiate ANC during the first trimester (Jiwani, 2020).

2.2.1.2: Proportion of mothers utilizing ANC Services in Africa

Antenatal care is one of the three most essential care - antenatal, delivery and post-natal, given to women during pregnancy and has the potential to contribute towards the achievement of the Sustainable Development Goal (SDG) target 3.1- reducing the global maternal mortality ratio to less than 70 per 100,000 and target 3.8 – achieve universal health coverage (Dickson, 2017). In LMICs, women with patterns of care that complied with global recommendations had suboptimal content of care (Benova *et al.,* 2018). In Ghana, most ANC services were offered by nurses and the rate of women receiving services had increased from 55% in 1988 to 89.5% in 2014 (Dickson, 2017).

2.1.1.3: Proportion of mothers utilizing ANC Services in Kenya

In Kenya, discrepancies in accessing ANC have been noted between geographical locations of women with those in rural areas attending less frequently as compared to their urban counterparts. Disparities are more pronounced among the rural and nomadic pastoralist communities with rural communities having a lower coverage as compared to urban (Jillo *et al.,* 2015). Studies done in parts of Nyanza region and Uasin Gishu county reported poor coverage of antenatal care (Fleming *et al.,* 2017 and Riang'a, 2018). In Nyanza the qualitative study reported that women thought early ANC is for those who have complications while the rest can start ANC later to check for fetal position and monitor progress. In Uasin Gishu, ten percent of the women-initiated ANC clinics in the first trimester. A study that analyzed ANC uptake across the sub counties in Kenya reported a wide range variation of 17% to 77%. The study recommended focused and localized approaches to improve access to ANC services (Wairoto, 2020).

2.2.1.4: Factors affecting ANC uptake

Utilization of antenatal care differs from one country to another and within countries; it differs from region to region or community to community. A study in India reported that women with high level of care were more likely to use trained assistance during delivery and at a health facility (Bloom, 1999). Another study in Bangladesh, reported that optimal uptake of ANC in a study population of more than three thousand participants was low with 4.2% attending ANC more than four times while 59% initiating care on time (Pervin *et al.*, 2021). A study that used data from seven countries reported the need for country policies and programs to be evaluated and implemented well to increase the level of ANC utilization (Saad – Haddad *et al.,* 2016). Studies done in South Africa and Ethiopia reported that promoting family planning, empowering women through education to help them make better decisions reduces mistimed pregnancies. Increased awareness through mass media and easy accessibility of services enhances uptake of ANC services (Ebonwu *et al.,* 2018 and Tekelab *et al.*, 2019). Early initiation of ANC can be challenging due to mistimed pregnancy, poor knowledge on the timing, poor accessibility of health facilities and the presence of children under five years in the family (Alemu, 2018). Unwanted pregnancy was similarly reported to be associated to poor ANC uptake in a study

done in Kenya (Ochako, 2016). A study in Nigeria reported that for antenatal, institutional delivery and post-natal care services uptake to be improved there is need to target women in the rural areas and those with low education levels (Dahiru, 2015). Another study reported distance, quality of care and costs as limiting factors hence the need to use creative and innovative approaches acceptable to a community (Okonofua *et al.,* 2018). Studies in Zambia have revealed that social and economic barriers, punitive procedures implemented by health services as well as adolescent unfriendly ANC services contribute to poor uptake of care (Jacobs, 2018 and Bwalya *et al.,* 2018). A study done in Rwanda reported being divorced, widowed or single, having an older age and lack of social support as factors that affect the uptake of ANC services. Transport unavailability and shorter opening hours also contributed to poor ANC uptake (Rurangirwa, 2017). In Africa antenatal care has been limited by less funding, weak health systems that lead to poor quality care as well as low human resources (WHO, 2008). A study in Kenya revealed that lack of check-ups for pregnancy complications, unskilled ANC provision and lack of tetanus injection were associated with neonatal mortality (Arunda, 2017). A study done at the coastal region of Kenya reported that poor socio demographic characteristics and inefficiencies in health facilities contribute to poor ANC utilization among the rural and urban women at the coast (Chorongo *et al.,* 2016). A study in Mandera County reported that age, education level, monthly income, gravida and parity were some of the factors that influenced ANC uptake (Adow *et. al.,* 2020).

2.2.2: Hospital delivery

Hospital delivery ensures that all deliveries are attended to by persons with the right knowledge, skills and equipment and also provide post-partum care to mother and baby. This can only be provided at a well-equipped health facility. Low access to appropriate maternal and child health services during labor, increases risks of adverse fetal outcomes such as death or disability (Babalola and Adesegun, 2009). More than 60 percent of people living in low income set ups live more than five miles from a health facility. This distance drastically increases for those living in rural areas. Despite the Kenyan government waiving hospital delivery fee in all public facilities many women still give birth at home due to lack of transport, fears about negative attitudes of health workers, long distances to health facilities, cultural

preferences, and charges for other services which are beyond what most families can afford (Ziraba *et al.,* 2009). Overall, 62% of births in Kenya are delivered under the supervision of a skilled birth attendant (KDHS, 2014) well below the MDG target of 90% of deliveries by 2015. Traditional birth attendants, relatives and friends continue to assist in the remaining with some mothers receiving no assistance at all (UNICEF, 2014). Kenyan health sector infrastructure has grown over the past five years (KDHS, 2014), but many women still live at a considerable distance from health facilities, cannot afford to pay fees for maternal services, and/or face other barriers to accessing quality care. Skilled birth attendance can avert or manage the most common causes of mortality for both mothers and newborns, namely hemorrhage and complications arising from prematurity / low birth weight (LBW) (Lassi *et al.,* 2014).

2.2.3: Postnatal care

This is the medical care given to a mother and her newborn child after birth and during the first six weeks of life. Women who deliver at home are less likely to utilize postpartum care services (Yamashita *et. al.*, 2014). Services offered during postnatal care period include: early breastfeeding initiation, vaccinations and postnatal visits which can have profound impact on bolstering the health of a mother and neonate (Lassi *et. al.,* 2014). In the above studies the impact of ANC and PNC on child morbidity and mortality is not well outlined. A study on determinants of post-natal care utilization I sub Saharan Africa, reported that Eastern Africa has a low (31.71%) PNC utilization as compared to other parts of Africa (Tessema, 2020). A study in Uganda (Dey,2021) reported that immediate post-natal period when high morbidity and mortality occur is critical for mothers and new born babies. The study reported less than 50% of women receiving such care and having received ANC with four or more than four times being positively associated with post-natal care. In Kenya, less than twenty percent of women receive post-natal care services with women in urban setting more likely to receive PNC as compared to those in rural settings. This is mainly due to low education levels, poverty and poor access to health care facilities (Langlois *et. al.,* 2015; Tessema, 2020).

2.2.4: Family planning services

This refers to care services provided through family planning programs to clients receiving reversible contraceptives (WHO, 2014). The services include client counseling and education, contraceptive drugs and devices, related diagnostic tests (including Pap tests and those for HIV and other STIs) and treatment after diagnosis (such as for urinary tract infections and STIs other than HIV).

Research indicates that family planning, including planning, delaying and spacing pregnancies, is linked to improved birth outcomes for babies, either directly or through healthy maternal behaviors during pregnancy (Kavanaugh and Anderson, 2013). Family planning prevents closely spaced and ill-timed pregnancies and births, which contribute to some of the world's highest infant mortality rates (WHO, 2014). Family planning is documented to prevent mother-child transmission of human immunodeficiency virus, contribute to birth spacing, lower infant mortality risk, and reduce the number of abortions, especially unsafe ones." (Tsui A, McDonald-Mosley R and Burke A, 2010). Women with mistimed and unwanted pregnancies initiate prenatal care at a later time than those whose pregnancies were intended. Recent studies found that, teen childbearing remains a significant risk factor for adverse infant health outcomes even after controlling for various maternal characteristics and circumstances. Teen mothers and their infant children are at higher risk for preterm delivery, low birthweight, and infant mortality, compared to mothers who postpone childbearing beyond the teen years (WHO, 2014). Pregnancy intention has been reported to influence nutrition outcomes as well spaced births allow a mother sufficient time and resources to breast feed and feed the young child (USAID, 2015).

2.3: Maternal mortality

Maternal mortality is defined by WHO as: the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from unintentional or incidental causes (WHO, 2019). After the exit of millennium development goals (MDGs), the Sustainable Development Goals (SDGs), target 3.1 requires participating countries to reduce their maternal mortality ratio to less than 70 deaths per 100,000 live births by 2030 (Manyeh, 2018). Ninety

four percent of all maternal deaths take place in low- and middle-income countries (WHO, 2019) out of which 66% occur in sub–Saharan Africa (Adedokun, 2019). In 2017, maternal mortality ratio in low-income countries was reported at 462 per 100,000 live births against 11 per 100,000 live births in high income countries (WHO, 2019). Although Kenya has had an improvement in reduction of maternal mortality, a maternal mortality ratio of 342 per 100,000 live births is still too high. The introduction of free delivery care in public health facilities has contributed to an increase in facility-based deliveries hence reducing maternal and neonatal deaths (Gitobu, 2018). Maternal mortality ratios that are above 300 are high and require interventions.

2.3.1: Factors affecting maternal mortality

Maternal mortality has been associated with both direct and indirect obstetric causes.

Eclampsia and hypertensive disorders

Studies done in Tanzania reported that eclampsia and hypertensive disorder are some of the leading causes of maternal deaths (Manyeh, 2018; Bwana, 2019). A facility-based study in China on hypertensive disorders in pregnancy reported that sub optimal antenatal care visits was associated with an increased risk of stillbirth in women with a hypertensive disorder in pregnancy (WHO, 2018). A study in Ethiopia reported the proportion of hypertensive disorders among pregnant mothers being high and more common among the elderly women (Berhe, 2018).

Hemorrhage, Obstructed labor, Sepsis and abortion related complications

Another study on the risk factors and trends in maternal mortality in low- and middle-income countries reported lack of formal education and antenatal care, hemorrhage and hypertensive disorders as higher risks for maternal deaths (Bauserman *et al.*, 2015).

A study in Kenya reported that hemorrhage, infections and eclampsia are major causes of maternal mortality among women (Muchemi, 2016). Severe bleeding, infection, pregnancy induced high blood pressure and unsafe abortion accounts for 80% of all maternal deaths (WHO, 2013). A study in Ethiopia reported that complications of anesthesia, embolism, peripartum cardiomyoparthy, and

complications of abortion, hemorrhage, hypertensive disorders and other infections are leading causes of maternal deaths (Tessema, 2017).

Maternal anemia

Anemia among women of reproductive ages affects their productivity, increases their susceptibility to infections and can lead to still births / miscarriages and maternal mortality. It can also lead to poor feto – neonatal outcomes (Teshale, 2020).

Optimal antenatal care and post-natal coverage.

Appropriate ANC coverage is associated with low antepartum mortality, while presence of a skilled health professional at childbirth is associated with low postpartum mortality (Merdad, 2018). An effective and efficient health care system that offers proper maternal care has been reported as a predictor of maternal mortality. These reveals the need for not only country specific interventions but community specific interventions to eliminate preventable maternal deaths (Alvarez, 2009; Merdad, 2018). Further, it has been shown that antenatal care and maternal education are risk factors for maternal mortality (Yego, 2014).

Maternal education and macro-economic factor

In low-income countries, it has been reported that corruption is one of the reasons to poor quality maternal care, unavailability of critical medicine and medical equipment (Lan, 2017). Proper maternal education helps mothers to make informed choices on care during pregnancy and delivery. High education levels among mothers has been associated with improved source of income and better understanding hence better access to quality care during pregnancy (Yego, 2014). Lack of formal education or poor levels of education increases the chances of early marriages among teenage girls and this enhances the possibility of accepting dangerous cultural practices that may increase the risks of maternal mortality.

Age of mother at first birth

In Kenya it has been reported that adolescent mothers have low ANC attendance and poor uptake of ARVs for PMTCT (Birungi, 2011; Ronnen, 2017). This in turn increases the risks of maternal mortality since the mothers' preexisting conditions will not be managed at the health facilities. Being younger than 20 years, having low socio-economic status or being single increases the risks for maternal mortality

(Manyeh, 2018). In sub–Saharan Africa it has been revealed that there is a wide discrepancy in the use of MCH services by adolescent mothers across countries (Mekonnen, 2019).

2.4: Feeding practices

Feeding practices are the principal determinant of a young child's nutritional status and future food habits. Infant feeding practices include no pre lacteal feeding, timely initiation of breast feeding within one hour after birth, exclusive breastfeeding until after six months, timely and appropriate introduction of complementary feeding to children around six completed months of age (Engebretsen, 2014) and continued breastfeeding alongside other foods for children until two years of age and beyond (Hussein *et al.*, 2015).

Identifying feeding practices that place infants at risk of developing malnutrition is important for determining which factors of early environment can be modified and thus are amenable to intervention (Thompson & Bentley 2014; Shinsugi, 2015). Appropriate infant feeding, namely, early initiation of breastfeeding with colostrum as the first food, no pre-lacteal feeding, exclusive breastfeeding to six months, followed by the introduction of complementary foods with continued breastfeeding, is important for survival as well as physical growth and mental development of the child (Karkee *et. al*., 2014). Studies on infant and child feeding have indicated that inappropriate feeding practices can have profound consequences for growth, development, and survival of infants and children, particularly in resource-poor settings (saha *et al.,* 2008; Asfaw *et al.,* 2015).

2.4.1: Pre lacteal feeding

Pre lacteal feeding is the giving the newborn baby any other food and /or drink before they begin breastfeeding. In some communities, culture dictates that when a baby is born, they ought to be given some liquid as a norm or initiation into the world. The reasons for pre lacteal feeding differ from one community to another. The type of foods uses also differ from region to another and from one caregiver to another. Pre lacteal feeding seem to be increasing in some regions as it decreases in others. Studies in Ethiopia, Nigeria and Indonesia, reported the prevalence of pre lacteal feeding as 46.4%, 49.8% and 45% respectively (Adem *et al.,* 2021; Berde,

2017; Rahmartani, 2017). In these studies, the prevalence of pre lacteal feeding was very high as the caretakers did not know the risks of pre lacteal feeding mainly delivered at home, had small babies at birth or had low levels of formal education. Delivery through caesarian section and colostrum avoidance increases the risks of prelacteal feeding.

2.4.2: Breast feeding practices

Breastfeeding should begin immediately or within one hour after birth and continue every 2 to 3 hours during the initial weeks of postpartum (Grodner, 2000). The mother's milk provides infant with temporary immunity against many infectious diseases (Roth, 2000). Breastfeeding contributes to the health and well-being of mothers; it helps to space children, reduces the risk of ovarian cancer and breast cancer, is a secure way of feeding and is safe for the environment (WHO, 2008). Failure to initiate breast feeding early within the first one hour, not only endangers the health and development of newborns by denying them colostrum, but also the mother's health may be compromised, and mother–child bonding may be suboptimal (Matanda *et al.,* 2014). Late initiation of breastfeeding increases the chances of introducing prelacteal feeding which can lead to reduction of breast milk (Lyellu, 2020; Ogundele, 2019; Prak, 2014; Adem, 2021).

Exclusive breastfeeding

Globally, 38% of infants are exclusively breastfed for the first four months of life (Black *et al.,* 2013). Recent analyses found that over 800, 000 deaths (SOWC, 2014) and about 10% of the global burden of disease among children under five years in resource-poor settings resulted from sub-optimal breastfeeding practices (Ogbo *et al.,* 2015). Globally, exclusive breastfeeding rate for infants under six months, based on national demographic survey data, ranged from 1% in Djibouti to 85% in Rwanda (SOWC, 2014). Higher rates of breastfeeding and exclusive breastfeeding are generally observed among lower income countries, while rural mothers usually breastfeed longer than their urban counterparts (Karkee *et al.,* 2014).

In Kenya, the proportion of children younger than 6 months who are exclusively breastfed has markedly increased from 32% in the 2008-09 KDHS to the current

61% (KDHS, 2014) though there is still a wide range between the rural and urban set ups and from region to region. The transition from EBF to complementary feeding (CF) is associated with several challenges in resource-poor settings, including infrequent feeding, low energy and less nutrient dense foods, poor food storage, sanitation and food taboos (Ahmad *et al.,* 2014). Premature cessation or low frequency of breastfeeding contributes to insufficient nutrient and energy intake in infants beyond 6 months of age (WHO, 2009). Occupation and education have been cited as barriers to EBF and poor complementary feeding, little is known if mothers are given necessary knowledge as required during ANC to improve on their child feeding skills.

2.4.3: Complementary Feeding Practices

Complementary feeding is the transition from exclusive breastfeeding to family foods (WHO, 2014) and it covers the period from 6 - 24 months of age, even though breastfeeding should continue up to two years of age and beyond. It is a process that begins when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk. An estimated 6% of under-five deaths can be prevented by ensuring optimal complementary feeding among which dietary diversity and meal frequency are the most important, significantly contributing to the realization of Millennium Development Goal 4 (Aemro *et al.,* 2013). Poor complementary feeding practices during infancy resulting in malnutrition contribute to impairment of cognitive and social development, poor school performance and reduced productivity later in life (Vyas *et. al.,* 2014).

Optimal complementary feeding depends not only on what infant is fed on but also on how, when, where and by whom a child is fed. The minimum acceptable diet recommends that breastfed children 6-23 months be fed foods from four or more food groups daily (KDHS, 2014). It has been shown that infants in resource-poor settings receive a wide range of foods before the age of six months. For example, 22% of mothers in surveys from 20 developing countries feed their infants solid foods before 6 months of age (Marriott *et al.,* 2007). Complementary feeding should be initiated at six months of age when an infant is developmentally ready (WHO, 2009). Foods used should be easily available at home, acceptable to mothers,

appropriate portion sizes, right meal frequency and food density, and encourage the child to eat (Trivedi *et al.,* 2015). Measures of infant and child nutritional status suggest that rates of malnutrition increase markedly between 4 and 12 months of age (Aemro *et al.,* 2013). In Kenya stunting rate is highest (36%) in children 18-23months old (KDHS, 2014) the time most infants receive complementary foods and are stopped to breastfeed. Globally, it is estimated that 6% of deaths among children below five years could be prevented through the achievement of universal coverage with improved complementary feeding alone (Ng *et al.,* 2011). In many countries faulty complementary feeding practices - primarily nutritionally inadequate and frequently contaminated foods that are introduced too early or too late - are a major contributing factor to infant and child malnutrition, growth failure, and high morbidity and mortality (SOWC, 2014). Meeting minimum standards of dietary quality is a challenge in many developing countries including Kenya especially in areas where household food security is poor. The diets of infants and young children in Kenya are cereal based- mainly maize and rice with low intakes of animal-source foods (KDHS, 2008 - 09). Mothers often introduce other forms of milk other than breast milk to infants much before 6 months as they think their milk is insufficient either because of their perception of inadequate growth of infant or perceived cause of child crying too often (Trivedi *et al.,* 2015). It is known that insufficient food intake in this period is common, and inadequate breast-feeding or complementary feeding is responsible for growth stunting and infant morbidity, including nutritional anemia in millions of children around the world (Yang *et al.,* 2012). In Kenya, only 21 percent of children aged 6-23 months consume an acceptable diet with children age 12-17 months being more likely than children in other age groups to consume an acceptable diet. (KDHS 2014). Indicators describing optimal breast-feeding practices are available and have been in use for some time but consistent and reliable indicators for optimal complementary feeding have been lacking. (Trivedi *et al.,* 2015).

2.5: Nutritional status

This is the condition of health of a person that is influenced by intake and utilization of nutrients. Malnutrition is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients cause measurable adverse effects

on body function and clinical outcomes (WHO, 2008). Malnutrition stems from various underlying determinants, including a lack of optimal feeding practices for infants (Wondafrash *et al.,* 2012) and it can enhance infant morbidity and mortality. In 2013, infant mortality accounted for 66.9 % of under-5 mortality in sub-Saharan Africa, and neonatal mortality for 34.2 % of under-5 mortality (UNICEF, 2014)

Malnutrition, particularly stunting, is still a severe public health problem in Sub-Saharan Africa (Abuya *et al.,* 2012; de Onis *et al.,* 2004, 2007) and it's represented as a risk factor for diarrhea mortality through the impact of stunting and wasting (WHO, 2010). Malnutrition weakens the child and increases the risks of child morbidity and mortality (Black *et al.,* 2013). Infants show slow growth during transitional period of introduction of complementary foods, because they do not get enough nutritious foods and malnutrition rate usually peaks at this time with consequences that persist throughout life (Teshome *et al.,* 2009). In 2009, the proportion of stunted children below five years old was reported as 35% and 16% were underweight (KNBS, 2010), while in 2014 it had decreased to 26% and 11% respectively. Wasting levels are highest for children aged 6-8 and 9-11 months, the period children are introduced to complementary food and are vulnerable to infectious diseases (KDHS 2014). Comprehensive interventions such as improving nutritional status of pregnant mothers, improving quality of complementary feeding for children, extensive family planning services and de-worming programs are important in managing childhood malnutrition (Wong *et al.,* 2014).

2.6: Infant morbidity and mortality

This is the prevalence of diseases among infants in a population. Poor nutritional status has been reported to increase the risk of illness and death among children (Ahmad *et al.,* 2014). Diarrhea, malaria and pneumonia are some of the common children's diseases in developing countries. Each year 2.5 billion cases of diarrheal disease are reported in children under 5 years and on average every day over 1,400 children die (SOWC, 2014). Diarrheal disease is a leading cause of mortality in children under five, resulting in around 750,000 deaths each year (UNICEF, 2012). Contamination of complementary foods is a major cause of diarrheal disease common in children 6 to 12 months old hence safe preparation and storage of

complementary foods can prevent contamination and reduce the risk of diarrhea (WHO, 2009). Newborns and infants less than 12 months of age are among vulnerable groups affected by malaria (WHO, 2010). In malaria-endemic areas, infants become vulnerable to *Plasmodium falciparum* malaria at around 3 months of age when immunity acquired from the mother starts to wane. Infants are at increased risk of rapid disease progression, severe malaria and death and severe anemia is particularly common in this age group.

Most studies on feeding practices and growth during infancy primarily investigated the growth and other health outcomes of infants in relation to breastfeeding and the type and timing of introduction of complementary foods (Saha *et al.,* 2008). These studies were based on cross-sectional data. Increasing access and utilization of maternal and child health services can drastically reduce maternal and infant deaths in sub-Saharan Africa (Mannah *et al.,* 2014). Mortality is due to obstetric complications, infections, diseases and inadequate dietary intake. Appropriate maternal and infant health care with promotion of optimal breastfeeding and complementary feeding could prevent more than a fifth of the under-five deaths in countries with high mortality rates (Kimani - Murage *et al.,* 2013).

2.6.1: Factors affecting infant and child mortality

Infant mortality is defined as the death of a child before reaching the age of one in a specific year or period (WHO, 2014). Neonatal mortality can be prevented, yet it represents 47% of total deaths among children under five. Ecological region, succeeding birth interval, breastfeeding status and type of delivery assistance have been found to be significant predictors of infant mortality in a study in Nepal (Lamichhane *et al.,* 2017). Children born at least two years after their succeeding siblings have a higher chance of survival as compared to those who are born earlier or before the elder attains two years. In another study done in Nigeria, exclusive breastfeeding has been reported to reduce infant mortality (Biks *et al.,* 2015). A study in Nigeria reported children born to mothers with no formal education, living in rural areas and high poverty being associated with mortality across all age ranges (Ezeh, 2015). This could be attributed to the poor resources and knowledge of the mother on detecting signs of danger and actions to take in case of such signs. A study in South west Ethiopia reported that not attending antenatal care, hand washing habit

with soap before feeding child, birth size, perceived benefits of mothers to modern treatment, birth order and preceding birth interval were determinants of infant mortality (Dube, 2013).

2.7: Conceptual Framework

Conceptual framework hypothesizes that availability and accessibility of health centers affect access and utilization of family planning, antenatal care, delivery care and postnatal care. Good socio-economic status affects access to MCH services and micro nutrient supplements as well as access to safe water sources, and sanitation. Optimal utilization of maternal and child health services (family planning, antenatal care, delivery care, postnatal care and child vaccination) affects infant feeding practices and infant care practices. Infant feeding and care practices in turn affect nutritional and morbidity status.

This study assessed the effect of maternal and child health services utilization and infant feeding practices on morbidity and nutritional status of infants. A key MCH service offered to expectant mothers is antenatal care. Based on the conceptual framework, optimal antenatal care was ascertained by checking the time the mother initiated antennal care clinics and the total number of visits made during the entire pregnancy. According to WHO guidelines, the first visit ought to be done in the first trimester. ANC clinic attendances was classified as those who initiated care within the first trimester and covered up to at least four times during their entire pregnancy versus those who began clinics after the first trimester did not cover up to four times. The ANC attendance was assessed against the level of stunting, wasting and underweight of infants. Place of delivery and mode of delivery also influences time taken to initiate breastfeeding as well as avoiding pre lacteal feeding.

Malnutrition and morbidity in infants is as a result of poor infant feeding, inappropriate care and hygienic practices. Infant feeding practices and care are as a result of underlying factors like maternal formal education, parity and availability of safe water and sanitation. The basic causes of malnutrition and morbidity in infants at societal level are knowledge and attitude of care givers, socio economic status maternal and child health services offered at health facilities. Services offered can only be effective if they are available, accessible and utilized in good time. Failure to

access and/ or utilize MCH services appropriately, compounded by poor socio-economic status and lack of maternal formal education can lead to inappropriate infant feeding practices. Inappropriate infant feeding practices is a leading cause to inadequate nutrient intake resulting in malnutrition and morbidity.

During ANC clinics mothers to be are taught on proper nutrition for the mother and baby during pregnancy and after. Present and preexisting health conditions are checked and treated during antenatal care. The mother to be is prepared for birth and feeding of the baby. Mothers who miss out on antenatal clinics or start the clinics later during pregnancy reduce the chances of identifying and dealing with any health condition. The mothers also miss out on knowledge on proper infant care and nutrition during the early stages of life. Prevention of undesirable infant outcomes can be directly addressed at level three which include proper infant feeding practices as well as infant care and hygienic practices. Appropriate antenatal care utilization enhances adoption of optimal infant feeding practices

Infants' nutritional status is as a result of care givers' knowledge and practices of infant feeding. Infant feeding practices are acquired either from health service providers or community members. Caregivers' knowledge on appropriate infant feeding practices was accessed. It was also assessed against diarrhea and malaria episodes, and level of anemia among infants. Infant morbidity comprised two aspects of diarrhea episodes and frequency; malaria occurrence or presence. Diarrhea occurrence was measured against MCH services utilized as well as infant feeding practices. Malaria occurrence was assessed against MCH services utilized. Both diarrhea and malaria can be affected by the type of care given, feeding and hygiene practices.

Maternal formal education level has an effect on choices made in terms of health seeking, infant feeding and hygiene practices. Parity and maternal formal education were assessed against ANC attendance. Infant feeding practices entailed Exclusive Breast-Feeding, Breast-Feeding Initiation, Complementary Feeding Initiation and dietary diversity and feeding frequency during Complementary Feeding. Infant Feeding Practices were assessed against diarrhea patterns as well as stunting,

wasting, underweight and anemia. This study focused on the basic, some underlying and direct factors affecting malnutrition and morbidity (Figure 2.1).

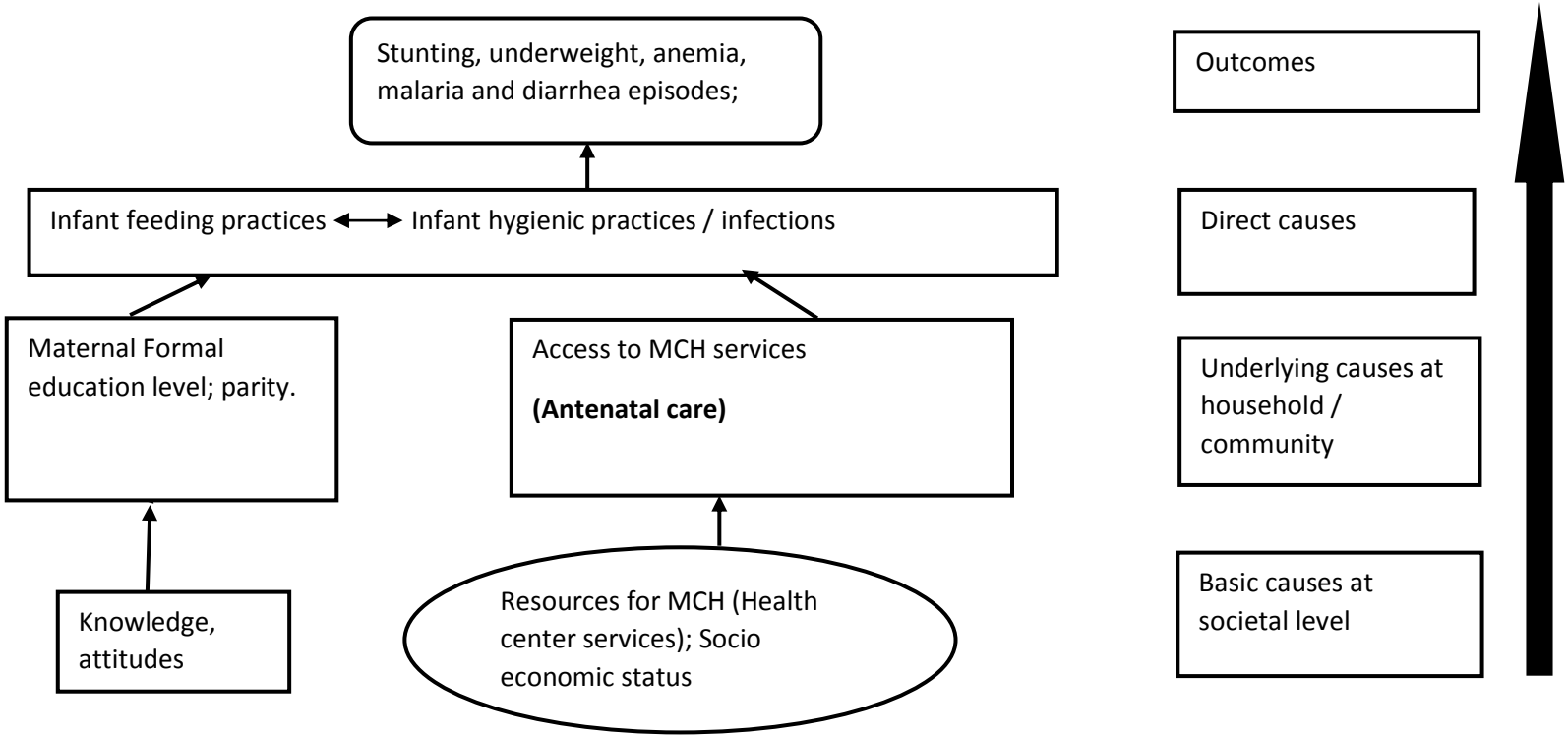


Figure 2.1: Conceptual framework on determinants of undernutrition.

(Source: Adapted from UNICEF, 1990)

CHAPTER THREE

MATERIALS AND METHODS

3.1: Study site

This study was carried out at Mwaluphamba and Kizibe health centers in Matuga sub-County, Kwale County. Kwale County is located in southern coastal part of Kenya. It borders the Republic of Tanzania to the South West, and the following areas; Taita Taveta to the West, Kilifi to the North, Mombasa to the North East and the Indian Ocean to the East. The county covers a total surface area of 8,270.2 square kilometers, with a population density of 105 persons per square km. It accounts for 1.42 per cent of Kenya's total surface area. The health centers are in Matuga Sub County, Mkongani ward. Matuga Sub County has a population of 194,252, an area of 1032.4km^2 and a population density of 188 persons per square km. Mkongani ward has a population of about 38,000 and an area of 213.6 km^2 (Kwale County Integrated Development Plan 2018 -2022, KNBS: 2019 Kenya Population & Housing Census volume 1.) (Appendix I).

3.2: Study design

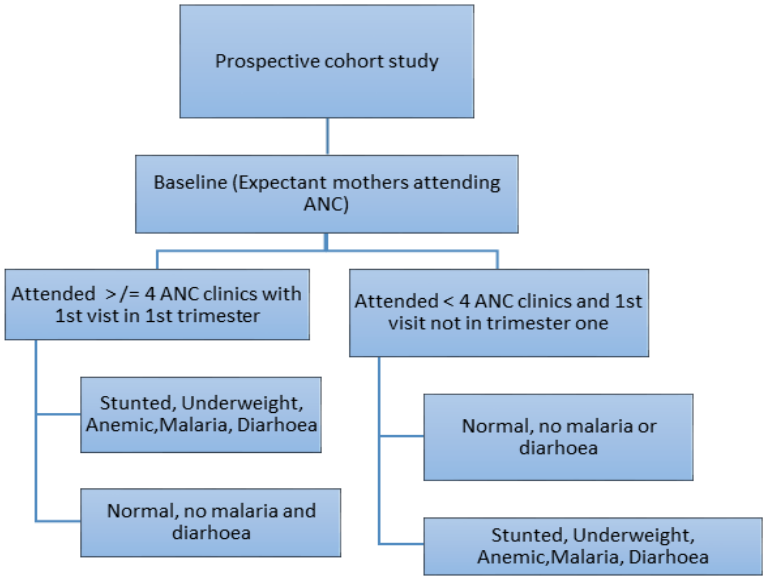
This was a prospective cohort study conducted in two public health facilities, which offer MCH services and have short-term delivery care. A prospective cohort study design was the most appropriate for this research since exposure of interest, which was antenatal care (ANC) initiation, was measured at baseline, before follow ups were done to check for the development of outcomes of interest. Mother – child pair were followed for a period of nine months.

3.3: Study population

The study population comprised expectant mothers attending antenatal care clinics at Mwaluphamba and Kizibe health centers in Matuga sub-County of Kwale County. The study was nested in the Kwale Health and Demographic Surveillance System (HDSS) that was following up women of reproductive age (15-49) and children below five years (0-59 months) in collaboration with Nagasaki University and Kenya Medical Research Institute (Kaneko *et al.,* 2012). Kwale HDSS covered 42,585 individuals. Participants were expectant mothers at a pregnancy stage of 20 weeks

and above. At baseline recruited expectant mothers filled questionnaires. The first follow up was done four months after the baseline. During the follow up mothers filled questionnaires and anthropometric measurements of infants was taken. Hemoglobin levels of infants were taken. The second follow up was carried out four months after the first follow up. The study was undertaken from February to November 2016. It took nine months to complete the study. The study design and variables are illustrated in Table 3.1 below.

Table 3.1: Study design flow chart



3.3.1: Inclusion criteria

a) Expectant mothers without any complications.
b) Aged 15 years old and above
c) At gestation of 20 weeks and above.
d) Seeking ANC services at Mwaluphamba or Kizibe health centers
e) Had attended at least one antenatal care clinic.
f) Living within Kwale HDSS.
g) Consenting mothers

3.3.2: Exclusion criteria

a) Mother on transit / visiting the facility only once.
b) Mothers who declined to consent.

3.4: Sample population and Sampling

3.4.1: Sample size determination

Sample size determination was done using the formula for cohort studies (Fleiss, 1981)

$$n = (Z_{\alpha/2} + Z_{\beta})^2 [P_1 (1-P_1) + P_2 (1-P_2)]$$

$$(P_1-P_2)^2$$

Where: $Z_{\alpha/2}$ = Probability of detecting false effect (2 sided) = 1.96

Z_{β} = Power = 80% = 0.84

P_1 = prevalence of malaria, diarrhea, anemia and stunting among infants whose mothers attended ANC visits <4 times = 50% = 0.5

P_2 = prevalence of malaria, diarrhea, anemia and stunting among infants whose mothers attended ANC visits > / = 4 times = 30% = 0.3 (KDHS, 2014)

$$\mathbf{n = (1.96 + 0.84)^2 [0.5 (1-0.5) + 0.3 (1-0.3)]}$$

$$\mathbf{(0.5- 0.3)^2}$$

$$\mathbf{n = 90.16 = 91}$$

The minimum sample size is 91 *2 = 182

3.4.2: Sampling procedure and recruitment of participants

Purposive sampling was used to pick two dispensaries of same level within Kwale HDSS. Both the facilities were based in the rural areas and at level two. Women at a pregnancy age of 20 weeks and above were given information about the study; its aim and follow up requirements as they came for clinics. A systematic random sampling approach was used to select expectant women coming for antenatal visits. The first mother was selected randomly. An interval of two was used to pick mothers coming to antenatal care clinic at the health center was invited to participate in the study. If one declined the next one was approached. The eligible consenting ones were selected until when the desired sample size was attained. When one was not eligible or didn't consent the next mother was approached. The pregnancy stage was based on maternal and child health booklet and with the help of health service

providers at the facilities. Those in agreement signed a written consent (Appendix II) to participate.

3.5: Study Variables

The study variables are outlined in table 3.2

Table 3.2: Study Variables

Dependent Variables	**Indicators**
Nutritional Status	Stunting: Length for age
	Underweight: weight for age
	Anemia: hemoglobin level
Morbidity	Diarrhea episodes
	Malaria episodes
Independent Variables	
Antenatal care clinic attendance	≥ 4 visits with first visit made during 1st trimester
Place of delivery	Health facility with the help of a trained health practitioner
Postnatal care	Care in the first two days after delivery
Use of family planning	Mother using a modern FP method
Child immunization	Completed basic immunization
Maternal education level	Formal education attained
Maternal parity	Number of children given birth to and who are alive
Maternal Occupation	Maternal occupation

3.5.1: Independent variables

At baseline antenatal care clinic attendance was assessed as the main independent variable. The time of ANC initiation and the number of times attended during the entire pregnancy were first self-reported by expectant mothers. The time of ANC clinic initiation was counter checked from MCH booklets for verification. Mothers were grouped into those who began early and those who began late. Early attendance was categorized as those who began clinics during the first trimester and attended

clinics at least four times during their entire pregnancy. The second group were those who began MCH clinics later than the first trimester and attended less than four times during pregnancy. Other independent variables included place of delivery, post-natal care and use of family planning and child immunization. Other variables were maternal education level, parity, occupation, access to safe water, sanitation and hygiene and age of mother.

3.5.2: Dependent variables

The dependent variables were the nutritional status (stunting, wasting, underweight and hemoglobin level) and morbidity (malaria and diarrhea episodes) status.

3.6: Data Collection

3.6.1: Data Collection Tools

Data was collected using structured questionnaires (Appendix III) adopted from Indicators for assessing Infant and Young Child Feeding practices (WHO, 2008) and modified for the study population. Health records (MCH cards) were used to get some information. Anthropometry instruments and optical instrument for non-invasive hemoglobin check were used to tabulate stunting, underweight status and hemoglobin levels respectively. Questionnaires were administered to expectant mothers for the first time at health facilities before they gave birth. Recruitment and questionnaire administration were done by investigator with the help of research assistants. Follow up interviews were started at four months after baseline survey and four months later. Mobilization was done with the help of Community health volunteers from the local area.

3.6.2: Questionnaires

Data collected using questionnaires included: socio demographic characteristics, maternal and child health services (ANC, FP, Delivery place, PNC and immunization coverage), infant feeding practices (pre-lacteal feeding, initiation of breastfeeding after birth, frequency of breastfeeding, exclusive breastfeeding till six months, frequency of breastfeeding, age at onset of complementary feeding and frequency of complementary feeding), mother's knowledge on feeding practices, malaria and diarrhea episodes. The infant feeding indicators were assessed using the World

Health Organization recommended definition of breastfeeding indicators for assessing Infant and Young Child Feeding (IYCF) practices (WHO, 2008). Baseline data collection was entirely done at the health facilities while follow up visits were done both at the facilities, in homes and during community outreach programs. Community outreach programs are visits organized by health facilities. It involves health care providers taking immunization and growth monitoring services closer to communities that live far from hospital. It is done in specified areas after mobilization by community health volunteers. In both health facilities outreach programs were done three times every month. During follow ups, a structured questionnaire was filled by mothers while children had their weight, length and hemoglobin levels checked.

3.6.3: Dietary diversity

Food intake was determined using 24-hour diet recall of the foods fed to children on complementary feeds. This study aimed at assessing individual dietary diversity scores (IDDS) which reflected on the nutrient adequacy of children 6-23 months of age based on the recommendation by UNICEF and WHO. Mothers were asked if the babies were being fed on other foods apart from breast milk. Those who said yes were asked the age at which they introduced the foods and the number of times in a day the baby was fed. Minimum dietary diversity food groups included in the questionnaire were:

i. Grains, roots and tubers
ii. Legumes and nuts
iii. Dairy products (milk, yogurt, and cheese)
iv. Flesh foods
v. Eggs
vi. Vitamin A rich fruits and vegetables
vii. Other fruits and vegetables

The above food groups are as established by WHO in calculation of minimum dietary diversity for children aged six to twenty-three months (WHO, 2010). A food group earns a score regardless of the quantity consumed. It's assumed that when an infant consumes at least four out of the seven food groups in a day, there is a high

possibility of consuming at least one animal-source food and one fruit or vegetable as an addition to grains, roots and tubers ensuring diversity in nutrients consumed. The reference period for the DDS was the previous 24 hours to reduce recall bias from caregivers. The minimum number of times infants were fed per day was also enquired. It varied with age (2 times for children 6-8 months old and 3 times for 9-23 months old as they continued to be breast fed.

3.6.4: Nutritional status

Nutrition status was determined using anthropometry. Anthropometric measurement was done according to WHO recommended procedures (WHO, 2008). Calibration was done on all the instruments before every use to enhance accuracy. Weight was taken using a salter scale weighing machine. Records were done to the nearest 0.1kilogram. The scale was calibrated every time after suspending weighing pants on it and re adjusting the readings to zero. Recumbent length was taken using a stadiometer. The board was laid on a flat surface since children were below two years. The child was placed on the stadiometer flat lying on their back with the head firmly held in position touching a horizontal head board. Legs were straightened with the feet at a right angle. Another board was put into contact with the heels and the length was taken to the nearest 0.1 centimeters.

3.6.5: Anemia status (Hemoglobin level)

An optical instrument that is noninvasive (does not require bleeding) was used to assess the Hb levels of infants Masimo Radical 7 (Masimo Corp., Irvine, CA, USA) pulse co-oximeter® was used to calculate hemoglobin concentration (SpHb) non-invasively using transcutaneous spectrophotometry. The procedure was followed as outlined in the user manual (Masimo corporation, 2007). Hemoglobin levels for infants were checked during the first follow up after recruiting mothers and at end line. The first follow up was done four months after completion of recruitment. The end line data collection was done four months after the first follow up.

3.6.6: Diarrhea and Malaria episodes

Diarrhea and malaria episodes within the previous two weeks before data collection for every infant was recorded based on the mother's recall. Mothers who reported

that their children had malaria were asked if malaria tests were carried out to make that conclusion or if it was a personal opinion. Probing was done to avoid mistaking other diseases for malaria. Those who went to hospital had records in the MCH booklets.

3.6.7: Infant feeding knowledge

Questions on infant feeding were included in the questionnaire. The questions were based on WHO definitions and guidelines on infant feeding. Thirteen questions were selected for lactating mothers. Each question was to be responded by either: strongly agree; agree; disagree; strongly disagree or I do not know. The responses were classified in two categories during analysis. The Likert scale responses was harmonized into correct or not correct response to a specific question.

3.7: Validity, Reliability and Pre – testing

Validity refers to how well the results among the study participants represent true findings among similar individuals outside the study. To ensure validity of the research, questionnaires were evaluated in relation to objectives of the study. Questionnaire items were evaluated to know if they answered the research questions. Internal validity is the extent to which observed results represent the truth in the general population. This was enhanced by minimizing on errors during measurement of anthropometrics. The measurements were done three times and the average was used. For the questionnaires, probing was done to ensure the data collected is as accurate as possible. The sample size was increased to take care of any loss to follow ups.

Reliability is how consistently a method can measure an attribute. A pre test was done to ensure the instruments were accurate. A pre- test was done using forty questionnaires at the Kwale County hospital. This was to correct questions that may not have been clear or needed probing. The questions were simplified to a language that is easily understood by the locals and easy to respond to. It also helped to give a basic translated version that could be easily understood by participants. The data was double entered to enhance accuracy.

3.8: Data management and Analysis

3.8.1: Data Management

The data was entered periodically into a PC and be kept safe under lock and key and with a backup. Data entry was performed with Microsoft Excel 2013. The data entered was password protected. The data was accessed by the principal investigator only. Data quality was maintained by doing quality checks during data collection, having double entry and further cleaning. Backups comprising memory sticks and writable CDs were used to store data for emergencies.

3.8.2: Data Analysis

The analysis was done using Statistical package for social scientist (SPSS) version 21 to determine significance at $p \leq 0.05$. Data was summarized using markers of central tendencies and spread depending on its distribution. Comparison of categorical variables was done using chi square test at a significance level of 95%. Proportions of expectant mothers that utilized ANC clinics at least four times against those who utilized less than four times were tabulated. A mother was classified as having appropriately attended ANC clinics if she began her visits during the first trimester and visited at least four times. Proportion of expectant mothers who began their ANC clinics during the first trimester against those who began in the second and third trimester were tabulated. Maternal demographic and socio-economic characteristics (age, level of education, occupation, parity, marital status, spouse occupation and education level) were compared to the prevalence of ANC clinic attendance. Cross tabulations and bivariate analysis were used to explore the relationship between socio economic status and ANC clinic utilization.

The exposure variables were the ANC attendance, use of insecticide treated mosquito nets, delivery at a health facility, post-natal care as well as socio demographic, and economic characteristics of the mothers. A mother was classified as having delivered at a health facility if it was a hospital set up with skilled delivery assistance (trained registered nurse, clinical officer or medical doctor). Postnatal care was care obtained from skilled health practitioners in the first two days after delivery. Morbidity status was assessed based on malaria and diarrhea episodes. Diarrhea was based on both

diagnosis and severity during the period in question. Diarrhea episodes was divided into >/= 3 episodes /day for 3-5 days in the past two weeks; </= 2 episodes / day for less than 3 days in the past two weeks and 1 episode/day for <2 days in the past two weeks to check for the severity in each infant. Malaria episodes was enquired from mothers during every visit if infant had suffered from malaria in the past two weeks prior to the interview. Chi square and logistic regression tests were used to check for relationship between exposure variables and malaria as well as diarrhea episodes and frequency.

Anthropometric measurements were converted to anthropometric indices of length for age to show stunting, length for weight to show underweight and weight for age to show wasting statuses. This was done as outlined by world Health organization (WHO, 2010). Anemia was determined according to the hemoglobin levels which was classified as severe (< 7g/dl) mild (7- 10.4g/dl), and normal levels (>11g/dl). The exposure variables were the ANC attendance, delivery at a health facility, post-natal care as well as socio demographic and economic characteristics of the mothers. Chi square and logistic regression tests were used to check for relationship between exposure variables and different aspects of nutritional status.

The exposure variables were time taken to initiate breastfeeding, prelacteal feeding, exclusive breast feeding for the first six months, complementary feeding initiation after six months, dietary diversity of a minimum of four food groups fed in a day, as well as socio demographic and economic characteristics of the mothers. Complementary feeding was analyzed based on recommendation that breastfed infants age 6-8 months be fed at least twice a day, while breastfed children above nine months must be fed at least three times a day (KDHS 2014; WHO, 2008). Chi square and logistic regression tests were used to check for relationship between exposure variables and diarrhea episodes and frequency.

The research also sought to establish if the different methods of feeding infants among mothers in Kwale has an impact on nutritional status (stunting, wasting, underweight, anemia) of infants. The exposure variables were time taken to initiate

breastfeeding, prelacteal feeding, exclusive breast feeding, complementary feeding initiation, dietary diversity, as well as socio demographic and economic characteristics of the mothers. Minimum dietary diversity was defined as the proportion of children who received foods from at least 4 food groups the previous day using a standardized list of 7 food groups (Maylis & Marie-Claude, 2011). The individual dietary diversity status was tabulated with nutritional status and anemia status. Chi square and logistic regression tests were used to check for relationship between exposure variables and different aspects of nutritional status measured.

3.9: Ethical consideration and approval of the study

Approval to carry out the study was obtained from Kenya Medical Research Institute - Scientific and Ethical Review Unit (SERU) (Appendix IV). Information about the study, its aims and follow up requirement was given to potential participants. Written informed consent was sought from mothers before participating in the study. Those in agreement were interviewed in private. They were informed of their freedom to leave the study at any time without being denied normal health services at health facilities. Mothers and / or infants who were malnourished or had chronic health challenges were advised to seek medical care from health facilities. The subjects' identity was not revealed at any one time to maintain their privacy. Permission to carry out the study was sort from the Kwale County director of health and county commissioner. Mwaluphamba and Kizibe health centers where participants were recruited and Kwale County Hospital where referrals were made. Mkongani ward community leaders (*nyumba kumi* heads) were informed of the intended study and its follow up plans. Kwale County Ministry of health was informed of the intended study and feedback was given for policy formulation.

3.10: Study limitations

This study was prone to limitations of recall bias. We tried to minimize this by probing and verifying some of the information by counter checking the mother and child Health booklets. Another limitation was loss to follow up due to culture. Culturally expectant mothers are required to move to their mother's house at least

two months to delivery time then go back to their marital homes two months after delivery. This is mandatory for first time mothers and optional for those with other young children. The length of time the study took also led to loss to follow up.

CHAPTER FOUR

RESULTS

4.1 Socio demographic characteristics of Study participants

Two hundred and eighty expectant mothers were recruited from Mwaluphamba (50.4 %) and Kizibe (49.6 %) dispensaries of Matuga sub-County. Two dispensaries were used to shorten the duration of recruitment. The ages ranged from 15 - 45 with mean age (SD) of 25.1 (± 6.8) years. Thirteen women did not give their ages. Majority were aged between 20 – 29 years. Majority (256, 91.8%) of the women were married and in a monogamous (182, 84.3%) marriage. Of the 280 expectant mothers, 74 (26.4 %) were lost to follow up. Reasons for loss to follow up were migration and deliberate drop out. Twenty mothers were lost due to different circumstances including loss of pregnancy, maternal mortality and neonatal mortality. One mother lost her pregnancy while two died during childbirth. Seventeen infants (8.3%) were lost due to stillbirths and neonatal mortality. Out of the 20 mothers lost through maternal mortality / pregnancy loss / stillbirths or neonatal mortality, only four (20%) initiated antenatal care within the first trimester while only six (30%) attended antenatal care clinics at least four times during their entire pregnancy. There was no statistically significant association between antenatal care service utilization and neonatal / maternal mortality.

More than one third (35.7%) of the expectant mothers, had children below two years. One hundred and eighty-two (65%) of the families had five to ten adult residents, 62 (22%) had less than four and 36 (13%) had more than ten living as one household. Half of the mothers (141, 50.1%) had no formal education. Majority (74%) of the mothers were housewives, while 55 (20%) were casual laborers and 19 (< 7%) were employed. Majority of spouses' (244, 87.1%) had either no formal education or primary level of education only and almost half (135, 48%) were casual laborers (Table 4.1).

Table 4.1: Demographic characteristics of expectant mothers attending ANC clinics in Matuga Sub County.

Characteristics	Baseline (N = 280)		Follow up (n = 197)		End line (n = 196)	
	n	(%)	n	(%)	n	(%)
Age of expectant mother (n = 267)						
15 - 19 years	59	22.0	38	20.0	38	20.0
20 - 29 years	144	54.0	98	50.0	97	52.0
30 - 39 years	51	19.0	40	21.0	40	21.0
40 - 45 years	13	4.9	11	5.6	12	6.1
Unknown ages	13	4.9	10	5.1	9	4.6
Parity						
Prim parous (1st child expected)	72	25.7	45	23.2	39	20.0
Multiparous (2nd, 3rd, 4th child)	118	42.1	84	43.3	79	40.5
Grand multiparous (5th child & above)	90	32.1	65	33.5	76	39.0
Highest spouse education level						
No formal education	95	34.0	62	31.5	54	30.0
Primary	149	53.0	106	53.8	101	56.1
Secondary	31	11.0	25	12.7	22	12.2
College	5	1.8	4	2.0	3	1.7
Highest mother's education						
No formal education	141	50.0	103	51.8	102	52.0
Primary school	115	41.0	76	38.1	75	38.3
Secondary school	20	7.1	15	7.6	15	7.7
College	4	1.4	4	2.0	4	2.0
Mother's employment status						
Housewife	206	74.0	146	73.0	145	74.0
Casual laborer	55	20.0	39	20.0	38	19.4
Government employee	8	2.9	7	3.5	6	3.0
Self-employed / business	11	3.9	7	3.5	7	3.6
Spouse employment status						
Not employed	45	16.0	15	8.2	12	6.6
Casual laborer	135	48.0	100	54.0	101	55.5
Government employee	18	6.4	12	6.5	12	6.6
Self-employed / Business	82	29.0	57	31.0	57	31.3

4.2 Utilization of maternal and child health services

More than a third (96, 34.3%) of the expectant mothers attended ANC clinic less than four times during their entire pregnancy. Although a good number (184, 65.7%) attended ANC clinics four or more times during their entire pregnancy, only a few (55, 19.6%) initiated clinics during the first trimester. One hundred and nineteen

mothers (60.4%) delivered in health facilities with the help of a health professional. Only eleven (9%) received post-natal care in the first two days. At baseline 98 (35%) were using modern family planning methods prior to conception while at end line 82 (41.8%) had started using modern family planning methods. (Table 4.2).

Table 4.2: Proportion of expectant mothers utilizing maternal and child health services in Matuga Sub County, Kwale County

Characteristics	Baseline		Follow up		End line	
	n	%	n	%	n	%
ANC clinic initiation						
Early (1st trimester)	55	19.6	40	20.3	37	19.0
Late (After 1st trimester)	225	80.4	157	79.7	158	81.0
Number of ANC visits						
< 4 visits	96	34.3	96	34.3	85	43.6
≥ 4 visits	184	65.7	184	65.7	110	56.4
Place of delivery	N/A					
Hospital			119	60.4	118	60.8
Home			66	33.5	64	33.0
TBA			8	4.1	8	4.1
Other (Road / Vehicle)			4	2.0	4	2.1
Use of Modern Family planning methods						
Yes	98	35.0	62	31.5	82	41.8
No	182	65.0	135	68.5	115	58.2
Completed child immunization schedule						
Yes	N/A		160	81.6		
No			36	18.4		
Postnatal care in first two days after child birth						
Yes	N/A		11	9.2		
No			108	90.8		

4.3 Anemia Status of Mothers

One hundred and sixty-seven mothers (59.6%) had been tested for anemia as at the time for baseline survey. Majority (115, 68.9 %) of those who had been tested were anemic. (Hb ≤ 10.9). Almost three quarters (83, 72.2%) of those who were anemic had initiated ANC clinic after the first trimester (Table 4.3).

Table 4.3: Anemia status of expectant mothers attending ANC in Kwale County

Hemoglobin levels among expectant mothers (N = 167)	Early ANC Initiation	Late ANC initiation.
	n (%)	n (%)
Severe anemia: Hb < 7 (17, 6.1%)	3 (5.5)	14 (6.2)
Moderate anemia: Hb: 7.0 – 9.9 (38, 13.6%)	8 (14.5)	30 (13.3)
Mild anemia: Hb: 10.0 - 10.9 (60, 21.4%)	17 (30.9)	39 (17.3)
Normal: Hb > = 11 (52, 18.6%)	16 (29.1)	36 (16.0)

4.4 Maternal characteristics

Almost two thirds (182, 65%) of the mothers had not been using any modern family planning method before conception. More than half (100, 54.9%) had no particular reason why they were not using modern family planning methods while a few sighted husband's disapproval (9, 4.9%), use of natural methods (48, 26.4%) or used but still conceived (25, 13.7%). A third (92, 33.5%) of the mothers had not planned for the current pregnancy. Majority (255, 91.4%) of the mothers reported using insecticide treated mosquito nets (ITN). More than three quarters (214, 76.7%) had been given iron / folic supplements during pregnancy, while more than half (160, 57.6%) got anti tetanus injection. A few of the mothers (13, 4.6 %) smoked cigarette or tobacco or used alcohol (17, 6.1%) during pregnancy. Majority of the infants (119, 60.4%) were born at health facilities. Most mothers who gave birth at places other than the health facility gave reasons as being on their way to hospital or the labor pains being at night hence unable to go to hospital due to lack of transport. Nine (4.6%) of the mothers gave birth through caesarian delivery. A good number (53, 44.5%) of mothers who gave birth at the health facilities didn't stay at the facility for more than four hours after delivery, while 55 (46.6%) were discharged after one day.

4.5 Infant characteristics

More than half (103, 52.3%) of the infants were of male gender. Sixty percent (119) of the infants were born in hospital hence not all birth weights were recorded. Majority of the infants had normal birthweight (≥ 2.5 kg) and 23 (13.2%) had low birthweight (< 2.5 kg). Some mothers (23, 11.7%) could not tell the birthweight since

the infants were born at home and they were taken for their first clinic after forty days as required traditionally. At midline, majority (145, 73.6%) of the infants were aged below six months and most were being breastfed (Table 4.4).

Table 4.4: Characteristics of infants of mothers attending MCH services in Matuga Sub County

Characteristics	Midline (n =197)		End line (n = 196)	
	n	%	n	%
Gender of Child				
Male	103	52.3	102	52.0
Female	94	47.7	94	48.0
Birth weight (n=174)				
Low birth weight	23	13.2	22	12.9
Normal weight	151	86.8	149	87.1
Age of infant				
< 6 months	145	73.6	0	0.0
≥ 6 months	52	26.4	196	100.0

4.6 Infant feeding practices

4.6.1 Breastfeeding practices

All mothers breastfed their children. More than a third of the mothers (76, 38.6%) initiated breastfeeding after one hour to several days after giving birth. The reasons for delayed breast-feeding initiation included having had a caesarian delivery, no milk, being in pain and a sick baby. Pre lacteal feeding was minimal (18, 9.2%) and majority (177, 91.7%) fed their babies on colostrum. Breastfeeding was done on demand by most mothers (187, 95.9%). Exclusive breastfeeding until six months was practiced by majority (159, 87.8%) of the mothers. Two infants were yet to be introduced to complementary foods despite being more than six months. The reasons given included being a poor feeder, infant not willing to take other milk or food (Table 4.5).

4.6.2 Complementary feeding practices

During the first follow up 95 (48.5 %) of the infants were on complementary feeds. More than half (52, 54.2 %) of the infants were introduced before six months. Majority (78.5 %) were fed less than four times per day and they used a cup and

spoon (92.5 %) for feeding. Majority (80.2 %) only fed the infants on less than four types of foods per day, Maize porridge being the common feed (Table 4.5).

Table 4.5: Infant feeding practices among lactating mothers in Kwale County

Characteristics	Follow up (n =197)		End line (n = 196)	
	n	%	n	%
Breastfeeding Initiation				
Within one hour after birth	121	61.4	120	61.2
After one hour	76	38.6	76	38.8
Prelacteal feeding				
Yes	18	9.2	18	9.2
No	176	90.7	178	90.8
Breastfeeding time				
Breastfed on demand	183	94.3	188	95.9
Not breastfed on demand	11	5.6	8	4.1
Complementary Feeding				
Yes	95	48.5	194	98.9
No	101	51.5	2	1.1
Complementary feeding frequency				
≤ 3 times per day	74	78.7	165	85.1
≥ 4 times per day	20	21.3	29	14.9
CF Time (Exclusive Breastfeeding)				
< 6 months	52	54.2	35	18.0
After six months	44	45.8	159	82.0
Dietary diversity				
Diverse diet (≥ 4 types /day)	20	21.5	36	19.8
Non diverse diet (< 4 types / day)	73	78.5	146	80.2
Feeding method				
Cup/ cup and spoon	86	92.5	122	62.9
Feeding bottle / others	7	7.5	72	37.1

C.F: Complementary Feeding

4.6.3 Knowledge on infant feeding practices

Most mothers (179, 95%) reported to have received breastfeeding advice from health care providers. More than a third (68, 34.7%) had incorrect knowledge on when breast-feeding of a newborn must be initiated after delivery. Majority (145, 74.7 %) had incorrect knowledge that newborn babies will be thirsty if not given drinking water. Half (97, 50%) of the mothers had correct knowledge that crying was not a sign for insufficient breastmilk. More than seventy percent (137, 70.6%) had incorrect knowledge that combining breast feeding with other types of milk when infant is below six months makes the baby healthy. More than three quarters (153, 78.9 %) had incorrect knowledge that an infant cannot be sustained on breast Milk alone for six months. Exclusive breastfeeding (EBF) was not a common in practice. This was evident from the mothers' incorrect knowledge that: Exclusive breastfeeding until six months is not sufficient to provide all nutrients for proper infant growth (152, 78.4%). Majority (163, 84%) had incorrect knowledge that breast milk can be expressed and kept for later use when mothers are out of reach. Less than half (93, 47.9%) had correct knowledge that feeding infants on formula and other foods affects the quantity of breastmilk. Mothers in Kwale had poor infant feeding knowledge and practices. (Table 4.6).

Table 4.6: Infant feeding Knowledge among breastfeeding mothers in Matuga Sub County

Variables	Knowledge			
	Correct N (%)		Not Correct n (%)	
Breastfeeding initiated within the first one hour after birth	128	(65.3)	68	(34.7)
Infant should be sustained on breast milk alone for six months	41	(21.1)	153	(78.9)
Infant does not need to be given drinking water	49	(25.3)	145	(74.7)
Infant will be hungry if not fed formula milk within the first 24 hours	57	(29.4)	137	70.6
Crying is a sign that mother's milk is insufficient	97	(50.0)	97	(50.0)
Exclusive breastfeeding until six months is not sufficient for the baby	65	(33.5)	129	(66.5)
Combining breastmilk with other types of milk when infant is less than six months gives better nutrition.	57	29.4	137	(70.6)
Infant should be breastfed on demand	179	(92.3)	15	(7.7)
Proper attachment to the breast is not needed for sufficient milk production	25	(12.9)	169	(87.1)
Women with small breast size have insufficient milk for the baby	29	(14.9)	165	(85.1)
Feeding infant on formula milk and other foods does not affect the quantity of breast milk produced	101	(52.1)	93	(47.9)
EBF until six months does not provide all the nutrients needed for optimal growth and development	42	(21.6)	152	(78.4)
Breast milk can be expressed and be kept for later use	31	(16.0)	163	(84.0)

4.7 Morbidity and Nutritional status of infants in Kwale County

4.7.1 Morbidity of infants

Malaria episodes were reported among 19 (9.7 %) infants during the first follow up and in twenty-one (12.0 %) during the end line. Eighteen (94.7%) mothers whose infants had malaria reported using Insecticide Treated Nets. Malaria was diagnosed at home through tests in laboratories by 2 (22.2%) of the mothers who delivered at home and 7 (77.8%) of those who delivered at health facilities (Table 4.7).

Table 4.7: Malaria and diarrhea status among infants in Matuga sub county, Kwale County

Characteristics	Follow up		End line	
	n	%	n	%
Sick from Malaria in last two weeks?				
Yes	19	9.7	21	12.0
No	177	90.3	154	88.0
Where Malaria was treated				
Hospital	19	100.0	20	95.2
Home	0	0.0	1	4.8
Had diarrhea in last two weeks				
Yes	43	21.9	60	33.1
No	153	78.1	121	66.9
Diarrhea frequency				
Less than two times /day for < 3 days	10	23.8	28	47.5
3 times/ day for3 - 5 days	29	69.0	25	42.4
Unknown	3	7.2	6	10.2
Diarrhea management				
Took baby to hospital	26	61.9	36	65.5
Bought medicine from shop	7	16.7	6	10.9
Gave child some herbs	2	4.7	3	5.5
Stopped without treatment	7	16.7	10	18.2

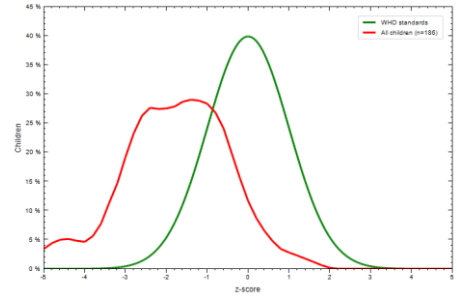
4.7.2 Nutritional status of infants

During follow up there were few cases of malnourished infants in comparison to end line. The rate of stunting among infants increased from sixty-nine (35%) to one hundred and three (55.4%) infants. At end line anemia presence increased from thirty (15%) to seventy-two (36.9%) (Table 4.8).

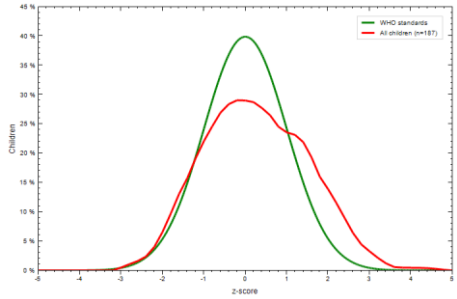
Table 4.8: Nutritional status of infants in Matuga sub county, Kwale County

Nutritional status	Follow up (n = 197)		End line (n = 196)	
	n	%	n	%
Stunting status				
Normal (Z > -2)	128	65.0	83	44.6
Stunted (Z = < - 2 to < -3)	69	35.0	103	55.4
Underweight status				
Normal (Z > -2)	147	75.0	140	75.3
Underweight (Z < - 2)	49	25.0	46	24.7
Anaemia status (haemoglobin levels)				
Anaemic - severe to mild (Hb < /=			72	36.9
10.8)	30	15.2		
Normal (Hb > / = 10.9)	167	84.8	123	63.1

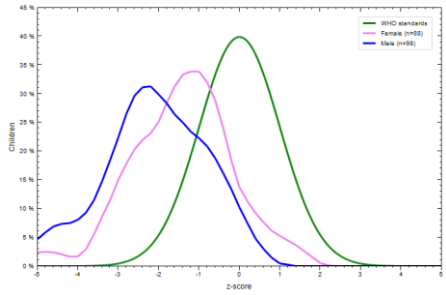
When the rate of stunting is compared to the WHO standards, more than half of the infants were stunted (Figure 4.1a). A good number were wasted as seen in figure 4.1b. There were more boys who were stunted as compared to girls. (Figure 4.1c). As compared to WHO standards more than half of infants were stunted. Stunting was more prevalent among the male gender than the female one.



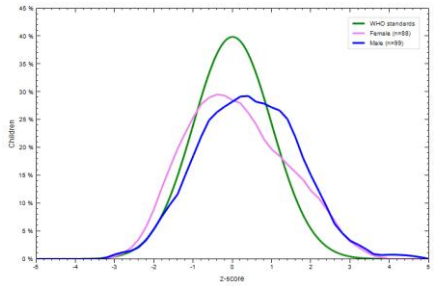
(a): Stunting status of the infants as compared to the WHO standards



(b): wasting status of infants as measured by BMI for age in comparison to WHO standards



(c): Stunting status by gender in comparison to the WHO standards



(d): Wasting status by gender in comparison to the WHO standards

Figure 4.1: Stunting and wasting status of infants in Kwale County

4.8 Maternal and Child health services and selected variables

4.8.1 Antenatal utilization and care characteristics of mothers' demographic

There was a statistically significant association between antenatal care initiation and maternal education level. Having no formal education was significantly associated with late initiation of ANC (p = 0.001). A mother without any formal education was 4.7 times more likely to initiate ANC clinics later than one who had attained education to high school level or above (OR 4.687; CI 1.765 – 12.447). Mothers with elementary education were 1.7 times more likely to initiate clinic later than those with secondary or tertiary education (OR: 1.7 (0.674 – 4.288). There was no statistically significant association between antenatal care utilization and infant birth weight. (p=0.399). (Table4.9).

Table 4.9: Antenatal care utilization among mothers in Matuga Sub County and its association to demographic characteristics

CHARACTERISTICS	ANTENATAL CARE VISITS (BASELINE)			
	Early (1st Trimester)	Late (After 1st Trimester	P value	OR (CI 95%)
	n (%)	n (%)		
Mother's education level				
No schooling (n = 141)	16 (29.1)	125 (55.6)	0.001	4.687 (1.765 – 12.447)
Primary school (n = 115)	30 (54.5)	85 (37.8)	0.261	1.7 (0.674 – 4.288)
Secondary School and above (n= 24)	9 (16.4)	15 (6.7)		R
Mother's employment status				
Housewife (n = 206)	41 (74.5)	165 (73.3)	0.13	1.266 (0.482 – 3.32)
Casual Laborer (n = 55)	6 (10.9)	49 (21.8)		3.587 (0.695 – 18.511)
Government / Self Employed / Business person (n = 19)	8 (14.5)	11 (4.9)		R
Parity			0.0001	
Prim gravida n = 72 (25.7%)	25 (45.5)	47 (20.9)		
Multiparous n = 118 (42.1%)	21 (38.2)	97 (43.1)		0.513 (0.223 – 1.183)
Grand multiparous n = 90 (32.1%)	9 (16.4)	81 (36.0)		R

OR: Odds Ratio; R: Reference

Tabulation between cumulative antenatal care visits and different demographic characteristics was done. The results showed that maternal education (p = 0.032), parity (p = 0.0001), and number of children between 2-5 years (p = 0.024) have a statistically significant association with antenatal care visits (Table 4.10)

Table 4.10: Association of selected factors with number of ANC visits among mothers seeking MCH services in Matuga sub County

CHARACTERISTICS	ANC visits (≥ 4) n (%)	ANC visits (< 4) n (%)	P value
Mothers' education level			
Primary school and below	83 (86.5)	173 (94.0)	0.032
Secondary school and above	13 (13.5)	11 (6.0)	
Parity			
Prime parous (1st child)	39 (40.6)	33 (17.9)	0.0001
Multi parous (2,3,4 children)	34 (35.4)	84 (45.7)	
Grand multi parous (five children & above)	23 (24.0)	67 (36.4)	
Mothers with children between 2-5 years			
No Child between 2-5 yrs.	51 (53.1)	64 (34.8)	
One child between 2-5 yrs.	26 (27.1)	78 (42.4)	0.024
Two children between 2-5 yrs.	15 (15.6)	34 (18.5)	
Three children between 2- 5 yrs.	4 (4.2)	8 (4.3)	

4.8.2: Association between place of delivery and demographic characteristics of mothers

More than a third (78, 39.6%) of the mothers delivered at their homes, traditional birth attendant homes or on their way to hospital. There was a statistically significant association between the place of birth and maternal educational level (p = 0.012). A mother without any formal schooling was seven times more likely to deliver at a place other than a health facility (OR: 6.982; CI 1.527 – 31.926). There was no statistically significant association between the place of delivery and maternal employment status. A housewife was 3.9 times more likely to deliver at a place different from the health facility as compared to government employed or mothers who do business as a source of income (OR: 3.947; CI 0.844 – 18.450) (Table 4.11).

Table 4.11: Place of delivery among mothers attending MCH services in Matuga sub County and its relationship to demographic characteristics

CHARACTERISTICS	Place of child delivery		P value	OR (CI 95%)
	Hospital	Not Hospital		
Mother's education level				
No schooling (n = 141)	55 (46.2)	48 (61.5%)	0.012	6.982 (1.527 – 31.926)
Primary school (n = 115)	48 (40.3))	28 (35.9)	0.05	4.667 (0.998 – 21.814)
Secondary School and above (n= 24)	16 (13.4)	2 (2.6)		R
Mother's employment status				
Housewife (n = 206)	85 (71.4)	61 (78.2)	0.081	3.947 (0.844 – 18.450)
Casual Laborer (n= 55)	23 (19.3)	15 (19.2)	0.127	3.587 (0.695 – 18.511)
Government / Self-employed / Business person (n = 19)	11 (9.2)	2 (2.6)		R

4.8.3: Modern family planning use and demographic characteristics of mothers

At baseline, only 35% of the mothers reported having been using a modern method of family planning prior to their pregnancy. There was a statistical significance between maternal parity and the use of modern family planning methods ($p = 0.0001$). At midline there was a statistical significance between FP use and maternal occupation ($p = 0.007$). Housewives were 6.6 times more likely to avoid modern family planning methods as compared to casual laborers and in employment (OR = 6.644, CI, 1.406 - 31.393) (Table 4.12).

Table 4.12: Use of modern family planning methods and demographic characteristics of mothers attending ANC in Matuga sub County

Variables	Use of modern FP at baseline		p value	Use of FP at midline		p value	OR (95% CI)
	Yes (%)	No (%)		Yes (%)	No (%)		
PARITY			**0.0001**			0.277	
Primiparous	4 (4.1)	68 (37.4)		15 (24.2)	29 (21.6)		0.801 (0.316 - 2.032)
Multiparous	53 (54.1)	65 (35.7)		31 (50.0)	55 (41.0)		0.602 (0.286 - 1.268)
Grand multiparous	41 (41.8)	49 (26.9)		16 (25.8)	50 (37.3)		R
Mother education level			0.465			0.209	
No schooling	53 (54.1)	88 (48.4)		31 (50.0)	71 (53.0)		1.373 (0.387 - 4.877)
Primary school	39 (39.8)	76 (41.8)		22 (35.5)	54 (40.3)		1.645 (0.466 - 5.808)
Sec. school & above	6 (6.1)	18 (9.9)		9 (14.5)	9 (6.7)		R
Mother's occupation			0.832			0.007	
Housewife	70 (71.4)	136 (74.7)		48 (77.4)	97 (72.4)		2.513 (0.661 - 9.547)
Casual laborer	21 (21.4)	34 (18.7)		6 (3.7)	32 (23.9)		6.644 (1.406 - 31.393)
Government /employed / business	7 (7.1)	12 (6.6)		8 (12.9)	5 (3.7)		R

At end line there was a statistical significance between use of modern family planning and maternal level of education (p = 0.0001) as well as maternal parity (p = 0.044). Mothers with secondary and higher-level education were 1.7 times (RR = 1.701 (0.821 – 3.523) more likely to utilize any modern method of family planning as compared to those without any formal education. (Table 4.13)

Table 4.13: Use of modern family planning method and demographic characteristics of mothers attending ANC in Matuga Sub-County, Kwale County

	Use of FP at end line				
Variables	**Yes (%)**	**No (%)**	**P value**	**OR (95% CI)**	**RR (95% CI)**
Parity			0.044		
Primiparous (no child / first child)	24 (29.6)	16 (16.3)		0.358 (0.158 - 0.810)	
Multiparous (2nd, 3rd, 4th child)	35 (43.2)	41 (41.8)			
Grand multiparous (5th child and above)	22 (27.2)	41 (41.8)			
Mother education level			**0.0001**		
No schooling	29 (35.4)	68 (70.1)		4.690 (1.473 - 14.933)	R
Primary school	43 (52.4)	24 (24.7)			0.649 (0.436 - 0.967)
Secondary School and above	10 (12.2)	5 (5.2)			1.701 (0.821 - 3.523)
Mother's occupation			0.413		
Housewife	63 (77.8)	71 (72.4)		1.331 (0.670 - 2.643)	1.175 (0.788 - 1.754)
Casual laborer	18 (22.2)	27 (27.6)			
Government employee /self-employed/ business					0.883 (0.663 - 1.177)

RR: Relative risk; OR: Odds ratio; CI: confidence interval

4.8.4 Maternal and Child Health service utilization and malaria among infants

At end line, there was no statistically significant association between the presences of malaria in infants with antenatal care initiation, place of delivery, post-natal care, having completed basic vaccinations as well as use of modern family planning. Majority (22, 91.3%) of children who had malaria were taken to hospital for testing and treatment. Self-medication was minimal. Early exposure to ANC did not affect the occurrence of malaria among the study infants. (RR: 1.194 CI, 0.474 – 3.007) (Table 4.14).

Table 4.14: Maternal and Child Health service utilization among mothers and its relationship on malaria prevalence among infants in Matuga Sub County, Kwale County

Characteristics	Infant had malaria in past two weeks		P value	OR (95% CI)	RR (95% CI)
	Yes n (%)	No n (%)			
Initiation of first ANC visit			0.709	1.224 (0.423 - 3.542)	
1st trimester	5 (21.7)	32 (18.5)			1.194 (0.474 - 3.007)
After 1st trimester	18 (78.3)	141 (81.5)			0.975 (0.849 - 1.121)
Place of birth			0.153	2.020 (0.759 - 5.374)	
Hospital	17 (73.9)	101 (58.4)			1.873 (0.772 - 4.541)
TBA, home, road	6 (26.1)	72 (41.6)			0.927 (0.841 - 1.023)
Postnatal care in first two days			0.605	0.575 (0.069 - 4.805)	
Yes	1 (5.9)	10 (9.8)			0.614 (0.090 - 4.197)
No	16 (94.1)	92 (90.2)			1.067 (0.871 - 1.307)
Completed child vaccinations			0.657	0.786 (0.271 -2.278)	
Yes	18 (78.3)	142 (82.1)			0.810 (0.322 - 2.038)
No	5 (21.7)	31 (17.9)			1.031 (0.894 - 1.188)
Using modern Family Planning methods			0.194	1.790 (0.738 - 4.342)	
Yes	10 (43.5)	52			1.663 (0.772 - 3.582)
No	13 (56.5)	121 (69.9)			0.929 (0.822 - 1.050)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval

4.8.5 Maternal and Child Health service utilization and diarrhea among infants

The prevalence of diarrhea had no statistically significant association with antenatal care clinic initiation ($p = 0.289$), place of delivery ($p = 0.402$), PNC ($p = 0.213$), coverage of basic vaccination ($p = 0.522$) as well as utilization of modern family planning methods ($p = 0.075$). Thirty-nine (62.9%) mothers took their babies to hospital for tests and treatment. Twelve (19.4%) mothers used herbs or drugs from local chemists while eleven (17.7%) did not give any treatment. Early initiation of antenatal care clinics had no influence on diarrhea occurrence among infants. (Table 4.15).

Table 4.15: Maternal and Child Health service utilization among mothers and its relationship on diarrhea prevalence among infants in Matuga Sub County

Characteristics	Infant had diarrhea in past two weeks		P value	OR (95% CI)	RR (95% CI)
	Yes n (%)	No n (%)			
1st ANC initiation			0.289	0.643 (0.283 - 1.460)	
1st trimester	9 (14.5)	28 (20.9)			0.730 (0.397 - 1.342)
After 1st trimester	53 (85.5)	106 (79.1)			1.135 (0.917 - 1.405)
Place of birth			0.402	1.305 (0.700 - 2.435)	
Hospital	40 (64.5)	78 (58.2)			1.202 (0.778 - 1.856)
Not hospital	22 (35.5)	56 (41.8)			0.921 (0.761 - 1.113)
PNC in first two days.			0.213	0.378 (0.078 - 1.836)	
Yes	9 (4.8)	9 (11.7)			0.491 (0.137 - 1.761)
No	40 (95.2)	68 (88.3)			1.299 (0.949 - 1.779)
Completed basic vaccinations			0.522	0.781 (0.366 - 1.668)	
Yes	49 (79.0)	111 (82.8)			0.848 (0.518 - 1.389)
No	13 (21.0)	23 (17.2)			1.086 (0.832 - 1.417)
Using modern F.P			0.075	1.771 (0.940 - 3.337)	
Yes	25 (40.3)	37 (27.6)			1.460 (0.971 - 2.197)
No	37 (59.7)	97 (72.4)			0.824 (0.655 - 1.037)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval; PNC: Post-natal care; F.P: Family planning

4.8.6 Antenatal care service utilization and nutritional status of infants

There was no statistically significant association between antenatal care attendance and nutritional status of infants in the study cohort. During the first follow up forty-nine (27.4%) of the infants were stunted. Among the 49 who were stunted, twenty-one (11.7%) were severely stunted. (Table 4.16).

Table 4.16: Antenatal care utilization among mothers attending in Kwale County and its relationship to infant nutrition at follow up

	ANC first visit		
Characteristics	**1st trimester**	**After 1st trimester**	**P value**
Height for Age Z scores			
Severely Stunted (Z < - 3) (n = 21)	2 (5.6)	19 (13.3)	0.384
Stunted (Z = < - 2) (n = 28)	7 (19.4)	21 (14.7)	
Normal (Z > -2) (n= 130)	27 (75.0)	103 (72.0)	
Weight for age Z scores			
Severely underweight (Z < - 3) (n = 16)	5 (12.5)	11 (7.0)	0.431
Underweight (Z < - 2) (n = 9)	1 (2.5)	8 (5.1)	
Normal (Z > - 2) (n = 172)	34 (85.0)	138 (87.9)	

4.8.7 Maternal and Child Health service utilization and its effect on underweight status of infants

At end line the number of infants who were stunted had increased to more than half (106, 54.4 %) of the cohort. Those who were underweight had increased from about ten percent (25, 12.7%) to a quarter (48, 24.7%) of the study population. There was no significance between nutritional status and time of initiating ANC. Infants whose mothers-initiated ANC late were 1.7 times more likely to be underweight as compared to those whose mothers began ANC early.

At end of study, 48 (24.5%) of the infant were under weight as measured by their weight for age. There was no statistical significance between MCH services utilized

and infant underweight status. Although the completion of basic vaccination and use of modern family planning methods showed figures less than 0.05, the relationship was insignificant since the confidence interval included one. Infants who had completed the basic vaccination were 2.3 times more likely to have a normal weight (OR 2.321. CI 1.075 – 5.013) as compared to those who had not completed basic vaccination (Table 4.17)

Table 4.15: Maternal and Child Health service utilization among mothers and its relationship on diarrhea prevalence among infants in Matuga Sub County

Characteristics	Infant had diarrhea in past two weeks		P value	OR (95% CI)	RR (95% CI)
	Yes n (%)	No n (%)			
1st ANC initiation			0.289	0.643 (0.283 - 1.460)	
1st trimester	9 (14.5)	28 (20.9)			0.730 (0.397 - 1.342)
After 1st trimester	53 (85.5)	106 (79.1)			1.135 (0.917 - 1.405)
Place of birth			0.402	1.305 (0.700 - 2.435)	
Hospital	40 (64.5)	78 (58.2)			1.202 (0.778 - 1.856)
Not hospital	22 (35.5)	56 (41.8)			0.921 (0.761 - 1.113)
PNC in first two days.			0.213	0.378 (0.078 - 1.836)	
Yes	9 (4.8)	9 (11.7)			0.491 (0.137 - 1.761)
No	40 (95.2)	68 (88.3)			1.299 (0.949 - 1.779)
Completed basic vaccinations			0.522	0.781 (0.366 - 1.668)	
Yes	49 (79.0)	111 (82.8)			0.848 (0.518 - 1.389)
No	13 (21.0)	23 (17.2)			1.086 (0.832 - 1.417)
Using modern F.P			0.075	1.771 (0.940 - 3.337)	
Yes	25 (40.3)	37 (27.6)			1.460 (0.971 - 2.197)
No	37 (59.7)	97 (72.4)			0.824 (0.655 - 1.037)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval; PNC: Post-natal care; F.P: Family planning

Table 4.17: Maternal and Child Health service utilization and its effect on weight for age status of infants in Matuga Sub County

Characteristics	Weight for Age		P value	OR (95% CI)	RR (95% CI)
	Normal n (%)	Underweight n (%)			
Initiation of first ANC			0.182	1.887 (0.735 - 4.845)	
1st trimester	31 (21.2)	6 (12.5)			1.144 (0.965 - 1.356)
After 1st trimester	115 (78.8)	42 (87.5)			0.606 (0.279 - 1.318)
Place of birth			0.508	1.250 (0.646 - 2.420)	
Hospital	90 (61.6)	27 (56.3)			1.058 (0.893 - 1.252)
TBA, home, road	56 (38.4)	21 (43.8)			0.846 (0.517 - 1.385)
PNC in first two days			0.253	3.210 (0.392 - 26.280)	
Yes	10 (11.0)	1 (3.7)			1.201 (0.968 - 1.490)
No	81 (89.0)	26 (96.3)			0.374 (0.056 - 2.497)
Completed basic vaccinations			0.029	2.321 (1.075 - 5.013)	
Yes	124 (84.9)	34 (70.8)			1.284 (0.977 - 1.687)
No	22 (15.1)	14 (29.2)			0.553 (0.334 - 0.918)
Use of modern FP method			0.03	2.231 (1.069 - 4.655)	
Yes	68 (50.0)	13 (31.0)			1.198 (1.019 - 1.407)
No	68 (50.0)	29 (69.0)			0.537 (0.299 - 0.963)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval; PNC: Post Natal Care

4.8.8 Maternal and Child Health service utilization and its effect on anemia status of infants

There was no statistically significant association between maternal and child health services and all infant anemic status. The comparison of anemia status and use of

modern family planning showed a statistically significant relationship (p = 0.044) (Table 4.18).

Table 4.18: Maternal and Child Health service utilization and its effect on anemia status of infants in Matuga Sub County, Kwale County

Characteristics	Anemia status		P value	OR (95% CI)	RR (95% CI)
	Anemic	Normal			
	n (%)	n (%)			
Initiation of 1st ANC			0.934	1.032 (0.493 - 2.158)	
1st trimester	14 (19.2)	23 (18.70			1.020 (0.644 - 1.615)
After 1st trimester	59 (80.8)	100 (81.3)			0.988 (0.748 - 1.306)
Place of birth			0.536	1.207 (0.665 - 2.189)	
Hospital	46 (63.0)	72 (58.5)			1.126 (0.771 - 1.646)
TBA, home, road	27 (37.0)	51 (41.5)			0.933 (0.752 - 1.159)
PNC in first two days			0.256	2.040 (0.585 - 7.116)	
Yes	6 (13.0)	5 (6.8)			1.473 (0.814 - 2.664)
No	40 (87.0)	68 (93.2)			0.722 (0.372 - 1.401)
Completed basic vaccinations			0.323	0.692 (0.332 - 1.439)	
Yes	57 (78.1)	103 (83.7)			0.802 (0.526 - 1.220)
No	16 (21.9)	20 (16.3)			1.159 (0.846 - 1.586)
Using modern F. P methods?			0.044	1.904 (1.013 - 3.576)	
Yes	33 (55.9)	48 (40.0)			1.536 (1.008 - 2.340)
No	26 (44.1)	72 (60.0)			0.807 (0.650 - 1.001)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval; PNC: Postnatal care

4.8.9 Maternal and Child Health service utilization and its effect on stunting status of infants

At end line 106 (54.1%) of the infants were stunted. There was no statistically significant association between maternal and child health services and infant stunting

status except the use of modern family planning methods (p = 0.041, RR: 1.382 (1.012 – 1.886). The risk of stunting among infants whose mothers were not using modern family planning methods prior to the current pregnancy were 1.382 times high as the risk of those who used (Table 4.19).

Table 4.19: Maternal and Child Health service utilization and its effect on stunting status of infants in Matuga Sub County, Kwale County

Characteristics	Stunting Status		P value	OR (95% CI)	RR (95% CI)
	Normal	Stunted			
	n (%)	n (%)			
Initiation of first ANC visit			0.967	1.015 (0.495 - 2.082)	
1st trimester	17 (19.1)	20 (18.9)			1.008 (0.683 - 1.487)
After 1st trimester	72 (80.9)	86 (81.1)			0.993 (0.714 - 1.381)
Place of birth			0.401	0.781 (0.439 - 1.390)	
Hospital	51 (57.3)	67 (63.2)			0.876 (0.645 - 1.190)
Not hospital	38 (42.7)	39 (36.8)			1.121 (0.855 - 1.470)
PNC in first two days			0.224	2.188 (0.605 - 7.913)	
Yes	7 (12.7)	4 (6.3)			1.432 (0.874 - 2.347)
No	48 (87.3)	60 (93.8)			0.655 (0.294 - 1.456)
Completed basic child vaccinations			0.204	1.620 (0.767 - 3.422)	
Yes	76 (85.4)	83 (78.3)			1.324 (0.832 - 2.105)
No	13 (14.6)	23 (21.7)			0.817 (0.613 - 1.089)
Use of modern Family Planning			0.041	1.859 (1.023 - 3.378)	
Yes	45 (53.6)	36 (38.3)			1.382 (1.012 - 1.886)
No	39 (46.4)	58 (61.7)			0.743 (0.554 - 0.996)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval; PNC: Post-natal Care

4.8.10 Nutrition and gender

Nutritional status was tabulated against gender. There was a statistically significant association between gender and stunting (p = 0.0001) as well as gender and weight

for age (p = 0.009). There were more stunted and underweight boys as compared to girls. The risk of being stunted and/ or underweight among the male gender was 1.69 and 1.724 times as high as the risk among the female gender. There was no statistically significant association between gender and anemia status (Table 4.20).

Table 4.20: Association between Nutrition and Gender of infants in Kwale County

	GENDER				
Stunting status	**Male n (%)**	**Female n (%)**	**p value**	**OR (95% CI)**	**RR (95% CI)**
Normal (n = 84)	33 (33.3)	51 (58.0)	0.001	0.363 (0.200 - 0.658	1.690 (1.240 - 2.304)
Stunted (n= 103)	66 (66.7)	37 (42.0)			
WFA status					
Normal (n = 141)	67 (67.7)	74 (84.1)	0.009	0.396 (0.195 - 0.805)	1.724 (1.084 - 2.743)
Underweight (n = 46)	32 (32.3)	14 (15.9)			

RR: Relative risk; OR: Odds ratio; CI: Confidence interval; WFA: Weight for age of infant

4.9 Infant feeding practices and diarrhea patterns in Kwale County.

Majority of the mothers (187, 95.4%) received advice on breast-feeding when they were expectant. The advice was mainly (178, 90.8%) from maternal and child health clinics. At 1st follow up all the children were being breast fed. Seventy-three (37.2%) of the mothers-initiated breastfeeding after the first hour. Reasons for delayed breast-feeding initiation included being in pain, mother having undergone a caesarian section delivery or having no milk. Cleaning the mother's teats before breastfeeding was done by 31 (15.8%) of the mothers. Hand washing before baby handling was done by 61 (31.1%). Majority 145 (74%) of the infants were breastfed on demand.

There was no statistically significant association between complementary feeding and diarrhea occurrence. Although the p value was significant, the confidence interval included one, signifying an insignificant relationship. There was no statistically significant association between infant feeding practices and diarrhea occurrence among infants. (Table 4.21).

Table 4.21: Infant feeding practices and diarrhea patterns among infants in Matuga sub county, Kwale County

Characteristics	Had diarrhea (Past two weeks)		p value	OR (95% CI)	RR (95% CI)
	Yes	No			
Wash hands with soap before handling baby					
Yes, n (%)	22 (36.1)	39 (63.9)	0.715	1.1282 (0.590 - 2.158)	1.082 (0.710 - 1.648)
No, n (%)	39 (33.3)	78 (66.7)			0.959 (0.764 - 1.204)
Sterilize baby feeding bottles / cups by boiling					
			0.736	1.165 (0.478 - 2.842)	
Yes, n (%)	9 (37.5)	15 (62.5)			1.103 (0.629 - 1.935)
No, n (%)	52 (34.0)	101 (66.0)			0.947 (0.681 - 1.317)
Clean teats before breastfeeding the baby					
			0.168	1.735 (0.789 - 3.814)	
Yes, n (%)	14 (45.2)	17 (54.8)			1.403 (0.891 - 2.208)
No, n (%)	47 (32.2)	99 (67.8)			0.809 (0.577 - 1.134)
Number of times fed per day			0.149	0.473 (0.168 - 1.330)	
2 /3 times per day, n (%)	53 (32.1)	112 (67.9)			0.642(.375 - 1.100)
On demand / > / = 4 times per day, n (%)	8 (50)	8 (50)			1.358 (0.823 - 2.241)
Dietary diversity					
No diversity: 1 or 2 varieties, n (%)	35 (29.4)	84 (70.6)	0.091	0.577 (0.304 - 1.094)	0.701 (0.468 - 1.051)
Diversified diet: > /= 3 varieties, n (%)	26 (41.9)	36 (58.1)			1.216 (0.955 - 1.547)
Complementary feeding			0.041	6.554 (0.838 - 51.272)	
Yes, n (%)	61 (33.5)	121 (66.5)			4.692 (0.702 - 31.363)
No, n (%)	1 (7.1)	13 (92.9)			0.716 (0.599 - 0.856)

There was no statistically significant association between breast-feeding initiation, prelacteal feeding, use of colostrum, introduction of complementary food and diarrhea occurrence (Table 4.22).

Table 4.22: Infant feeding practices and diarrhea patterns in Kwale County

Characteristics	Child had diarrhea in last two weeks		P value	O R (CI)	RR (CI)
	Yes	No			
Time of child breastfeed			0.351		
Breastfed on demand	46 (76.7)	99 (82.5)		0.697 (0.326 – 1.492)	0.793 (0.495 – 1.270)
After every 2 - 3 hrs. / when available	14 (23.3)	21 (17.5)			
Breastfeeding Initiation			0.78		
Less than one hour	38 (63.3)	74 (61.2)		1.097 (0.579 – 2.080)	1.064 (0.692 – 1.637)
After an hour to several days	22 (36.7)	47 (38.8)			
Prelacteal feeding done			n.s	0.944 (0.296 – 3.006)	
Yes	4 (9.3)	15 (9.8)			0.955 (0.383 – 2.383)
No	39 (90.7)	138 (90.2)			
Use of colostrum			0.768		
Continued to feed the baby	40 (93.0)	138 (90.2)		1.449 (0.4 – 5.257)	
Removed and poured / had no milk	3 (7.0)	15(9.8)			

RR: Relative risk; OR: Odds ratio; CI: Confidence interval

4.10 Infant feeding practices and nutritional status in Kwale County

4.10.1 Infant feeding practices and anemia status among infants in Kwale County

Infant feeding practices included breastfeeding initiation, age at weaning and dietary diversity. At end line two infants (1.7%) were not on complimentary feeding. Majority (119, 65.7%) of those who were on complimentary feeding were only giving one or two food varieties with maize meal porridge being the most common food. There was a statistical significance between ages at which complementary food

was introduced (p = 0.032) and anemia status. The risk of being anemic among infants who were weaned earlier was 1.735 times as high as the risk of anemia among infants who were weaned at the right age. (RR = 1.735, CI 1.111 – 2.707) more likely to develop anemia compared to those who were weaned after six months. There was no statistically significant association between dietary diversity and anemia status of infants. There was a statistically significant association between the initiation of breastfeeding and anemia. (p = 0.02) The risk of being anemic among children who were initiated to breast feed after one hour or later was 1.314 times as high as the risk of anemia among infants who were initiated to breastfeed within one hour after birth. (RR: 1.314, CI 1.029 – 1.678) more likely to be anemic as compared to those who were given three or more varieties of complementary foods (Table 4.23).

Table 4.23: Infant feeding practices and anemia status among infants in Kwale County

	Anemia Status				
Characteristics	**Anemic**	**Normal**	**P value**	**OR (95% CI)**	**RR (95% CI)**
Age at weaning			**0.032**	2.616 (1.060 - 6.457)	
< 6 months	12 (19.4)	10 (8.4)			1.735 (1.111 - 2.707)
After 6 months	50 (80.6)	109 (91.6)			0.663 (0.415 - 1.061)
Dietary diversity			0.057	0.540 (0.285 - 1.023)	
No diversity: ≤ 3	35 (56.5)	84 (70.6)			
varieties					0.675 (0.454 - 1.005)
Diversified diet: ≥ 4	27 (43.5)	35 (29.4)			
varieties					1.250 (0.976 - 1.602)
Initiation of breastfeeding			**0.02**	0.495 (0.273 - 0.897)	
less than one hour	37 (50.7)	83 (67.5)			0.651 (0.455 - 0.931)
After one hour to	36 (49.3)	40 (32.5)			
several days					1.314 (1.029 - 1.678)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval

4.10.2 Infant feeding practices and stunting status among infants in Matuga Sub County.

There was a statistically significant association between dietary diversity and infants' stunting status (p = 0.0001). The risk of stunting among infants who were fed on three or less varieties of foods was 1.9 times as high as the risk of anemia among those who were fed on four or more varieties of foods (RR: 1.902; 95% CI 1.310 – 2.761). There was no statistically significant association between the age when complementary feeding was started and stunting (0.418) as well as the number of times the infant was fed per day and stunting (Table 4.24).

Table 4.24: Infant feeding practices and stunting status among infants in Matuga sub county, Kwale County

	Stunting Status		**p value**	**OR (95% CI)**	**RR (95% CI)**
Characteristics	**Normal n (%)**	**Stunted n (%)**			
Baby on complementary foods					
Yes (n = 179)	83 (98.8)	96 (99.0)	0.918	0.865 (0.053 - 14.039)	1.073 (0.266 - 4.318)
No (n = 2)	1 (1.2)	1 (1.0)			
At which age did you introduce other foods			0.418	0.681 (0.268 - 1.734)	1.178 (0.817 - 1.701)
< 6 months (n = 21)	8(9.6)	13 (13.5)			
After 6 months (158)	75 (90.4)	83 (86.5)			
Dietary diversity			0.0001	0.283 (0.148 - 0.541)	1.902 (1.310 - 2.761)
No diversity (n = 118)	42 (50.6)	76 (78.4)			
Diversified diet (n = 62)	41 (49.4)	21 (21.6)			
Number of times fed per day			0.469	1.475 (0.512 - 4.247)	0.849 (0.566 - 1.274)
2 /3 times per day (n = 164)	77 (92.8)	87 (89.7)			
On demand / > / = 4 times per day (n = 16)	6 (7.2)	10 (10.3)			

RR: Relative risk; OR: Odds ratio; CI: Confidence interval

4.10.3 Infant feeding practices and weight for age status among infants in Matuga Sub County

There was a statistically significant association between dietary diversity and infants' underweight status (p = 0.009). The risk of being underweight among infants who were fed on three or less than three varieties of foods was 2.4 times (RR: 2.364; 95% CI 1.172 – 4.769) as high as the risk of underweight among infants fed on more than three varies of food. There was no statistically significant association between the age when complementary foods were introduced and weight for age status as well as the number of times the infant is fed per day and weight for age status (Table 4.25).

Table 4.25: Infant feeding practices and underweight status among infants in Matuga sub County, Kwale County

Characteristics	Weight for age		P value	OR (95% CI)	RR (95% CI)
	Normal	Underweight			
Infant age on introduction of complementary foods			0.841	1.114 (0.386 - 3.218)	
< 6 months	17 (12.5)	5 (11.4)			1.026 (0.804 - 1.309)
After 6 months	119 (87.5)	39 (88.6)			0.921 (0.407 - 2.085)
Feeding cutlery			0.206		
Cup and spoon (n = 121)	88 (64.7)	33 (75.0)			
Feeding bottle (n = 59)	48 (35.3)	11 (25.0)			0.894 (0.759 - 1.053)
Number of feeds per day			0.507	1.457 (0.477 - 4.450)	
2 /3 times per day (n = 164)	125 (91.9)	39 (88.6)			0.761 (0.350 - 1.655)
On demand / (n = 16)	11 (8.1)	5 (11.4)			
Dietary diversity			0.009	0.337 (0.146 - 0.781)	
No diversity n= 118	82 (60.3)	36 (81.8)			0.798 (0.685 - 0.930)
Diversified diet n = 62)	54 (39.7)	8 (18.2)			2.364 (1.172 - 4.769)

RR: Relative risk; OR: Odds ratio; CI: Confidence interval

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATION

5.1 DISCUSSION

This chapter discusses results of the study and how they relate to the objectives on the effect of maternal and child health services utilization and feeding practices on morbidity and nutritional status of infants. It also gives a conclusion of the study and makes recommendations.

5.1.1 Maternal and child health service utilization

The maternal and child health services covered under this study were: antenatal care, delivery care, postnatal care and use of modern family planning methods.

5.1.1.1 Antenatal care utilization

All the women in this study attended at least one antenatal care clinic. Sixty six percent attended four or more times during the entire pregnancy. Twenty percent (55) appropriately attended antenatal care clinics as recommended by World Health Organization. Appropriate antenatal care utilization in this study was low. The prevalence of ANC initiation compares with that reported in KDHS, 2014, which was 20% nationally, 16.2% in rural parts of Kenya and 17.6% at the coastal part of Kenya (KDHS, 2014). The total number of visits done during the entire pregnancy is however lower than what has been reported both nationally (57.6 %) and at the coastal region (62.3 %). The ANC prevalence compares to studies done in Kwale and South Sudan where it was 32% and 42% respectively (Brown et al, 2008 and Mugo et al, 2015). Majority of the women (225, 80.4%) started ANC visits during the second and third trimester. This finding is similar to a study done in Malindi and Kilifi along the Kenyan Coast which reported 68% of women starting ANC at trimester two (Dorah Chorongo *et.al.,* 2016). The late initiation of ANC can be due to lack of awareness on the importance of early initiation of ANC and stigma associated to teenage pregnancy which is high in Kwale County. Delayed ANC initiation has been associated with many reasons including finances, culture around pregnancy disclosure, pregnancy wantedness, distance to health facilities and perceptions on the need to start ANC early (Jiwani, 2020). In this study, delayed ANC initiation could have been mainly due to perceptions on the need to start early

and the stigma associated to pregnancy in teenage girls. This could be true from the number of mothers who had no formal education and teenage pregnancies.

5.1.1.2 Health facility delivery

In this study, some mothers delivered in homes with the aid of traditional birth attendants or relatives, while a few delivered on their way to hospitals. The prevalence of delivering at a health facility (60.4 %) is similar to the national one (61%) as reported in KDHS (KDHS 2014). Delivery at places other than health facilities was supported with reasons like preference of traditional birth attendant, encouragement from mothers, distance to the facilities, giving birth on the way to hospital, and labor occurring at night. These are similar to findings of a study in Uganda (Kawungezi *et al.,* 2015) where mothers gave reasons like the decision of the husbands or the TBA is the only one they know. Another study among the Maasai community in Magadi Sub County, in Kenya showed much lower (39 %) prevalence of delivering at the health facilities. The study reported that high parity, distance from the health facility, women not being final decision makers on place of birth contributed to the high number that delivered away from health facilities. (Karanja et al., 2018). Women in Kwale may have similar challenges since means of transport in the rural parts is mainly motorbikes that are not comfortable for a mother in labor pain. The decision on where to delivery is made by elderly women more so for the new mothers. Another study in North West Tanzania (Konje et al., 2020) reported that women viewed giving birth as a normal process that can be at home. Hospital delivery was for complicated pregnancy and labor. This is a common believe among many African cultures and it will continue being asset back to delivering at health facilities when women are not empowered through formal education.

5.1.1.3 Post Natal Care

The postnatal care in this study referred to care given the first two days after delivery. The number of mothers who received postnatal care was very low (12, 10.1%), three quarters (9, 75%) of whom had gone through caesarian delivery. This prevalence is far below the national level (52.9 %). The prevalence is also much lower as compared to other studies done in North Shoa, Ethiopia, North west Ethiopia and Nigeria where it was 28.4%, 57.5% and 37 % respectively (Akibu *et al.,*

2018; Wudineh *et al.,* 2018; Somefun 2016). Another study in Northern Ethiopia, reported that most mothers were unaware of postnatal care. Mothers who attended at least four antenatal care visits or lived in urban areas were more likely to have postnatal care as compared to those living in rural areas or having attended ANC fewer times. (Berhe et al., 2019). Although Mothers who deliver at home need to visit health facilities within 48 hours for review by a health care provider, cultural practices among natives in Kwale require mothers to stay away from their husbands and new born babies to be kept away from the public for up to 40 days (Matsuyama *et al.,* 2013). This culture could be a contributing factor towards poor adherence to PNC for mothers who deliver both at home and at health facilities.

5.1.1.4 Use of modern Family planning Methods

The use of modern family planning prior to pregnancy within the study cohort was low (62, 32.6 %). The prevalence was lower than the national (58.0 %), coastal region (38.3 %) as well as that of Kwale County (38.2%) as reported in KDHS (KDHS 2014). Kenya is however among the sub Saharan countries that have had tremendous improvement in the increase in modern contraceptive prevalence rate among married people (Cahill *et al.*, 2018). The modern family planning prevalence in Kenya differs from one community to another. Its higher in urban settings as compared to rural areas. A study in western Kenya (Juma, 2015) reported that age, level of education and knowledge on family planning benefits were some of the hindrances to embracing modern family planning methods. These factors could have contributed towards low use of family planning in the study cohort since the number that had formal education was very low. Low education levels can affects both the understanding and uptake of the practice that may be contrary to the cultural beliefs and practices. A study in Ghana (Apanga, 2015) that reported a low adherence to modern family planning reported that mothers with high parity and high education levels were most likely to use modern family planning methods as compared to those with fewer children and no formal education. Low use of modern family planning methods has been associated with misconceptions about family planning methods, husbands' opposition, as well as fear of side effects (Yadav, 2020). A study in Togo (Koffi, 2018) that engaged men in family planning talks reported men strongly

disapproving women's unilateral decisions on family planning. Such disapprovals can be reduced through clarification of misconceptions about family planning by sensitizing both men and women on benefits of family planning.

5.1.2 Infant Feeding Practices

The infant feeding practices covered in this study included: prelacteal feeding, breastfeeding initiation, exclusive breastfeeding, complementary feeding initiation, complementary feeding frequency and dietary diversity during complementary feeding.

5.1.2.1 Pre lacteal feeding

This was minimally done (9.2%) with most mothers giving water and glucose solution before breastfeeding. The prevalence is close to that reported nationally which ranges from 6 to 25 % according to regions with those in rural areas having higher (17%) as compared to those who live in the urban areas (12%) (KDHS, 2014). This finding is contrary to those in other studies done in Nairobi, South Sudan, Ethiopia and Nigeria which reported higher prevalence of 26.8%, 59%, 25.3%, and 58% respectively of pre lacteal feeding (Lakati *et al.*, 2010; Tongun *et al.,* 2018; Temesgen *et al.*, 2018; El-Gilany *et al.*, 2014). Lack of maternal formal education, colostrum avoidance, home delivery, lack of knowledge on the risks of pre lacteal feeding are some of the factors that have been reported to promote pre lacteal feeding (Sorrie,2020, Amele, 2019, Tongun et al., 2018). Some countries have reported higher prevalence of pre lacteal feeding as shown in a study in Vietnam that showed 73.3% (Nguyen *et al.,* 2013). The wide difference is attributable to the study having been in a rural set up. Pre lacteal feeding has been reported to be more rampant in urban set ups as compared to rural areas (Tekaly, 2018).

Colostrum avoidance among the mothers was low (8.2%). This is similar to other studies done in Ethiopia that reported a prevalence of 13.5% and 12.0% colostrum avoidance (Legesse *et al.*, 2015, Yimer, 2018).

5.1.2.2 Early Breast-feeding Initiation

Breast-feeding should be initiated within the first hour after a child is born except for HIV positive mothers who may not wish to breastfeed. In this study more than a third

of the mothers (37%) initiated breastfeeding one hour after delivery. Delayed Breastfeeding initiation increases the chances for pre lacteal feeding. The prevalence of breastfeeding initiation was similar to national one (62%) as reported in KDHS (KDHS 2014). A study in the Middle East reported that breast-feeding initiation is associated with mode of delivery, prelacteal feeding and rooming in (Alzaheb, 2017). Other studies in India have reported prevalence of early initiation of breastfeeding at 43.8% and 78% respectively. (Dhami et al., 2021 and Bansal, 2021). The wide range of differences in the prevalence indicates the wider margin that exists from one community to another and from one geographical area to another. Majority of the babies in the study cohort were born through normal delivery as opposed to the caesarean section mode. This increased the chances of initiating breastfeeding within the first hour of delivery for most mothers.

5.1.2.3 Exclusive Breastfeeding practices

The prevalence of exclusive breastfeeding in this study was 87.8%. This was higher than the national level of 61% as reported by KDHS (KDHS, 2014). This is contrary to studies done Brazil and in informal settlements of Nairobi that reported EBF at 5% and 2 % respectively (Maciel, 2018, Kimani Murage *et al.,* 2011). The prevalence however is similar to a study in Southern Ethiopia that reported 86.6% EBF (Hoche, 2018). Another study in India reported exclusive breastfeeding prevalence of 58.7% (Dhami et al., 2021). The high EBF prevalence can be attributable to the study cohort being mostly of housewives. Housewives are able to balance their working time to attend to infants as demanded. A study in Ghana (Nkrumah, 2020) that was looking at challenges of EBF among working mothers, reported family- work life balance as one of the hindrances in exclusive breastfeeding since work environment is away from infants. Studies in the Middle East (Alzaheb, 2017) and Ethiopia (Ayalew, 2020; Tsegaw, 2021) have reported some of the determinants of exclusive breastfeeding to include, antenatal care, postnatal care, support of husband, no breast complication, female infant, age and mode of delivery. Studies in Congo and Rwanda, reported that caregivers knowledge as well as beliefs attached to breastfeeding in community and social networks as factors that determine if a child is exclusively breastfed (Wood, 2020 and Umugwaneza, 2021). Friends and mothers

are trusted for advice since they have more experience than new mothers. This contributed to some of the mothers giving water to new borns with a belief that one cannot live without water.

5.1.2.4 Complementary Feeding Practices

Timely introduction of complementary foods is important to ensure that the infant has sufficient nutrients since breastmilk is insufficient after 6 months. The complementary feeding timing, frequency and diversity of complementary foods can affect an infant's nutritional status. In this study cohort, 12.2% had early introduction of complementary foods. Early complementary foods introduction can lead to infant malnutrition since it can affect the breastmilk quantity. This prevalence is similar to that of studies done in Eastern and southern Ethiopia, which reported 19 % and 13.4% (Semahegn, 2014, Hoche, 2018). It is however contrary to other studies done in informal settlements of Nairobi, Brazil, Tanzania and Saudi Arabia, which recorded higher prevalence of 98%, 95%, 91.2% and 62.5% respectively (Kimani Murage *et al.*, 2011, Maciel, 2018, Masuke et al., 2021 & Alzaheb, 2017). A study in Rwanda (Umugwaneza, 2021), reported that beliefs like complementary feeding must be started with liquids was a barrier to optimal infant feeding practices. The low early complementary feed introduction in the study cohort could be attributable to the geographical region. The level of poverty in rural households could have contributed to the kind of foods available for the infants.

Although more than half (58.1%) had a minimum meal frequency, very few (6.6%) met the minimum dietary diversity. The prevalence is contrary to that of other studies done in (Nigeria, Tanzania, Saudi Arabia, Myanmar, India and Indonesia) where dietary diversity was reported as 31.5%, 26% 15.7%, 25%, 15.1% and 39% respectively (Udoh, 2016; Masuke et al., 2021, Chaudhary 2018; Mya 2,019; Chhabra,2021 & Ahmad 2018). Some studies have shown varying meal frequencies as reported in studies done in Tanzania and different parts of India as 40.3%, 27.4% and 60.6% respectively (Masuke et al., 2021; Dhami et al., 2021; Chhabra, 2021).

In the study cohort, the wide differences between the meal frequency and dietary diversity could be attributable to maternal formal education levels. The mothers are

well aware that infants need food frequently but the kind of food labelled, as baby food was mainly maize flour porridge with limited or no diversity.

5.1.3 Antenatal care utilization and sociodemographic characteristics

More than half (141, 50.4%) of the mothers had no formal schooling. Less than ten percent (24, 8.6%) had secondary or tertiary education. Majority (206, 73.6%) were housewives. Majority of the husbands (87.1%) had no formal schooling or only primary school level. Findings of this study showed a significant association between low ANC attendance and having no formal schooling ($p = 0.001$) as well as parity ($p = 0.0001$). A mother without any formal education was four times (OR = 4.687 (1.765 – 12.447) more likely to initiate ANC later as compared to those with some formal education. The results are similar to those for a study in Nigeria that showed an increase in age, education level and monthly wage were associated with an increase in Maternal and Child Health service utilization (Agunwa et al. 2017). Another study in Ghana reported that the social economic characteristics of mothers had an influence on maternal and child health service utilization (Nuamah, 2019). This finding is similar to studies done in Tharaka Nithi County which reported 52% prevalence of ANC and the uptake of ANC being associated with maternal education and parity among other factors (Eliphas, 2017). In this study mothers without any formal education were seven times more likely to initiate antenatal clinics late as compared to those with high school education and above. The findings are similar to those in other studies conducted in Nyandarua, in Kenya and Brazil that reported that poor education level is a hindrance to ANC attendance (Wanjira, 2011, Bernades, 2014). A study in India also reported associations between inadequate utilization of ANC and high parity, low education level as well as poor economic status (Sohag, 2013). The high number of teenage mothers can promote late initiation of ANC due to stigma associated with having the pregnancy and late pregnancy disclosure. Lack of Knowledge about pregnancy, pregnancy disclosure, lack of power to make decisions, lack of money, shame for teenagers and cultural beliefs attached to adolescent pregnancy have been reported as some of the reasons for adolescent expectant mothers starting ANC late or infrequently (Exavery, 2013; KDHS, 2014; Kisuule, 2013). Majority of the expectant mothers had between two and four children

(42.1%) while a quarter (25.7%) were first time mothers. This could have contributed to low antenatal initiation and attendance other studies done have reported older multiparous women to visit ANC in late pregnancy because of being accustomed to pregnancy experience, or feeling they have heard all advice from health professionals. Further a study in Brazil reported women with higher parity facing pressure associated with multiple number of children in their care hence affecting ANC attendance (Bernardes, 2014). In this study multiparous and grand multiparous women (75.8 %) initiated ANC visits late. Late initiation and utilization of ANC could be resulting from perceptions of previous pregnancies, time management and scarce resources for big families. It is possible that multiparous mothers, who have greater experience, feel more confident during pregnancy and consider antenatal care less. About a fifth (17.3%) of those who started clinics late were teenagers. The findings are similar with a study in Mulago, Kampala which reported that pregnancy disclosure affects timing of ANC initiation among teenage mothers to be. Late recognition of pregnancy among teenagers has also reported to delay ANC initiation (Kisuule, 2013). Mothers who had no formal education were 4.7 times more likely to start attending ANC clinics late. The findings are similar to those of a study done in Tanzania which reported that mothers with higher education have higher probability of initiating and seeking ANC services earlier (Gross, 2012). A study carried out in Kenya reported that absence of check-ups for complications during pregnancy, antenatal care from unskilled attendants and missing of tetanus vaccine were associated with neonatal mortality in Kenya (Arunda, 2017).

It was further shown that there is a strong relationship between employment and ANC service utilization where unemployed women were less likely to attend ANC in comparison to the employed due to lack of money. These findings are similar to studies done in Pakistan and Eastern Sudan which reported initiation and utilization of ANC being significantly associated with high parity, low education attainment and unemployment (Sohag, 2013, Ali, 2010). A study in Congo by Nsibu *et. al.*, (2016), showed that early ANC initiation is positively associated with the reproductive age, level of education, proximity to the health facility and presence of a male partner. Factors that hindered early initiation of ANC included: cost of service, distance to

the facility, time for waiting for service and stigmatization of teenage and elderly mothers.

5.1.4 Antenatal care service utilization and nutritional status of infants, Kwale County.

This study showed no significant relationship between ANC utilization and stunting among infants. It is contrary to a study conducted in northern Ghana by Ali *et al.*, (2017), which showed that stunting is less prevalent among children whose mothers attended ANC for at least 4 times during pregnancy. Another study in Kumasi, Ghana reported that appropriate utilization of antenatal care has a positive influence to maternal and child outcomes (Asundep, 2014). In this study there were more boys who were stunted and underweight as compared to girls. The results are similar to a study in Ecuador which reported that being male was associated to stunting. In this study there was no significant association between ANC initiation and malaria and diarrhea occurrences.

5.1.5 Infant feeding practices and diarrhea patterns in, Kwale County.

In this study there was no statistical significance between breast feeding initiation, pre lacteal feeding and use of colostrum with diarrhea. There was a statistically significant relationship between introduction of complementary feeding and diarrhea.. It has been documented that optimal infant feeding practices reduces diarrhea incidences (Gizaw *et al.,* 2017). A study carried out in sub Saharan African countries by Ogbo *et al.,* (2017) showed that early breastfeeding initiation and exclusive breastfeeding were significantly associated with lower risk of diarrhea while introduction of complementary feeding was associated to higher risks of diarrhea. A study in Ethiopia (Nigatu, 2019), reported early cessation of exclusive breastfeeding leads to increased episodes of diarrhea and other childhood morbidity. In this study, there was no statistical relationship between exclusive breastfeeding and diarrhea episodes. This can be attributable to the cohort having mostly breastfed their children.

5.1.6 Infant feeding practices and nutritional status in, Kwale County.

In this study, initiation of breast-feeding had a statistically significant association with anemia. Earlier initiation of breastfeeding reduce the chances of pre lacteal feeding which when practiced affects the quantity of milk for breastfeeding. The complementary feeding, meal frequency, introduction of complementary food and dietary diversity were significantly associated to anemia. Infants who did not have a diversified diet were more likely to be anemic as compared to those who had a diversified diet. A study in Iran reported that infants who are exclusively breast fed for six months and more have increased chances of being anemic (Dalili et al., 2015). Another study in Msambweni, Kwale County reported that infants who were exclusively breast-fed had better iron status and high hemoglobin levels. (Uyoga, 2017)

Dietary diversity was significantly associated with stunting and underweight status of infants. Infants who did not have a diversified diet were more likely to be stunted and underweight as compared to those who had a diversified diet. There was no significant association between early initiation of breastfeeding and complementary food initiation with stunting. These findings are similar to that reported in Rwanda that showed no relationship between initiation of breastfeeding and stunting (Nsereko, 2018). Other studies in Tanzania, Malawi and India, reported that poor dietary diversity was associated with increased risks of stunting in infants (Masuke et al., 2021; Twabi, 2021 & Chhabra, 2021). Appropriate complementary feeding has been reported to decrease risks of stunting, wasting and underweight in infants (Twabi, 2021). This could be a result of delayed breastfeeding initiation increasing the chances of prelacteal feeding which in turn affects the quantity of milk produced by the lactating mother.

5.2 CONCLUSIONS

1. The proportion of expectant mothers who appropriately utilized antenatal care services in Matuga sub County, Kwale County was low.

2. Antenatal care service utilization did not increase or decrease malaria and diarrhea episodes nor have influence on the nutritional status of infants

3. Some infant feeding practices influenced diarrhea episodes and affected the nutritional status of infants

4. There was poor knowledge on infant feeding & practices among the mother. The low levels of formal education among mothers can be a hindrance in their understanding when they attend clinics and are guided on what to do. The importance of initiating ANC clinics early is unknown.

5. The information given during the ANC visits does not affect the mother's decisions on childcare. This could be due to low levels of education hence the poor uptake and application of the information. The positive outcome could be attributable to the nature of the mothers. Only a quarter were first time mothers hence the possibility of having some experience on how to take care of a newborn baby despite initiating ANC later during pregnancy.

   The null hypothesis was rejected.

5.3 RECOMMENDATIONS

This study therefore recommends as follows:

1) There is need to implement education and health policies at the grassroots in the region. Lack of formal education is a hindrance to uptake of knowledge other than the known cultural practices. Information given at health facilities during the MCH visits may not be clear due to low levels of formal education. Although there is free basic education in public primary schools and free maternity and delivery care in public health facilities policies must be directed towards making the services more attractive to be embraced by majority of the population.

2) There is need for awareness by the ministry of health on the importance of early ANC initiation and attendance to both the mother and infant. The language of communication at the health facilities must be simplified to the level of the mothers. Involvement of male partners in antenatal care can improve maternal and child health outcomes.

3) Appropriate infant feeding practices and its importance in promotion of infant nutritional status must be emphasized without demonizing the cultural practices of the community. Enhanced awareness can be done through schools and at MCH clinics on the common practices and optimal infant feeding practices to discourage traditional practices that increase the risks of negative outcomes. Mothers need to be empowered with information on nutritional value of locally available foods for complementary feeding and be guided on when to introduce foods, food diversity and frequency.

4) Mothers need to be economically empowered to meet the basic need of providing food for their families; this will lessen the burden of malnutrition among children. Encourage mothers to work hard and help in providing food for their families.

5) There is need to do more research on:

    a. The reasons for low levels of education among mothers despite free primary education

    b. Reasons for late initiation of antenatal care despite free maternity services

    c. Why stunting and underweight is more prevalent in boys than in girls.

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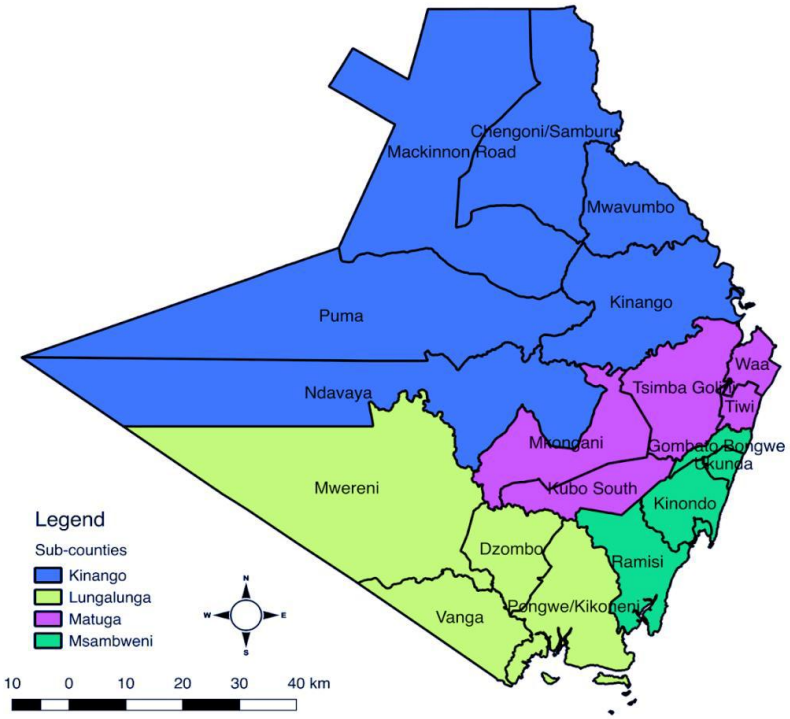
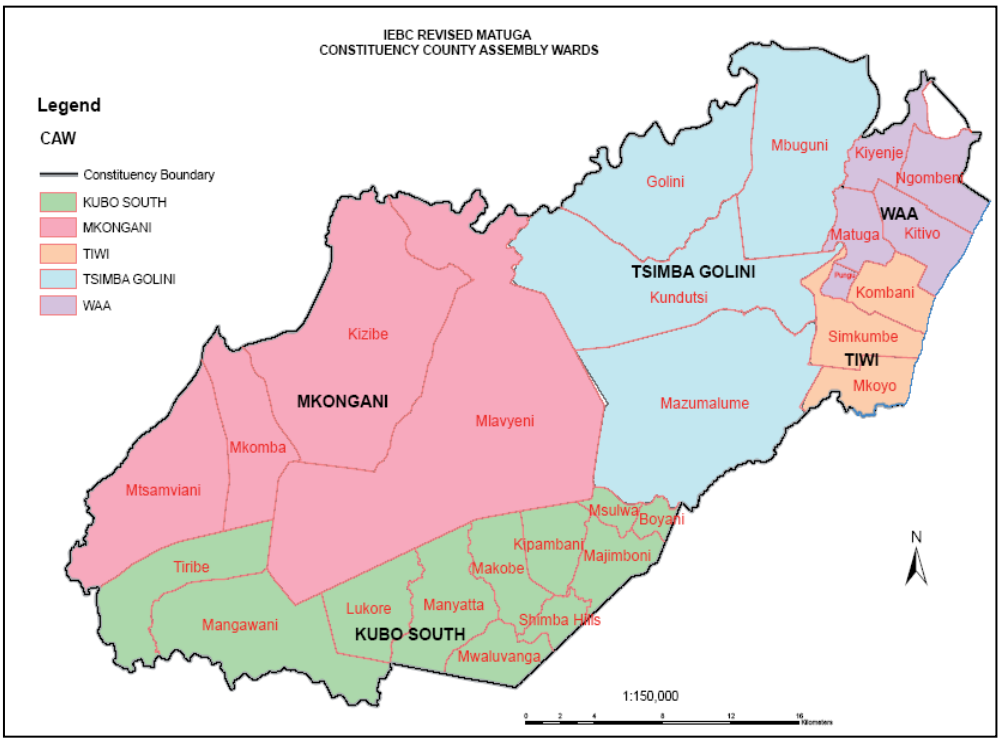
APPENDICES

Appendix I: Map of Study Site

A: Kwale County



B: Matuga sub-County



Appendix II: Informed Consent Document

Effect of maternal and child health service utilization and feeding practices on morbidity and nutritional status of infants in Kwale County, Kenya

Principal Investigator: Norah Mumeme Wekesa

Dear Mother:

My name is Norah Mumeme. We have started a research project on Maternal and child Health Service Utilization and feeding practices on morbidity and nutritional status of infants in Kwale County, Kenya in collaboration with Kenya Medical Research Institute, Nagasaki University and Jomo Kenyatta University of Agriculture and Technology.

This research is to assess the use of health services by mothers and children and relate it to malaria and diarrhea patterns and nutritional status of babies

During registration, your information and that of your household will be taken. This is only for identification and research purposes; it will not be in any way linked to your confidential records or any other data.

Research Procedures: We will talk to you while at the MCH clinic to record maternal and child health service utilization and socio economic statuses of your family. After you give birth we will meet you at the clinic or at outreach centres (depending on where you like to take your baby for monthly check ups) and record the health condition of your child. Furthermore we would like to take some information from (MCH) booklet about you and your child at birth and date of birth. We will take current length, head circumference and weight. We will also check if your child has anemia without taking blood. The child will be checked at 1 month then after every 4 months until when they reach 12 months of age. During every visit length, weight, head circumference, anemia status, malaria and diarrhea status as well as immunization coverage will be recorded.

Risks:

There are minimal risks of participating in this study. The determination of anemia (hemoglobin level) will be by a non-invasive method and will not involve the drawing of blood. You are free to stop your participation at any time even after starting.

Benefits:

By participating in this study, there is no direct benefit to you and your child but the information you give will help health providers to give better services for you and your child. A referral will be done when there is need. If you and your child will be

found sick at home will be referred to health center and followed up to ensure appropriate care has been provided.

Confidentiality: We will keep personal information about you and your child confidential and separate from any other information you give, and will use the information for research purposes only. No names of respondents will appear in any report. No report will allow anyone to relate results to your household. The final results of this research will be presented as publications in peer reviewed journals and a thesis for academic purposes and will be provided to the health system to help improve services

Participant's Rights: Your participation in this study is voluntary and if you decline to participate, you and your child will not be denied any services that are normally available to you. You have a right to decide whether to be interviewed or not, and you can stop the interview at any time, if you are not satisfied with this study.

Contact Information: If you have any questions concerning the interview, or any inquiry, please do not hesitate to contact the following:

1. Norah Mumeme: Centre of Public Health Research, KEMRI, Tel 0724 439 159

2. The Secretary, KEMRI- Scientific Ethical Review Unit (SERU) P.O. Box 54840-00200, Nairobi; Telephone numbers: 020-2722541, 0722205901, 0733400003; Email address: seru@kemri.org

I have understood the information given. I have had the opportunity to ask questions about it and all questions that I have asked have been answered to my satisfaction.

[…...] Yes, I give consent for me and my child's participation in this research and understand that I have the right to withdraw from at it any time.

[…] NO, I don't consent to participate in this research.

Participant: _____ Signature: _____

Researcher: _____ Signature: _____

Thank you very much.

Appendix IIB: Informed Consent Document in Swahili

Matumizi ya huduma za afya kwa wamama na watoto na lishe zinavyohusiana na maradhi na afya ya watoto wachanga, Kaunti ya Kwale.

Mtafiti Mkuu: Norah Mumeme Wekesa

Fomu ya Ridhaa

Mama

Jina langu ni Norah Mumeme. Tuko na mradi wa kuchunguza matumizi ya huduma za afya kwa kina mama na watoto wadogo na lishe na vile zinaathiri afya ya watoto katika Kaunti ya Kwale. Utafiti unafanywa tukishirikiana na Taasisi ya utafiti ya KEMRI, taasisi ya kuchunguza magonjwa ya kitropiki ya Chuo Kikuu cha Nagasaki na Chuo kikuu cha Jomo Kenyatta cha Kilimo Na Tekinologia. (JKUAT)

Utafiti huu una nia ya kutambua matumizi ya huduma za afya kwa mama waja wazito na watoto wachanga na lishe na jinsi zinavyochangia kwa afya ya watoto wa umri huo.

Wakati wa usajili, taarifa kukuhusu na ile kuhusu jammii yako zitachukuliwa. Hii ni kwa nia ya kukutambulisha na utafiti. Taarifa hiyo haitatumika kamwe kwa kukuhusisha wewe na habari yeyote utakayotoa ama itakayopatikana kuhusu afya yako na motto wako. Habari hii, itahifadhiwa kwa usiri mkuu, pasipo kuieneza kwa umma.

Utaratibu wa Utafiti:

Tutaongea nawe wakati utakapokuwa umeenda kwa huduma za kliniki ya wamama wajawazito. Tutarekodi hali yako ya afya, matumizi yako ya huduma za afya na hali yako ya kiuchumi. Mtoto atakapozaliwa tutakutana nawe pamoja na mtoto wako ili kujua hali yako ya afya na ile ya mwanao. Tutapima urefu, uzito na kichwa cha mtoto pamoja na kujua afya ya damu ya mtoto / kwa kuangalia kama ako na damu ya kutosha wakati tukiwatembelea. Tutapendelea pia kujua kama mtoto ameadhirika na maradhi ya malaria na kuendesha. Kadhalika tutafwatilia kujua kama mtoto anaendelea na chanjo vyema.

Uchunguzi huu utatupa uwezo wa kupendekeza kwa wamama wajawazito njia mwafaka za kujitunza na kutunza watoto wao kwa afya bora. Kwa lengo hili, tunakuomba uturuhusu kuongea nawe wakati unakuja kliniki kukuuliza maswali kukuhusu na baadaye kuhusu mtoto wako atakapozaliwa.

Hatari:
Hakuna madhara makubwa yanayoweza kupatikana kutokana na wewe na mwanao kushiriki kwa utafiti huu. Utaweza kujua afya ya mtoto wako ya damu, kwa njia zisizohusisha utoaji wa damu.

Faida:
Kwa kuhusika na mradi huu hakuna faida ya ki fedha lakini kuhusika kwako kutawezesha kutolewa kwa huduma za afya kwako na kwa mwanao ziwe bora zaidi

kutokana na majibu unayotoa.Utajulishwa kuhusu hali yako ya afya. Watoto na akina mama ambao watapatikana na magonjwa watatumwa kwenye kituo cha afya na kufuatiliwa ili kuhakikisha wamepata huduma za afya zinazofaa.

Usiri:

Rekodi yoyote kuhusiana na utambulisho wako au matokeo ya utafiti yatabaki siri. Jina lako halitarekodiwa katika ripoti yoyote ya matokeo, na utapokea nakala ya fomu hii ya idhini. Unakaribishwa kuuliza maswali kabla ya kuhusishwa kwenye utafiti huu na wakati wowote baada ya hapo. Wajumbe wa timu ya utafiti wako daima tayari kuyajibu maswali yako wakati wowote wa kazi.

Haki za mshiriki:

Kushiriki katika utafiti huu ni hiari kabisa na kama wewe ukibadili nia ya kuhusishwa kwenye utafiti huu, unaweza kuacha wakati wowote bila madhara yoyote kwako. Hautanyimwa huduma yoyote unayohitaji hata baada ya kuondoka kutoka utafiti.

Maelezo ya kuwasiliana:

Kama una maswali yoyote kuhusu mahojiano, au maswali, tafadhali usisite wasiliana na wafuatao:

1. Norah Mumeme; CPHR, KEMRI katika nambari ya simu 0724 439 159
2. Katibu wa Kamati ya Maadili ya KEMRI kupitia anwani SLP 54840-00200, nambari za simu, +254 (020) 2722541, +254 722 205 901, +254 733 400 003, barua pepe: seru@kemri.org

Nimesoma maelezo na nikauliza maswali ili kuelewa Zaidi. Nimejibiwa kikamilifu.

Ndio […...] ninatoa ithini ya kuhusika kwa huu mradi pamoja na mwanangu atakayezaliwa. Ninaelewa kuwa nina haki ya kukatiza kuhusika kwangu wakati wowote.

La […...] sitoi ithini ya kuhusika kwa huu mradi huu.

Mhusika: _____ Sahihi: _____

Mtafiti: _____ Sahihi: _____

Appendix III: Questionnaire

A: Questionnaire on Maternal Characteristics – Baseline data

(Mother at 20 weeks pregnancy and above)

DATE: ____ / ____ / 20___ Mother MCH No. _____ Interviewer: _____

Effect of maternal and child health service utilization and feeding practices on morbidity and nutritional status of infants in Kwale County, Kenya

Dear Mother

My name is Norah. Am a student at Jomo Kenyatta University of Agriculture and Technology in Thika. I would like to ask some questions about you and your child and all the people who live together in your house.

1. In what month and year were you born?
   i. Date _____ Unknown_____
   ii. Month _____ Unknown _____
   iii. Year _____ Unknown _____
2. How old are you? _____ Years old.
3. What is your current weight? (as indicated in MCH booklet) Weight _____kg
4. What is your current hemoglobin level? (as indicated in the Mch booklet) and when was is it taken (gestational age)? Hb _____Gestational age _____
5. Which is your area of residence?
   1. Mwalu -Tserezani [ ]
   2. Mwalu -Mtsangatamu [ ]
   3. Mwalu -Pande [ ]
   4. Mwalu -Mlafyeni [ ]
   5. Mwalu -Sirira [ ]
   6. Mwalu -Komanazilale [ ]
   7. Mwalu -Gandini [ ]
   8. Mwalu -Kaoyeni [ ]
   9. Mwalu -Burani [ ]
   10. Mwalu -Mwamtobo [ ]
   11. Mwalu -Mwele [ ]
   12. Mwalu -Pengo [ ]
   13. Mwalu -Kibuyuni [ ]
   14. Mwalu -Myugutu [ ]
   15. Mwalu -Sagalato [ ]

16. Mwalu -Chirazini [ ]
17. Mwalu -Kajiweni [ ]
18. Mwalu -Puma [ ]
19. Mwalu -Kirazini [ ]
20. Mwalu - Dzanikeni [ ]
21. Kizibe [ ]
22. Kizi – Vumirira [ ]
23. Kizi – Bahakanda [ ]
24. Kizi – Kaoyeni [ ]
25. Kizi – Mwaryarya [ ]
26. Kizi – Mbadzi [ ]
27. Kizi – Vidziyani [ ]
28. Kizi – Mwamtobo [ ]
29. Kizi – maponda [ ]
30. Kizi – Kirewe [ ]
31. Kizi – Mirihini [ ]
32. Kizi – Kajiweni [ ]
33. Other (Give name) _____ [ ]

6. Marital status

1). Married / staying with a man [ ]
2). Single (Skip to Q15) [ ]
3). Divorced (Skip to Q15) [ ]
4). Widowed (Skip to Q15) [ ]

7. If married are you in a polygamous or monogamous type of family

1). Monogamous (Skip to Q10) [ ]
2). Polygamous [ ]

8. If polygamous, how many wives are you in the extended family

1). 2 [ ]
2). 3 [ ]
3). > 4 [ ]

9. Are you the 1st, 2nd, 3rd or 4th wife?

1).First [ ]
2). Second [ ]
3).Third [ ]
4). Fourth [ ]

5). Other (Specify) [ ]

10. If married, when was your husband born? 0) Unknown; Day ____ Month _____ Year _____

11. What is the age of your husband? _____ years old; I don't know _____

12. If you are married, what is the highest level of your spouse's formal education?

1). No schooling [ ]
2). Primary [ ]
3). Secondary [ ]
4).College [ ]

13. If married what is your spouse's occupation / form of employment

1). Not employed [ ]
2). Casual laborer [ ]
3).Government employee (Tsc. PSc,) [ ]
4). Other (specify) _____ [ ]

14. What is your religion?

1). Muslim [ ]
2). Christian [ ]
3). Other (Specify) [ ]

15. What is your highest level of formal education?

1). No schooling [ ]
2). Primary school [ ]
3). Secondary [ ]
4) College and above [ ]

16. What is your occupation / form of employment

1). Not employed [ ]
2). Casual laborer [ ]
3). Government employee [ ]
4). Other (Specify) _____ [ ]

17. Do you take alcohol?

1. Yes [ ]
2. No [ ]

18. If you take alcohol, how often do you use it?

1. Occasionally [ ]
2. Everyday [ ]
3. Never [ ]

19. Do you smoke cigarette?

1. Yes [ ]
2. No [ ]

PARITY AND MCH SERVICES

20. How many children do you have?

1. None (Skip to 23) [ ]
2. One [ ]
3. Two [ ]
4. Three [ ]
5. Four [ ]
6. Five [ ]
7. Six [ ]
8. Seven [ ]
9. Eight [ ]
10. Other(Specify) _____ [ ]

21. When was the last time you gave birth (even if your child is no longer living)

1. Date _____ Unknown ____
2. Month _____ Unknown ____
3. Year _____ Unknown ____

22. What is the age of your youngest child?

1. Below two years [ ]
2. Three years [ ]
3. Four years [ ]
4. Five years [ ]
5. More than five years [ ]

23. This pregnancy is which number in your lifetime

1). First [ ]
2). Second [ ]
3). Third [ ]
4). Fourth [ ]
5). Fifth and above [ ]

24. Have you been using family planning services?

1). Yes [ ]
2). No [ ]

25. Did you plan for this pregnancy?

1). Yes (Skip to Q 27) [ ]
2). No I wanted a baby later [ ]
3). No, I just found out I was expectant [ ]

26. If No why didn't you use family planning services?

1). My husband doesn't approve [ ]
2). It didn't work for me so I stopped [ ]
3). I used but still got pregnant [ ]
4). Other reason (specify) _____ [ ]

27. When was your first ANC visit?

1). 8 weeks [ ]
2). 16 weeks [ ]

3). 24 weeks [ ]
4). 28 weeks [ ]
5). 32 weeks [ ]
6). 36 weeks [ ]

28. How many antenatal care visits have you made to the clinic?

1). This is the first [ ]
2). Less than three [ ]
3). More than four [ ]

29. Have you received any anti tetanus (tetanus toxoid) injection in hospital? (confirm from MCH book)

1. Yes [ ]
2. No [ ]

98. I don't know [ ]

30. Do you sleep under an insecticide treated mosquito net (ITN)?

1. Yes [ ]
2. No [ ]

31. Have you received any iron / folic tablets (micro nutrient supplementation)? (MCH book)

1). Yes [ ]
2). No [ ]
98).Unknown [ ]

SOCIO ECONOMIC CHARACTERISTICS

32. In your home do you have the following :

1. Electricity, TV, radio, Mobile phone, Solar, Motorbike, bicycle [ ]
2. Radio, Mobile phone, bicycle [ ]
3. Radio, Motorike [ ]
4. Radio [ ]
5. Motorbike, phone [ ]
6. Solar, Radio, Mobile phone, Bicycle [ ]
7. Radio, mobile phone [ ]
8. Mobile phone, bicycle [ ]

9. Solar, Mobile phone, Radio [ ]
10. Electricity, TV, Mobile phone, Motor bike [ ]
11. Other / Non of the above [ ]

33. Do members of your family own any agricultural Land
    1). Yes [ ]
    2). No [ ]
34. What types of crops are grown in that farm?
    a. Maize, Cassava, cashewnuts, coconuts, mangoes [ ]
    b. Cassava, cassava, cashewnuts, coconuts [ ]
    c. Maize, cassava, Coconuts [ ]
    d. Maize, Cassava, Kales, Cashewnuts, Tangerines [ ]
    e. Maize, Cashewnuts, coconuts, Mangoes, Oranges, Local vegetable [ ]
    f. Maize, Cassava, Cashewnuts, coconuts, mangoes, oranges [ ]
    g. Maize, Cassava, Coconuts, mangoes, oranges [ ]
    h. Maize, Cassava,cashewnuts [ ]
    i. Maize Cassava, Oranges [ ]
    j. Maize Cassava, Beans, Local vegetables, Mangoes [ ]
    k. Maize, Cassava, Tangerines, Oranges, Local vegetables [ ]
    l. Maize Cassava, Tomatoes,Kales, Cashewnuts, Coconuts, Mangoes, Oranges, Tangerines, Pineaples, Beans [ ]
    m. Maize, cassava, Local vegetables, Beans [ ]
    n. Others _____ [ ]
35. How does your family get food during dry season?
    1). Employment [ ]
    2). Daily casual work [ ]
    3). Stored food [ ]
    4). Provide labour for food [ ]
    5). Other (specify) [ ]
36. Does your family have the following animals?
    1. Local cattle and goats [ ]
    2. Local cattle, goats and poultry [ ]
    3. Local cattle, goats, grade cattle, poultry [ ]

4. Local cattle and poultry [ ]
5. Goats and poultry [ ]
6. Grade animals and poultry [ ]
7. Poultry [ ]

37. Who decides on what food is bought / cooked in your family?

1). Yourself / mother [ ]
2). Husband [ ]
3). Mother in law [ ]
4). Other (specify) [ ]

38. How much do you use on family food on a monthly basis?

1). < Kshs 5,000 [ ]
2). Kshs 5, 000 – 10, 000 [ ]
3). > Kshs 10, 000 [ ]
4). I don't have a job [ ]
5). I can't estimate [ ]

39. How many individuals (children and adults) are there in your family?

1). < / = 4 [ ]
2). 5-10 people [ ]
3). More than10 People [ ]

40. In your family how many children are:

1. Below two years: 0 [ ] 1 [ ] 2 [ ]
2. Between 2- 5 years old: 0 [ ] 1 [ ] 2 [ ] 3 [ ]
3. Are above 5 years old: 0 [ ]; 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] > 5 [ ]

41. Which is the main source of drinking water for your family?

1).Piped drinking water in residence [ ]
2).Piped drinking water outside residence [ ]
3). Borehole / well for drinking water [ ]
4). River / canal water for drinking [ ]
5).Rain water for drinking [ ]
6).Others (specify) [ ]

42. What is the main type of toilet facility used by your family?

1). Septic tank /flashing toilet [ ]
2). Water sealed / slab toilet [ ]
3). Open latrine [ ]
4). Bush / field as latrine [ ]

5). Other type (specify) [ ]

43. What is the main type of flooring materials in your house?

1).Murram [ ]
2) Earth /soil [ ]
2). Wooden / planks [ ]
3). Cement [ ]
4). Other type (specify) [ ]

44. What is the main wall material for your house?

1). Cane/ palm/ trunks [ ]
2). Rudimentary walls [ ]
3).Tin [ ]
4). Bricks, blocks, concrete [ ]
5). Stones [ ]
6). Cement [ ]
7). Other type (specify) [ ]

45. What is the main roofing material for your house?

1). Grass/ palm tree leaves [ ]
2). Iron sheets [ ]
3). Tiles [ ]
4). Cement [ ]
5). Other type (Specify) [ ]

Thank you.

B: Maternal and Infant Health Questionnaire – Follow up questionnaire
DATE: ____ / ____ / 20__ Interviewer:
_____
Effect of maternal and child health service utilization and feeding practices on morbidity and nutritional status of infants in Kwale County, Kenya
Dear Mother / caregiver
My name is Norah. I am a student at Jomo Kenyatta University of Agriculture and Technology in Thika. I would like to ask some questions about you and your child and all the people who live together in your house.
Child Name _____ Child ID
_____
Mother's Name _____ Village
_____
CHILD CHARACTERISTICS

1. When did you give birth? (Confirm with MCH card if available)
    1. Date _____ Unknown _____
    2. Month _____ Unknown _____
    3. Year _____ Unknown _____
2. How is your child now
    1. Alive [ ]
    2. Dead [ ]
    3. Died within the first 4 weeks [ ]
3. Is (name) a girl or a boy?
    1. Boy/ male ___
    2. Girl / female ___
4. Which is the birth order of (name)?
    1. First born [ ]
    2. Second born [ ]
    3. Third born [ ]
    4. Fourth born [ ]
    5. Fifth born or more [ ]
5. What was (name) birth weight? MCH ___ Recall _____
    1. _____ grams
6. What is (name) progressive measurements indicated below: (Confirm from MCH booklet)

ITEM	CURRENT	SIX WEEKS	MONTH TWO	MONTH THREE	MONTH FOUR
Weight (g)					
Length (cms)					
Head circumference					
Hemoglobin level					

MATERNAL HEALTH SERVICES

7. When did you start attending antenatal clinics (confirm from MCH book)
    1. Before pregnancy was 3 months [ ]
    2. After 3 months but before 6 months [ ]
    3. After six months [ ]
8. Total antenatal clinics attended during entire pregnancy
    1. < / = 4 [ ]
    2. > 5 [ ]
    3. None [ ]
9. If you didn't attend the clinics at all or went for less than four times what was the reason for that?
    1. Distance [ ]
    2. Check for any complications [ ]
    3. Was visiting TBA too [ ]
    4. Other (specify) _____ [ ]
10. At which place did you delivery your baby?

1. Health facility [ ]
2. Home (self/ relative) [ ]
3. TBA home [ ]
4. Other (specify) _____ [ ]

11. How did you decide on the place of delivery marked above ?
    1. For safety / medical advice [ ]
    2. Was on my way to hospital [ ]
    3. I prefer TBA [ ]
    4. TBA are friendly / cheaper [ ]
    5. The distance to the health facility [ ]
12. How long were you in labour pains before giving birth?
    1. < 6 hrs. [ ]
    2. 6 – 12 hrs. [ ]
    3. 12 – 24 hrs. [ ]
    4. Can't remember [ ]
13. Did you give birth normally or through a caesarian section (operation)

1). Normal/ vaginal [ ]
2). Instrument/ CS [ ]

14. If you delivered at hospital how long did you rest at the hospital before going home:
    1. < 2 hrs. [ ]
    2. 2- 4 hrs. [ ]
    3. 1 day [ ]
    4. 2 days [ ]
    5. 3- 5 days [ ]
15. Did you receive any advice about breastfeeding during pregnancy?

1. Yes [ ]
2. No [ ]

16. What was the source of your advice on breastfeeding?
    1. Health care workers [ ]
    2. Mother in law [ ]
    3. Family members [ ]
    4. Friends [ ]
    5. Other (specify) _____ [ ]

BREASTFEEDING PRACTICES AND KNOWLEDGE

17. Has (name) ever been breastfed?
    1. Yes [ ]
    2. No [ ]
18. Is (name) breastfeeding?
    1. Yes [ ]
    2. No [ ]
19. How long did you take before starting to breastfeed your baby for the first time
    1. Immediately [ ]
    2. < 1 hour [ ]
    3. 1 hour – 1 day [ ]
20. If you took more than an hour what was the reason for taking that long?
    1. Had pain due to CS delivery [ ]
    2. Had no milk [ ]
    3. Had back pain [ ]
    4. Baby was given formula milk [ ]
    5. Too much pain to breastfeed. [ ]

21. What was your baby given before being breastfed for the first time?
    1. Nothing [ ]
    2. Water [ ]
    3. Formula milk [ ]
    4. Other (specify) _____ [ ]
22. What did you do to the first milk in the first three days (colostrum)
    1. Give to the baby [ ]
    2. Express and pour [ ]
    3. Had no milk for 1 week [ ]

4. Other (specify) _____ [ ]

23. Did you receive any breastfeeding information after delivery?

1. Yes [ ]
2. No [ ]

24. If yes, what was the source of your information?

1. ANC clinics [ ]
2. Mother in law [ ]
3. Mother [ ]
4. Relative [ ]
5. Other (Specify) [ ]

25. How frequent do you breastfeed (name)?

1. On demand [ ]
2. After every 2-3 hours [ ]
3. When available [ ]
4. At night [ ]

26. Have you experienced any of the following?

1. Feeling of having insufficient breastmilk Yes[ ]No [ ]
2. Infant has difficult suckling Yes [ ] No [ ]
3. Pain during breastfeeding Yes [ ] No [ ]
4. Swollen breasts / engorgement Yes [ ] No [ ]
5. Cracked nipples Yes [ ] No [ ]

27. How did you deal with the challenge (s) named above?

1. Had received advice during pregnancy [ ]
2. Received support in hospital 1st 3 days after delivery [ ]
3. Advised by family member [ ]

4. Other (specify) _____
[ ]

28. The statements below are about infant feeding practices. Indicate using a tick whether you strongly agree, agree, disagree, strongly disagree or are not sure about them.

		Strongly agree	Agree	Disagree	Strongly disagree	I don't know
i.	A new born baby should start breastfeeding within the first 1 hour after being born					
ii.	Infant cannot be sustained on breast milk alone until 6 months					
iii.	Infant will be thirsty if not given water					
iv.	Infant will be hungry if not given formula within 24 hours					
v.	Crying is a sign breastmilk is not enough					
vi.	EBF till 6 months is not sufficient for the baby					
vii.	Combining breast milk and formula milk under 6 months is best for good nutrition					
viii.	Infant should be fed on demand					
ix.	Proper attachment to breast is not needed for sufficient milk production					
x.	Women with small breasts have insufficient milk for infants					

xi.	Feeding infant on formula and other foods does not affect breast milk production					
xii.	EBF < 6months doesn't provide all nutrients needed for optimal growth and development					
xiii.	Breastmilk can be expressed and kept for later use					

COMPLEMENTARY FEEDING PRACTICES

29. Is (name) being fed on other foods other than breast milk?
    1. Yes [ ]
    2. No (Skip to Q 35) [ ]

30. At what age did you introduce the foods?
    1. Only before my breasts started producing milk. [ ]
    2. 4 weeks [ ]
    3. 8 weeks [ ]
    4. 12 weeks [ ]
    5. 16 weeks [ ]
    6. 20 weeks [ ]
    7. 24 weeks [ ]
    8. After 24 weeks [ ]

31. What kind of foods are you giving to your baby?
    1. Plain water [ ]
    2. Infant formula (NAN, Lactogen) [ ]

3. Milk (Tinned, powdered, packet, fresh from cow / goat) [ ]
4. Thin porridge [ ]
5. Mashed potatoes [ ]
6. Other (specify) _____ [ ]

32. How many times is (name) fed per day?
1. 2 times / day [ ]
2. 3 times / day [ ]
3. 4 times / day [ ]
4. Fed on demand [ ]

33. If you are giving other foods beside breast milk, how do you feed (name)?
1. Feeding bottle [ ]
2. Cup and spoon [ ]
3. Other (specify) _____ [ ]

INDIVIDUAL DIETARY DIVERSITY

34. What kind of foods did (name) eat yesterday?
1. Grains, roots, tubers (Porridge, potatoes, rice, ugali) [ ]
2. Legumes, nuts and seeds (ndengu, pojo, beans, njugu, korosho) [ ]
3. Dairy products (Milk, Yogurt, Cheese) [ ]
4. Flesh foods (Meat, fish, poultry, and organ meats) [ ]
5. Eggs [ ]
6. Dark green leafy vegetable [ ]

7. Vitamin A rich fruits and vegetables (mango, pawpaw, passion, loquats) [ ]
8. Other fruits and vegetables (avocado, banana, cashewnut fruit, mabuyu, tende, pineapple, limau, mkwaju, water melon, ndimu) [ ]

SICKNESS

35. In the last 2 weeks has your (name) had diarrhea?
    1). Yes [ ]
    2). No [ ]
36. If yes, how many times did (name) diarrhea?
    1). < 2 times / day for < 3 days [ ]
    2). 3times /day for 3-5 days [ ]
37. How did you manage the diarrhea?
    1). I took the baby to hospital [ ]
    2). I bought some drugs from the shop [ ]
    3). I gave some traditional herbs [ ]
    4). Other (specify) _____ [ ]
38. In the last two weeks has (name) been treated of malaria?
    1. Yes [ ]
    2. No [ ]
39. Where was the treatment given
    1. Hospital [ ]
    2. Home [ ]
40. If the treatment was given at home, how did you know (name) had malaria?
    1. Signs(fever, lack of appetite) [ ]

2. Advised by relative (mother in law, sister) [ ]
3. Tested in the lab [ ]
4. Other (Specify) _____ [ ]

41. Which vaccinations has (name) been given? (Confirm with MCH card)
    1. BCG at birth [ ]
    2. DPT / Hep B + Hib 1 at 6 weeks [ ]; 10 weeks[ ] ; 14 weeks [ ]
    3. OPV at 6 weeks [ ]; 10 weeks [ ]; 14 weeks [ ]
    4. Rotavirus at 6 weeks [ ]; at 10 weeks [ ]
    5. Other (Specify) _____ [ ]

42. Are you using any modern family planning method
    1). Yes [ ] 2). No [ ]

43. If No, What is the reason for that?
    1. Am still planning for it. [ ]
    2. Am ready for another baby [ ]
    3. I use traditional / natural means of FP. [ ]
    4. My husband does not allow [ ]
    5. Other (specify) _____ [ ]

44. Do you sleep under an ITN with (name)?
    1. Yes [ ]
    2. No [ ]

Thank you

C: QUESTIONNAIRE for follow up: infants at ages - 8 months and above

DATE: ____ / ____ / _____ Interviewer: _____

Effect of maternal and child health service utilization and feeding practices on morbidity and nutritional status of infants in Kwale County, Kenya

Dear Mother / caregiver

My name is Norah. I am a student at Jomo Kenyatta University of Agriculture and Technology in Thika. I would like to ask some questions about you and your child and all the people who live together in your house.

CHILD CHARACTERISTICS

Child Name _____Child ID _____

Mother's Name_____ Village _____

1. Current weight (grams) _____
2. Current Length (cm) _____
3. Head circumference (cm) _____
4. Chest circumference (cm) _____
5. Current hemoglobin level _____

BREASTFEEDING PRACTICES

6. Is (name) breastfeeding?
   1. Yes [ ]
   2. No [ ]
   3. I have never breast fed [ ]

7. If yes how frequent do you breastfeed (name)?
   1. On demand [ ]
   2. After every 2-3 hours [ ]
   3. When available [ ]
   4. At night [ ]

8. Do you experience any of the following? 1).Yes; 2). No;
   i. Feeling of having insufficient breastmilk [ ]
   ii. Pain during breastfeeding [ ]
   iii. Cracked nipples [ ]

9. How do you deal with such challenges?
   1). Seek help from health facility [ ]
   2). Seek advice from family members [ ]
   3). Other (specify) _____ [ ]

COMPLEMENTARY FEEDING PRACTICES

10. Have you started feeding your baby on other foods other than breast milk?
    1. Yes [ ]

2. No [ ]

11. If yes, at which age did you introduce the foods?

1). < 6months [ ]

2). only before my breasts started producing milk. [ ]

3). > 6 months [ ]

12. What kind of foods are you giving to your baby

1. Plain water [ ]
2. Infant formula milk (NAN, Lactogen) [ ]
3. Milk (Tinned, powdered, fresh from Cow/ goat) [ ]
4. Commercial Juice or juice drinks (Quencher, Afia, Soda) [ ]
5. Thin porridge [ ]
6. Mashed potatoes [ ]
7. Clear broth [ ]
8. Yogurt [ ]
9. Any other liquids (Name) _____ [ ]

13. How many times is the baby fed per day?

1. 2 times / day [ ]
2. 3 times / day [ ]
3. 4 times a day [ ]
4. on demand [ ]

14. How do you feed your baby?

1. Cup and spoon [ ]
2. Feeding bottle [ ]
3. Other (specify) _____ [ ]

INDIVIDUAL DIETARY DIVERSITY

15. What kind of foods did your child eat yesterday? Tick where applicable

1. Grains, roots, tubers (e.g. Ugali, Porridge, rice, potatoes, cassava) [ ]
2. Legumes, nuts and seeds (e.g. Beans, Lentils,) [ ]
3. Dairy products (e.g. Milk, Yogurt, Cheese) [ ]
4. Flesh foods (e.g. Meat, fish, poultry, and organ meats) [ ]

5. Eggs [ ]
6. Dark green leafy vegetable [ ]
7. Vitamin A rich fruits and vegetables (mango, pawpaw, passion, loquats) [ ]
8. Other fruits and vegetables (avocado,banana,cashewnut fruit, mabuyu, tende, pineapple, limau, mkwaju, water melon, ndimu) [ ]

Child vaccination and sickness

16. In the last 2 weeks has (name) had diarrhea?
    1. Yes [ ]
    2. No [ ]
17. If yes, how many times did (name) diarrhea
    1. < 2 times / day for < 3 days [ ]
    2. 3 times/day for 3-5 days [ ]
    3. Unknown [ ]

18. How did you manage / stop (name)'s diarrhea?
    1. I took the child to hospital/ health centre [ ]
    2. I treated at home with medicine from chemist/ self-prescription [ ]
    3. I used some herbs at home [ ]
    4. It cleared without treatment [ ]
    5. Other (specify) _____ [ ]
19. Does (name) sleep under an insecticide treated net (ITN)?
    1. Yes [ ]
    2. No [ ]
20. In the last two weeks has (name) been treated / suffered from malaria?
    1. Yes [ ]
    2. No [ ]

21. If (name) had malaria, how did s/he get treatment?

1. I took the child to hospital [ ]
2. I bought drugs from the chemist [ ]
3. I gave traditional herbs [ ]

22. Which of the following do you do to ensure good hygiene for the baby?

1). Yes; 2). No

i. Change baby clothing when soiled [ ]

ii. Hand wash with soap before handling baby [ ]

iii. Clean teats before breastfeeding [ ]

iv. Sterilize baby feeding bottle by boiling [ ]

v. Others (Specify) _____ [ ]

23. Are you using any modern family planning method

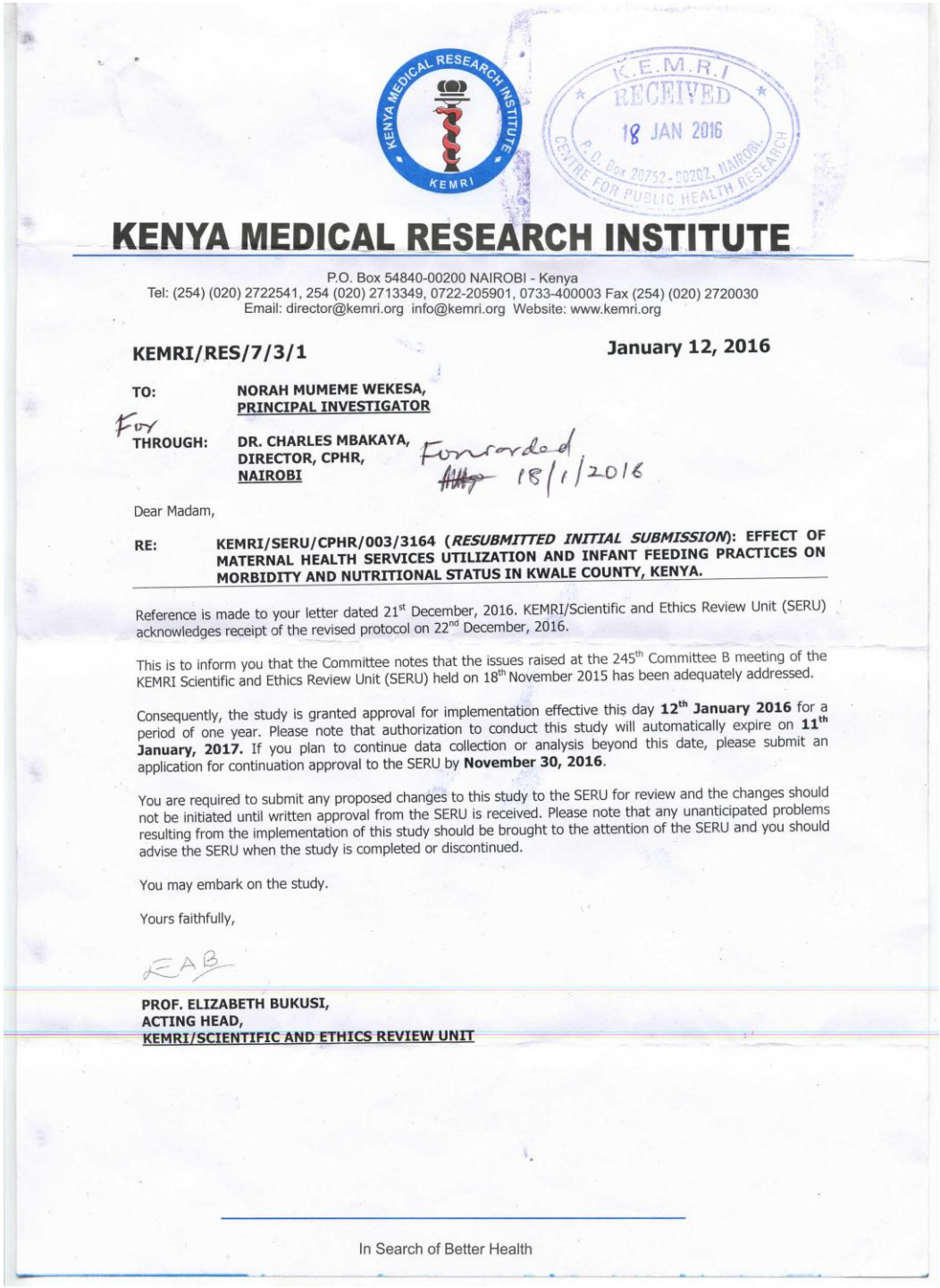
1). Yes [ ] 2). No [ ]

24. If No, What is the reason for that?

1. Am still planning for it. [ ]
2. Am ready for another baby [ ]
3. I use traditional / natural means of FP. [ ]
4. My husband does not allow [ ]
5. Other (specify) _____ [ ]

Thank you

Appendix IV: SERU Approval for the Study



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KEMRI/RES/7/3/1 **January 12, 2016**

TO: **NORAH MUMEME WEKESA,**
PRINCIPAL INVESTIGATOR

For
THROUGH: **DR. CHARLES MBAKAYA,**
DIRECTOR, CPHR,
NAIROBI

Forwarded 18/1/2016

Dear Madam,

RE: **KEMRI/SERU/CPHR/003/3164 (*RESUBMITTED INITIAL SUBMISSION*): EFFECT OF MATERNAL HEALTH SERVICES UTILIZATION AND INFANT FEEDING PRACTICES ON MORBIDITY AND NUTRITIONAL STATUS IN KWALE COUNTY, KENYA.**

Reference is made to your letter dated 21st December, 2016. KEMRI/Scientific and Ethics Review Unit (SERU) acknowledges receipt of the revised protocol on 22nd December, 2016.

This is to inform you that the Committee notes that the issues raised at the 245th Committee B meeting of the KEMRI Scientific and Ethics Review Unit (SERU) held on 18th November 2015 has been adequately addressed.

Consequently, the study is granted approval for implementation effective this day **12th January 2016** for a period of one year. Please note that authorization to conduct this study will automatically expire on **11th January, 2017.** If you plan to continue data collection or analysis beyond this date, please submit an application for continuation approval to the SERU by **November 30, 2016**.

You are required to submit any proposed changes to this study to the SERU for review and the changes should not be initiated until written approval from the SERU is received. Please note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of the SERU and you should advise the SERU when the study is completed or discontinued.

You may embark on the study.

Yours faithfully,

EAB

PROF. ELIZABETH BUKUSI,
ACTING HEAD,
KEMRI/SCIENTIFIC AND ETHICS REVIEW UNIT

In Search of Better Health

Appendix V: Publications

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INFANT FEEDING KNOWLEDGE AND PRACTICES AMONG LACTATING MOTHERS IN KWALE COUNTY, KENYA
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INFANT FEEDING KNOWLEDGE AND PRACTICES AMONG LACTATING MOTHERS IN KWALE COUNTY, KENYA

NORAH M. WEKESA, ANSELIMO. MAKOKHA, VIOLET. W. WANJIHIA, RAPHAEL W. LIHANA, SATOSHI KANEKO and MOHAMED KARAMA

ABSTRACT

Background: **Lactating mothers' knowledge on infant feeding and its practices are key determinants of children's nutritional status and future food habits. In Kenya, stunting rates among children below five years is 26 %.** *Objective:* **To assess infant feeding knowledge and practices among lactating mothers in Kwale County where stunting stands at 29%.**
Design: **A cross sectional study.** *Setting:* **Maternal and Child Health clinics or respective households.**
Subjects: **Lactating mothers who were part of a baseline survey.**
Results: **One hundred and ninety-seven lactating mothers were interviewed. Most mothers (65.3%) had knowledge of breastfeeding within the first hour and majority (91.8%), gave colostrum to the newly born. Majority (84%) had no knowledge on expressing a mother's milk for later use. Complementary feeds had been introduced by 48.2% of which more than a quarter gave before six months. Maize meal porridge was the common weaning food in addition to mother's milk. There was a significant relationship between: breast feeding advice given during antenatal care and use of colostrum ($r = 0.165$, $N = 197$, $p = 0.021$); breastfeeding initiation and pre-lacteal feeding ($r = -0.264$, $N = 197$, $p = 0.0001$); parity and place of birth ($r = 0.184$, $N = 197$, $p = 0.001$) as well as pre-lacteal feeding and use of colostrum ($r = -0.289$, $N = 197$, $p = 0.0001$).**
Conclusion: **There was poor knowledge of preservation of mother's milk and dietary diversity during complementary feeding. There is need for an intervention to empower mothers on best practices for optimal growth and development of infants.**

BACKGROUND

Infant feeding practices are the principal determinant of a young child's nutritional status and future food habits. Appropriate infant feeding, namely, early initiation of breastfeeding with colostrum as the first food, no pre-lacteal feeding, exclusive breastfeeding to six months, followed by the introduction of appropriate complementary foods with continued breastfeeding, is important for survival as well as physical growth and mental development of the child (1), (2). It is important to identify feeding practices that place infants at risk of developing malnutrition. This helps determine environmental factors that can be modified and be amenable to intervention (3), (4). Studies on infant and young child feeding have indicated that inappropriate feeding practices can have profound

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High Parity and Low Education are Predictors of Late Antenatal Care initiation among Women in Maternal and Child Health Clinics in Kwale County, Kenya

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Abstract

Background: Timely initiation of antenatal care (ANC) clinic attendance during pregnancy helps identify and reduce risk factors in pregnancy. The World Health Organization (WHO) recommends at least four ANC visits during pregnancy with the first being in the first trimester. In most developing countries including Kenya, the first visit occurs late in some mothers. **Aim:** This study describes ANC attendance by mothers at clinics in Kwale County. It was conducted with the aim of determining factors affecting ANC attendance in two dispensaries in Kwale County. **Design:** A cross-sectional study using quantitative research methods was adopted. **Results:** Two hundred and eighty pregnant women at a gestational age of 20 weeks and above were recruited and interviewed. All the mothers made at least one ANC visit with 19.6% starting in the first trimester. About a quarter of the mothers (24.0 %) came for the first time at nine months gestational age. There was a significant relationship between late ANC initiation and low or no formal education ($p = 0.001$) as well as higher parity ($p = 0.0001$). Mothers with no formal education were four times more likely to initiate ANC clinics late compared to those with secondary or tertiary education (OR = 4.687; CI 1.765 – 12.447). The likelihood of mothers whose husbands had no formal education initiating ANC later was almost three times more likely as compared to those who had secondary or tertiary education (OR = 2.775; CI 1.107 – 6.960). Multiparous women were more likely to initiate ANC clinics earlier compared to grand multiparous women (OR = 0.513; CI 0.223 – 1.183). **Conclusion:** Timely initiation and appropriate ANC attendance was low in Kwale. Low education level and high parity had a significant negative association with timely ANC initiation. There is need for community mobilization and enlightening on the importance of timely ANC attendance for mothers to reap the full benefits of maternal and child health care.

Keywords: Maternal, Antenatal, Child, Health, Parity, Multiparous, Grand multiparous.