EFFECTS OF *m*HEALTH TECHNOLOGIES ON UPTAKE OF ROUTINE GROWTH MONITORING AMONG CAREGIVERS OF CHIDREN 9-24 MONTHS IN NYAMIRA 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

This work is dedicated to my loving family, husband Justus, sons Elisha and Elihu and daughter Elisheva, parents, brothers and sisters for their untiring and persistent support and encouragement to pursue this course.

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DEFINITION OF OPERATIONAL TERMS

Caregivers **:** a person who is responsible for attending to the daily physical, emotional and social needs of children aged 9-24 months.

Caregivers' knowledge **:** information that caregivers have with regards to routine growth monitoring of children aged 9-24 months.

Caregivers' attitude **:** feelings/opinions (positive or negative) caregivers have about routine growth monitoring for children aged 9-24 months

Effects **:** positive or negative changes on uptake of routine growth monitoring among caregivers of children aged 9-24 months as a result of implementation of *m*Health intervention

Growth monitoring chart **:** curves developed by WHO that are used by health care providers to follow a child's growth over a period of time.

Health care provider **:** a person trained formally and stationed in child clinics in health facilities to provide welfare services to children including routine growth monitoring

Mobile Health technologies (*m*Health): use of mobile phone applications (STM and VC) to enhance routine growth monitoring among caregivers of children aged 9-24 months

Routine Growth Monitoring **:** regular measurement of a child's size (height, weight, head circumference) to ensure normality in growth

Short Text Message (STM) **:** mobile phone application for sending messages on routine growth monitoring to caregivers of children aged 9-24 months

Voice Call (VC) **:** mobile phone application that allows conversation with caregivers of children aged 9-24 months through calling using available network

ABBREVIATIONS AND ACRONYMS

ANC **:** Antenatal Care

APGAR **:** Activity, Pulse, Grimace, Appearance, and Respiration

BJOG **:** British Journal of Obstetrics and Gynaecology

BMC **:** BioMed Central

BMI **:** Body Mass Index

CIDP **:** County Integrated Development Plan

CI **:** Confidence Interval (95%)

CSA **:** Central Statistical Agency

ECPCP **:** European Confederation of Primary Care Paediatricians

GHO **:** Global Health Observatory

GMC **:** Growth Monitoring Curve

GMP **:** Growth Monitoring and Promotion

GOBI **:** Growth Monitoring, Oral rehydration, Breastfeeding and Immunization

GPRS **:** General Packet Radio Service

GPS **:** Global Positioning System

HCP **:** Healthcare Provider

HE **:** Health Education

ICT **:** Information and Communications Technology

IMCI **:** Integrated Management of Childhood Illnesses

IDS **:** Institute of Development Studies

IJIRAS **:** International Journal of Innovative Research and Advanced Studies

JAMA **:** Journal of the American Medical Association

JMIR **:** Journal of Medical Internet Research

KII **:** Key Informant Interview

KNBS **:** Kenya National Bureau of Statistics

KPHC **:** Kenya Population and Housing Census

LMIC **:** Low-and Middle-Income Countries

MNCH **:** Maternal, Neonatal and Child Health

MOH **:** Ministry of Health

***m*HEALTH** : Mobile Health

NACOSTI **:** National Commission for Science, Technology and Innovation

NSW **:** New South Wales

OR **:** Odds Ratio

PAHO **:** Pan American Health Organization

PDAs **:** Personal Digital Assistants

PI **:** Principal Investigator

PLoS **:** Public Library of Science

RA **:** Research Assistant

RGM **:** Routine Growth Monitoring

SD **:** Standard Deviation

SDGs **:** Sustainable Development Goals

SIM **:** Subscriber Identity Module

SMS **:** Short Message Service

STM **:** Short Text Message

SPSS **:** Statistical Package for Social Sciences

TCA **:** To Come Again

UNICEF **:** United Nations Children's' Fund

USA **:** United States of America

USAID **:** United States International Agency for Development

VC **:** Voice Call

VHV **:** Village Health Volunteer

WHO **:** World Health Organization

ABSTRACT

Routine growth monitoring (RGM) of children is important in assessing their health and nutritional status. This provides opportunities for implementation of interventions aimed at reducing under five mortality rates, infectious diseases and malnutrition thus ensuring achievement of the Sustainable Development Goals (SDGs) targeting good health and wellbeing. Despite the increased use of mobile health technologies in improving child health, there is still low uptake of routine growth monitoring services for children aged 9-24 months. The main objective of this study was to find out the effects of mobile health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya. This was a quasi-experimental study. The experiment arms received Short Text Message (STM) and Voice Call (VC). Questionnaires with open and closed-ended questions and Key Informant Interview Guide (KII) were used to collect information from the respondents. Nyamira County, health facilities and KII were chosen using purposive sampling method. Caregivers of children aged 9 months were chosen using census method and the study intervention was assigned to the selected health facilities using simple random sampling method. Results of the study at baseline revealed that only 118(65.6%) of the caregivers knew the meaning of RGM. Caregivers' knowledge on the meaning of RGM showed a significant association with level of education (χ^2=29.238; df=4; p<0.0001), occupation (p=0.001), monthly income (p=0.015) and residence (χ^2=6.332; df=1; p=0.012). There was tremendous improvement in the proportion of caregivers 154(85.6%) who knew the meaning of routine growth monitoring after implementation of study intervention. All the caregivers 60(100%) who received STM as well as all caregivers 60(100%) who received VC knew the meaning RGM which was an improvement of 30% and 35% respectively at the endline. Pre-intervention result revealed that 11(18.3%) caregivers from intervention arm 1 (STM), 13(21.7%) from intervention arm 2 (VC) and 14(13.3%) caregivers from control arm maintained RGM prior to recruitment in the last 8 months. Post-intervention result analysis revealed that 51(85%) caregivers from intervention arm 1, 50(83.3%) from intervention arm 2 and 2(3.3%) caregivers from control arm complied with RGM schedule. Post intervention analysis of the results revealed that caregivers from intervention arm1 9(100%) and intervention arm2 10(100%) took their children to nearby health facilities. Caregivers from the control arm gave various reasons for skipping RGM including that they forgot their TCAs 58(100%), Healthcare providers did not tell them 53(91.4%), their children were not sick 52(89.7%) among other reasons. The analysis demonstrates that in month 1 those caregivers who received STM were 6.875 times more likely to take their children for RGM compared to the control (OR = 6.875; 95 CI: 3.591 - 13.164; χ^2=73.818; df=1; p<0.001). In month 1, those caregivers who received VC and HE were 6.750 times more likely to take their children for RGM compared to those in control arm (OR = 6.750; 95 CI: 3.522 - 12.938; χ^2=70.612; df=1; p<0.001). Analysis of results showed that there was no statistical association in proportion of caregivers who received STM compared to those who received VC in month 1 (χ^2=0.100; df=1; p=0.752). Caregivers in intervention arm 1 27(45%), intervention arm 2 26(43.3%) and control arm 27(45%) felt that mobile health technologies were good in increasing uptake of RGM. Policy makers and implementers in the health sector will find these study findings useful in deciding whether to adopt STM, VC or both in improving uptake of routine growth monitoring for children aged 9-24 months.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Early detection of developmental problems in children usually occurs during the first five years of life. Timely detection of abnormalities in growth among children instigates corrective interventions to achieve full growth potential. Periodic measurement of children aged below five years is of utmost importance since it allows through monitoring and comparison to assess any deviations and thus predict alterations in the development of the child (Amira et al., 2012). The health and nutritional status of children can be assessed through routine growth monitoring. Poor nutritional status among children below two years increases the risk to infectious diseases which results to high rates of mortality (WHO, 2007). According to WHO (2018), about 5.4 million (74 per 1000 live births) deaths among children aged below five years occurred in 2017. Furthermore, child mortality was reported to be high (69 per 1000) in low-income countries in WHO-African Region in that same year. One of the Sustainable Development Goals targets at reducing under-five mortality from 39 per 1000 live births to at least as low as 25 per 1000 live births (WHO, 2018).

Growth monitoring is the regular measurement of a child's size to monitor his/her growth (Living and Loving, 2018). Optimal growth monitoring requires accurate anthropometric measurements using appropriate equipment and techniques and accurate plotting on a consistent growth chart appropriate for age and gender (Dietitians of Canada & Canadian Paediatric Society, 2010). It is done between 0-59 months at a health facility or community level (WHO, 2006). Routine growth monitoring is one of the services offered in Maternal Neonatal and Child Health (MNCH) clinics in health facilities encompassing routine check-ups by health workers to examine whether a child is growing as expected. Other services

provided in these clinics are not limited to; vitamin A supplementation, immunization, health education and counselling, minor ailment treatment, screening for nutritional and medical conditions for management and defaulter tracing and follow-ups (Debuo et al., 2017). Measuring the weight and length of children monthly reflects their growth pattern which is compared against WHO's growth standards to ascertain whether a child is growing consistently, showing a growth concern or trending towards a growth problem that need to be addressed. Growth failure among children aged 0-24 months has critical lifetime consequences (WHO, 2013). Worldwide, about 111 million children were underweight, 165 million stunted, and 43 million were overweight. Under nutrition mostly affect children below two years of age (WHO 2013).

In Ethiopia, 40% of children under five were stunted, 25% were underweight and 9% were wasted (Central Statistical Agency (CSA), 2014) while in Mozambique, 41% were stunted, 24% underweight, 4% wasted and 3%overweight (Mozambique Demographic and Health Survey). A study conducted in Ethiopia found out that only 16.9% of caregivers of children aged below two years utilized routine growth monitoring services (Feleke et al., 2017). Caregivers in the rural areas of Ethiopia gave various reasons on why they missed growth monitoring sessions as scheduled in their children's clinic cards including: workload, child not sick to seek care and health workers not telling them to attend these sessions (Feleke et al., 2017). A study done in Ghana found out that routine growth monitoring among children offered an opportunity for implementation of interventions aimed at reducing under five mortality rates, infectious diseases and malnutrition (Debuo et al., 2017). Majority (98.1%) of mothers in Ghana believed that taking their children monthly to the clinic for weight measurement was important (Gyampoh et al., 2014).

In Kenya, it is estimated that 16% of children are underweight, 7% wasted and 35% are stunted (MOH, 2017). The MOH (2010) recommended that routine growth monitoring should be done for children from birth up to 2 years since this is the fastest period a child grows and develops in all aspects. A study conducted in Kiambu County, Kenya found out that there was low utilization of growth monitoring services among children aged 12-59 months and that caregivers had low awareness on the importance and utilization of growth monitoring clinic services among children aged 12-59 months (Mwari et al., 2017).

Previous studies have reported increased access and use of mobile phones in especially low- and middle-income countries (LMIC) (Felicie et al., 2016, Labrique & Agarwal, 2014, Sanou, 2014, Ojang et al., 2012). Text messaging, voice calls and internet are the major functions of mobile health (Lee et al., 2014). Mobile health application is quite often used to offer educational information to clients and enhance change of their behaviours, monitoring, as an interaction tool among healthcare providers, in data collection and reporting, management of human resources and in managing chronic diseases (Milena et al., 2018, Felicie et al., 2016, Fortuin et al., 2016, Labrique, 2013). This study therefore sought to determine the effects of mobile health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

1.2 Problem statement

Majority of caregivers stop attending child health clinics after their children receive the WHO recommended measles vaccine at the age of 9 months. According to MOH (2017), it is estimated that 16% of children are underweight, 7% wasted and 35% are stunted with Nyanza region reported to have the highest child mortality rates. Despite the increased use of mobile health technologies in improving child health, there is still low uptake of routine growth monitoring services for children aged 9-24 months.

In Kenya, the uptake of routine growth monitoring among children more than 12 months old is below average (30%), in particular, Nyamira county reported to have low uptake of routine growth monitoring services for children aged 10-59 months (MOH, 2017, Nyabuti, 2015). Furthermore, Nyamira County experiences high child morbidity and mortality, low routine immunization coverage and high malnutrition rates among children aged below five years (Nyamira County Government, 2017). According to Nyamira County Government (2017), only 39% of children aged 6-59 months received vitamin A supplementation and 13% of these children were stunted. Few studies have been conducted focusing on routine growth monitoring, in particular, the use of mobile health technology. This study therefore sought to find out on the effects of mobile health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

1.3 Justification of the study

Nyamira County's under-five mortality rate stands at 81 per 1000 live births which is above the national average of 54 per 1000 live births and the global (WHO-African Region) average of 74 per 1000 live births (Nyamira County Government, 2017, WHO, 2018). Timely detection of abnormalities in children is usually possible during the first two years of life to initiate appropriate and corrective interventions. Caregivers' failure to attend routine growth monitoring more especially for children aged 9-24 months has greater lifetime consequences. It may lead to malnutrition, increased spread of infectious diseases and high mortality rates (WHO, 2007& WHO,2013). Growth monitoring is one of the ways that can be used to assess the nutritional and health status of children below five years. Furthermore, it provides health workers with an opportunity to discuss promotive and curative care measures including breastfeeding, healthy eating and active living with children and their caregivers. According to WHO 2013, children under the age of five years

should receive vitamin A supplementation at 6 ,12, 18, 24, 30, 36, 42, 48, 54 and 60 months thus if children are not taken to clinics after nine months for routine growth monitoring, then they will miss these important supplements. Deworming of children under five years normally begins at 24 months therefore continuation of routine growth monitoring beyond 9 months ensures children are dewormed in time. Scientific evidence reveal that a child grows in all aspects during the first two years of life and any abnormality that is not corrected during this period becomes irreversible (Nyabuti, 2015, WHO, 2013).

1.4 Research questions

1. What is the caregivers' knowledge on routine growth monitoring of children aged 9-24 months in Nyamira County, Kenya?
2. What is the uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya?
3. What is the difference in effect between use of STM and VC on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya?
4. What is the caregivers' attitude on use of *m*Health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya?

1.5 Null Hypotheses

1. There is no significant statistical association between the caregivers' knowledge and use of *m*Health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

2. Mobile Health technologies have no statistical association with uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.
3. There is no significant statistical association between the use of STM and VC on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.
4. There is no significant statistical association between the caregivers' attitude and use of *m*Health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

1.6 Research objectives

1.6.1 General objective

To find out the effects of mobile health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

1.6.2 Specific objectives

1. To find out the caregivers' knowledge on routine growth monitoring of children aged 9-24 months in Nyamira County, Kenya.
2. To find out the uptake of routine growth monitoring services among caregivers of children aged 9-24 months in Nyamira County, Kenya.
3. To compare the effects of STM and VC on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.
4. To find out the caregivers' attitude on use of *m*Health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

1.7 Significance of the study

The findings from this study are useful in generating important health information that will enable policy makers in Nyamira County and the national government including those in the private health sector to make decision on whether or not to adopt mobile health technologies as an appropriate intervention in routine growth monitoring. The study is also useful as it contributes in educating caregivers on the importance of taking their children for routine growth monitoring beyond the 9th month. Future researchers and scholars will find these study findings useful as they may use them as their reference when conducting studies of *m*health on routine growth monitoring or other similar studies.

1.8 Limitations and delimitations

1.8.1 Limitations

The major study limitation was that the caregivers from the study and control arms had a likelihood of meeting and sharing information they received on text message or voice call. This was solved by doing appropriate selection of the study participants from different health facilities. For instance, study arms and controls were selected from different health facilities.

1.8.2 Delimitations

This study was conducted in selected health facilities in Nyamira County, Kenya. It focused on caregivers' knowledge on routine growth monitoring, uptake of routine growth monitoring services, differences between short text message and voice call on uptake of routine growth monitoring and caregivers' attitude on use of mhealth technologies on uptake of RGM among caregivers of children aged 9-24 months in Nyamira County, Kenya.

1.9 Conceptual Framework

Independent Variables **Intervening Variable** **Dependent Variable**

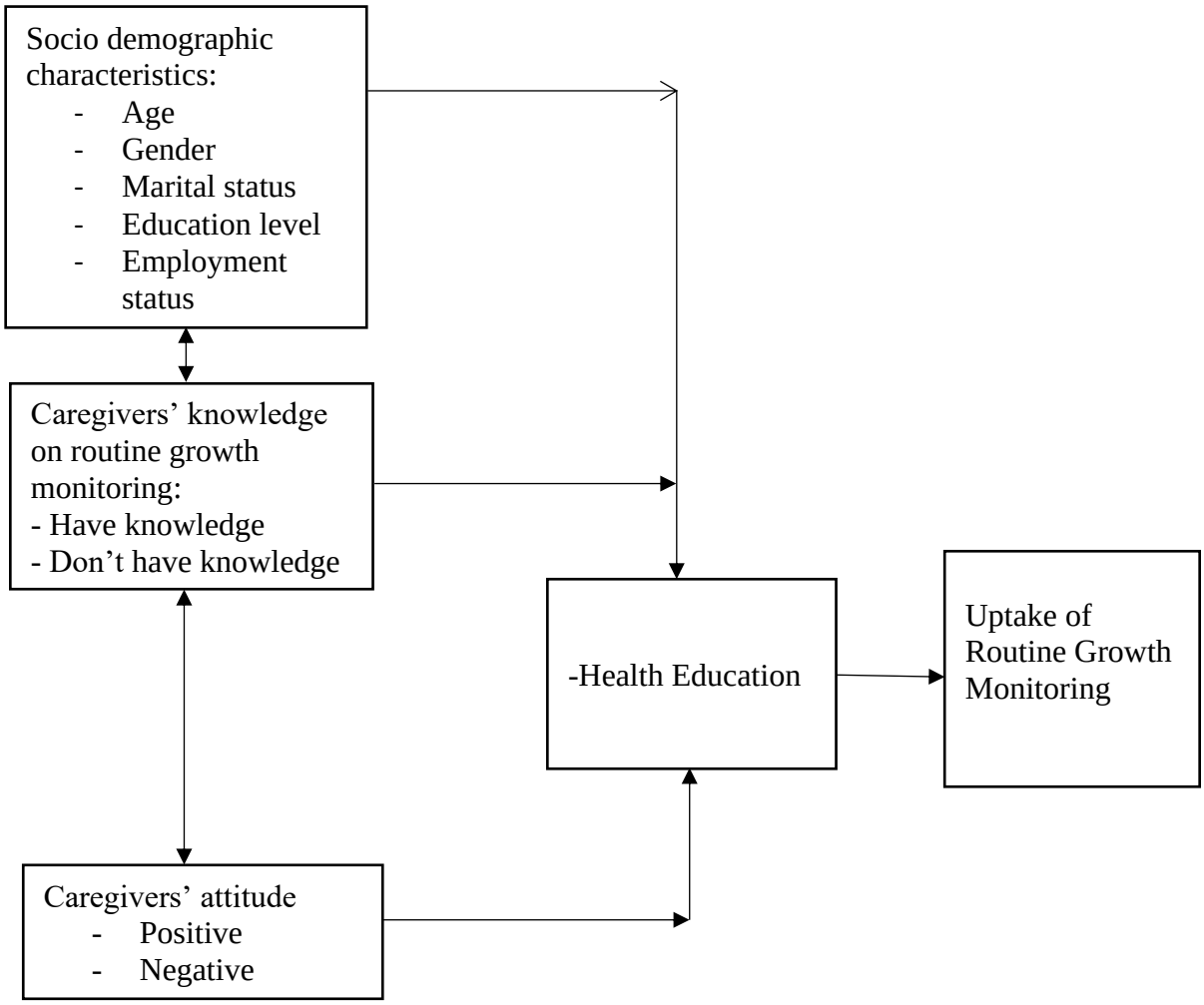

Figure 1.1: conceptual framework (Adapted from Literature Review, 2018)

Based on the conceptual framework (Figure 1.1) socio-demographic characteristics such as age, gender, marital status, educational level and employment status are related with caregivers' knowledge on Routine Growth Monitoring (RGM) that is, having knowledge and not having knowledge on RGM. Further, socio-demographic characteristics and caregivers' knowledge relate with caregivers' attitude on use of STM and VC in improving uptake of RGM. Health education influences caregivers' knowledge and attitude on RGM and at the same time affects the uptake of RGM. These factors interact with each other to determine the uptake of RGM among caregivers of children aged 9-24 months in Nyamira County, Kenya.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the meaning, History and importance of routine growth monitoring, overview (global, regional, local and status of routine growth monitoring in the study area), knowledge and level of routine growth monitoring, effects of mobile health technologies on uptake of Maternal and Child Health (MNCH) services and attitude on use of *m*Health technologies on uptake of routine growth monitoring.

2.2. Meaning of Growth Monitoring

One of the services provided in child welfare clinics in health facilities is growth monitoring that is done monthly as recommended by World Health Organization (WHO) in 2013. Growth monitoring is the regular measurement of a child's size to monitor his/her growth (Living and Loving, 2018). It is the serial weighing and measuring of the length/height and head circumference (if child is less than 2 years old) of a child and graphing both measurements on a growth chart (Griffiths, 1996). According to United Nations Children's Fund (UNICEF) (2008), growth monitoring is the process of conducting periodic anthropometric measurements among children aged 0-59 months to establish the growth rate and compare it with WHO (2006) growth standards in order to assess growth adequacy and identify growth faltering at early stages to initiate required interventions. A past study established that routine growth monitoring has an association with feeding practices among children below five years (Subedi et al., 2012)

2.3 History of Growth Monitoring

Regular weighing of infants was advocated by Guillot in the 18th century to assess the adequacy of lactation in neonates. Nuremberg was the first person to weigh infants systematically beyond the perinatal period in the year 1970. Russow was the pioneer of growth standards and he is the one who found out that growth reflects an infant's well-being. The first growth reference was introduced in 1906 in England and welfare centres organized nationwide to conduct child weighing were established in mid 1920s (Ashworth et al., 2008). World Health Organization (WHO) and Food and Agriculture Organization (FAO) in a joint committee recommended the use of growth charts in 1961. The Catholic Relief Services and the United States Agency for International Development (USAID) implemented growth monitoring in developing countries in Africa, Asia, Latin America in 1970s (Ashworth et al., 2008). A standard weight chart was developed by WHO and guidelines for use published in 1978. In the 1980s, UNICEF advocated for growth monitoring and promotion in its primary health-care strategy that promoted growth monitoring, oral rehydration, breastfeeding and Immunization (GOBI). Countries were given weighing scales and supported in their local production of growth charts by UNICEF. An evaluation was done by UNICEF supporting growth monitoring in 1990 which revealed low coverage, few growth promotion actions and poor understanding of the causes of malnutrition (Shrimpton et al., 2003). New international growth charts were released by WHO in conjunction with UNICEF showing the growth of children from birth to age five years in the year 2006. In Kenya, growth monitoring was launched in the year 1985 by the Ministry of Health (MOH) in partnership with UNICEF (Nyabuti, 2015, MOH, 2004).

2.4 Importance of Routine Growth Monitoring

Growth monitoring is the single most tool for defining health and nutritional status in children since disturbances in health and nutrition affect growth. Past studies have revealed three major benefits of routine growth monitoring. Firstly, it reduces the spread of infectious diseases. Diseases associated with abnormal growth among children under five years can easily be identified and appropriate intervention undertaken (Debuo et al., 2017, Bilal et al., 2014). Secondly, growth monitoring reduces malnutrition. Routine growth monitoring offers opportunities for healthcare providers to discuss on breastfeeding, healthy eating and active living with children and their caregivers (Inka et al., 2016, Debuo et al., 2017, Bilal et al., 2014, Panpanich & Garner, 2009). Nutrition counselling is emphasized during welfare child clinics targeted at decreasing over nutrition and undernutrition in children below five years (WHO/UNICEF, 2014). Thirdly, it leads to reduction of child mortality. Many (60%) of the deaths among children are caused by malnutrition (WHO, 2013, Nitin & Sanjay, 2016). Routine growth monitoring offers an opportunity for tackling issues of malnutrition in addition to detection of abnormalities which could lead to death (Fedele et al., 2018, Debuo et al., 2017, Nyabuti, 2015, Panpanich & Garner, 2009, Ashworth et al., 2008).

2.5 Overview of Routine Growth Monitoring

2.5.1 Global Overview

Routine growth monitoring among children aged below five years is a global concern. New international growth charts based on a large global sample of children aged up to five years from six countries namely Brazil, Norway, India, USA, Oman and Ghana were developed by WHO in conjunction with UNICEF in the year 2006 (WHO/UNICEF,2014). The health and nutritional status of children can be assessed through routine growth monitoring. Routine growth monitoring is conducted less frequently in developed countries for instance

the Child Growth Foundation in Britain recommended five routine growth measurements from birth up to five years while in developing countries UNICEF recommended monthly routine growth monitoring for children below five years (Panpanich & Garner, 2009). Globally, 26% of children below five years are stunted, 16% are underweight, 8% wasted while 7% were underweight (UNICEF/WHO/World Bank, 2018). Nutritional stunting affects more than 80% of children below five years old in developing countries (Sajady et al., 2018). More than 90% of children who suffer from undernutrition live in developing countries. Growth stunting is experienced most often among children with poor nutritional status in their first two years of life (Liu et al., 2015). A study done in Brazil found out that majority of the participant health facilities had the anthropometric equipment required for measuring weight and height of children under the age of five years (Dixis & Ina, 2017). A European-based study involving 11 European countries revealed that only 29% of these countries used the WHO 2006 growth charts (Scherdel et al., 2013). According to the Ministry of Health and Population in Nepal (2017), its national nutrition program recommended at least six growth monitoring sessions during the first year, four sessions during the second year and three sessions each in the remaining years. A study done in India found out that growth monitoring involving trained health workers led to declined mortality among the under-fives (Nitin & Sanjay, 2016). According to New South Wales (NSW) (2017), it is important to perform routine growth monitoring for under five using anthropometric measurements for height, weight and head circumference. Growth monitoring of children who were aged below five years in Thailand occurred only on three instances namely; when a child was ill, during vaccination in a public health office or during visits conducted in the villages by Village Health Volunteers (VHOs) (Roesler et al., 2018).

Routine growth monitoring offers an opportunity for various discussions including breastfeeding, healthy eating and active living with children, prompt detection of problems in children, preventive and promotive care (Dietitians of Canada & Canadian Paediatric Society, 2010). According to British Columbia 2018, five changes occur between the ages of 12 and 24 months and they include; physical growth, cognitive development, language development, sensory and motor development and emotional and social development. It is important to routinely monitor the growth of children below two years using all the three WHO recommended measurements including Weight-for- Age, Length-for-Age and Weight-for-Length as well as Head Circumference since they enable identification of problems such as underlying chronic diseases, feeding practices and recent and sudden illnesses (British Columbia, 2013). According to WHO (2013), it is extremely difficult to reverse stunting problems that occurred when children were between 6-23 months old.

2.5.2 Regional Overview

Africa has been experiencing severe stunting among children aged below five years since the 19th century (UNICEF/WHO/World Bank, 2012). Studies conducted in East Africa reveal that caregivers do not routinely take their children aged below five years for routine growth monitoring making it difficult to identify developmental problems until school age (Bilal et al., 2014, WHO, 2012). Findings from a study conducted in Ghana indicated that about 93% of caregivers attended growth monitoring sessions regularly (Debuo et al., 2017). A past study conducted in Zimbabwe found out that more than 73% of children aged below five years did not attend RGM (Marume et al., 2019). In Nigeria, more than half (53.2%) of the respondents did not understand on how regular they should attend growth monitoring for their children aged below five years should be conducted (Adenike et al., 2014). A study conducted in Ethiopia revealed that majority (55%) of the study participants acknowledged

that monitoring of the growth of their children was regularly done although only about 16% of them attended RGM (Feleke et al., 2017)

2.5.3 Local Overview

Uptake of routine growth monitoring among children more than 12 months old is below average (30%) in Kenya (MOH, 2017). Majority of children aged more than 12 months sought child clinic services for Integrated Management of Childhood Illnesses (IMCI) rather than routine growth monitoring (MOH, 2006). A study conducted in Kiambu County found out that only 20% of caregivers routinely took their children aged 12-59 months for growth monitoring and that caregivers had low awareness on the importance and utilization of growth monitoring clinic services among children aged 12-59 months (Mwari et al., 2017).

Child mortality is reported to be the highest in Nyanza, North Eastern, Western and Coast regions in Kenya and it is estimated that 16% of children under five years are underweight, 7 % are wasted while 35% are stunted (MOH, 2017).

2.5.4 Status of Routine Growth Monitoring in Nyamira County

Nyamira County has been reported to have low uptake of routine growth monitoring for children aged between 10-59 months (Nyabuti, 2015). Furthermore, the county experiences high child morbidity and mortality, low immunization coverage and high malnutrition rates among children aged between 12-59 months (Nyamira County Government, 2017). Nyamira County targeted on the reduction of malnutrition rates by 5% among the under-five and increasing routine immunization coverage to 60% (at health facility and community level) in her 2013-2017 County Integrated Development Plan (Nyamira County Government, 2017).

2.6 Caregivers' Knowledge on Routine Growth Monitoring

Caregivers should be able to understand and interpret growth charts whether they are literate or illiterate. A study conducted in Lesotho established that mothers who used a particular growth chart and were taught to interpret growth curves appeared to comprehend more on growth patterns (Panpanich & Garner, 2009). Mothers of well-nourished children learn equally well with or without growth charts but mothers of underweight children learn better when they are taught with growth charts (Ashworth et al., 2008). Only 32.1% of caregivers in Ethiopia reported that growth monitoring should be carried out monthly. A similar study conducted in Southern Ethiopia found out that 53 % of the caregivers had poor knowledge on growth monitoring (Daniel et al., 2017). Majority of them said they did not know what a growth chart entailed nor did they know how to interpret growth curves (Daniel et al., 2017).

A study conducted in Ghana revealed that more than 40% of the caregivers lacked good knowledge on routine growth monitoring. This study found out that more than 30% of the caregivers did not understand the meaning of routine growth monitoring and only 18.7% of them were able to interpret the normal, static, upward and decline growth curves (Debuo et al., 2017). A study in Zambia established that majority (92%) of the caregivers of children aged between 0-59 months had knowledge on the importance of growth monitoring (Banda, 2012). Caregivers of children aged between 12-23 months in Zambia and Ethiopia were reported to have poor knowledge on feeding practices (Bilal et al., 2014, Banda, 2012). More than half of the caregivers were unable to understand and interpret the growth charts (Daniel et al., 2014, Elana et al., 2009). Low comprehension on growth charts implies that healthcare providers do not educate caregivers using the growth chart (Gyampoh, 2012).

2.7 Uptake of Routine Growth Monitoring Services

Previous studies show that majority of caregivers fail to regularly attend child welfare clinics if attendance entails economic losses (opportunity costs and transport costs) or if attendance leads to neglect of family duties and responsibilities with those most at risk of malnutrition tending to attend least often. Caregivers value medications more than preventive care services such as counselling on nutrition (Ashworth et al., 2008). Scaling up effective interventions in order to achieve high coverage for routine growth monitoring especially for the poor is not an easy task (Ashworth et al., 2008). In Europe, only 29% of respondents reported to have used WHO recommended reference standard growth charts (Scherdel et al., 2013). A study done in Ghana revealed low level in using growth monitoring services with only 13.6% of the caregivers reported to have attended child welfare clinic for growth monitoring as recommended (Agbozo et al., 2018).

Previous studies found out that growth monitoring visits become irregular when immunization schedule is completed (Nyabuti, 2015, Rasheed, 2012, Mapatano, 2008, MOH, 2004). In Ethiopia, health workers revealed that routine growth monitoring was emphasized among children below two years because mental and physical growth is very fast in the first two years of life (Bilal et al., 2014). A study conducted in Zambia found out that growth monitoring had performed poorly because of various reasons weak monitoring and supervision, lack of motivational package attached to the growth monitoring programme and poor practices among health workers (Charlton et al., 2009). Growth monitoring in Kenya was less than 30% nationally, less than 25% in Nyanza region and less than 25% in Nyamira County (Nyabuti, 2015, MOH, 2004).

2.8 Mobile Health Technologies (Voice calls and text messaging)

Mobile Health is a medical and public health practice that is supported by mobile phones and tablets, making use of text, audio, images, video or coded data in the form of short messaging services (SMS), voice SMS, applications accessible via general packet radio service (GPRS), global positioning system (GPS), third and fourth generation mobile telecommunications, and Bluetooth (World Bank, 2016). It is the use of wireless communication devices such as mobile phones, tablets, Personal Digital Assistants (PDAs) and other wireless devices to support public health and clinical practice (Fortuin et al. 2016, Free et al. 2014). Globally, there is widespread use of mobile phones hence the application of mobile health (Fortuin et al, 2016). Various studies have reported increased access and use of mobile phones in especially low-and middle-income countries (LMIC) (Felicie et al. 2016, Labrique & Agarwal, 2014, Sanou, 2014, Ojang et al. 2012). Text messaging, voice calls and internet are the major functions of mobile health (Lee et al, 2014). Mobile health application is quite often used to offer educational information to clients and enhance change of their behaviours, monitoring, as an interaction tool among healthcare providers, in data collection and reporting, management of human resources and in managing chronic diseases (Milena et al. 2018, Felicie et al. 2016, Fortuin et al. 2016, Labrique, 2013).

Mobile health technologies had great potential to impact management of chronic diseases since many people have strong attachments to their mobile phones and tend to carry them everywhere thus can easily connect to their HCP irrespective of where they are making monitoring of their health conditions easier (Hamine et al., 2015). *Mh*ealth intervention using text messages and voice calls contributes significantly to behavior change and management of diseases respectively (Dale et al., 2016 and Hall et al., 2014)

2.9 Effects of mobile health Intervention in improving uptake of Maternal, Neonatal and Child Health (MNCH) services

Positive effects of *m*Health interventions in health care have been reported previously by various researchers given the relatively emerging field of research and wide interest in *m*Health interventions to improve uptake of services in Low- and Middle-Income Countries (LMIC) (Felicie et al., 2016, Philbrick, 2013, Tamrat &Kuchnowski, 2012). *m*Health interventions can be implemented in isolation at various levels or combined with other sections in the health sector such as human resources and infrastructure (Gazmararian et al., 2012, Tamrat & Kuchnowski, 2012). *m*Health intervention using especially text messages contributes significantly to behavior change and management of diseases (Dale et al., 2016, Hall et al., 2014).

A study conducted in Zanzibar (Wired Mothers Intervention) reported increased Antenatal Care (ANC) visits to more than four as recommended by WHO. This intervention used unidirectional text messaging and direct two-way communication in a free call voucher system to provide education on pregnancy, reminders for antenatal care visits and an emergency medical response system also found a significant decrease in the perinatal mortality rate of more than 50% (Lund et al., 2014a). A similar study in Thailand revealed that ANC visits were higher after mothers were sent text messages as reminders to attend clinic (Kaewkungwal et al., 2010). Vaccination rates for newborn babies in India increased significantly when unidirectional text messages were sent to mothers to remind them to take their children for vaccination (Pathak, 2012). The use of text messages in South Africa reported high knowledge among women who attended ANC visits (Lau et al., 2014). Findings from a similar other study that used text messages as reminders in India revealed significant increment in knowledge among mothers who sought maternal and child health care services (Datta et al., 2014). Previous studies have reported that use of lay-terms and

local languages when giving information to caregivers increases access to *m*Health interventions (Felicie et al., 2016, Lund et al., 2014a, Lund et al., 2014b, Datta et al., 2014, Khorshid et al., 2014, Lau et al., 2014, Dean et al., 2012, Lund et al., 2012). Use of text and voice messages among Nigerian mothers significantly improved breastfeeding practices in the neonatal period (Flax et al., 2014).

2.10 Attitude on use of Mobile Health Technologies

Use of Short Messaging Service (SMS) reminders was perceived to improve medication adherence, quality of life and self-efficacy among adolescents with asthma (Johnson et al., 2015). About 49.7% of study participants in Singapore had positive attitude towards mobile health noting that *m*health could be used to improve the health of individuals (Hossain et al., 2018). According to Poor 2016, more than 25% of people surveyed revealed that health tracking application made them feel bad. A study by William et al., 2013 established that 79% of kidney transplant recipients had a positive attitude towards mobile phone-based health technology. Furthermore, no discomfort was reported as they agreed to be monitored using *m*health technology and they expressed confidence that their privacy will be upheld (William et al., 2013). Majority of respondents had a positive reception on *m*health and believed that its adoption was right as it prevented occurrence of unnecessary illnesses (Martinez, 2015). However, those respondents who had negative reception pointed confidentiality concerns as a result of mobile phone system hacking.

2.11 Summary of literature review and gaps addressed by this study

The Ministry of Health (MOH) recommended that routine growth monitoring should be done for children from birth up to 2 years (MOH, 2010). Scientific evidence reveal that a child grows in all aspects during the first two years of life and any abnormality that is not corrected during this period becomes irreversible (WHO, 2013). Consequently, many caregivers stop attending child health clinics after their children receive the WHO recommended measles vaccine at the age of 9 months. From literature reviewed, *m*health (voice calls and text messaging) has significantly improved uptake of services by reminding clients of their scheduled appointments. A study conducted in India that used text messages as reminders revealed significant increment in knowledge among mothers who sought maternal and child health care services (Datta et al., 2014). Despite the growing interest in the field of *m*health, there remains little evidence on their effects on uptake of RGM in Kenya. This study therefore will seek to address this gap by finding out on the effects of mobile health technologies on uptake of routine growth monitoring among caregivers of children aged 9-24 months in Nyamira County, Kenya.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

This chapter describes the research design, variables, study location and target population, inclusion and exclusion criteria, sampling techniques, sample size determination, research instruments, pre-testing, validity and reliability of the study, data collection techniques, data analysis and ethical consideration.

3.2 Study design

This was a quasi-experimental study design. Participants for the study were assigned into control and experiment arms for comparison purposes. Recruitment of the study subjects was done during their 9^{th} month visit to clinic. The researcher then followed up the experiment arms from the 10^{th} month for a period of 9 months while the control arm was not followed up. This design is deemed appropriate as it sought to find out whether mobile health technologies have effects on uptake of routine growth monitoring after the 9^{th} month of clinic visit.

3.3 Study Variables

3.3.1 Independent Variables

The independent variables for this study were socio-demographic characteristics (age, gender, education level, marital status, employment status), caregivers' knowledge on routine growth monitoring, uptake of routine growth monitoring services, effects of text message and voice call on uptake of routine growth monitoring and caregivers' attitude on use of *m*health technologies on uptake of RGM.

3.3.2 Intervening Variable

The intervening variables for this study were STM and VC that were used to remind the caregivers to take their children for RGM after the 9th month and HE given to the caregivers on RGM after their children attain 9 months.

3.3.3 Dependent Variable

Uptake of routine growth monitoring among caregivers of children aged 9-24 months was the dependent variable for this study.

3.4 Study Location

This study was conducted in Nyamira County which is one of the 47 County Governments in the Republic of Kenya created under the first schedule of the Constitution of Kenya 2010. Nyamira County is in Nyanza region of Kenya. It lies on the latitude 0° 44' 59.99" N and longitude**:** 35° 00' 0.00" E. Situated in the Western highlands of Kenya, it covers an area of 897 km² with a total population of 605, 576 as at 2019 (KNBS, 2019) and a population density of 675 persons per square kilometre. The population growth rate stands at 1.83% (KNBS 2019). It borders the counties of Kericho to the East, Bomet to the South East, Kisii to the South, Homa Bay to the West and Kisumu to the North West. The County is divided into 5 Sub-counties namely; Nyamira South, Borabu, Masaba North, Nyamira North and Manga. The study was done in six health facilities namely: Nyamira County Referral Hospital, Ekerenyo, Nyamusi, Borabu and Masaba Sub-County Hospitals and Ting'a Health Centre.

3.5 Target population

All caregivers of children aged 9-24 months.

3.5 Study population

The study population included 180 caregivers of children aged 9-24 months in selected health facilities in Nyamira County and 12 key informants.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion criteria

Caregivers of children aged 9-24 months and consent to the study. Those caregivers who had taken the selected health facilities as their regular child welfare centres were included in the study.

3.6.2 Exclusion Criteria

Caregivers who had brought their children for the first time since their usual facilities have temporary challenges in providing routine growth monitoring were excluded from the study.

3.7 Sampling Techniques

Nyamira County was chosen purposively because it had the study characteristics just like any other county in Kenya. Purposive sampling was used to select health facilities for the study. This was based on the high population of children visiting MNCH clinics. Using simple random sampling, study intervention was assigned to the selected health facilities. For that case, caregivers from Nyamira County Referral Hospital and Ting'a Health Centre received Short Text Messages (STM) and Health Education (HE), those from Nyamusi and Borabu Sub-County Hospitals received Voice Calls (VC) and Health Education (HE) while those from Ekerenyo and Masaba Sub-County Hospitals did not receive STM, VC nor HE since they were the control arm of the study. Caregivers of the children aged 9 months were selected using census method. This is because the children who were brought to the health facilities for RGM were few. Purposive sampling method was used to select twelve key informants for the study.

3.8 Sample size determination

A formula by Charan & Biswas, (2013) was used to determine the sample size for the study.

$$\mathbf{n = \frac{2(Z_{\alpha} + Z_{\beta})^2 * p(1-p)}{(p_2 - p_1)^2}}$$

Where,

n = sample size required from each condition (pre and post intervention).

$\mathbf{Z\alpha}$ = critical value for the normal distribution of population at 95% confidence interval for two tailed ($Z_{.05}$ is 1.96)

$\mathbf{Z_{\beta}}$ = critical value for the normal distribution for the probability of type II error at 80% power for this study ($Z_{.2}$ is 0.842).

p = pooled prevalence (prevalence in case arm (p_1) + prevalence in control arm (p_2)

$\mathbf{p_1 - p_2}$ = difference in proportion of events in two arms in an experimental study

From a study carried out in Nyamira County (Nyabuti, 2015), about 53% of the children are taken for routine growth monitoring. This study anticipates increasing uptake of routine growth monitoring to 80%. Therefore, the effect size will be the difference between the previous uptake and the new proportion after the intervention.

Therefore, $\mathbf{p_1 - p_2 = 0.53-0.80=-0.27}$

Further pooled prevalence= (0.53+0.80)/2= 0.665

The sample size therefore becomes:

$$n = \frac{2(1.96+0.842)^2 * 0.665(1-0.665)}{(-0.27)^2}$$

$$n = \frac{2(2.802)^2 * 0.665(0.335)}{(-0.27)^2}$$

$$n = \frac{3.49810394}{0.0729} = 47.98 \approx 48 \text{ for a single arm}$$

48 for a single arm, add 25% to cater for attrition

n = 48 +12

n = 60 for a single arm * 3 = 180

Therefore, the sample size (n) becomes 180 caregivers.

3.9 Design of the intervention

Caregivers of children 9-24 months recruited into two experiment arms of the study received STM and VC together with HE while control arm did not receive anything. For the 1st experimental arm, caregivers received both health education on routine growth monitoring and a short text message (STM). A short text message of about 15 words was designed by the study. The caregivers were requested to save the short text message (STM) and show it during their RGM to the research team. The STM was sent once to the participants before the next clinic visit (a day prior to appointment day). For the 2nd experimental arm, caregivers received health education and voice calls (VC). The VC lasted for not more than two minutes served as a reminder for next clinic visit. The voice call was also done once before the next appointment (a day prior to appointment day). Both the STM and VC were done at the same time prior to appointment. The study considered suggestions that were given by health care providers in Maternal, Neonatal and Child Health (MNCH) sections on the content of the text message as a reminder to the caregivers for clinic visit. Training was conducted for the purpose of confirming the correct phone use, language that was used and completeness of the message for both STM and VC. The caregivers were advised to report technical errors with their mobile phones including loss of phone to the research team and give alternative mobile phone numbers in which they could be reached. The 3rd arm was a control. Caregivers in the control arm did not receive health education, STM nor VC. This arm served as a control to the experiment arms. The topographic design of the intervention is shown in Figure 3.1

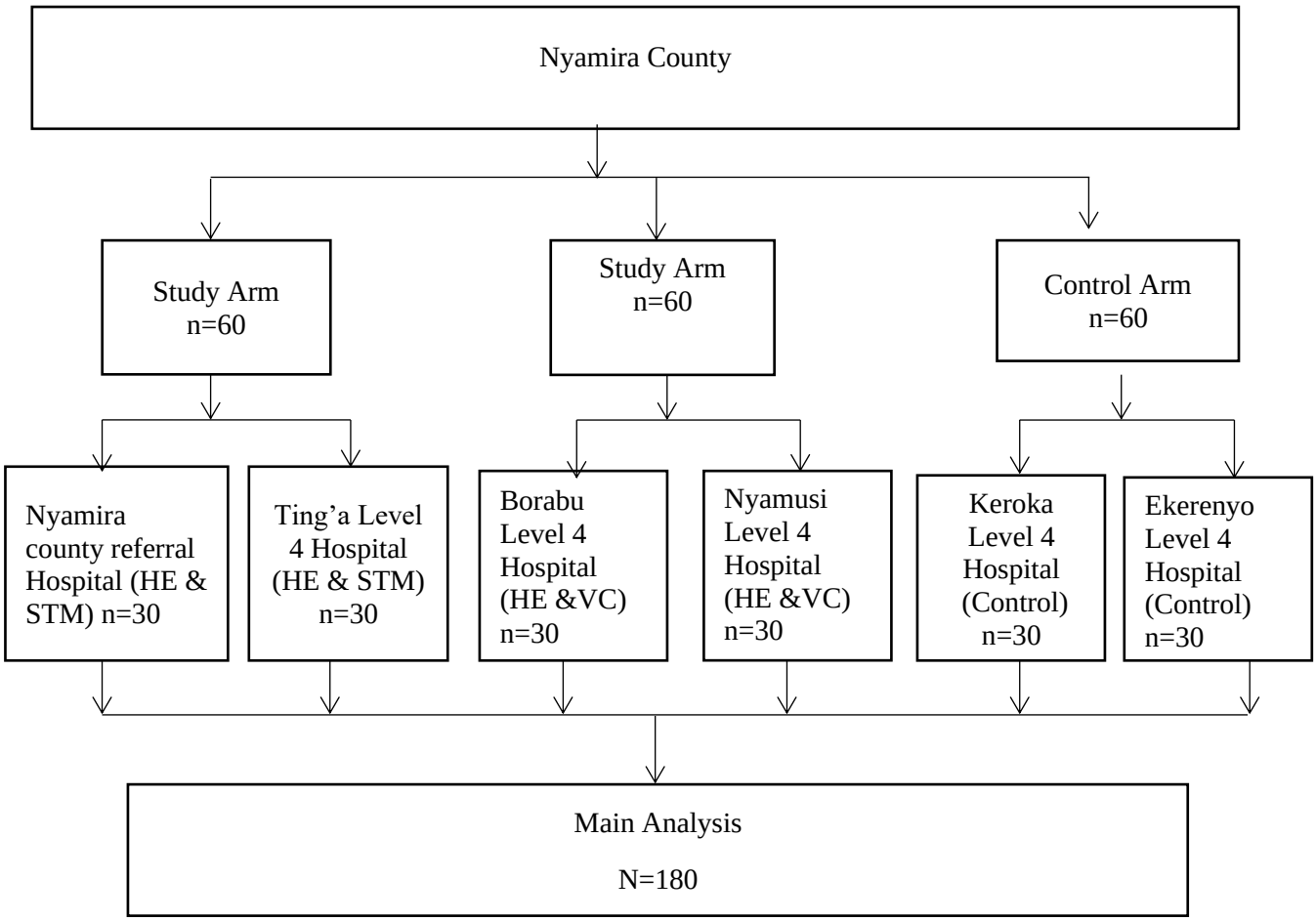

Figure 3.1: Design of the Intervention

3.10 Research Instruments

Researcher administered questionnaire and key informant interview guide (KII) were used in the study. The questionnaire was used to collect information related to socio-demographic and economic characteristics of the caregivers, their knowledge on RGM, uptake of RGM, effects of mhealth on uptake of RGM and attitude of caregivers on use of mhealth technologies on uptake of RGM. The KII was used to obtain information related to RGM from participants who had key information on the subject matter including nursing officers in-charges and staff of MNCH clinics.

3.11 Pre-testing

Pre-testing of the questionnaire was carried out in Esani Sub-County Hospital. The pre-test involved 10% of the study sample. The purpose of the pre-test was to check for unclear elements of the study tools which were corrected before the final tool was printed.

3.12 Validity and Reliability of the study

3.12.1 Validity

This is the degree to which results obtained from data analysis actually represent the phenomenon under study (Mugenda and Mugenda, 2003). Study instruments were reviewed by supervisors from the Department of Health Management and Informatics of Kenyatta University who are experts in the field of study. Revision of items in the study instruments was then done based on the comments from the reviewers thus getting rid of unclear questions in the tools.

3.12.2 Reliability

Reliability is the degree to which a particular measuring procedure gives the same results over a number of repeated times (Orodho, 2005). Collection of varied types of data from different sources and using different instruments ensured consistency, replicability and dependability of the results. The study used different research instruments including questionnaire and Key Informant Interview (KII) guide to enhance reliability of the results.

3.13 Data collection techniques

Questionnaires with both closed and open-ended questions and key informant interview guide were used to obtain information from the respondents. The study recruited six Research Assistants (RA) who helped in administering the questionnaires to the respondents. These RAs received adequate training on data collection from the study prior to engaging in the study. Close supervision of the RAs was done throughout the study by

the PI to ensure accuracy of data collection process. During the data collection period, the research team introduced themselves and explained the purpose of the study to the respondents in a clear, open and honest manner. Caregivers who consented to the study were guided by the research team in filling the questionnaires. The research team also recorded information that was given by the key informants. These tools were written in English and administration took about 25 minutes and 30 minutes respectively.

3.14 Data Analysis

Statistical Package for Social Sciences (SPSS) version 23 was used for the analysis of the quantitative data collected. Chi-square test and Odds' Ratio were used to test the relationship between the dependent and independent variables and the relationship was deemed significant when p-value was less than 0.05 at 95% confidence level. Content analysis was done for qualitative data. Frequencies and percentages were used for analysis of descriptive data. Results were then presented as narrations or direct quotes which were then triangulated with the quantitative data.

3.15 Ethical consideration

Approval to conduct the study was obtained from Kenyatta University Graduate School. Ethical clearance was obtained from Kenyatta University Ethics and Review Committee. Research permit was sought from National Commission for Science, Technology and Innovation (NACOSTI). Further approval was sought from ethics and review committee in the County. The study sought informed consent from the respondents before proceeding with the research. They were assured that their mobile phone numbers and names were only to be used during the study for follow-up. These names and mobile numbers were not included during data analysis and this was to ensure anonymity. Information given by the participants was kept under lock in cabinets and password protected in computers to ensure

privacy and confidentiality. The findings of the study were disseminated to the various health facilities, in which the research was conducted, Nyamira County's Ministry of Health and Kenyatta University Graduate School.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the results of the study on the effects of *m*health on uptake of routine growth monitoring among caregivers of children 9-24 months in Nyamira County, Kenya. The main sections of the study results include socio-demographic characteristics of the study participants, caregivers' knowledge on routine growth monitoring, uptake of routine growth monitoring, comparison of the effects of short text message and voice call on uptake of routine growth monitoring and caregivers' attitude on use of *m*Health technologies on uptake of routine growth monitoring.

4.2 Socio-demographic and economic characteristics of the study respondents

The study involved 180 caregivers of children aged 9 months at baseline and 18 months at endline. Out of these, 60 of them received Short Text Messages (STM) and Health Education (HE), another 60 received Voice Calls (VC) and Health Education (HE) while 60 respondents formed the control arm of the study.

4.2.1 Age of Caregivers

Table 4.1 presents the distribution of age among the study participants. The age of the caregivers ranged from below 18 years to between 38-42 years. Most of the caregivers were aged between 23-27 years old in intervention arm 1 (STM and HE) 20 (33.3%), intervention arm 2 (VC and HE) 23 (38.3%) and control arm 24 (40%). There was no significant statistical association in the distribution of age of the caregivers between intervention arm 1 and control arm (p=0.243), intervention arm 2 and control arm (p=0.751), intervention arm 1 and intervention arm 2 (p=0.566).

Table 4.1: Socio-demographic and economic characteristics of the study participants

Variable	STM & HE (n=60)	Control (n=60)	Significance	VC & HE (n=60)	Control (n=60)	Significance	STM & HE (n=60)	VC & HE (n=60)	Significance
Age (years)									
< 18	3(5%)	0(0%)		1(1.7%)	0(0%)		3(5%)	1(1.7%)	
18-22	11(18.3%)	14(23.3%)		13(21.7%)	14(23.3%)		11(18.3%)	13(21.7%)	
23-27	20(33.3%)	24(40%)		23(38.3%)	24(40%)		20(33.3%)	23(38.3%)	
28-32	17(28.3%)	14(23.3%)		18(30%)	14(23.3%)		17(28.3%)	18(30%)	p=0.566*
33-37	6(10%)	8(13.3%)		5(8.3%)	8(13.3%)		6(10%)	5(8.3%)	
38-42	3(5%)	0(0%)	p=0.243*	0(0%)	0(0%)	p=0.751*	3(5%)	0(0%)	
Marital status									
Married	51(85%)	52(86.7%)	χ^2=0.069;	56(93.3%)	52(86.7%)		51(86.7%)	56(93.3%)	
Single	9(15%)	8(13.3%)	df=1; p=0.793	4(6.7%)	8(13.3%)	p=0.362*	9(13%)	4(6.7%)	p=0.239*
Education Level									
Primary	18(30%)	21(35%)		27(45%)	21(35%)	χ^2=3.642;	18(30%)	27(45%)	
Secondary	30(50%)	25(41.7%)	χ^2=3.026; df=4;	23(38.3%)	25(41.7%)	df=4; p=0.457	30(50%)	23(38.3%)	χ^2=2.934; df=3;
Tertiary/ College	12(20%)	14(23.3%)	p=0.553	10(16.7%	14(23.3%)		12(20%)	10(16.7%	p=0.402
Occupation									
Peasant Farmer	24(40%)	24(40%)		21(35%)	24(40%)		24(40%)	21(35%)	
Housewife	20(33.3%)	25(41.7%)	p=0.149*	25(41.7%)	25(41.7%)	p=0.025*	20(33.3%)	25(41.7%)	p=0.495*
Self-employed	12(20%)	4(6.7%)		13(21.7)	4(6.7%)		12(20%)	13(21.7)	
Employed	4(6.7%)	7(11.7%)		1(1.7%)	7(11.7%)		4(6.7%)	1(1.7%)	
Monthly Income									
< 5000	28(46.6%)	24(40%)		25(41.7%)	24(40%)		28(46.6%)	25(41.7%)	
5,000-10, 000	6(10%)	6(10%)		9(15%)	6(10%)	χ^2=0.911;	6(10%)	9(15%)	
10,000 and above	4(6.7%)	6(10%)	p=0.852*	5(8.3%)	6(10%)	df=3; p=0.823	4(6.7%)	5(8.3%)	p=0.862*
Dependant/None	22(36.7%)	24(40%)		21(35%)	24(40%)		22(36.7%)	21(35%)	
Gender of child									
Male	30(50%)	26(43.3%)	χ^2=0.536;	33(55%)	26(43.3%)	χ^2=1.634;	30(50%)	33(55%)	χ^2=0.301;
Female	30(50%)	34(56.7%)	df=1; p=0.464	27(45%)	34(56.7%)	df=1; p=0.201	30(50%)	27(45%)	df=1; p=0.583

Key: * Fisher's exact test

4.2.2 Marital Status

As shown in Table 4.1, more than 80% of the caregivers in all the three study arms were married. There was no significant association in the distribution of marital status of the caregivers between study arm 1 and control arm (χ^2= 0.069; df=1; p=0.793), study arm 2 and control arm (p=0.362), study arm 1 and study arm 2 (p=0.239).

4.2.3 Gender of Caregivers and that of their Children

Table 4.1 shows that all the caregivers in both the intervention arms and the control arm were female (100%). Among the children in the intervention arm 1 (STM and HE), the proportion of male children was equal to that of female at 50%. In the intervention arm 2 (VC and HE), 33(55%) of the children were male and 27(45%) were female while in the control arm 26(43.3%) were male and 34(56.7%) female. The study did not establish any significant statistical association in the distribution of gender of the children between intervention arm 1 and control arm (χ^2= 0.536; df=1; p=0.464), intervention arm 2 and control arm (χ^2= 1.634; df=1; p=0.201), intervention arm 1 and intervention arm 2 (χ^2= 0.301; df=1; p=0.583)

4.2.4 Education Level

Table 4.1 presents the analysis of the level of education of the caregivers. Among the respondents in the intervention arm 1 (STM and HE), 18(30%) had primary education qualification, 30(50%) secondary and 12(20%) tertiary. In intervention arm 2 (VC and HE), 27(45%) had primary education, 23(38.3%) secondary and 10(16.7%) tertiary education and in the control arm, 21(35%) had attained primary level of education, 25(41.7%) secondary and 14(23.3%) tertiary education.

There was no significant statistical association in proportion of caregivers at all education levels in intervention arm 1 and control arm (χ^2= 3.026; df=4; p=0.553), intervention arm 2 and control arm (χ^2= 3.642; df=4; p=0.457), intervention arm 1 and intervention arm 2 (χ^2= 2.934; df=3; p=0.402)

4.2.5 Occupation

Analysis of the occupation of the caregivers is presented in Table 4.1. Among the intervention arm 1 (STM and HE), 24(40%) were peasant farmers, 20(33.3%) housewives, 12(20%) self-employed and 4(6.7%) salaried workers. In the intervention arm 2 (VC and HE), 21(35%) were housewives, 25(41.7%) peasant farmers, 13(21.7%) self-employed and 1(1.7%) salaried workers. In the control arm, 24(40%) were housewives, 25(41.7%) peasant farmers, 4(6.7%) self-employed and 7(11.7%) salaried workers. There was no significant statistical association in proportion of caregivers with different occupations in intervention arm 1 and control arm (p=0.149), intervention arm 2 and control arm (p=0.025), intervention arm 1 and intervention arm 2 (p=0.495).

4.2.6 Monthly Income

Table 4.1 presents the monthly income of the caregivers. Most of the study participants were either dependants or earned a monthly income of less than Kshs 5,000. In the intervention arm 1 (STM and HE), 28(46.6%) earned less than Kshs 5,000 and 22(36.7%) were dependants. In the intervention arm 2 (VC and HE), 25(41.7%) earned less than Kshs 5,000 and 21(35%) were dependants and in the control arm, 24(40%) earned a monthly income of less than Kshs 5,000 and 24(40%) were dependants. There was no significant association in the distribution of study participants' monthly income between intervention arm 1 and control arm (p=0.852), intervention arm 2 and control arm (χ^2=0.911; df=3; p=0.823), intervention arm 1 and intervention arm 2 (p=0.862).

4.2.7 Distance to the Health Facility

Analysis of the distance from the caregivers' residence to the health facility where they took their children for RGM is presented in Table 4.2. Most of the caregivers in all the three study arms accessed their health facilities within a radius of 2-5 KM. There was no significant association in the perceived distance to the health facility among the study participants between intervention arm 1 and control arm (χ^2= 0.420; df=2; p=0.811), intervention arm 2 and control arm (χ^2= 0.649; df=2; p=0.723), intervention arm 1 and intervention arm 2 (χ^2= 1.304; df=2; p=0.521).

Table 4.2: Distance to the Health Facility

Variable	STM & HE (n=60)	Control (n=60)	Significance	VC & HE (n=60)	Control (n=60)	Significance	STM& HE (n=60)	VC & HE (n=60)	Significance
Distance from caregivers' residence to health Facility									
< 2 KM	17(28.3%)	14(23.3%)	χ^2=0.420; df=2; p=0.811	14(23.3%)	14(23.3%)	χ^2=0.649; df=2; p=0.723	17(28.3%)	14(23.3%)	χ^2=1.304; df=2; p=0.521
2-5 KM	37 61.7%)	39(65%)		36(60%)	39(65%)		37(61.7%)	36(60%)	
> 5KM	6(10%)	7(11.7%)		10(16.7%)	7(11.7%)		6(10%)	10(16.7%)	

It is worth noting that caregivers in the intervention arms and control arm showed the same socio-demographic characteristics with no significant statistical associations among them. That means that the participants were all of the same characteristics and therefore would not affect subsequent results in the study.

4.3 Caregivers' knowledge on Routine Growth Monitoring

4.3.1 Caregivers' knowledge on Routine Growth Monitoring at Baseline

The study wanted to establish caregivers' knowledge on Routine Growth Monitoring at the baseline. Therefore, all the caregivers in both intervention arms and control arm were interviewed at baseline to assess their understanding of the meaning of Routine Growth Monitoring, when children should be taken for RGM, what is done at RGM clinic, benefits

of RGM, meaning of a Child Health Card or book, Information in a child health card or book, meaning of a Growth Monitoring Curve (GMC), how to interpret Growth Monitoring Curve (GMC), health problems likely to be encountered out of failure to attend RGM.

4.3.1.1 Meaning of Routine Growth Monitoring (RGM)

Figure 4.1 presents caregivers' knowledge on RGM at baseline. About 118(65.6%) of the caregivers knew the meaning of RGM while 62(34.4%) did not understand its meaning. Among participants in Intervention arm 1 (STM & HE) 42(70%) knew the meaning of RGM. In intervention 2 (VC & HE), 39(65%) understood it and in control arm, 37(61.7%) understood the meaning of RGM. They all defined it correctly as regular measurement of a child's size in terms of height, weight and head circumference to ensure normality in growth.

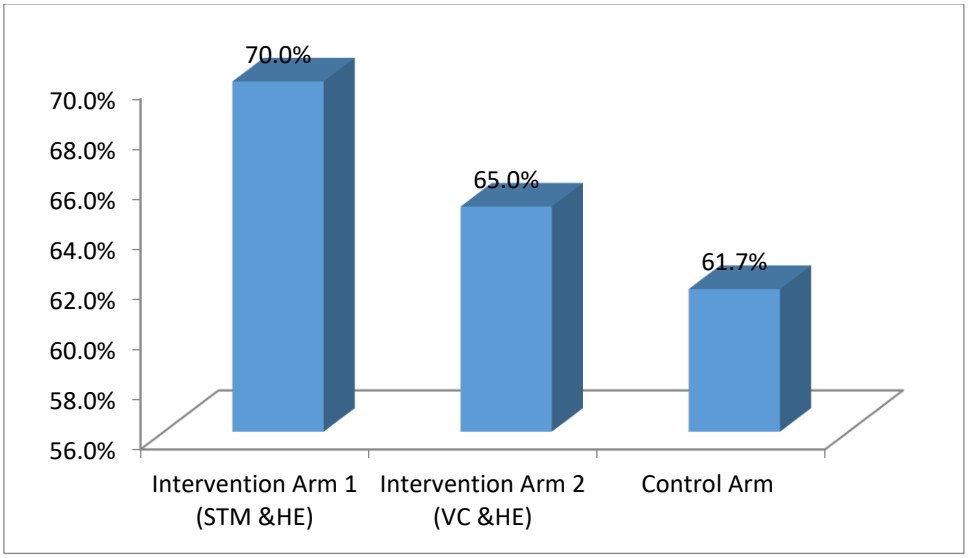

Figure 4.1: Proportion of Caregivers who knew that children should be taken for RGM

One of the Nurses in one of the health facilities reported "*Regular growth monitoring is that consistent measurement of children below 5 years of their height, weight and head circumference to ensure normalcy in growth".* Another male Nurse reported, "*You will be*

able to tell of their malnutrition and health issues". Head nurse in one of the facilities said that*, "it must be regular meaning every month for children who are below five years"*

Table 4.3 presents the association of socio-demographic and economic characteristics and caregivers' knowledge on the meaning of RGM. Caregivers' knowledge on the meaning of RGM showed a significant association with level of education (χ^2=29.238; df=4; p<0.0001), occupation (p=0.001), monthly income (p=0.015), residence (χ^2=6.332; df=1; p=0.012). Further, there was no significant association between caregivers' knowledge on meaning of RGM and their age (p=0.897), marital status (χ^2=0.140; df=1; p=0.708) as well as gender of their children (χ^2=0.142; df=1; p=0.837).

Table 4.3: Association between socio-demographic/economic characteristics and meaning of RGM

Variable		Meaning of RGM		Significance
		Aware	Not Aware	
Age (Years)	Below 18	2(1.7%)	2(3.2%)	p=0.897*
	18-22	24(20.3%)	14(22.6%)	
	23-27	44(37.3%)	23(37.3%)	
	28-32	32(27.1%)	17(27.4%)	
	33-37	13(11.1%)	6(9.7%)	
	38-42	3(2.5%)	0(0%)	
Marital status	Married	105(89.2%)	54(87.1%)	χ^2=0.140; df=1; p=0.708
	Single	13(1.1%)	8(12.9%)	
Education level	Primary	27(22.9%)	38(61.3%)	χ^2=29.238; df=4; p<0.001
	Secondary	61(51.7%)	17(27.4%)	
	Tertiary	18(15.3%)	7(11.3%)	
Occupation	Peasant Farmer	36(30.5%)	33(53.2%)	p=0.003*
	Housewife	47(39.8%)	23(37.1%)	
	Self-employed	23(19.5%)	6(9.7%)	
	Employed	12(10.2%)	0(0%)	
Monthly Income	< 5000	42(35.6%)	35(36.5%)	p=0.015*
	5 000-10 000	15(12.7%)	6(9.7%)	
	10000 and above	14(11.9%)	1(1.6%)	
	Dependant/None	47(39.2%)	20(32.3%)	
Gender of child	Male	59(50%)	30(48.4%)	χ^2=0.142; df=1; p=0.837
	Female	59(50%)	32(51.6%)	
Residence	Urban	51(43.1%)	15(24.2%)	χ^2=6.332; df=1; p=0.012
	Rural	67(56.8%)	47(75.8%)	

Key: * Fisher's exact test

4.3.1.2 Caregivers' knowledge on when children should be taken for RGM

Table 4.4 presents caregivers' knowledge on when children should be taken for RGM. About 28(66.7%) of caregivers in study arm 1(STM and HE) knew that children should be taken for RGM during immunization, 16(38.1%) said monthly and 5(11.9%) said that when children are sick. Among study arm 2 (VC and HE), 22(59.2%) of the caregivers knew that children should be taken for RGM monthly, 17(43.6%) during immunization and 10(25.6%) of them mentioned that it is when they are sick. Among the control arm, 21(56.7%) of caregivers knew that children should be taken for RGM monthly, 15(40.5%) indicated that children should be taken for RGM during immunization and 8(21.6%) of them said that children should be taken for RGM when sick. A Nurse in one of the facilities reported *"once a caregiver comes to the clinic for the first time, we inform her when to come next." "First time caregivers have little understanding as to when they should take their babies for regular growth monitoring clinic"* said a Nurse at the MNCH clinic.

Table 4. 4: Proportion of caregivers who were to receive STM, VC and those in control with knowledge that children should be taken for RGM

Variable	STM & HE (n=42)	Control (n=37)	Significance	VC & HE (n=39)	Control (n=37)	Significance	STM& HE (n=42)	VC & HE (n=39)	Significance
Monthly	15(35.7%)	20(54.1%)	χ^2=1.008; df=1; p=0.315	22(56.4%)	20(54.1%)	χ^2=0.147; df=1; p=0.702	15(35.7%)	22(56.4%)	χ^2=1.915; df=1; p=0.166
When sick	4(9.5%)	8(21.6%)	p=0.362*	10(25.6%)	8(21.6%)	χ^2=0.261; df=1; p=0.609	4(9.5%)	10(25.6%)	p=0.153*
During immunization	27(64.3%)	17(45.9%)	χ^2=3.589; df=1; p=0.058	17(43.6%)	17(45.9%)	χ^2=0.170; df=1; p=0.680	27(64.3%)	17(43.6%)	χ^2=3.589; df=1; p=0.058

Key: * Fisher's exact test

As shown in Table 4.4, there was no statistical significant association among caregivers who were to receive STM compared to those in control arm with knowledge that children should be taken for RGM monthly (χ^2=1.008; df=1; p=0.315), when sick (p=0.362) as well as during immunization (χ^2=3.589; df=1; p=0.058) (Table 4.4). Likewise, the study found

no statistical significant association among caregivers who were to receive VC and those in control arm with knowledge that children should be taken for RGM monthly (χ^2=0.147; df=1; p=0.702), when sick (χ^2=0.261; df=1; p=0.609) as well as during immunization (χ^2=0.170; df=1; p=0.680). Further, the study did not get any statistical association among caregivers who were to receive STM and VC with knowledge that children should be taken for RGM monthly (χ^2=1.915; df=1; p=0.166), when sick (p=0.153*) as well as during immunization (χ^2=3.589; df=1; p=0.058).

4.3.1.3 Knowledge on what is done during RGM visit

Table 4.5 presents caregivers' knowledge on what is exactly done at MNCH clinic during RGM Visit. About 42(100%) of the caregivers in intervention arm 1 (STM & HE), 39 (100%) in intervention arm 2 (VC & HE) and 37(100%) from control arm knew that weight of children is measured during RGM. Other activities mentioned by caregivers done during RGM visit included; measurements of children's height {intervention arm 1 (STM & HE) 41 (97.6%), intervention arm 2 (VC & HE) 38(33.6%) and control arm 37(100%)}, detection of malnutrition in children {intervention arm 1 8(19%), intervention arm 2 2(5.1%) and control arm 9(24.3%)} among others. It is clear from the study that majority of the caregivers did not know that vitamin A and other child vaccines were provided during RGM visits and especially after 9 months.

> *"Child's height, weight and head circumference are very basic measurements done at the MNCH clinics when children are brought for monitoring and immunization",* said one of the nurses. *"Mothers are taught on how to feed their child to avoid under nutrition. Vitamin A is every time given to the child when brought for growth monitoring"* another nurse in said.

As presented in Table 4.5, there was no significant association in proportion of caregivers among those who used STM together with HE compared to those in the control arm who knew that: weight was measured (χ^2=0.926; df=1; p=0.336), Height measured (χ^2=0.586; df=1; p=0.444), malnutrition was detected (χ^2=0.069; df=1; p=0.793), poor health was detected (χ^2=0.086; df=1; p=0.769), there are lessons on feeding practices (p=0.364*), lessons on hygiene practices (p=0.364*), Head circumference measured (p=0.364*), teaching on signs of abnormality in children (p=0.079*), teachings on signs of sickness in children (p=0.619*), lessons on home remedy for sick child (p=1.000*), vitamin A supplementation (p=1.000*), and Child vaccination (p=1.000*). From the analysis of the baseline results, the proportion of caregivers who were to receive short text message and health education was insignificantly different compared to those who were to be in the control arm. The analysis demonstrated that at baseline caregivers' knowledge in both arms was nearly the same. For the case of those who were to receive voice call (VC) together with health education compared to control arm, the study did not exhibit any statistical association between the two armss with regards to their knowledge that: weight is measured (χ^2=0.144; df=1; p=0.705), Height is measured (χ^2=0.036; df=1; p=1.000), malnutrition is detected (p=0.053*), poor health is detected (p=0.163*), there are lessons on feeding practices (p=1.000*), lessons on hygiene practices (p=1.000*), Head circumference is measured (p=1.000*), lessons on signs of abnormality in children (p=1.000*), lessons on signs of sickness in children (p=0.619*), lessons on home remedy for sick child (p=1.000*), vitamin A supplementation (p=0.244*), and Child vaccination (p=0.057*) . From the analysis of the baseline results, the proportion of caregivers who were to receive voice call (VC) and health education was insignificantly different compared to those who were to

receive STM and HE. The analysis demonstrated that at baseline caregivers' knowledge in both arms was nearly the same.

Table 4.5: Caregivers' knowledge on what is done to children aged between 10 -24 months during RGM

Variable	STM & HE (n=42)	Control (n=37)	Significance	VC & HE (n=39)	Control (n=37)	Significance	STM& HE (n=42)	VC & HE (n=39)	Significance
Weight measured	42 (100%)	37 (100%)	χ^2=0.926; df=1; p=0.336-	39 (100%)	37 (100%)	χ^2=0.144; df=1; p=0.705	42 (100%)	39 (100%)	χ^2=0.342; df=1; p=0.559
Height measured	41 (97.6%)	37 (100%)	χ^2=0.586; df=1; p=0.444	38 (97.4%)	37 (100%)	χ^2=0.036; df=1; p=1.000	41 (97.6%)	38 (97.4%)	χ^2=0.333; df=1; p=0.564
Detection of malnutrition	8 (19%)	9 (24.3%)	χ^2=0.069; df=1; p=0.793	2 (5.1%)	9 (24.3%)	p=0.053*	8 (19%)	2 (5.1%)	p=0.095*
Detection of poor health	6 (14.3%)	7 (18.9%)	χ^2=0.086; df=1; p=0.769	2 (5.1%)	7 (18.9%)	p=0.163*	6 (14.3%)	2 (5.1%)	p=0.272*
Taught hygiene practices	4 (9.5%)	1 (2.7%)	p=0.364*	1(2.6%)	1 (2.7%)	p=1.000*	4 (9.5%)	1(2.6%)	p=0.364*
Taught feeding practices	4 (9.5%)	1 (2.7%)	p=0.364*	1(2.6%)	1 (2.7%)	p=1.000*	4 (9.5%)	1(2.6%)	p=0.364*
Head circumference measured	4 (9.5%)	1 (2.7%)	p=0.364*	0(0%)	1 (2.7%)	p=1.000*	4 (9.5%)	1(2.6%)	p=0.364*
Taught signs of abnormality in children	3 (7.1%)	0 (0%)	p=0.079*	1 (2.6%)	0 (0%)	p=1.000*	3 (7.1%)	1 (2.6%)	p=0.619*
Taught signs of sickness in children	3 (7.1%)	1 (2.7%)	p=0.619*	0 (0%)	1 (2.7%)	p=1.000*	3 (7.1%)	0 (0%)	p=0.244*
Taught home remedy for sick child	0 (0%)	1 (2.7%)	p=1.000*	1 (2.6%)	0 (0%)	p=1.000*	0 (0%)	1 (2.6%)	p=1.000*
Vitamin A supplementation	0 (0%)	1 (2.7%)	p=1.000*	3 (7.7%)	0 (0%)	p=0.244*	0 (0%)	3 (7.7%)	p=0.244*
Child vaccination	1 (2.4%)	0 (0%)	p=1.000*	5 (12.8%)	0 (0%)	p=0.057*	1 (2.4%)	5 (12.8%)	p=0.207*

Key: * Fisher's exact test

As presented in Table 4.6, the study exhibited insignificant statistical association between caregivers who were to receive STM and VC in regards to their knowledge that: weight is measured (χ^2=0.342; df=1; p=0.559), Height is measured (χ^2=0.333; df=1; p=0.564),

malnutrition is detected (p=0.095*), poor health is detected (p=0.272*), there are lessons on feeding practices (p=0.364*), lessons on hygiene practices (p=0.364*), Head circumference is measured (p=0.364*), lessons on signs of abnormality in children (p=0.619*), lessons on signs of sickness in children (p=0.244*), lessons on home remedy for sick child (p=1.000*), vitamin A supplementation (p=0.244*), and Child vaccination (p=0.207*) . From the analysis of the baseline results, the proportion of caregivers who were to receive STM was insignificantly different compared to those who were to receive VC. The analysis demonstrated that at baseline caregivers' knowledge in both arms was nearly the same.

4.3.1.4 Knowledge on benefits of RGM

The caregivers were interviewed at baseline to establish whether they understood the benefits of RGM to the children as shown in Table 4.6. Results of the study showed that 34(81%) of caregivers from intervention arm 1 (STM &HE), 27(69.2%) from intervention arm 2 (VC & HE) and 31(83.8%) from the control arm said that it is required for uptake of all vaccines for children as the major benefit of RGM. Other benefits of RGM mentioned by caregivers included; that it enabled them to learn feeding practices {intervention arm 1 (40.5%), intervention arm 2 (33.3%) and control arm (37.8%)}, healthy lifestyle {intervention arm 1 (38.1%), intervention arm 2 (23.1%) and control arm (21.6%)} among other benefits. In-charge Nurse of MNCH clinic in one of the health facilities reported *"the benefits of regular growth monitoring don't only involve uptake of all vaccines but also the caregivers get to know health matters of the child, good health lifestyle, able to identify abnormality in children and learn feeding practices."* Another Nurse in one of the Facilities asserted that, *"some of the caregivers don't understand the benefits routine growth monitoring". "These caregivers need to be told every now and then the benefits of regular growth monitoring"* said one of the health care providers at one of the MNCH clinics.

As shown in Table 4.6, there was no statistical association in proportion of caregivers who were to receive STM and HE and those in control arm with knowledge of benefits that RGM creates opportunity to: uptake of all vaccines (χ^2=0.302; df=1; p=0.583), learn feeding practices (χ^2=0.391; df=1; p=0.532), Learn healthy lifestyle (χ^2=0.745; df=1; p=0.388), identify abnormality in children (χ^2=0.960; df=1; p=0.327), as well as to know child's progress in health matters (p=1.000*). The study found no statistical association among caregivers who were to receive VC and HE and those in control arm with knowledge on benefits that RGM creates opportunity to: uptake of all vaccines (χ^2=0.534; df=1; p=0.465), learn feeding practices (χ^2=0.048; df=1; p=0.827), Learn healthy lifestyle (χ^2=0.519; df=1; p=0.471), identify abnormality in children (χ^2=0.069; df=1; p=0.793), as well as to know child's progress in health matters (p=0.119*). Further, the study did not find any statistical association in proportion of caregivers who were to receive STM and VC with knowledge on benefits: uptake of all vaccines (χ^2=1.634; df=1; p=0.201), learn feeding practices (χ^2=2.476; df=1; p=0.116), Learn healthy lifestyle (χ^2=0.519; df=1; p=0.471), identify abnormality in children (χ^2=0.519; df=1; p=0.471), as well as to know child's progress in health matters (p=0.207*).

Table 4.6: Proportion of Caregivers with knowledge on the benefits of RGM

Variable	STM & HE (n=42)	Control (n=37)	Significance	VC & HE (n=39)	Control (n=37)	Significance	STM& HE (n=42)	VC & HE (n=39)	Significance
Uptake of all vaccines	34 (81%)	31 (83.8%)	χ^2=0.302; df=1; p=0.583	27 (69.2%)	31 (83.8%)	χ^2=0.534; df=1; p=0.465	34 (81%)	27 (69.2%)	χ^2=1.634; df=1; p=0.201
Learn feeding practices	17 (40.5%)	14 (37.8%)	χ^2=0.391; df=1; p=0.532	13 (33.3%)	14 (37.8%)	χ^2=0.048; df=1; p=0.827	17 (40.5%)	13 (33.3%)	χ^2=0.711; df=1; p=0.528
Learn healthy lifestyle	16 (38.1%)	12 (32.4%)	χ^2=0.745; df=1; p=0.388	9 (23.1%)	12 (32.4%)	χ^2=0.519; df=1; p=0.471	16 (38.1%)	9 (23.1%)	χ^2=2.476; df=1; p=0.116
Identify abnormality in children	12 (28.6%)	8 (21.6%)	χ^2=0.960; df=1; p=0.327	9 (23.1%)	8 (21.6%)	χ^2=0.069; df=1; p=0.793	12 (28.6%)	9 (23.1%)	χ^2=0.519; df=1; p=0.471
To know child's progress in health matters	1(2.4%)	0 (0%)	p=1.000*	5 (12.9%)	0 (0%)	p=0.119*	1 (2.4%)	5 (12.8%)	p=0.207*

Key: * Fisher's exact test

The study clearly showed that caregivers who were recruited in the three arms of this study were not significantly different in terms of knowledge on the benefits of RGM at baseline.

4.3.1.5 Caregivers' knowledge on meaning of a Child Health Card or book

Figure 4.2 presents caregivers' knowledge on meaning of a child health card or book. More than 44 (73.3%) of the caregivers from intervention arm 1 (STM & HE), 35 (58.3%) from intervention arm 2 (STM & HE) and 33 (55%) from the control arm understood the meaning of a child health card/book/record. They all defined it correctly as a document that contains clinic details including name, age, date of birth among other details for a particular child.

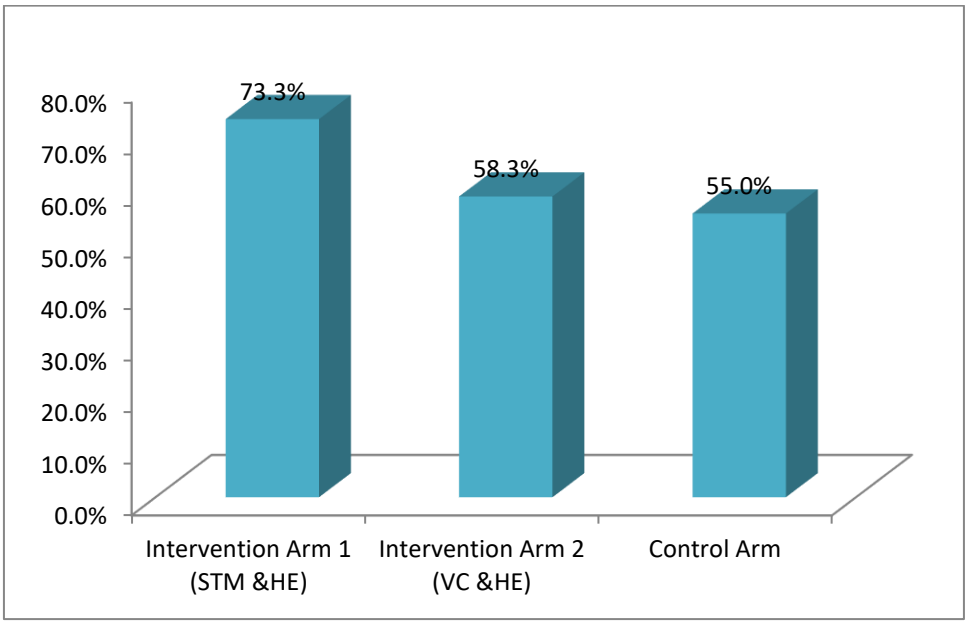

Figure 4.2: Proportion of caregivers who knew the meaning of a Child Health Card

4.3.1.6 Caregivers' awareness on the Information in a child health card or book

Table 4.7 presents caregivers' awareness of various information contained in a child health card or book including weight-for-age {Intervention arm 1 (STM & HE) 41 (93.2%), intervention arm 2 (VC & HE) 31 (88.6%) and control arm 31 (93.1%), height-for-age {intervention arm 1 (90.9%), intervention arm 2 (85.7%) and control arm (90.9%)}, TCA {intervention arm 1 (75%), intervention arm 2 (54.3%) and control arm (84.8%)} among other information. In interviewing health care provider as key informants, one of them reported *"most caregivers carry child health cards with them whenever they visit the clinic but they rarely know the content and importance of it."* Another reported *"there is need for regularly educating mothers on the information and significance of child card". "Some of the caregivers don't know how to read and even interpret what is in the card but then we every time try to inform them"* reported another health care provider in MNCH clinic of one of the health facilities.

As shown in Table 4.7, there was no statistical association in proportion of caregivers who were to receive STM and those in control arm regarding weight-for-age (χ^2=3.472; df=1; p=0.062), Height-for-age (χ^2=3.429; df=1; p=0.064), when To Come Again (χ^2=0.834; df=1; p=0.361), recommended vaccine schedule (χ^2=1.222; df=1; p=0.269), feeding recommendation guide (χ^2=1.477; df=1; p=0.224), bio-data (χ^2=1.534; df=1; p=0.215), vitamin A supplementation schedule (χ^2=0.081; df=1; p=0.776), paediatric assessment information (χ^2=3.064; df=1; p=0.080), head circumference (χ^2=2.502; df=1; p=0.114), milestone assessment (p=1.000*), HIV prophylaxis schedule (p=1.000*), Body Mass Index (BMI)-for-age (p=1.000*), family planning information for the mother (p=1.000*), way of creating bond between mother and child (p=1.000*). From the study, it was noted that there was no statistical association in proportion of caregivers who were to receive VC and those in control arm with information regarding weight-for-age (χ^2=0.000; df=1; p=1.000), height-for-age (χ^2=0.033; df=1; p=0.855), when To Come Again (χ^2=0.000; df=1; p=1.000), recommended vaccine schedule (χ^2=0.926; df=1; p=0.336), feeding recommendation guide (χ^2=0.000; df=1; p=1.000), bio-data (χ^2=0.000; df=1; p=1.000), vitamin A supplementation schedule (χ^2=0.678; df=1; p=0.410), paediatric assessment information (p=1.000*), head circumference (χ^2=0.209; df=1; p=0.648), milestone assessment (p=1.000*), HIV prophylaxis schedule (p=1.000*), Body Mass Index (BMI) - for-age (p=1.000*), family planning information for the mother (p=1.000*), way of creating bond between mother and child (p=0.496*) in a child health card or book.

Table 4.7: Caregivers' awareness on the information in a Child health card/book

Variable	STM & HE (n=44)	Control (n=33)	Significance	VC & HE (n=35)	Control (n=33)	Significance	STM& HE (n=44)	VC & HE (n=35)	Significance
Weight-for-age	41 (93.2 %)	31 (93.9%)	χ^2=3.472; df=1; p=0.062	31 (88.6%)	31 (93.9%)	χ^2=0.000; df=1; p=1.000	41 (93.2%)	31 (88.6%)	χ^2=3.472; df=1; p=0.062
Height-for-age	40 (90.9 %)	30 (90.9%)	χ^2=3.429; df=1; p=0.064	30 (85.7%)	30 (90.9%)	χ^2=0.033; df=1; p=0.855	40 (90.9%)	30 (85.7%)	χ^2=3.429; df=1; p=0.064
To Come Again (TCA)	33 (75%)	28 (84.8%)	χ^2=0.834; df=1; p=0.361	28 (80%)	28 (84.8%)	χ^2=0.000; df=1; p=1.000	33 (75%)	28 (80%)	χ^2=0.834; df=1; p=0.361
Recommended vaccine schedule	29 (65.9 %)	23 (69.7%)	χ^2=1.222; df=1; p=0.269	18 (51.4%)	23 (69.7%)	χ^2=0.926; df=1; p=0.336	29 (65.9%)	18 (51.4%)	χ^2=4.232; df=1; p=0.061
Feeding recommendation guide	20 (45.5 %)	14 (42.4%)	χ^2=1.477; df=1; p=0.224	14 (40%)	14 (42.4%)	χ^2=0.000; df=1; p=1.000	20 (45.5%)	14 (40%)	p=0.207*
Bio-data	13 (29.5 %)	19 (57.6%)	χ^2=1.534; df=1; p=0.215	19 (54.3%)	19 (57.6%)	χ^2=0.000; df=1; p=1.000	13 (29.5%)	5 (14.3%)	χ^2=4.183; df=1; p=0.071
Vitamin A supplementation schedule	11 (25%)	10 (30.3%)	χ^2=0.081; df=1; p=0.776	7 (20%)	10 (30.3%)	χ^2=0.678; df=1; p=0.410	11 (25%)	7 (20%)	χ^2=1.215; df=1; p=0.270
Paediatric assessment notes/information	13 (29.5 %)	6 (18.2%)	χ^2=3.064; df=1; p=0.080	6 (17.1%)	5 (14.3%)	p=1.000*	13 (29.5%)	5 (14.3%)	χ^2=4.183; df=1; p=0.071
Head circumference	8 (18.2 %)	4 (12.1%)	χ^2=2.502; df=1; p=0.114	2 (5.7%)	4 (12.1%)	χ^2=0.209; df=1; p=0.648	8 (18.2%)	2 (5.7%)	p=0.095*
Milestone assessment	4(9.1 %)	5 (15.2%)	p=1.000*	4 (11.4%)	5 (15.2%)	p=1.000*	4(9.1%)	4 (11.4%)	p=1.000*
HIV prophylaxis schedule	3 (6.8%)	3 (9.1%)	p=1.000*	0 (0%)	3 (9.1%)	p=1.000*	3 (6.8%)	0 (0%)	p=0.244*
Body Mass Index (BMI)-for-age	2 (4.5%)	2 (6.1%)	p=1.000*	1 (2.9%)	2 (6.1%)	p=1.000*	2 (4.5%)	1 (2.9%)	p=1.000*
Family planning information for the mother	0 (0.0%)	1 (0.0%)		1 (2.9%)	0 (0.0%)	p=1.000*	0 (0.0%)	1 (2.9%)	p=1.000*
Ways of creating bond between mother and child	0 (0.0%)	1 (0.0%)		2 (5.7%)	0 (0.0%)	p=0.496*	0 (0.0%)	2 (5.7%)	p=0.496*

Key: * Fisher's exact test

Additionally, Table 4.7 shows that there was no statistical association in proportion of caregivers who were to receive STM and VC regarding information in a child health card including weight-for-age (χ^2=0.000; df=1; p=1.000), height-for-age (χ^2=0.033; df=1; p=0.855), when To Come Again (χ^2=0.000; df=1; p=1.000), recommended vaccine schedule (χ^2=0.926; df=1; p=0.336), feeding recommendation guide (χ^2=0.000; df=1; p=1.000), bio-data (χ^2=0.000; df=1; p=1.000), vitamin A supplementation schedule (χ^2=0.678; df=1; p=0.410), paediatric assessment information (p=1.000*), head circumference (χ^2=0.209; df=1; p=0.648), milestone assessment (p=1.000*), HIV prophylaxis schedule (p=1.000*), Body Mass Index (BMI)-for-age (p=1.000*), family planning information for the mother (p=1.000*), way of creating bond between mother and child (p=0.496*).

4.3.1.7 Proportion of caregivers who knew the meaning of a Growth Monitoring Curve (GMC)

As shown in figure 4.3, only 10(16.7%) of caregivers from intervention arm 1 (STM & HE), 18(30%) from intervention arm 2 (VC & HE) and 7(11.7%) from control arm understood the meaning of a growth monitoring chart. They correctly defined it as a curve showing a child's height and weight in a period of time.

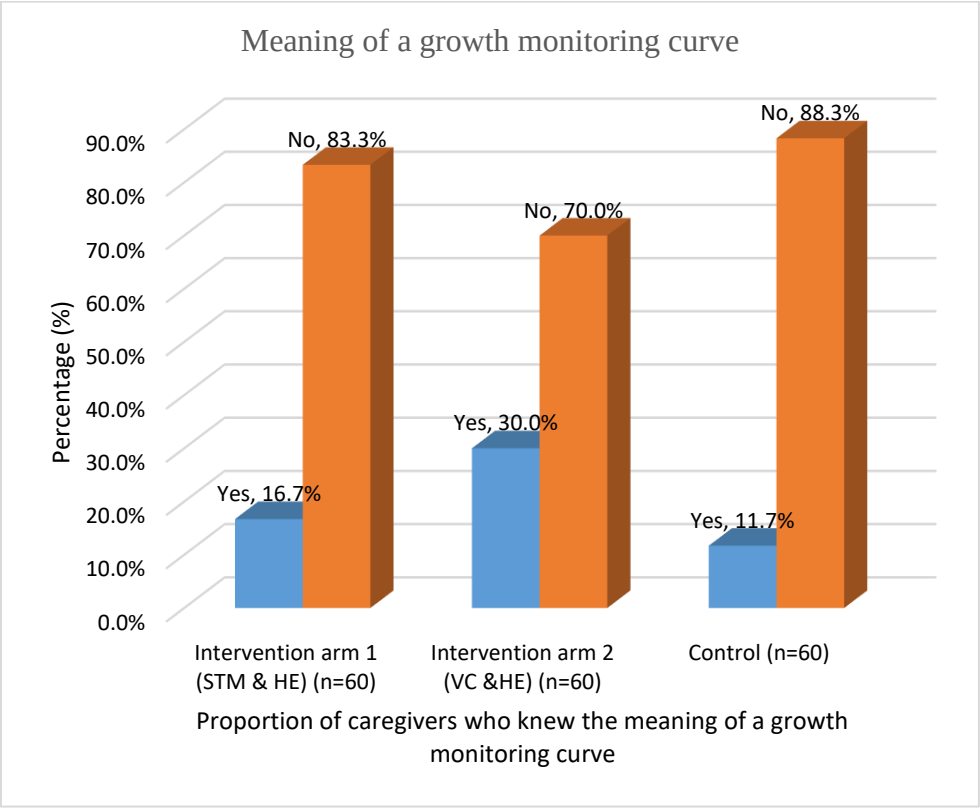

Figure 4.3: Proportion of caregivers who knew the meaning of a growth monitoring chart

"Majority of the caregivers don't know the meaning of growth monitoring curve; they can't even read and interpret it" reported Head nurses of all the health facilities involved in this study. Almost all the health care providers interviewed for key information pointed out that *"Nurses don't bother to train caregiver on the meaning of growth monitoring card nor to assist them interpret the curve, they are only told whether the child is doing good or bad then the follow up date."*

4.3.1.8 Caregivers who knew how to interpret Growth Monitoring Curve (GMC)

As shown in figure 4.4, only 2(20%) of the caregivers in intervention arm 1 (STM & HE), 5(27.8%) in intervention arm 2 (VC & HE) and 2 (28.6%) from the control arm who knew how to interpret a growth monitoring curve.

Figure 4.5 presents caregivers' sources of knowledge on interpretation of GMC, 2 (20%) of them from intervention arm 1 (STM & HE), 4(22.2%) from intervention arm 2 (VC & HE) and 3 (42.9%) from the control arm said that it was by self-knowledge.

As presented in figure 4.6, among those who indicated that they did not know how to interpret a growth monitoring curve, 7(70%) from intervention arm 1 (STM & HE), 6(33.3%) from intervention arm 2 (VC & HE) and 6(85.7%) from the control arm reported that their healthcare providers had never taught them on how to interpret a GMC.

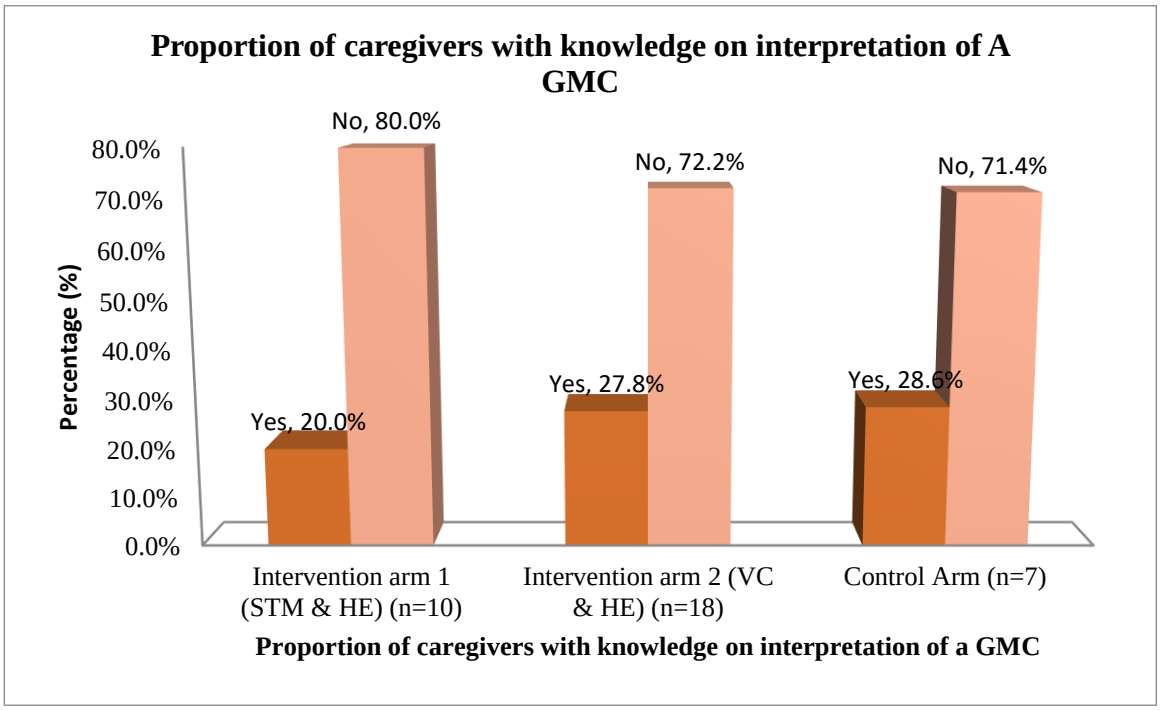

Figure 4.4: Proportion of caregivers with knowledge on interpretation of a GM

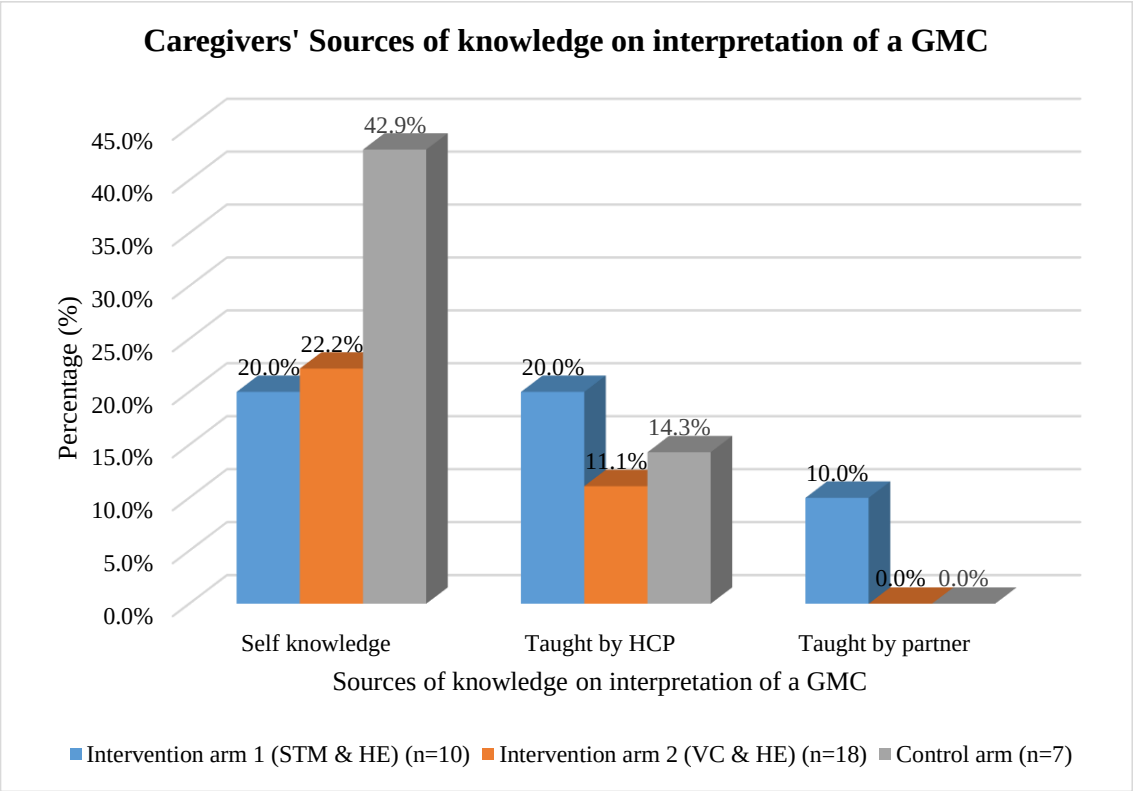

Figure 4.5: Caregivers' Sources of knowledge on interpretation of a GMC

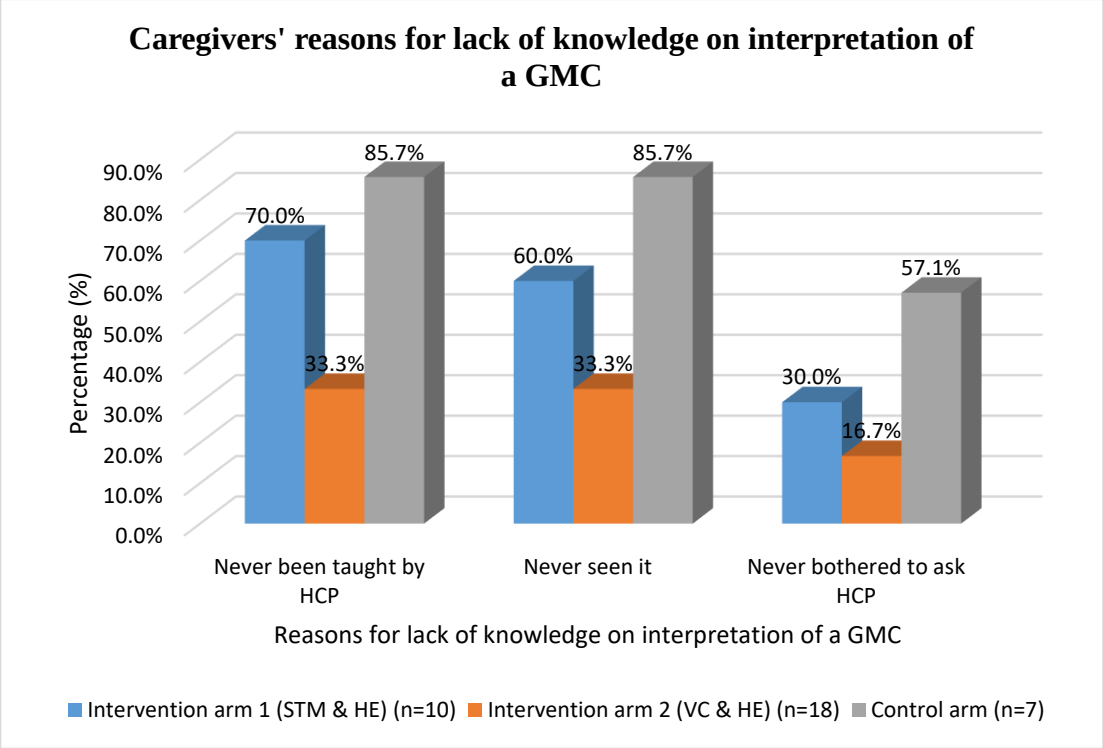

Figure 4.6: Caregivers' reasons for lack of knowledge on interpretation of a GMC

4.3.1.9 Caregivers' knowledge on health problems likely to be encountered out of failure to attend RGM

Figure 4.7 presents caregivers' knowledge on health problems likely to be encountered out of failure to attend RGM. About 31(73.8%) of the caregivers from intervention arm 1 (STM &HE), 29(74.4%) from intervention arm 2 (VC & HE) and 27(73%) from control arm mentioned that there is a likelihood of developing health problems among children not taken for RGM. Various health problems likely to be encountered which were reported by the caregivers include measles disease {intervention arm 1 (STM & HE), 23(54.8%), intervention arm 2 (VC & HE) 19(65.5%) and control arm 15(55.6%)}, malnourishment {intervention arm 1 (34%), intervention arm 2(27%) and control arm (39%) and poliomyelitis disease {intervention arm 1 (30%), intervention arm 2(45%) and control arm (25%)}.

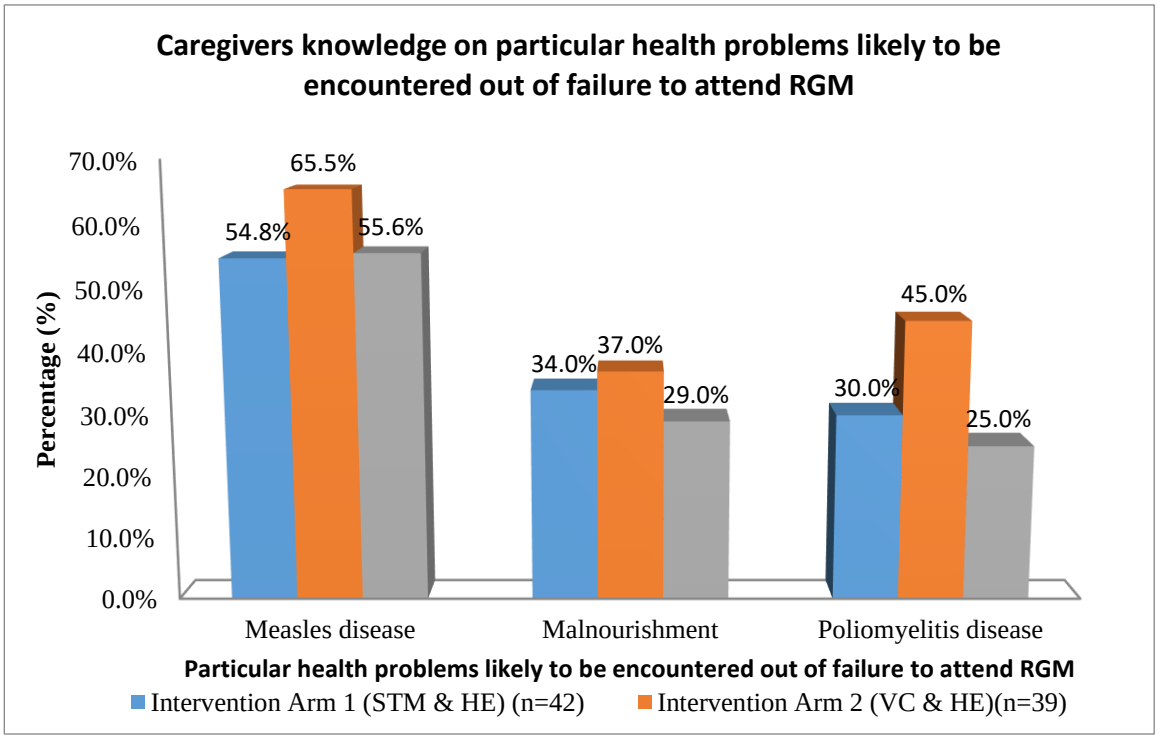

Figure 4. 7: Proportion of caregivers who knew health problems likely to be encountered out of failure to attend RGM

"Most caregivers discontinue regular growth monitoring activities after 9 months because they don't understand of it after the 9th month. They don't even know of the many health problems children encounter once they discontinue regular growth monitoring after 9 months" reported Head Nurse of one of the health facilities.

4.3.2 Caregivers' knowledge on Routine Growth Monitoring at Endline

At the end of the STM, VC and HE interventions, the study wanted to establish whether health education in particular had some effect on caregivers' knowledge on RGM. Therefore, all the caregivers in the intervention arms and the control arm were interviewed at endline to find out their understanding on meaning of Routine Growth Monitoring, when children should be taken for RGM, what is done to children at RGM clinic, benefits of RGM, meaning of a Child Health Card or book, Information in a child health card or book, meaning of a Growth Monitoring Curve (GMC), how to interpret Growth Monitoring Curve (GMC), health problems likely to be encountered out of failure to attend RGM. All these aspects put together were used to demonstrate caregivers' knowledge on Routine Growth Monitoring after the intervention at the end of the study. Study on caregivers' knowledge at this stage was important so as to establish whether HE interventions had any significant improvement.

4.3.2.1 Meaning of Routine Growth Monitoring (RGM)

Analysis of the study results showed a tremendous improvement in the proportion of caregivers 154(85.6%) who knew the meaning of routine growth monitoring after the STM, VC and HE interventions comparing with 118(65.6%) caregiver at the beginning of the study. Proportion of caregiver who did know the meaning of RGM reduced from 62(34.4%) at the baseline to 26(14.4%) at the end of the study. Further analysis revealed that all the

caregivers 60(100%) who received STM and HE as well as all caregivers 60(100%) who received voice call knew the meaning RGM which was an improvement of 30% and 35% respectively at the endline.

4.3.2.2 Caregivers' knowledge on when children should be taken for RGM

As shown in Table 4.8, post-intervention results revealed that all the caregivers 60 (100%) who received STM and all 60 (100%) of those who received VC were aware that children should be taken for RGM. This was an improvement of 30% and 35% from the initial 42(70%) and 39(65%) respectively at the baseline. Analysis demonstrated that after health education and phone use, the proportion of caregivers with knowledge that children should be taken for RGM monthly grew to 60(100%) in both intervention arms 1 and 2. In the control arm, the proportion of caregivers who correctly knew when children should be taken for RGM still remained low. The study observed a statistical association in the proportion of caregivers who received STM and those in control arm with knowledge that children should be taken for RGM (OR =3.000; 95% CI: 2.098 – 4.291; χ^2=60.000; df=1; p<0.001). The same statistical association was observed with the proportion of caregivers who received VC and those in control arm (OR =3.000; 95% CI: 2.098 – 4.291; χ^2=60.000; df=1; p<0.001).

Table 4. 8: Caregivers' knowledge on when children should be taken for RGM

Variable	STM & HE (n=60)	Control (n=34)	Odds Ratio (OR)	95% Confidence Interval (CI)		Significance	VC & HE (n=60)	Control (n=34)	Odds Ratio (OR)	95% Confidence Interval (CI)		Significance
				Lower	Upper					Lower	Upper	
Monthly	60(100%)	20(58.8%)	3.000	2.098	4.291	χ^2=60.000; df=1; p<0.001	60(100%)	20(58.8%)	3.000	2.098	4.291	χ^2=60.000; df=1; p<0.001
When child is sick	0(0%)	9(26.5%)	1.176	1.058	1.308	p=0.003*	0(0%)	9(26.5%)	1.176	1.058	1.308	p=0.003*
During immunization	0(0%)	17(50%)	1.364	1.171	1.588	p<0.0001*	0(0%)	17(50%)	1.364	1.171	1.588	p<0.0001*

Key: * Fisher's exact test

4.3.2.3 Knowledge on what is done during RGM visit

Table 4.9 presents post-intervention analysis of knowledge on what is done during RGM visit. All 60(100%) who received STM and HE, all those 60(100%) who received VC & HE as well as those in control arm 34(100%) knew that weight and height of children are measured. Post-intervention analysis showed that there were significantly more caregivers among those who received STM together with HE compared to those in the control who knew that the following activities are done during RGM visit: lessons on feeding practices (OR=59.000; 95% CI: 8.44 – 412.147: p<0.001*), detection of poor health OR=8.286; 95% CI: 4.124 – 16.649; p<0.001*), lessons on hygiene practices (OR=50.000; 95% CI: 7.136-350.330: p<0.001*), detection of malnutrition (OR=1.700; 95% CI: 0.849-3.404: χ^2=2.342; df=1; p=0.126), lessons on signs of sickness in children (OR=38.000; 95% CI: 5,390-267.913: p<0.001*), Head circumference measured (OR=9.000; 95% CI:1.176-68.854; p<0.001*) lessons on home remedy for sick child (OR=2.000; 95% CI:0.186-21.473; p<0.001*) Vitamin A supplementation (OR=15.00; 95% CI:5.820-38.660; p<0.001*), and Child vaccination (OR=15.00; 95% CI:5.820-38.660; p<0.001*. The analysis demonstrates

that those who received heath education were more likely to know what is done during RGM visit compared to those who did not.

Table 4.9: Caregivers' knowledge on what is done to children aged between 10 -24 months during RGM

Variable	STM & HE (n=60)	Control (n=34)	OR	95% CI		Significance	VC & HE (n=60)	Control (n=34)	OR	95% CI		Significance
				Lower	Upper					Lower	Upper	
Weight measured	60 (100%)	34 (100%)	1.765	1.414	2.202	χ^2=33.191; df=1; p<0.001	60 (100%)	34 (100%)	1.765	1.414	2.202	χ^2=33.191; df=1; p<0.001
Height measured	60 (100%)	34 (100%)	1.765	1.414	2.202	χ^2=33.191; df=1; p<0.001	60 (100%)	34 (100%)	1.765	1.414	2.202	χ^2=33.191; df=1; p<0.001
Taught feeding practices	59(98.3 %)	1 (2.9%)	59.000	8.446	412.147	p<0.001*	52 (86.7%)	1 (2.9%)	52.881	7.555	370.135	p<0.001*
Detection of poor health	58 (96.7%)	7 (20.6%)	8.286	4.124	16.649	p<0.001*	49 (81.7%)	7 (20.6%)	7.000	3.454	14.188	χ^2=59.063; df=1; p<0.001
Taught hygiene practices	50 (21.4%)	1 (2.7%)	50.000	7.136	350.330	p<0.001*	29 (2.6%)	1 (2.7%)	29.000	4.080	206.105	p<0.001*
Detection of malnutrition	17 (28.3%)	10 (29.4%)	1.700	0.849	3.404	χ^2=2.342; df=1; p=0.126	19 (31.7%)	10 (29.4%)	1.900	0.965	3.739	χ^2=3.683; df=1; p=0.055
Taught signs of sickness in children	38 (63.3%)	1 (2.9%)	38.000	5.390	267.913	p<0.001*	12 (20%)	1 (2.9%)	12.000	1.610	89.414	P=0.002*
Head circumference measured	9 (15%)	1 (2.9%)	9.000	1.176	68.854	p=0.017*	7 (11.7%)	1 (2.9%)	7.000	0.888	55.170	p=0.061*
Taught home remedy for sick child	2 (3.3%)	1 (2.9%)	2.000	0.186	21.473	p=1.000*	10 (16.7%)	1 (2.9%)	10.000	1.321	75.704	p=0.008*
Vitamin A supplementation	60 (100%)	4 (11.7%)	15.000	5.820	38.660	p<0.001*	60 (100%)	4 (11.7%)	15.000	5.820	38.660	p<0.001*
Child vaccination	60 (100%)	4 (11.7%)	15.000	5.820	38.660	p<0.001*	60 (100%)	4 (11.7%)	15.000	5.820	38.660	p<0.001*

Key: * Fisher's exact test

As presented in Table 4.9, caregivers' knowledge on other activities done during RGM visit, the study demonstrated significantly a higher proportion among those who received VC together with HE and those in the control as indicated: taught feeding practices (OR=52.881; 95% CI: 7.555 – 370.135: p<0.001*), detection of poor health (OR=7.000; 95% CI: 3.454-14.188; χ^2=59.063; df=1; p<0.001), Taught hygiene practices (OR=29.000; 95% CI: 4.080 – 206.105: p<0.001*), detection of malnutrition (OR=1.900; 95% CI: 0.965-3.739: χ^2=3.683; df=1; p=0.055), taught signs of sickness in children (OR=12.000; 95% CI: 1.610-89.414: P=0.002*), Head circumference measured (OR=7.000; 95% CI:0.888-55.170; p=0.061*) Taught home remedy for sick child (OR=10.000; 95% CI:1.321-75.704; p=0.008*), Vitamin A supplementation (OR=15.00; 95% CI:5.820-38.660; p<0.001*), and Child vaccination (OR=15.00; 95% CI:5.820-38.660; p<0.001*). The analysis demonstrated that those who received heath education were more likely to know what is done during RGM visit compared to those who did not.

4.3.2.4 Knowledge on benefits of RGM

As presented in Table 4.10, post-intervention interviews were done to the caregivers in all the three study arms to establish their knowledge on the benefits of RGM. Uptake of all vaccines was cited as one of the benefits of RGM by all caregivers 60(100%) who received HE and STM, all those 60 (100%) who received VC together with HE and 34 (56.7%) by those in control arm of the study. Analysis of knowledge on other benefits of RGM revealed that there were significantly more caregivers 59(98.3%) among those who used STM together with HE compared to 14(41.2%) caregivers in the control arm who knew that education on feeding practices (OR=4.214; 95% CI: 2.661- 6.675: χ^2=29.253; df=1; p<0.001) is a benefit. A significant majority of caregivers 59(98.3%) among those who used

STM together with HE compared to none 0 (0.0%) in the control arm, mentioned child's progress in health as another benefit (OR=0.017; 95% CI: 0.002 – 0.116; p<0.001*). Significantly more caregivers 57(95%) among those who used STM together with HE compared to those 13(38.2%) in the control arm knew that learning healthy lifestyle is a benefit (OR=4.385; 95% CI: 2.701 - 7.119: χ^2=66.377; df=1; p<0.001). It was established that significantly, more caregivers 36 (60%) among those who used STM together with HE compared to those 7(20.6%) in the control arm cited that abnormality in children is identified during RGM visit at the health facility (OR=4.971; 95% CI: 2.408- 10.262: χ^2=29.253; df=1; p<0.001. From the analysis of the post intervention there was a significantly increased proportion of caregivers who received HE and STM having knowledge on benefits of RGM compared to those who were in control.

Table 4.10: Caregivers' knowledge on the benefits of RGM

Variable	STM & HE (n=60)	Control (n=34)	Odds Ratio (OR)	95% Confidence Interval (CI)		Significance	VC & HE (n=60)	Control (n=34)	Odds Ratio (OR)	95% Confidence Interval (CI)		Significance
				Lower	Upper					Lower	Upper	
Uptake of all vaccines	60 (100%)	34 (100%)	1.765	1.414	2.202	χ^2=33.191; df=1; p<0.001	60 (100%)	34 (100%)	1.765	1.414	2.202	χ^2=33.191; df=1; p<0.001
Learn feeding practices	59 (98.3%)	14 (41.2%)	4.214	2.661	6.675	χ^2=29.253; df=1; p<0.001	57 (95%)	14 (41.2%)	4.071	2.564	6.464	χ^2=63.677; df=1; p<0.001
To know child's progress in health matters	59 (98.3%)	0 (0.0%)	0.017	0.002	0.116	p<0.001*	55 (91.7%)	0 (0.0%)	0.083	0.036	0.193	p<0.001*
Learn healthy lifestyle	57 (95%)	13 (38.2%)	4.385	2.701	7.119	χ^2=66.377; df=1; p<0.001	50 (83.3%)	13 (38.2%)	3.846	2.346	6.305	χ^2=45.748; df=1; p<0.001
Identify abnormality in children	36 (60%)	7 (20.6%)	4.971	2.408	10.262	χ^2=29.253; df=1; p<0.001	29 (48.3%)	7 (20.6%)	4.005	1.906	8.413	χ^2=18.294; df=1; p<0.001

Key: * Fisher's exact test

4.3.2.5 Caregivers' knowledge on meaning of a Child Health Card or book

Post intervention analysis showed that all 60(100%) of the caregivers who received HE & STM, all 60(100%) of them who received HE & VC and 29(48.3%) of the control arm understood the meaning of a child health card/book. Comparing with the baseline analysis (figure 4.2), the intervention greatly increased the proportion of caregivers' knowledge on meaning of a Child Health Card or book.

4.3.2.6 Caregivers' knowledge on the Information in a child health card or book

Post intervention analysis of the study results revealed an increased proportion of caregivers who knew information contained in a child health card as shown in Table 11. All 60(100%) caregivers who received HE & STM compared to 27(93.1%) in the control arm knew that weight for height was part of the information in a child card (OR=2.222; 95% CI: 1.680 – 2.940; p<0.001*). A significantly high proportion 60(100%) of caregivers who received HE & STM compared to those 26(89.7%) who did not receive anything knew that both Height-for-Age and when To Come Again (TCA), were part of the information in a child card (OR=2.308; 95% CI: 1.728 – 3.082; p<0.001*). All 60(100%) caregivers who received HE & STM knew information about recommended vaccine schedule in the card compared to 20(69%) in the control arm with same knowledge (OR=3.000; 95% CI: 2.098 – 4.291; p<0.001*). All 60(100%) caregivers who received HE & STM and 24(82.8%) in the control knew about bio-data information in child card (OR=2.500; 95% CI: 1.834 – 3.408; p<0.001*). The study observed that there was significantly more caregivers who received STM compared to those in the control arm who were aware of the following information in child health card: Head circumference (OR=17.000; 95% CI: 5.613-51.483; p<0.001*), Feeding recommendation guide (OR=3.692; 95% CI: 2.245-6.072; χ^2=40.845; df=1; p<0.001), Family planning information for the mother (OR=3.692; 95% CI: 2.245-6.072;

χ^2=40.845; df=1; p<0.001), Milestone assessment (OR=8.136; 95% CI: 3.452-19.176; χ^2=44.730; df=1; p<0.001), Vitamin A supplementation schedule (OR=4.667; 95% CI: 2.085-10.447; χ^2=40.845; df=1; χ^2=19.863; df=1; p<0.001), Ways of creating bond between mother and child (OR=4.667; 95% CI: 2.085-10.447; χ^2=40.845; df=1; χ^2=19.863; df=1; p<0.001), Paediatric assessment notes/information (OR=3.333; 95% CI: 1.440-7.715; χ^2=9.624; df=1; p=0.002), Body Mass Index (BMI)-for-age (OR=6.667; 95% CI: 2.091-21.256; χ^2=15.545; df=1; p<0.001) and HIV prophylaxis schedule (OR=2.750; 95% CI: 0.927-8.155; p=0.095*). Analysis of results on those who received HE & VC compared to those caregivers in the control arm was done. The study revealed that all 60 (100%) caregivers who received HE & VC compared to 27(93.1%) those in control, knew that weight for height information was in a child card (OR=2.222; 95% CI: 1.680 – 2.940; χ^2=45.517; df=1; p<0.001). A significantly high proportion 60 (100%) of caregivers who received HE & VC compared to those 26(89.7%) who were in the control arm knew that Height-for-Age was part of the information in a child card (OR=2.308; 95% CI: 1.728 – 3.082; χ^2=47.442; df=1; p<0.001). A significantly high proportion 59 (98.3%) of caregivers who received HE & VC compared to those 26(89.7%) who were in the control arm knew that when To come again (TCA) information was in a child card (OR=2.308; 95% CI: 2.269 – 1.696; χ^2=43.926; df=1; p<0.001).

Table 4.11: Proportion of Caregivers' awareness on the information in a Child health card/book

Variable	STM & HE (n=60)	Control (n=29)	OR	95% CI		Significance	VC & HE (n=60)	Control (n=29)	OR	95% CI		Significance
				Lower	Upper					Lower	Upper	
Weight-for-age	60(100%)	27(93.1%)	2.222	1.680	2.940	p<0.001*	60(100%)	27(93.1%)	2.222	1.680	2.940	χ^2=45.517; df=1; p<0.001
Height-for-age	60(100%)	26(89.7%)	2.308	1.728	3.082	p<0.001*	60(100%)	26(89.7%)	2.308	1.728	3.082	χ^2=47.442; df=1; p<0.001
To Come Again (TCA)	60(100%)	26(89.7%)	2.308	1.728	3.082	p<0.001*	59(98.3%)	26(89.7%)	2.269	1.696	3.036	χ^2=43.926; df=1; p<0.001
Bio-data	60(100%)	24(82.8%)	2.500	1.834	3.408	p<0.001*	60(100%)	24(82.8%)	2.500	1.834	3.408	χ^2=51.429; df=1; p<0.001
Recommended vaccine schedule	60(100%)	20(69%)	3.000	2.098	4.291	p<0.001*	58(98.7%)	20(69%)	2.900	2.021	4.160	χ^2=52.894; df=1; p<0.001
Head circumference	51(85%)	3(10.3%)	17.000	5.613	51.483	p<0.001*	11(18.3%)	3(10.3%)	3.667	1.077	12.487	p=0.043*
Feeding recommendation guide	48(80%)	13(44.8%)	3.692	2.245	6.072	χ^2=40.845; df=1; p<0.001	45(75%)	13(44.8%)	3.462	2.094	5.723	χ^2=34.171; df=1; p<0.001
Family planning information for the mother	48(80%)	13(44.8%)	3.692	2.245	6.072	χ^2=40.845; df=1; p<0.001	45(75%)	13(44.8%)	3.462	2.094	5.723	χ^2=34.171; df=1; p<0.001
Milestone assessment	40(66.7%)	5(17.2%)	8.136	3.452	19.176	χ^2=44.730; df=1; p<0.001	25(41.7%)	5(17.2%)	5.000	2.051	12.188	χ^2=17.778; df=1; p<0.001
Vitamin A supplementation schedule	28(46.7%)	6(20.7%)	4.667	2.085	10.447	χ^2=19.863; df=1; p<0.001	15(25%)	6(20.7%)	2.500	1.041	6.006	χ^2=4.675; df=1; p=0.031
Ways of creating bond between mother and child	28(46.7%)	6(20.7%)	4.667	2.085	10.447	χ^2=19.863; df=1; p<0.001	15(25%)	6(20.7%)	2.500	1.041	6.006	χ^2=4.675; df=1; p=0.031
Paediatric assessment notes/information	20(33.3%)	6(20.7%)	3.333	1.440	7.715	χ^2=9.624; df=1; p=0.002	13(21.7%)	6(20.7%)	2.167	0.882	5.322	χ^2=3.064; df=1; p=0.080
Body Mass Index (BMI)-for-age	20(4.5%)	3(6.1%)	6.667	2.091	21.256	χ^2=15.545; df=1; p<0.001	3(2.9%)	3(6.1%)	1.000	0.210	4.758	p=1.000*
HIV prophylaxis schedule	11(6.8%)	4(9.1%)	2.750	0.927	8.155	p=0.095*	4(0%)	4(9.1%)	1.000	0.262	3.815	p=1.000*

Key: * Fisher's exact test

As presented in Table 4.11, a high Proportion of caregivers 58(98.7%) in intervention arm 2 compared to 20(69%) of them in the control arm, knew that recommended vaccine schedule information was in child card (OR=2.900; 95% CI: 2.021 – 4.160; χ^2=52.894; df=1; p<0.001). All 60(100%) caregivers who received HE & VC and 24 (82.8% in the control arm knew that bio-data information was in child card (OR=2.500; 95% CI: 1.834 – 3.408; χ^2=51.429; df=1; p<0.001). The study observed that a significant majority of caregivers who received HE &VC compared to those in the control arm, knew that the following information was part of child health card: Head circumference (OR=3.667; 95% CI: 1.077-12.487; p=0.043*), Feeding recommendation guide (OR=3.462; 95% CI: 2.094 - 5.723; χ^2=34.171; df=1; p<0.001), Family planning information for the mother (OR=3.462; 95% CI: 2.094 -5.723; χ^2=34.171; df=1; p<0.001), Milestone assessment ((OR=5.000; 95% CI: 2.051-12.188; χ^2=17.778; df=1; p<0.001), Vitamin A supplementation schedule (OR=2.500; 95% CI: 1.041-6.006; χ^2=4.675; df=1; p=0.031), ways of creating bond between mother and child (OR=2.500; 95% CI: 1.041-6.006; χ^2=4.675; df=1; p=0.031), Paediatric assessment notes/information (OR=2.167; 95% CI: 0.882-5.322; χ^2=3.064; df=1; p=0.080), Body Mass Index (BMI)-for-age (OR=1.000; 95% CI: 0.210 - 4.758; p=1.000*) and HIV prophylaxis schedule (OR=1.000; 95% CI: 0.262 - 3.815; p=1.000*).

The analysis of results demonstrated that those who received HE in both interventional arm 1 and 2 were more likely to have knowledge on the information in a child card or book compared to those in control arm. (Table 4.11). The post intervention analysis results clearly demonstrate that health education improved knowledge of caregivers on the information in the child health card.

4.3.2.7 Proportion of caregivers who knew the meaning of a Growth Monitoring Curve (GMC)

Figure 4.8 presents the post-intervention analysis of the Proportion of caregivers who knew the meaning of a Growth Monitoring Curve**.** A high proportion of caregivers 60(100%) who received HE & STM and 59(98.3%) those who received HE & VC knew the meaning of a Growth Monitoring Curve (GMC) as showing a child's height and weight in a period of time. Few of the caregivers 7(11.7%) in the control arm understood the meaning of a growth monitoring curve at the endline.

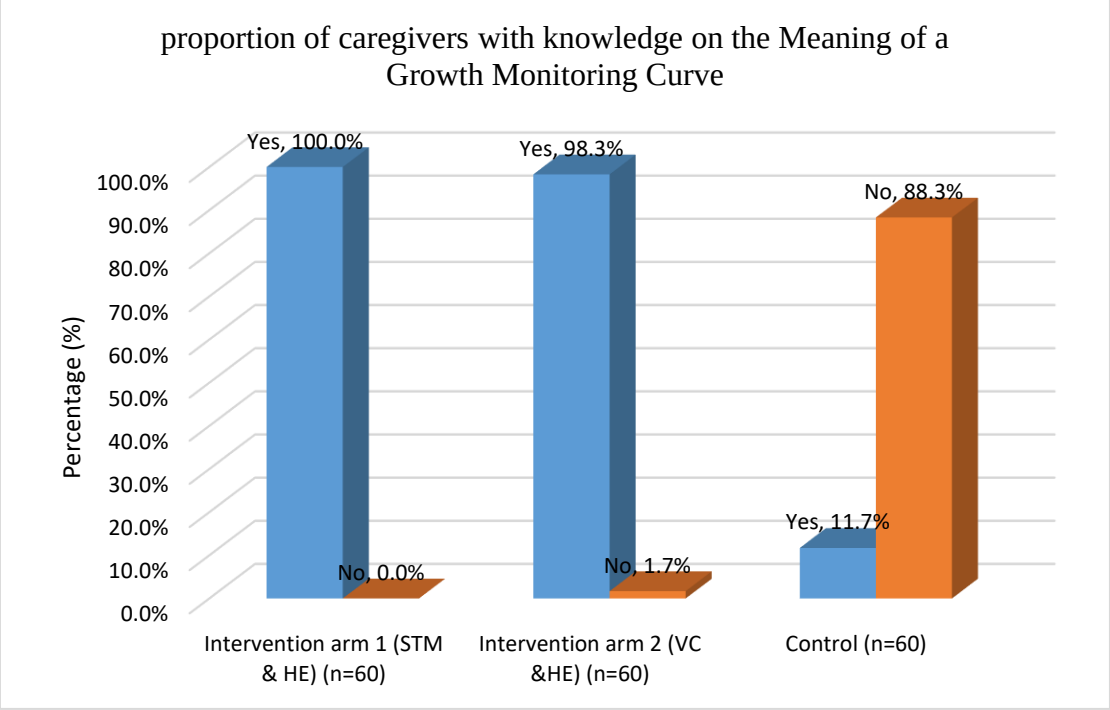

Figure 4. 8: Proportion of caregivers who knew the meaning of a growth monitoring curve

This clearly demonstrated that health education intervention worked to increase the proportion of caregivers who knew the meaning of a growth monitoring curve from 10(16.7%) of those who received HE & STM and 18(30%) of those who received HE & VC at the baseline (Figure 4.3) to the current high proportion of caregivers at the endline.

The proportion of caregivers 7(11.7%) of those who did not receive health education remained the same 7(11.7%) at post-intervention.

4.3.2.8 Proportion of Caregivers who knew how to interpret Growth Monitoring Curve (GMC)

Figure 4.9 shows the analysis of the post-intervention results of caregivers who knew how to interpret Growth Monitoring Curve. All 60(100%) caregivers in intervention 1, and 2 who received health education increased from 2(20%) and 5(27.8%) respectively at baseline (Figure 4.4). The proportion of caregivers 2(28.6%) in the control at the baseline (figure 4.4) remained the same 7(11.7%) at post intervention (figure 4.9) since they did not receive any health education. This demonstrated the power of health education in improving caregivers' knowledge.

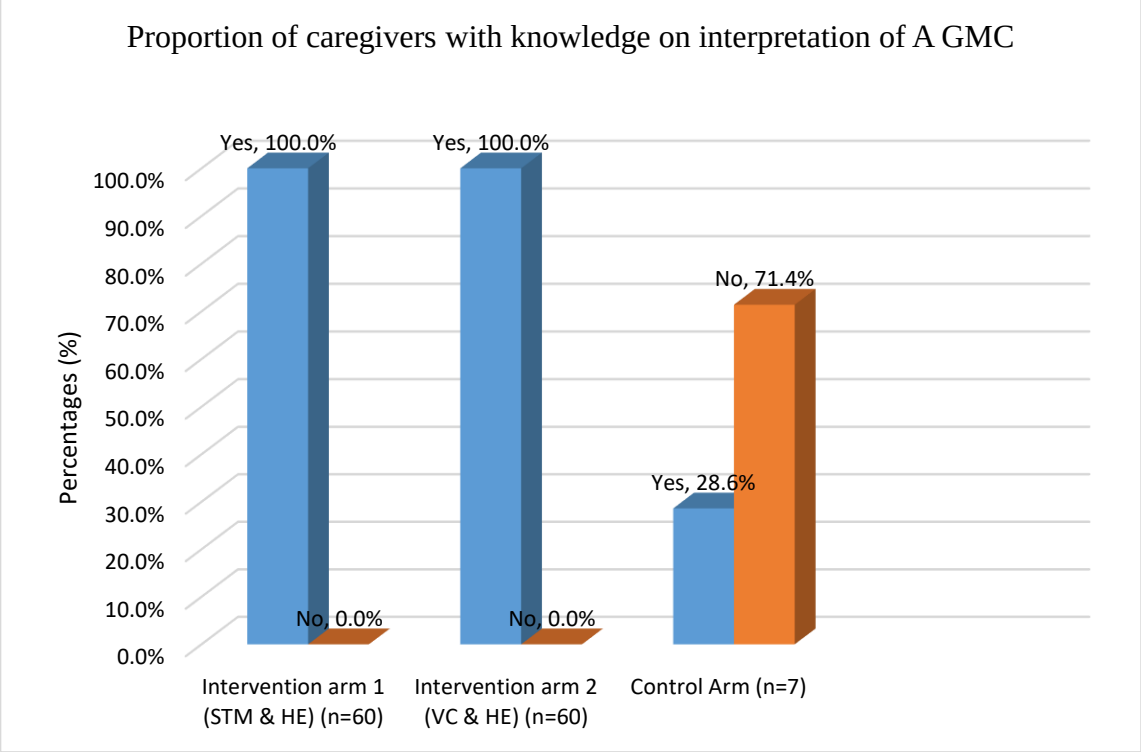

Figure 4.9: Proportion of caregivers with knowledge on interpretation of a GMC

4.3.2.9 Caregivers knowledge on health problems likely to be encountered from failure to attend RGM

At the endline the study wanted to establish whether there was an increase in proportion of caregivers with knowledge on health problems associated with failure to attend RGM. Post intervention analysis of results showed that all caregivers 60(100%) in both intervention arm 1 and 2 who received health education reported that they knew health problems likely to be encountered out of failure to attend RGM. The results clearly demonstrated that health education intervention worked to increase the proportion of caregivers from 31(73.8%) of those in intervention arm 1 and 29(74.4%) of those in intervention arm 2 at the baseline (section 4.3.1.9) to the current all caregivers at the endline (Table 4.12)

Table 4.12 presents the post-intervention analysis of caregivers' knowledge on health problems likely to be encountered out of failure to attend RGM. The study established that a significant huge proportion of caregivers who received HE in intervention arm 1 compared to those who did not receive anything were aware that measles (OR=2.200; 95 CI: 1.615 - 2.996; χ^2=33.750; df=1; p<0.001), poliomyelitis as well as underweight/overweight (OR=3.051; 95 CI: 1.876 - 4.963; χ^2=27.343; df=1; p<0.001) and Flu (OR=31.000; 95 CI: 4.371 - 219.839; χ^2=38.352; df=1; p<0.001) are some of the health problems associated with failure to take children for RGM.

Table 4.12: Caregivers' knowledge on particular health problems likely to be encountered out of failure to attend to RGM

Variable	STM & HE (n=60)	Control (n=34)	OR	95% CI		Significance	VC & HE (n=60)	Control (n=34)	OR	95% CI		Significance
				Lower	Upper					Lower	Upper	
Measles	55(91.7%)	25(73.5%)	2.200	1.615	2.996	χ^2=33.750; df=1; p<0.001	56(93.3%)	25(73.5%)	2.240	1.648	3.045	χ^2=36.505; df=1; p<0.001
Poliomyelitis	42(70%)	14(41.2%)	3.051	1.876	4.963	χ^2=27.343; df=1; p<0.001	36(60%)	14(41.2%)	2.571	1.555	4.252	χ^2=16.594; df=1; p<0.001
Underweight/ overweight	42(70%)	14(41.2%)	3.051	1.876	4.963	χ^2=27.343; df=1; p<0.001	17(28.3%)	14(41.2%)	1.214	0.660	2.235	χ^2=0.391; df=1; p=0.532
Flu	31(51.7%)	1 (2.9%)	31.000	4.371	219.839	p<0.001*	13(21.7%)	1(2.9%)	13.000	1.755	96.272	p=0.001*
Tetanus	21(35%)	11(32.4%)	1.909	1.011	3.605	χ^2=4.261; df=1; p=0.039	16(26.7%)	11(32.4%)	1.455	0.738	2.869	χ^2=1.195; df=1; p=0.274
Malnourishment	21(35%)	11(32.4%)	1.909	1.011	3.605	χ^2=4.261; df=1; p=0.039	12(20%)	11(32.4%)	1.091	0.523	2.277	χ^2=0.054; df=1; p=0.817
Tuberculosis (TB)	17(28.3%)	2 (5.9%)	8.500	2.053	35.193	p<0.001*	25(41.7%)	2(5.9%)	12.500	3.098	50.443	p<0.001*
Typhoid	17(28.3%)	1(2.9%)	17.000	2.336	123.717	p<0.001*	12(20%)	1(2.9%)	12.000	1.610	89.414	p=0.001*
Meningitis	16(26.7%)	1(2.9%)	16.000	2.191	116.855	p<0.001*	9(15%)	1(2.9%)	9.000	1.176	68.854	p=0.008*
Yellow fever	16(26.7%)	1(2.9%)	16.000	2.191	116.855	p<0.001*	6(10%)	1(2.9%)	6.000	0.745	48.342	p=0.051*
Chicken Pox	14(23.3%)	1(2.9%)	14.000	1.900	103.132	p<0.001*	12(20%)	1(2.9%)	12.203	1.638	90.904	p=0.001*
Influenza	14(23.3%)	1(2.9%)	14.000	1.900	103.132	p<0.001*	8(13.3%)	1(2.9%)	8.000	1.032	62.008	p=0.015*
Hepatitis B	14(23.3%)	1(2.9%)	14.000	1.900	103.132	p<0.001*	6(10%)	1(2.9%)	6.000	0.745	48.342	p=0.051*
Hepatitis A	14(23.3%)	1(2.9%)	14.000	1.900	103.132	p<0.001*	4 (6.7%)	1 (2.9%)	4.000	0.460	34.750	p=0.171*

Key: * Fisher's exact test

As presented in table 4.12, the other health problems identified by a significant big number of those who received health education compared to a significantly small number of caregivers who did not receive any HE intervention include: Tetanus (OR=31.000; 95 CI: 4.371 - 219.839; χ^2=38.352; df=1; p<0.001), Malnourishment (OR=1.909; 95 CI: 1.011 - 3.605; χ^2=4.261; df=1; p=0.039), Tuberculosis (OR=17.000; 95 CI: 2.336 - 123.717;

p<0.001*), Typhoid (OR=17.000; 95 CI: 2.336 - 123.717; p<0.001*), Meningitis (OR=16.000; 95 CI: 2.191 - 116.855; p<0.001*), Yellow fever (OR=16.000; 95 CI: 2.191 - 116.855; p<0.001*) and Chicken Pox, Influenza, Hepatitis A &B with each (OR=14.000; 95 CI: 1.900 - 103.132; p<0.001*). Study Participants who received health education compared to those who did not were more likely to know the health problem associated with failure to attend for RGM. Endline analysis of results for caregivers in intervention arm 2 was compared with that of control arm. The results revealed that a significant high proportion of caregivers who received HE in intervention arm 2 compared to those who did not receive anything were aware that measles (OR=2.240; 95 CI: 1.648 - 3.045; χ^2=36.505; df=1; p<0.001), poliomyelitis as well as underweight/overweight (OR=2.571; 95 CI: 1.555 - 4.252; χ^2=16.594; df=1; p<0.001) and Flu (OR=13.000; 95 CI: 1.755 - 96.272; p=0.001*) are some of the health problems associated with failure to take children for RGM. Other health problems identified by a significant high number of those who received health education compared to a significantly small number of caregivers who did not receive any HE intervention include: Tetanus (OR=1.455; 95 CI: 0.738 - 2.869; χ^2=1.195; df=1; p=0.274), Malnourishment (OR=1.091; 95 CI: 0.523 - 2.277; χ^2=0.054; df=1; p=0.817), Tuberculosis (OR=12.500; 95 CI: 3.098 - 50.443; p<0.001*), Typhoid (OR=12.000; 95 CI: 1.610 - 89.414; p=0.001*), Meningitis (OR=9.000; 95 CI: 1.176 - 68.854; χ^2=6.982; df=1; p=0.008), Yellow fever (OR=6.000; 95 CI: 0.745 - 48.342; p=0.051*), Chicken Pox (OR=12.000; 95 CI: 1.610 - 89.414; p=0.001*), Influenza (OR=8.000; 95 CI: 1.032 - 62.008; p=0.015*), Hepatitis B (OR=6.000; 95 CI: 0.745 - 48.342; p=0.051*), and Hepatitis A (OR=4.000; 95 CI: 0.460 - 34.750; p=0.171*) .The analysis demonstrated that those who received HE in both interventional arm 1 and 2 were more likely to be aware of the health problems associated with failure to taken a child for RGM.

4.4 Uptake of Routine Growth Monitoring (RGM)

The study interviewed caregivers in both intervention and control arms to establish whether they took their children for routine growth monitoring as required, at baseline and endline. Both baseline and post intervention analyses of results are presented in the subsequent subsections.

4.4.1 Uptake of Routine Growth Monitoring (RGM) at baseline

The study wanted to establish caregivers' uptake of Routine Growth Monitoring at the baseline. Therefore, all the caregivers in intervention and control arms were interviewed at baseline to find out whether caregivers did RGM.

4.4.1.1 Proportion of caregivers who maintained RGM schedule before STM, VC and HE intervention (last 8 months).

Figure 4.10 presents the pre-intervention result analysis of proportion of caregivers who maintained RGM schedule before STM, VC and HE intervention (last 8 months). About 11(18.3%) caregivers from intervention arm 1, 13(21.7%) from intervention arm 2 and 14(13.3%) caregivers from control arm maintained RGM prior to recruitment in the last 8 months. On the other hand, 49(81.7%) caregivers from intervention arm 1 (STM & HE), 47(78.3%) from intervention arm 2 (VC and HE) and 46(76.7%) from control arm confirmed to have missed RGM visit to the clinic for their children at least once or more.

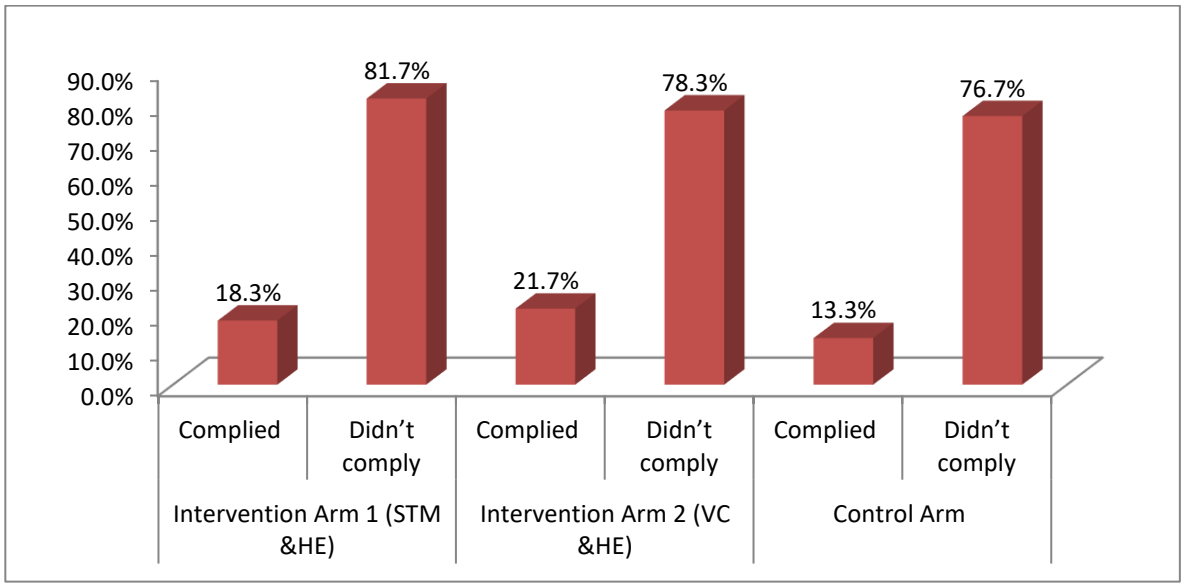

Figure 4.10: Proportion of caregivers who complied or not with RGM prior to recruitment

"Very few caregivers continue with regular growth monitoring after the 9th month of measles immunization" reported Head Nurse in one of the health facilities. A nurse in one of the MNCH clinic said that *"it will require a great intervention to convince mothers to bring their children after the 9th month unless when the child is sick"*. A Nurse from another facility reported "*what brings caregivers here is when their child are sick or when they suspect a problem. Otherwise we are not sure if they will come for the second measles vaccine."*

As shown in Table 4.13, a bigger proportion of caregivers 27(44.9%) from intervention arm 1 (STM & HE), 22(40.4%) from intervention arm 2 (VC & HE) and 24(52.2%) from the control arm said that they had missed RGM twice. Some good number of caregivers from intervention arm 1 (STM & HE) 16(32.6%), intervention arm 2 (VC & HE) 17(36.2%), and control arm 12(26.1%) missed RGM twice. Other caregivers from intervention arm 1 (STM & HE) 8(16.3%), intervention arm 2 (VC & HE) 11(23.4%), and control arm 10(21.7%) missed RGM once. About 3(6.1%) caregivers missed RGM four times.

Table 4.13: Number of Times caregivers from the three study arms missed RGM

Variable	**Intervention Arm1 (STM &HE) n=49**	**Intervention Arm 2 (VC &HE) n= 47**	**Control Arm (n=46)**
Once	8(16.3%)	11(23.4%)	10(21.7%)
Twice	22(44.9%)	19(40.4%)	24(52.2%)
Three Times	16(32.6%)	17(36.2%)	12(26.1%)
Four Times	3(6.1%)	0(0.0%)	0(0.0%

Table 4.14 presents several reasons why caregivers missed RGM. About 31.5% from intervention arm 1 (STM & HE), 34.6% from intervention arm 2 (VC & HE) and 33.9% among the control arm said that they forgot the date "To Come Again" (TCA). Other caregivers from intervention arm1 (38.7%), intervention arm 2(29%) and control arm (32.3%) said that healthcare provider did not tell them to bring their children again. Another reason given by caregivers in intervention arm 1 (30.2%), intervention arm 2 (27.9%) and control arm (41.9%) was that the child was not sick to be brought for RGM among other reasons.

> *"We have tried to ask caregivers why they cannot continue with regular clinics, mostly they say to have no reason for coming when there no vaccine for the children and they are not sick",* said a nurse in one of the MNCH clinics. Another nurse said *"most of us don't encourage caregivers to bring children for regular growth monitoring beyond 9th month".*

Table 4.14: Caregivers' reasons for skipping RGM prior to recruitment

Reasons for Skipping RGM	Intervention		Control	Significance
	STM & HE (n=49)	VC & HE (n=47)	(n=46)	
Forgot TCA	40 (81.6%)	44 (93.6%)	43 (93.5%)	χ^2=0.952; df=5; p=0.966
Healthcare provider did not say	24 (49%)	18 (38.3%)	20 (43.5%)	χ^2=3.149; df=5; p=0.677
My child was not sick	13 (26.5%)	12 (25.5%)	18 (39.1%)	χ^2=5.286; df=5; p=0.382
Healthcare provider said there was no need since no vaccine was scheduled	6 (12.2%)	12 (25.5%)	16 (34.8%)	χ^2=7.252; df=5; p=0.203
I did not find reason for doing it	8 (16.3%)	8 (17%)	14 (30.4%)	χ^2=5.760; df=5; p=0.330
I had a busy schedule at home/work	4 (8.1%)	8 (17%)	8 (17.4%)	p=0.731*
Health facility is far	1 (2%)	3 (6.4%)	3 (6.5%)	p=0.429*
Striking nurses	3 (6.1%)	2 (4.3%)	1 (2.2%)	p=0.740*
My partner is not supportive	0 (0%)	1 (2.1%)	2 (4.3%)	p=0.435*
I was not feeling well	0 (0%)	1 (2.1%)	0 (0%)	p=1.000*
Friends discouraged me	2 (4.1%)	0 (0%)	0 (0%)	p=0.162*
Healthcare provider sent me back because I went a day prior to TCA	1(2%)	0 (0%)	0(0%)	p=0.326*
I assumed RGM was not important	0 (0%)	0 (0%)	1 (2.2%)	p=1.000*
I lost my child's clinic card	1 (2%)	0 (0%)	0 (0%)	p=1.000*
Travelled without child's clinic card	0 (0%)	1 (2.1%)	0 (0%)	p=1.000*
My husband passed on	1 (2%)	0 (0%)	0 (0%)	p=1.000*
I relocated residence	1 (2%)	0 (0%)	0 (0%)	p=1.000*
TCA fall on a public holiday	0 (0%)	1 (2.1%)	0 (0%)	p=1.000*

Key: * Fisher's exact test

As presented in Table 4.14, baseline analysis of results on Caregivers' reasons for skipping RGM revealed that, the proportion of caregivers from both intervention arms and control arm who said to have forgotten TCA were not significantly different (χ^2=0.952; df=5; p=0.966). There was no statistical association in the proportion of caregivers from intervention and control arms who indicated that healthcare providers did not tell them to return their children for RGM (χ^2=3.149; df=5; p=0.677). The study did not find any statistical association in the proportion of caregivers from intervention and control arms who said that their children were not sick (χ^2=5.286; df=5; p=0.382) to be brought for RGM. The proportion caregivers who did not see the importance of RGM were not significantly different in intervention arm 1, 2 and control arm.

As shown in Table 4.14, there was no statistical association in proportion of caregivers from intervention arms 1, 2 and control arm who gave the following reasons: Healthcare provider said there was no need since no vaccine was scheduled (χ^2=7.252; df=5; p=0.203), did not find reason for doing it (χ^2=5.760; df=5; p=0.330), had a busy schedule at home/work (p=0.731*), Health facility is far (p=0.429*), striking nurses (p=0.740*), partner not supportive (p=0.435*), was not feeling well (p=1.000*), discouraged friends (p=0.162*), Healthcare provider sent me back because I went a day prior to TCA (p=0.326*), assumed that RGM was not important (p=1.000*), lost my child's clinic card (p=1.000*), travelled without child's clinic card (p=1.000*), my husband passed on (p=1.000*), relocated residence (p=1.000*), and TCA fall on a public holiday (p=1.000*).

Table 4.15: Association between socio-demographic/economic characteristics and skipping RGM

Variable		Skipping RGM		Significance
		Skipped	Did not skip	
Age (Years)	Below 18	4 (2.8%)	0 (0%)	p=0.075*
	18-22	27 (19.0%)	11 (28.9%)	
	23-27	57 (40.1%)	10 (26.3%)	
	28-32	41 (28.9%)	8 (21.1%)	
	33-37	11 (7.7%)	8 (21.1%)	
	38-42	2 (1.4%)	1 (2.6%)	
Marital status	Married	125 (88%)	34 (89.5%)	p=1.000*
	Single	17 (12%)	4 (10.5%)	
Education level	Primary	54 (38%)	12 (31.6%)	χ^2=9.132; df=4; p=0.058
	Secondary	66 (46.5%)	12 (31.6%)	
	Tertiary	22 (15.5%)	14 (36.8%)	
Occupation	Peasant Farmer	55 (38.7%)	14 (36.8%)	χ^2=6.706; df=3; p=0.082
	Housewife	58 (40.8%)	12 (31.6%)	
	Self-employed	23 (16.2%)	6 (15.8%)	
	Employed	6 (4.2%)	6 (15.8%)	
Monthly Income	< 5000	61 (43%)	16 (42.1%)	p=0.870*
	5 000-10 000	16 (11.3%)	5 (13.2%)	
	10000 and above	11 (7.7%)	4 (10.5%)	
	Dependant/None	54 (38%)	13 (34.2%)	
Gender of child	Male	70 (49.3%)	19 (50%)	χ^2=0.006; df=1; p=0.939
	Female	72 (50.7%)	19 (50%)	

Key: * Fisher's exact test

Table 4.15 shows that there was no significant association between compliance with RGM schedule and age (p=0.075*), marital status (p=1.000*), education level (χ^2=9.132; df=4; p=0.058), occupation (χ^2=6.706; df=3; p=0.082), monthly income (p=0.870*) and gender of child (χ^2=0.006; df=1; p=0.939).

4.4.2 Uptake of Routine Growth Monitoring (RGM) at Endline

The study wanted to establish caregivers' uptake of Routine Growth Monitoring at the endline. Therefore, all the caregivers in intervention and control arms were interviewed at endline to determine whether caregivers attended RGM.

4.4.2.1 Proportion of Caregivers who complied with RGM schedule during STM, VC and HE intervention

Figure 4.11 presents the post-intervention result analysis of the proportion of caregivers who complied with RGM schedule during STM, VC and HE intervention. About 51(85%) caregivers from intervention arm 1, 50(83.3%) from intervention arm 2 and 2(3.3%) caregivers from control arm complied with RGM schedule. On the other hand, 9(15.0%) caregivers from intervention arm 1 (STM & HE), 10(16.7%) from intervention arm 2 (VC and HE) and 58(96.7%) caregivers from control arm confirmed to have skipped RGM visit to the clinic for their children once or more times. Post intervention analysis of results demonstrated that with effective health education together with STM and VC, caregivers are likely to take their children for RGM beyond 9 months. Post-intervention analysis of results showed a higher compliance to RGM appointments compared to baseline results which posted very proportions of caregivers how said to taken their children for RGM.

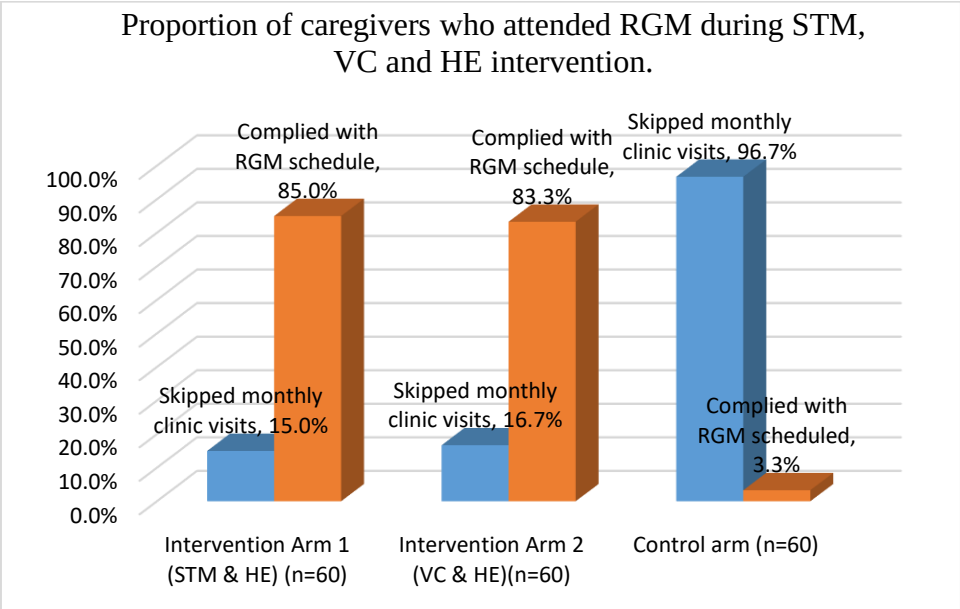

Figure 4.11: Proportion of caregivers who complied with RGM schedule during STM, VC and HE intervention

Table 4.16 presents the number of times caregivers skipped RGM after STM, VC and HE intervention. Those caregivers who did not comply with RGM schedule were asked to state the number of times they had skipped RGM during the study period. Post-intervention results showed that caregivers skipped RGM between once and eight times. The analysis revealed that of those caregivers who skipped RGM visits during the study period, all 9(100%) of them from intervention arm 1, skipped once, 5(50%) from intervention arm 2 skipped once, and another 5(50%) of them skipped twice. Analysis results of control arm showed that caregivers skipped RGM more than two times. That is, 24(41.4%) caregivers skipped seven times, 18(31%) eight times, 8(13.8%) six times, 4(6.9%) five times and 4 (6.9%) four times. The study showed that caregivers from the intervention arms only skipped RGM visits once or twice.

Table 4.16: Number of times caregivers skipped RGM after STM, VC and HE intervention

Number of times	Intervention Arms		Control Arm (n=58)
	STM & HE (n=9)	**VC & HE (n=10)**	
Once	9 (100%)	5 (50%)	0 (0%)
Twice	0 (0%)	5 (50%)	0 (0%)
Four times	0 (0%)	0 (0%)	4 (6.9%)
Five times	0 (0%)	0 (0%)	4 (6.9%)
Six times	0 (0%)	0 (0%)	8 (13.8%)
Seven times	0 (0%)	0 (0%)	24 (41.4%)
Eight times	0 (0%)	0 (0%)	18 (31%)

As shown in Table 4.16, there was a significant reduction in proportion of caregivers from 49(81.7%) at baseline to 9(15%) at endline in intervention arm1 and from 47(78.3%) at baseline to 10(16.7%) at endline in intervention arm 2 who skipped RGM visits. Analysis revealed that the number of times caregivers skipped RGM visit reduced from 4 times at baseline (Table 4.13) for intervention arm1 and 3 times for intervention arm 2 to once and twice respectively at the endline (Table 4.16). The improved RGM visit to clinics was attributed to health education, short text message and voice call interventions.

For the case of control arm, the study witnessed a high proportion of caregivers at baseline 46(76.7%) and endline 58(96.7%) who missed RGM visits (Table 4.13 and 4.16 respectively). There was increased number of times caregivers skipped RGM visits from 3 times at baseline (Table 4.13) to eight times (entire study period) at the endline (Table 4.16).

4.4.2.3 Caregivers' reasons for skipping RGM after STM, VC and HE intervention

Table 4.17 shows caregivers' reasons for skipping RGM after STM, VC and HE intervention. The post-intervention analysis of results revealed that caregivers from in intervention arm1 9(100%) and intervention arm2 10(100%) took their children to nearby health facilities. Further analysis showed that caregivers took their children to the nearby health for RGM because their usual health facility was far;

striking nurses and that healthcare provider sent them back because they went a day prior to TCA. Caregivers from the control arm gave various reasons for skipping RGM including that they forgot their TCAs 58(100%), Healthcare providers did not tell them 53(91.4%), their children were not sick 52(89.7%), not finding any reason for doing it 48(82.8%), they had busy schedules 39(67.2%) among other reasons. Many caregivers assumed that RGM was not important 24(41.4%) while others took their child to a nearby health facility 17(29.3%). Other caregivers in the control arm claimed that their partners were not supportive 9(15.5%) among other reasons.

Table 4.17: Caregivers' reasons for skipping RGM after STM, VC and HE intervention

Reasons for Skipping RGM	**Intervention**		**Control (n=58)**	**Significance**
	STM & HE (n=9)	**VC & HE (n=10)**		
Forgot TCA	0 (0%)	0 (0%)	58 (100%)	p<0.001*
Healthcare provider did not say	0 (0%)	0 (0%)	53 (91.4%)	p<0.001*
My child was not sick	0 (0%)	0 (0%)	52 (89.7%)	p<0.001*
I did not find reason for doing it	0 (0%)	0 (0%)	48 (82.8%)	p<0.001*
I had a busy schedule at home/work	0 (0%)	0 (0%)	39 (67.2%)	p<0.001*
Took child to a nearby health facility	9 (100%)	10 (100%)	17 (29.3%)	χ^2=8.750; df=5; p=0.119
My partner is not supportive	0 (0%)	0 (0%)	9 (15.5%)	p<0.001*
Healthcare provider said there was no need since no vaccine was scheduled	0 (0%)	0 (0%)	3 (5.2%)	p=0.009*
I assumed RGM was not important	0 (0%)	0 (0%)	24 (41.4%)	p=0.412*
Health facility is far	1 (2%)	3 (6.4%)	3 (6.5%)	p=0.297*
Striking nurses	3 (6.1%)	2 (4.3%)	1 (2.2%)	p=0.530*
Friends discouraged me	0 (0%)	0 (0%)	6 (10.3%)	p<0.001*
Healthcare provider sent me back because I went a day prior to TCA	1(2%)	0 (0%)	0(0%)	p=0.412*

Key: * Fisher's exact test

As shown in Table 4.17, the proportion of caregivers from the control arm was significantly high compared with that of caregivers who received STM, VC and HE with reasons including forgot TCA (p<0.0001*), healthcare provider did not tell (p<0.0001*),

children were not sick (p<0.0001*), did not find reason for RGM (p<0.0001*), had a busy schedule at home/work (p<0.0001*), partner were not supportive (p<0.0001*), healthcare provider said there was no need for RGM since no vaccine was scheduled (p=0.009*), discouraged by friends (p<0.0001*). There was no statistical association in proportion of caregivers among the intervention and control arms who assumed RGM was not important (p=0.412*), health facility is far (p=0.297*) and those who claimed that healthcare provider sent me back because they went a day prior to TCA (p=0.412*).

> *"We have witnessed huge numbers of caregivers than before bringing children for regular growth monitoring since this intervention started"* reported Head Nurse in one of the health facilities which participated in the intervention. This was the message from the other interventional health facilities. *"It is surprising that if caregivers are educated and consistently reminded to bring their children for regular growth monitoring, they comply"* reported a nurse in one of the interventional health facilities.

4.5 Effects of *m*health (STM and VC) on uptake of RGM.

4.5.1 Accessibility of mobile phone

Table 4.18 presents on accessibility of mobile phone by the caregivers. Analysis of results revealed that all the caregivers in the three study arms accessed a mobile phone with majority of them reporting ownership. In Intervention arm 1(STM & HE) 55(91.7%) of caregivers owned a phone, 1(1.7%) borrowed while 4(6.7%) shared. In intervention arm 2 (VC & HE) 49(81.7%) owned a phone, 2(3.3%) borrowed and 9(15%) shared. Likewise, in the control arm, 53(88.3%) of caregivers owned a phone, 1(1.7%) borrowed while 6(10%) shared.

As shown in Table 4.18, the study did not establish any statistical association in the proportion of caregivers who accessed a mobile phone in intervention arm 1 and control arm (p=0.870), intervention arm 2 and control arm p=0.708 as well as intervention arm 1 and 2 (p=0.271). Therefore, the study analysis observed that caregivers in the three arms of study had access to mobile phone, a sign that any intervention involving the technology would succeed.

Table 4.18: Proportion of caregivers who accessed a mobile phone

Variable	STM & HE (n=60)	Control (n=60)	Fisher's Exact Test	VC & HE (n=60)	Control (n=60)	Fisher's Exact Test	STM& HE (n=60)	VC & HE (n=60)	Fisher's Exact Test
Owned	55(91.7%)	53(88.3%)	p=0.870	49(81.7%)	53(88.3%)	p=0.708	55(91.7%)	49(81.7%)	p=0.271
Borrowed	1(1.7%)	1(1.7%)		2(3.3%)	1(1.7%)		1(1.7%)	2(3.3%)	
Shared	4(6.7%)	6(10%)		9(15%)	6(10.0%)		4(6.7%)	9(15%)	

4.5.2 How often study participants use Mobile Phone, STM and VC

As presented in Table 4.19, the respondents were asked about how often they used a mobile phone. About 91.7% from intervention arm 1 (STM and HE), 75% from intervention arm 2 (VC and HE) and 90% from the control arm indicated that it is daily. Further, many of the study participants in the intervention arm 1 (81.7%), intervention arm 2 (68.3%) and control arm (81.7%) reported use short text message and voice call always. Analysis of study participants' use of mobile phone did not observe any statistical association between those caregivers who used short text message and those in control arm (χ^2=0.001; df=1; p=1.000); those who used voice call and control arm (χ^2=2.844; df=1; p=0.092) and those who used short text message compared to those of voice call (χ^2=2.844; df=1; p=0.092). It meant that caregivers in the study area highly used their phone and that any current and future health intervention using a phone would succeed.

4.5.3 Caregivers' ideal time to receive STM or VC

Table 4.19 presents caregivers' ideal time to receive STM or VC. Analysis of results in study showed that all the caregivers in the three study arms would accept STM or VC to remind them to take their children for RGM. Study respondents quoted different times which they preferred to receive reminders. Many of the caregivers preferred evening hours 45 (75%) of them in intervention arm 1; 16(26.7%) in intervention arm 2 and 17 (28.3%) in the control arm.

Table 4.19: Caregivers' mobile phone, STM and VC use and ideal time to receive STM or VC

Variable	STM & HE (n=60)	Control (n=60)	Significance	VC & HE (n=60)	Control (n=60)	Significance	STM & HE (n=60)	VC & HE (n=60)	Significance
Mobile phone usage									
Daily	55 (91.7%)	54 (90%)	χ^2=0.100; df=1; p=0.752	45 (75%)	54 (90%)	χ^2=4.675; df=1; p=0.031	55 (91.7%)	45 (75%)	χ^2=6.000; df=1; p=0.014
Often	5 (8.3%)	6 (10%)		15 (25%)	6 (10%)		5 (8.3%)	15 (25%)	
STM/VC usage									
Always	49 (81.7%)	49 (81.7%)	χ^2=0.001; df=1; p=1.000	41 (68.3%)	49 (81.7%)	χ^2=2.844; df=1; p=0.092	49 (81.7%)	41 (68.3%)	χ^2=2.844; df=1; p=0.092
Sometimes	11 (18.3%)	11 (18.3%)		19 (31.7%)	11(18.6 %)		11 (18.3%)	19 (31.7%)	
Ideal time of receiving STM/VC									
Morning	1 (1.7%)	21 (35%)	p<0.001*	3 (5%)	21 (35%)	p<0.001*	1 (1.7%)	3 (5%)	p=0.518*
At noon	2 (3.3%)	5 (8.3%)		3 (5%)	5 (8.3%)		2 (3.3%)	3 (5%)	
Afternoon	12 (20%)	17 (28.3%)		16 (26.7%)	17 (28.3%)		12 (20%)	16 (26.7%)	
Evening	45 (75%)	17 (28.3%)		16 (26.7%)	17 (28.3%)		45 (75%)	16 (26.7%)	

Key: * Fisher's exact test

4.5.4 Caregivers willingness use Mobile Phone in RGM.

When the respondents were asked if they would take their children for RGM if reminded by STM or VC, all the participants in the three study arms (100%) were highly willing. All the study participants (100%) in all the three study arms demonstrated willingness to continue receiving STM or VC up to the time their children turned 24 months and beyond. Furthermore, the study revealed that all study participants (100%) in the three study arms

expressed willingness to recommend STM or VC to their friends who were having children of less than 60 months.

4.5.5 Challenges and Negative effects directly attributed to use of STM or VC.

Table 4.20 presents challenges and negative effects directly attributed to use of STM or VC. Analysis of results revealed three major challenges directly attributed to use of STM or VC. Caregivers in intervention arm 1 42(70%), Intervention arm 2 37 (61.7%) and control ground 34 (56.7%) cited high cost of airtime challenge attributed to use mobile phone (Table 4.23). Other challenges identified by caregivers included injuries and confidentiality issues. The study did not observe any statistical association between the proportions of caregivers in intervention arm 1 and those in control arm for all challenges including high cost of airtime (χ^2=2.297; df=1; p=0.130), injuries including radiations (χ^2=2.344; df=1; p=0.126) and confidentiality issues (χ^2=0.834; df=1; p=0.361) (Table 4.20). There was no statistical association in proportion of caregivers in intervention arm 2 and control arm who cited the same challenges: high cost of airtime (χ^2=0.310; df=1; p=0.677), injuries (χ^2=3.589; df=1; p=0.058). The study did not observe any statistical association among the proportions of caregivers when comparing those in intervention arms 1 and 2 who mentioned high cost of airtime (χ^2=0.926; df=1; p=0.336), injuries (χ^2=0.136; df=1; p=0.713) and confidentiality issues (χ^2=1.714; df=1; p=0.190) as challenges directly 0attributed to use of STM.

Analysis of the study results revealed four main perceived negative effects of using STM or VC on uptake of RGM. Caregivers in intervention arm 1 17(28.3%), Intervention arm 2 11(18.3%) and control arm 13(21.7%), highlighted compromised privacy especially when a mobile phone is shared. Some caregivers in intervention arm 1 16(26.7%), Intervention arm 2 14(23.3%) and control arm 21(35%) mentioned hanging up of phone thus not receiving intended message on time. Other caregivers in intervention arm 1 11(18.3%),

Intervention arm 2 13(21.7%) and control arm 17(28.3%) cited that it needs concentration. Last but not least was missed information if caregiver's mobile phone is off was said by those in intervention arm 1 14(23.3%), Intervention arm 2 16(26.7%) and control arm 10(16.7%). The study did not observe any statistical association between the proportions of caregivers in intervention arm 1 and those in control arm who cited privacy compromised (χ^2=0.711; df=1; p=0.399), hanging up of phone (χ^2=0.977; df=1; p=0.323), needs concentration (χ^2=1.677; df=1; p=0.195) and missed information when mobile is off (χ^2=0.833; df=1; p=0.361) as negative effects of phone. There was no statistical association in proportion of caregivers in intervention arm 2 and control arm who cited the same negative effects of phone use: privacy compromised (χ^2=0.208; df=1; p=0.648), hanging up of phone (χ^2=1.976; df=1; p=0.160), needs concentration (χ^2=0.711; df=1; p=0.399) and missed information when mobile is off (χ^2=1.768; df=1; p=0.184). The study did not observe any statistical association among the proportions of caregivers when comparing those in intervention arms 1 and 2 who mentioned privacy compromised (χ^2=1.677; df=1; p=0.195), hanging up of phone (χ^2=0.178; df=1; p=0.673), needs concentration (χ^2=0.208; df=1; p=0.648) and missed information when mobile is off (χ^2=0.208; df=1; p=0.648) as negative effects directly attributed to use STM or VC.

Table 4.20: Challenges directly attributed to use of STM or VC and Negative effects of using STM or VC on uptake of RGM

Variable	STM & HE (n=60)	Control (n=60)	Significance	VC & HE (n=60)	Control (n=60)	Significance	STM & HE (n=60)	VC & HE (n=60)	Significance
Challenges directly attributed to use of STM									
High cost of airtime	42 (70%)	34 (56.7%)	χ^2=2.297; df=1; p=0.130	37 (61.7%)	34 (56.7%)	χ^2=0.310; df=1; p=0.677	42 (70%)	37 (61.7%)	χ^2=0.926; df=1; p=0.336
Injuries	35 (58.3%)	43 (71.7%)	χ^2=2.344; df=1; p=0.126	33 (55%)	43 (71.7%)	χ^2=3.589; df=1; p=0.058	35 (58.3%)	33 (55%)	χ^2=0.136; df=1; p=0.713
Confidentiality issues	27 (45%)	32 (53.3%)	χ^2=0.834; df=1; p=0.361	20 (33.3%)	32 (53.3%)	χ^2=4.887; df=1; p=0.027	27 (45%)	20 (33.3%)	χ^2=1.714; df=1; p=0.190
Negative effects of using STM or VC on uptake of RGM									
Needs concentration	11 (18.3%)	17 (28.3%)	χ^2=1.677; df=1; p=0.195	13 (21.7%)	17 (28.3%)	χ^2=0.711; df=1; p=0.399	11 (18.3%)	13 (21.7%)	χ^2=0.208; df=1; p=0.648
Privacy compromised	17 (28.3%)	13 (21.7%)	χ^2=0.711; df=1; p=0.399	11 (18.3%)	13 (21.7%)	χ^2=0.208; df=1; p=0.648	17 (28.3%)	11 (18.3%)	χ^2=1.677; df=1; p=0.195
Hanging of phone	16 (26.7%)	21 (35%)	χ^2=0.977; df=1; p=0.323	14 (23.3%)	21 (35%)	χ^2=1.976; df=1; p=0.160	16 (26.7%)	14 (23.3%)	χ^2=0.178; df=1; p=0.673
Missed information when mobile off	14 (23.3%)	10 (16.7%)	χ^2=0.833; df=1; p=0.361	16 (26.7%)	10 (16.7%)	χ^2=1.768; df=1; p=0.184	14 (23.3%)	16 (26.7%)	χ^2=0.178; df=1; p=0.673

4.5.6 Effects of use of *m*health technologies on attendance of RGM

At the end of the study, analysis of caregivers' monthly visits for RGM was done to demonstrate the actual effect of using mobile phone. Analysis was done to compare the proportion of caregivers who received short text message together with health education and those in the control arm from month 1 to mouth 9. Month 1 of the study was the 1st month of intervention after recruitment of caregivers to the study. Month 9 was the last month of the intervention, and the time when caregivers were expected to bring their children for second measles immunization.

Table 4.21: Proportion of caregivers who turned up for RGM in intervention arm 1and control arm

Variable	STM & HE (n=60)	Control (n=60)	OR	95% CI		Significance
				Lower	Upper	
Month 1						
Attended	55(91.7%)	8(13.3%)	6.875	3.591	13.164	χ^2=73.818; df=1; p<0.001
Failed to attend	5 (8.3%)	52 (86.7%)	0.096	0.041	0.224	
Month 2						
Attended	58(96.7%)	7(11.7%)	8.286	4.124	16.649	p<0.001*
Failed to attend	2(3.3%)	53(88.3%)	0.038	0.010	0.148	
Month 3						
Attended	58(96.7%)	4(6.7%)	14.500	5.619	37.415	p<0.001*
Failed to attend	2(3.3%)	56(93.3%)	0.036	0.009	0.140	
Month 4						
Attended	58 (96.7%)	4 (6.7%)	14.500	5.619	37.415	p<0.001*
Failed to attend	2 (3.3%)	56 (93.3%)	0.036	0.009	0.140	
Month 5						
Attended	59 (98.3%)	3 (5%)	19.667	6.524	59.285	p<0.001*
Failed to attend	1 (1.7%)	57 (95%)	0.018	0.003	0.123	
Month 6						
Attended	59 (98.3%)	2 (3.3%)	29.500	7.549	115.284	p<0.001*
Failed to attend	1 (1.7%)	58 (96.7%)	0.017	0.002	0.120	
Month 7						
Attended	59 (98.3%)	2 (3.3%)	29.500	7.549	115.284	p<0.001*
Failed to attend	1 (1.7%)	58 (96.7%)	0.017	0.002	0.120	
Month 8						
Attended	59 (98.3%)	2 (3.3%)	29.500	7.549	115.284	p<0.001*
Failed to attend	1 (1.7%)	58 (96.7%)	0.017	0.002	0.120	
Month 9						
Attended	59 (98.3%)	35 (58.3%)	1.686	1.358	2.093	p<0.001*
Failed to attend	1 (1.7%)	25 (41.7%)	0.040	0.006	0.286	

Key: * Fishers' exact test

Table 4.21 shows that in month 1, majority of caregivers (55(91.7%) who received STM compared to those in control arm 8(13.3%) turned up for RGM. The analysis demonstrates that in month 1 those caregivers who received STM and HE were 6.875 times more likely to take their children for RGM compared to those who did not receive anything (OR = 6.875;

95 CI: 3.591 - 13.164; χ^2=73.818; df=1; p<0.001) (Table 4.21). It was observed that those caregivers who received STM and HE were more likely to take their children for RGM compared to those who did not receive anything in Month 2 (OR = 8.286; 95 CI: 4.124 - 16.649; p<0.001*), month 3 (OR = 14.500 : 95 CI: 5.619 - 37.415; p<0.001*), month 4 (OR = 14.500 ; 95 CI: 5.619 - 37.415; p<0.001*), month 5 (OR = 19.667 ; 95 CI: 6.524 - 59.285; p<0.001*), month 6 (OR = 29.500; 95 CI: 7.549 - 115.284; p<0.001*), month 7 (OR = 29.500; 95 CI: 7.549 - 115.284; p<0.001*) and month 8 (OR = 29.500; 95 CI: 7.549 - 115.284; p<0.001*). In month 9, caregivers who received STM and HE 59(98.3%) were more likely to take their children for RGM compared to 35(58.3%) in control arm (OR = 1.686; 95 CI: 1.358 - 2.093; p<0.001*). Many 35(58.3%) caregiver turned up for RGM in 9th month compared to previous months because of the 2nd schedule of measles recommended by World Health Organization (WHO) and the Government of Kenya (GoK). Analysis of results of caregivers who received voice call and health education was compared with those who did not receive anything. In month 1, results showed that majority of caregivers 54(90%) who received VC compared those in control arm 8(13.3%) turned up for RGM. In month 2 and 3, a higher proportion of caregivers 59(98.3%) and 58(96.7%) respectively turned up for RGM compared to a small and declined number of caregivers 7(11.7%) and 4 (6.7%) in control arm during the same period of time. The rest of the months 4 to 9, recorded all caregivers 60 (100%) turning up for RGM in intervention arm 2. The analysis demonstrates that in month 1 those caregivers who received VC and HE were 6.750 times more likely to take their children for RGM compared to those who did not receive anything (OR = 6.75095 CI: 3.522 - 12.938 ; χ^2=70.612; df=1; p<0.001).

Table 4.22: Proportion of caregivers who turned up for RGM in intervention arm 2 and control arm

Variable	VC & HE (n=60)	Control (n=60)	OR	95% CI		Significance
				Lower	Upper	
Month 1						
Attended	54 (90%)	8 (13.3%)	6.750	3.522	12.938	χ^2=70.612; df=1; p<0.001
Failed to attend	6 (10%)	52 (86.7%)	0.115	0.054	0.248	
Month 2						
Attended	59 (98.3%)	7 (11.7%)	8.429	4.198	16.923	p<0.001*
Failed to attend	1 (1.7%)	53 (88.3%)	0.019	0.003	0.132	
Month 3						
Attended	58 (96.7%)	4 (6.7%)	14.500	5.619	37.415	p<0.001*
Failed to attend	2 (3.3%)	56 (93.3%)	0.036	0.009	0.140	
Month 4						
Attended	60 (100%)	4 (6.7%)	15.000	5.820	38.660	p<0.001*
Failed to attend	0 (0%)	56 (93.3%)				
Month 5						
Attended	60 (100%)	3 (5%)	20.000	6.638	60.260	p<0.001*
Failed to attend	0 (0%)	57 (95%)				
Month 6						
Attended	60 (100%)	2 (3.3%)	30.000	7.680	117.191	p<0.001*
Failed to attend	0 (0%)	58 (96.7%)				
Month 7						
Attended	60 (100%)	2 (3.3%)	30.000	7.680	117.191	p<0.001*
Failed to attend	0 (0%)	58 (96.7%)				
Month 8						
Attended	60 (100%)	2 (3.3%)	30.000	7.680	117.191	p<0.001*
Failed to attend	0 (0%)	58 (96.7%)				
Month 9						
Attended	60 (100%)	35 (58.3%)	1.714	1.384	2.123	p<0.001*
Failed to attend	0 (0%)	25 (41.7%)				

Key: * Fishers' exact test

Table 4.22 shows that those caregivers who received VC and HE were more likely to take their children for RGM compared to those who did not receive anything in Month 2 (OR = 8.429; 95 CI: 4.198 - 16.923; p<0.001*), month 3 (OR = 14.500 95 CI: 5.619 3- 7.415 p<0.001*), month 4 (OR = 15.000 ; 95 CI: 5.820 - 38.660 p<0.001*), month 5 (OR =

20.000 ; 95 CI: 6.638 - 60.260 ; p<0.001*), month 6 (OR = 30.000; 95 CI: 7.680 - 117.191; p<0.001*), month 7 (OR = 30.000; 95 CI: 7.680 - 117.191; p<0.001*) and month 8 (OR = 30.000; 95 CI: 7.680 - 117.191; p<0.001*). In month 9 caregivers who received VC and HE 60(100%) were 1.714 times more likely to take their children for RGM compared to 35(58.3%) in control arm (OR = 1.714; 95 CI: 1.384 - 2.123; p<0.001*).

The study further analysed results of the attendance for RGM among caregivers who received STM and compared with those who received VC. Analysis of results showed that there was no statistical association in proportion of caregivers who received STM compared to those who received voice call in month 1(χ^2=0.100; df=1; p=0.752), month 2 -3 (p=1.000* for both), month 4 (p=0.496), and month 5 to 9 (p=1.000* for each of them). Analysis of STM and VC intervention results demonstrated that their use can significantly improve (Table 4.21 and 4.22) uptake of RGM among caregivers.

Table 4.23 presents that there was no statistical association between use of short text message and voice call. Both STM and VC improved uptake of RGM almost equally since the proportion of caregivers who turned up for RGM was virtually the same. This means that that the study would recommend use STM or VC in improving and sustaining uptake of RGM.

Table 4.23: Proportion of caregivers who turned up for RGM in intervention arm 1and 2

Variable	STM & HE (n=60)	VC & HE (n=60)	OR	95% CI		Significance
				Lower	Upper	
Month 1						χ^2=0.100; df=1; p=0.752
Attended	55 (91.7%)	54 (90%)	1.019	0.909	1.141	
Failed to attend	5 (8.3%)	6 (10%)	0.833	0.269	2.584	
Month 2						p=1.000*
Attended	58 (96.7%)	59 (98.3%)	0.983	0.928	1.041	
Failed to attend	2 (3.3%)	1 (1.7%)	2.000	0.186	21.473	
Month 3						p=1.000*
Attended	58 (96.7%)	58 (96.7%)	1.000	0.936	1.069	
Failed to attend	2 (3.3%)	2 (3.3%)	1.000	0.146	6.869	
Month 4						p=0.496*
Attended	58 (96.7%)	60 (100%)	0.967	0.922	1.013	
Failed to attend	2 (3.3%)	0 (0%)				
Month 5						p=1.000*
Attended	59 (98.3%)	60 (100%)	0.983	0.951	1.016	
Failed to attend	1 (1.7%)	0 (0%)				
Month 6						p=1.000*
Attended	59 (98.3%)	60 (100%)	0.983	0.951	1.016	
Failed to attend	1 (1.7%)	0 (0%)				
Month 7						p=1.000*
Attended	59 (98.3%)	60 (100%)	0.983	0.951	1.016	
Failed to attend	1 (1.7%)	0 (0%)				
Month 8						p=1.000*
Attended	59 (98.3%)	60 (100%)	0.983	0.951	1.016	
Failed to attend	1 (1.7%)	0 (0%)				
Month 9						p=1.000*
Attended	59 (98.3%)	60 (100%)	0.983	0.951	1.016	
Failed to attend	1 (1.7%)	0 (0%)				

Key: * Fishers' exact test

4.6 Caregivers' attitude on use of mHealth technologies on uptake of RGM at Baseline

4.6.1 Attitude on use of *m*health technologies in increasing uptake of RGM

Table 4.24 presents caregivers' different attitudes in relation to use of *m*health technologies in improving uptake of RGM. Caregivers in intervention arm 1 27(45%), intervention arm 2 26(43.3%) and control arm 27(45%) felt that mobile health technologies were good in increasing uptake of RGM. Other caregivers in intervention arm 1 28(46.7%), intervention arm 2 26(43.3%) and control arm 22(36.7%) felt that it encourages many caregivers to take children for RGM. Some caregivers in intervention arm 1 2(3.3%), intervention arm 2 4(6.7%) and control arm 6(10%) saw it as an innovative approach of increasing RGM. A few of the caregivers from control arm 4(6.7%) said it as a cheap method of increasing RGM uptake. Some caregivers who were to receive STM 5(3%), VC 4(6.7%) and control arm1(1.7%) indicated that it is easy to manage. Analysis of results to compare attitudes of caregivers who were to receive STM and control arm confirmed that there was no statistical association among those who said that it: is a good technology (χ^2=0.007; df=1; p=0.933), encourages many caregivers to take children for RGM (χ^2=1.234; df=1; p=0.267), is an innovative approach of increasing RGM (p=0.272*), is a cheap method of increasing uptake of RGM (p=0.119*) and is easy to manage method (p=0.619*). Comparing attitudes of caregivers who received VC and control arm did not establish any statistical association among those who said that it: is a good technology (χ^2=0.034; df=1; p=0.854), encourages many caregivers to take children for RGM (χ^2=0.556; df=1; p=0.456), is an innovative approach of increasing RGM (p=0.743*), is a cheap method of increasing uptake of RGM (p=0.119*) and is easy to manage method (p=0.364*). Further comparison of attitudes of caregivers who were to receive STM and VC did not find any statistical association among

those who reported that it: is a good technology (χ^2=0.071; df=1; p=0.790), encourages many caregivers to take children for RGM (χ^2=0.135; df=1; p=0.714), is an innovative approach of increasing RGM (p=0.679*) and is easy to manage method (p=1.000*s.

Table 4. 24: Caregivers attitude and views on use of *m*health technologies in improving uptake of RGM

Variable	STM & HE (n=60)	Control (n=60)	Significance	VC & HE (n=60)	Control (n=60)	Significance	STM & HE (n=60)	VC & HE (n=60)	Significance
Caregivers' thoughts on use of mobile technologies in increasing uptake of RGM									
Good technology	27 (45%)	27(45%)	χ^2=0.007; df=1; p=0.933	26 (43.3%)	27 (45%)	χ^2=0.034; df=1; =0.854	27 (45%)	26 (43.3%)	χ^2=0.071; df=1; p=0.790
Encourages many caregivers to take children for RGM	28 (46.7%)	22(36.7 %)	χ^2=1.234; df=1; p=0.267	26 (43.3%)	22 (36.7%)	χ^2=0.556; df=1; p=0.456	28 (45%)	26 (43.3%)	χ^2=0.135; df=1; p=0.714
Innovative approach of increasing RGM	2 (3.3%)	6 (10%)	p=0.272*	4 (6.7%)	6 (10%)	p=0.743*	2 (3.3%)	4 (6.7%)	p=0.679*
Cheap method of increasing uptake of RGM	0 (0.0%)	4 (6.7%)	p=0.119*	0 (0%)	4 (6.7%)	p=0.119*	0 (0.0%)	0 (0%)	
Easy to manage method	3 (5%)	1 (1.7%)	p=0.619*	4 (6.7%)	1 (1.7%)	p=0.364*	3 (5%)	4 (6.7%)	p=1.000*
Caregivers' views on how use of STM or VC increase uptake of RGM									
Serves as a reminder	55 (91.7%)	49 (81.7%)	χ^2=3.605; df=1; p=0.058	52 (86.7%)	49 (81.7%)	χ^2=0.563; df=1; p=0.453	55 (91.7%)	52 (86.7%)	χ^2=1.409; df=1; p=0.235
Many caregivers will always take children for RGM	3 (5%)	7 (11.7%)	p=0.322*	7 (11.7%)	7 (11.7%)	χ^2=0.001; df=1; p=1.000	3 (5%)	7 (11.7%)	p=0.322*
Many caregivers will be accessed	1 (1.7%)	1 (1.7%)	p=1.000*	2 (3.3%)	1 (1.7%)	p=1.000*	1 (1.7%)	2 (3.3%)	p=1.000*
Vaccination will be done in time	0 (0.0%)	3 (5%)	p=0.244*	0 (0.0%)	3 (5%)	p=0.244*	0 (0.0%)	0 (0.0%)	

Key: * Fishers' exact test

4.6.2 Caregivers 'Views on whether use of STM or VC increase uptake of RGM

Table 4.24 presents on caregivers' views on whether use of STM or VC increase uptake of RGM. When caregivers from the three arms of the study were asked whether use of STM or VC will increase uptake of RGM, all of them 180(100%) said yes. Further analysis of the study results revealed that majority of the caregivers in intervention arm 1 55(91.7%), intervention arm 2 52(86.7%) and control arm 49(81.7%) viewed STM or VC as a reminder to take

children for RGM. Caregivers in intervention arm 1 3(5%), intervention arm 2 7(11.7%) and control arm 7(11.7%) reported that many caregivers will always take children for RGM if they received STM or VC.

As shown in Table 4.24, analysis of results did not reveal any statistical association in proportion of caregivers who were to receive STM compared to those in control arm whose views were that: it served as a reminder (χ^2=3.605; df=1; p=0.058), many caregivers will always take children for RGM (p=0.322*), many caregivers will be accessed (p=1.000*) and that vaccination will be done in time (p=0.244*). Comparing views of caregivers who received VC and control arm, the study did not establish any statistical association among those who said that it: served as a reminder (χ^2=0.563; df=1; p=0.453), many caregivers will always take children for RGM (χ^2=0.001; df=1; p=1.000), many caregivers will be accessed (p=1.000*) and that vaccination will be done in time (p=0.244*). Further comparison of views of caregivers who were to receive STM comparing to those of VC did not find statistical association among those who said that it: served as a reminder (χ^2=1.409; df=1; p=0.235), many caregivers will always take children for RGM (p=0.322*), and that many caregivers will be accessed (p=1.000*)

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Socio-demographic and economic characteristics of the study respondents

This study found out that most of the caregivers were aged between 23-27 years old in the three arms of the study. This result is consistent to a similar study done in Ghana which realized that more than half (53.7%) of the caregivers of the children were aged between 26 to 35 years (Debuo et al., 2017). A study conducted in Ethiopia also revealed that many (73%) of the caregivers were in the age gap of 20 to 35 years (Woke, 2013). Results of the study revealed that all the caregivers from the three study arms were female and biological mothers of the children. This concurs to a study done in Uganda in which over 93.7% of the caregivers were biological mothers of the children (Debuo et al., 2017). A similar other study also found out that many (94%) of the caregivers were mothers of the children (Mwari et al., 2017). The study showed that majority of the caregivers in the three study arms were married. This is in agreement to another study done in Ethiopia which found out that 89.3% of the caregivers of children were married (Daniel et al., 2017). According to the findings of the current study, most of the caregivers had secondary level of education. This study concurs to a study conducted in Kenya which reported that many (63.7%) of the caregivers who attended RGM in Kenya had secondary level of education (Nyabuti, 2015). This explains why this study was feasible as many of the caregivers were able to read STM and also receive VC. High levels of literacy mean better health seeking behaviour since caregivers understand the importance of RGM. Findings of the study revealed that many of the caregivers were either peasant farmers or housewives. This agrees to another study conducted in Ethiopia which found out that most (88%) of the caregivers of children were farmers (Bilal et al., 2015). However, this is inconsistent to a similar other study done in

Kenya which found out that more than half (54.8%) of the caregivers of the children were self-employed (Nyabuti, 2015). Study results showed that most of the caregivers earned a monthly income of less than Kshs 5000. This concurs to a study done in Ethiopia which reported that many of the caregivers earned a monthly income of between 500 to 1000 Birr (1575 to 3150 Kshs) (Daniel et al., 2017)

This study revealed that there was no significant statistical association in the distribution of socio-demographic and economic characteristics of the study respondents between the study arms. This implies that all the study participants were all of the same characteristics and therefore would not affect subsequent results in the study.

5.1.2 Caregivers' knowledge on Routine Growth Monitoring

At baseline, the study found out that 34.4% of the caregivers from all the study arms did not understand the meaning of RGM. This result concurs with the findings of a similar study conducted in Ghana which found out that more than 30% of the caregivers did not understand the meaning of routine growth monitoring (Debuo et al., 2017). The study realized a significant improvement in knowledge on interpretation of a GMC among caregivers who received STM, VC and HE. This result is consistent to the findings of a similar study conducted in Ethiopia which found out that about more than half (62.1%) of the caregivers knew how to interpret a GMC (Daniel et al., 2017). However, this result is contrary to the findings of a study conducted in Ghana which reported that only 18.7% of caregivers were able to interpret the normal, static, upward and decline growth curves (Debuo et al., 2017). The caregivers who knew how to interpret a GMC reported that their source of knowledge on interpretation of a GMC was self at baseline. At endline, those caregivers who knew how to interpret a GMC reported to have been taught during this study by HCP. This result is consistent to the findings of similar studies conducted in other

countries whereby more than 77% of the caregivers revealed that Healthcare Providers (doctors and nurses) were the main sources of information regarding their children (Seskute et al., 2018, Kundi et al., 2015, Kennedy et al., 2011). This therefore confirms the Healthcare Providers' role is necessary in ensuring caregivers receive the correct information regarding RGM. There was a significant improvement in knowledge on when children are taken for RGM among caregivers who received STM, VC and HE intervention with majority reporting monthly. This contrasts the findings of another study conducted in Ethiopia whereby only 32.1% of caregivers reported that growth monitoring should be carried out monthly (Daniel et al., 2017). From the analysis of study results, more than half of the study participants understood the importance of RGM. This result agrees to those of another similar study done in Zambia which reported that majority (92%) of the caregivers of children had knowledge on the importance of growth monitoring (Banda, 2012). Further analysis revealed that uptake of all vaccines was the main benefit of RGM. A study conducted in Ghana found out that medications including vaccinations are more valued than preventive services such as nutrition counselling (Ashworth et al., 2008). Another study conducted in Ghana reported knowledge on child's growth status as the major benefit of attending RGM (Agbozo, 2018). The study found a significant statistical association between caregivers' level of education and knowledge on the meaning of RGM. This means that the more a caregiver was educated, the more likely they are to attend RGM.

Overall, the knowledge status of the caregivers significantly improved after STM, VC and HE intervention. This finding agrees to the findings from a similar other study that used text messages as reminders in India which reported significant increment in knowledge among mothers who sought maternal and child health care services (Datta et al., 2014).

This finding is however inconsistent to the finding of a similar other study done in Ethiopia which found out that 53% of the mothers had poor knowledge on GM (Daniel et al., 2017). Another study conducted in Ghana reported that more than 40% of the caregivers lacked good knowledge on routine growth monitoring (Debuo et al., 2017).

5.1.3 Uptake of RGM

The study found out that majority of the caregivers who received STM, VC and HE intervention complied with RGM since their children were born. This finding disagrees to the findings of a study done in Ghana which revealed low level of using growth monitoring services with only 13.6% of the caregivers reported to have attended child welfare clinic for growth monitoring as recommended (Agbozo et al., 2018). The study revealed several reasons why caregivers skipped RGM at baseline including they forgot the appointment date "To Come Again" (TCA), healthcare provider did not tell them to bring their children again, the child was not sick to be brought for RGM among other reasons. However, at endline, the caregivers who received STM, VC and HE intervention reported to have visited nearby health facilities. Previous studies revealed various reasons given by caregivers for reduction in utilization of RGM services. These reasons included; inconvenient time scheduling (Laar et al., 2015), socio-cultural beliefs and practices, scolding of teenage mothers by HCP (Agbozo, 2018), socio-demographic factors (Cameron et al., 2014), long waiting time (Turkson,2009), poorly motivated HCP (Charton, 2009), poor client-staff relationship (Martin et al., 2005). A similar other study conducted in Zambia found out that growth monitoring had performed poorly because of various reasons including weak monitoring and supervision, lack of motivational package attached to the growth monitoring program and poor practices among health workers (Charlton et al., 2009).

5.1.4 Effects of STM and VC on attendance of RGM

The study revealed a great improvement in attendance of RGM among caregivers who received STM, VC and HE intervention compared to those in the control arm. This finding agrees to study conducted in China which found out that text messaging reduced lost-to-follow up thus improving monthly clinic visits (Liu et., 2015). This concurs with another study conducted in Nigeria which found out that use of text and voice messages among Nigerian mothers significantly improved breastfeeding practices in the neonatal period (Flax et al., 2014). Vaccination rates for newborn babies in India increased significantly when unidirectional text messages were sent to mothers to remind them to take their children for vaccination (Pathak, 2012). A similar study in Thailand revealed that ANC visits were higher after mothers were sent text messages as reminders to attend clinic (Kaewkungwal et al., 2010).

Caregivers who missed to attend RGM in the health facilities in which they were recruited among the intervention arms reported to have visited nearby health facilities for RGM. Child welfare clinic services including RGM are decentralized in all levels of healthcare in Kenya including health centres and dispensaries. Perhaps, this explains why caregivers opt to seeking RGM services from health facilities nearby their homes.

In addition, caregivers might opt to attend RGM in nearby health facilities if attendance in previous health facilities they were registered entails economic losses (opportunity costs and transport costs). Non-attendance was observed to be low among caregivers who received STM, VC and HE intervention. This finding concurs to the findings of a similar other study conducted in Saudi Arabia which reported lower rates of non-attendance among patients who received SMS reminders (Youssef, 2014). This finding is also consistent to

another study conducted in Brazil in which non-attendance was lower among patients who were sent SMS reminders to attend medical clinics (Da Costa et al., 2009).

The study employed STM and VC that utilized the use of local languages. This significantly improved attendance of RGM. Previous studies have reported that use of lay-terms and local languages when giving information to caregivers increases access to *m*Health interventions (Felicie et al., 2016, Lund et al., 2014a, Lund et al., 2014b, Datta et al., 2014, Khorshid et al., 2014, Lau et al., 2014, Dean et al., 2012, Lund et al., 2012)

*m*health (STM and VC) intervention was found to have improved attendance of RGM during the entire study period. *m*Health interventions in health care has been reported previously by various researchers given the relatively emerging field of research and wide interest in *m*Health interventions to improve uptake of services in Low and Middle-Income Countries (LMIC) (Felicie et al., 2016, Philbrick, 2013, Tamrat &Kuchnowski, 2012). A similar study found out that *m*health technologies had great potential to impact management of chronic diseases since many people have strong attachments to their mobile phones and tend to carry them everywhere thus can easily connect to their HCP irrespective of where they are making monitoring of their health conditions easier (Hamine et al., 2015)

It is important to note that *m*health interventions cannot only be used to improve attendance of RGM as revealed in this study but can also be used for long-term sustainability of behaviour change with regards to taking children below 5 years for monthly child welfare clinics. Previous studies found out that *m*Health intervention using text messages and voice calls contributes significantly to behavior change and management of diseases (Dale et al., 2016) and Hall et al., 2014)

5.1.5 Caregivers' attitude on use of *m*Health technologies on uptake of RGM

The study found out that at baseline, caregivers in all the three study arms perceived use of STM and VC as a good technology that increases uptake of RGM. This finding concurs to the finding of a similar study in which use of Short Messaging Service (SMS) reminders was perceived to improve medication adherence, quality of life and self-efficacy among adolescents with asthma (Johnson et al., 2015)

Majority of the caregivers reported that use of STM and VC served as a reminder to them to take their children for RGM. This means that caregivers had positive attitude towards *m*health and this greatly contributed to the success of implementation of the study intervention. Previous studies have revealed positive attitudes among study participants. More than 79% of kidney transplant recipients had a positive attitude towards mobile phone-based health technology (William et al., (2013). A similar other study conducted in Singapore found out that about 49.7% of study participants in Singapore had positive attitude towards mobile health noting that *m*health could be used to improve the health of individuals (Hossain et al., (2018). Another study revealed that majority of respondents had a positive reception on *m*health and believed that its adoption was right as it prevented occurrence of unnecessary illnesses (Martinez, 2015)

5.1.6 Summary of the study findings

The current study enrolled 180 caregivers of children aged 9 months at baseline. Among them, 60 received Short Text Messages (STM) and Health Education (HE), 60 received Voice Calls (VC) and Health Education (HE) and 60 respondents formed the control arm of the study. The study found out that most of the caregivers were aged between 23-27 years old in the three arms of the study. All the caregivers from the three study arms were female and biological mothers of the children. Majority of the caregivers were married. Most of the caregivers had secondary level of education. Many of the caregivers were either peasant farmers or housewives. Most of the caregivers earned a monthly income of less than Kshs 5000. The study revealed that there was no significant statistical association in the distribution of socio-demographic and economic characteristics of the study respondents between the study arms. This implies that all the study participants were all of the same characteristics and therefore would not affect subsequent results in the study.

At baseline, the study found out that 34.4% of the caregivers from all the study arms did not understand the meaning of RGM. However, this percentage reduced to 14.4% after STM, VC and HE intervention. The study realized a significant improvement in knowledge on interpretation of a GMC among caregivers who received STM, VC and HE. The caregivers who knew how to interpret a GMC reported that their source of knowledge on interpretation of a GMC was self at baseline. At endline, those caregivers who knew how to interpret a GMC reported to have been taught during this study by HCP. This therefore confirms that the Healthcare Providers' role is necessary in ensuring caregivers receive the correct information regarding RGM. From the analysis of study results at endline, more than half of the study participants understood the importance of RGM. Further analysis revealed that uptake of all vaccines was the main benefit of RGM. The study found a significant statistical

association between caregivers' level of education and knowledge on the meaning of RGM. This means that the more a caregiver was educated, the more likely they are to attend RGM. Overall, the knowledge status of the caregivers significantly improved after STM, VC and HE intervention.

The study found out that more than 80% of the caregivers who received STM, VC and HE intervention complied with RGM since their children were born. The study revealed several reasons why caregivers skipped RGM at baseline including they forgot the appointment date "To Come Again" (TCA), healthcare provider did not tell them to bring their children again, the child was not sick to be brought for RGM among other reasons. However, at endline, the caregivers who received STM, VC and HE intervention reported to have visited nearby health facilities.

The study revealed a great improvement in attendance of RGM among caregivers who received STM, VC and HE intervention compared to those in the control arm. Caregivers who missed to attend RGM in the health facilities in which they were recruited among the intervention arms reported to have visited nearby health facilities for RGM. Child welfare clinic services including RGM are decentralized in all levels of healthcare in Kenya including health centres and dispensaries. Perhaps, this explains why caregivers opt to seeking RGM services from health facilities nearby their homes. In addition, caregivers might opt to attend RGM in nearby health facilities if attendance in previous health facilities they were registered entails economic losses (opportunity costs and transport costs).

Non-attendance of RGM was observed to be low among caregivers who received STM, VC and HE intervention. The study employed STM and VC that utilized the use of local languages. This significantly improved attendance of RGM. *m*health (STM and VC)

intervention was found to have improved attendance of RGM during the entire study period. It is important to note that *m*health interventions cannot only be used to improve attendance of RGM as revealed in this study but can also be used for long-term sustainability of behaviour change with regards to taking children below 5 years for monthly child welfare clinics.

The study found out that at baseline, caregivers in all the three study arms perceived use of STM and VC as a good technology that increases uptake of RGM. Majority of the caregivers reported that use of STM and VC served as a reminder to them to take their children for RGM. This means that caregivers had positive attitude towards *m*health and this greatly contributed to the success of implementation of the study intervention. Table 5.1 shows a summary of the hypothesis against the findings of the study.

Table 5.1: Summary of the hypothesis against the findings of the study.

Hypothesis	**Finding**	**Decision (Reject or fail to reject null hypothesis)**
There is no significant statistical association between the caregivers' knowledge and use of *m*Health technologies on uptake of RGM	Majority of the caregivers who received STM,VC and HE understood RGM	Null hypothesis rejected
Mobile Health technologies have no statistical association with the uptake of RGM	High levels of attendance was observed among caregivers who received STM or VC	Null hypothesis rejected
There is no significant statistical association between the use of STM and VC on uptake of RGM	STM or VC usage have no difference on uptake of RGM	Null hypothesis failed to be rejected
There is no significant statistical association between the caregivers' attitude and use of *m*Health technologies on uptake of RGM	Caregivers had positive attitude towards use of STM and VC	Null hypothesis rejected

5.2 Conclusions

i) All the caregivers from the three study arms were female and biological mothers of the children.

ii) At baseline, more than 30% of the caregivers did not understand the meaning of RGM. However, this percentage reduced to 14.4% after the STM, VC and HE intervention. This implies that caregivers of children should be regularly trained and reminded by HCP on RGM.

iii) The uptake of RGM significantly improved at endline upon implementation of STM, VC and HE intervention. It is therefore important to consider using these *m*health reminders to ensure high uptake of RGM services.

iv) Using STM or VC had no difference on uptake of RGM. This means that whether STM or VC is used, the uptake shall still be improved.

v) Caregivers had positive attitudes regarding the use of STM or VC on uptake of RGM as they believed this intervention could increase uptake. This made the study feasible as the caregivers willingly accepted to receive STM or VC intervention.

5.3 Recommendations

5.3.1 Recommendations from the study

i) Healthcare Providers (HCP) especially those deployed in Child Welfare Clinics should ensure they have relevant and updated material on RGM for regular training of the caregivers. This will ensure all caregivers regardless of their socio-economic and demographic characteristics have equal knowledge on RGM at all times.

ii) Policy makers in health facilities should work to ensure funds are allocated for implementation of STM or VC reminders for the purpose of improving uptake of RGM and other healthcare services provided in the health facilities.

iii) Healthcare Providers (HCP) should work hand-in-hand with policy makers in health facilities to decide on the *m*health intervention (STM or VC) is worth investing in. This is because either STM or VC has similar effect on uptake of RGM.

iv) Healthcare Providers (HCP) should work to ensure positivity of *m*health use among caregivers of children is held to the later.

5.3.2 Recommendations for further study

i) A study should be carried out on the role of male partner involvement in promoting uptake of RGM.

ii) A longitudinal study should be conducted to compare the health outcomes among children who are taken for RGM against those who are not taken.

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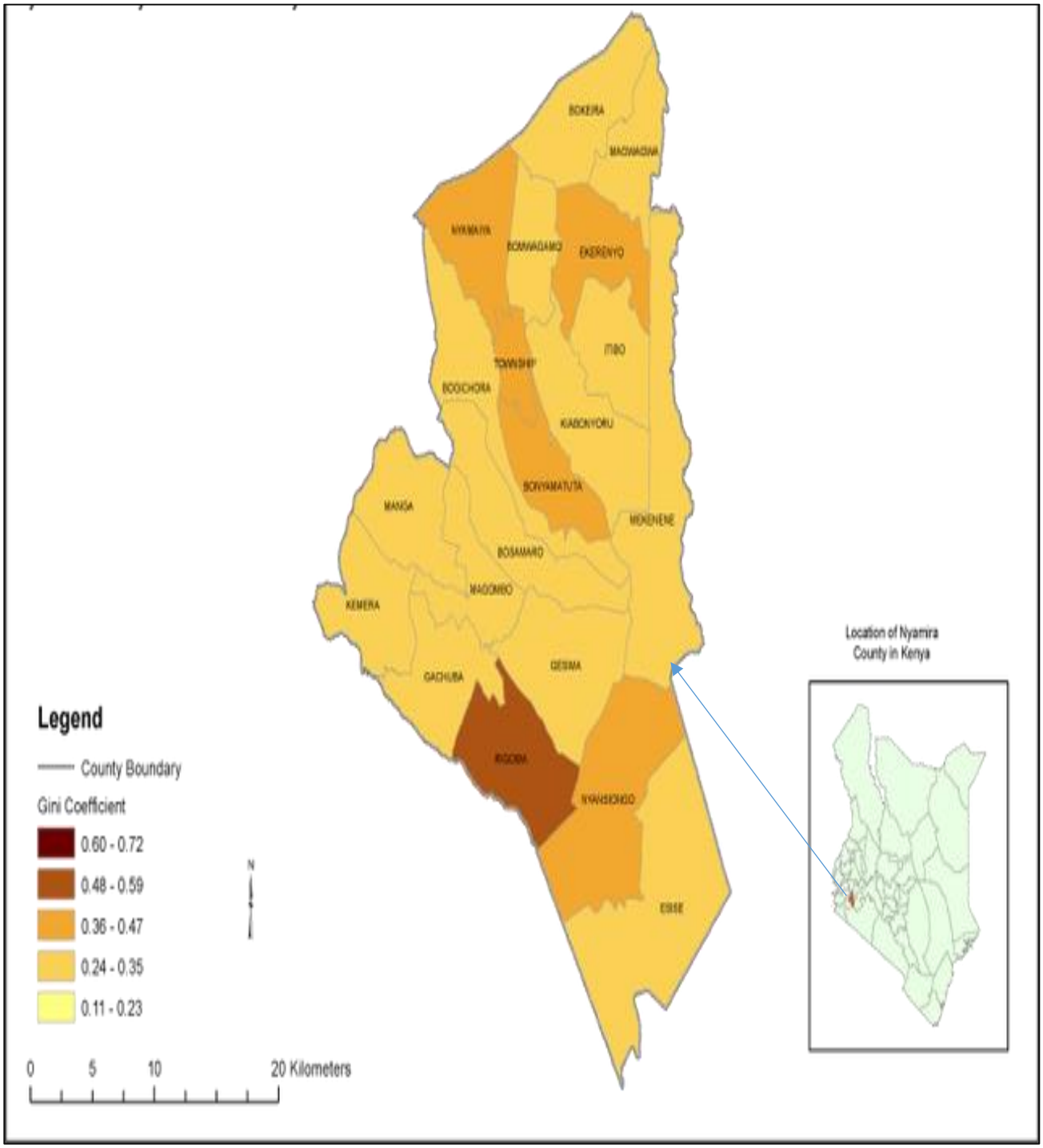
APPENDICES

Appendix 1: A map of Kenya and a map of Nyamira County



Appendix 2: Consent Form

My name is Nyang'echi Edna Nyanchama, a PhD student from Kenyatta University. I am conducting a study on **"Effects of Mobile Health Technologies on uptake of Routine Growth Monitoring among Caregivers of Children aged 9-24 months in Nyamira County".** The information will be used by the Ministry of Health to improve uptake of routine growth monitoring in Nyamira County as well as in other Counties in Kenya. This study is for academic purposes only.

Procedures to be followed

Participation in this study will require that I ask you questions. I will record the information from you in a questionare and tape record for key informant interviews.

You will be required to provide your working/active mobile phone numbers.

You will be enrolled into the study and followed up for a period of between 9 months.

Discomforts and risks

Some of the questions you will be asked may make you uncomfortable. You are requested to answer those questions with honesty and sincerity to enable the researcher come up with appropriate recommendations targeted at improving uptake of routine growth monitoring. The interview will take at most twenty five (25) minutes. However, for key informant interview, it will take thirty (30) minutes.

Reward/Benefits

There is no reward/benefit which will be given for agreeing to participate in this study.

Confidentiality and Privacy

The interviews will be conducted in a private setting within the hospital. The questionnaires will be kept in a locked cabinet for safe keeping. Your identity (name/phone numbers) will not be disclosed in publications, conferences or in seminars where this work will be shared.

Consequences of withdrawal

Participation in the study is voluntary. You may ask questions related to the study at any time. You may refuse to respond to any questions and you may stop the interview at any time. You may also stop being in the study at any time without any consequences. You will receive growth monitoring services whether or not you withdraw at any time of the study.

Contact information

If you have any questions or need clarifications you may contact Ms. Edna Nyang'echi on 0725342052 or Dr. Andre Yitambe on 0715720568 or Dr. Kenneth Rucha on 0723227480 or the Kenyatta University Ethical Review Committee Secretariat on kuerc@ku.ac.ke.

Participant's Statement

The above information regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time.

Name of Participant…….

Signature or Thumbprint_____ Date_____

Investigator's statement

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

Name of Interviewer……..

Interviewer signature _____ Date_____

Appendix 3: Questionnaire

Introduction

My name is Nyang'echi Edna Nyanchama. I am a PhD student in the school of Public Health of Kenyatta University. I am conducting academic research entitled "**Effects of *m*Health Technologies on Uptake of Routine Growth Monitoring among Caregivers of Children 9-24 Months in Nyamira County, Kenya".** The aim of the study is to investigate whether mobile phone technology in short text message (STM) and voice call (VC) can increase the uptake of routine growth monitoring.

Background information

County ……
Sub-
County……...……...
Name of Health Facility……
Caregiver's Name. ……...……...……
Caregiver's Phone No. 1……Phone No. 2…….. Phone No. 3……...…
Interviewer's Name ……
Date……....
Time started…….....……
Time ended ……..…….

SECTION 1
Socio-demographic characteristics

No.	Question	Coding categories	
Q 1	How old are you?		
Q 2	Gender?	Male 1 Female 2	
Q 3	What is your level of education *(if other specify)*	Never attended school/None 1 Primary 2 Secondary 3 Tertiary college 4 University 5	
Q 4	What is your marital status?	Single 1 Married 2	
Q 5	How old is the child you have brought to clinic today? (*Answer in terms of months)*		
Q 6	When was the child you have brought to clinic today born? (*Date/Month/Year)*		
Q 7	What is the gender of the child you have brought to clinic today?	Male 1 Female 2	
Q 8	Do you have any other child less than five years?	Yes 1 No 2	Q 8a, Q8b
Q 8a	If yes, how many?	One 1 Two 2 Three 3 Oher (specify)……4	
Q 8b	How old is? Child one Child two Child three Other (specify)……..	 …… …….... …… ……	
Q 9	What is your occupation? *(if other specify)*	Farmer 1 Casual worker 2 Housewife 3 Self –employed/business 3 Salaried worker/Employed 4	

		Other (specify)……..5	
Q 10	What is your approximate monthly income?	Less than 5,000 1 5,000-10,000 2 10,000-15,000 3 15,000-20,000 4 20,000-25,000 5 25,000-30,000 6 30,000-35,000 7 35,000-40,000 8 Over 40,000 9 Dependant/None 10 Other (specify)……. 11	
Q 11	What is the distance from your place of residence to the health facility?	Less than 2 KM 1 2-5 KM 2 More than 5 KM 3 Don't know 4	
Q 12	Where do you reside?	Urban 1 Sub-urban 2 Rural 3	

SECTION 2

Knowledge on routine growth monitoring

Now I would like to focus on your knowledge regarding routine growth monitoring.

Q 1	Do you know what routine growth monitoring is?	Yes 1 No 2	Q 1a
Q 1a	If yes, what is routine growth monitoring? *(if other, specify)*	Regular measurement of a child's size (height, weight, head circumference) 1 Serial weighing and measuring of the length/height and head circumference of a child and graphing both measurements on a growth chart 2 Process of conducting periodic anthropometric measurements among children aged 0-59 months 3 Others (specify)……..…..4	
Q 2	When should children be taken for routine growth monitoring? *(if other specify*	Monthly 1 When child is sick 2 During immunization 3 Others(specify)……..4	
Q 3	What is done during routine growth monitoring? *(More than one answer possible, if other specify)*	Weight measured 1 Height measured 2 Head circumference measured 3 Detection of malnutrition 4 Detection of poor health 5 Taught on feeding practices 6 Taught hygiene practices 7 Taught signs of sick child 8 Taught home remedy for sick child 9 Taught signs of abnormality in children 10 Others (specify)……..11	
Q 4	What are the benefits of routine growth monitoring?*(More than one answer possible, if other specify)*	Learn feeding practices 1 Learn healthy lifestyle 2 Identify abnormality in child 3 Uptake of all vaccines 4 Other (specify)……5	

Q 5	Do you know what a child health card/book/record is?	Yes 1 No 2	Q 5a, Q 5b
Q 5a	If yes, what is a child health card/book/record? (*write in verbatim)*		
Q 5b	What information does a child health card/book/record contain? (*More than one answer possible, if other specify)*	Weight-for-age 1 Height/length-for-age 2 Head circumference 3 Recommended vaccination schedule 4 Bio data (name, residence, date & place of birth, delivery method, APGAR score, weight at birth, ANC profile, family history, discharge weight, mother's name, father's name & contact addresses) 5 Paediatric assessment notes/information 6 Vitamin A supplementation schedule 7 BMI-for-age 8 Feeding recommendation guide 9 Milestone assessment 10 HIV prophylaxis schedule 11 Clinic appointment dates 12 Others (specify)……13	
Q 6	Do you know what a growth monitoring chart is?	Yes 1 No 2	Q 6a
Q 6a	If yes, what is a growth monitoring chart? (*write in verbatim)*		
Q 7	Do you know how to interpret a growth monitoring chart?	Yes 1 No 2	Q 7a Q7b
Q 7a	If yes, how did you know how to interpret it? *(More than one answer possible. If other, Specify)*	Self-knowledge 1 Health care provider taught me 2 Taught by partner3 Taught by a friend 4 Other(Specify)……5	
Q 7b	If no, why? (*More than one answer possible. If other, Specify)*	Never seen it 1 Never been taught by health care provider 2 Never bothered to ask 3 Others (Specify)……4	
Q 8	Do you think a child is likely to encounter any health problems if he or she is not taken for routine growth monitoring?	Yes 1 No 2	Q 8a
Q 8a	If yes, which health problems do you think a child is likely to encounter if not taken for routine growth monitoring? (*write in verbatim)*		

SECTION 3

Uptake of routine growth monitoring

Q 1	For the last 8 months, have you ever skipped taking your child for routine growth monitoring?	Yes 1 No 2	Q 1a, Q1b
Q 1a	If yes, how many times have you skipped taking your child for routine growth monitoring?	Once 1 Twice 2 Thrice 3	

		Four times 4 Other (specify)……..5	
Q 1b	If yes, what were the reasons for skipping routine growth monitoring for your child? (*more than one answer possible, if other specify)*	Health facility far 1 I did not find reason for doing it 2 Friends discouraged me 3 Health care provider did not say 4 My child was not sick 5 I had a busy schedule at work /home 6 My partner did not support me 7 I forgot "To Come Again" (TCA) date 8 Other (specify)……9	

SECTION 4
Effects of Short Text Message and Voice Call on uptake of routine growth monitoring

Q 1	Do you access a mobile phone?	Yes 1 No 2	
Q 1a	If yes, how do you access it?	Own 1 Borrowed 2 Shared 3 Provided 4 Other (specify)…….5	
Q 1b	How often do you use mobile phone?	Daily 1 Often 2 Rarely 3	
Q 1c	How often do you use text message or voice call?	Always 1 Sometimes 2 Often 3 Rarely 4 Never 5	
Q 2	Would you accept to receive a short text message or a voice call to remind you to take your child for routine growth monitoring?	Yes 1 No 2	Q 2a Q 2b
Q 2a	If yes, at what time would you wish to receive the short text message or voice call?	In the morning 1 At noon 2 In the afternoon 3 In the evening 4	
Q 2b	If no, what are the reasons for not wishing to receive the short text message or voice call? (W*rite in verbatim)*		
Q 3	Would you bring your child for routine growth monitoring if you are reminded through a short text message or voice call? (W*rite in verbatim)*	Yes 1 No 2 Not sure 3	
Q 4	Would you wish to continue receiving short text message or voice call till the current child is 60 months?	Yes 1 No 2	Q 4a
Q 4a	If no, what are the reasons for not wishing to continue receiving short text message or voice call till the current child is 60 months? (W*rite in verbatim)*		
Q 5	What are the negative effects directly attributed to short text messaging or voice calling? (*more than one answer possible, if other specify)*	Injuries while working and using mobile phone 1 Poverty (charging, airtime) 2 Breaches confidentiality 3 Other (specify)…….4	

Q 6	Would you recommend use of short text message or voice call to your friends with children below five years?	Yes 1 No 2	Q 6a
Q 6a	If no, what are the reasons for not recommending use of short text message or voice call to your friends with children below five years? (*write in verbatim)*		
Q 7	What are the negative effects of using short text messages or voice call on uptake of routine growth monitoring? (*write in verbatim)*		

SECTION 5

Caregivers' attitude on use of *m*Health technologies on uptake of routine growth monitoring

Q 1	What do you think about use of mobile technology in increasing uptake of routine growth monitoring? (*write in verbatim)*		
Q 2	Do you think short text message or voice call reminders would increase uptake of routine growth monitoring?	Yes 1 No 2	Q 2a Q 2b
Q 2a	If yes, how do you think use of short text message or voice call can increase uptake of routine growth monitoring? (*write in verbatim)*		
Q 2b	If no, why do you think use of short text message or voice call cannot increase uptake of routine growth monitoring? (*write in verbatim)*		

Appendix 4: Key Informant Interview Guide (Health care provider-MNCH)

Introduction

Sub- County……

Name of Health Facility…… ……

Health care provider's Phone No. 1……..Phone No. 2……...……... Phone No.3……...…

Interviewer's Name …….

Date…….....

Time started…….....……..

Time ended ……..

1. What is routine growth monitoring?
2. What do you normally do for children during routine growth monitoring?
3. What are the benefits of routine growth monitoring?
4. Which problems occur to children who are not taken for routine growth monitoring?
5. What reasons do caregivers give for failing to keep scheduled appointments for routine growth monitoring?
6. What do you think should be done by Nyamira County Government to increase uptake of routine growth monitoring?
7. Do you think implementation of *m*health technologies (short text message and voice call) can increase uptake of routine growth monitoring?

Appendix 5: Health Education Guide

Meaning of routine growth monitoring

- This is the regular measurement of a child's size (height, weight, head circumference) to ensure normality in growth.

When routine growth monitoring is done

- It is recommended by WHO that growth monitoring be done monthly for children aged 0-60 months.

Benefits of routine growth monitoring

- Caregiver learns feeding practices (balanced diet) for children
- Caregiver learns healthy lifestyle for his/her child
- Aids in Identification of abnormality in child
- Ensures uptake of all vaccines.

Problems associated with not attending routine growth monitoring

- A child misses on scheduled vaccination
- Occurrence of irreversible disorders in children

Child health clinic record/book

- Used to keep measurements of child's growth (weight, height, head circumference), clinic appointment dates and other relevant health information for a child.

Routine growth monitoring curve

- Curves developed by WHO that are used by health care providers to follow a child's growth over a period of time.

Types of routine growth monitoring curves

- Normal curve
- Static curve
- Upward curve
- Decline curve

Interpretation of routine growth monitoring curves

The direction of the line shows the child's health:

- Normal curve- child's health is good
- Static curve – child's health is not good
- Upward curve-child's health is in danger
- Decline curve-child may be ill

Appendix 6: Short Text Message (STM) that will be sent to Caregivers

English language

…….(Name of child) is scheduled for well-baby clinic tomorrow…… (day/month/year) at 9.00 am. …….. (Name of hospital).

Kiswahili language

…… (jina la mtoto) anahitajika katika kliniki cha watoto kesho tarehe……. (siku/mwezi/mwaka) saa tatu asubuhi. …….. (jina la hospitali)

Kisii language

…… (erieta ri'omwana) naganeirie koretwa ekeriniki kiabana rituko ria mambia chitariki ……(rituko/omotienyi/omwaka) chinsa isato chia mambia. …….. (erieta ri'enyagitari)

Appendix 7: Content of Voice Call (VC) to Caregivers

English language

Good morning/afternoon/evening? I am calling from ……. (name of hospital) to remind you to bring ……. (Name of child) for well-baby clinic tomorrow …… (day/month/year) at 9.00 am.

Kiswahili language

Habari ya asubuhi/MNCHana/jioni? Ninakupigia simu kutoka hospitali ya……. (jina la hospitali) kukukumbusha umlete……. (jina la mtoto) kwa kliniki cha watoto kesho tarehe……. (siku/mwezi/mwaka) saa tatu asubuhi.

Kisii language

Bwakire/bwairire buya? Nigo ngoaka esimi korwa…… (erieta ria enyagitari) gokoinyoria orete omwana ……. (erieta ria omwana) ekeriniki kiabana rituko ria mambia chitariki ……...…(rituko/omotienyi/omwaka) chinsa isato chia mambia.

Appendix 8: Recruitment and Intervention, Form 1

EFFECTS OF MOBILE HEALTH TECHNOLOGIES ON UPTAKE OF ROUTINE GROWTH MONITORING AMONG CAREGIVERS OF CHILDREN AGED 9-24 MONTHS IN NYAMIRA COUNT, KENYA
RECRUITMENT AND INTERVENTION, FORM 1

Health Facility Name…….

Research Assistant Name……..Mobile No……

S/N	Caregivers' Name	Mobile 1	Mobile 2	Mobile 3	Recruitment & Intervention Dates														
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Appendix 9: Routine Clinic Attendance, Form 2

EFFECTS OF MOBILE HEALTH TECHNOLOGIES ON UPTAKE OF ROUTINE GROWTH MONITORING AMONG CAREGIVERS OF CHILDREN AGED 9-24 MONTHS IN NYAMIRA COUNT, KENYA
ROUTINE CLINIC ATTENDANCE, FORM 2

Health Facility Name……..…….

Research Assistant Name……..……..Mobile No……

Key: D - Date to come again; A – Attended (tick- √) or Not Attended (mark - ×)

S/N	Caregiver's & child's Name	Permanent Reg. No	Contact	Routine Clinic Attendance Register To Come Again (TCAs)																															
				1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
				D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A
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Appendix 10: Graduate School Approval of Research Proposal

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: kubps@yahoo.com
dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School

DATE: 31st January, 2019

TO: Ms. Nyang'echi E. Nyanchama
C/o Department of Health Mngt. & Informatics
Kenyatta University

REF: Q97/38404/17

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge the receipt of your revised Research Proposal entitled **"Effects of mHealth Technologies on Uptake of Routine Growth Monitoring among Caregivers of Children 10-24 Months in Nyamira County, Kenya"** as per recommendations raised by the Graduate School Board of 9th January, 2019.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed supervision Tracking Forms per semester. The form has been developed to replace the progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

By copy of this letter, the Registrar (Academic) is hereby requested to grant you substantive registration for your Ph.D. studies.

Thank you.

KENYATTA UNIVERSITY OFFICE OF DEAN 01 FEB 2019 GRADUATE SCHOOL P.O. BOX 43844-00100 NAIROBI

REUBEN MURIUKI
FOR: DEAN, GRADUATE SCHOOL

c.c. Registrar (Academic) Att; Mr. Likam
Chairman, Department of Health Management & Informatics

Supervisor

1. Dr. Andre Yitambe
   C/o Department of Health Mngt. & Informatics
   Kenyatta University

2. Dr. Kenneth Rucha
   C/o Department of Health Mngt. & Informatics
   Kenyatta University

RM/cao

Committed to Creativity, Excellence & Self-Reliance

Appendix 11: Ethical Clearance Letter

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email chairman.kuerc@ku.ac.ke
kuerc.secretary@ku.ac.ke
Website: www.ku.ac.ke

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Tel: 8710901/12

Our Ref: **KU/ERC/ APPROVAL/VOL.1** (222) Date: 14th February, 2019

NYANG'ECHI EDNA
P.0 Box 43844-00100
Nairobi

Dear Edna,

APPLICATION NUMBER: PKU/974/I1026. "EFFECTS OF *m*HEALTH TECHNOLOGIES ON UPTAKE OF ROUTINE GROWTH MONITORING AMONG CAREGIVERS OF CHILDREN 10-24 MONTHS NYAMIRA COUNTY, KENYA"

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic **"Effects of mHealth Technologies on Uptake of Routine Growth Monitoring among Caregivers of Children 10-24 Months Nyamira County, Kenya"** received on 1st February, 2019 and discussed on 12th February, 2019

2. APPLICANT

Nyang'echi Edna

3. SITE

Nyamira County, Kenya

4. DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines and **APPROVED that the research may proceed for a period of ONE year from 12th February, 2019**

5. ADVICE/CONDITIONS

i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

KENYATTA UNIVERSITY
OFFICE OF THE CHAIRMAN
15 FEB 2019
ETHICS REVIEW COMMITTEE
P.O BOX 43844 - 00100 NAIROBI

PROF. JUDITH KIMIYWE
CHAIRMAN ETHICS REVIEW COMMITTEE

I NYANGECHI EDNA .....accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of...15TH FEBRUARY..... 2019.

cc.
DVC-Research Innovation and Outreach

Appendix 12: Research Permit from NACOSTI

THIS IS TO CERTIFY THAT:
MS. EDNA NYANCHAMA NYANGECHI
of KENYATTA UNIVERSITY, 0-100
Nairobi,has been permitted to conduct
research in *Nyamira County*

on the topic: *EFFECTS OF MHEALTH TECHNOLOGIES ON UPTAKE OF ROUTINE GROWTH MONITORING AMONG CAREGIVERS OF CHILDREN 10-24 MONTHS IN NYAMIRA COUNTY, KENYA.*

for the period ending:
11th March,2020

Permit No : NACOSTI/P/19/11505/28484
Date Of Issue : 12th March,2019
Fee Recieved :Ksh 2000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

1. **The License is valid for the proposed research, location and specified period.**
2. **The License and any rights thereunder are non-transferable.**
3. **The Licensee shall inform the County Governor before commencement of the research.**
4. **Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.**
5. **The License does not give authority to transfer research materials.**
6. **NACOSTI may monitor and evaluate the licensed research project.**
7. **The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.**
8. **NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.**

National Commission for Science, Technology and innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

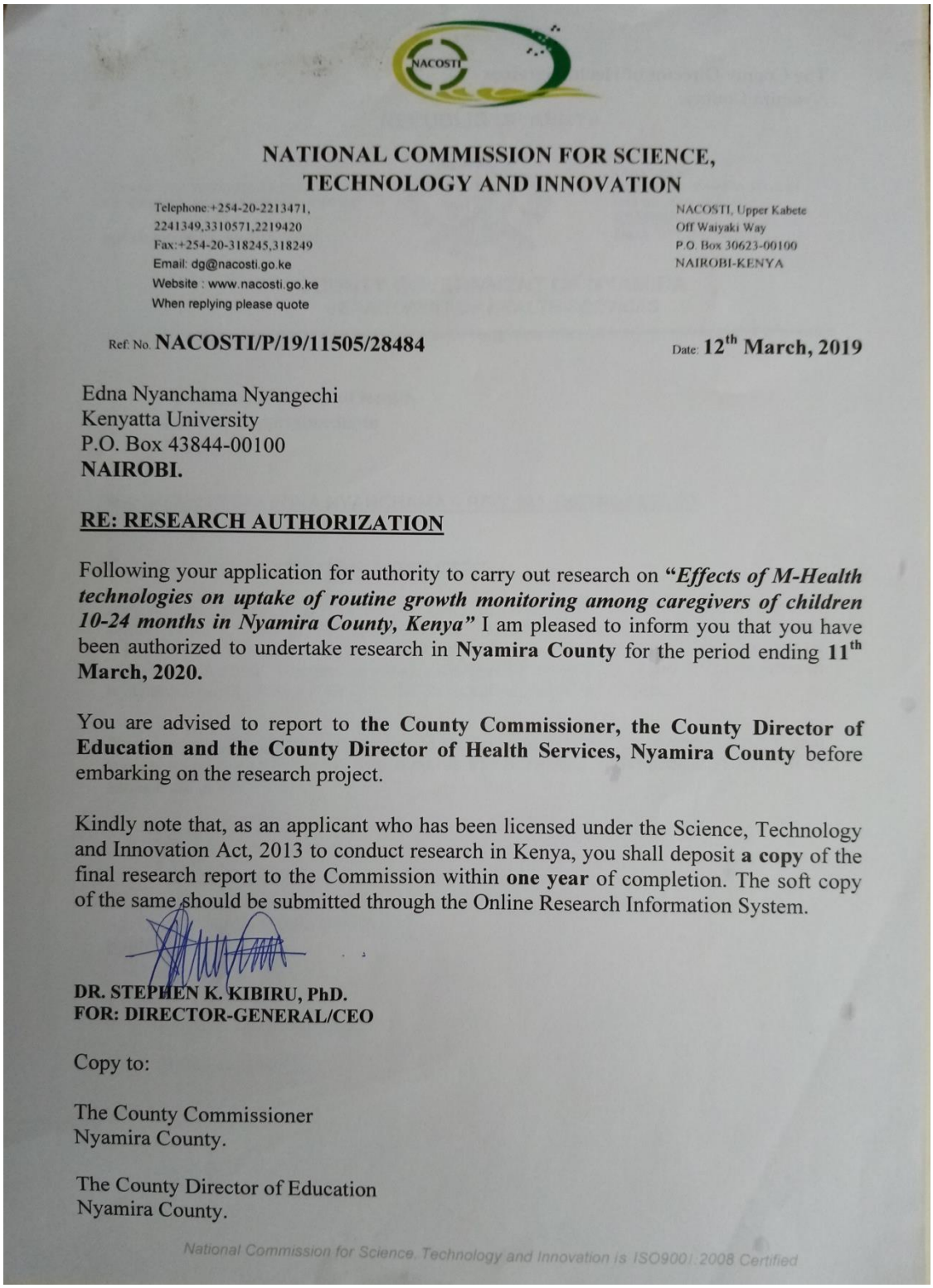
National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 23504

CONDITIONS: see back page

Appendix 13: Research authorization from NACOSTI



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

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

Ref: No. **NACOSTI/P/19/11505/28484**

Date: **12th March, 2019**

Edna Nyanchama Nyangechi
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Effects of M-Health technologies on uptake of routine growth monitoring among caregivers of children 10-24 months in Nyamira County, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Nyamira County** for the period ending **11th March, 2020.**

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

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

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nyamira County.

The County Director of Education
Nyamira County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

Appendix 14: Research Authorization from County Government of Nyamira Department of Health Services

REPUBLIC OF KENYA

Website: http://www.nyamira.go.ke
When replying please quote our reference:

Ref: NCG/GEN. CORR./VOL. 6(16)

Chief Officer,
Department of Health Services
P.O Box 434– 40600,
NYAMIRA.
Date: 31st Dec. 2018.

COUNTY GOVERNMENT OF NYAMIRA
DEPARTMENT OF HEALTH SERVICES

To,

All Medical Officers of Health
Medical Superintendents
Facility I/C

RE: NYANG'ECHI EDNA NYANCHAMA – REG. NO. Q97/38404/2017)

Reference is made to the above subject matter.

The above named is a student at Kenyatta University, School of Public Health, Department of Health Management and Informatics pursuing a PhD in Health Management. She is studying on" ***Effects of Mobile Health Technologies on uptake of Routine Growth Monitoring among caregivers of children aged 10-24 months in Nyamira County, Kenya"*** for her PhD in Health Management thesis.

The purpose of this letter therefore is to request you to allow her to undertake the said survey in your health facility and avail all the necessary information that may be of assistance to her

31 DEC 2018

Dr. Jack Magara
Ag. Chief Officer – Health Services
Nyamira County

CC.

CECM – Health Services
Nyamira County