



UNIVERSITY OF NAIROBI

**EFFICACY OF MOBILE PHONE USE ON PATIENT RETENTION IN CARE IN
POSTNATAL CLINIC IN NAKURU**

**A dissertation submitted in partial fulfilment for the award of the degree of Masters of
Medicine in Paediatrics and Child health of the University of Nairobi.**

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DECLARATION

This dissertation is my original work and has not been presented for the award of a degree in any other University

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DEDICATION

To my dear parents Thuraiya Said and Khalid Alkizim for their support and guidance throughout my life. To my husband Khalid Abdallah and our daughter Maysam Khalid for their love, patience, support and prayers.

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ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Care
BF	Breast feeding
CHW	Community Health Worker
GoK	Government of Kenya
KDHS	Kenya Demographic Health Survey
KNH	Kenyatta National Hospital
MoH	Ministry of Health
NMR	Neonatal Mortality Rate
PMTCT	Prevention of Mother to Child Transmission
PNC	Postnatal Care
SMS	Short Message Service
UNICEF	United Nations Children's Fund
UON	University of Nairobi
WHO	World Health Organization

DEFINITION OF TERMS

Postnatal period:	Begins immediately after birth up to 6 weeks
Immediate Postnatal period:	Covers the first 24 hours of life
Early Postnatal period:	Covers day 2 to day 7 of life
Late postnatal period:	Covers day 8 to day 42 of life
Retention in care:	Continuous follow-up as scheduled in appropriate medical care
Efficacy:	According to the Oxford dictionary is the ability to produce desired or intended result

ABSTRACT

Introduction: Postnatal Clinic attendance has been shown to be an important strategy to improve neonatal survival by increasing mother's knowledge on care of her baby and prompt recognition of illness and appropriate health seeking behaviour. Retention in the postnatal clinic has remained low especially in developing countries. In addition high client volumes and staff shortages impinge on the quality of services such that mothers are not adequately appraised on optimal infant feeding and recognition of neonatal danger signs. Use of mobile phones has largely been tested in improving uptake of other reproductive and child health services. This study aimed to assess the use of mobile phones as an intervention to increase postnatal clinic retention, promote exclusive breastfeeding and increase mother's knowledge on neonatal danger signs.

Objectives: The main objective was to compare retention in postnatal clinic at the 48 hour, 2 weeks and 6 weeks postnatal visit of mother-infant pairs randomized to phone reminders and short text messaging versus current standard of care. The secondary objective was to determine the impact of this intervention on exclusive breastfeeding rates, ability to identify neonatal danger signs and outcome of infant at 6 weeks across the study groups.

Methodology: This was an Open Label randomized controlled study. Mother infant pairs from Nakuru County Referral Hospital were randomly assigned to receive weekly mobile phone call reminders, text messages or current standard of care for the controls. All the three arms received standard of care education. The text arm received weekly texts reminders and the phone arm received weekly phone calls. Primary outcome assessed were rates of postnatal clinic attendance at 48 hours, 2 weeks and 6 weeks. Secondary outcomes were to compare rates of exclusive breastfeeding in the three arms, to compare knowledge (ability to identify) neonatal dangers signs and compare vital status of the neonates at 6 weeks. Intention to treat principle was used to analyse the data.

Results: A total of 180 mother-infant pairs were enrolled into the study, 60 receive text message, 61 phone call 61 and 59 were controls. There was significantly higher retention rates at all points of observation. At 48 hour visit the attendance rates for the control, text and phone call were 39%, 64 % and 75% ($p=0.005$ text versus control and $p=0.0001$ phone versus control). At 2 weeks the attendance was also higher in the intervention arms but difference was significant only in the phone call arm $p=0.047$. At the 6 weeks visit, the attendance rates were 72.9 % in the control, 90 % in the text arm and 88.9% in the phone call arm (p value 0.02 text versus control and 0.03 phone versus control). There was a 33% and

38% increase in identification of neonatal dangers in text and phone call arms respectively ($p=0.016$ for text and $p=0.008$ for phone). Self-reported rates of exclusive breast feeding were higher in the intervention arms but not statistically significant. With 76 % in the control, 84 % in the text and 84% in the phone call (p value 0.27 for text versus control and 0.26 for phone versus control). There was a 3 % increase in mortality in the control arm however it was not statistically significant p value of 0.364 for text versus control and 0.360 for phone call versus control.

Conclusion: These results suggest that mobile phone calls and text messages can be an important strategy in improving postnatal clinic attendance and improve knowledge on neonatal danger signs.

CHAPTER ONE: INTRODUCTION

1.1. Background of the study

Postnatal period is an important phase in the lives of newborn babies. Missing a postnatal clinic appointment affects continuum of care and contributes to neonatal morbidity and mortality (2)(5). Globally, 2.7 million new-borns die each year (6) . In Africa, 1.2 Million newborns die in the first month. According to Kenya Demographic Health Survey 2013 report, neonatal mortality rate in Kenya was estimated at about 22 per 1000 live births(7). Decline in Neonatal mortality Rate (NMR) has been slow compared to infant mortality rate and under five mortality rate as shown in figure 1 below. (7) The higher decline in infant and under-five mortality has been due to strategies promoted by WHO such as immunization, integrated management of child hood illnesses, Infant and young child feeding.

Interventions to reduce neonatal mortality have mainly focussed on immediate postnatal period as there is evidence that shows most of the deaths occur in the first 24 hours(8)

There is need to test interventions focusing on the entire postnatal period so as to prevent neonatal deaths occurring after the immediate postnatal period.

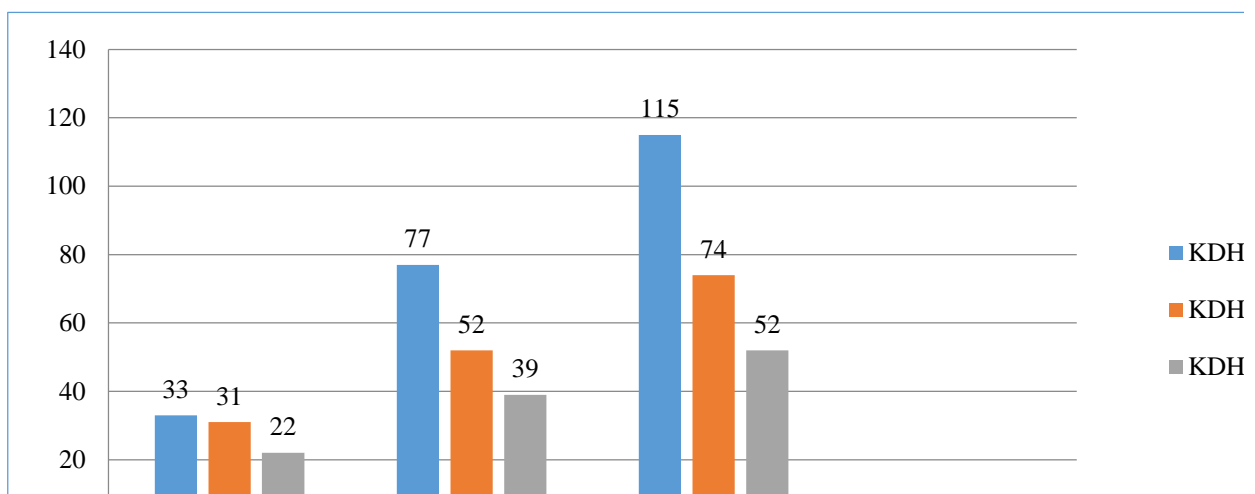


Figure 1: Trends in childhood mortality rates, adapted from the Kenya Health Demographic Survey

1.2. Causes of neonatal mortality

Globally, the three main causes of neonatal mortality are birth asphyxia, prematurity /low birth weight complications and sepsis (8). Early onset neonatal sepsis occurs in the first 72 hours after delivery and is acquired from microorganisms transmitted vertically from the

mother to her baby before or during delivery while late onset neonatal sepsis occurs after 72 hours of life and is usually acquired from the environment (9). A systematic review of 22 studies done to determine the timing of cause specific deaths in developing countries revealed that one half of deaths due to sepsis occurred in the first week, one quarter occurred in each second, third to fourth weeks of life (10).

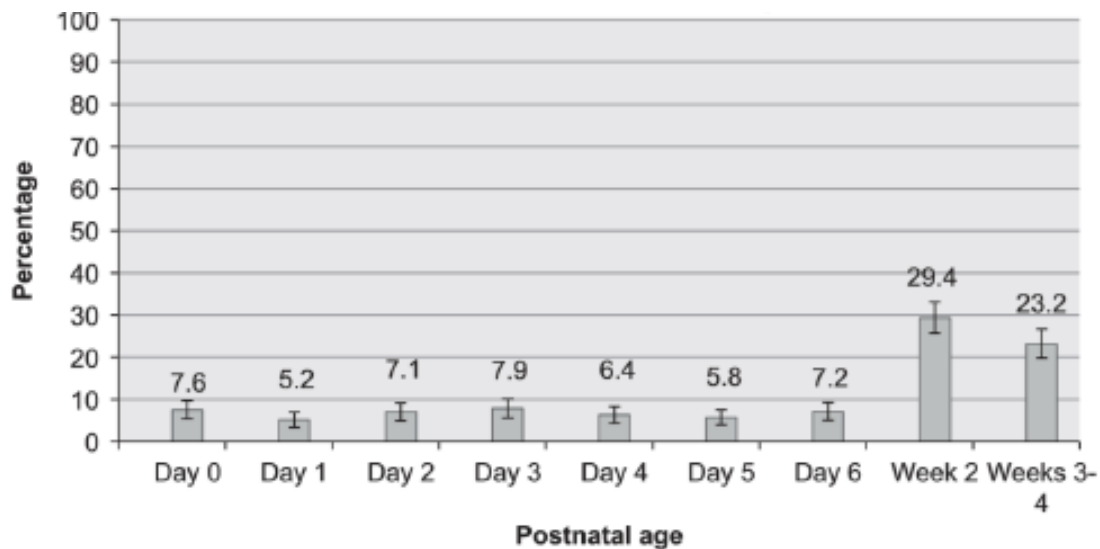


Figure 2: Distribution of deaths due to sepsis,
Source: When do new-borns die? A systematic review of timing of overall and cause-specific neonatal deaths in developing countries Sankar et al (10)

It is estimated that more than three quarters of neonatal deaths can be prevented and 80% of these deaths are preventable using cost effective interventions (11)(4) (3). These interventions include:

- Postnatal visits
- Promotion of exclusive breastfeeding
- Hygienic umbilical cord care
- Thermal care
- Training health care workers in neonatal resuscitation

1.3. Services offered at Postnatal Clinic

WHO guidelines on assessment of postnatal mothers and newborns to detect postnatal complications, counselling on infant feeding family planning, essential newborn care and early infant diagnosis (EID) for HIV were adopted by the Government of Kenya in 2013 and adapted into a care guideline as listed below.

Table 1: Services offered at Postnatal Clinic;

<i>Timing</i>	<i>Services offered</i>
<i>Within 48 hours</i>	<ul style="list-style-type: none"> • New born Physical Assessment • Counselling on Exclusive breastfeeding • Essential new born care • Neonatal danger signs assessment and management • Nevirapine if sero-exposed • Appointment for next visit
<i>2 weeks</i>	<ul style="list-style-type: none"> • Infant Physical examination • Exclusive breastfeeding counselling • Essential new born care • Neonatal danger signs :assessment, management, counselling • Growth monitoring • Immunization • Appointment for next visit
<i>6 weeks</i>	<ul style="list-style-type: none"> • Infant Physical examination • Exclusive breastfeeding counselling • Essential new born care • Neonatal danger signs: assessment, management, counselling • Co-trimoxazole (as indicated) • Growth monitoring • Immunization • Appointment for next visit

Source: GOK National Guidelines for Quality Obstetric and Perinatal Care (12)

Effective prevention of neonatal deaths requires compliance with these guidelines by mothers of newborns and the health providers. This study seeks to evaluate strategies for enhancing adherence and delivery of this care package.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

To achieve the third Sustainable Development Goal (SDG3) target of reducing neonatal mortality to less than 12 per 1000 live births, there is need to scale up strategies for reducing neonatal mortality. One of the strategies recommended by World Health Organization(WHO) to address this problem is to increase number of postnatal visits and improve on Postnatal Care(13) . WHO recommends that postnatal mothers and their new-borns should receive care for 24 hours after delivery and should receive at least three additional visits as follows :

- Within 48-72 hours
- Between day 7-14
- 6 weeks after delivery.

It has been documented that ,if routine PNC reached 90 per cent of babies and their mothers,10-27% of new born deaths could be prevented (8).

2.2. Postnatal care in Kenya

In order to improve access and quality of health care services provided to mothers and their new-borns and decrease neonatal morbidity and mortality, the Government of Kenya recommends increased contact with health care workers and has also subsidized costs on maternal new born and child health services.

After the introduction of free maternity services in June 2013, an increase in utilization of ANC (4) and hospital deliveries (MOH 2015) was witnessed, but postnatal services still remain the least utilized in the continuum of care(2). Comparing data from KDHS 2008 report to the 2013 report shows a worsening picture in utilization of postnatal services in Kenya

Table 2: Trends in Utilization of Postnatal Care

Postnatal clinic attendance	KDHS 2008/2009	KDHS 2013/2014
Postnatal check-up within 48 hours	42%	36%
No postnatal check up	53%	52%

Regional studies have had similar results as KDHS. Studies on postnatal clinic utilization conducted in Kiambu, Nyeri and Nakuru showed very low rates of postnatal clinic attendance

with less than half attending one clinic visit in the entire postnatal period. (14)(15)(16) The main reasons for not going for postnatal clinic that were noted in these studies were: having other responsibilities e.g. house hold chores; forgetting the date of clinic appointment and/or being oblivious of the importance of postnatal clinic attendance

2.3. Barriers to utilization of postnatal services

Even when postnatal services are readily available at all health facilities, several barriers may play a role in non-utilization of postnatal services.

2.3.1 Mother's education

Lack of formal education was found to be a significant factor in postnatal care utilization. Mothers with little formal education were found to attend Postnatal clinic less(17)(18) (19)This is corroborates Kenya Demographic Health Survey 2013 report, that showed the percentage of postnatal care utilization increased with formal education .Seventy four percent of mothers with no formal education had no postnatal check-up while 25% of mothers with formal education had no postnatal check-up.

2.3.2 Maternal age

Younger mothers have access to education and have greater exposure so are more likely to utilize postnatal services. Somefun et al (18)in Nigeria found that maternal age among other factors significantly affected utilization of postnatal services.

2.3.3 ANC attendance

Studies have shown that mothers who do not attend ANC miss the opportunity to access education on the importance of postnatal clinic services offered during postnatal visits. This contributes to their low attendance in the postnatal clinic (20)(21).

2.3.4 Lack of awareness

Studies investigating factors that affect utilization of postnatal services have found that lack of awareness of the importance of postnatal services is one of the major contributing factors. A cross sectional study done in Ethiopia to identify factors associated with PNC utilization found that only 40 % of mothers were aware of Postnatal services (22).

Other factors contributing to non-utilization of postnatal services include: transportation costs ,marital status and partner education status (18)(20).

2.4. Interventions to increase utilization of healthcare services

Some Interventions have been attempted on different preventive services such as Antenatal care, postnatal care, and childhood immunization. Some of the strategies used to increase uptake of postnatal services include combined clinics, community health workers, incentives and use of mobile phones.

2.4.1 Integrated Clinics

The combined clinic has been used in many developing countries as a strategy to increase retention in the clinic by harmonizing postnatal care for mother and infant. This model is also a strategy of prevention of mother to child transmission where during each postnatal visit, services are integrated. The mother receives postpartum care, breastfeeding support, family planning, CD 4 testing, antiretroviral medications and nutritional counselling. The infant receives newborn care , early Infant Diagnosis for HIV and Screening for malnutrition and tuberculosis (23).

2.4.2 Community Health Workers

Community Health Workers (CHW) have an important role in ensuring postnatal care utilization. They serve as a link between health system and mothers. Community health workers mainly provide services such as counselling mothers, provision of health education and identifying and referring sick babies. They also encourage mothers to attend postnatal visits and promote health care seeking behaviour. In 2013 WHO recommended home visits within the first week after delivery. This led to many countries exploring CHW as a strategy to improve maternal and neonatal health. Mc-Connel et al (24) conducted a randomized controlled trial in which a check- list was used by a CHW to assess the health of the mother and new-born. The postnatal checklist used led to early utilization of postnatal care and better recognition of maternal and neonatal danger signs. Lema et al (25) found that CHW home visits improved ANC visits, testing for HIV ,exclusive breast feeding and postnatal care utilization.

2.4.3 Incentives

Low cost incentive intervention has been shown to increase postnatal care utilization. Incentives used have been in form of vouchers, cash, gifts and services. Incentives given to health care providers are mostly given to HCW working in rural areas to motivate them. Incentives given to postnatal mothers on the other hand assist them to overcome barriers to utilization of postnatal services e.g. transport costs. Studies have shown better compliance to postnatal clinic appointments when these incentives are used (26).

2.4.4 Mobile Phone use

The mobile phone market has been rapidly growing worldwide .It has been reported that there were more than 7 billion mobile cellular subscriptions by the end of 2015 (27).In Kenya the number of mobile phone subscriptions were estimated to be 37.8 million in 2016(28). Currently, mobile phones are affordable to many Kenyans due to low rate tariffs offered by competing mobile networks and availability of cheap mobile handsets from China.

Mobile phone reminders have been used to increase postnatal clinic attendance. A study done in South Africa to evaluate the use of mobile phone technology to increase postnatal care utilization, showed that phone calls and text messages significantly increased rates of postnatal clinic attendance at the scheduled 3 day appointment the rise was significant from 45% in control, to 72% and 81% in phone calls and text reminders respectively (p <0.001)(29).

Mobile phone applications have been utilized to increase uptake of postnatal care services in Africa .In Kenya, a mobile phone platform called Toto-health is used to promote maternal and child health. Mothers who are registered to the platform get clinic appointment reminders, vaccination reminders, nutrition and family planning advice.

In Ethiopia, a study was conducted in 10 health centres where the intervention group received mobile phone with an application that sent appointment reminders and educative messages. The study demonstrated an increase in ANC, hospital delivery and PNC in those facilities in the intervention arm (30).

Mobile phone technology has been utilized as an intervention to promote and support exclusive breast feeding. Kihara et al(31) did a study to evaluate mobile phone counselling as

a strategy to promote exclusive breastfeeding There was a significant increase in rates of exclusive breastfeeding in the intervention arm .At 14 weeks, exclusive breastfeeding rates were 87% in the phone call arm compared to 45 % in the control arm. (p value <0.05). Use of phone technology has also been used to promote adherence of antiretroviral medication and to increase retention in care in prevention of mother to child transmission of HIV (32).

CHAPTER THREE: JUSTIFICATION AND STUDY OBJECTIVES.

3.1 Justification

Uptake of Postnatal services is suboptimal globally. According to the Kenya Demographic and Health Survey (KDHS) of 2014, only 36% of new-borns had a postnatal check-up within the first two days after birth and that more than half of infants born in a health facility (52 %) did not receive a postnatal check-up. A recognised problem globally is low maternal knowledge on neonatal danger signs. Therefore there is need to have interventions that focus on increasing level of postnatal care education.

Mobile phone calls have been found to be effective as they are more interactive(31). Statistics have shown that many people prefer texting over phone calls(33) because texting is more convenient ,cost effective and less intrusive (34). Use of mobile phone technology to follow up mother-infant pairs and also remind them of their clinic appointment dates may increase retention rates in the post natal clinic .No similar local studies done with emphasis on retention in care in postnatal clinic care.

The mobile phone intervention may reinforce knowledge on breast feeding, neonatal danger signs and other postnatal practices. Information obtained from this study may inform targeted strategies to improve uptake of health services.

3.2 Problem statement

The postnatal period is important as mothers and their newborns are at an increased risk of developing complications. Therefore, they require close follow up to detect and manage complications early. Likewise the content of health education given to mothers during the postnatal period determines their vigilance to recognise neonatal danger signs and seek treatment early.

In Nakuru County Referral hospital, no previous study assessing retention in postnatal clinic has been done. This study seeks to determine the effect of using mobile phone technology as an intervention to counsel mothers so as to improve retention in the postnatal clinic, increase rates of exclusive breast feeding and increase knowledge on neonatal danger signs.

3.3. Research Question

Does use of mobile phone communication improve patient retention in the postnatal clinic?

3.4. Study Objectives

3.4.1. Primary Objective

To compare rates of attendance for the 48 hour, 2 week and 6 week postnatal visit between mothers randomized to weekly text messages or weekly phone calls versus control.

3.4.2 Secondary Objectives

- a) To compare exclusive Breast Feeding rates between mother infant pair randomized to weekly text messages or weekly phone call versus control at 6 weeks
- b) To compare ability to identify (knowledge of) danger signs between mothers randomized to weekly text messages or weekly phone call versus control at 6 weeks
- c) To compare outcome of the infant randomized to weekly text messages or weekly phone calls versus control at 6 weeks.

CHAPTER THREE: METHODOLOGY

3.1. Study Design

This was an open label randomized control trial. Postnatal mothers with infants from Nakuru County Referral Hospital were randomly assigned to receive text messages, phone call reminders or standard of health care.

3.2. Study Population

Postnatal mothers who delivered at Nakuru County Referral Hospital.

3.3. Study Area

The study was carried out in Nakuru County Referral Hospital (NCRH), maternity, post-natal wards and postnatal clinic. Nakuru County Referral Hospital has a busy maternity ward with an average of 600 deliveries, 480 spontaneous vertex deliveries (SVD) and 120 caesarean section deliveries every month. Approximately 300 mothers are seen in the postnatal clinic every month .It is a teaching hospital for Egerton University and Kenya Medical Training College.

Nakuru is 150 km west of Nairobi. It is divided into 11 sub counties: Naivasha, Gilgil, Rongai, Kuresoi North, Kuresoi South, Bahati ,Molo ,Njoro , Subukia and Nakuru Town East and Nakuru Town West.

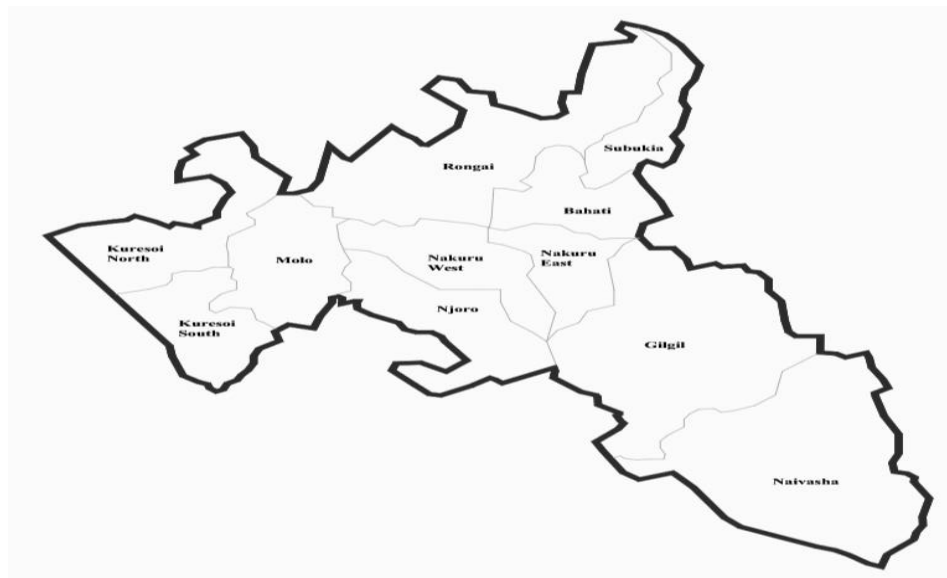


Figure 3: Map of Nakuru County showing constituencies

3.4. Study period:

From November 2017 to January 2018.

3.5. Inclusion criteria.

1. Mothers who have access to mobile phones
2. Mothers willing to be followed up at NCRH
3. Mothers who deliver at term.(37 completed weeks)
4. Mothers discharged within 24 hours of delivery.

3.6. Exclusion criteria

1. Mothers who do not have access to a mobile phone
2. Mothers who declined to participate in the study
3. Mothers who give birth to preterm babies.
4. Mothers with prolonged hospitalization. (More than 24 hours after delivery)

3.7. Sample size determination

Sample size was estimated using STATA Version 12

Sample size and power for means and proportions (*SAMPSI*) command was used as shown:

$$n = \frac{\{u \sqrt{[\pi_1(1 - \pi_1) + \pi_0(1 - \pi_0)]} + v \sqrt{[2\bar{\pi}(1 - \bar{\pi})]}\}^2}{(\pi_0 - \pi_1)^2}$$

n = sample size

Assumptions are shown below:

u = 0.8, corresponds to power 80%

v = corresponds to 5% significance level

Using Kihara's study(31):

$\pi_1 = 0.93$, corresponds to 93% exclusively breastfed babies at 6weeks in the intervention arm

$\pi_0 = 0.72$, corresponds to 72% exclusively breastfed babies in the control group

Calculated sample size in each arm: 60

Total sample Size: **180**

3.8. Sampling Procedure

Two research assistants were trained by the researcher on using data tools. Mothers coming to deliver at NCRH were identified by reviewing the admission book .After delivery, the mothers who met the inclusion criteria were approached by a research assistant and the study was introduced to them. Mothers who accepted to participate signed a written consent and were interviewed to collect socio-demographic data.

3.9. Sampling technique (Randomization)

An allocation list was made using computer generated block randomization. To ensure that the allocation sequence was not predictable, the sequence numbers were sealed inside brown envelopes. The envelopes were assigned to participants as they were being enrolled. The allocation ratio was 1:1:1.The participants were apprised of intervention they had been allocated.

3.10. Intervention

All the groups received standard of care. Mother and Child health Booklet was used as guide to give postnatal education.(35) The postnatal care education topics included the following:

1. Postnatal clinic attendance: The mothers were informed on number of postnatal visits recommended and emphasis on importance of attending all scheduled visits was made.
2. Breast feeding education: The mothers were educated on benefits of exclusive breastfeeding, dangers of breast milk substitutes and Breastfeeding difficulties
3. Neonatal danger signs: Mothers were educated on how to prevent infection in the newborn, how to identify neonatal danger signs and were advised to seek care immediately when the baby is ill.

Demonstrations on breast feeding techniques and cleaning the cord were made. The postnatal care talks were given daily during the hospitalization period. Before discharge mothers in the phone call intervention group were informed that they will be called to be reminded to attend their scheduled follow up visits. The mothers in the text intervention group were informed that they will be receiving weekly texts

3.11. Follow up procedures in the intervention arm 1(text messages)

The Primary researcher sent text messages to each participant within 24 hours of delivery. They were reminded of the 48 hour, 2 week and 6 week visit. The participants also received educative messages to refresh the knowledge of the mothers on topics discussed before

discharge. The reminders and educational text messages were standardized and were sent every week (on Monday) for 6 weeks. A delivery notification message was used as a proxy measure of whether the message was read by the participants. The primary researcher replied to messages sent by mothers regarding baby's health.

3.12. Follow up procedures in the intervention arm 2(phone calls)

The primary researcher called the mother within twenty four hours of delivery (after discharge) to remind her of the 1st postnatal visit. Subsequently, the researcher called each participant in the phone call intervention arm, every week, on Monday (6 weeks follow-up). The participants were reminded of the 48 hour, 2 weeks and 6 weeks appointment visits. They were also reminded of benefits of exclusive breast feeding, dangers of breast milk substitutes and ameliorate mother's knowledge on neonatal danger signs. The participants were allowed to ask questions regarding the infant's health. A maximum of three phone calls were attempted. The primary researcher then attempted to reach the mother using any other number provided.

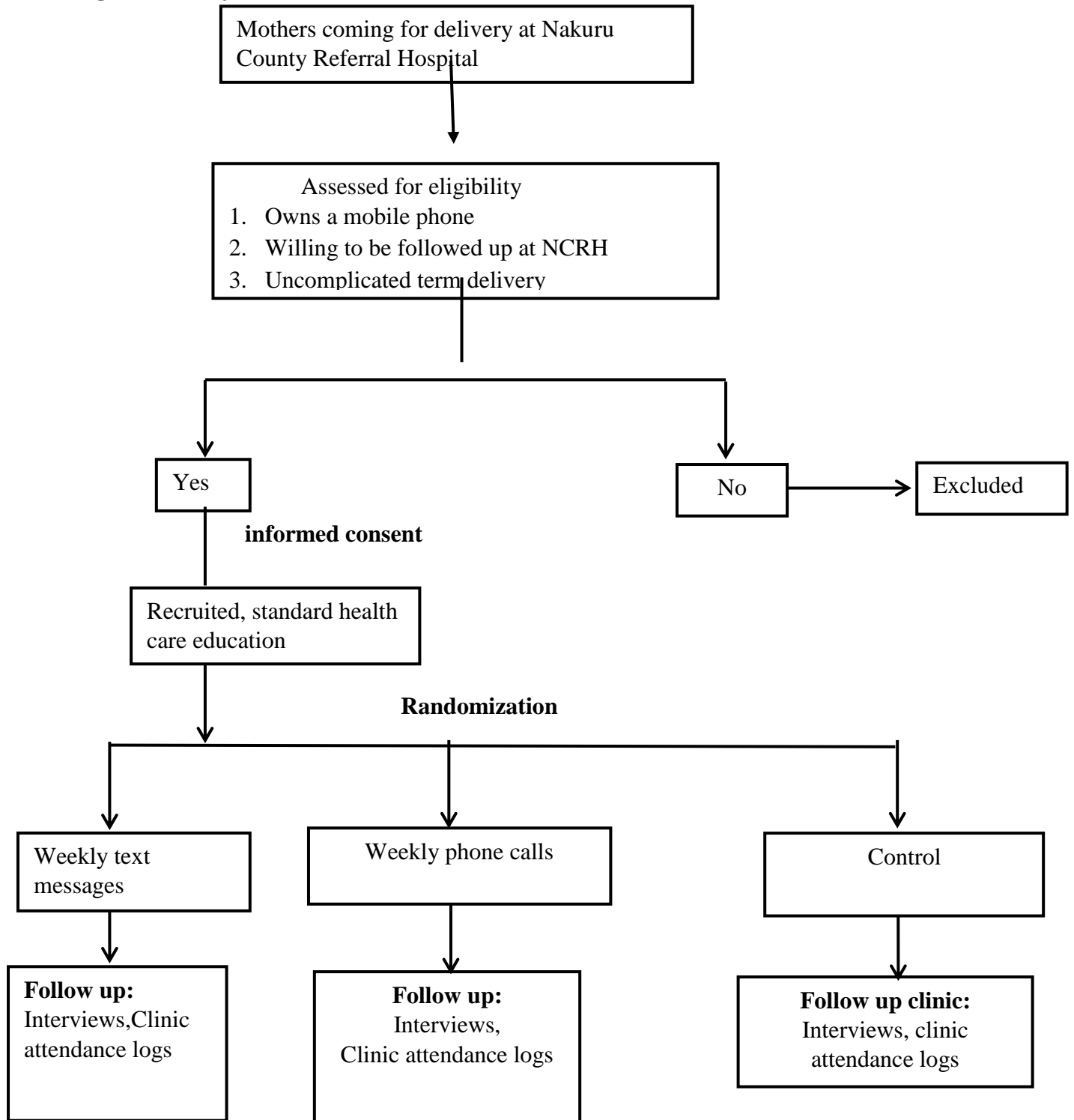
Mothers were not given mobile phones or airtime credit but all phone call and text message costs were incurred by the primary researcher.

3.13. Follow up procedures in the Control group

Participants randomized to control arm received standard of care (SOC) but were not called by the research team. They were reminded verbally by the nurse before discharge. However, they were allowed to call the researcher if they wish.

A flow chart describing the study procedure is shown below:

Figure 4: Study Flow Chart



3.14. Outcome measures

The primary outcome measured was retention in care at 48 hours, 2 weeks and 6 weeks. At discharge, each participant (mother-infant pair) was given a return date at day 2, 2 weeks and at 6 weeks. Retention in care was assessed as keeping the scheduled appointment date. Any mother who came a week after the scheduled date was not included.

Secondary Outcomes

- Exclusive breastfeeding rate were measured as self-reported duration of Exclusive breast feeding.
 - A mean score of the number of WHO neonatal danger signs listed by the study participants was done in each group
- The outcome of the infants was assessed at 6 weeks.

3.15. Data management and analysis

Data was collected by the research assistants using questionnaires. The data obtained was evaluated by the primary investigator for errors and omissions, and then analysed using STATA version 9. Baseline characteristics of mothers in the three arms were compared. Intention to treat principle was used to analyse the data. Similarities between the three arms was demonstrated by comparing baseline characteristics using Chi square tests and Student's T test for categorical and continuous variables respectively.

The effect of mobile phone technology was measured by comparing retention rates in postnatal clinic at 48 hours, 2 weeks and 6 weeks. Retention at Postnatal Clinic were compared between the three groups using Relative risk. Furthermore, rates of exclusive breastfeeding and vital status of infants were compared in the three arms using Chi square test and the possibility of having the outcomes in the intervention groups were shown using relative risk ratio. T- test was done to compare the mean score on knowledge of danger signs. All statistical tests were performed at 95% confidence level and 5% level of significance.

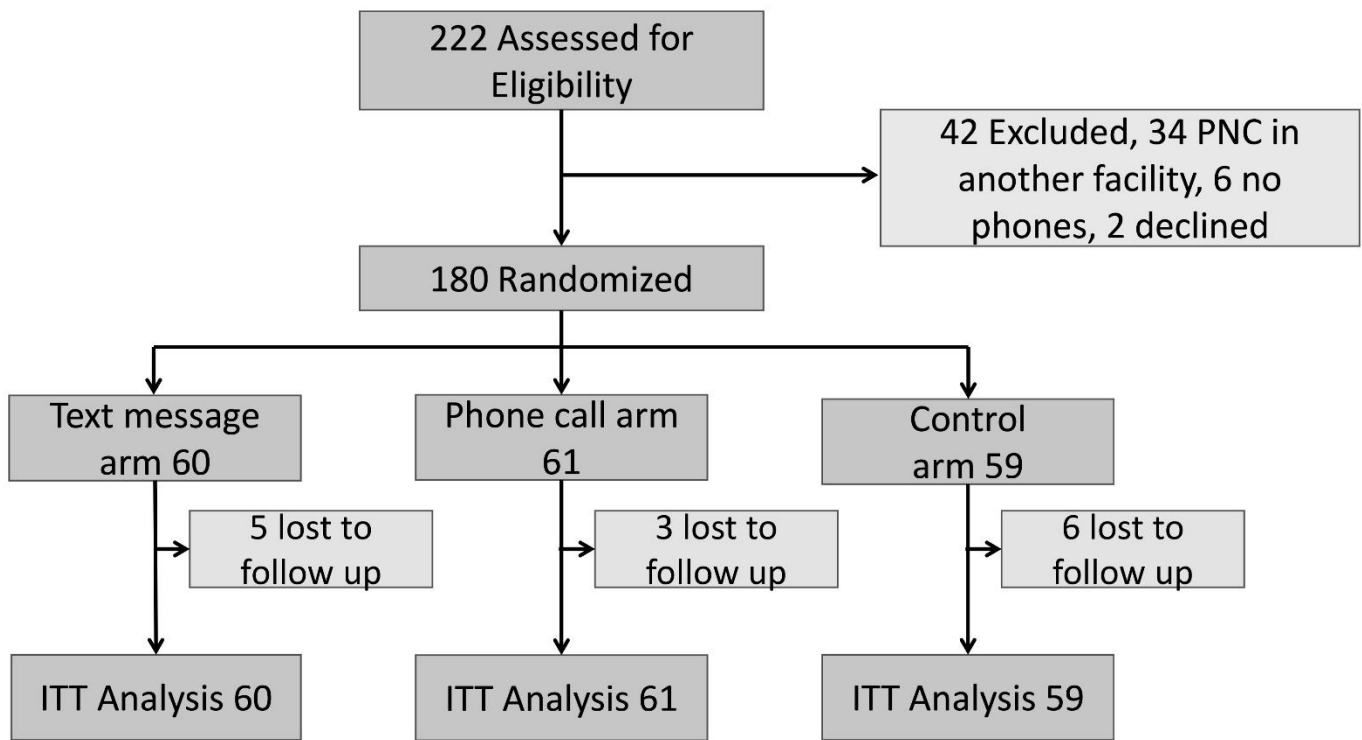
CHAPTER FOUR: RESULTS

4.1 Introduction

Between 6th November and 31st January 2018, Mother-infant pairs were recruited as demonstrated on figure 5 below. A total of 222 mothers who had delivered babies by uncomplicated vaginal delivery were approached to participate in the study. Forty two of them were not eligible because thirty four mothers indicated that they planned to obtain their postnatal care in a facility; six mothers indicated that they did not have ready access to any cell phones; and two mothers declined to participate in the study. Of the mothers approached for the study, 180 of them met the inclusion criteria. They were assigned into groups as follows: Control group –59, text message group -60 Phone call group –61 participants. The total number of participants who were lost to follow up were 14: text -5, phone-3 and control -6.

Figure 5: Study profile

Study Profile



Key: ITT intention to treat analysis

Socio-demographic characteristics

The characteristics of the 180 participants in the study are displayed on table 3 below. Randomization into the three arms of the study was successful. The three arms of the study were similar for the infant and maternal variables that were measured. At enrolment infants in the three groups were comparable in terms of age at discharge, birth weight and gender. The median age of the mothers was 26 in the control and text arm and 24 in the phone arm. Majority of the mothers had completed primary education, in the control arm 69.5%, 73.3% in the text and 62.3 in the phone call arm. More than half (55.93%) of those in the control arm were employed and slightly less than half (43.3%) of those recruited in the text were employed and (44.26%) in the phone call arm were employed. Majority of the mothers recruited were residing in the urban areas with about 84 %, 86% and 88% in the control, text and phone call respectively. Majority of the mothers were married with 88% in the control arm, 88 % in the text arm and 85 % in the phone call arm.

Table 3: Socio demographic characteristics

Characteristics	Text (N=60)	Phone call (N = 61)	Control (N=59)	Text vs control Chi- square	P value	Phone vs control Chi- square	P value
Infant characteristics							
Age of baby in hours Median IQR	19(22-17)	19(22-17)	18(20-16)	0.0847	0.8	0.0451	0.8
Mean Birth weight in grams	3096.3	3102.8	3101.3	0.0838	0.9	0.0255	1.0
Gender							
Male	32(53.33)	25(40.98)	20(40.68)	1.902	0.2	0.0012	1.0
Female	28(46.67)	36(59.02)	35(59.32)				
Maternal Characteristics							
Age of mother in years Median IQR	26(30.5- 22)	25(35-22)	26(29-23)	0.0067	0.9	0.0333	0.9
Level of Education							
Primary	16(26.7)	23(37.7)	18(30.5)	0.2151	0.6	0.6905	0.4
Post primary	44(73.3)	38(62.3)	41(69.5)				
Occupation							
Employed	26(43.33)	27(44.26)	33 (55.93)	1.8889	0.2	1.6338	0.2
Not employed	34(56.67)	34(55.73)	26(44.07)				
Residence							
Urban	52(86.67)	54(88.52)	50(84.75)	0.0896	0.8	0.3706	0.5
Rural	8(13.33)	7(11.48)	9(15.25)				
Marital status							
Married	53(88.33)	52(85.25)	52(88.14)	0.011	1.0	0.2167	0.6
Single	7(11.67)	9(14.75)	7(11.86)				

Table 4: Patient retention in Postnatal clinic

	Text	Phone	Control	RR	95% CI	p value	RR	95%CI	p value
				Text			Phone		
				versus			versus		
				control			control		
Attendance at 48 hr	38(64)	45(75)	22(38.6)	1.67	1.16-2.4	0.01	1.94	1.4-2.7	0.0001
Attendance at 2 weeks	45(75)	50(81.97)	39(66.1)	1.13	0.90-1.43	0.29	1.24	1.0-1.5	0.05
Attendance at 6 weeks	54(90)	54(88.5)	43(72.9)	1.23	1.04-1.47	0.02	1.21	1.02-1.45	0.03

At 48 hours attendance of the postnatal clinic was 22 (38.6%) of 59, 45 (75%) of 61, and 38 (64.4%) for the control, phone call and text message group respectively. Compared to controls, the adherence to 48 hour visit was significantly higher for the phone RR=1.94 [(95% CI 1.4, 2.7) p=0.0001] and text message RR=1.67 [(95% CI 1.16, 2.4) p=0.01] arms of the study.

At 2 weeks 50 (81.97%) mother infant pairs in the phone call arm attended the scheduled visit compared to 45(75%) in the text messaging and 39 (66.1%) in the control arm. Only the mobile phone call arm of the study had statistically significant higher adherence to the 2 week postnatal visit RR=1.24 [(95% CI 1.0, 1.5) p =0.05].

At 6 weeks, 54 (90%) of mothers in the text message arm, 54 (88.5%) in the phone call arm, and 43 (72.9%) in the control arm showed up for the visit. Both the text message intervention and mobile phone call were found to be effective in increasing postnatal clinic attendance RR=1.23 [(95% CI 1.04, 1.47) p=0.03] and RR=1.21 [(95% CI 1.02, 1.45) p=0.03] respectively.

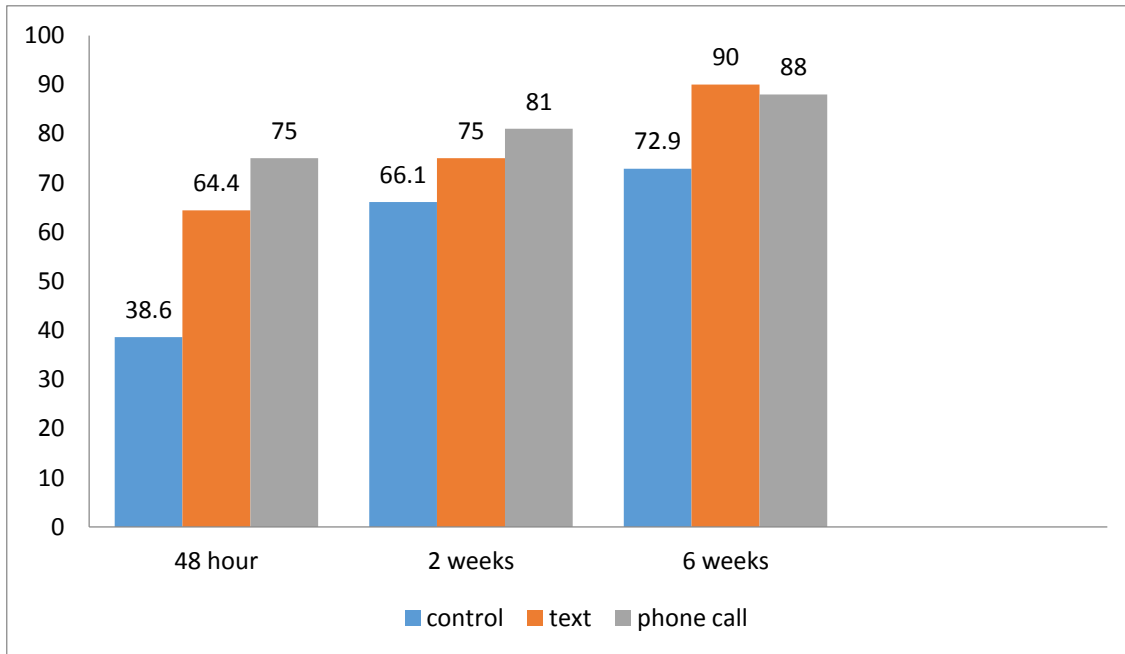


Figure 6: Postnatal clinic attendance rates

Table 5: Secondary outcomes

Secondary outcomes	Text N 60 n(%) Mean (SD)	Phone N 61 n (%) Mean (SD)	Control N 59 n(%) Mean (SD)	RR Text versus control	CI95%	p value	RR Phone versus control	CI95%	p value
Exclusive breastfeeding	48(84.21)	49(84.48)	34(75.56)	1.11	0.91-1.36	0.27	1.12	0.92-1.37	0.26
Neonatal danger signs mean score	75.70 (15.32)	80.47 (15.71)	42.73 (28.94)			0.016			0.008
Outcome (Dead)	3(5.08)	1(1.67)	1 (1.64)	0.33	0.03-3.06	0.364	0.32	0.03-3.01	0.360

As shown in table 5 above, at 6 weeks, 34(75.56%) mothers reported that they were exclusively breast feeding in the control arm, 48(84.21) in the text arm and 49(84%) in the phone call arm. The rate of exclusive breastfeeding was similar in the three arms of the study ($p > 0.05$).

A mean score of the neonatal danger signs was used to assess knowledge in the different arms. T- test was done to compare the mean score on knowledge of danger signs. Overall knowledge in the control arm was 42.7%, 75.7% in the text and 80.47% in phone call arm. Women in the text and phone arms of the study had significantly better knowledge of neonatal danger signs p value 0.016 and 0.008 for text and phone call arms respectively.

There was a total of 5 deaths among the study participants. The incidence of death in the control, text and phone call was found to be 5.08%, 1.67% and 1.64 % respectively, a 3 fold increase in the control arm, however it was not statistically significant p value 0.364 (text versus control) and p value 0.360 (phone versus control).

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

DISCUSSION

In this study, the text message and phone call interventions were very effective in increasing attendance rates at 48 hour, 2 weeks and 6 weeks. At 6 weeks less than 1 in 10 mothers in the intervention arm failed to attend the clinic compared to 4 in 10 women in the control

The attendance rates have been significantly higher in the intervention arms. Our results were comparable with other studies in which mobile phone reminders significantly reduced non-attendance. For example Mokaya et al in a 2015 study in South Africa, found that sms reminder and phone call significantly increased attendance at the 3 day appointment from 45% in controls to 81% and 72% in mothers who received sms reminders and phone calls, respectively ($p < 0.001$) (29) Adanikin et al (2010) found that text messages improved postnatal clinic attendance rates(36) There are published studies that have failed to show a benefit when SMS reminders are used to promote postnatal care. The study by Nortan et al in 2012, which showed no difference in clinic attendance rate (81 % versus 72%) $p = 0.42$ for women exposed to text message reminders compared to control(37)

Knowledge on the danger signs in neonates by the mothers or caretakers is a key component and predictor of infant outcomes. The second important finding in this study was the significant improvement in knowledge of danger signs in the two intervention arms of the study. There was 33% and 38% higher knowledge score in the SMS and phone arm of the study compared to controls and this difference was very significant (p value 0.016 and 0.008 for text and phone versus control respectively).The findings are reflective of other studies that have also shown a difference in the ability to identify danger signs In an interventional study done by Butt et al reminder calls to the mothers mobile phone in the post natal period significantly increased knowledge of neonatal danger signs from 35% in the pre intervention to 98 % post intervention(39).

The WHO recommends exclusive breastfeeding for a minimum of 6 months(38)Despite this recommendation, only 72% of mothers practice exclusive breast feeding at 6 weeks.(7)

Our study showed self-reported exclusively breast feeding rates at 6 weeks was 75% in the control arm and marginally higher at 84% in the text and phone call, which is higher than the national rates of 61%. There was a positive trend in both the interventions although did not

show statistical significance. This contrasts with the Kihara et al study where exclusive breastfeeding rates were significantly higher in the phone based counselling group at 6 weeks 10 weeks and 14 weeks (p value <0.05) (31). The difference in results may be due to the population studied, our study being all women while Kihara study was restricted to primiparous women. The Kihara study also showed that self-reporting of exclusive breastfeeding was an inaccurate method of obtaining information on exclusive breastfeeding rates with the gold standard test using deuterated water giving a positive predictive value of only 20%.(31)

At 6 weeks, mothers were interviewed over the phone to establish the outcome of their infants. 3 infants from the control group died whereas 1 infant died from the text and 1 from the phone call group. The difference in mortality between the text versus control and phone call versus control was not statistically significant. (p=0.364 and 0.360 respectively. Our study was not powered to look at mortality as an outcome.

Other findings

It was significantly cheaper to text the participants versus phone calls. The total cost of texting the 60 mothers in the text arm intervention for the study period was ksh600. i e cost of weekly text messages for 6 weeks. The total cost for phone calls made for the 6 weeks was Ksh 4000 calls. The time taken for texting was also less than calling time as bulk texting method was used. Text messages cost lower than phone calls in this study, since it costs almost seven times more to make phone calls than to send text messages.

The participants were allowed to call, text and even whatsApp text their questions and concerns and prompt answers provided to them, reassured them especially when they were not sure on the correct step to take regarding the challenges they were facing. Some of the most frequently questions asked by the mothers were:

- Appropriate contraception during lactation period,
- Management of hard stool and colic
- Baby refusing to nurse
- Appropriate nutrition to increase breast milk supply
- Management of eye discharge

STRENGTHS OF THE STUDY

The randomization was successful and therefore the observed difference can be attributed to the intervention

STUDY LIMITATIONS

The study was not blinded, so could be prone to observer bias. However this was reduced by randomisation and blinding of outcome assessment. Information bias was another limitation. It was noted that obtaining information using self-reported method could have been inaccurate. Further research is needed to validate the data derived by self-report on exclusive breastfeeding.

CONCLUSION

These results suggest that mobile phone calls and text messages can be an important strategy in improving postnatal clinic attendance, and improve knowledge on neonatal danger signs.

RECOMMENDATIONS

Mobile phone call and text message are both effective in increasing postnatal retention.

A new study to be carried out with a larger number of subjects and for a longer period to be able to demonstrate the effect of phone use on outcomes like mortality.

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APPENDIX

Appendix 1; Consent

Appendix 1 PARENT INFORMATION SHEET

Mother-Infant Pair Serial No.....

PARENT INFORMATION SHEET

I am Dr.Munira Alkizim from the University of Nairobi; Department of Paediatrics and Child Health. I am conducting a study to evaluate a method of promoting retention to postnatal clinic, promote exclusive breastfeeding rates and increase knowledge on neonatal danger signs.

My Supervisors, both of whom are based at the Department of Paediatrics and Child Health at the University of Nairobi are:

1. Prof. Nduati
2. Prof Wamalwa

I am requesting your participation in this study. I would like to bring to your attention the following ethical considerations which will guide your enrolment as a study participant:

1. Participation in this study is voluntary
2. You may withdraw from the study at any time and there are no consequences for your decision to withdraw
3. After you read the explanation, please feel free to ask any questions that will allow you to understand clearly the nature of the study.
4. Any information you provide including details on your demographic characteristics will be treated as confidential.
5. The study protocol has been reviewed by an ethics committee. This protocol can be availed to you should you be interested in the study details.

I will be available to answer any questions that will help you to understand the nature of the study. If you need to seek clarification you can contact me on telephone number **0721336085**.

Purpose of the study

Postnatal Clinic visits have been shown to improve neonatal survival. The mobile phone intervention has already been tested in other parts of the world and has been found to be useful. In Kenya, Mobile phones have been used to improve other health practices e.g. breast feeding. Because we do not know if text messages or phone calls will be more effective in

increasing postnatal care retention, we need to be able to compare this. Mother infant pairs taking part in this research will therefore be randomly assigned into three groups that will be preselected before-hand. The first group will receive weekly phone calls, the second group will receive weekly texts and the third group will be reminded by the nurse before discharge to attend postnatal clinic. The participants will be randomly assigned to the three groups.

.

Study procedures.

If you decide to take part in this study, a questionnaire will be provided. I will be available to guide you through the questionnaire. Depending on the group you will be allocated to, we shall be calling you every week or send you weekly texts to remind you to attend postnatal clinic. You will also get key postnatal messages (exclusive breastfeeding and neonatal danger signs identification)

We shall administer a questionnaire at every planned clinic visit (48 hour, two and six weeks) on Exclusive breastfeeding and knowledge of neonatal danger signs.

Other issues

There is no cost to you for being in this study. The researcher shall incur all the calling costs.

Benefit: While taking part in the study, we shall be calling you every week to follow up on your Infant's wellbeing and to remind you on what you already know on the importance of postnatal clinic attendance.

You may benefit in the future from information learned in this study. You will be counselled on breastfeeding and neonatal danger signs.

Consent form

I, the undersigned, do hereby give consent to participate in this, study. The nature and purpose of the study have been fully explained to me. I am aware that participation is voluntary and that there are no consequences to withdrawal from the study. I have been informed that all data provided will be used for study purposes only.

Signed..... Date.....

I _____ declare that I have adequately explained to the participant the study purpose, procedures, risks and benefit. I have given the participant time to ask questions and seek clarifications regarding the study.

Signed Date.....

IDHINI

Jina langu ni Dkt. Munira Alkizim kutoka chuo kikuu cha Nairobi; Idara ya watoto na afya kwa watoto. Nafanya Utafiti ili kutadhmini njia ya kukuza uhifadhi katika kliniki za kujifungua, Kukuza viwango vya kipekee vya kunyonyesha na kuongeza ufahamu kuhusu dalili za hatari mwezi mmoja baada ya kujifungua.

Wasimamizi wa somo hili ambao pia ni walimu katika idara ya watoto na afya kwa watoto ni:

1. Prof. Nduati
2. Prof. Wamalwa

Naomba kushirikiana nawe katika utafiti huu. Ningependa pia kuorodhesha maadili ambayo yatakuongoza ili kukupa muongozo wakati wa utafiti huu:

1. Kushiriki katika utafiti huu ni kwa hiari
2. Unaweza kujiondoa kwenye utafiti huu wakati wowote na hakuna hatua yoyote itakayochukuliwa dhidi yako iwapo utajiondoa.
3. Baada ya kusoma maelezo uko huru kuuliza swali lolote litakalokusaidia kuelewa vyema utafiti huu.
4. Habari zozote utakazotoa ikiweno sifa za watu itachukuliwa kama siri.
5. Itifaki ya utafiti imechunguzwa na kamati ya maadili, Itifaki hii inaweza kutolewa kwako iwapo unahaja ya kujua maelezo kuhusu utafiti huu.

Ninaweza kujibu swali lako litakalokusaidia kuelewa vyema kuhusiana na utafiti huu. Iwapo unataka maelezo au ufafanuzi zaidi nipigie simu kwa nambari 0721336085

Lengo la utafiti

Kutembelea Kliniki baada ya kujifungua imeonyesha kuboresha maisha ya uzazi. Simu ya rununu zimefanyiwa majaribio na kupatikana kuwa muhimu kuokoa maisha ya watioto wachanga. Nchini Kenya simu za rununu zimetumika kuboresha afya ya uzazi kwa mfano Kunyoshesha. Kwa sababu hatujui iwapo kutuma arafa au kupiga simu ni muafaka katika huduma ya baada ya kujifungua tunahitaji kulinganisha hili. Mama wa watoto wachanga watakaotumika katika utafiti huu watawekwa katika vikundi vitatu na kuteuliwa kabla ya utafiti kuanza. Kikundi cha kwanza watapigiwa simu kila wiki, kikundi cha pili kitakuwa

kikitumiwa arafa kila wiki huku nalo kundi la tatu wauguzi watakumbushwa na wauguzi kuelekea katika kuhudhuria kliniki.

Jinsi ya kufanya utafiti

Iwapo utakubali kushiriki katika utafiti huu,maswali yatatolewa.Nitakuwepo kukuelekeza kuhusu maswali hayo.Kulingana na kundi utakaokuwa tutakupigia simu kila wiki au kukutumia ujumbe was ms kila wiki kukumbusha kuhudhuria kliniki ya watoto.vilevile utapata ujumbe muhimu ya baada ya kujifungua ikiwemo dalili ya maradhi hatari yanayohusishwa baada ya kujifungua na jinsi ya kujizuia.

Pia tutatoa maswali pindi utakapohudhuria Kliniki(masaa 48,wiki mbili na sita) kuhusu kunyonyesha na ufahamu wa dalili hatari yanayojitokeza baada ya kujifungua.

Masuala Mengine

Hakuna ada utakazotozwa ili kuhusika kwenye utafiti huu. Mtafiti ndio atakayelipia ada zote

Umuhimu: Ukiwa ndani ya utafiti huu,tutakupigia simu kila wiki kujua jinsi mtoto wako anaendelea,na kukukumbusha unayoyajua na umuhimu ya kupata kuhudhuria Kliniki baada ya kujifungua.

Unaweza kufaidika baadaye kwa Maelezo kutokana katika utafiti huu.Utapewa ushauri kukhusu kunyonyesha na dalili hatari zinazotokana na kujifungua

FOMU YA RIDHAA.

Mimi niliyetia saina nimeridhia kujihusisha na utafiti huu,nimeelezwa kikamilifu kuhusu Kusudi na asili ya utafiti huu,Snafahamu vyema kuwa kushiriki kwa utafiti huu ni kujitolewa na kwamba hakuna hatua yoyote itachukuliwa dhidi yangu iwapo nitajiondoa.Nimeelezwa kuwa habari zozote nitakazotowa ziztumika kwa utafiti huu pekee

Sahihi..... Tarehe.....

Mimi_____ Nakiri kuwa nimemfananulia mshiriki kusudi, utaratibu, hatari, na faida ya utafiti huu. Nimempa muda kuuliza maswali na kutafuta ufafanuzi kuhusu utafiti.

Appendix 2: Questionnaire

Questionnaire

Study arm

Control	<input type="text"/>
Text message	<input type="text"/>
Call	<input type="text"/>

Sociodemographic

1. mother-infant pair serial number Date: __/__/____
2. i) Age of mother: _____
3. i) Date of birth of baby: __/__/____ ii) Gender: _____: _____

4. Marital status:

Married	<input type="text"/>
Single	<input type="text"/>
Divorced	<input type="text"/>

5. Residence ----- urban
rural

6. Level of education[⊕] include number of years in school)

Tertiary	<input type="text"/>
Secondary	<input type="text"/>
Primary	<input type="text"/>
None	<input type="text"/>

7. Occupation:

Self employed	<input type="text"/>
Formal	<input type="text"/>
Casual	<input type="text"/>

Other (Specify)

8. Level of education (Spouse)

Tertiary	<input type="text"/>
Secondary	<input type="text"/>
Primary	<input type="text"/>
None	<input type="text"/>

9. Occupation (spouse)

Self employed

Formal

Casual

Other (specify)

10 No of children

Back ground information

11. Did you attend ANC during pregnancy? Yes No

12 Did you receive Postnatal Care Education during Antenatal clinic Yes No

13 Source of information

Nurse

Doctor

Other

Follow up questionnaire.

First visit (48 hours)

1 Age of infant _____

2 Date of first visit

3 Did you attend the 48 hour clinic yes no

4 .If yes ,what postnatal services did you receive(Newborn)

Immunization

Assessment of baby

Management of complication

Others(specify)

Reason for not attending

Not aware

Not important

Busy

Sick

Other (specify) _____

Infant feeding practice

1 How do you feed your child (tick all that apply)

Breastfeed

Infant Formula

Mix feeding

Other (specify)

2 When do you breast feed (name of child)

On demand

3 hourly

Other (specify)

3 Have you ever fed (name of child) with anything else other than breast milk

1 yes

2 No

4 What breastfeeding information did you receive in hospital

Benefits of exclusive breastfeeding

How to position

Risks of infant formula

Breastfeeding difficulties

5 What did you learn from postnatal care education

Neonatal danger signs

6 Do you know of any signs suggesting serious illness in a baby?

Hotness of body

Difficulty Lfast berathing

Yellowness of eyes palms soles

Poor feeding

Lethargy

What do you do when baby is ill

Take to hospital immediately

Try giving medications like paracetamol

Other(specify) _____

Second visit(2 weeks)

1 Age of infant _____

2 Date of second visit _____

3 a)Did you attend the 48 hour postnatal visit

Yes

No

b) Reason for not attending

Not aware

Not important

Busy

Sick

Other (specify) _____

4.If yes ,what postnatal services did you receive(Newborn)

Immunization

Assessment of baby

Management of complication

Others(specify)

Infant feeding practice

5 How do you feed your child(tick all that apply)

Breastfeed

Infant Formula

Mix feeding

Other(specify)

6 When do you breast feed your of child

On demand

3 hourly

Other(specify)

7. Have you ever fed (name of child) with anything else other than breast milk

1 yes

2 No(skip to..)

8 What breastfeeding information did you receive in hospital

Benefits of exclusive breastfeeding

How to position

Risks of infant formula

Breastfeeding difficulties

What did you learn from postnatal care education

Neonatal danger signs

Do you know of any signs suggesting serious illness in a baby?

Hotness of body

Difficulty breast feeding

Yellowness of eyes palms soles

Poor feeding

Lethargy

Other

What do you do when baby is ill

Take to hospital immediately

Try giving medications like paracetamol

Other(specify) _____

Third visit (6 weeks)

1. Age of infant

2. Date of third visit: ___/___/___

3. Did you attend the 2 week postnatal clinic visit Yes No

4. If you ticked 'No' in question 3, please state the reason for not attending

Not aware

Not important

Busy

Sick

Other (Specify)

5. What postnatal services did you receive(Newborn

Immunization

Assessment of baby

Management of complication

Breastfeeding Counselling

Other (Specify)

Infant feeding practice

6. How do you feed your child?

Breastfeed

Infant Formula

Mix feeding

Cow milk

7. When do you breast feed your child?

On demand

Other (Specify)

8. What breastfeeding information did you receive in hospital?

Benefits of exclusive breastfeeding

How to position

Risks of infant formula

Breastfeeding difficulties

Other (specify)

9. Did the breastfeeding education influence your decision on how to feed your child

Yes No Don't know

Neonatal danger signs

10. Do you know of any signs suggesting serious illness in a baby?

Hotness of body

Difficulty in breathing

Yellowness of eyes palms soles

Poor feeding

Generalized body weakness

Other.....

11. What do you do when baby is ill?

Take to hospital immediately

Try giving medications like paracetamol

Other (Specify)

SECTION F: VITAL STATUS OF CHILD AT 6 WEEKS.

12. Date of Discharge

13. Was the child ill during the postnatal period?

14. Hospitalization during postnatal period?

15. Outcome (dead /alive)

Log Calls

Serial no	Mother infant no	Telephone no	Call 1	Call 2	Call 3	Call 4	Call 5	Call 6
1			Date / /					
2								
3								
4								
5								

Calls made by mothers

Serial no	Date	Mother infant no	Telephone no	Randomization Arm T(text) C(Control) P(phone call)	Concerns raised	Recommendations made

Text Arm

Serial no	Mother infant no	Telephone no	Text 1	Text 2	Textl 3	Textl 4	Text 5	Text 6
1			Date / /					
2								
3								
4								
5								

Text messages sent by mothers

Serial no	Date	Mother infant no	Telephone no	Randomization Arm T(text) C(Control) P(phone call)	Concerns raised	Recommendations made

Appendix 3: Ethics Approval