

**IRON AND FOLIC ACID SUPPLEMENTATION AMONG REGNANT
WOMEN: A COMMUNITY-BASED APPROACH IN KIAMBU
COUNTY, KENYA**

BY

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Doctor of Philosophy in Community Health Nursing at the
University of Nairobi**

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DECLARATION

I hereby declare that this thesis is my original work and has not been presented for a degree or any other award in any other institution:

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DEDICATION

I would like to dedicate this work to my mother, Mrs. Esther Njue without whom I would not be alive today; my late father, Mr. Wilson Njue, who desired to take me abroad for further studies before his demise; and my beloved husband, Isaac Kamau, for his great support, encouragement and advice throughout my academic journey. God richly bless you.

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LIST OF ACRONYMS AND ABBREVIATIONS:

ANC: Antenatal Clinic

CBA: Community-based Approach

CHV: Community Health Volunteer

DID: Difference–In-Difference

FGD: Focus Group Discussion

Hb: Haemoglobin

HCP: Health Care Provider

IDA: Iron Deficiency Anaemia

IDI: In - Depth Interviews

IEC: Information, Education and Communication

IFAS: Iron and Folic Acid Supplementation

KDHS: Kenya Demographic Health Survey

KII: Key Indepth Interviews

MCH: Maternal and Child Health Clinic

MUAC: Mid Upper Arm Circumference

SPSS: Statistical Package for Social Sciences

SDGs: Sustainable Development Goals

OPERATIONAL DEFINITIONS

Adherence: The act of faithfully taking iron and folic acid supplements according to the recommended dose and timings.

Anaemia: A condition where the haemoglobin (Hb) level in the body is less than 11g/dl which depicts decreased oxygen-carrying capacity.

Antenatal Care Clinic (ANC): A section in the facility where a pregnant woman receives pre-natal services which include regular checkups, nutritional supplements (IFAS), dewormers and medical and nutritional information throughout pregnancy.

Community: A group of people living in a certain geographical area and working together for a common goal. They share the same resources such as water, climatic and geographic conditions, health services, administration and leadership, as well as disadvantages such as shortages, risks and dangers.

Community-based Approach: Strategy whereby one goes to the people where they live to provide a service or product.

Community Health Volunteer (CHV): Resident individuals of a particular area who volunteer and are selected by their communities for training on how to deal with community health problems and treat common diseases. They voluntarily offer health related services at the community level.

Compliance: Adhering firmly and devotedly to taking of iron and folic acid supplements as per recommendations.

In this study, the IFAS compliance status was defined as the number of IFAS tablets taken by pregnant women in the preceding 7 days (1 week). Respondents who took at least 70% of the expected dose, an equivalent of five (5) tablets per week, were considered as compliant with IFAS while those who took less than five IFAS tablets were considered as non-compliant.

Fixed Health Facility Approach – Standard practice whereby antenatal women receive IFAS from the health facility when they attend antenatal clinics using the standard protocols.

Health Care Providers (HCP): Any professionally trained medical person in a medical training institution who is currently offering health services in a health institution.

Iron and Folic Acid (IFA) tablet: A supplement which contains 60mg Iron (ferrous fumarate), which is equivalent to 200mg ferrous Sulphate, and 400µg (0.4 mg) folic acid combined into one.

Iron and Folic Acid Supplementation (IFAS): Provision of IFAS education and tablets to all pregnant women.

Iron Deficiency Anaemia (IDA): A condition in which blood lacks adequate healthy red blood cells due to lack of iron necessary for formation of haemoglobin.

Knowledge: Awareness of a particular situation or fact acquired through education or experience; a state of having been informed or made aware of something. In this study, the term “knowledge” means facts and information that pregnant women have acquired about IFAS. It was classified as either high or low depending on their knowledge score, using the average as the cut-off point.

Nutritional Status: The assessment of the state of nourishment of a client.

Obstetric Outcome: End result of a pregnancy that applies to both state of mother and neonate.

- **Maternal Outcome:** the physical examination findings on condition of the mother immediately after delivery to include haemoglobin level and any obstetric complications experienced.
- **Neonatal Outcome:** the neonatal physical examination findings to include survival status (living/dead), birth weight, and any congenital anomalies noted.

Peri-conceptual: Period before conception to early pregnancy up to first trimester.

Pregnancy: Gestation or state of a woman having a baby/foetus developing in her womb which normally takes an average period of 40 weeks from the last menstrual period.

ABSTRACT

Background: Iron and folic acid are micronutrients whose deficiency is common during pregnancy resulting in anaemia. Iron and Folic Acid Supplementation (IFAS), an essential intervention strategy for prevention of anaemia during pregnancy, is currently provided for free to pregnant women in Kenya during antenatal care (ANC). Despite these efforts, compliance with IFAS remains low over the years and iron-deficiency anaemia remains a public health problem in Kenya affecting 55% pregnant women.

Objective: To implement a community-based approach for iron and folic acid supplementation and education among pregnant women in Kiambu County, Kenya.

Methods: A Pretest-Posttest Quasi-Experimental study design was used, consisting of intervention and control group, using mixed methods to collect quantitative and qualitative data, among 364 pregnant women 15-49 years, Health Care Providers (HCPs) and Community Health Volunteers (CHVs) in five health facilities in Lari Sub-County, Kiambu County. The CHVs provided IFAS supplements, education and weekly follow-up to pregnant women in intervention group while control group followed standard practice from health facilities. Baseline and endline data were collected during ANC and compared. Quantitative data was analyzed using STATA version 14. Analysis of effect of intervention was done using Difference-In-Difference regression approach. Thematic analysis was used for qualitative data.

Results: The level of utilization existing IFAS policy documents by HCPs was 55%, most being unavailability at health facilities. The intervention resulted in effect difference in maternal IFAS knowledge of 19.1% with intervention group levels increasing most by 34% (from 57.4% to 91.7%). There was significant ($p < 0.001$) change in the proportion with positive attitude towards

IFAS: the odds of having positive attitude at endline was 9 times that of baseline (OR=9.2:95%CI 3.1, 27.2). Levels of compliance increased by 8% (from 63.8% to 71.4%) in intervention group and 6% (from 68.5% to 74.3%) in control group. However, these differences did not yield statistical significance between the two study groups. There was slight improvement in mean haemoglobin levels in intervention group (from 13.08 to 13.39 g/dl) compared to slight decrease in control group (from 13.89 to 13.15 g/dl).

Qualitative findings elicited three themes namely: perceived benefits, challenges experienced and recommendations regarding Community-based Approach (CBA) of IFAS. The approach was perceived to be beneficial by the participants, with reported perceived increased access and utilization of both IFAS and ANC services. The main challenge experienced was CHVs lack of salary and IFAS stock-outs aggravated by the increased IFAS utilization. The participants recommended complementing antenatal IFAS distribution with CBA of IFAS.

Conclusion: Implementation of CBA of IFAS increased supplement awareness and utilization as well as consumption of iron/folate rich sources of food, leading to reduced anaemia levels and better pregnancy outcomes. The potential of CHVs in IFAS programme is not fully utilized but very promising.

Recommendation: Based on the study findings, there is need to adopt CBA of IFAS to complement antenatal distribution for diversification of IFAS policy implementation in Kenya. Thus, CHVs need formal integration into existing vertical health facility approach in provision of community based IFAS services to augment IFAS delivery to pregnant women to improve the low compliance levels.

CHAPTER ONE: INTRODUCTION

1.1 Background

Iron and folic acid are micronutrients that are essential for normal physiological function, for growth and development as well as maintenance of life. Their deficiency causes characteristic biochemical or physical changes especially anaemia and its consequences (World Health Organization, 2017). Micronutrient deficiencies, including iron and folic acid, are prevalent in Kenya, especially at critical stages of the life cycle like pregnancy when the nutritional requirement for specific minerals and vitamins are increased (Ministry of Health, 2011a). Micronutrient deficiencies have been found even among population groups with enough food to meet the recommended daily allowances for energy requirements (Ministry of Health, 2011b). Deficiencies of iron and folate are particularly common during pregnancy, due to their increased maternal and foetal requirements for both the pregnant woman and the developing foetus. These deficiencies can have negative impacts on the health of the mothers and their children, before and during pregnancy and after birth (Ministry of Health, 2012a; WHO, 2013).

Iron deficiency is the most common form of micronutrient problem and the most prevalent nutritional deficiency causing significant global morbidity and mortality (Aamer & Zulfiqar, 2012; Ministry of Health, 2013c). The deficiency of iron results in imbalance between demand and supply which causes iron deficiency anaemia. Globally, over two billion people, constituting one third of the world's population, suffer from anaemia, half of which is due to iron deficiency (Ministry of Health, 2013b). This is the only nutrient deficiency found to be significantly prevalent in both developed and developing countries (World Health Organization, 2014). Iron deficiency anaemia is the 15th most important risk factor contributing to total global mortality, and the 13th to the global burden of disease (USAID, 2014). The most affected groups are: first children and

teenagers, due to their high requirements during the growth and development process and second women of reproductive age, 15-49 years, as a result of loss of iron from menstruation or high iron needs for both the foetus and mother the during pregnancy. Sadly, this increased iron need is not regularly met by diet. This is because of insufficient amount and/or low bioavailability of iron, particularly in developing countries that have insufficient intake of bioavailable dietary iron compared to the increased iron demands in pregnancy (Milman, 2012; Pasricha et al, 2013). Consequently, as earlier indicated in 2000, up to 90% of maternal anaemia develops due to the aforesaid phenomenon (Elder, 2000). Therefore, supplementation with iron and folic acid during pregnancy is a key intervention strategy to overcome the aforesaid challenge.

The global prevalence of pregnancy-related anaemia spans from 41.8 to 43.8% translating to approximately 59 million pregnant women (Mulambah et al, 2014). Among the women with anaemia, 90% reside in Africa or Asia (World Health Organization, 2012a). Whereas, Africa has the highest prevalence of anaemia in both pregnant and non-pregnant women, Asia has the largest absolute number of women with anaemia, accounting for 38% of the global total (USAID, 2014). The deficiency is mostly prevalent among pregnant women and younger children. This puts them more at risk of life-long consequences (World Health Organization, 2017). In addition, iron deficiency anaemia affects more than 40% of women of reproductive age in the developing world (Aamer & Zulfiqar, 2012).

Iron Deficiency Anaemia (IDA) remains a public health problem in Kenya with high prevalence of 55.1% among pregnant women and 46.4% among non-pregnant women (Ministry of Health, 2013a; Mulambah et al, 2014). Indeed, IDA accounts for more than half of all anaemia cases in pregnancy (Mithra et al, 2014). It is also estimated to cause one-tenth of maternal mortality in addition to one-fifth of perinatal mortality (MoH, 2012a). Furthermore, it results in an increased

risk of premature delivery, low birth weight (Mohajan, 2014) and fetal growth retardation as well as reduced immunocompetence of both mother and baby. Both Iron and folic acid play a vital role in maintaining healthy red blood cells that carry oxygen throughout the body. A deficiency of either iron or folic acid can cause anaemia hence the need to address and control these deficiencies through interventional strategies.

During pregnancy, there is an increased requirement for nutrients, especially iron and folic acid. Most women in developing countries begin their pregnancy with already exhausted body stores of iron and folic acid, creating a higher extra requirement for these nutrients than usual. This implies that any slight change in haemoglobin levels during pregnancy can result in severe and every so often fatal consequences if not managed early enough (Mulambah et al, 2014).

Iron and Folic Acid Supplementation (IFAS) for pregnant women has been shown to reduce both maternal and child morbidity and mortality (Ministry of Health, 2012a). Moreover, folic acid if taken before conception and consistently during the early months of pregnancy is key in preventing birth deformities of the neural-tube (Ministry of Health, 2012a; World Health Organization, 2013). Some of the notable benefits of IFAS in improving maternal and child health are: better pregnancy outcome of mother and child by reducing maternal deaths and low birth weight; protecting both the mother and infant against anaemia by increasing serum ferritin and haemoglobin levels during pregnancy, improving the status of maternal iron in the puerperium period, (including among women who start pregnancy with sufficient body stores of iron) thus improving the iron status of infants postpartum. In addition, it improves cognitive development in young child children (World Health Organization, 2013).

In 2010, the Ministry of Health, Kenya, adopted IFAS as one of the high impact interventions in nutrition to control micronutrient deficiency (Ministry of Health, 2013c) and specifically to address anaemia during pregnancy. An enteric coated combined formulation (60mg iron and 400µg folic acid) replaced the high dose (200mg) iron supplement in 2012 which was associated with more side effects, and to help reduce the pill burden. Iron and folic acid supplements are currently offered nationally free of charge by the government in all public health facilities, in form of one combined tablet per day, rather than separate tablets. The ministry also developed various information, education and communication (IEC) materials on IFAS in an effort to improve the IFAS compliance and coverage (Ministry of Health, 2011b; 2013a). Despite routine iron supplementation being almost universally recommended to prevent and control maternal anaemia during pregnancy, more so in developing countries, the prevalence of anaemia during pregnancy has remained unacceptably high worldwide (Adanikin et al, 2015). One main problem encountered with iron supplementation during pregnancy is compliance (Peña-Rosas et al, 2012) as it requires daily administration.

Experiences in several countries have proved that community-based systems of IFA distribution can reach more women and achieve higher rates of behavior change than antenatal distribution alone. In a 1994 study in the Gambia where iron supplementation was distributed by traditional birth attendants (TBAs), the results showed reduced anaemia and iron deficiency rates and an increase in average birth weight (Maternal and Child Health Integrated Program, 2014). In a 2000 study in Indonesia, community-based services as well as sources of supplements were expanded by expanding local, community-based providers of iron and folate supplements and anaemia counseling and education services and to pregnant women. This led to better utilization and higher compliance as well as net increase in haemoglobin levels among pregnant women receiving their

supplements and information on a weekly basis from trained TBAs compared to the control group receiving regular services from health facilities (Elder, 2000). In Thailand, utilizing a preventive approach by health service providers particularly village health volunteers to encourage antenatal care schedule adherence, led to decline in anaemia rates among pregnant women and preschool children (Pattanee, 2002). Therefore, there is need to address the IFAS implementation strategy to strengthen supplementation programme interventions to further increase supplementation coverage and consequently reduce deficiencies of these crucial micronutrients among women and children in Kenya.

1.2 Statement of the Problem

Inspite of the interventions in place to address micronutrient deficiencies like Iron and Folic Acid Supplementation (IFAS), iron-deficiency anaemia among pregnant women remains high (55.1%) in Kenya and is a leading indirect cause of the high maternal and child deaths in Kenya (Ministry of Health, 2012a) . The Kenya national IFAS coverage target is set at 80% (Ministry of Health, 2013c). Regardless of free provision of IFA supplements nationally, the compliance is far below the target. Whereas the benefits of this high impact intervention are well known, the uptake is low in Kenya with 30% of the pregnant women reportedly not taking any iron/folate supplements at all during pregnancy, 53% of the pregnant women taking for less than 60 days, 5% taking for 60-89 days and only 8% taking for 90 or more days (Kenya National Bureau of Statistics & Macro ICF, 2015). A study among pregnant women attending antenatal care at Thika Hospital, a level five (secondary level) hospital in Kiambu county, found that the IFAS adherence rate (defined as use of supplements for ≥ 4 days in a week) was 24.5% (Dinga, 2013). The supplementation was found to be 18% in a rural set-up in the neighbouring Machakos County (Juma et al, 2015) and

lately 67% in urban Nairobi County with only 7% initiating IFAS use before 12 weeks of gestation (Okube et al, 2016). With these repeatedly low percentages of IFAS coverage, this calls for a change in strategy to increase the IFAS uptake and compliance by pregnant women.

Currently, IFAS is predominantly provided at health facilities during the antenatal care visits as part of Focused Antenatal Care (FANC). Antenatal distribution of IFAS is useful but often inadequate, creating need to explore other delivery mechanisms and pathways for example community networks, structures and systems. This strategy alone may not adequately address IFAS compliance challenges due to inadequate knowledge and counseling skills among health care providers, inadequate health facilities, and minimal contact time with each client due to heavy workload as well as unreliable supply of IFAS. Inadequate engagement of Community Health Volunteers (CHVs) in IFAS interventions may be associated with poor access to services, more so, in the hard to reach areas (Ministry of Health, 2013b). Experience shows lack of effective implementation mechanisms of interventions as a major obstacle in control of IDA. Since effectiveness and success of IFAS is highly dependent on the maternal compliance with the IFAS tablets as earlier research indicated (Smitasiri & Solon, 2005), integrated approach has been recommended since then (Bhutta et al, 2005) in coordination with other nutrition and primary health care programs as well as operation research. In this regard, a community-based approach may be a promising strategy as revealed by the findings of its implementation and testing in this study.

1.3 Justification

Iron and folic acid supplementation has been proven as an affordable intervention with potential to reduce maternal morbidity and mortality due to anaemia in Kenya. Policies and guidelines have

been developed by the Ministry of Health and iron folic acid supplements are already in the list of essential drugs making it essential to strengthen demand and supply systems for the successful implementation of this programme. This study was necessary to scale up the use of combined distribution approaches to increase IFAS compliance and coverage among pregnant women and also to generate evidence on the need for combined distribution approaches of IFAS.

This study aimed at introducing modalities of IFAS distribution to complement the existing health facility method of distributing IFAS in order to increase its utilization by pregnant women in communities in Kenya. The community-based strategy is expected to ensure consistent access of the IFAS supplements and information through counselling with the aim of increasing coverage and compliance with IFAS. Through this strategy, communication strategies were enhanced in order to expand IFAS coverage and help pregnant women to understand the importance of taking the supplements and to address any fears or misconceptions associated with supplementation. The sustainability of intervention programs highly depends on the involvement of the community.

The findings of this study are likely to change the practice of IFAS distribution in Kenya, by integrating Community Health Volunteers (CHVs) and involving them more actively in IFAS distribution. The community-based strategy could guarantee consistent access to supplements provided together with minimum, consistent, clear and easily understandable information and counselling that eventually increase coverage and compliance with IFAS. Evidence reveal that community-based approach of IFAS can reach more women, achieve higher compliance rates and reduce prevalence of anaemia than antenatal distribution alone. Despite being attached to public health facilities in Kenya, CHVs have not been actively involved in distribution of IFAS. The CHVs were thus integrated in IFAS distribution and actively involved in this study to reach out to

pregnant women through home visits to provide IFA supplements and closely follow them up to address all their questions, challenges and concerns raised.

To date, there is no published study in Kenya focusing on the feasibility of utilizing CHVs in distribution of IFAS in combination with the fixed health facility strategy. This study therefore utilized CHVs to deliver IFA supplements and education to pregnant women in the community with the aim of improving access, availability and utilization of IFAS. The study has generated information on the experiences of CHVs which can be used develop policies to diversify implementation of IFAS among pregnant women in Kenya. This study has also generated evidence on the usability of community-based approach of IFAS and the need for utilization of both community and health facility approach to distribute IFAS.

1.4 Research Questions

This study sought to answer the following research questions:

1. Do health care providers in antenatal clinics in Kiambu County, apply existing policy guidelines on Iron and Folic Acid Supplementation (IFAS)?
2. How does community based IFAS education affect the knowledge, attitude and practice of IFAS among the pregnant women?
3. How does community-based iron and folic acid supplementation affect compliance with IFAS among the pregnant women?
4. What is the nutritional status (dietary, anthropometry, haemoglobin and folate status) of the pregnant women, before and after intervention of a community-based approach of IFAS?
5. What are the experiences of health care providers, community health workers and pregnant women involved in the community-based approach of IFAS?

1.5 Objectives

1.5.1 Broad Objective:

To determine the effect of a community-based approach of iron and folic acid supplementation and education among pregnant women in Kiambu County, Kenya

1.5.2 Specific Objectives

1. To establish the level of utilization of existing IFAS policy guidelines by health care providers in antenatal clinics in Kiambu County
2. To determine the effect of community-based IFAS education on the knowledge and attitude of IFAS among the pregnant women
3. To determine the effect of community-based approach of IFAS on the level of compliance with IFAS among the pregnant women
4. To determine the nutritional status (dietary, anthropometry, haemoglobin and folate levels) of the pregnant women, before and after intervention of a community-based approach of IFAS?
5. To describe the experiences of health care providers, community health workers and pregnant women of participating in the community-based approach of IFAS

1.6 Hypotheses

Null hypotheses (Before study)

1. Community-based approach of IFAS distribution and education does not improve the level of IFAS knowledge among pregnant women compared to the fixed health facility-based approach
2. Community-based approach of IFAS distribution does not improve the level of compliance with IFAS among pregnant women compared to the fixed health facility-based approach

Alternative hypotheses (Before study)

1. Community-based approach of IFAS distribution and education improves the level of IFAS knowledge among pregnant women compared to the fixed health facility-based approach
2. Community-based approach of IFAS distribution improves the level of compliance with IFAS among pregnant women compared to the fixed health facility-based approach

After the study, the above null hypotheses were accepted based on lack of statistical significance, although practically there was improvement in both IFAS knowledge and compliance.

1.7 Study Variables

Independent Variables: Socio-demographic characteristic to include age, education level, occupation, marital status, average income, parity, religion and gravidity; availability/access to IFAS supplements; side-effects; and challenges experienced while taking IFAS.

Dependent Variables: Knowledge on IFAS, attitude towards IFAS and compliance with IFAS among pregnant women

Intervening Variables: Utilization of IFAS policy documents; source of IFAS information; training of HCPs, CHVs and pregnant women on IFAS provision, counselling, referrals and follow-up; and training of the pregnant women on IFAS.

Intervention: Community-based IFAS distribution/education and follow-up of pregnant women by CHVs

Outcome Variable: Uptake and utilization of IFAS among pregnant women; nutritional statuses

Secondary outcome variable: Obstetric Outcome of both Mother and Neonate

1.8 Conceptual Framework

Figure 1 below illustrates the conceptual framework showing the variables and their relationship; the key components of this study. Compliance to IFAS depends on many factors, access to the supplements being one of the main factors. The delivery of IFAS will be done by community health workers in the community after training to enhance access and availability.

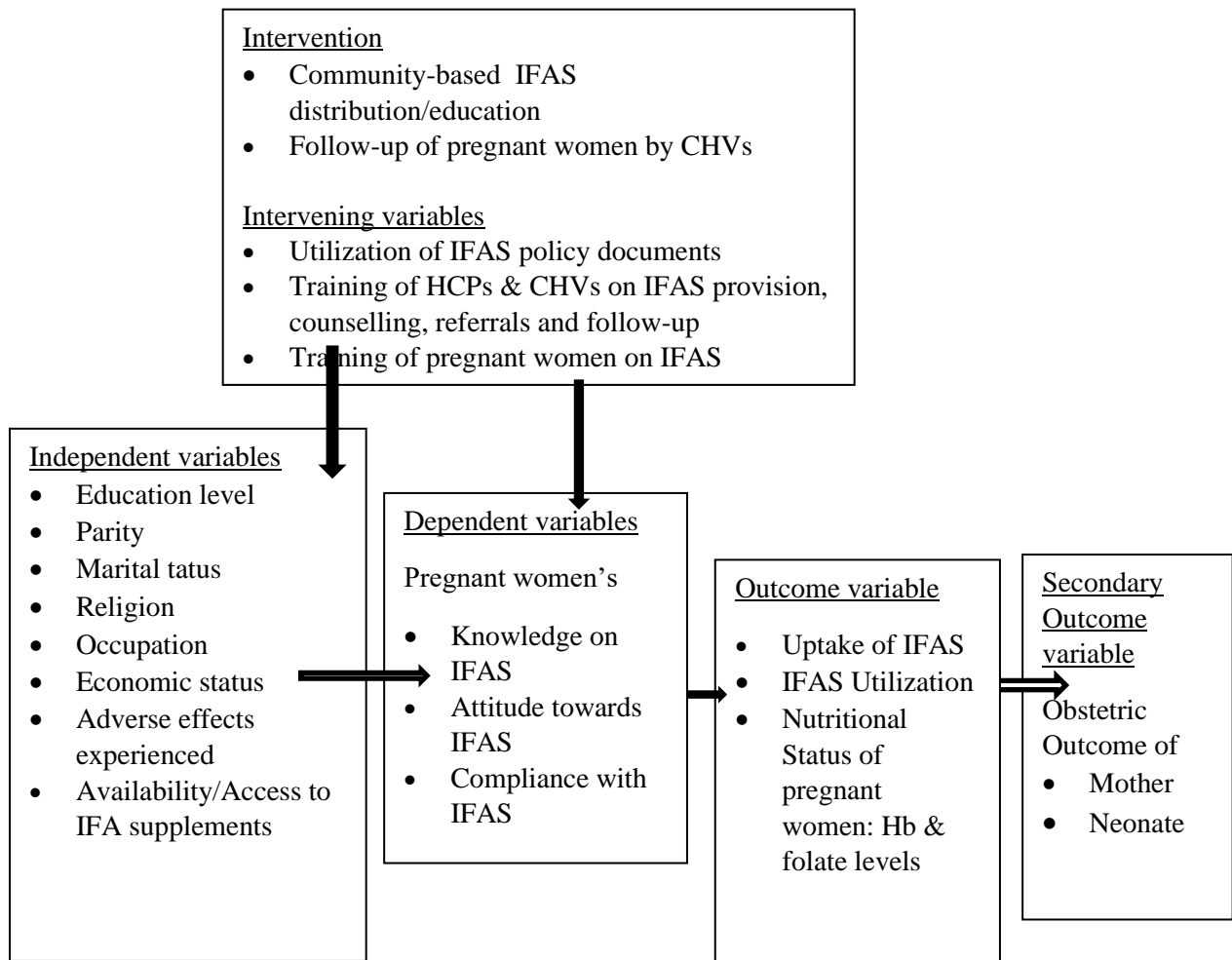


Figure 1: Conceptual framework

CHAPTER TWO: LITERATURE REVIEW

2.1 Iron and Folic Acid as Micronutrients

Iron and folic acid are micronutrients that are very essential for normal physiological function of the body, for growth and development as well as maintenance of life. They help maintain healthy red blood cells to enable them to effectively transport oxygen throughout the body. Their deficiency causes characteristic biochemical or physical changes resulting in anaemia (World Health Organization, 2017) which can have a negative impact on the health of the mothers and their children, before, during pregnancy and after birth (Ministry of Health, 2012a; World Health Organization, 2013). The need to further control these deficiencies and avert the poor birth outcomes led to this study whereby, a community-based approach was utilized for iron and folic acid supplementation (IFAS). There is need to diversify approach in IFAS delivery in Kenya since the compliance remains low (KNBS & ICF International, 2014).

Research has shown that iron deficiency is the most common form of micronutrient malnutrition and the most prevalent nutritional deficiency causing significant morbidity and mortality globally (Aamer & Zulfiqar, 2012; Bilimale & Anjum, 2010; Ministry of Health, 2013a). Globally, one third of the world's population which totals to over two billion people (Ministry of Health, 2013b; Ministry of Public Health and Sanitation, 2008), suffer from anaemia, half of which results from iron deficiency followed by folate deficiency (Mulambah et al, 2014) especially in pregnancy. Iron deficiency happens to be the only nutrient deficiency which is also highly prevalent in high income countries (World Health Organization, 2014). The deficiency is especially prevalent among young children and pregnant women, making them at greater risks of life-threatening life-long consequences culminating in death. Even mild and moderate anaemia increases the risk of mortality in pregnancy (Sanghvi et al, 2010). The greatest percentage of maternal anaemia is due

inadequate intake of bioavailable dietary iron compared to increased iron demands especially in developing countries, Kenya included (Milman, 2012; Pasricha et al, 2013). Therefore, iron and folic acid supplementation during pregnancy is a key intervention strategy.

2.2 Prevalence of Anaemia in Pregnancy

Anaemia during pregnancy is one of the most significant factors contributing to the burden of disease globally (Mulambah et al, 2014). Approximately 59 million pregnant women are anaemic with the global prevalence of anaemia during pregnancy ranging from 41.8% to 43.8% (Mulambah et al, 2014) being highest at 61.3% in Africa and 52.5% in South East Asia (Bilimale & Anjum, 2010). In developing countries, every second pregnant woman is estimated to be anaemic (World Health Organization, 2014). Anaemia affects over 80% of women in many African countries (Waweru et al, 2009) as well as India (Singh et al, 2008) while it is the second highest cause of maternal mortality in Asia (Singh et al, 2008). The most common cause of anaemia globally is iron deficiency anaemia, accounting for more than half of all cases of anaemia in pregnancy (Mithra et al, 2014).

In Kenya, anaemia in pregnancy continues to be a public health problem with 55.1% of the pregnant women being anaemic (Ministry of Health, 2013b), approximately 60% being due to iron deficiency (Ministry of Health, 2011b). Localized studies in Kenya have shown a prevalence of 40% - 53% (Mulambah et al, 2014; Waweru et al, 2009). This prevalence is comparable with results from similar studies in Africa of 32.8% to 48.4% and 34% to 44% in South America (Adam et al, 2014; Mulambah et al, 2014) though higher in rural Uganda at 63.1% (Mbule et al, 2013).

In Kenya, anaemia in pregnancy is estimated to cause 20% and 10% of perinatal mortality and maternal mortality respectively (MoH, 2012a) whereas it is the second highest cause of maternal

mortality in Asia (Sanghvi et al, 2010). In addition, it results in poor pregnancy and birth outcomes including low birth weight and increased risk of premature delivery (Mohajan, 2014) as well as fetal growth retardation and reduced immunocompetence of both mother and baby (Heshmat et al, 2009). Therefore, there is need to develop innovative strategies to combat these high anaemia rates and their negative consequences thus a community-based strategy of IFAS to reach more pregnant women by taking IFAS to them in their homes.

2.3 Iron and Folic Acid Supplementation Programmes

Supplementation involves the provision of high dose preparations of a nutrient in the form of tablets, capsules and oil solutions. The WHO recommends provision of oral iron and folic acid supplementation on a daily basis during antenatal care is to decrease maternal iron deficiency, anaemia and the risk of low birth weight (World Health Organization, 2013). Research has not shown additional benefit between multiple micronutrient supplementation and IFAS alone, even in earlier studies (Bhutta et al, 2009; Christian et al, 2003b; Eneroth et al, 2010; Haider et al, 2011; Kawai et al, 2011; Ramakrishnan et al, 2004; Zeng et al, 2008). However, clinical benefits have been demonstrated among HIV infected pregnant or lactating women not using antiretroviral therapy (Siegfried et al, 2012). Thus, IFAS remains top on the list of mandatory supplements during pregnancy (Ministry of Health, 2012a).

Weekly iron-folic acid supplementation has also been found cost-effective in preventing anaemia among women (Casey et al, 2011) including in earlier studies among adolescents (Jayatissa & Piyasena, 1999; Kanani & Poojara, 2000). Supplementation programmes are recommended in addition to food based approach for prevention of micronutrient deficiency particularly in cases of severe deficiencies (Dairo & Ige, 2009). Some countries like Thailand and Nicaragua, through

their large scale supplementation, have successfully reduced maternal anaemia (Sanghvi et al, 2010). Integration into primary health-care system has been recommended since late 1900s (Charoenlarp et al, 1988) as well as into community-based interventions (Alam et al, 2015; Bhutta et al, 2005).

2.3.1 Benefits of Iron and Folic Acid Supplementation

During pregnancy, there is increased demand for nutrients, particularly iron and folic acid. In developing nations, most women initiate pregnancy with already low stores of iron and folic acid in the body, needing higher than usual extra requirement. Thus, any slight reduction in levels of haemoglobin may result in fatal consequences if not managed early (Mulambah et al, 2014).

Supplementation in this study involved use of one tablet daily which is a combination of iron and folic acid taken throughout pregnancy. Prenatally, IFAS has been shown to reduce maternal and child morbidity and mortality (Ministry of Health, 2012a; Titalley et al, 2010b) by reducing obstetrical complications and improving physical performance as well as pregnancy outcomes (Aamer & Zulfiqar, 2012). Some of the notable benefits of IFAS include: reducing risk of low birth weight (Christian et al, 2003a; Passerini et al, 2012) or preterm delivery (Shah et al, 2014; Zeng et al, 2008); protecting both the mother and infant against anaemia by increasing serum ferritin and haemoglobin levels during pregnancy (Pena-Rosas et al, 2012; Sanghvi et al, 2010), improving the status of maternal iron in the puerperium period, (even among women who start pregnancy with sufficient stores of iron) thus improving the postpartum iron status of infants . In addition, it reduces prenatal and infant mortality (Titalley et al, 2010a; Titalley et al, 2010b) and improves cognitive development in young children (World Health Organization, 2013). Furthermore, folic acid if taken before conception and early pregnancy is key in preventing disorders of the neural-tube (MoH, 2012a).

2.3.2 Combined Iron and Folic Acid Supplementation and Education in Kenya

Daily oral IFAS is one of the high impact interventions in nutrition adopted by the Ministry of Health in 2010 in an effort to control micronutrient deficiency in Kenya (Ministry of Health, 2013c) and specifically address anaemia among pregnant women. It is routinely provided within Focused Antenatal Care [FANC](Ministry of Health, 2012a). Prior to 2012, iron and folate were administered as separate tablets. Since 2012, a combined iron and folic acid (IFA) tablet has been in use. This was informed by the need to lessen the side effects that pregnant women experience as well as the pill burden to make the supplements more acceptable thus increase compliance levels. The national policy guidelines require provision of only one combined IFAS tablet daily throughout pregnancy to all pregnant women during antenatal care (ANC) clinic in all public health facilities. However, due to lack of clarity, some health workers were found to insist on first taking Hb levels among pregnant women to screen for anaemia before providing IFAS tablets (Ministry of Health, 2012a) leading to missed opportunities for IFAS. This calls for education and diversification in the programme intervention strategies. Hence the use of CHVs in this study to take IFAS to the mothers in their homes accompanied with counselling to educate them.

2.3.3 Compliance to Iron and Folic Acid Supplementation and its Associated Factors

Compliance is one of the main factors that affects the effectiveness of the IFAS programme.

Compliance is the degree to which patient's actions correspond to the medical advice provided (Bilimale & Anjum, 2010). Research suggests that compliance (or not) is greatly determined by rational decisions that patients make, after weighing costs versus benefits of medical advice, influenced by their surrounding social and cultural circumstances. Bilimale and Anjum, 2010,

suggests that “more open, cooperative doctor-patient relationships” (Bilimale & Anjum, 2010) are the key to improved compliance.

Compliance with IFAS is generally low. Dairo and Lawoyin showed in mid 2000s that those who need the supplements most, comply the least (Dairo & Lawoyin, 2006). The Kenya Demographic Health Surveys 2003, 2008 and 2014 have consistently reported low compliance levels with less than 8% pregnant women taking supplements for 90 or more days and over 30% not taking at all (KNBS & ICF International, 2014). Thika hospital in Kiambu County reported IFAS adherence rate of 24.5% in 2013 (Dinga, 2013).

Various factors have been associated with IFAS compliance including forgetfulness, birth order, travel, age, perceived side effects, socioeconomic status, cost of the IFA tablets (Mithra et al, 2014), supplements stock-outs (Maina-Gathigi et al, 2013a) as well as lack of clear understanding on importance of IFAS in pregnancy (Gebremedhin et al, 2014; Mithra et al, 2014) due to insufficient counselling . Although Gremedhin and colleagues identified inadequate supply as the foremost barrier to effective supplementation programs (Gebremedhin et al, 2014), others barriers include inadequate IFAS distribution, poor access and utilization of antenatal care services, beliefs against drug use during pregnancy, and fears that too much iron may cause excess blood or big baby, leading to difficulties in delivery. All in all, concern for health of both mother and foetus influence higher compliance with taking IFAS (Pal et al, 2013) as well as improved physical well-being of the mother with the relief of signs and symptoms of anaemia, especially improved appetite and fatigue . In my view, the home set-up is most comfortable for the client. This study emphasized personalized relationship with clients and education with counselling to increase the low compliance.

2.3.4 Policy Guidelines on IFAS and Information, Education and Communication (IEC)

Materials in Kenya

The Ministry of Health, through the Division of Nutrition has developed various IFAS documents and materials for information, communication and education. They include: “National policy guidelines on combined iron and folic acid (IFA) supplementation for pregnant mothers in Kenya; Mothers leaflet – in Kiswahili; National iron and folic acid supplementation communication strategy 2013 – 2017; Iron and folic acid supplementation (IFAS): Dialogue guide for health care providers; Community health workers counselling guide – in Kiswahili; Various IFA posters – Kiswahili for pregnant mother, potential mother then doctor and nurse; Food and Nutrition Security Policy; Kenya Nutrition Bulletin; Accelerating reduction of iron deficiency anaemia among pregnant women in Kenya: Plan of action 2012-2017; National Nutrition Action Plan 2012-2017; Maternal, infant and young child nutrition: National operational guidelines for health workers 2013 – 2017” (Ministry of Health, 2011b; 2013a; MoH, 2012a; b; 2013). This research sought to find out whether these documents are available and in use.

2.4 Community-based Approach for Iron and Folic Acid Supplementation

2.4.1 Community-based Interventions

The term community has diverse meanings in research application. Generally, as defined from early 2000s (Atienza & King, 2002) and in this research, it refers to a geographic area. It could also refer to community-based agencies like schools, churches and values/behaviors that create personal communities of meaning without necessarily following geographic boundaries (Bruce et al, 2002). Owing to little scientific evidence on integration of overall health efforts, more research has been recommended on integrated and effective strategies for delivery of community-based interventions (C.D.I., 2010; Kc et al, 2011; Shah et al, 2011).

Right from older studies as outlined below, community-based interventions generally refer to community as the setting for interventions although it may also refer to community as the target, agent or resource (McLeroy et al, 2003). They are integrated and comprehensive, targeting either a geographic community or a group of individuals but not a single individual (Klassen et al, 2000). By focusing on geographic communities, interventions can be either through or in collaboration with community-based agencies, or attempting to change individual behaviour by reaching them in their local community settings (Bruce et al, 2002) like in this research. Different strategies can be utilized that include education/behavior change, engineering/technology (alter the physical environment), and legislation/enforcement (Klassen et al, 2000). Education/behavior change will be utilized in this research to increase IFAS awareness and utilization.

A prerequisite to successful community-based interventions is community involvement and ownership of the intervention. This requires careful assessment of the processes and structures in a community before an intervention and an insider's understanding of the community. To achieve this, various skills are utilized to engage and responsibly interact with communities and community agencies as evidenced by studies since early 2000s outlined below (Bruce et al, 2002). It can be done through various ways; particularly education in this study; and at various levels ranging from individuals, to families, to social networks, to organizations, and to public policy. Despite all these different levels, the focus is primarily to change individuals' behaviours so as to reduce population's risk of disease (McLeroy et al, 2003). Hence this study will use community agents, specifically CHVs who live among the community members, as a link to the community.

2.4.2 Use of Community Agents in Health Interventions

Community agents refer to the point of contact/intermediary between intervention/health service and clients at community level. They vary depending on the area, but most are volunteers. They are commonly called Community Health Workers (CHWs) although they are described in several terms including peer counsellors, village health workers and community volunteers together with lay health workers, traditional birth attendants (TBAs) (Gill et al, 2011) or community-based midwives (Perry & Zulliger, 2012). Some countries have more than one kind of CHWs (George et al, 2012). Countries call them by different names such as village health worker (Nigeria), family welfare educator (Botswana), community health aide (Jamaica), community health guide (India), community health agent (Ethiopia), Barangay health worker (Philippines), health aide and rural doctor (China). In Kenya, and in this study, they are referred to as Community Health Volunteers (CHVs). Since 1990s, Witmer (1995) broadly defined community health workers as “community members who work almost exclusively in community settings and who serve as connectors between health care consumers and providers to promote health among groups that have traditionally lacked access to adequate care” (Witmer et al, 1995). Although the WHO and Global Health Workforce Alliance now recognize CHWs as an integral part of health care service provision (Perry & Zulliger, 2012) and highly cost-effective (Perry & Zulliger, 2012; Vaughan et al, 2015), most countries have no clear national policies or strategies for establishment of CHWs programmes .

Community health workers usually perform various functions associated with health care delivery especially in developing nations due to shortage of health care providers (Bigirwa, 2009; Kane et al, 2010). As a link, they facilitate access to services and educate providers about community health needs especially for those living in rural and underserved areas (George et al, 2012; Jaskiewicz &

Tulenko, 2012). Their diverse roles are summarized into two distinct but overlapping roles: provision of health services and promotion of health in a community (Perry & Zulliger, 2012). They are trained in some way, though varied in countries (Redick et al, 2014), to deliver health related interventions though most of them do not have tertiary or formal professional education (George et al, 2012; Perry & Zulliger, 2012).

Despite the contribution of CHWs in both preventive and curative services, work environment challenges and weakening characteristics influence their functionality and sustainability (Shakir, 2010). These include: supplies and equipment, supportive supervision, workload, and respect from health and community system, affecting their productivity (Jaskiewicz & Tulenko, 2012). In conclusion, community agents can reach more pregnant women, even in the most inaccessible areas, through home visits and provide intensive and frequent counseling as well as referrals and follow-up. This will in turn improve IFAS compliance as well as ANC services utilization.

2.4.3 Experiences on Community-based Interventions and Community-based IFAS

There are many forms of community-based interventions, the bottom-line is more involvement of community lay persons in intervention implementation than health professionals e.g. Community-Directed Intervention (CDI). This refers to an intervention directed by the community itself at the community level and undertaken in a participatory manner to ensure community ownership throughout the intervention process. It has been tried in numerous countries for various interventions with excellent results (C.D.I., 2010). These include delivery of ivermectin, Vitamin A supplements, tuberculosis directly-observed treatment (DOT), distribution of insecticide-treated nets and home management of malaria (C.D.I., 2010)

Community-based interventions are more feasible and cost-effective if implemented in combination. There are promising benefits of implementing health programmes using lay health workers, in comparison with standard care alone such as: in enhancing uptake of breastfeeding and immunization services; decreasing morbidity and mortality resulting from common childhood illnesses; and improving outcomes in TB treatment (Lewin et al, 2006). Services by CHWs have improved nutritional status, reduced maternal and child mortality, and controlled transmission of HIV, tuberculosis (TB) and malaria (Perry & Zulliger, 2012), and reduced injuries (Klassen et al, 2000).

Community-based interventions have been utilized in different health services with great success. They have significantly improved antenatal and neonatal practice indicators (Gogia & Sachdev, 2010) in addition to reducing maternal/child morbidity and mortality (Lassi et al, 2010; Lewin et al, 2005). Training TBAs in a rural African community that had limited access to healthcare because of their high dispersion, significantly reduced neonatal mortality by up to 50% (Gill et al, 2011) in addition to CHWs utilization reducing adverse perinatal outcomes in meta-analysis of several trials (Gogia & Sachdev, 2010; Wilson et al, 2011). Elsewhere, with proper training and supervision of community-based peer counsellors, there was improvement in exclusive breastfeeding rates as well as initiation and duration, (Das et al, 2016) while significantly decreasing incidences of diarrhoea among infants and increasing lactation amenorrhoea (Haider & Saha, 2016) in addition to improving childhood immunization uptake (Lewin et al, 2005). HIV-trained village women, Ashas, greatly improved ART adherence among the intervention respondents and significantly reduced barriers to ART compared to those in usual care group (Nyamathi et al, 2012). Community-based health promotion education programs have also

improved awareness and management of non-communicable diseases (Centers for Disease Control, 2014; Lu et al, 2015).

In earlier studies, community-based interventions produced mixed results although this could be attributed to current advancement in research processes. An analysis of three community intervention trials in U.S. aiming at evaluating the effectiveness of wide-spread, comprehensive health education on reduction of cardiovascular disease risk in the community did not yield statistical significance (Winkleby et al, 1997). Similarly, despite successful implementation of a community education programme in Minnesota (Blackburn, 1985), there was no significant effect of Minnesota heart health intervention program on morbidity and mortality from coronary heart disease and stroke (Leupker et al, 1996). Mixed findings were also realized for effects of interventions on health practitioners' capacity or planning behaviors in relation to the interventions (Leeman et al, 2015).

Experiences in several countries have proved that community-based systems of IFA distribution can help achieve higher rates of behavior change by reaching more women than antenatal (ANC) distribution can reach alone (Maternal and Child Health Integrated Program, 2014). In Nicaragua, there was a reduction in prevalence of anaemia while IFAS coverage among pregnant women increased to over 80% (Sanghvi et al, 2010). Iron supplementation distributed by TBAs in Gambia led to reduced iron deficiency and anaemia and consequently increased the average birth weight whereas in Indonesia, compliance and haemoglobin rise was higher among the TBA-served group (Elder, 2000). In Thailand, utilization of village health volunteers led to decline in anaemia rates among pregnant women and preschool children (Pattanee, 2002). In Nepal, there was a drastic reduction in anaemia in pregnant women from 78% in 1998 to 42% in 2006 (Sanghvi et al, 2010). There have myths that community distribution of IFAS would discourage pregnant women from

attending antenatal care at health facilities. However, these myths were dismissed by the contrary evidence of the studies above whereby community volunteers instead contributed to increasing antenatal care attendance (Maternal and Child Health Integrated Program, 2014). The importance of antenatal IFAS distribution has been demonstrated and various strategies put in place to improve IFAS uptake including: strengthening counselling sessions during ANC, increasing community awareness, access and coverage of health services as well as community participation in health. Despite these efforts, the expected benefits have not been fully achieved and more still needs to be done to improve IFAS uptake, to increase infant survival (Titaley, 2014).

Experiences in the developing countries indicate that most often, those who need the supplements most, especially the poorest women with most deficient intakes, tend to be the least likely to receive these supplements during pregnancy. On the contrary, those individuals who take dietary supplements might be the most unlikely to need them (Knudsen et al, 2007). The experience of MICronutrients And Health (MICAH) program in Ghana and Malawi indicates that community-based administration of anaemia control interventions is critical to their success (World Vision, 2006). In developing countries, factors contributing to low compliance with IFAS during pregnancy include poor awareness about IFAS in relation to anaemia, together with insufficient medical delivery systems (Bilimale & Anjum, 2010). Thus best outcomes have been seen when the supplementation is coupled with community-based health interventions (Harrison, 2010).

Conclusively, antenatal distribution of IFAS is useful but often inadequate creating need to explore other delivery channels like community systems. There is need to expand communication efforts in order to improve understanding of the importance of IFAS. This will also help to address any misconceptions, wrong perceptions or fears relating to IFAS. The sustainability of intervention programs highly depends on the involvement of the community. Therefore, there is need to address

the IFAS implementation strategy to strengthen supplementation programme interventions to further increase supplementation coverage, and consequently reduce deficiencies of these crucial micronutrients among women and children. In this regard, a community-based approach may be a promising strategy because it immediately increases access to the supplements by pregnant women.

2.5 Knowledge, Attitude and Practice of IFAS by Health Workers and Pregnant Women

Various socio-demographic factors influence the use or non-use of antenatal IFAS services including individual socio-cultural circumstances. Research shows that there is a relationship between less frequent use of supplements during pregnancy and obstetric and other socio-demographic factors which further reflects failure of primary health care providers to enhance maternal health, social inequity and maternal attitudes towards pregnancy (Nuno et al, 2008). Several socio-demographic factors have considerably been associated with low prenatal utilization of IFAS. These include: advanced maternal age, maternal literacy, wealth index, spouse literacy, provision of prenatal knowledge of anaemia as well as counselling information about IFAS (Gebremedhin et al, 2014; Nisar et al, 2014a). Three fundamental factors that are significant to this study have been discussed here:

2.5.1 Inadequate Counselling, Awareness and Limited Knowledge on IFAS

Inadequate counseling, associated with poor counselling skills of health providers is a key barrier to effective supplementation. Provision of counselling information and education on importance of IFAS in pregnancy leads to better utilization of IFAS (Gebremedhin et al, 2014; Pal et al, 2013) in relation to lengthier duration (Yekta et al, 2008) and higher adherence (Maina-Gathigi et al,

2013a), eventually leading to more adequate supplementation (Aguayo et al, 2005). A study in Thika, Kenya showed that only about half of the respondents (45 to 58%) were provided with any information or counselling about IFAS (Maina-Gathigi et al, 2013a; Yekta et al, 2008) while in Iran, respondents knowledge on anaemia was noticeably low (Yekta et al, 2008). A while ago, by accompanying supplementation with communication among Tanzanian adolescents, the prevalence of anaemia decreased while compliance greatly improved among them (Muro et al, 1999). In Kenya, limited knowledge and/or lack of information has been reported in various aspects of IFAS education and counselling, among health workers. This has been an obstacle that has adversely affected utilization of IFAS (Ministry of Health, 2013b). Therefore, proper counselling significantly determines adherence to daily IFAS throughout pregnancy. It was emphasized in this study by weekly follow-up of participant by CHVs who empowered them through continuous education and counselling. The CHVs were also empowered beforehand through training and provision with necessary counselling aids.

2.5.2 Late start of antenatal care by pregnant women

In Kenya, IFAS is currently provided during antenatal care clinic (ANC) visits only, through focused ANC (FANC) services. Challenges have been realized with the health care providers' capability to provide the FANC range of services including limited knowledge on critical aspects like routine services expected for FANC such as timing of visits (Ministry of Health, 2012a). Adequacy of antenatal care is a major determinant of IFAS utilization during pregnancy (Lunet et al, 2008). Studies have reported that problematic access and failure/poor utilization of antenatal care services has been highly associated with low utilization of antenatal IFAS (Maina-Gathigi et al, 2013a; Nisar et al, 2014a). These findings highlight the urgent need to improve the implementation strategies that will target all pregnant women to improve IFAS coverage and

increase the use of antenatal IFAS supplements like the community-based approach of IFAS practiced in this study.

2.5.3 Side Effects of IFAS Experienced and their Management

Studies have shown side effects to daily IFAS are a major reason for low compliance, lack of utilization and an obstacle to adequate impact of supplementation (Bilimale & Anjum, 2010; Gebremedhin et al, 2014; Taye et al, 2015; Zavaleta et al, 2014). These include effects on gastrointestinal tract such as epigastric pain, nausea, vomiting, diarrhea, constipation or gastritis. Faeces may also turn black due to unabsorbed iron which is not harmful and IFAS should continue (Ministry of Health, 2013b; c). During administration of IFAS, clients should be counselled on possible side effects of the supplements and their management. Many health workers do not even remember to inform clients that they may experience any side effects so clients are ill-prepared leading to non-compliance with any slight discomfort (Ministry of Health, 2013b). Alternatively, counselling improves compliance (Chakma et al, 2013). To avert side effects, they should be advised to: take IFAS together with meals or at bed time, eat plenty of vegetables and fruits, and avoid taking high doses of Vitamin C supplements together with IFAS because of their counter-action. A former study in late 1900s indicated that the severity and frequency of occurrence of side effects increases with the amount/dose of iron administered (Charoenlarp et al, 1988), although this variation was not observed when the dose was less than 100mg. Consequently, MoH, Kenya, reduced the amount of iron per tablet from 200mg to 60 mg and combined it with folic acid into one tablet to reduce both side effects and pill burden thus enhance IFAS utilization.

2.6 Nutritional Status and Iron and Folic Acid Supplementation

During pregnancy, the demand for nutrients, particularly blood-forming iron and folic acid, is increased. Most women in low income countries begin pregnancy with already lower than normal stores of these nutrients in the body, making their extra requirement higher. This implies that any small decrease in their haemoglobin levels needs to be addressed immediately otherwise delays in management might lead to fatal consequences (Mulambah et al, 2014). Moreover, the nutritional status of a woman at the time of conception and during pregnancy significantly determines both the maternal and infant outcomes (Gunaratna et al, 2015). Therefore, this study would have been incomplete if the nutritional status of these women was not determined since IFAS complements diet.

2.6.1 Dietary Status

Diet forms the foundation in prevention of micronutrient deficiency (Dairo & Ige, 2009). It is important to assess pregnant women's dietary habits for targeted counselling (Arkkola et al, 2006). Food choices are positively associated with age and education (Arkkola et al, 2006). Unhealthy food choices were common among pregnant women of lower socio-economic status who rarely consumed fruits but rather consumed diets more frequently of plant origin (Chakma et al, 2013; Waweru et al, 2009) unlike those of higher socio-economic status who made healthy food choices (Alwan et al, 2011; Arkkola et al, 2006), just like high IFAS compliers (Knudsen et al, 2007). Low consumption of vegetables and meat of less than once a day and less than once a week respectively, was found common in Ethiopia and was associated with increased anaemia (Haidar & Pobocik, 2009). However, lower than recommended dietary iron intake has been reported among majority of pregnant women even in developed countries like UK (Alwan et al, 2011) just like in India (Samuel et al, 2013).

Apart from dietary intake, bioavailability of both iron and folate is influenced by various factors, which most women are never informed about during counselling. Food handling practices can either enhance or inhibit their availability. Iron inhibitors include: drinking coffee, tea, and chocolates with food or immediately after food. These beverages have tannin that binds iron. Excess intake of copper, zinc, lead and phosphates reduce iron absorption. On the other hand, the following practices enhance availability of iron and should be encouraged: mixing sources of foods with other sources that are rich in Vitamin C (ascorbic acid); serving of haeme and non-haeme sources of iron; fermentation, sprouting, malting and germination of cereals. The presence of high quality protein, vitamin A, E and B complex, copper, calcium, manganese, molybdenum and Zinc also enhance iron absorption. Various cooking methods that increase amount of iron available include: proper cooking of legumes and cereals to decrease the phytic effect; for vegetables the presence of Vitamin C reduces the effect of oxalates and malic acid; cooking eggs softly, makes more iron available for use (Ministry of Public Health and Sanitation, 2008; Pasricha et al, 2013).

Similarly, bio-availability of folate is variable among food (30-80%) compared to folic acid (Ministry of Public Health and Sanitation, 2008). Folates from plant sources are less well utilized than that from animal sources. Folate's bioavailability in individual foods varies from as high as 96% in cooked lima beans to as low as 25% in lettuce (USAID, 2003). Folate can be considerably lost during food production processes of cooking as well as harvesting, storage, and distribution. Similarly, folate of animal origin can be lost during cooking (FAO, 2001). Foods which contain conjugate inhibitors such as cabbage, yeast and oranges inhibit folate availability. Deficiency of both iron and vitamin C impairs folate utilization (Ministry of Public Health and Sanitation, 2008).

2.6.1.1 Food Sources of Iron and Body Requirements in Pregnancy

It is very vital to counsel pregnant women to fully understand the food sources of iron to enable them to make healthy food choices. It has been found that low dietary iron intake results from low consumption of iron-rich foods and is a fundamental predisposing factor to iron deficiency anaemia (Aikawa et al, 2006). Iron sources are categorized into either animal sources (haeme-iron) or plant sources (Non-haeme sources). Animal sources are readily bioavailable. These include red meat (especially liver and kidneys), fish, poultry and egg yolk. Nevertheless, plant sources are not readily bio-available because iron absorption is inhibited by the malic acid, oxalates and phytates, which these plant sources contain (Ministry of Health, 2012b; Ministry of Public Health and Sanitation, 2008). These include whole cereals such as millet, sorghum, wheat, maize and oats; legumes such as cowpeas, kidney beans, peas and soybeans; nuts; dried fruits; molasses and dark green vegetables such as blacknight shade, spinach, amaranth, stinging nettle and kale.

During pregnancy, there is increased iron demand at different stages of pregnancy of around 700-850mg in total of absorbed iron making the iron needs very high (Waweru et al, 2009). These demands are 3-5 times the iron requirements of non-pregnant women and hardly met by diet alone, even if fortified, especially in developing countries where normal diets are usually low in bioavailable iron (Zavaleta et al, 2000). Hence the need for supplementation in addition to the best food choices that accommodate iron-rich foods.

2.6.1.2 Food Sources of Folate and Body Requirements in Pregnancy

Counselling pregnant women on folate-rich foods is similarly very essential to anaemia control, folate deficiency being the second major cause of anaemia in pregnancy (Mulambah et al, 2014). All foods of plant and animal origin contain folate, including green leafy vegetables, liver, fish, legumes, and fruits like avocado, sunflower seeds, egg yolk, pulses and yeast. The richest sources

include brewer's yeast, spinach, kidney beans, fish, groundnuts, kidney and liver (Ministry of Public Health and Sanitation, 2008). Other sources include corn, green peas, oranges, grapefruit, pineapples, banana and sweet melon (Ministry of Health, 2012b). Bio-availability of folate (naturally occurring) is variable among food (30% - 80%) compared to folic acid (synthetic) (Ministry of Public Health and Sanitation, 2008). Folates from plant sources are less well utilized than from animal sources.

The requirements for folic acid are similarly increased in pregnancy due to the rapidly dividing cells in the foetus and higher losses in urine (World Health Organization, 2012a). Folic acid supplements are particularly essential in the peri-conceptual period, that is, before and one month after conception to specifically prevent neural tube defects (World Health Organization, 2013). Therefore folate-rich food choices should be promoted among pregnant women in all forums even before conception.

2.6.1.3 Symptoms of Anaemia (in Pregnancy)

Anaemia during pregnancy often has no symptoms in its early stages and may go un-noticed clinically, though not devoid of severe outcomes. As the haemoglobin level decreases, the supply of oxygen to vital organs goes down. At this juncture, pregnant women complain of fatigue, general weakness and headaches. Generally, paleness (of the skin, mucous membrane, tongue and nail beds) only becomes noticeable when haemoglobin levels decrease to about 7.0g/dl (Mulambah et al, 2014). In addition to pallor and above symptoms, other symptoms include: shortness of breath, dizziness, and tiredness (Ministry of Health, 2012b).

Further decrease of haemoglobin levels to 4.0g/dl leads to starvation of most body tissues of oxygen. The heart muscles are the most affected and may fail leading to heart failure and death (Mulambah et al, 2014). Both mild and moderate anaemia may not cause maternal death directly,

but they contribute to other causes of death, especially post-partum haemorrhage. Anaemic women are not able to withstand loss of blood in the same manner as healthy women who are not anaemic do. Loss of a small amount of blood in an anaemic woman during delivery can be life-threatening. Failure to manage anaemia adequately during pregnancy can lead to serious morbidity and mortality. In addition, it weakens the ability to withstand blood loss. This therefore increases the possibility of death occurring from blood loss during child birth (Mulambah et al, 2014). It is therefore paramount for pregnant women to be constantly examined for the above symptoms. In addition, they should be thoroughly counselled to clearly identify them to enable immediate action in case they experience any.

2.6.2 Haematologic Status

2.6.2.1 Haemoglobin Status

Anaemia refers to “low level of haemoglobin in the blood, as evidenced by a reduced quality or quantity of red blood cells” (World Health Organization, 2012a). Iron status is commonly measured by measuring the hematocrit (Hct) or haemoglobin (Hb) levels to assess anaemia. This is the most commonly used method in low income countries, where iron deficiency is most prevalent. The level of blood haemoglobin thus reflects the total iron stores in the body. Alternative approaches, which are more costly and less available, involve iron-related tests like erythrocyte protoporphyrin, transferrin saturation, and serum ferritin and serum transferrin receptors. Haemoglobin levels of pregnant women were measured in this study.

The WHO categorizes anaemia as a severe public health problem when at the national level, the prevalence of anaemia is 40% and above, based on haemoglobin levels (World Health Organization, 2012a). The same WHO classification will apply in this study as follows:

haemoglobin test levels of 100-109g/l (10-10.9g/dl) indicate mild anaemia, 70-99g/l (7.0-9.9g/dl) indicate moderate anaemia, less than 70 g/l (7.0g/dl) indicate severe anaemia and less than 40 g/l (4.0g/dl) is life threatening anaemia (Ministry of Public Health and Sanitation, 2008; Mulambah et al, 2014). According to the WHO, anaemia in pregnancy occurs when haemoglobin levels fall below 110g/l (11.0g/dl), at sea level, during the first and third trimester of pregnancy. However, during the second trimester, Hb levels normally go down by around 5g/l (0.5g/dl) (World Health Organization, 2012a). Therefore, in this study, anaemia was considered present if haemoglobin level was below 11.0 g/dl.

2.6.2.2 Folate Status

Serum folate is considered a sensitive indicator of recent dietary intake. A better indicator of short-term folate status are the fasting concentrations of serum folate. Serum levels of less than 5µg/ml are an early sign of deficiency. Usually, red blood cells only accumulate folate during the process of erythropoiesis, so folate in red blood cells reflects body tissue stores. In addition, red blood cells have a life span of up to 120 days. Thus the concentration of folate in red blood cells does not drastically change with changes in folate intake (Barry Shane, 2011). Red blood cell folate of less than 150µg/ml indicates reduced store with parallel liver and tissue stores (Ministry of Public Health and Sanitation, 2008). Red cell folate concentration remains an important indicator of folate status. The measurement of both red blood cell folate and serum folate concentrations is useful for the monitoring of trends in folate status trends for the evaluation of public health interventions' impact (World Health Organization, 2012b). In this study, serum folate was also measured among pregnant women.

2.7 Philosophical Basis of the Study: Ontological and Epistemological Perspectives

The philosophical foundation that influenced the research process in this mixed methods study was that of the positivism paradigm of inquiry (Brierley, 2017; Memon et al, 2017) based on the following philosophical assumptions:

Ontological perspective is concerned with assumptions on the nature of reality while epistemological perspective inquiries into the nature of knowledge and truth. This study applied both subjective and objective views of reality. In this study, the researcher views reality as multiple and socially constructed. On one hand, the relativist ontological perspective that reality is a finite subjective experience that differs from person to person, formed a basis of this study. This influenced the subjective epistemology utilized in this study which aims to explore, discover, and understand phenomena through the process of social interaction and indicates that knowledge is influenced by an individual's reflections and interpretations. Further, it influenced the methodology utilized in this intervention study to involve individual follow-up of pregnant women in their homes. Each pregnancy is unique, and the individual's world is an experienced reality based on social or individual formations (Brierley, 2017; Kamel, 2017) .

On the other hand, the study involved measurement of proportions and quantities, which are objective. These views guided the theoretical framework, using diffusion of innovation theory to assess how an idea (iron and folic acid supplementation) spreads through the social system or population in the community over time. In addition, the views guided the methodology, whereby a pretest-posttest quasi-experimental study design was utilized in this study. In this regard, this study was not randomized. Instead, the intervention was implemented, and data collected in the natural setting of the pregnant women which was their home environment without any manipulation (Brierley, 2017; Memon et al, 2017).

2.8 Theoretical Framework

2.8.1 Diffusion of Innovation Theory

This study utilizes the Diffusion of Innovation (DOI) Theory. This theory was developed by E.M. Rogers in 1962 and is among the oldest social science theories. The origin of the theory was in communication, explaining how, a product or an idea spreads through a certain social system or population over time. Eventually, the population, as part of a social system, adopt a new product, idea, or even behavior (Rogers, 2003). The main components of the theory are: “(1) The innovation (2) The adopter (3) The social system (4) The individual adoption-process (5) The diffusion system” (Dearing, 2009).

This DOI theory has been used successfully in public health to hasten adoption of important public health programs that typically aim to change the behavior of a social system. These include studies in areas such as information technology, snowmobile, antibiotic drugs, and HIV/AIDS prevention. It has been used to evaluate the dissemination and use of products or health services in the community. Just like the origin of this theory is in communication, its focus is on understanding the processes and forms of communication among members of social systems and how new products or ideas spread throughout the community (Ivanov & Blue, 2008). Figure 2 below illustrates this theory.

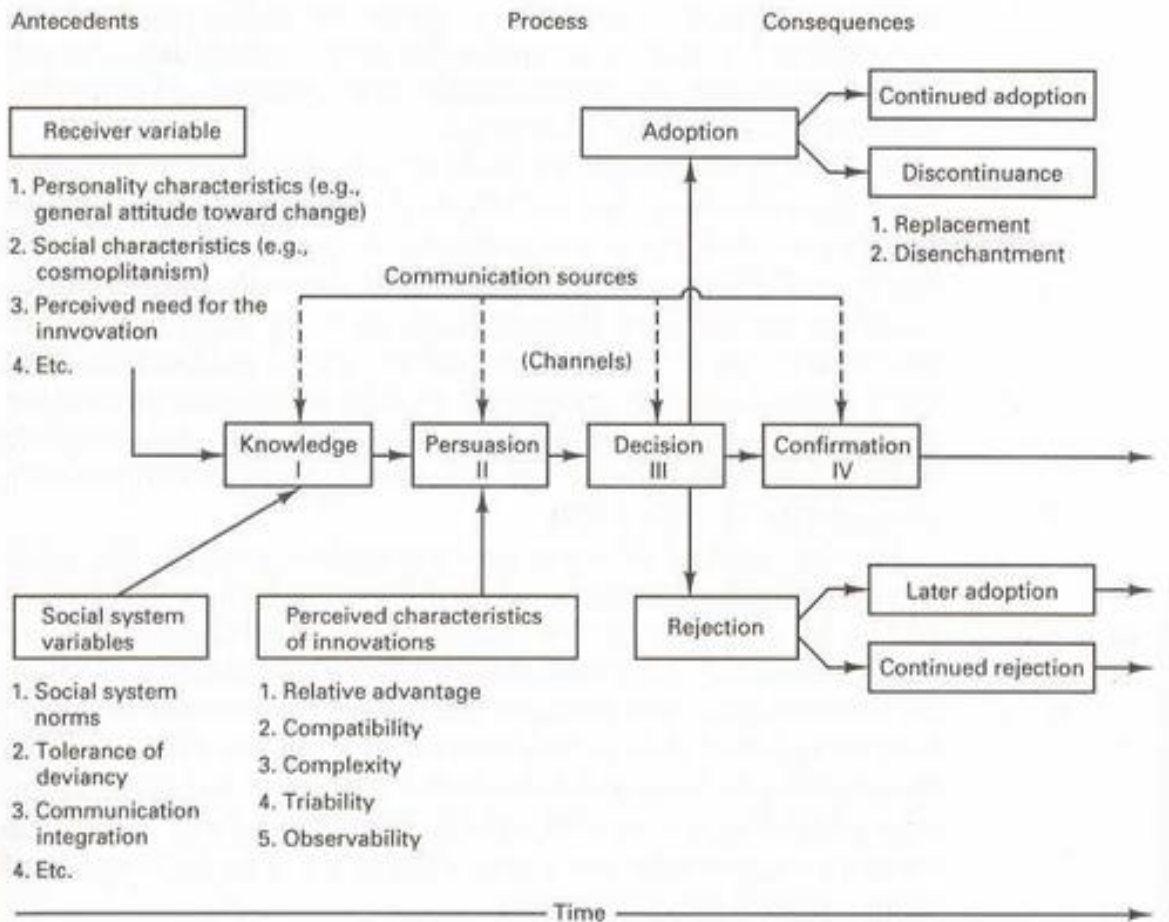


Figure 2: Diffusion of Innovation Theory

(Source: Rogers, 1983 Pg 5)

2.8.2 Diffusion of Innovation Theory and Change Agent, Applied in my Study

The DOI theory recognizes the role played by of a change agent, including his or her interactive relationships in communication with clients, and various approaches of diffusion that may be used in order to change clients' behavior.

A *change agent* is an individual who influences the innovation decisions of clients in a manner that the change agency finds appropriate to ensure adoption of new products or ideas and enable the flow of innovations to an audience of clients from a change agency (Rogers, 1983; 2003).

The change agent provides a communication linkage between a change agency and a client system. To ensure effectiveness of this type of communication, the innovations selected must address the needs and problems of the specific clients. In addition, effectiveness of the linkage is ensured by providing feedback from the client system to the change agency through the change agent. Provision of feedback will facilitate making appropriate adjustments as required based on previous successes and/or failures (Rogers, 1983; 2003).

The change agency in this study was the Ministry of Health, the change agent was the community health volunteers and the client system was the pregnant women as shown in figure 3 below. The interrelationship between this concept and the study variables is shown in figure 4.

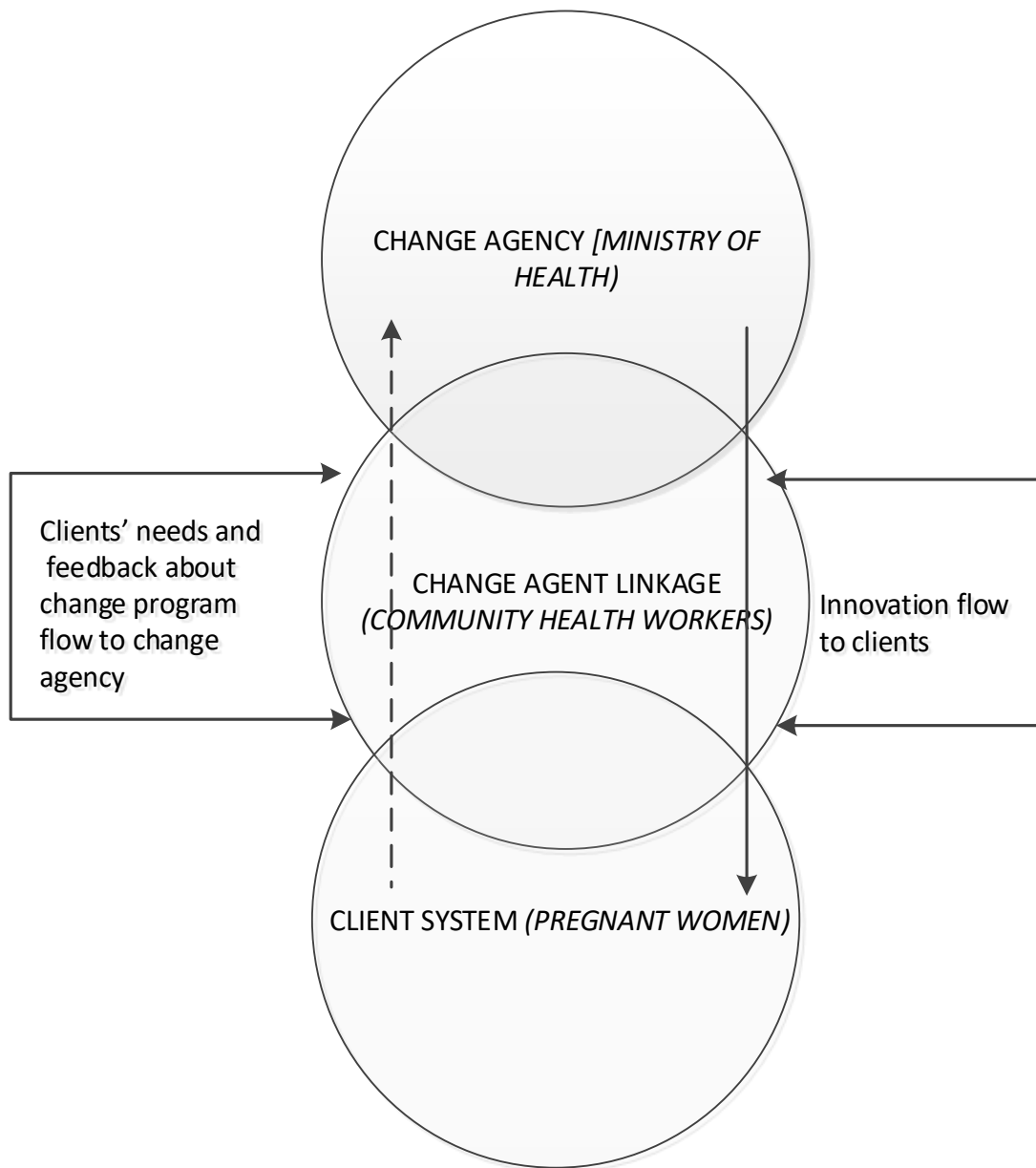


Figure 3: Change agent linkage between a client system and a change agency

(Source: Rogers, 2003 Pg 314)

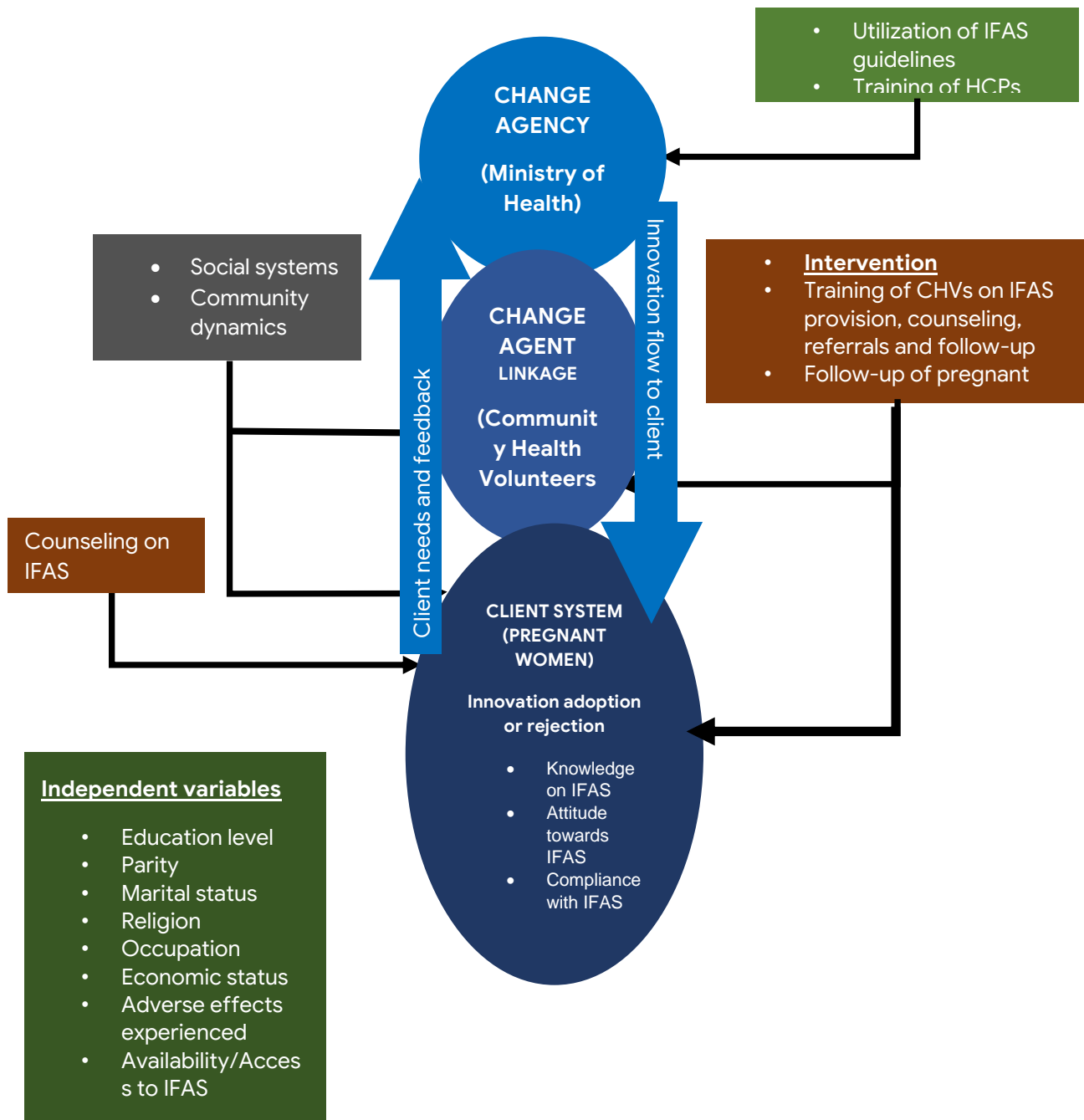


Figure 4: Community-based IFAS conceptual framework

2.9 Research Gap Identified

There is scarce information in Kenya on the use of community-based approaches (CBA) for iron and folic acid supplementation (IFAS). Studies conducted in other countries at different times have consistently shown that CBA of IFAS can reach more women, achieve higher compliance rates

and reduce prevalence of anaemia than antenatal care clinic (ANC) distribution alone (Elder, 2000; Maternal and Child Health Integrated Program, 2014; Pattanee, 2002; Sanghvi et al, 2010; Titaley, 2014; World Vision, 2006; Yip, 2002), including among adolescents (Chakma et al, 2013). By piloting a community based IFAS distribution in Kenya, I sought to obtain information currently unavailable on the approaches that will optimize outcomes for pregnant women and their babies. Hence the use of community health volunteers (CHVs) in this study to distribute IFAS and educate pregnant women in their homes.

Community-based approach for IFAS by use of CHVs for distribution has not been introduced in Kenya despite low compliance with IFAS over the years as witnessed by the Kenyan Demographic Health Surveys (KDHS) 2003, 2008 and 2014. Despite much efforts and provision of IFAS free of charge by the government, compliance remains low. Nationally, only 8% of all pregnant women reportedly take iron and/or folic acid supplements for 90 days or more during pregnancy and 30% do not take them at all (KNBS & ICF International, 2014). Kiambu County, the study site, reported IFAS adherence rate of 24.5% (Dinga, 2013) and Machakos County 18% (Juma et al, 2015).

There is no evidence on the practicability of community-based approach (CBA) for IFAS in Kenya. It has not been piloted/tried in the local set-up. Currently, IFAS is only provided at health facilities during ANC visits as part of Focused Antenatal Care (FANC) package as per the current policy (Ministry of Health, 2012a; 2013b). There is therefore need for operation research on other alternative approaches like CBA, exploring practicability in the local set-up and environment.

Kenya has not integrated CBA with the facility-based approach in the implementation of IFAS. Smitasiri and Solon (2005) identified one of the major obstacles in anaemia control as lack of effective strategy implementation mechanisms. The success and effectiveness of IFAS is highly

dependent on the compliance to the IFAS tablets (Smitasiri & Solon, 2005). Hence, research has recommended an integrated approach (Bhutta et al, 2005), where there is joint implementation with other primary health care and nutrition programs. Furthermore, operation research has been recommended for quite some time since the 1990s (Yip, 1994). Anaemia prevalence was shown to remain high while IFAS coverage remains low even where antenatal care (ANC) coverage was high (Sanghvi et al, 2010). Thus, there is need for integrated approach rather than facility-based approach alone.

This study sought to fill the gap of integration of IFAS distribution strategies due to the need to scale up IFAS utilization in Kenya by use of CBA to increase IFAS compliance and coverage (Maternal and Child Health Integrated Program, 2014). It is one of the high impact nutrition interventions (Ministry of Health, 2013c) that are currently being scaled up under the global ‘Scaling up Nutrition’ Movement, of which Kenya is a member (Ministry of Health, 2013b). The CHVs are able to reach more pregnant women in the community through home visits to provide IFA supplements and education and closely follow them up, addressing their challenges and concerns (Charles et al, 2011) thus improve compliance (Zavaleta et al, 2014).

Conclusively, limited outcome in meeting the objectives of IFAS via the current strategy of antenatal distribution alone clearly indicates a need for concrete evidence to modify the current policy and integrate other approaches. This calls for exploration of use of other strategies. Therefore this study sought to implement CBA using CHVs to augment achievement of IFAS objectives. Action to widen implementation of IFAS by including CHVs is unlikely to happen unless there is convincing evidence that the CBA promises better outcomes.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the methods used to determine the effect of a community-based approach of IFAS, using community health volunteers (CHVs) to distribute iron and folic acid (IFA) supplements and provide IFAS education to pregnant women. The chapter begins by describing the study site, study design and intervention, and illustrates the key activities that were carried out during the conduct of the study. The chapter also explains the data collection, quality assurance, management, analysis, and presentation procedures.

3.1 Study Site

The study was conducted in Lari Sub-County (Figure 6) in Kiambu County (Figure 5), a County in the former Central Province of Kenya. The study was prompted by a research conducted by Lynette Dinga in 2013 at Thika hospital, a level five hospital in Kiambu County, that confirmed low IFAS adherence rate (defined as use of IFAS supplements for ≥ 4 days per week) of 24.5%, compared to the national target of 80% coverage (Ministry of Health, 2013c).

Kiambu County (Figure 5) covers an area of 2,543.42 km² and is in the Central highlands of Kenya, close to Kenya's capital city of Nairobi. The County shares its borders with four other Counties: Nyandarua and Murang'a to the North, and Kajiado and Nakuru to the West. Thika is its largest town although the administrative capital of the County is Kiambu town. The County has twelve Sub-Counties namely: Thika Town, Kiambu, Kikuyu, Juja, Gatundu South, Gatundu North, Kiambaa, Ruiru, Githunguri, Kabete, Limuru and Lari. The County has a population of 1,623,282 people, 51% of whom are females as per the latest census in 2009 (County government of Kiambu, 2018).

The County is a leading innovative commercial hub that is considered as one of the wealthiest counties in Kenya. The main economic activity is agriculture. The County is predominantly rural, but its urban population is increasing rapidly as pressure for residence by the expanding Nairobi's working population bordering it increases. Kiambu County has over 300 health facilities which comprise two level five hospitals namely Thika and Kiambu hospitals, which serve as the referral hospitals for the entire County (County government of Kiambu, 2018).

Lari Sub-County (Figure 6), the site for this study, is in the Western part of Kiambu County. The Sub-County is further divided into five wards: Lari/Kirenga, Kijabe, Kamburu-Kamuchege, Kinale and Nyanduma. Lari has a total area of 439.20 square kilometers. The main towns in the area are Nyambari, Kimende, Kijabe, and Kinale. According to the 2009 census, Lari Sub-County has a population of 123,895 people. The area is largely mountainous. Majority of its residents practice agriculture as the main economic activity and source of livelihood, with the area being dominated by subsistence farming. Tea farming is largely practiced by residents of the eastern part of Lari. The highest point in Lari Sub-County is Kijabe, which is on the edge of the Great Rift Valley at an altitude of 2,200m. Due to this, the Sub-County is earmarked for construction of high-altitude athletics center by the County government.

The study was conducted in the five largest, in terms of client/patient population, public health facilities in the Sub-County namely: Lari hospital, Kagwe, Kagaa, Githirioni and Kinale health centres. Lari Sub-County hospital, the only government hospital in the Sub-County, is a former Health Center, which is being currently upgraded to a level four (primary level) hospital. The hospital is located at Rukuma Shopping Center in Lari/Kirenga Ward. Being the largest government health facility in the Sub-County, it is the administrative headquarter and also hosts the Sub-County Health Management Team (SCHMT). The study was based in the community and

maternal and child health (MCH) clinics whereas maternity units were used for evaluation of obstetric outcome. Recruitment of respondents was done both in MCH and the community.



Figure 5: Map of Kiambu County

(Source: <https://kiambu.go.ke/political-units/>)(KIAMBU, 2018)

IEBC REVISED LARI CONSTITUENCY COUNTY WARDS ASSEMBLY

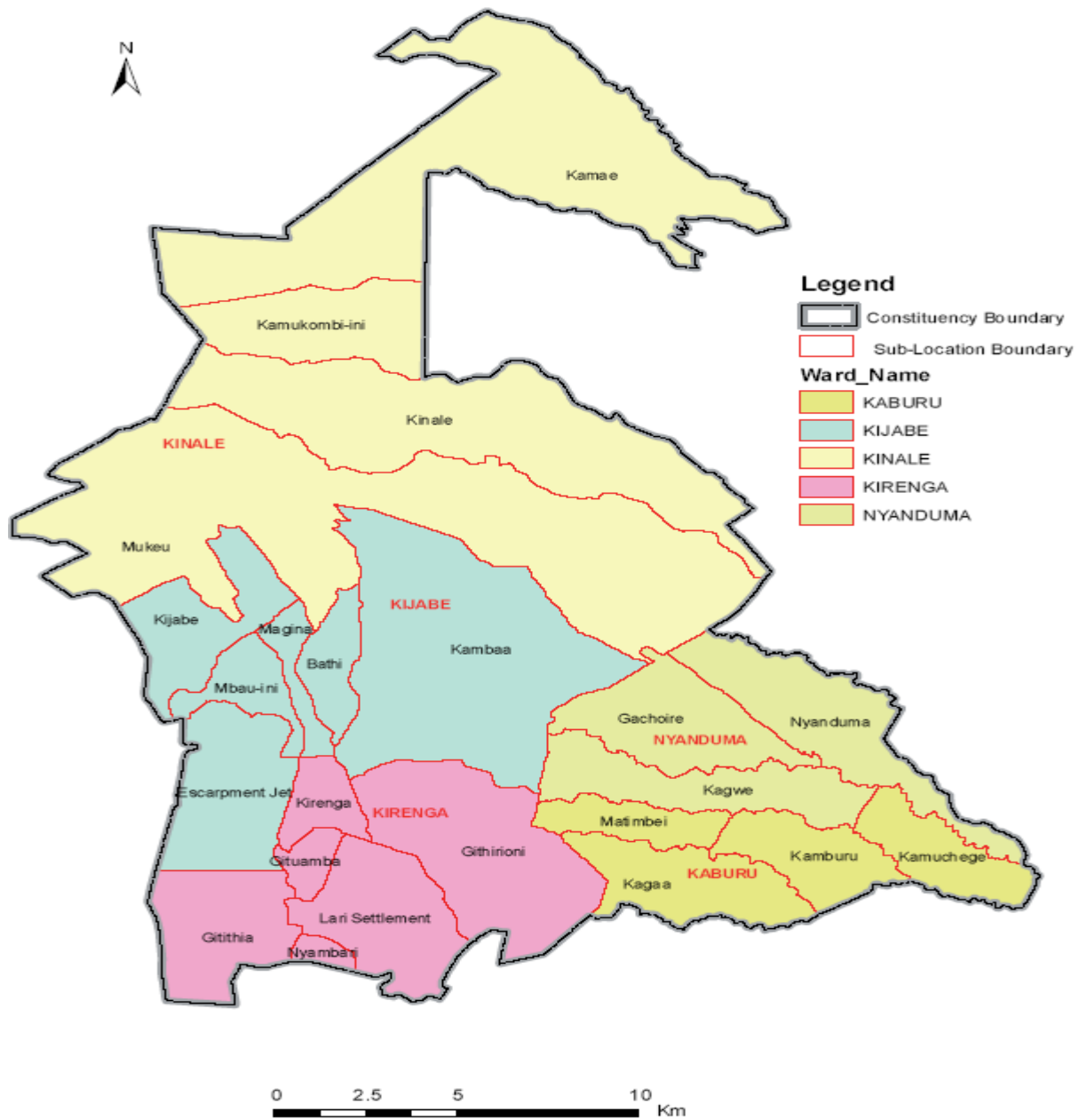


Figure 6: Map of Lari Sub-County

(Source: <https://informationcradle.com/kenya/lari-constituency/>) (Information Cradle, 2018)

3.2 Study Duration

The study was conducted between June 2016 and April 2017. A Gantt chart for the timelines of this study has been included (Appendix XVI).

3.3 Study Design

A pretest-posttest quasi-experimental study design with a control group was adopted for this intervention study. This was to allow for observation of the variables before and after the intervention. Mixed methods approach of data collection for both quantitative and qualitative data were used to enrich the quality of data collected as well as the training information. The study implemented a new community-based approach for Iron and Folic Acid Supplementation (IFAS) whereby the oral IFA supplements were administered to pregnant women in combination with IFAS education by community health workers (CHWs), alternatively and currently known as community health volunteers (CHVs). For comparison purposes in this study, that is, between the new community-based distribution strategy and the standard practice of fixed health facility-based distribution strategy of IFAS, an intervention study group and a control study group were used.

3.3.1 Structure of the study

The study was structured in three phases namely inception, implementation and follow-up phases as shown in figure 7 below:

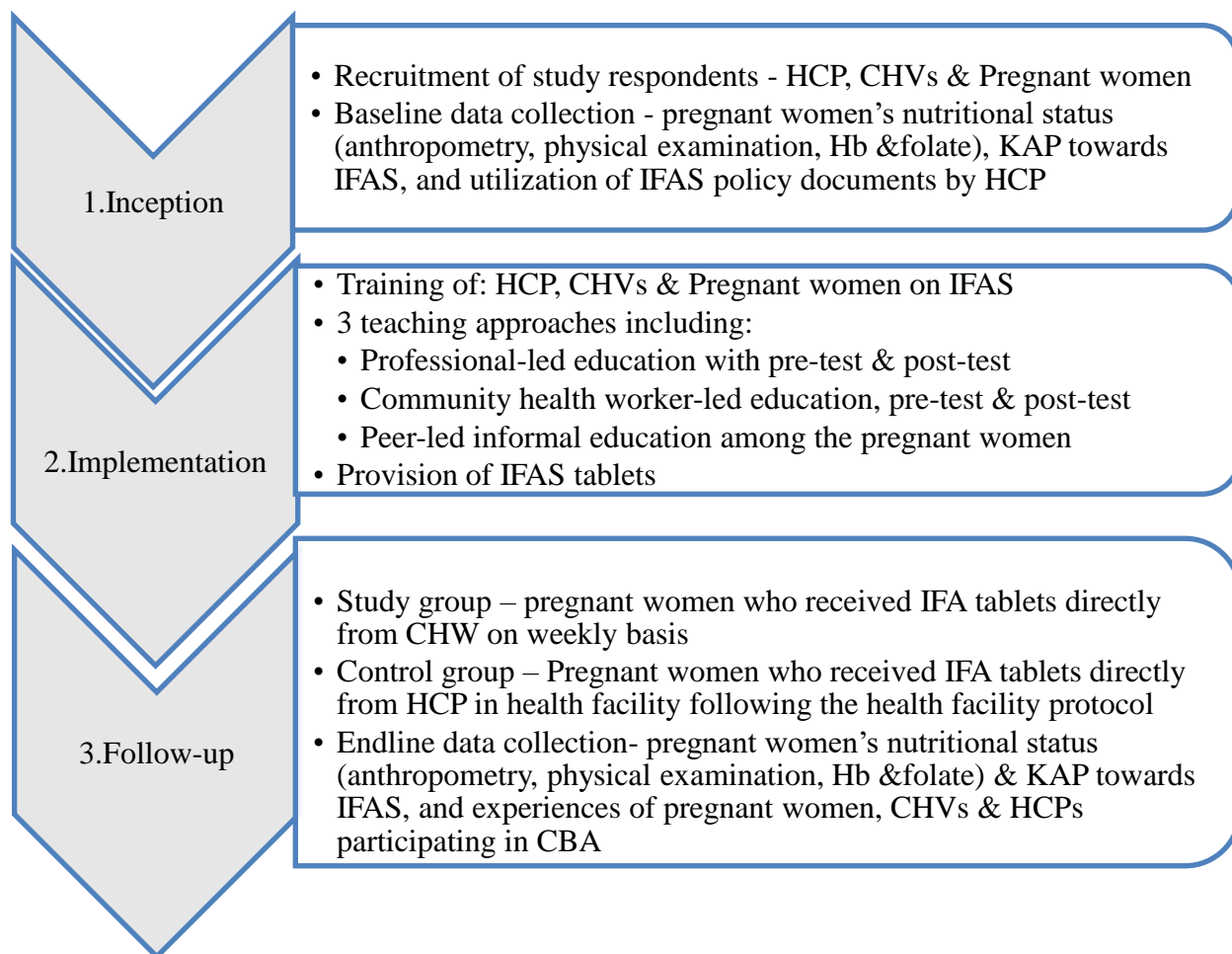


Figure 7: Study phases

Phase 1: Inception phase

This phase involved identification and recruitment of the study respondents; health care providers (HCPs), community health volunteers (CHVs) and pregnant women. During this phase, baseline information was obtained as follows:

Quantitative data was obtained so as to get the proportion of participants and quantities of the various measures before and after the intervention (Male, 2015). Quantitative data was obtained from pregnant women using a semi-structured questionnaire that was composed of: socio-demographic characteristics; knowledge, attitude and practices of IFAS, nutritional status assessment including anthropometric measurements (weight, height and MUAC), physical examination, haemoglobin and folate levels. A client-provider interaction was assessed by observing a counselling session during service delivery at ANC room using a checklist. The checklist was used to determine the counselling content and practices as well as utilization of IFAS policy guideline documents. In addition, desk review of all IFAS documents available in the facilities was done.

Qualitative data was obtained to explore the feelings of the research participants and help understand the meaning they ascribe to their experiences (Sutton & Austin, 2015). Qualitative data was obtained using: Key Informant Interviews (KII) involving HCPs and CHVs including the nurse in charge of ANC services and CHVs' leader at each health facility. Focus Group Discussions (FGDs) and In-Depth Interviews (IDIs) were conducted among pregnant women at each health facility to corroborate the research questionnaires data. Details of the interviews are included in the data collection section.

Baseline information obtained during this phase was integrated into the implementation phase and used to improve the trainings of HCPs, CHVs and pregnant women by addressing the gaps identified in relation to IFAS programme implementation. One main finding was: deficient information on various IFAS sub-topics like anaemia, increased nutrients during pregnancy, enhancers and inhibitors of iron/folate hence most clients were not counselled on them.

Phase 2: Implementation phase

This phase involved training of HCPs, CHVs and pregnant women on IFAS and distribution/education on IFAS using either (1) community-based distribution of IFAS tablets and education by the trained CHVs within the community set-up for the intervention group or (2) health facility-based IFAS distribution and education by HCPs during ANC clinics for the control group.

During this phase, trainings were conducted using three teaching methodologies:

- (i) Professional-led education among HCPs working in ANC, comprising mainly of nurses
- (ii) Community health volunteer-led education by CHVs
- (iii) Peer-led informal education among the pregnant women

Teaching methodologies

I. Professional-led education

This involved a three days refresher training on IFAS programme for 32 HCPs working in Lari Sub-County health facilities, comprising of mainly nurses. The objective of the training was to provide update information on IFAS, to build their capacity to health educate pregnant women on IFAS at the health facility and enable them to provide the necessary support to CHVs. Various teaching methods were applied during the training including discussions, demonstrations and lecture methods. To assess comprehension, feedback was sought by use of questions and answers.

Among the HCPs trained, the ANC clinic in charges were recruited to supervise and facilitate the necessary support to the CHVs.

The training was conducted by the researcher in collaboration with the Kiambu County Nutritionist. Various IFAS IEC materials were provided for training by the Division of Nutrition, MoH, including: health workers training guide; national policy guideline on combined iron and folic acid (IFA) supplementation for pregnant mothers in Kenya; mothers leaflets, in both English and Kiswahili; dialogue guide for health care providers; community health workers counselling guide, in Kiswahili; and assorted IFAS posters in both English and Kiswahili for pregnant mother, potential mother then doctor and nurse. The IEC materials were then distributed to trainees for reference in their health facilities during health education of clients and for use in disseminating IFAS information to their colleagues.

The researcher developed a training programme (Appendix VIII B) in accordance with the government IFAS training protocols. The three days training programme covered several topics on IFAS. These were such as: anaemia in pregnancy; dose, frequency, duration and side-effects of IFAS and their management; food sources of iron/folate; IFAS policy guidelines; distribution strategies through ANC approach and the new community-based approach.

The training was done at Lari hospital because it is the headquarters of the Sub-County. A pre-test was administered at the beginning of the training session and a post-test at the end to evaluate the impact of the training and determine the level of IFAS knowledge gained after training. It consisted of multiple-choice questions and true/false questions on all the IFAS topics covered during training (Appendix VIII B). The pre-test average score was 80% which increased to 88% during the post-test.

II. Community health volunteers-led education

This involved a one-day training of 16 CHVs on the IFAS programme implementation. The objective of the training was to update them on the IFAS programme, teach them on community distribution strategy, and discuss the logistics of implementation of the community-based approach of IFAS. This was to enable them to provide continued IFAS education to the pregnant women as they distribute IFAS and follow them up in their homes.

The training was conducted by the researcher and a research assistant who was a professional nutritionist, at Lari hospital, the headquarters of the Sub-County. Various teaching methods including lecture, demonstrations and discussions were used on a round table sitting format, to engage the CHVs in thorough discussions and communicate effectively. The content of training included: importance of administering IFAS tablets to pregnant women; causes, symptoms and effects of anaemia in pregnancy; dose, frequency and duration of IFA supplementation; common side effects such as black stools, stomach upset, constipation and diarrhea, and their management; how and when to best take IFAS; food sources of iron/folate; and enhancers/inhibitors of iron/folate absorption.

Training community health volunteers on implementation of community-based approach

During the CHV training, implementation of the community-based approach of IFAS was discussed in detail. The CHVs were taught to identify pregnant women in their area to teach and counsel them on IFAS and encourage them to attend the antenatal clinic. The activities of CHVs were clarified as follows: the CHVs picked IFAS tablets from the health facility safely pre-packed in envelopes containing seven (7) tablets each for distribution to the pregnant women weekly, and kept hard copy records of all the IFAS tablets distributed. The IFAS tablets distribution was

accompanied by a monthly calendar as provided by the Ministry of Health, which the pregnant women were to tick every time they swallowed the tablets.

III. Peer-led informal education for pregnant women

This involved informal education and message sharing by the pregnant women. The objective was to enhance continued IFAS education in all informal settings where the pregnant women interact to disseminate IFAS information to the entire community.

Pregnant women were initially educated on the importance of IFAS during pregnancy either by a health care provider at the health facility or a community health worker at the community set-up/home. The pregnant women were encouraged to continue offering IFAS education to their fellow pregnant women and other contacts on a peer-led approach to enhance further learning during various informal gatherings like women groups, church and other social gatherings.

Phase 3: Follow-up phase

This phase involved follow-up of all pregnant women recruited to participate in the study depending on which study group they belonged to: the intervention group was followed up by CHVs in their homes while the control group was followed up by HCPs at the health facility using the standard health facility protocols.

The intervention group was followed up weekly by CHVs. The purpose of CHVs weekly follow-up visits to pregnant women in the community-based approach of IFAS distribution was to provide IFAS education, assess their progress, assess for any side effects or challenges experienced, countercheck the ticking of the IFAS calendar, establish and record number of IFAS tablets taken during the week for validation and distribute more IFAS tablets. The CHVs addressed any

challenges experienced by pregnant women and properly kept the hard copies of records. Seven tablets to be taken during the following week were then given to the women. The CHVs provided information to the pregnant women on various IFAS topics discussed during training and encouraged them to visit the health facility at least once every month for ANC services as well as assessment of their haemoglobin and folate levels, done before and after intervention. Continuous IFAS education was provided during the weekly follow-up visits until delivery to determine their obstetric outcome. The researcher reviewed the records by CHVs weekly. The CHVs were supportively supervised by ANC in charge of the health facilities to which they were attached.

At the end of this phase, endline data was collected as follows:

Quantitative data was obtained from pregnant women using a semi-structured questionnaire regarding: socio-demographic characteristics; knowledge, attitude and practices of IFAS, nutritional status including anthropometric measurements of weight, height and MUAC, haemoglobin and folate levels and physical examination. This was done to allow comparisons for knowledge, attitudes and practices of IFAS as well as nutritional status of pregnant women post intervention.

Qualitative data was obtained on experiences of health care providers, community health volunteers and pregnant women involved in the community-based approach in health facilities. Key Informant Interviews (KII) were conducted among HCPs and CHVs to include the nurse in charge of antenatal care services in each health facility and all CHVs involved up to the end of the study. In-Depth Interviews (IDIs) were conducted among two pregnant women from each health facility involved up to the end of the study. In addition, the birth outcome was determined for both the mother and the neonate immediately after delivery for both intervention and control groups. The maternal outcome included the physical examination findings on condition of the mother

immediately after delivery and any obstetric complications experienced. On the other hand, neonatal outcome included the neonatal physical examination findings, that is, survival status (living/dead), birth weight, and any congenital anomalies noted.

3.4 Study Population

3.4.1 Target Population

The target population for iron and folic acid supplementation and education were pregnant women 15-49 years of age. The study respondents included Health Care Providers (HCPs) and Community Health Volunteers (CHVs), who were trained on implementation of the IFAS programme to offer updated IFAS education to pregnant women. The CHVs were trained to provide community based IFAS education, counselling, weekly follow-up and distribution of IFAS tablets to the pregnant women in their homes.

3.4.2 Study Population

The study population comprised of pregnant women residing in Kiambu County who were in the reproductive age of 15-49 years since 55% of all anemic women 15–49 years of age live in Africa or Asia (USAID, 2014). Although the adult age is 18 years, the fact that teenage pregnancy is rampant in Kenyan society is noteworthy (Kenya National Bureau of Statistics & Macro ICF, 2015). In addition, many girls especially in the rural areas are predisposed to early marriages and become pregnant before the adult age. This is evidenced by the current Kenya Demographic and Health Survey 2014, where 15% of women age 15-19 years had already given birth while 18% had begun childbearing (had a live birth or were pregnant with their first child). The percentage of women who have begun childbearing increases rapidly with age, from about 3% among women

aged 15 years to 40% among women age 19 years (Kenya National Bureau of Statistics & Macro ICF, 2015) hence the inclusion of those under age in this study.

The cut-off gestational period was 33 weeks to allow time for follow-up of the pregnant women. After 33 weeks gestation, the period before delivery would be too short to allow significant follow-up of the women since these women would have completed a great part of their third trimester of pregnancy. They would be having only one month (4 weeks) to the earliest possible time of delivery of a term baby which is 37 completed weeks of gestation (Fraser & Cooper, 2009).

The expected loss to follow-up was 30% and this was considered by increasing the sample size by 30%. A contact/locator form was used to minimize participant's loss to follow-up (Appendix XIII).

3.4.2.1 Inclusion Criteria

Pregnant women aged 15-49 years who provided informed consent to participate in the study

Pregnant women aged 15-49 years mentally and physically stable

Pregnant women aged 15-49 years who were below 33 weeks in the pregnancy gestation

Pregnant women aged 15-49 years below 33 weeks of pregnancy gestation residing in the study area for at least one year

3.4.2.2 Exclusion Criteria

Pregnant women aged 15-49 years with chronic illnesses like sickle cell disease

Pregnant women aged 15-49 years on treatment for obstetric complications like antepartum haemorrhage and bleeding ulcers

Pregnant women aged 15-49 years who did not consent to participate in the study

3.4.2.3 Eligibility Criteria for Health Care Providers

All health care providers working in the antenatal care clinic of the selected health facilities for not less than 6 months who consented to participate in the study, for IFAS training

All nurse in charges of antenatal care services in the selected health facilities who consented to participate in the study, to provide supportive supervision to CHVs.

3.4.2.4 Eligibility Criteria for Community Health Volunteers

All active CHVs attached to the selected health facilities, who consented to participate in the study.

3.4.3 Study Groups

This study consisted of an intervention study group and a control study group in the ratio of 1:1 for comparison purposes (Kothari & Garg, 2014a). The total sample size was therefore divided into two, half for each group. The two study groups are described below.

3.4.3.1. Intervention Group

The respondents were assigned to the intervention group if they came from a community that had an operational community unit attached to the health facility and with active community health volunteers. The intervention group included those pregnant women who met the inclusion criteria who received IFAS education and supplements directly from CHVs on a weekly basis until they delivered. The CHVs provided information and encouraged them to visit the health facility at least once every month to have their weight, height and Mid Upper Arm Circumference (MUAC) measured and other antenatal care (ANC) services provided. A sample of **170** pregnant women

formed this group which is half of the total sample of **340** after considering a 30% estimated loss to follow-up, which is within the acceptable range for follow-up studies (Mary et al, 2008).

3.4.3.2 Control Group

The respondents were assigned to the control group if they came from a community that did not have an operational community unit meaning community health volunteers were not active. The control group included those pregnant mothers who met the inclusion criteria who received IFAS education and supplements directly from Health Care Providers (HCPs) at the fixed health facilities. This group followed standard practice (monthly ANC visits) according to the health facility protocol of both IFAS education, administration during the provision of antenatal care as well as follow-up during subsequent antenatal care clinics. Their weight, height and Mid Upper Arm Circumference (MUAC) were taken and other ANC services provided during the ANC visits. A sample of **170** pregnant women formed the control group, which is half of the total sample of **340**, with a 30% estimated loss to follow-up already considered.

3.5 Sampling and Sample Size Determination

3.5.1 Sampling Technique

Multi-stage sampling was adopted to identify the Sub-County and identify health facilities where the study was conducted. Two stages were employed: Sub-County stage and health facility stage. The sampling frame consisted of all the Sub-Counties in Kiambu County. A criteria was used at each stage. The Sub-County with existing functional (active) community units formed the basis for the intervention, comprising of those whose community health volunteers were actively involved in provision of community health services to community members. All the major health

facilities: with highest client/patient population turnover and with existing and functional (active) community units were used to implement the intervention. These were considered because of the low turn-over of antenatal clients in public health facilities in Lari Sub-County.

All the pregnant women attending antenatal care in the already selected health facilities were eligible for the study. Consecutive sampling was used to include all accessible pregnant women as part of the sample. Consecutive sampling is considered the best type of non-probability sampling with best representation of entire population. All pregnant women who met the inclusion criteria were clearly informed about the study as outlined in the informed consent information sheet (Appendix VII). Those who provided both verbal and written informed consent to participate in the study were recruited. Those residing in a community that had a functional community unit with active community health volunteers who consented to have IFAS distributed to them at their homes by community health volunteers formed the intervention group. Those residing in a community that did not have a functional community unit formed the control group, who received their IFAS from fixed health facilities during antenatal care services, until the required sample size of 170 was reached.

Key informants were purposively chosen to provide detailed information at the inception phase (baseline) as well as the follow-up phase of study (endline). The key informants were: the nurse in charge of antenatal care services at each health facility and CHVs leaders from each health facility. Likewise, In-Depth-Interviews (IDIs) were conducted among two pregnant women randomly chosen from each health facility.

3.5.2 Sample Size Determination

Sample size expected to determine the effect of community-based strategy of IFAS distribution was calculated using the following formula for a binary outcome (Demidenko, 2008):

$$n = \left(\frac{r+1}{r}\right) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(D)^2}$$

Where n is the minimum sample size for the study group at the end of the study.

- For 0.05 significance level, $Z_{\alpha}=1.96$
- For 90% power, $Z_{\beta}=1.282$
- \bar{p} is the average of expected prevalence of control group and intervention group (control 25% to 45% intervention)
- r is the ratio of sample expected in control and intervention groups (1:1)
- D is the expected effect in IFAS compliance of 20% (Control 25% to 45% intervention)

$$N = [2(0.35)(0.65)(1.282+1.96)^2] / 0.2^2 = \mathbf{120}. \text{ Adding 30\% loss to follow-up} = \mathbf{170}$$

(initial sample size divide by the expected response rate i.e 120/0.7)

The final sample size per study group was 170 and in both groups was therefore **340**.

Due to the cost implications for folate tests analysis and its relatively non-specific nature, a sub-sample of 60 pregnant women were randomly chosen for the folate test. This sample size was arrived at considering the minimum size for which significant statistical power could be achieved (Mugenda & Mugenda, 2003). Stratified sampling was used to stratify folate tests by group of follow-ups: 30 from control group and 30 from intervention group. Systematic sampling was then

applied to select every 5th respondent from each group for folate test, based on the calculated sample size of 170 ($170/30 = 5.7$) per group.

3.6 Data Collection Tools and Procedures

3.6.1 Pretest and Posttest Measurements

The study consisted of data collection before and after the implementation of a community-based approach of IFAS. This was done to provide information for comparison of data before (baseline) and after (endline) the intervention. To determine the overall effect of the intervention, the outcome of the intervention and control groups were compared by comparing changes between baseline and endline data in the two study groups.

The pretest and posttest data collected is outlined below.

Pretest data: A baseline survey was conducted at the beginning of the study to obtain baseline data on: knowledge, attitude and practices of IFAS by HCPs, CHVs and pregnant women; socio-demographic and nutritional status of pregnant women: including anthropometric measurements of weight, height, MUAC, and biochemical assessment of haemoglobin (Hb) and folate levels; and use of IFAS policy documents by HCPS.

Posttest data: An endline survey was conducted at the end of study to obtain endline data on: knowledge, attitude and practices of IFAS by pregnant women; nutritional status of pregnant women, including anthropometric measurements of weight, height, MUAC, and biochemical assessment of haemoglobin and folate levels; and experiences of HCPs, CHVs and pregnant women of participating in the community-based approach of IFAS distribution. In addition, after delivery, maternal and neonatal outcome were determined.

Before data collection commenced, informed consent was obtained from the clients, who were clearly informed about the details of what the study entailed as per the informed consent information sheet (Appendix VII). The questions they had concerning the study were answered and all unclear details clarified. It was emphasized that participation was voluntary, and that they could withdraw anytime from the study without facing any adverse consequences. Those who agreed to take part were requested to sign the informed consent certificate in two copies and keep one copy, after which data was collected.

3.6.2 Quantitative Data Collection Tools and Procedures

Appropriate references were used (Kothari & Garg, 2014a; Male, 2015) for quantitative data collection. Quantitative data was collected using the following instruments:

A Semi-structured interviewer administered questionnaire was used to obtain both baseline and endline data on socio-demographic characteristics from every pregnant woman recruited in the study as well as physiological parameters, knowledge, attitude and practices in relation to IFAS. The questionnaire was developed by the researcher and pre-tested as outlined subsequently.

A Food Frequency Questionnaire (FFQ) was included in the questionnaire and used to determine the frequency of taking iron and folate food sources.

A 24-hour diet recall was included in the questionnaire and used to assess food sources of iron and folate in the diet. The pregnant women were asked to indicate the food they had eaten in the last 24 hours from the time of data collection.

A Checklist was developed and used to observe a client-provider interaction through observation of a counselling session to obtain information on IFAS programme implementation in health facilities and service delivery practices including: the process of prescribing/administration; instructions before and after prescribing/administration of IFAS; evaluation of clients'

comprehension of counselling; recording; utilization of IFAS policy documents and job aids like IFAS calendars; and health facility processes with regard to IFAS. The checklist was also used during desk review involving physically checking for IFAS documents to obtain information on IFAS policy documents and IEC materials available at health facilities. Mitigation of Hawthorne effect that occurs with observation is outlined in section 3.7.2.

A data abstraction form was used for assessment of pregnant women nutritional status:

- **Anthropometric measurements:** Height, weight and mid-upper arm circumference (MUAC) of pregnant woman recruited were determined and recorded. In addition, weight was monitored at every ANC clinic throughout the study.
- **Physical examination** - Head to toe assessment findings during antenatal services were recorded with more attention to abdominal examination findings to determine foetal growth and wellbeing. The fundal height was monitored and recorded at every ANC clinic throughout the study.
- **Haematological and biochemical assessment**
 - Haemoglobin levels were determined before and after intervention by collecting a blood specimen.
 - Serum folate levels of a sub-sample of 60 pregnant women were equally determined before and after intervention.

3.6.3 Qualitative Data Collection Tools

Prior to qualitative data collection, informed consent was obtained as earlier indicated. All interviews were audio-taped and clearly labelled with the date, place of interview and interviewee code then transferred to the computer for data storage. Appropriate references were used (Barker et al, 2013; Sutton & Austin, 2015).

Qualitative data was collected using the following instruments:

A focus group discussion (FGD) interview guide was used to conduct five audio-taped FGDs, one in each health facility, to obtain baseline information regarding the knowledge, attitudes and practices of the women towards IFAS. The FGDs were conducted before filling of questionnaires in health facilities commenced to ensure the participants were different. Pregnant women attending antenatal care were approached after service provision, explained about the study and their informed consent to participate in the FGD obtained from those who met the inclusion criteria. Those who agreed to participate in the FGDs were recruited and taken to the interview room. The researcher conducted the FGDs with the help of a research assistant. The researcher started by creating rapport with participants to create a free atmosphere for them to share their expressions/experiences, facilitating introductions, giving participants identification codes and recording their socio-demographic characteristics. Out of the five FGDs, two consisted of 11 pregnant women while two consisted of 12 and one consisted of 8 pregnant women. These small numbers allowed all participants to be involved, any sensitive issues to be discussed and ensured the researcher revealed indepth data. Each FGD was conducted within a duration of 45-60 minutes. The FGD findings were used to improve the questionnaire and study trainings by addressing the gaps identified during the discussion.

Health care provider's Key Informant Interview (KII) guide was used to obtain detailed baseline data on IFAS programme implementation in the health facility from the nursing officer in charge of antenatal services, to improve the study questionnaire and trainings by addressing the gaps identified. It was equally used to obtain endline data on their experiences with IFAS community-based approach, whose findings were included in the final analysis.

Community health volunteer's (CHV) interview guide was used to conduct key informant interviews from the CHV leader in each health facility to obtain detailed information on IFAS programme implementation practices. The baseline information was equally used to improve the questionnaire and trainings by addressing the gaps identified. On the other hand, it was used to collect endline information on CHVs experiences with community-based approach of IFAS, whose findings were included in the final analysis.

Pregnant mothers' in-depth interview guides were used to obtain detailed baseline data on IFAS services delivery which was used to improve the study questionnaire and IFAS trainings. Equally, it was used to collect endline data on their experiences with community-based approach of IFAS, from two pregnant woman from each health facility, which was included in the final data analysis.

3.6.4 Estimation of Haemoglobin Levels

A portable HemoCue B-Hb photometer machine was used for measuring haemoglobin concentration. This was done directly using one drop of capillary blood through a finger prick. The test was therefore done on the spot by a trained laboratory technologist and the patient given immediate feedback. Quality control measures were maintained throughout the entire process of specimen collection, specimen processing and analysis, as clearly outlined in the next session.

3.6.4.1 Specimen collection procedure and handling

The procedure for sample collection was as follows: first the procedure was explained to each participant. If the participant was uncomfortable, clarification on the procedure was made and any questions she had were answered. All those who did not consent for the test were excluded. After receiving informed consent, the phlebotomist put on a fresh pair of disposable latex gloves, warmed the participant's fingertip, cleaned it with alcohol swabs and punctured with a lancet. The

first two drops of blood were discarded; the microcuvette was then filled with a single drop of blood. The filled microcuvette would be placed into the HemoCue microcuvette holder immediately, within one to three minutes of taking the sample. The haemoglobin value would appear on the display which would then be recorded. All waste materials and sharps were segregated and disposed appropriately.

3.6.4.2 Interpretation of haemoglobin results

The WHO anaemia classification was used to interpret the haemoglobin levels. A pregnant woman was considered anaemic if her haemoglobin concentration was lower than 11.0g/dl (110 g/L), at sea level. According to the WHO classification, haemoglobin test levels of 100-109g/l (10-10.9g/dl) indicate mild anaemia, 70-99 g/l (7.0 - 9.9 g/dl) indicate moderate anaemia, less than 70 g/l (7.0g/dl) indicate severe anaemia and less than 40 g/l (4.0g/dl) is life threatening anaemia (Ministry of Public Health and Sanitation, 2008; Mulambah et al, 2014; World Health Organization, 2012a).

3.6.5 Estimation of Folate Levels

Folate levels were estimated from the blood plasma/serum. Serum folate was determined early in the morning to get the fasting concentrations that are a better indicator of short-term folate status. Non-fasting specimens yield falsely elevated results and patients taking folate may have misleading results. Quality control measures were maintained throughout the entire process of specimen collection, transportation to the laboratory, specimen processing and analysis or assaying, as clearly outlined in the next session.

3.6.5.1 Specimen collection procedure and handling

The sample collection procedure was as follows: first the procedure was explained to each participant. If the participant was uncomfortable, clarification on the procedure was made and any questions she had were answered. All those who did not consent for the test were excluded. After receiving informed consent, the phlebotomist put on a fresh pair of disposable latex gloves, cleaned the participant's upper surface of the elbow with alcohol and punctured with a needle and syringe that was used to draw 1 milliliter of venous blood. The collected venous blood was put in a vacutainer containing gel then left to stand to allow the cells to settle down and separate from the liquid portion of blood. Folate is light sensitive so exposure to light was minimized during sample handling and storage by use of an amber tube or wrapping with foil paper.

The plasma was then emptied into smaller vacutainers. Alternatively, a centrifuge was used to separate the blood cells from the plasma. The samples were then put in a cool box to maintain their potency and transported to Kenyatta National Hospital (KNH) biochemistry laboratory number 16 where the testing was done using Immunoassay (IA) – Cobas 6000 (Automated analyzer) by one of their competent laboratory technicians. In case of hemolysis, the sample would be rejected. The folate values were then read and recorded. All waste materials including remaining sample content and sharps were segregated and disposed of appropriately.

3.6.5.2 Interpretation of results for estimation of folate Levels

Serum folate is a non-specific test and patients taking folate may have misleading results. However, it is a sensitive indicator of recent dietary folate intake and fasting concentrations are a better indicator of short-term status. The normal serum folate level is above 5.4 µg/ml. Serum levels of less than 5µg/ml are an early sign of deficiency whereby 3.4-5.4 µg/ml is borderline and

less than 3.4 µg/ml is low [(Barry Shane, 2011) and KNH Biochemistry Lab 16]. Different units were used by the KNH Biochemistry Lab 16 machine whose automated normal values were 12.9 to 40.0 ng/ml.

3.6.6 Recruitment and Training of Research Assistants

A total of five research assistants with a background in health training, specifically degree nurses, nutritionists and laboratory technicians, were recruited to assist in conducting the study. A training programme was developed for training the research assistants (Appendix XII). The researcher trained them on data collection methods, interviewing skills, ethics in research conduct and how to effectively relate with respondents. They were also trained on the data collection tools and how to ask questions in the various tools in a manner that the respondents could understand without posing any bias. They assisted in training CHVs and provided supportive supervision to them.

3.6.7 Pretesting of Data Collection Tools

The research instruments were pre-tested on a sample size of 30 (above 10% of sample size) in Kiambu level V hospital, to help in making required modifications to improve them. The pre-testing exercise also gave the research assistants an opportunity to practice on how to collect data before the actual study, to perfect their data collection techniques. Data collected was analyzed and used to improve the research tools.

3.7 Data Quality Assurance and Control Procedures

3.7.1 Data Collection and Analysis Controls

The research instruments were pre-tested before the actual research study was carried out to improve their quality and ensure they were able to test what was intended. Research assistants

were trained before the pre-testing using the training programme developed by researcher to ensure all aspects of ethical conduct of research were covered including quality data collection and management. The researcher supported the research assistants and supervised them closely to ensure data collected was of high quality by adhering to data collection procedures, sampling procedures and research ethics, such as; proper administration of informed consent and proper recording according to the approved protocols.

The research assistants had been trained on filling out the questionnaires correctly to enhance accuracy, validity and reliability. They checked each questionnaire for completeness before releasing the participant. The researcher checked the questionnaires daily for omissions and possible erroneous entries to ensure that each question was answered clearly and was correctly recorded. Data was then carefully entered into the computer and cleaned. The hard copies of the questionnaires were kept under lock and key whereas the soft copy was password protected and backed up regularly. Statistical checks for errors were done by examining frequency distribution on all variables for any items that were not logical.

3.7.2 Mitigating Hawthorne Effect during Counselling Session Observation

Observation checklists were filled by the researcher. To control for Hawthorne effect, discretion was applied whereby the researcher did not out-rightly inform the nurse that she was being observed but rather objectively recorded details of the counselling session on a notebook then objectively filled the checklist immediately after stepping out of the antenatal room.

3.7.3 Laboratory Data Quality Control

Quality control measures were maintained throughout the entire process of specimen collection, transportation to the laboratory, specimen processing and analysis or assaying.

3.7.3.1 External laboratory quality control

The sample collection procedure was first explained to each participant as per the informed consent sheet, consent given, and consent form signed in two copies, one copy for the respondent and the other copy kept by the researcher. Blood collection was done aseptically and specimens were handled using universal precautions as follows: The specimens were only handled by qualified laboratory technicians; the folate specimens were only handled by qualified laboratory technicians working in KNH biochemistry laboratory 16; all samples were accurately labelled using coded stickers with assigned participant number. Folate is light sensitive so exposure to light was minimized during sample handling and storage by use of an amber tube and wrapping with foil paper. Transfer of samples was done in a temperature maintained cool box. The samples were put in a cool box consisting of pre-cooled icepacks to maintain their potency and transported to KNH biochemistry laboratory 16 where the testing was done within 24 hours. To control for validity of the results, a random sample was picked and tested in an independently run laboratory to ensure it gave the same results.

3.7.3.2 Internal laboratory quality control

Internally, good laboratory practice was observed, and manufacturers' protocols followed. Aseptic technique was observed to avoid contamination of samples. They were carefully handled, dealing with one stock sample at a time, to avoid mixing the specimens. Since they were transported in a cool box, on arrival in the laboratory, they were kept under refrigeration to avoid drastic temperature changes. Towing was minimized. Careful analysis was done using ImmunoAssay (IA) – Cobas 6000 machine, which is an automated analyzer, by a qualified competent laboratory technician, within 24 hours. The machine was first calibrated for accuracy according to manufacturers' protocols. To ensure daily internal quality control, double checking

of the results was done by running samples alongside the controls. The controls were run every day alongside the tests as a measure of guaranteeing confidence in the results. The control materials are commercially available from the same equipment supplier. In case of haemolysis, the sample was rejected. The folate values were then read from the automated analyzer and recorded.

3.8 Data Management and Analysis

3.8.1. Quantitative Data Management and Analysis Procedures

In order to examine effectiveness of the intervention, baseline and endline surveys were conducted in both study groups, using the same questionnaire. To ensure adherence to optimal data quality standards, there was close supervision of the research assistants by the researcher. The research assistants were trained on correct use of the research instruments and consenting to enhance accuracy, validity and reliability.

Quantitative data at both baseline and endline was coded after collection then entered into the computer, cleaned and validated using Statistical Package for Social Sciences (SPSS) statistical software version 22. Data entry was done during the study to minimize errors. It was then exported to STATA version 14 for analysis. To ensure confidentiality, the computer access was restricted by password protection. Each questionnaire had a unique identifier to allow validation. Data cleaning and validation was done prior to analysis.

Descriptive statistics, including univariate analysis: simple proportions, n (%), for categorical variables and mean with standard deviation for continuous variables, were reported at baseline and endline. Characteristics of respondents were also described in both intervention and control groups. To ensure the change caused by the intervention was not by chance, the allocation into the intervention and control group was random and baseline characteristics were similar in both

groups. Homogeneity of study groups at baseline was determined to compare socio-demographic characteristics of both groups. Bivariate analysis, using the chi-square test, was done for comparison between groups. Multivariate analysis was used to control for confounders.

The analysis of effect of the intervention was done using a Difference-In-Difference (DID) regression model to compare outcomes between intervention and control groups before (baseline) and after (endline) the intervention. The changes in the dependent variables in the intervention group (from baseline to endline) were compared to changes in the control group (from baseline to endline) as shown in the table 1 below (Kothari & Garg, 2014b). The intervention effect was measured by odds ratio and 95% confidence level of the interaction term between study groups (intervention and control) and period of survey (baseline and endline) in the multiple logistic regression model. A p-value of 0.05 was considered statistically significant. Since the same respondents who participated in the baseline are the same who participated in the end term evaluation, the analysis considered using a paired analysis with repeated measures instead of treating the respondents in baseline and endline as independent groups.

All results are presented graphically in frequencies, percentages and summary statistics.

Table 1: Intervention Effect Formula

	Baseline		Endline
Intervention group	Level of phenomenon before intervention (X)	Intervention introduced →	Level of phenomenon after intervention (Y)
Control group	Level of phenomenon without intervention (A)		Level of phenomenon without intervention (Z)
Intervention Effect = (Y-X) – (Z-A)			

Source: Kothari and Garg, 2014 pg 41

3.8.2 Determination of Respondents' Level of Knowledge

To assess the level of knowledge about IFAS during pregnancy, respondents were asked 8 questions, some of which had multiple answers, on: benefits of IFAS, frequency of use of IFAS, duration of taking IFAS, side effects, management of side-effects, effect of iron/folate deficiency, signs and symptoms of anaemia, and food sources for iron during pregnancy. Women who reported not to have heard of IFAS were only excluded in the questions referring to IFAS but were included in the last 3 questions. A correct answer for each item was scored as "1" and incorrect answer scored as "0". A summation of all the scores for each participant was done. Based on references from other studies (Ahamed, 2018; Getachew et al, 2018), those Those who scored above the average value (50%) were considered as somehow knowledgeable and those who scored below the average value were considered as less knowledgeable.

3.8.3 Determination of Respondents' Attitude

The respondents' attitude towards IFAS was assessed on 15 Likert scale items. A correct answer for each item was scored as "5" and incorrect answer scored as "1". The scores for each participant were summed up. Using references from other studies (Ahamed, 2018; Mahmoud, 2007) and in consideration of majority score, a respondent was considered to have a positive attitude if they scored 70% and above and a negative attitude if they scored less than 70% . Women who reported not to have heard of IFAS were excluded in the assessment of attitude.

3.8.4 Determination of Respondents' Compliance Levels

The compliance with IFAS was assessed based on the reported number of IFAS tablets taken in the preceding one week (seven days) before the interview. The IFAS compliance status was

defined as the number of IFAS tablets taken in the preceding seven (7) days. Pregnant women who took at least 70% of the expected dose of the IFAS tablets in the week preceding the interview, an equivalent of five tablets per week, were considered compliant with IFAS (Dinga, 2013; Sadore et al, 2015). Conversely the respondents who took less than 30% of the expected IFAS dose, an equivalent of less than five IFAS tablets, were considered non-compliant. Women who reported not to be taking IFAS in the current pregnancy due to the ANC visit being the first were excluded in the assessment of compliance since majority of the women get IFAS during an ANC visit.

3.8.5. Qualitative Data Management and Analysis Procedures

Thematic analysis was used for qualitative data using *NVIVO version 10* statistical software. Qualitative data was audio recorded during collection. A field diary was kept for back-up and to document happenings and write reflective notes that would inform final analysis and data interpretation. Audio recorded data from the KII, IDIs and FGDs were transcribed verbatim and translated into English (where applicable) by the researcher and one research assistant. Each transcript was labelled with the date and place of interview and interviewee code. The transcripts were typed using Microsoft Word.

The researcher imported typed word documents into NVIVO 10 statistical software which was used to organize and analyze qualitative data. Theoretical thematic analysis was done using the six-step framework by Braun and Clarke (2013) as also outlined by Maguire and Delahunt (2017). The first step was familiarization with the data which involved reading and re-reading transcripts, listening to audio-recorded data and writing down the initial impressions. The second step was generating initial codes through open coding. The first two transcripts were used to develop as many codes as possible. These codes were then modified into higher-order codes as more

transcripts were read and re-read. The third step was searching for themes which involved examining the codes to identify and organize those fitting together into preliminary broader themes. The fourth step was reviewing the themes and involved modifying and developing preliminary themes further to make appropriate changes to ensure each theme was distinct. Higher order codes were grouped into sub-themes then organized into relevant overarching themes that best capture the content of the sub-themes and codes that built them. The fifth step was defining and naming the themes followed by the sixth step of writing up the final report where the findings were summarized according to the themes identified. The summary was then described in detail and representative quotations presented in the results for each theme that emerged (Clarke & Braun, 2013; Maguire & Delahunt, 2017).

3.9 Ethical Considerations

Approval for scientific and ethical issues was sought and granted by Kenyatta National hospital/University of Nairobi Ethics and Research Committee (KNH-ERC/A/90 protocol number – P706/11/2015). Research permit for the study was obtained from the National Commission for Science, Technology and Innovation (NACOSTI/P/18/81499/22319).

Respondents were fully protected from any form of harm. Emphasis on issues of confidentiality and privacy were made clear at the time of consenting to participate in the study. No name appeared on the questionnaires so no participant identification with information could occur. The purpose of study was made clear to respondents who were required to give informed consent prior to their voluntary participation in the study. Respondents were at liberty to discontinue from the study at any time without facing any adverse consequences. The under-age gave assent if they agreed to take part in this study and their significant other (husband or mother) who have attained 18 years gave an informed consent on their behalf. Information was kept confidential by restricted access

and coding of questionnaires. Authority to conduct the study was sought from Kiambu County, Lari Sub-county authorities and all the five health facilities involved. Specific client feedback for the laboratory tests was given immediately after results to the respondents. The study findings will be shared with the hospital authorities.

3.10 Assumptions of the Study

The study was carried out based on the following assumptions;

1. The population of pregnant women was homogeneous since all reside in the same County.
2. The pregnant women were assumed to be honest in answering the questionnaire.
3. That the different CHVs passed the same IFAS information to all the pregnant women.

3.11 Dissemination of the Study Findings

The preliminary baseline findings were shared with Lari Sub-County health management team and health facilities where the study was conducted. The researcher intends to share the final research findings with the County and Sub-County leadership as well the health facilities where the study was conducted.

The research findings will be shared with stakeholders including the Ministry of Health especially the Division of Nutrition where the IFAS programme is based. In addition, the final research findings will be shared with Kenyatta National hospital/University of Nairobi Ethics and Research Committee who provided ethical approval to conduct the study, and the National Commission for Science, Technology and Innovation from whom the research permit for the study was obtained. The findings have also been and will continually be disseminated through local and international conferences and publications in peer reviewed journals.

3.12 Study Limitations and Delimitations

The study had several limitations which were mitigated as indicated below:

1. The study was not randomized. The intervention was community-based, using the natural setting and did not modify the environment of the respondents. The effect of this limitation was minimized by use of a control group. This avoids extraneous variation resulting both from passage of time and from non-comparability of the test and control areas. In addition, due to the low turn-out of antenatal clients in the Sub-County, consecutive sampling was used to include all accessible pregnant women as part of the sample.
2. The nature of the study design; being an intervention study involving following up the clients over a period of time, there would be loss to follow-up affecting the statistical significance of the study. This was minimized by increasing the sample size by the estimated rate of loss to follow-up of 30%.
3. High loss to follow-up. This was the biggest challenge that this study experienced. There was a high rate of loss to follow-up from 340 at baseline to 189 at endline mainly because of the extended industrial action (strikes) among all cadres of public health workers during the study period, but more so among the doctors and nurses. The industrial action meant absence of many essential services in these public health facilities that led to a migration of many clients from the public health facilities, where the study was based, to private or mission health facilities. This high loss to follow-up probably adversely affected the statistical significance of the study due to the reduced sample at endline. As indicated by Thiese et al, 2016, the traditional level of significance, $P < 0.05$, can be negatively impacted by small sample size. This limitation was mitigated by using the respondents' contact/locator form to trace as many as possible at home. However, it was more difficult to trace those in the control group because they were not being followed at home on a regular basis.

4. Training of HCPs. Both the HCPs and CHVs were trained instead of CHVs alone, potentially introducing confounding of the effect. This could not be avoided because CHVs needed to refer clients for other antenatal care services and were being supervised and issued with IFAS tablets by the nurses, who therefore needed to be trained as well.
5. High cost of folate tests. The cost of estimation of folate levels was too high yet the test is relatively non-specific, in that patients taking folate may have misleading results, making it difficult to do the test for all the study respondents hence a sub-sample was chosen for estimation of folate levels.
6. Recall bias and subjectivity because the study greatly relied on verbal reports from the interviewees. This challenge was circumvented through training of interviewers as well as double questioning to identify any inconsistencies in the interview reports. Generalizations of the study findings to other areas with different socio-demographic characteristics may be difficult since the study is restricted to one Sub-County.
7. Haemoglobin concentration was not adjusted for the high altitude of the study site. Residents of high-altitude areas usually have a high haemoglobin concentration than low altitude areas as a compensatory mechanism due to the lower oxygen concentration in the high altitude areas. This could have contributed to the low prevalence of anaemia in this study in addition to the fact that the study area is an agricultural zone with plenty of green leafy vegetables. However, WHO indicates that this adjustment can lead to misclassification of anaemia and needs to be validated with the clinical outcome (Gonzales et al, 2018) hence adjustment was not done.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents the results from data collected during the study involving implementation of a community-based approach of IFAS among pregnant women. The presentation of results in this chapter begins with socio-demographic characteristics of the study respondents followed by findings of utilization of IFAS policy guidelines documents by health care providers (HCPs). This is followed by presentation of results on the effect of community-based approach of IFAS on maternal: knowledge, attitude and compliance, a description of nutritional status before and after intervention and finally a qualitative description of the experiences of health care providers, community health volunteers and pregnant women participating in the community-based approach of IFAS.

4.1 Socio-Demographic Characteristics of Study Respondents

A total of 340 pregnant women participated in the study during the baseline, of these 189 (56%) participated during the endline. The socio-demographic characteristics of respondents at baseline according to study group are shown in table 2. Most (n=212, 62%) respondents were 20-29 years of age, with mean age of 25.6 (SD \pm 5.6). Most (n=288, 85%) of them were married, had a secondary level of education (n=180, 53%), unemployed (n=167, 49%), and earned less than KSh. 10,000 per month (n=305, 93%). Whereas only 6% (n=20) had attained tertiary level of education, only 3% (n=10) were formally employed. In terms of gravidity, most (n=223, 68%) of the women were multigravida. There was no statistical difference ($p>0.05$) in the characteristics of the women at baseline between the two comparison groups, so they all started at the same level.

Table 2: Socio-demographic characteristics of study respondents at baseline by group

Variable	Total (Col %) N=340	Hospital (Row %) N=218	Community (Row %) N=122	Chi-square p-value
Age of pregnant woman in years				
Less than 20 years	43 (12.6)	27 (62.8)	16 (37.2)	0.899
20-29 years	212 (62.4)	138 (65.1)	74 (34.9)	
30 years and above	85 (25)	53 (62.4)	32 (37.6)	
Mean age (std)	25.6 (5.6)	25.6 (5.9)	25.7 (5.7)	
Marital status				
Married	288 (84.7)	183 (63.5)	105 (36.5)	0.32
Single	51 (15)	35 (68.6)	16 (31.4)	
Education level				
Primary	137 (40.7)	89 (65)	48 (35)	0.467
Secondary	180 (53.4)	111 (61.7)	69 (38.3)	
Tertiary	20 (5.9)	15 (75)	5 (25)	
Occupation of pregnant woman				
Unemployed	167 (49.1)	108 (64.7)	59 (35.3)	0.978
Casual employment	77 (22.6)	49 (63.6)	28 (36.4)	
Self-employed/Employed	96 (28.2)	61 (63.5)	35 (36.5)	
Average income per month in Kshs				
Less than 10,000	305 (93)	194 (63.6)	111 (36.4)	0.274
10,000 and above	23 (7)	12 (52.2)	11 (47.8)	
Parity				
0	111 (33)	74 (66.7)	37 (33.3)	0.106
1	92 (27.4)	53 (57.6)	39 (42.4)	
2	80 (23.8)	50 (62.5)	30 (37.5)	
2 and above	53 (15.8)	41 (77.4)	12 (22.6)	
Gravidity				
Primigravida	107 (32.4)	74 (69.2)	33 (30.8)	0.171
Multigravida	223 (67.6)	137 (61.4)	86 (38.6)	
Religion of pregnant woman				
Protestant Christian	283 (83.5)	179 (63.3)	104 (36.7)	0.512
Catholic Christian	56 (16.5)	38 (67.9)	18 (32.1)	

4.2 Availability and Utilization of IFAS Guidelines by Health Care Providers

A checklist was used for observation and desk review, that is, checking physical presence of available IFAS documents in the five health facilities where the study was conducted. The IFAS policy documents included: job aids for example counselling guides; policy guidelines documents; protocol documents; IEC materials like brochures; and mothers' record calendars for recording IFAS tablets taken.

4.2.1 Availability of IFAS Policy Guideline Documents at Health Facilities

The 5 (100%) health facilities displayed different posters with information about IFAS at different health services delivery points. Among them, only 2 (40%) displayed the national policy guidelines of IFAS, while none had IFAS counselling guides, IFAS calendars or brochures/leaflets. Thus most IFAS policy documents were not available in health facilities.

4.2.2 Practices and Content of Counselling Session on IFAS

To determine the level of utilization of IFAS policy documents, a checklist was used for observation of a provider-client interaction during an antenatal counselling session in each of the five health facilities. The overall level was then calculated by summing up the totals from the five health facilities and determining the average. The checklist was also used to record information on IFAS programme implementation and service delivery practices. The specific items observed are indicated in figure 8.

Observation of the counselling session revealed that health care providers administered IFAS services to all pregnant women, irrespective of their Hb levels, in all (100%) health facilities. However, counselling on the side-effects of IFAS and their management was only done in 20% (n=1, out of 5) of the health facilities. Furthermore, evaluation on the comprehension of the counselling content by clients was only done in 20% (n=1) of the health facilities. Despite the

universal provision of IFAS to all antenatal women, they were not given information on the causes, signs/symptoms and consequences of anaemia in any of the health facilities. In addition, the counselling session did not cover information about the increased nutritional requirement during pregnancy and enhancers/inhibitors of iron/folate absorption, in any of the health facilities (figure 8). A summation of total scores for each health facility divided by number of health facilities, found the level of utilization of IFAS policy documents as average at 55%.

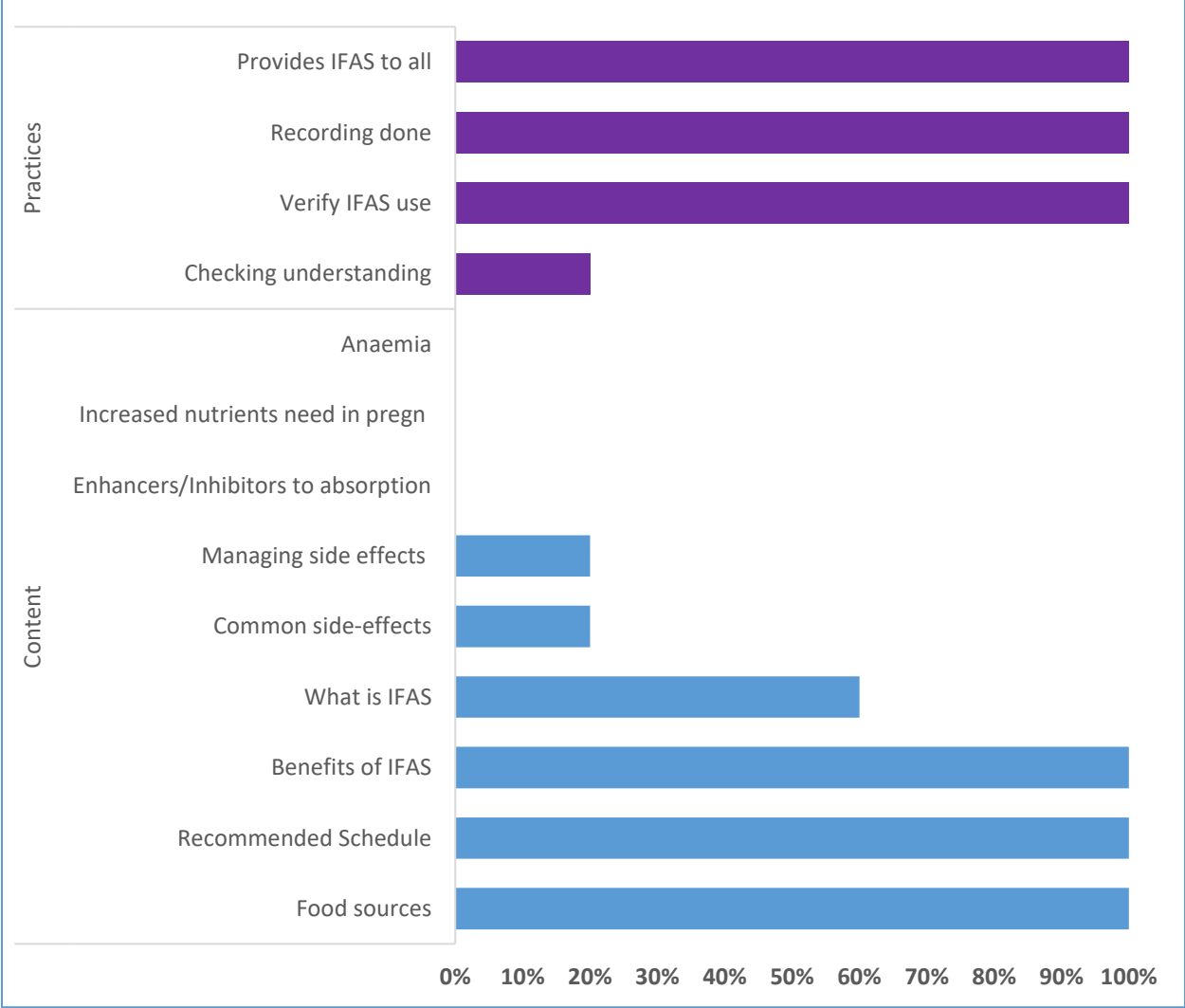


Figure 8: Practices and content of counselling session on IFAS in health facilities

4.3 Effect of Community-based Approach on Maternal Knowledge towards IFAS

4.3.1 Level of Knowledge on IFAS among Pregnant Women

The respondents' level of knowledge was classified as either high if the score was above 50% or low if the score was below 50%, following computation of the percentage scores.

Figure 9 shows a comparison between baseline and endline levels of maternal knowledge on IFAS for both hospital (control group) and community (intervention group) study groups. Both HCPs and CHVs were trained on IFAS programme. Overall, there was an increase in the level of knowledge in both groups. The improvement was higher (34%) in the intervention group (from 57.4% to 91.7%) compared to 21% (from 63.4% to 84.6%) in the control group. The intervention had a net effect of 13% (34%-21%) improvement in IFAS knowledge level. However, it did not yield statistical difference since the Difference-In Difference (DID) between the two groups is 0.13 and the Confidence Interval (CI) contains 0 (95%CI: -0.01, 0.27).

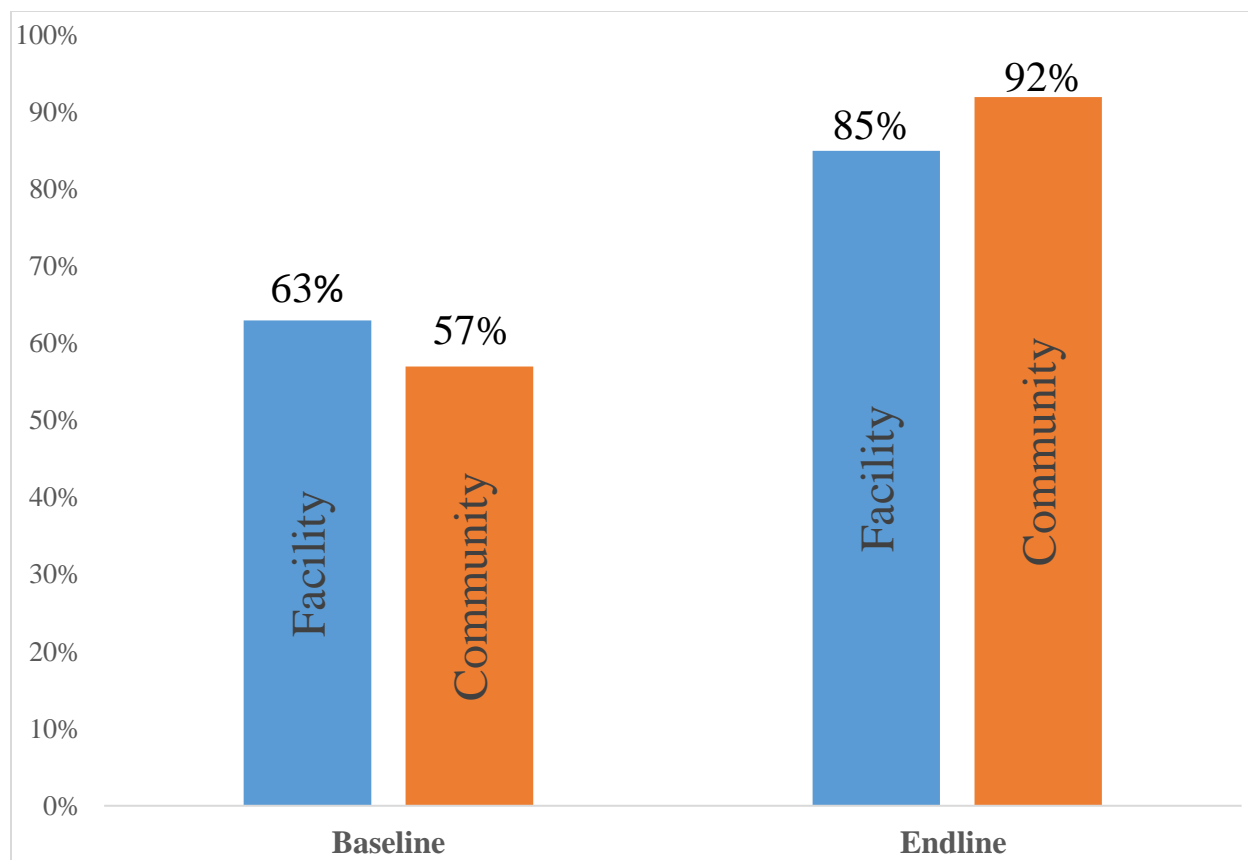


Figure 9: Maternal IFAS knowledge during study period

4.3.2 Factors Associated with Maternal Knowledge on IFAS

Results of logistic regression to assess the effect of the intervention and other potential factors on maternal IFAS knowledge are shown in table 3. There was a highly significant ($p=0.000$) change in levels of IFAS knowledge between the two time points: the odds of being knowledgeable at endline was 3 times that at baseline ($OR=3.1;95\%CI\ 1.7-5.6$) adjusting for other factors. Employment status significantly influenced maternal knowledge, with casuals ($p=0.02$) and the employed ($p=0.057$) being more likely than unemployed to be knowledgeable, adjusting for other sociodemographic factors. However, the effect of the intervention did not yield statistical difference between the two groups on maternal knowledge on IFAS.

Table 3: Factors associated with maternal knowledge on IFAS

Variable	Odds Ratio	P-value	[95% Confidence Interval]	
Community vs. hospital	0.819	0.423	0.503	1.335
Endline vs. Baseline	3.109	0.000*	1.713	5.643
Interaction (group, time)**	2.718	0.075	0.904	8.169
Age				
20-29 years vs. <20 years	1.733	0.116	0.872	3.443
> 30 years vs. <20 years	1.523	0.359	0.620	3.742
Level of education				
Secondary vs. Primary	1.140	0.591	0.706	1.842
Tertiary vs. Primary	1.093	0.849	0.437	2.731
Occupation				
Casual vs. Unemployed	0.523	0.020*	0.303	0.905
Employed vs. Unemployed	0.607	0.057*	0.363	1.016
Marital Status				
Single vs. Married	1.024	0.942	0.537	1.954
Income in Kshs				
>10,000 vs. <10,000	1.714	0.237	0.701	4.192
Parity				
1 vs. 0	0.640	0.401	0.226	1.815
2 vs. 0	1.312	0.644	0.414	4.152
3 vs. 0	1.240	0.735	0.358	4.291
Gravidity				
Multigravida vs. Primigravida	1.194	0.726	0.443	3.216
Religion				
Catholic vs. Protestant	1.355	0.313	0.751	2.444

*Significant p-value at 0.05, ** DID

4.3.3 Sources of IFAS Information among Study Respondents

Generally, there was great improvement (from 67.3% at baseline to 99.6% at endline) in the proportion of respondents who had heard of IFAS. The proportion of respondents who obtained information from brochures/leaflets improved most during the study period, followed by those who obtained information from CHVs, more so, in the intervention group (11%-33.3%) as shown in figure 10.

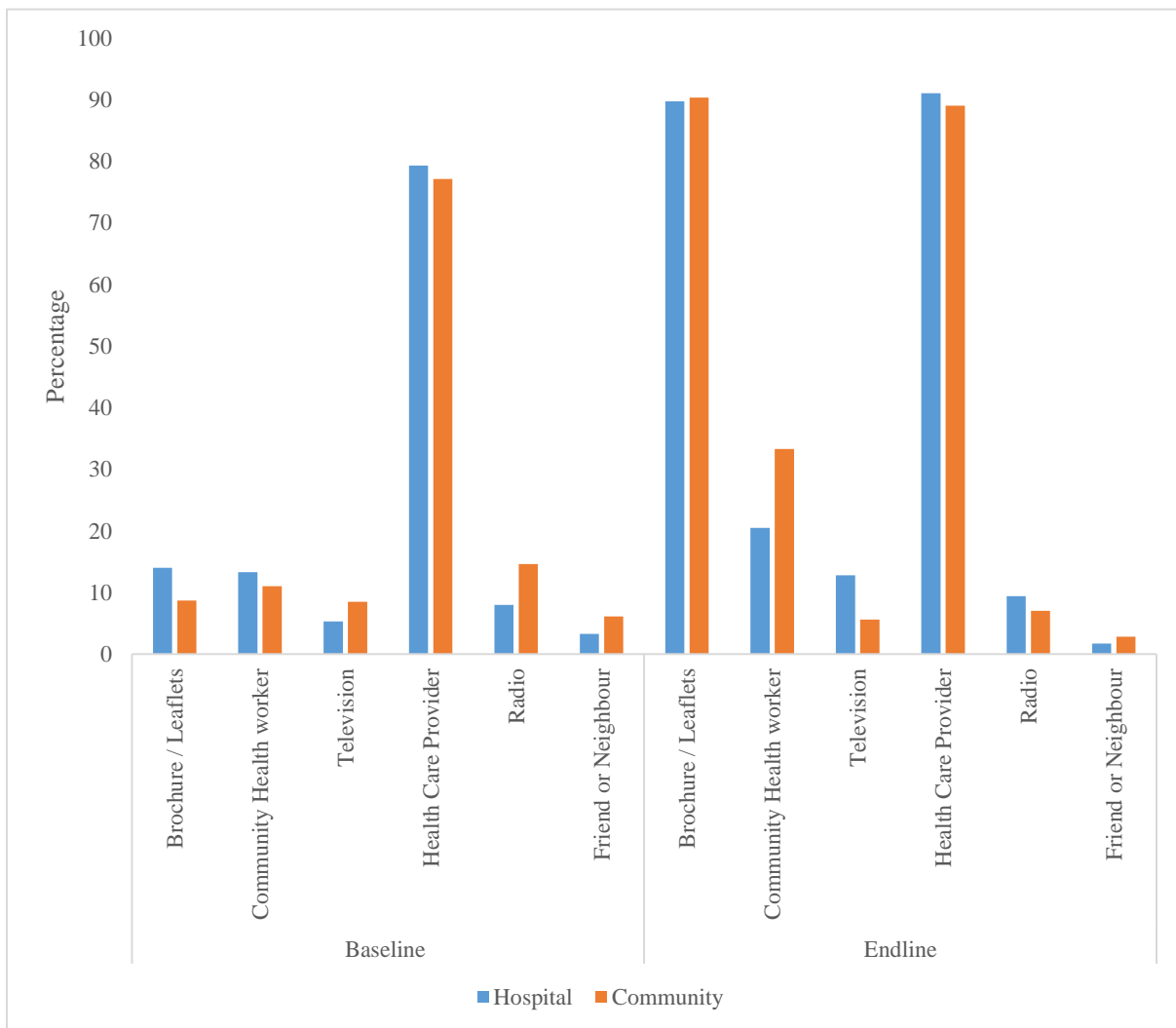


Figure 10: Sources of IFAS information among pregnant women

4.3.4 Components of Counselling during Issue of IFAS Tablets in Antenatal Room

During the study period, there was a general improvement in the proportion of pregnant women counselled on various components of IFAS during their issuance in ANC room, as shown in figure 11.

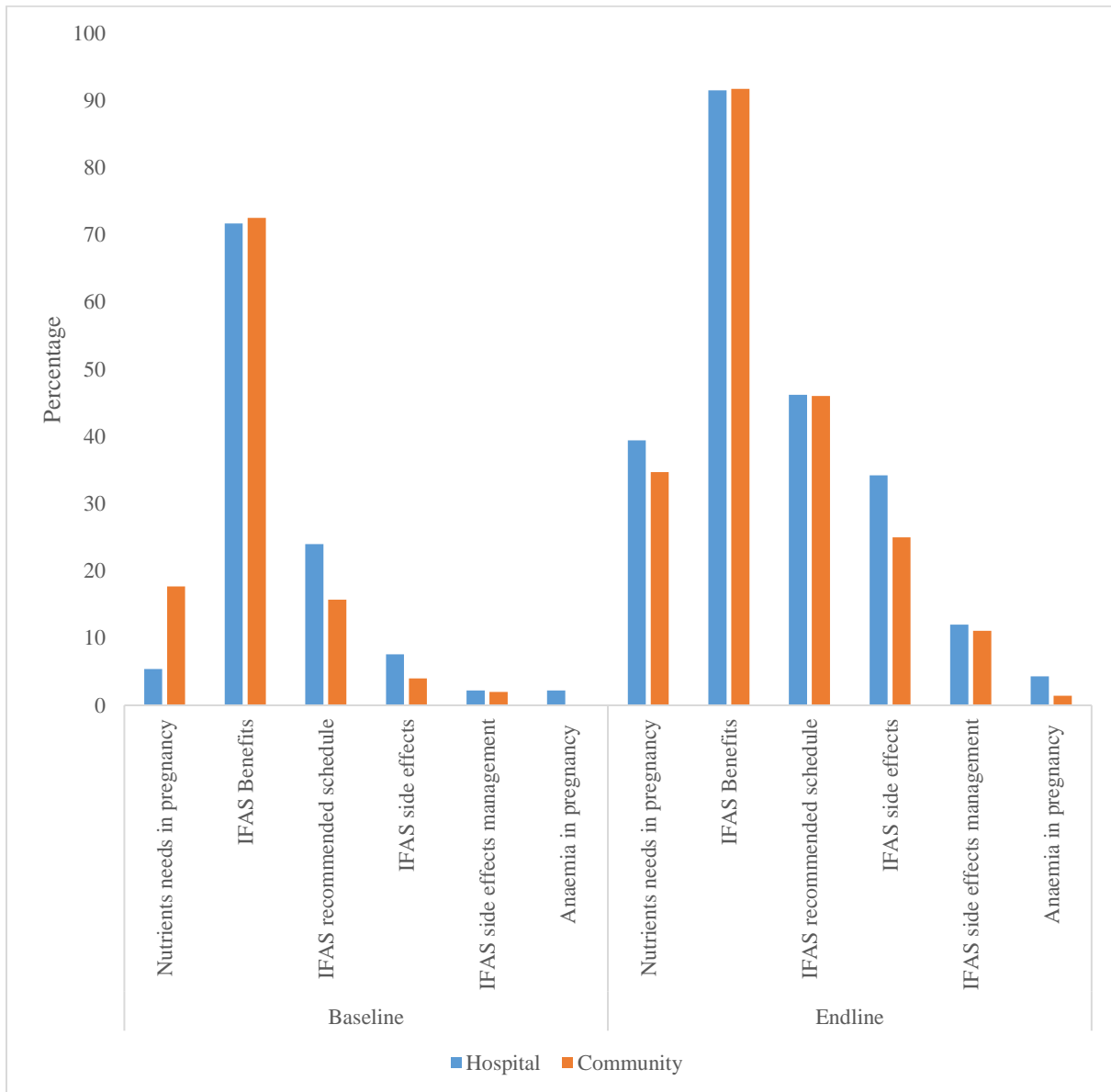


Figure 11: Advice provided during counselling and issue of IFAS in ANC room

4.4 Effect of Community-based Approach on Maternal Attitude towards IFAS

4.4.1 Attitude of Pregnant Women towards IFAS

Figure 12 shows the results comparing maternal attitude towards IFAS between baseline and endline for each study group. There was an increase in the proportion of pregnant women who had a positive attitude towards IFAS in both groups at endline. The increase was higher at 26% (from 67% to 93%) in the intervention group compared to 20% (from 75% to 95%) in the control group. The intervention showed a net effect of 6% (26%-20%) increase in positive attitude. However, it did not yield statistical difference since the DID between the two groups is 0.06 and the CI contains 0 (95%CI: -0.09, 0.20).

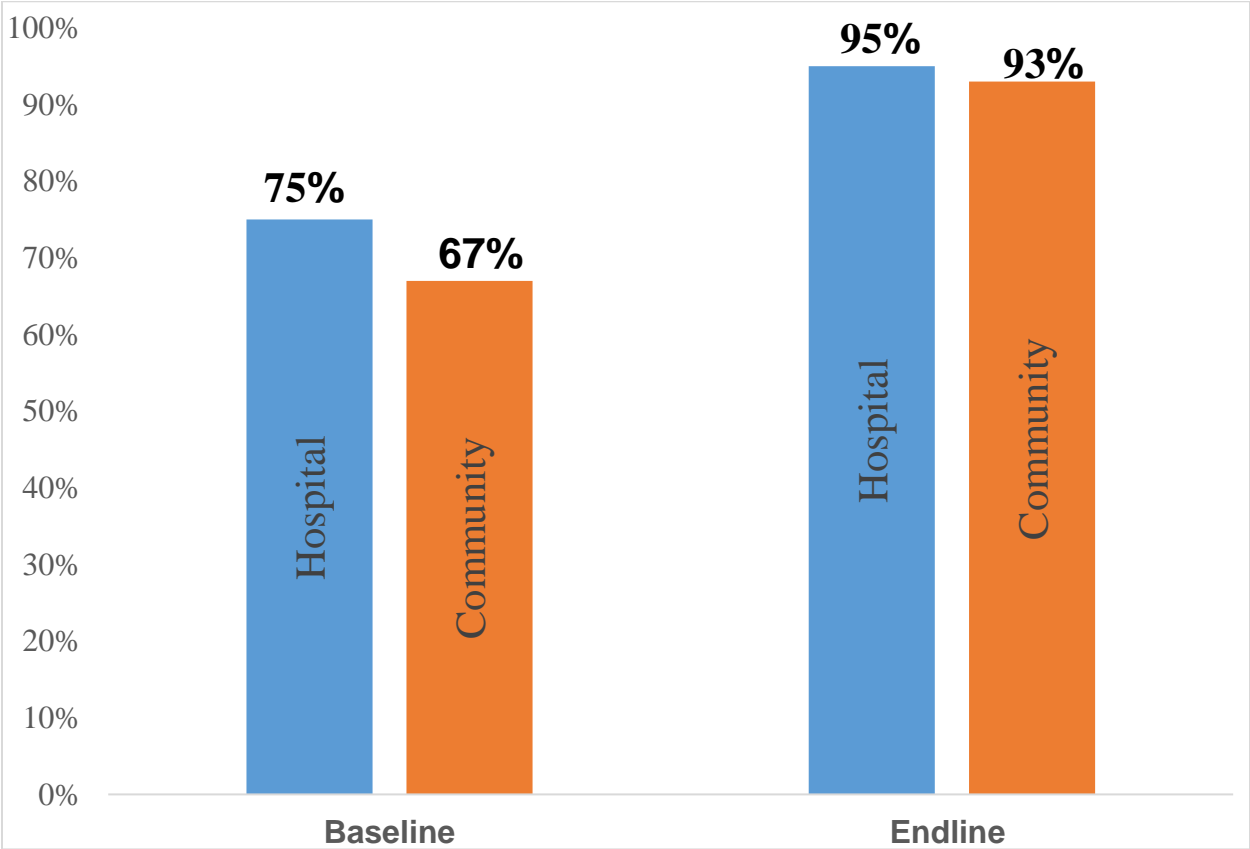


Figure 12: Maternal attitude towards IFAS during study period

4.4.2 Factors Associated with Positive Maternal Attitude towards IFAS

Results of logistic regression to assess the effect of the intervention and other potential factors on maternal attitude towards IFAS are shown in table 4. There was a highly significant ($p=0.000$) change in proportion of those who had a positive attitude towards IFAS between the two time points: the odds of having a positive attitude towards IFAS at endline was 9 times that of baseline (OR=9.2: 95%CI 3.1, 27.2) adjusting for other factors. However, the effect of the intervention did not yield statistical difference between the two groups on maternal attitude towards IFAS.

Table 4: Factors associated with positive maternal attitude towards IFAS

Variable	Odds Ratio	P-value	[95% Confidence Interval]	
Community vs. hospital	0.773	0.439	0.403	1.483
Endline vs. Baseline	9.213	0.000*	3.119	27.215
Interaction (group, time)**	0.718	0.679	0.150	3.446
Age group				
20-29 years vs. <20 years	0.801	0.685	0.275	2.335
>= 30 years vs. <20 years	0.930	0.913	0.252	3.436
Highest education level				
Secondary vs. Primary	1.412	0.291	0.744	2.677
Tertiary vs. Primary	1.110	0.863	0.340	3.624
Occupation				
Casual vs. Unemployed	1.347	0.454	0.617	2.938
Employed vs. Unemployed	0.893	0.749	0.446	1.788
Single vs. Married				
0.983	0.973	0.372	2.601	
Income in Kshs				
>10,000 vs. 10,000	1.156	0.788	0.401	3.334
Parity				
1 vs. 0	2.141	0.338	0.450	10.180
2 vs. 0	2.760	0.228	0.529	14.398
3 vs. 0	1.865	0.483	0.327	10.641
Gravidity				
Multigravida vs. Primigravida	0.439	0.287	0.096	1.996
Religion				
Catholic vs. Protestant	0.707	0.381	0.326	1.535

*Significant p-value at 0.05, **DID

4.5 Effect of Community-based Approach on Maternal Compliance with IFAS

4.5.1 Compliance with IFAS among Pregnant Women

In this study, respondents who took at least 70% (5 tablets) of the expected dose of IFAS in the week preceding the interview were considered compliant with IFAS as earlier explained. Figure 13 shows the levels of compliance with IFAS between baseline and endline across the two groups. There was an improvement in compliance with IFAS in both groups at endline. Levels of compliance increased by 8% (from 63.8% to 71.4%) and 6% (from 68.5% to 74.3%) in the intervention and control group, respectively. The intervention had a net effect of 2% (8%-6%) increase in compliance. However, it did not yield statistical difference since the DID between the two groups is 0.02 and the CI contains 0 (95%CI: -0.20, 0.24).

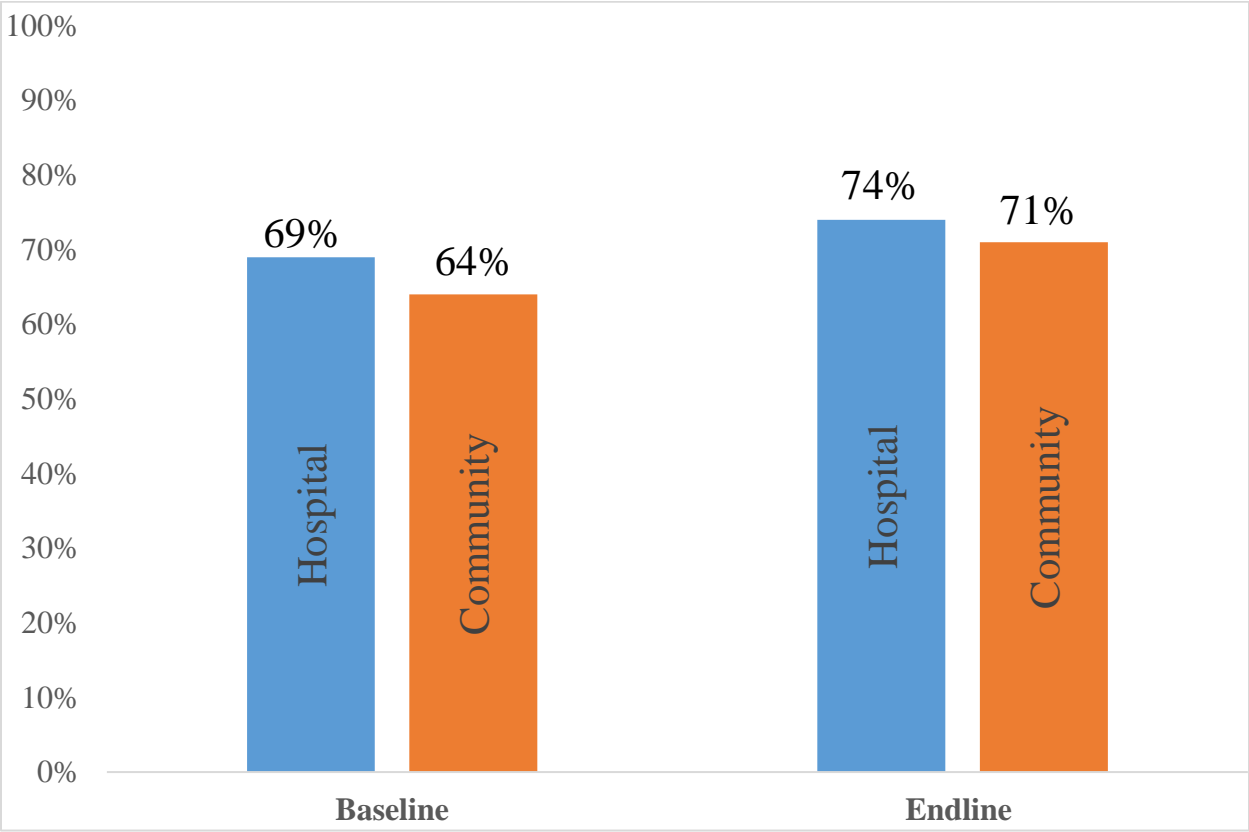


Figure 13: Compliance with IFAS among pregnant women

4.5.2 Factors Associated with Maternal Compliance with IFAS

Results of logistic regression to assess the effect of the intervention and other potential factors on maternal compliance with IFAS are shown in table 5. There was no statistical difference in compliance with IFAS between the two time points and between the intervention and control groups.

Results of a logistic regression to assess the effect of knowledge and attitude on compliance with IFAS are shown in table 6. Even though the findings indicate that both knowledge and attitude did not have a statistical difference on compliance with IFAS, however, the odds ratio for all the variables apart from the study group were above 1, indicating that those with higher levels of

knowledge and positive attitudes were more likely to be compliant than those with lower levels knowledge or negative attitudes. Likewise, respondents were more likely to be compliant at endline than at baseline.

Table 5: Factors associated with maternal compliance with IFAS

Variable	Odds Ratio	P-value	95% Confidence Interval	
Community vs. hospital	0.936	0.873	0.416	2.106
Endline vs. Baseline	1.634	0.172	0.807	3.310
Interaction (group, time)**	0.764	0.635	0.251	2.321
Age group				
20-29 years vs. <20 years	1.121	0.796	0.471	2.665
≥ 30 years vs. <20 years	1.133	0.833	0.354	3.631
Highest education level				
Secondary vs. Primary	0.900	0.736	0.489	1.658
Tertiary vs. Primary	0.680	0.550	0.191	2.413
Occupation				
Casual vs. Unemployed	1.289	0.526	0.588	2.827
Employed vs. Unemployed	0.759	0.402	0.399	1.445
Single vs. Married	1.528	0.388	0.584	4.000
Income in Kshs				
≥10,000 vs. <10,000	1.524	0.412	0.557	4.164
Previous pregnancies				
1 vs. 0	1.424	0.597	0.384	5.280
2 vs. 0	2.140	0.289	0.525	8.729
3 vs. 0	3.320	0.141	0.671	16.424
Multigravida vs. Primigravida	0.371	0.123	0.105	1.310
Catholic vs. Protestant	1.627	0.267	0.689	3.840

**DID

Table 6: Maternal Knowledge and Attitude versus Compliance

Variable	Odds Ratio	P-value	95% Confidence Interval	
Community vs. hospital	0.716	0.401	0.329	1.560
Endline vs. Baseline	1.076	0.831	0.547	2.118
Interaction (group, time)*	1.156	0.787	0.404	3.312
Knowledgeable vs. Not knowledgeable	1.562	0.145	0.857	2.846
Positive vs. Negative attitude	1.331	0.444	0.640	2.766

DID*4.5.3 Side Effects Experienced with IFAS and their Management**

The results in figure 14 shows a comparison between baseline and endline proportions of side-effects experienced by each study group. There was increased awareness of the specific side effects of IFAS in both groups during the study period. In addition, the number of side effects reported was generally way much lower in the intervention group compared to the control group at endline, unlike at baseline where the control group reported more side effects. This depicts there was greater awareness on the management of IFAS side effects in the intervention group than in the control group, as revealed in figure 15. Notably, in the intervention group, there was a greater decrease in the proportion of respondents who stopped taking IFAS (22.6%-9.8%) on experiencing side-effects. Moreover, there was greater change in the practices of managing IFAS side effects such as taking IFAS with meals (6.5%-15.7%) and taking IFAS at bedtime (3.2%-17.7%), in the intervention group compared to the control group.

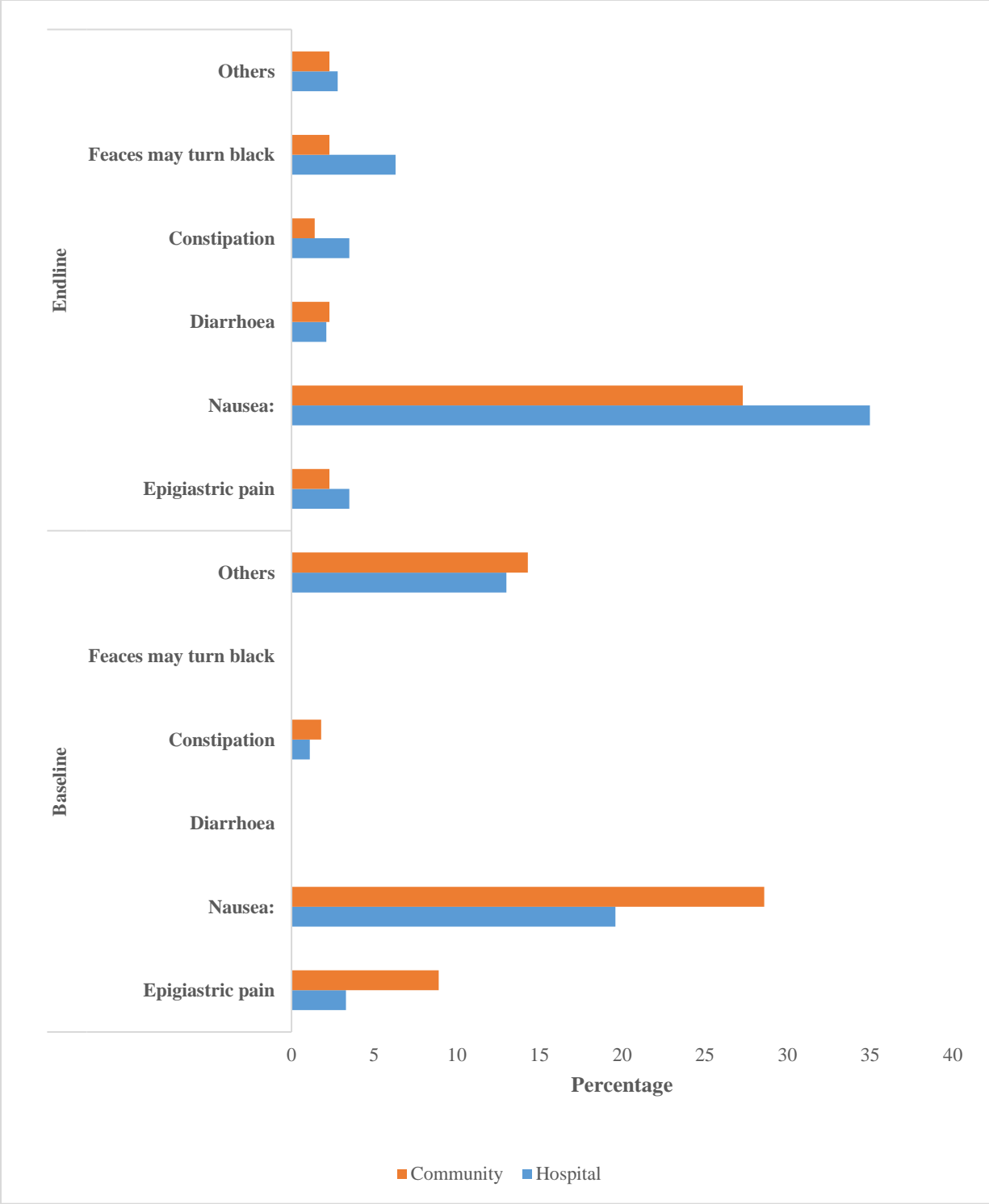


Figure 14: Side effects experienced by pregnant women taking IFAS

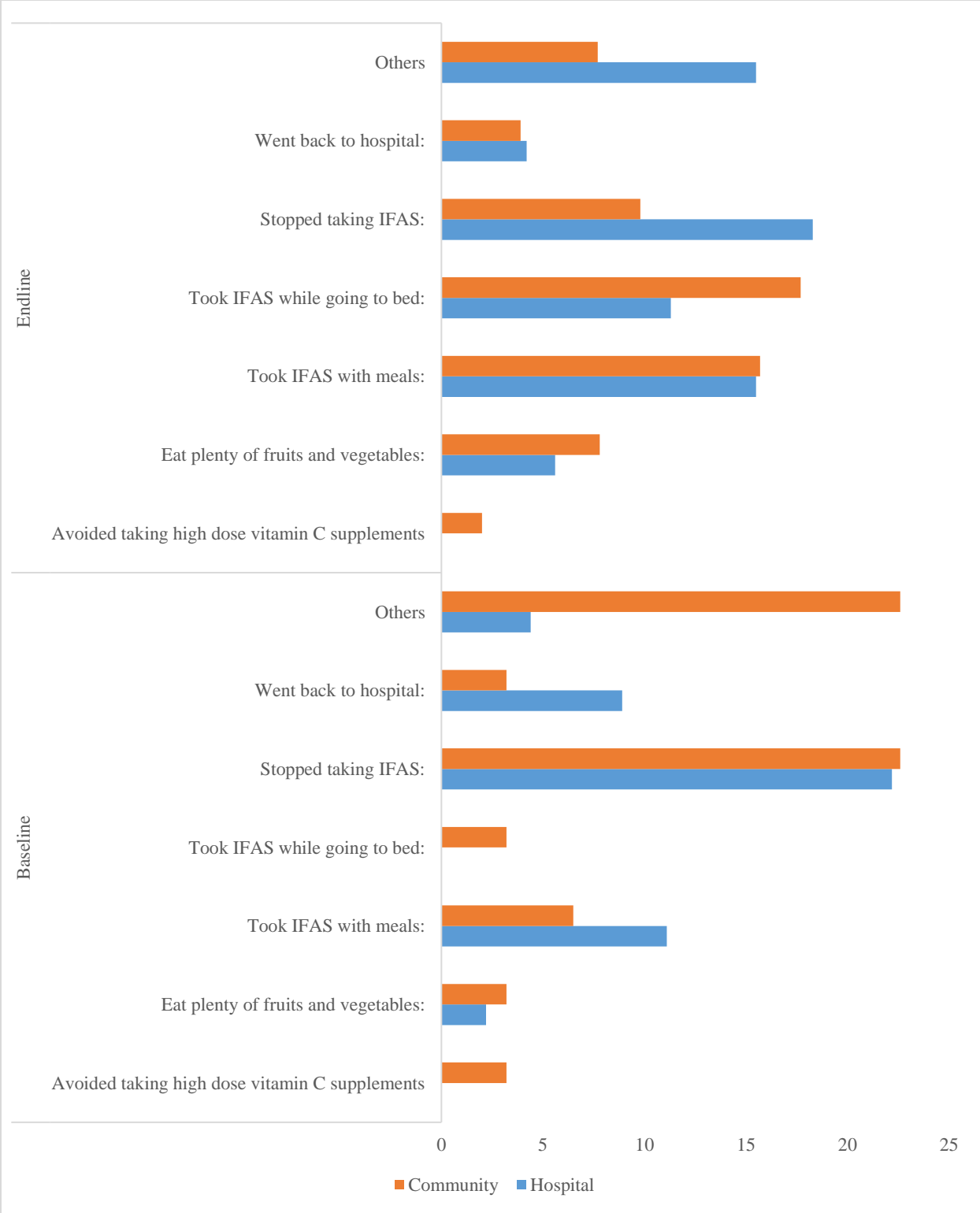


Figure 15: Management of IFAS side effects by pregnant women

4.6 Maternal Nutritional Status and Community-based Approach of IFAS

4.6.1 Food Frequency Intake

Table 7 shows the frequency of intake of specific food sources among pregnant women. Single food sources have been reported rather than food groups to show the change regarding iron and folate food sources. There was an increase in the consumption of readily available food sources like green leafy vegetables, whole grain cereals and legumes during the study period in both groups. However, there was a decrease in the consumption of more costly food sources for example, meat products in both groups. A similar trend was observed from the 24-hour dietary recall (table 8), although with higher increase in the consumption of most food sources.

Table 7: Frequency of consumption of iron/folate food sources among pregnant women

Type of food	Baseline		Endline	
	Hospital	Community	Hospital	Community
	Frequently	Frequently	Frequently	Frequently
Whole grain cereals	75 (34.4)	42 (34.7)	52 (44.4)	31 (43.1)
Eggs	13 (6)	5 (4.1)	9 (7.7)	3 (4.2)
Liver	5 (2.3)	5 (4.1)	2 (1.8)	1 (1.4)
Red meat	14 (6.5)	12 (9.8)	14 (12.1)	4 (5.6)
White meat	11 (5.1)	2 (1.6)	1 (0.9)	0 (0)
Avocado	90 (42.1)	67 (56.8)	35 (30.4)	26 (36.6)
Legumes	21 (9.7)	15 (12.3)	29 (25.2)	13 (18.3)
Nuts	11 (5)	8 (6.6)	10 (8.5)	3 (4.2)
Orange vegetables	127 (58.3)	72 (59)	95 (81.9)	56 (77.8)
Dark green leafy vegetables	126 (58.1)	60 (49.2)	87 (74.4)	58 (80.6)

Table 8: A 24-hour dietary recall by pregnant women

Food Type	Facility		Community	
	Baseline	Endline	Baseline	Endline
Cereals	205 (94)	116 (99.1)	115 (94.3)	68 (94.4)
Root and tubers	149 (68.3)	88 (75.2)	84 (68.9)	51 (70.8)
Legumes and nuts	119 (54.6)	68 (58.1)	64 (52.5)	44 (61.1)
Red meat	49 (22.5)	39 (33.3)	29 (23.8)	19 (26.4)
White meat	13 (6)	4 (3.4)	5 (4.1)	3 (4.2)
Eggs	63 (29)	33 (28.4)	17 (13.9)	19 (26.4)
Milk	193 (88.5)	113 (96.6)	101 (82.8)	70 (97.2)
Green leafy vegetables	161 (74.2)	105 (89.7)	83 (68)	62 (87.3)
Other vegetables	201 (92.2)	116 (99.1)	119 (97.5)	71 (98.6)
Fruits	150 (68.8)	105 (89.7)	85 (70.2)	60 (83.3)
Avocados	77 (35.6)	37 (31.6)	57 (47.9)	19 (27.1)
Oils and fats	205 (94)	116 (99.1)	118 (96.7)	70 (97.2)

4.6.2 Anthropometric Measurements and Antenatal Care Attendance among Respondents

4.6.2.1 Antenatal Care Clinic Attendance among Pregnant Women

The pattern observed in ANC clinic attendance was similar across the two study groups as shown in figure 16. Although majority of the pregnant women attended the first antenatal care clinic, the percentage attending the clinic decreased with subsequent visits. However, even though an equal number from both groups attended the first ANC clinic, those attending subsequent visits was slightly higher in the intervention group compared to the control group.

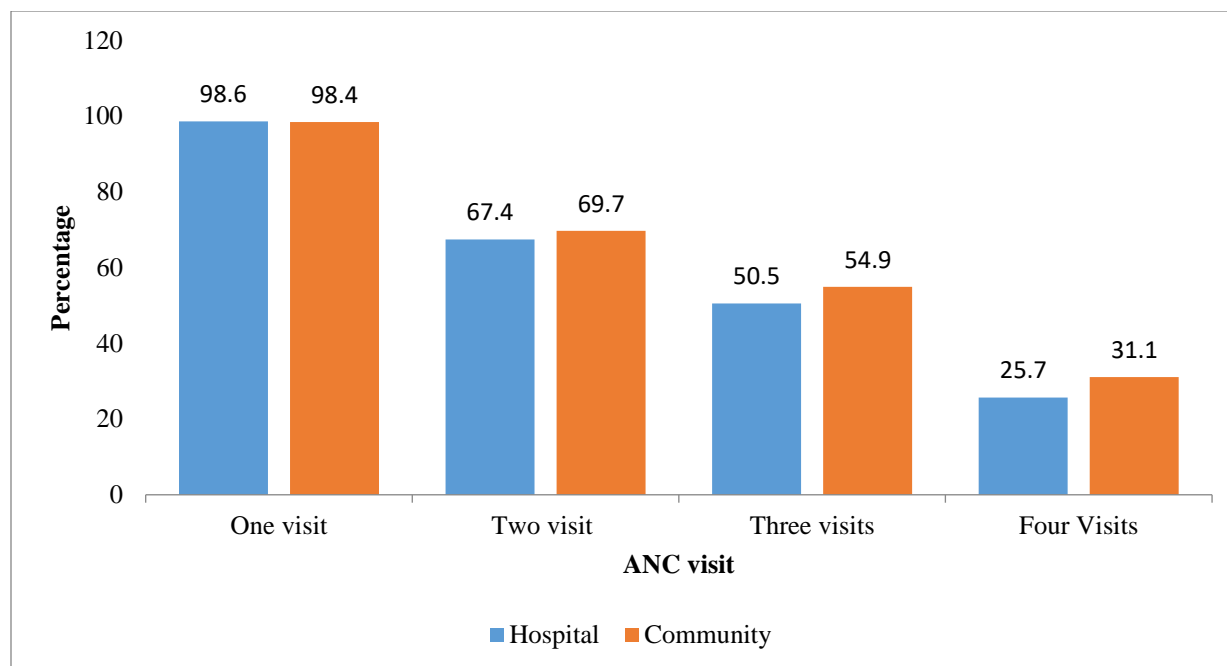


Figure 16: Frequency of ANC clinic attendance among pregnant women

4.6.2.2 Weight Measurements among Pregnant Women

The pattern observed in weight measurements was similar across the two study groups as shown in figure 17. The mean weight was 64.8 ± 11.23 and 64.2 ± 10.68 for intervention and control group respectively (table 9). There was steady increase in weight with subsequent ANC clinics across groups, although the greatest proportion of respondents had weights of less than 60kgs across all visits.

Table 9: Summary of the overall mean anthropometric measurements

Variable	Hospital Mean (std)	Community Mean (std)
Weight	64.21 (10.68)	64.76 (11.23)
Fundal height	26.85 (5.04)	27.6 (4.83)
MUAC	24.88 (5.66)	25.86 (4.95)
Height	157.58 (10.43)	156.94 (9.05)

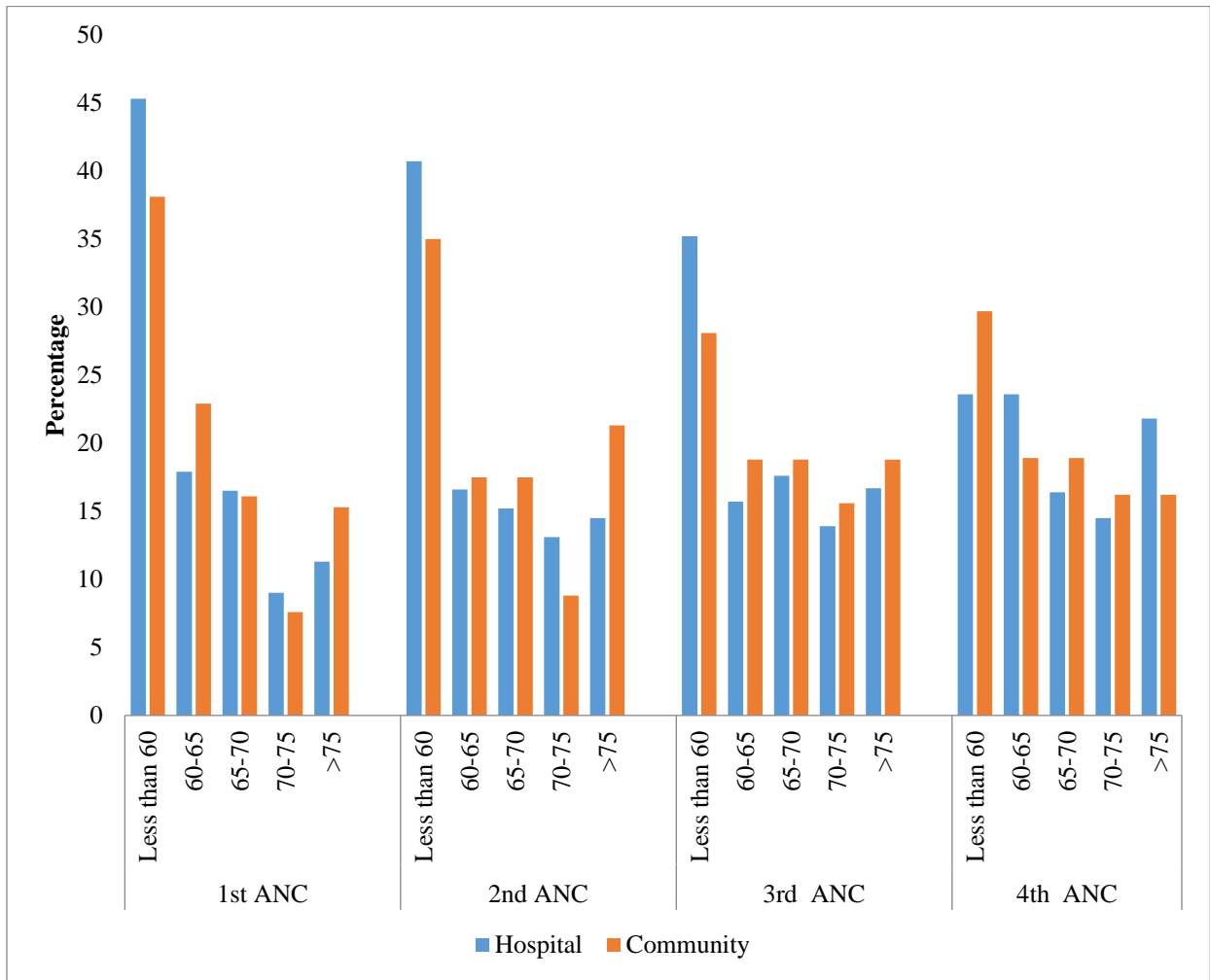


Figure 17: Weight measurements among pregnant women

4.6.2.3 Fundal Height Measurements among Pregnant Women

The mean fundal height was 27.6 ± 4.83 for intervention group and 26.85 ± 5.04 for control group, as shown in table 9. During their first ANC clinic attendance, the highest percentage of pregnant women had a fundal height of less than 28cm across groups. The fundal height increased with every subsequent visit as expected with growth in pregnancy.

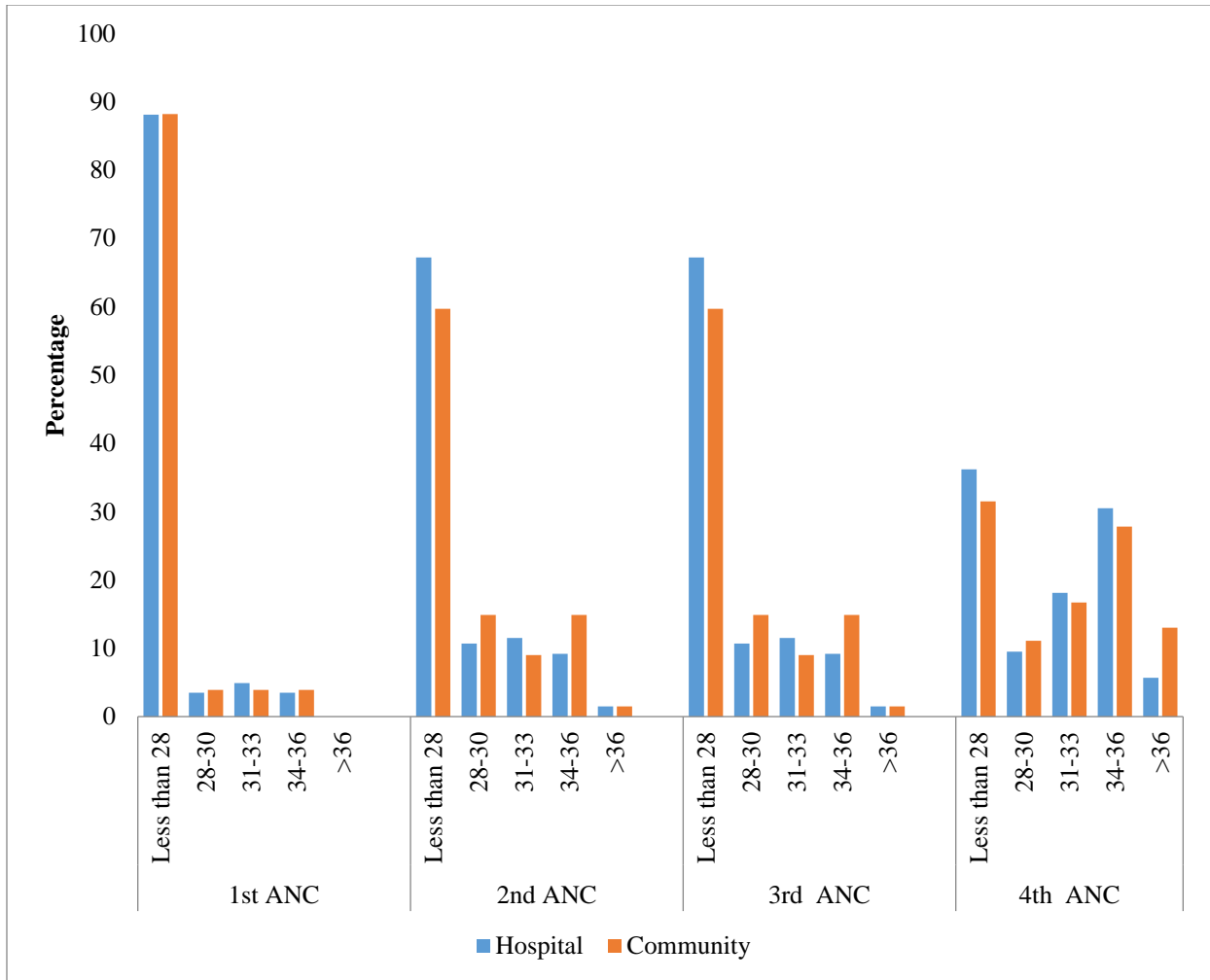


Figure 18: Fundal height measurements among pregnant women

4.6.2.4 Height Measurements among Pregnant Women

Height does not change during pregnancy hence was measured once during the study period. The pattern observed in height measurements was similar across the two study groups as shown in figure 19. The mean height was 156.94 ± 9.05 and 157.58 ± 10.43 for intervention and control group respectively (table 9). There was a greater percentage with less than 156cm, which is an obstetric risk, in the intervention group as compared to the control group.

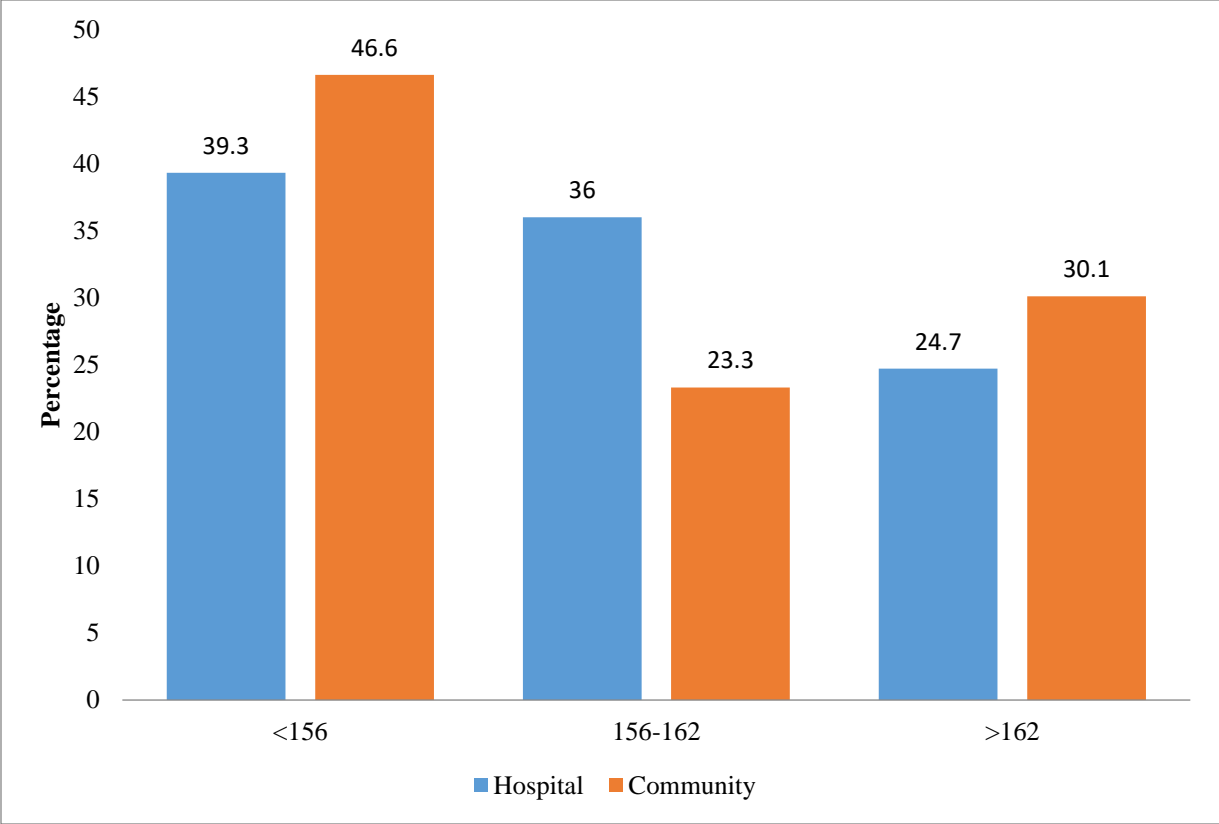


Figure 19: Height measurements among pregnant women

4.6.2.5 Mid Upper Arm Circumference (MUAC) Measurements among Pregnant Women

Mid Upper Arm Circumference (MUAC) measurements do not significantly change during pregnancy hence were also measured once during the study period. The mean MUAC was 25.86 ± 4.95 and 24.88 ± 5.66 for intervention control group respectively (table 9). Even though the greatest percentage of the respondents had a normal MUAC level of between 23 and 32cm in both groups, a substantial percentage of them (19.9% and 14% in control and intervention groups respectively) had a lower than normal MUAC of less than 23cm indicating malnutrition in both groups, as shown in figure 20. Moreover, a small percentage in both groups (2.6% and 2.8% in control and intervention groups respectively) had a higher than normal MUAC of ≥ 33 cm indicating overweight.

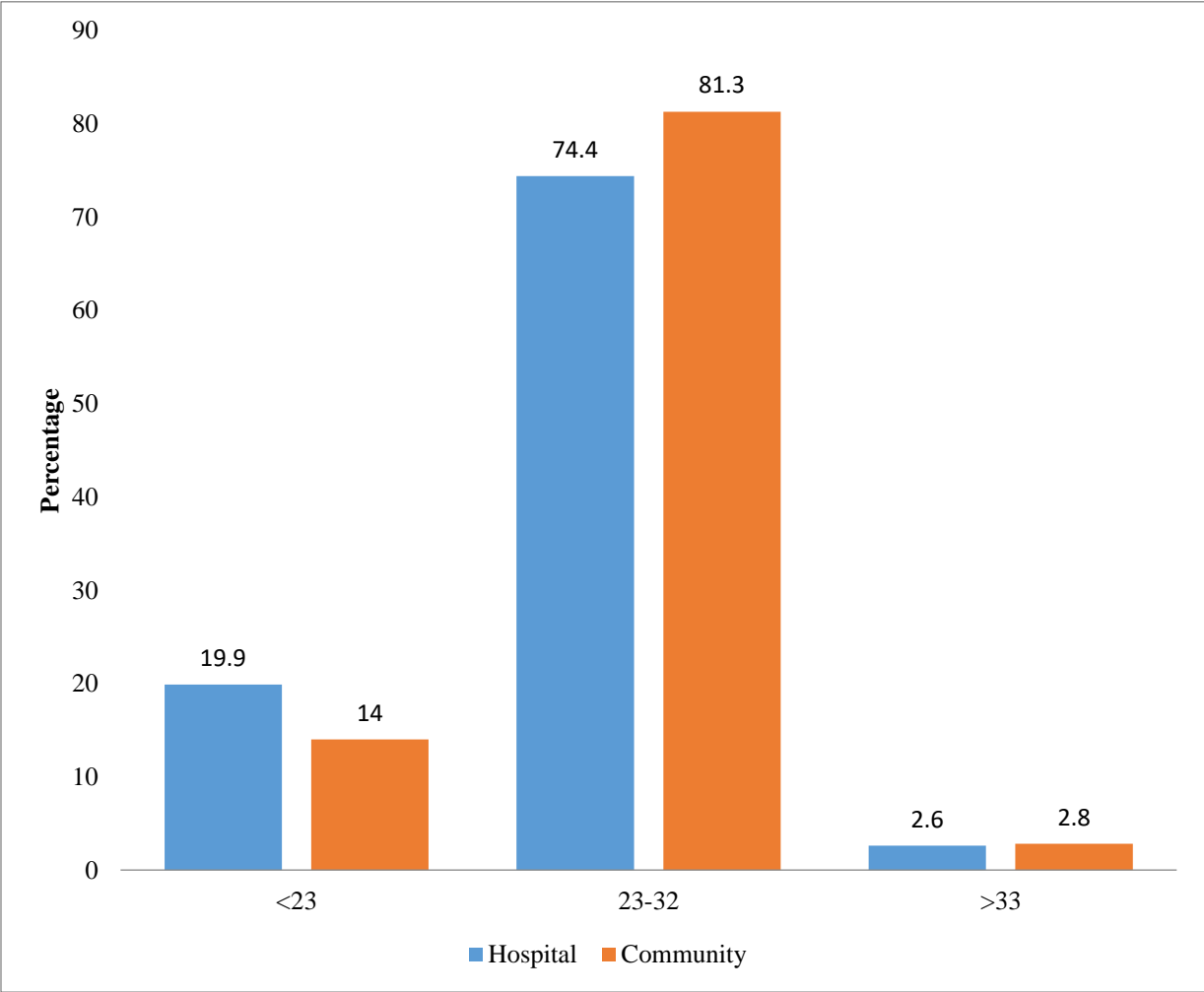


Figure 20: MUAC measurements among pregnant women

4.6.3 Haematological Measurements among Pregnant Women

4.6.3.1 Haemoglobin Levels among Pregnant Women

A pregnant woman was considered anaemic if her haemoglobin (Hb) level was lower than 11.0g/dl (110 g/L). The Hb levels were similar across study groups as shown in figure 21. Majority of the respondents had normal Hb levels during both study periods. There was a slight improvement in

mean Hb in the intervention group from 13.08 to 13.39 g/dl compared to a slight decrease in the control group from 13.89 to 13.15 g/dl across the study periods. The prevalence of anaemia (mild/moderate) reported of 1% and 0.8% at baseline in the control and intervention group respectively (based on Hb levels) was quite low while none had low Hb at endline in any of the groups.

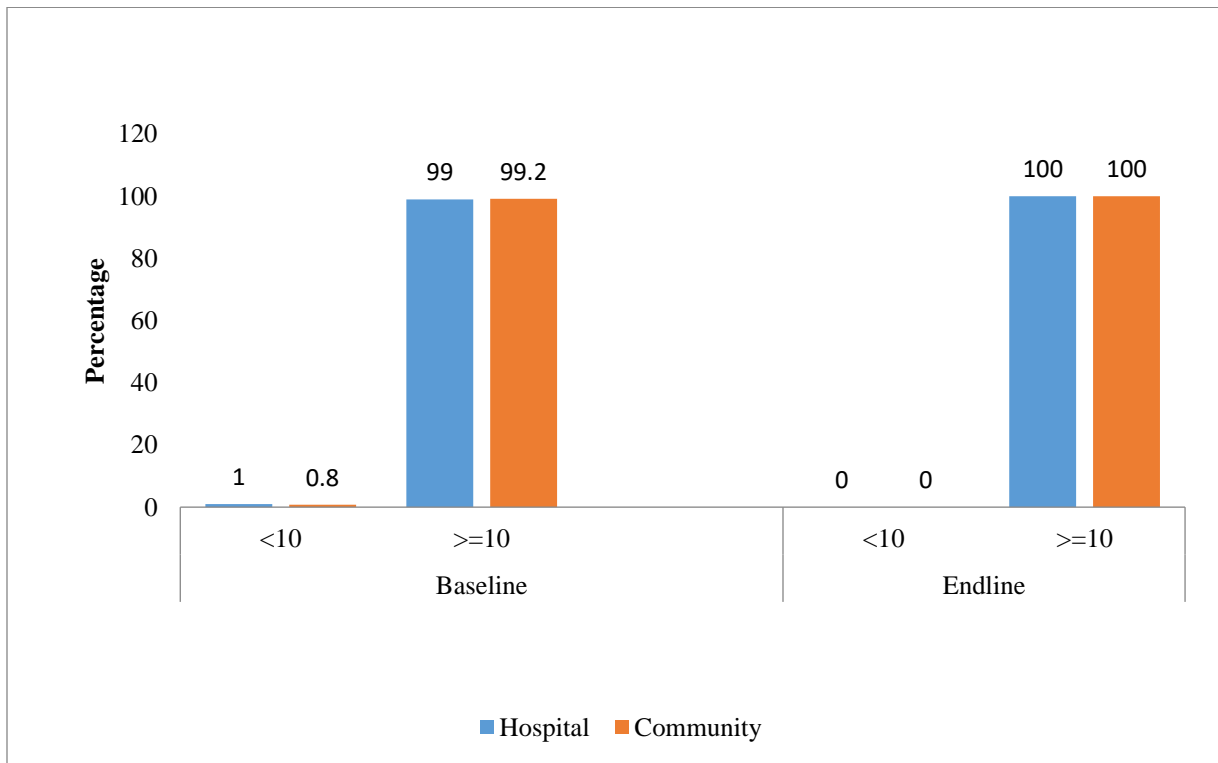


Figure 21: Haemoglobin levels among pregnant women

4.6.3.4 Folate Levels among Pregnant Women

The normal serum folate level is above 5.4 µg/ml. The machine used to analyze folate levels had automated normal values of 12.9 to 40.0 ng/ml. The mean folate levels among pregnant women decreased across both groups (table 10), owing to the great loss to follow-up during the study period.

Table 10: Mean Folate levels among respondents

	Hospital			Community		
	n	Mean (std)	Median (IQR)	n	Mean (std)	Median (IQR)
Baseline	48	15.72 (4.09)	16.59 (13.13,19.86)	53	15.68 (4.31)	16.3 (13.42,20)
Endline	6	14.04 (6.62)	16.22 (7.54,20)	13	14.94 (6.52)	18.78 (11.4,20)

4.6.4 Pregnancy Outcome (Secondary Study Outcome)

The pregnancy outcome of both mother and baby are shown in figure 22. The frequencies of outcome were similar across both study groups, with majority of the mothers and their babies being healthy, although the percentages were slightly higher in the control group compared to the intervention group, owing to the fact that it was difficult to trace most of the women in the control group to get their pregnancy outcome, following the loss to follow-up at endline earlier indicated.

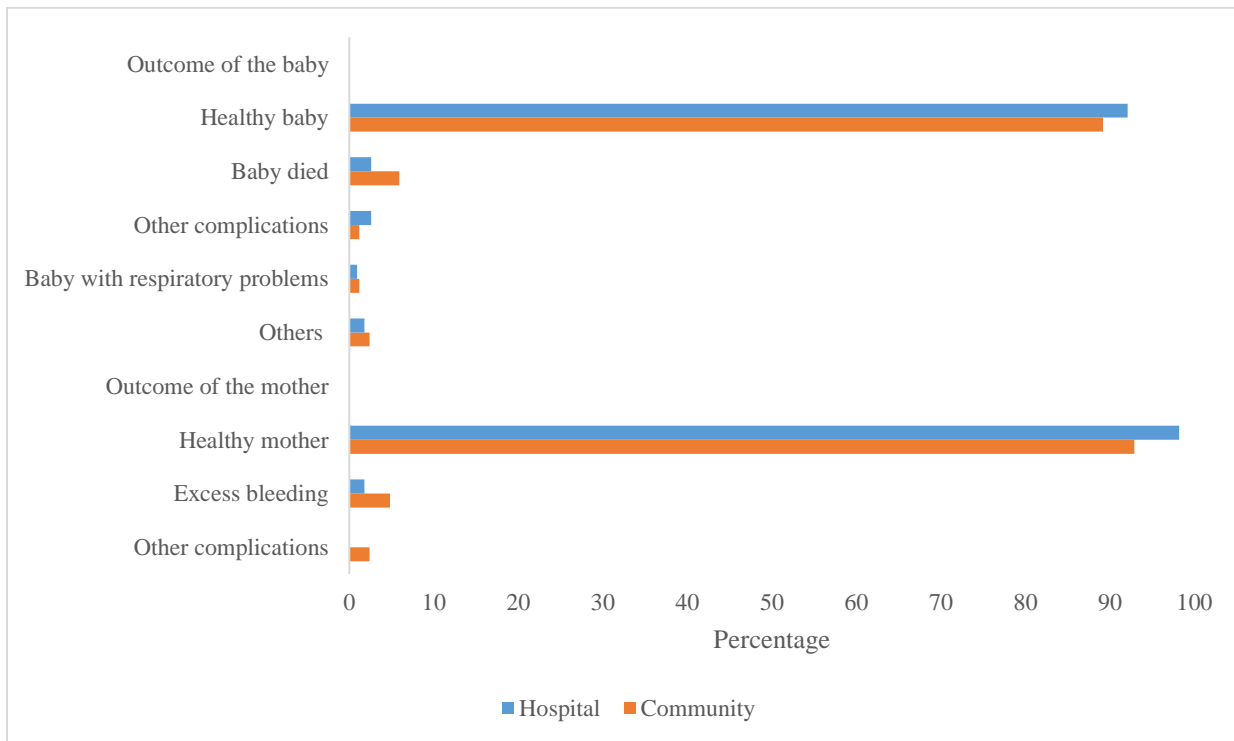


Figure 22: Frequencies of pregnancy outcome after delivery

4.7 Experiences of Community Health Volunteers (CHVs), Health Care Providers (HCPs) and Pregnant Women of Participating in a Community-based Approach of IFAS

The experiences of HCPs, CHVs and pregnant women of participating in a Community-based Approach (CBA) of IFAS was based on various topics including: perceptions, benefits, IFAS counselling provision, home visits' evaluation, failures and challenges. Three themes emerged from the qualitative findings that were common among the three categories of participants namely: perceived benefits, challenges experienced and recommendations regarding CBA of IFAS. The following narrative describes a triangulation of the experiences of the three categories of participants. The narrative begins with a description of experiences of CHVs of home visits followed by a description of the three themes.

4.7.1 Experiences of Home Follow-up, Provision of IFAS Education and Supplements to Pregnant Women by Community Health Volunteers

The CHVs reported that they had very helpful and interactive sessions with pregnant women as they visited them in their homes. This was witnessed by reports CHVs received from pregnant women who reported having had open discussions with CHVs where they learnt a lot and received enormous support. The CHVs reported perceived better compliance with IFAS among pregnant women and associated perceived benefits including: increased ANC attendance, being more energetic, having sufficient blood levels, having no excessive bleeding at birth, no complications at delivery, and increased babies' birth weight thus healthier babies. One CHV reported a testimony from one of the mothers, who had a healthy twin delivery:

“She was very happy to see me at her home because if she did not take IFAS in order to increase her blood levels and improve on her pregnancy maybe there were going to be some complications..... she explained to me how she felt after giving birth that she had enough energy and did not have low blood levels.” (*CHV, health facility 2, IDI*)

The CHVs shared their experiences in providing IFAS education and counselling. The CHVs reported that they were able to educate pregnant women on how to tackle side effects that hindered their taking IFAS through the counselling sessions held. Addressing side-effects and their management led to better compliance as opposed to the common practice of stopping IFAS with every slight discomfort/side-effect. Sharing her experience, one CHV had this to say:

“It is good because like now the ones who come to the health facility are given IFAS but when they return home and some have side effects, they stop taking them. But if you give them in the community, if they have side effects on taking them, you talk and encourage her to keep on taking them, that way I saw it is good.” (*CHV, health facility 1, IDI*)

The home visits made by CHVs presented an excellent opportunity for closer interaction with the clients and for other health messages as well. They reported better relations with the community, associated with better communication with clients and more consultations from them. This helped create awareness in the community not only about IFAS but also about other health issues, thus improving general community understanding on health matters. Furthermore, CHVs reported that, through this approach, peer education and counselling was enhanced among the peers of pregnant women leading to better understanding of the importance of taking IFAS. As reported by a CHV

in the quote below, this was evidenced by pregnant women referring their fellow pregnant women to CHVs early in pregnancy to start IFAS.

“.... some of the pregnant women brought their friends to me to start taking IFAS immediately they knew they were pregnant.” (*CHV, health facility 1, IDI*)

The CHVs equally reported better relations with the health facilities’ staff. They reported becoming more conversant with the hospital and how it operates in the various departments, which they did not know before. In addition, they reported that they were able to interact with the nurses more unlike before and respect each other more in their respective roles.

4.7.2 Perceived benefits of community-based approach of IFAS

The HCPs, CHVs and pregnant women all reported numerous perceived benefits of CBA of IFAS.

The CHVs reported that they gained a lot of knowledge on IFAS. The CHVs were happy with trainings received and desired more regular updates. They also reported that it was a very enriching and satisfying experience to them, to be of great help to pregnant women and to contribute positively to the community’s health in general. As one CHV put it:

“.... the advantages are so many in the community than what we can think”
(*CHV, health facility 2, IDI*)

The CHVs reported that IFAS utilization increased so much that this sub-county which had rarely experienced IFAS stock-outs before, experienced serious stock-outs during the study period. In addition, CHVs reported increased early ANC services utilization, going against the common practice of starting ANC clinics late in the locality. Besides, increase in health services utilization

was not just for ANC services but other health services also like laboratory, immunization and family planning services among others.

The above findings were supported by the nurses participating in CBA of IFAS. Based on their experience, nurses identified various perceived benefits of CBA of IFAS to pregnant women as well. First, there was closer follow-up by CHVs which led to more acceptance and uptake of IFAS thus higher levels of utilization and compliance. Secondly, ANC clinic attendance improved. Thirdly, nutritional status of pregnant women improved due to consistent nutritional education offered by CHVs. Fourthly, access to IFAS improved since the women could always get IFAS at home reducing missed opportunities for IFAS distribution. Consequently, cases of low haemoglobin levels/anaemia during pregnancy and delivery reduced as evidenced by this quote by one nurse:

“.... ANC attendance improved because CHVs were really mobilizing mothers to come to the clinic. For the deliveries we had, I would say we did not have many serious cases due to low Hb. Also, IFAS adherence improved.” (*Nurse in charge of ANC services, facility 1, IDI*)

The nurses perceived that this approach bridged the gap between health facility and community. The approach also brought the nurses and CHVs closer, improving their working relationships, as a team. The nurses reported that harmonious working enabled pregnant women to trust CHVs more. This enhanced the confidence of pregnant women to consult CHVs over other health matters thus leading to improved community health in general as earlier indicated. One nurse said:

“This was a good project because it is a gap and an area which health workers have not taken seriously.” (*Nurse in charge of ANC services, facility 1, IDI*)

Just like the CHVs, the nurses were impressed and encouraged by the IFAS training provided. They found this approach time-saving in relation to counselling clients. This was an advantage to them which helped them to address their heavy workload that often affected their quality of IFAS counselling. Sharing their views, they said:

“It was not tedious on our side. When the client is supposed to take IFAS from CHV, you spend less time with them.” (*Nurse in charge of ANC services, facility 2, IDI*)

“.....we tell them about IFAS, but always depends on the workload.” (*Nurse in charge of ANC services, facility 1, IDI*)

To further support the above findings, pregnant women participating in CBA of IFAS reported that the experience of using CBA of IFAS was very good, helpful and not problematic at all. One pregnant woman said:

“It has been going on in a good manner.” (*ANC woman, health facility 1, IDI*)

The pregnant women reported several other perceived benefits as well. First, the convenience of receiving regular supply of IFAS at home and not waiting until the next ANC clinic. Second, IFAS was readily accessible and available even to those far away from the hospital. Third, they appreciated the fact that they did not have to spend money on bus fare to go to the health facility only for the purpose of receiving IFAS tablets. Fourth, some were pleased with the visits because they did not have to stop their chores, thus saving on their time. Fifth, health education offered enabled them to manage any IFAS side-effects experienced, in the most appropriate way. Sixth, close follow-up by CHVs provided an opportunity to consult on other health problems hence were

helped comprehensively. Overall, they were happy with the outcome and reported increased blood levels on testing. Referring to easy IFAS access, one of them said:

“The ones who are far will access the supplements easily” (*ANC woman, health facility 2, IDI*)

4.7.3 Challenges Experienced with Community-based Approach of IFAS

Most of the pregnant women reported that they did not experience any challenges with the CBA of IFAS. Only one woman reported that although the CHV visited her weekly, there are times he failed to come on time including times when client did not have supplements.

“.....sometimes he did not come on time and kept me waiting” (*ANC woman, health facility 1, IDI*)

One of the major challenges experienced by the participants during implementation of CBA of IFAS was IFAS stock-outs, owing to the increased IFAS utilization in the Sub-County. The nurses reported that this had not been reported before in the entire Sub-County and that it was due to improved ANC attendance and increased IFAS utilization. The perceived benefit of improved ANC attendance thus became a challenge to the nurses. However, this was circumvented by the researcher engaging management of health facilities to acquire more IFAS supplies. The pregnant women were protected from missing the IFAS tablets by ensuring the subsequent week’s supply was availed before the one they were taking was exhausted. The CHVs reported that the delay caused by bureaucratic processes of acquiring health supplies reduced their morale. In addition to the stock-outs, improved ANC attendance led to increased workload among nurses, much more

than they are used to at the highest peak, perpetuating the problem of limited time with client to provide detailed quality counselling, as indicated by this quote:

“Even though we give them IFAS at the clinic, due to workload, we do not have time to emphasize on its importance.” (*Nurse in charge of ANC services, facility 1, IDI*)

Despite the reported fact that many pregnant women embraced the home visits by CHVs with enthusiasm, some CHVs reported facing frustrations with regard to home visits. Whereas a few women were living in hard-to-reach areas, a few others did not fully embrace home visits so they became uncooperative. The CHVs reported that they sometimes missed a few of the pregnant women both at home and on phone. This was how one of the CHV described her experience:

“I can say dealing with pregnant women is not easy since they tend to have bad moods and I would find one in a bad mood who would not even want us to talk and she thinks the IFAS are for my own benefit not hers” (*CHV, health facility 3, IDI*)

The perceptions of CHVs revealed that some were fearful of the pregnant women’s reactions as the study began. The CHVs feared non-acceptance or rejection from both pregnant women and the community. To their surprise, the intervention was well received by the entire community, went on very well and women were positive and cooperative. One of them said:

“We thought it was going to be hard to convince the mothers to accept these supplements” (*CHV, health facility 5, IDI*)

The other major challenge reported by CHVs was lack of monthly remuneration. However, the researcher provided USD 150 per month to facilitate their transport for weekly home visits. The CHVs reported that lack of monthly salary is a challenge and interferes with their commitment

because they have to search for other income generating activities to undertake in order to provide for their families. Sharing his frustrations in lack of salary, one CHV said:

“The major problem is lack of facilitation.” (*CHV, health facility 1, IDI*)

4.7.4 Participants’ Recommendations towards Community-based Approach of IFAS

Finally, when asked which strategy they preferred to use for IFAS distribution, all the categories of participants suggested implementation of the CBA of IFAS. The pregnant women were overwhelmingly contented with how the CBA of IFAS was implemented and highly suggested its continuation. The nurses recommended integration of both hospital and community-based distribution, as long as the CBA of IFAS is practiced professionally with appropriate and timely referrals where need be, to avoid mismanagement of pregnant women. Moreover, they recommended more community-based education and good IFAS supply to curb stock-outs.

The CHVs recommended their official recognition. All CHVs unanimously asked for continued motivation and monthly salary. They reported that community work is very involving and getting no compensation for it does not augur well with their roles as bread winners, since at the end of the day, they need to put food on the table.

Of concern to CHVs was the need for more advocacy, social mobilization, sensitization and general meeting with all stakeholders, particularly husbands of pregnant women, which they highly suggested. They also recommended consistent IFAS supply. To sum it all, CHVs recommended permanent adoption of CBA into IFAS distribution to complement facility distribution. They suggested integration of both strategies to reach all pregnant women as illustrated in these quotes:

“I would like it to be made a permanent program.” (*CHV, health facility 1, IDI*)

“If we leave them on their own after educating them a little in the hospitals we won’t get any benefits from this programbecause I have realized that the mothers who get IFAS from the hospital, some throw them in the toilets or just keep them after collecting themso I would love it to be made permanent” (*CHV, health facility 2, IDI*).

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction:

This chapter discusses the findings from this study in line with its stated objectives. Comparison of the baseline and endline results have been made, as well as a categorization according to the intervention and control study groups. The results have also been compared with other study findings both locally and internationally. The discussion on socio-demographic characteristics has been integrated with other study variables.

The homogeneity of the study population in the two study groups was calculated at baseline and revealed no statistical difference between the control and intervention groups, indicating that both groups had similar characteristics at the start of the study.

5.1 Availability and Utilization of IFAS Guidelines by Health Care Providers

The findings from this study show that IFAS policy guidelines and documents were scarce in the health facilities. Most of these documents were not available. The reason for this unavailability could be attributed to failure of the health system to have the hard copies printed or a gap in dissemination of these documents from the Ministry of Health (MoH) headquarters. The MoH has developed various Information, Education and Communication (IEC) materials in an effort to improve IFAS coverage nationally (Ministry of Health, 2011b; 2013a; MoH, 2012a; b; 2013). Whether or not these materials have been disseminated from Ministry of Health headquarters as well as their availability at the peripheral health facilities and whether health care providers use them in provision of IFAS services or not is a matter that this research sought to establish. Thus, availability of relevant IFAS policy documents was limited.

The scarcity of IEC materials on IFAS in health facilities may have contributed most to their average utilization (55%) leading to counselling that was not standardized across the health facilities as well as ineffective and incomplete counselling for clients. For example, in observing the counselling session, it was only in one health facility that the counselling information on the side-effects of IFAS and how to mitigate was provided to the client. Similarly, it was in only one health facility that the client's comprehension of the counselling content was evaluated. This is consistent with reports that health education is one of the key factors in determining uptake of health interventions (Alam et al, 2015; Matiri et al, 2017). However, it may be affected by lack of appropriate or relevant job aids and guides, as revealed in this study.

The above findings are consistent with other studies that health workers at all levels need to be empowered with critical knowledge and skills, especially interpersonal skills for effective counselling as well as appropriate job aids for effective health education provision to clients (Nisar et al, 2014b). These include counselling guides and policy documents to ensure provision of standardized health messages (Alam et al, 2015). Guides should be updated on a regular basis and promptly distributed so that they can be useful. An integral part of health education should be provision of IEC materials for clients to take home, for reference. In response to these findings of limited IEC materials on IFAS, numerous IEC materials were sought from the MoH and distributed to the entire Sub-County. Consequently, the HCP reported they were empowered with necessary information and job aids for effective health education provision. Subsequently, they felt that the distribution of various IEC materials should be sustained to keep all levels of health workers and their clients' updated with current materials and information.

The marginal (55%) utilization of IFAS policy documents noted in this study was most likely due to scarcity and limited availability of IEC materials. It is good to note that, all pregnant women who attended antenatal care were universally provided with IFAS in all health facilities irrespective of the value of their haemoglobin levels. In contrast, observation of provider-client interaction done in health facilities during antenatal counselling session revealed that none of the pregnant women were counselled on the causes, signs and symptoms or consequences of anaemia. Moreover, none of the pregnant women were counselled on; the increased need for nutrients during pregnancy and the inhibitors and enhancers of iron/folate absorption, by any of the HCPs, in any of the health facilities. Research has shown that a great percentage of maternal anaemia occurs due to insufficient intake of bioavailable dietary iron particularly in developing countries (Milman, 2012; Pasricha et al, 2013). It is therefore very important to ensure proper choices of food that promote iron and folate absorption among pregnant women by providing effective counselling and information on the food interactions and practices.

Effective communication is one of the key counselling skills which can be enhanced by ensuring HCP have the right tools and knowledge on what to communicate to clients. This is supported by evidence that training and provision of information on importance of IFAS supplementation in pregnancy leads to better utilization (Gebremedhin et al, 2014; Pal et al, 2013). In addition, increasing IFAS awareness, community education and adequate counselling improves its compliance among pregnant women (Maina-Gathigi et al, 2013a; Popa et al, 2013), eventually leading to more effective supplementation (Aguayo et al, 2005). Thus, effective counselling skills should be enhanced among HCP, who are in contact with pregnant women during antenatal care services.

Findings from this study also showed that HCPs in all health facilities provided IFAS tablets to all pregnant women attending antenatal care irrespective of the value of their haemoglobin levels, as earlier indicated. Further, findings revealed that providing IFAS education to the HCPs together with IFAS IEC materials greatly improved the counselling status at ANC. This was in response to reports in Kenya that poor knowledge and/or lack of information among HCP in many aspects of education and counselling has been a hindrance that negatively affects IFAS utilization (Ministry of Health, 2013b). Hence needs to be fully addressed. Even though the HCPs training was initially thought of as a refresher training during study conception, it revealed that it was the first training ever in Kenya, specifically on IFAS among nurses.

Even though the MoH has developed numerous IEC materials on IFAS, their dissemination is usually done together with trainings which has not been very effective. Through this study, the researcher distributed many varied IEC materials during the IFAS trainings to all health facilities in Lari Sub-County including IFAS training guides, varied posters, counselling guides, brochures and mothers' IFAS calendars. These, together with increased knowledge and its translation into practice by HCPs probably contributed greatly to the improvement in counselling components as reported by pregnant women. Earlier studies indicated inadequate counselling by HCP as a key barrier to IFAS (Galloway et al, 2002; Galloway & McGuire, 1994). Communication efforts need to be escalated to address any fears or misconceptions relating to IFAS. The trainings should therefore be extended to other parts of the country in form of continuous medical education programmes among HCP.

5.2 Effect of Community-based Approach on Maternal Knowledge on IFAS

Findings from this study revealed improvement in maternal IFAS knowledge after the intervention. The study shows that nearly all the pregnant women had heard of IFAS during endline compared to baseline where about a third of them had not heard of IFAS. Furthermore, there was a greater improvement in the proportion of pregnant women who scored high for levels of IFAS knowledge, more so in the intervention group. This means that pregnant women were reached during IFAS counselling both at health facilities and community and provided with more detailed information on IFAS which increased their awareness on IFAS. It further implies that community education using CHVs was successful as evidenced by the greater improvement in the intervention group. These findings agree with other studies that have shown that community-based systems of IFA distribution can spread more widely to reach a higher population of women and attain more positive behavior change, including knowledge, compared to antenatal (ANC) provision alone (Maternal and Child Health Integrated Program, 2014). Iron and folic acid supplementation is cost-effective and a common strategy used to control iron deficiency anaemia (Wiradnyani et al, 2016; World Health Organization, 2012a). The uptake of IFAS is affected by several factors, among them maternal knowledge. Generally, high IFAS knowledge has been associated with better IFAS compliance (Gebremedhin et al, 2014). Hence, the need to constantly seek for approaches to improve maternal knowledge on IFAS.

The proportion of pregnant women who scored high on computation of levels of IFAS knowledge was much lower than the total proportion of pregnant women who had simply heard of IFAS. This shows that many of the pregnant women do not have detailed information about IFAS. This could also imply that a substantial percentage of women are either unaware of IFAS or do not know the actual names of the supplements given to pregnant women, most probably because the HCP has

not informed them. This could lead to confusion in view of the many other supplements or drugs offered during other health services provision. Thus, women need to know what exactly is offered to them. This was observed at baseline during a counselling session where a nurse provided IFAS to a pregnant woman and informed her the purpose of the supplement but not its name. These study findings are similar to a study done among Saudi females on folic acid whereby, though 88% had heard of it, only 53.8% of them had accurate information about its benefits (Al-Akhfash et al, 2013). In view of these findings, more approaches are required to enhance health education and counselling to provide clients with detailed information on IFAS.

Based on the above findings, there seems to be a problem in the quality of counselling provided at health facilities which is consistent with other studies (Nisar et al, 2014b; Titaley, 2014). Therefore, it is important to have HCPs well informed and constantly updated to ensure they conduct quality, effective counselling on IFAS and provide pregnant women with relevant IFAS information as reported by Gebremedhin and colleagues (Gebremedhin et al, 2014). This implies that there is need to establish appropriate strategies to provide pregnant women with detailed information on IFAS to answer the why, when and how of IFAS. This should include the actual name, importance, duration of supplementation, maintaining supplementation, side-effects or challenges and most importantly how to mitigate these side-effects or challenges. This will most probably increase maternal IFAS knowledge and consequently its utilization. In addition, this could also be effected by more formal involvements of CHVs in IFAS programme, to closely follow-up pregnant women and provide counselling information at the community level, as evidenced in this study and other studies (Shivalli et al, 2015).

This study reveals that the using CHVs to distribute IFAS tablets and provide IFAS health education was successful in improving IFAS knowledge among pregnant women because the odds of being more knowledgeable at endline was 3 times that at baseline. Employment status was linked with influence on maternal IFAS education with those employed being more likely to be knowledgeable than the unemployed. Level of education is a known determinant of formal employment and income (Al-Hossani et al, 2010; Taye et al, 2015). Clients with high income are more likely to have attained high education level and hold formal employment, or own good businesses (Abdullahi et al, 2014; Arega Sadore et al, 2015; Gebreamlak et al, 2017; Rai, 2013; Taye et al, 2015). These findings are similar to a recent study in Ethiopia where there was a positive significant association between educational status, family income and nutritional knowledge of pregnant women (Tenaw et al, 2018). This further shows that obtaining formal education and improving socio-economic status is likely to increase IFAS knowledge among women hence should be enhanced.

It is noteworthy that, the source of IFAS information reported by pregnant women that resulted in the greatest improvement between baseline and endline in this study was brochures, followed by CHV, then HCP. Possible explanations for these findings may include; (a) a lot of IEC materials that were distributed during trainings including posters, brochures, mothers IFAS calendars and counselling guides were effectively utilized, (b) brochures/leaflets act as a reference material that mothers can always use to remind themselves and since they go home with it, it is an important source of information, (c) community health volunteers are closer to the community leading to better interpersonal communication skills than health care providers, (d) health care providers may still be overworked as earlier studies noted and therefore provide inadequate counselling (Galloway & McGuire, 1994). It is very important that mothers are provided with relevant

information and properly advised to increase their level of knowledge on IFAS thus enhance compliance. Thus, consideration of source of information and its effectiveness is necessary.

Further, this means the IEC materials distributed by the researcher during this study were of much benefit to pregnant women in communicating more about IFAS. This underscores the need to provide IEC materials to clients for reference at home as part of health education. The greater improvement on those who reported CHVs as their source of IFAS information in the intervention reveals that follow-up by CHVs was successful. Pregnant women were all required to come for antenatal care. This played a big role in HCPs being reported by the majority as their source of IFAS information during the study. These findings further emphasize the need for standardized counselling across health facilities and thus provision of counselling guides as indicated by other studies (Aguayo et al, 2005; Fiedler et al, 2014; Galloway et al, 2002; Nisar et al, 2014b; Taye et al, 2015).

This study shows that CHVs provide an important link between health service and community, their effectiveness being highly dependent on proper training and facilitation with IEC materials. As shown in this and other studies, formal and more involvement of CHVs can go a long way in improving compliance by closely following up the pregnant women at the community level (Alam et al, 2015; Matiri et al, 2017). Traditionally, HCPs have been the greatest source of health information for clients and patients (Seck & Jackson, 2008). However, recently CHVs have emerged as an important source of health information as well (Ministry of Health, 2012b; 2013b; Nisar et al, 2014a). These findings demonstrate that, if properly trained and facilitated, CHVs could play a vital role in increasing uptake of health interventions like IFAS as well as acting as a

credible source of health education as reported by Saprii et al (Saprii et al, 2015). Hence, the need to properly train CHVs and formalize their operations too.

5.3 Effect of Community-based Approach on Maternal Attitude towards IFAS

Findings from this study reveal an improvement in positive attitude towards IFAS among the respondents, more so in the intervention group, following the implementation of a community-based approach of IFAS. This study revealed a highly significant change in the positive attitude between baseline and endline, with the odds of having a positive attitude towards IFAS at endline being 9 times that at baseline. This positive change indicates that overall positive beliefs, opinions and perception of pregnant women towards IFAS improved during this study. Furthermore, it means that pregnant women gave up the negative views they held against IFAS. This shows that maternal attitude is one of the key factors that affects the IFAS programme. These findings are similar to a nutrition education intervention study done among postpartum women that demonstrated significantly greater improvement in overall positive health beliefs and practices culminating in women giving up their traditional taboos (Liu et al, 2009). Elsewhere, maternal attitudes have been associated with less frequent use of various supplements (Nuno et al, 2008). Thus, attitude greatly influences health practices.

The attitude and perception of pregnant women is based on the information they receive from the various sources which in turn determines their practices (Alam et al, 2015). This shows the interrelationship between maternal knowledge, attitude and practice. Recently, a study in Ethiopia showed a positive significant association between maternal attitude and nutritional knowledge of pregnant women (Tenaw et al, 2018). Since most clients trust what the health worker says as “gospel truth” (Nisar et al, 2014b) investing in giving women adequate information, will most

probably produce a positive attitude which will in turn improve IFAS uptake and practices. This is clearly demonstrated in this study by the great and positive change in attitude during the study. The community-based approach of IFAS distribution utilized in this study aimed at improving maternal IFAS knowledge, attitude and utilization. This study attempted to change individual behaviour by reaching pregnant women in their local community settings as practiced by Bruce and colleagues (Bruce et al, 2002) using the strategy of education/behaviour change (Klassen et al, 2000). This is because behaviour is greatly influenced by attitude.

5.4 Effect of Community-based Approach on Maternal Compliance with IFAS

Compliance with IFAS improved during the study period with the intervention group showing higher improvement than the control group. This denotes an increase in IFAS uptake. This means there was an improvement in the proportion of women who consistently consumed the IFAS tablets daily as recommended. These findings were similar to a coverage of 67% reported in urban Nairobi County (Okube et al, 2016) in Kenya and 64.7% reported in India (Mithra, 2013) respectively. However, the findings were higher than reports on IFAS coverage from low and medium income countries (LMIC) with similar rural settings namely, South Ethiopia (39.2%), Pakistan (38.3%), (Arega Sadore et al, 2015), Nigeria (37.5%) (Dairo & Lawoyin, 2006) and Western Ethiopia (20.4%) (Taye et al, 2015). However, lower coverage (18%) has been reported in a neighbouring County of Machakos, Kenya (Juma et al, 2015). Elsewhere, Bilmale and colleagues suggested adoption of a “more open, cooperative health professional-patient relationships” as critical to improving compliance (Bilmale & Anjum, 2010). Clarification of all associated issues through open communication is highly recommended. This has proved fruitful in this study with the use of CHVs. Since both HCPs and CHVs were trained in this study to provide IFAS tablets and education, both intervention and control groups yielded similar

improvement in compliance levels although it was slightly more in intervention group. Hence community-based education using CHVs should be adapted formally.

Following the intervention, there was an increase in the percentage of pregnant women counselled on various components of IFAS during their issuance at ANC room. This implies that the IFAS advice provided to pregnant women contributed to promoting compliance in this study. This is consistent with findings in other studies where accompanying health education with clear instructions on intake of IFAS substantially improved its compliance (Arega Sadore et al, 2015; Gebreamlak et al, 2017). This is demonstrated in another Kenyan study where advice by health workers was independently associated with higher compliance (Dinga, 2013). Studies show increased IFAS awareness and health education coupled with quality counselling and effective communication provided to pregnant women improve IFAS compliance (Gebremedhin et al, 2014; Pal et al, 2013; Wendt et al, 2014). This necessitates the need for targeted and focused information and training on importance of IFAS during pregnancy (Maina-Gathigi et al, 2013a). Consequently, there is more effective supplementation (Aguayo et al, 2005). This further indicates the need to expand strategies aiming at creating awareness on IFAS both at health facility level and community level so as to further facilitate health education of clients. Using CHVs to do this has proved to be of great benefit in this study and would be a promising strategy if adapted formally.

Findings from this study revealed a decrease in side effects reported at endline compared to baseline, more so in the intervention group. Similarly, the study showed more awareness on practices related to IFAS side effects mitigation in the intervention group. Studies have associated awareness of side effects of IFAS and their management with high compliance (Bilimale & Anjum, 2010; Gebremedhin et al, 2014; Taye et al, 2015; Zavaleta et al, 2014). This is because side effects

experienced on taking IFAS are associated with poor compliance as well as utilization. Many HCPs fail to inform clients about side-effects of IFAS resulting in either poor or non-compliance with any slight discomfort (Ministry of Health, 2013b). Empowering pregnant women with skills to mitigate the side effects of IFAS often leads to higher compliance (Bilimale & Anjum, 2010; Gebremedhin et al, 2014; Nisar et al, 2014b). Many pregnant women stop taking IFAS tablets when they experience side effects. Thus, it is crucial to provide pregnant women with critical, detailed and accurate information on side-effects of IFAS and their management through effective counselling. This will enhance their adherence to IFAS (Bilimale & Anjum, 2010; Gebremedhin et al, 2014).

Failure to provide counselling on IFAS side-effects could be as a result of either lack of information or wrong attitude by HCPs. Although some HCPs may think that citing IFAS side-effects will make pregnant women not to take IFAS, in contrast, providing detailed counselling on IFAS side effects and their management leads to more utilization as this study indicates. Providing counselling information to pregnant women on the expected IFAS side-effects and how to mitigate them, together with reassurance that they will lessen with time, decreases the likelihood of a negative reaction to these side-effects when they occur. This was demonstrated in a study among Indonesian women, who were not concerned about IFAS side-effects following the warning of likely side effects. This study indicates that this is one of the IFAS topical areas that requires strengthening among HCPs for quality IFAS counselling. Consistent refresher trainings on IFAS among all cadres of health workers are equally required to capacitate them with appropriate up to date knowledge and information on IFAS. They will subsequently train pregnant women to manage IFAS side-effects whenever they occur rather than discontinuing IFAS which leads to poor or non-compliance.

Findings in this study did not reveal any major challenges experienced by women in relation to the IFAS programme. Taken together, these few challenges could be overcome through adequate, quality targeted and focused counselling during health education. By applying CBA in this study, there was a decrease in essentially all the challenges initially reported. Overall, the few challenges could be alleviated using innovative approaches focusing on both the clients as the beneficiaries and the health sector, like formally adapting use of CHVs in the IFAS programme as practised in this study, who are already volunteering in Kenyan communities.

5.5 Maternal Nutritional Status and Community-based Approach of IFAS

5.5.1 Maternal Food Intake

As far as food intake is concerned, a 24 hour dietary recall was utilized to confirm what pregnant women had reported using a food frequency questionnaire, since it is easier to remember foods taken during the previous 24 hours than a week or more ago. Similar findings were observed with both data collection methods. Generally, there was increase in the consumption of most locally available food sources that are rich in iron and folate especially dark green leafy vegetables. This increase in consumption of dark green vegetables could have been due to the fact that, this being a rural agricultural area, most women grow their own vegetables making them more readily available. In addition, it could be due to increased awareness of the importance of these locally available foods as good sources of iron/folate. Conversely, consumption of the more costly iron/folate food sources like liver decreased during the study, probably due to decreased purchasing power among pregnant women as they tried to save for child birth and delivery.

These findings are similar to a nutrition education intervention study among postpartum women that demonstrated significantly greater improvement in overall dietary patterns such as

consumption of fruits, vegetables, and soybeans (Liu et al, 2009; Nisar et al, 2014b). The finding contrasts with what Cheng and colleagues found in China, where high proportions of pregnant women of 64% and 97% in their last trimester had low intakes of iron and folate respectively (Cheng et al, 2009). Low intakes of less than once a day and less than once a week in vegetables and meat respectively, was found in Ethiopia and was associated with increased anaemia (Haidar & Pobocik, 2009). However, lower than recommended dietary iron intake has been reported among majority of pregnant women even in developed countries like UK (Alwan et al, 2011) just like India (Samuel et al, 2013). It is therefore necessary to constantly offer nutritional education and counselling based on the increased nutrient need during pregnancy so that pregnant women can increase their intake of these vital nutrients to maintain a healthy pregnancy.

This study revealed greater increase in appropriate and cost-effective iron/folate food choices and consumption in the intervention group showing that application of CBA was effective including education and follow-up by CHVs. Iron and folate food sources was one of the topics CHVs were to educate pregnant women, during follow-ups, to enable them make appropriate iron/folate rich food choices. Consumption of a variety of foods increases dietary diversification, this being a critical factor in providing an extensive range of micronutrients, including iron and folate. Adoption of appropriate and desirable food choices that meet all the daily nutrient requirements is one of the policy recommendations for improving micronutrient malnutrition (Tontisirin et al, 2002). Thus, it is important to assess pregnant women's dietary habits so as to provide targeted counselling based on needed information (Arkkola et al, 2006) due to the increased nutrients requirement during pregnancy and for better outcome of pregnancy (World Health Organization, 2013).

5.5.2 Antenatal Clinic Attendance and Anthropometric Measurements

Findings from this study reveal that the average clinic attendance of less than 3, is far below the expected minimum of 4 by standard guidelines under FANC (Ministry of Health, 2012a). Increased clinic attendance during the study period as reported by nurse in-charges at ANC clinics despite the low average clinic attendance, supports to dispel the myth that community delivery of IFAS will hinder women from attending health care facilities (Maternal and Child Health Integrated Program, 2014). Instead, CHVs helped to increase clinic attendance as reported by nurses and pregnant women. This could mean that this average was even lower before the study. Sufficient prenatal care has been reported as one of the main factors that determine IFAS utilization during pregnancy (Lunet et al, 2008). Studies show that difficult access and failure/poor utilization of antenatal care services has been significantly contributes to non-use of IFAS antenatally (Maina-Gathigi et al, 2013a; Nisar et al, 2014a). This can however be improved by utilizing CHVs as demonstrated in this and other community-based studies (Maternal and Child Health Integrated Program, 2014). Hence CHVs should be formally recognized and adapted in the health care system, to help improve both ANC clinic attendance as well as utilization of ANC services.

Nutritional assessment during pregnancy is challenging due to the serial weight gain of both mother and baby. Generally, mean anthropometric measurements of weight, fundal height, MUAC and height in this study were within normal range. There was a persistently steady increase in weight and fundal height with subsequent ANC clinic visits just as is expected with pregnancy.

As far as height is concerned, the mean height reported of 157.58cm and 156.94cm in control and intervention group respectively was just at the borderline of the normal range. This means most pregnant women were not at risk of obstetric complications with reference to their height measurements. This mean height is similar to mean height of 156.74 +5.99cm reported in Brazil

(Ricalde et al, 1998) and 159.8 ± 6.2 cm reported in South Africa (Fakier, 2015). Short maternal stature (146-156cm) has been used to identify risk for LBW and obstetric complications but there is no clear cut-off value for maternal height for general use in developing countries.

The mean weight of 64.21kg and 64.76kg in control and intervention groups respectively reported in this study was within normal range but less than $72.5 \text{kg} \pm 17.7 \text{kg}$ reported in South Africa (Fakier, 2015), probably due to different lifestyles and diets consumption. Measurement of weight alone is inadequate and BMI is also limited, even in the first or early second trimester (Fakier, 2015). As pregnancy advances, BMI is neither practical nor accurate due to the maternal/foetus-related increase in weight. Whereas excessive gain of weight in pregnancy is undesirable and can result in complications, pregnancy weight gain within recommended ranges contributes to best outcome for both mother and baby (Rasmussen et al, 2009). Excessive weight gain during pregnancy should be avoided through health education to guide pregnant women to have well-planned, adequate and healthy diets (Uusitalo et al, 2009). This study is not sufficient to give conclusive evidence on the aspect of weight in pregnancy and a more controlled study would help determine this.

Research has indicated that MUAC can be used to estimate BMI and detect nutritional disorders (Khadivzadeh, 2002). A recent study has shown that MUAC is as effective as BMI in assessing mortality risks associated with under nutrition among African school aged children and adolescents (Mramba et al, 2017). Due to the MUAC's strong correlation with BMI in pregnancy, it is reliably used as a substitute for BMI estimation and an alternative indicator to assess nutritional status in pregnancy and screen women at risk for potential adverse pregnancy outcomes (Fakier, 2015; Ricalde et al, 1998). The MUAC is an effective, simple, quick and cost-effective screening tool for poor nutritional status in adults (Ayatollahi, 2012). This is especially applicable in

pregnancy where BMI is not practical due to the foetus-related increase in weight. Moreover, it is highly significant because low MUAC has consistently been associated with increased risk of low infant birth weight as well as other adverse health outcomes such as pre-term birth, intra-uterine growth retardation and perinatal mortality (Tang et al, 2013; Ververs et al, 2013).

This study revealed that the mean MUAC of pregnant women was within normal range though on the lower limit. This means that most women were well nourished and had good nutritional status with reference to MUAC. This finding was almost similar to 27.00 +3.44cm reported in Brazil (Ricalde et al, 1998) and less than 29.4cm ± 4.83cm reported in South Africa(Fakier, 2015), 2015). In this study, MUAC cut-off value of 23cm was used, which is the recommended cut-off value in women in African and Asian set-up (Ververs et al, 2013). However, further findings in this study revealed abnormal MUAC measurements in a few women who had lower than normal (<23cm), indicating malnutrition, while a substantial number had higher than normal (≥33cm), indicating over nutrition. This shows the need to take MUAC as a routine measurement to check for malnutrition during pregnancy since Body Mass Index (BMI) does not practically apply in pregnancy due to the physiological weight related body changes involved.

5.5.3 Haematological Measurements

With reference to haematological status, the low prevalence of anaemia (mild and moderate) reported at baseline in both the control and intervention groups respectively (on basis of Hb levels) is less than 7.8% reported in Nyeri Sub-county (Maina-Gathigi et al, 2013a) but much lower than that 40%-53% reported in other localized studies in Kenya (Mulambah et al, 2014; Waweru et al, 2009). This low rate of anaemia might be explained by the high altitude of the study site. People living in high altitude areas tend to have higher Hb than those in low altitude areas, as a compensatory measure to the low oxygen levels there.

Unlike the low abnormal Hb readings, the folate deficiency was much higher and slightly increased with pregnancy across the study groups. This could partly be explained by the low number of respondents tested for folate levels at endline owing to the high loss to follow-up. About a quarter of the women were folate deficient at baseline while a third were folate deficient at endline across the study groups. These findings are similar to 26% deficiency reported in India (Pathak et al, 2007) but less than 44% reported in China (Ren et al, 2006) and much less than 79.3% reported in Tokyo, Japan (Matsuzaki et al, 2008). Folate test levels are scarcely available especially in developing nations because the test is very expensive yet non-specific. The serum folate test is only accurate as a measure of recent dietary folate intake. Nonetheless, assessment of serum folate is useful for the monitoring trends of folate status. In addition it useful in evaluation of the impact of interventions of public health importance like IFAS (World Health Organization, 2012b).

Finally, the actual effect of IFAS on these haematological tests cannot be determined from this study owing to the short duration of follow-up in this study. Also, many factors affect bioavailability of these micronutrients in the body which this study is not able to control for. Thus, there is need for a randomized controlled trial to clearly understand these dynamics.

5.6 Experiences of Community Health Volunteers, Health Care Providers and Pregnant Women of Participating in a Community-based Approach (CBA) of IFAS

The main findings from the qualitative data were: (1) all the three groups of study participants were positive about CBA of IFAS (2) Provider-client communication was improved at various levels (3) there was increased demand for not only IFAS but other health services as well (4) community-based education needs strengthening (5) the main challenge experienced was IFAS

stock-outs (6) integration of CBA of IFAS into the existing ANC distribution to ensure its continued use was highly recommended.

These findings are consistent with literature on strengths of community-based distribution of IFAS as a valuable platform in implementation of IFAS programmes (Kavle & Landry, 2017). The three groups of study participants found this approach beneficial to not only the pregnant women but also to all stakeholders and entire community. They were all positive and supportive of this approach. Using CHV to provide IFAS tablets and education was a very satisfying experience to them. As other studies indicate, CHVs carry out varied functions related to delivery of health care especially in developing nations due to shortage of health care providers (Bigirwa, 2009; Kane et al, 2010). During the CBA of IFAS, CHVs felt valued and appreciated in that they made significant contributions to improvement of the health of pregnant women. This encouraged CHVs to be more committed. In turn, pregnant women benefitted more by consistently receiving closer follow-up from CHVs. Thus, involving CHVs in CBA of IFAS can go a long way in ensuring the benefits of IFAS are realized.

Following this study, communication among the various stakeholders was enriched. The nurse-CHV-client interaction was improved both at facility and community levels. There was closer interaction between nurses, CHVs and pregnant women. Consistent with other studies, CHVs acted as a link to facilitate access to health services by clients and informed nurses about community health needs (Witmer et al, 1995) particularly for those residing in underserved and rural areas (George et al, 2012; Jaskiewicz & Tulenko, 2012). Since the nurses in charge of the health facilities where CHVs were attached provided supportive supervision and IFAS tablets to CHVs, this link was activated more thus more opportunities to communicate and exchange ideas. This increased community awareness and uptake of IFAS. As Titaley (2014) indicates,

participation of the community in health programs is essential for the improvement of their uptake. This cannot be achieved without proper communication. The CHVs are closer to the community leading to presumably better interpersonal communication with community members than health care providers. In this regard, equipping them with the necessary IFAS information in a simple way can achieve more and help address related fears or misconceptions. This in turn increases understanding of the importance of taking supplements.

One of the unanticipated benefits of the study was increased demand for not only IFAS but also other health services. Pregnant women developed more confidence in CHVs causing more consultations and referrals for health services. This increased utilization of varied health services in addition to increased ANC attendance and IFAS utilization. Numerous studies have also indicated great success with community-based interventions as outlined below. They have significantly improved antenatal and neonatal practice indicators (Gogia & Sachdev, 2010) in addition to reducing maternal/child morbidity and mortality (Lassi et al, 2010; Lewin et al, 2005). The training of TBAs in a certain highly geographically dispersed, rural community in Africa that had limited access to healthcare, significantly reduced neonatal mortality by up to 50% (Gill et al, 2011). In addition, using CHWs reduced adverse perinatal outcomes in meta-analysis of several trials (Gogia & Sachdev, 2010; Wilson et al, 2011). Using community health volunteers reduced maternal anaemia in Thailand, (Pattanee, 2002) and Nepal (Sanghvi et al, 2010). The community volunteers led to increased antenatal care attendance, dismissing the myth that community-based IFAS distribution hinders pregnant women from attending health facilities for antenatal care provision (Maternal and Child Health Integrated Program, 2014).

Community-based IFAS education including peer counselling, positively implicated, (Ara et al, 2018) yielded positive results in this study and needs strengthening. Likewise, the importance of

family support in IFAS use is critical (Tinago et al, 2017). As Titaley stated, strengthening counselling sessions during antenatal care alone without improving community-based education is not sufficient to improve IFAS uptake (Titaley, 2014). Pregnant women should be provided with detailed counselling on anaemia control (Campaore et al, 2014). Expanding community-based services and sources of supplements by expanding local, community-based providers delivering anaemia counselling and education services and IFAS tablets improved IFAS utilization in Indonesia (Elder, 2000). Lack of clear information on the benefits of IFAS in pregnancy (Mithra et al, 2014) due to inadequate counselling (Galloway et al, 2002) is one of the factors affecting compliance (Martin et al, 2017). Counselling enables clients to gain understanding of taking initiative and creating demand for these services. Formative research has emphasized the need for community-based counselling (Birhanu et al, 2018; Kavle & Landry, 2017; Martin et al, 2017). Nurses in this study stated providing inadequate IFAS counselling. On the contrary, pregnant women indicated positive learning experiences from CHVs. They appreciated this approach, stating they learned a lot, freely and with ease. Thus, the need to strengthen community-based education cannot be over-emphasized.

Stock-outs of IFAS tablets was the main challenge experienced in this study. It was a major concern for all the three categories of study participants. Stock-outs (Gebremedhin et al, 2014; Maina-Gathigi et al, 2013a) and inconsistent IFAS supply (Birhanu et al, 2018; Gebremedhin et al, 2014) have been cited as a challenge and foremost barrier to effective IFAS use. Through this approach, a demand for IFAS was created which could not be met by existing resources. This indicates that health facilities underestimate the quantity of required resources due to probable underutilization of their health services. Replenishing the IFAS stock was not easy because of the

long bureaucratic government systems that were time-consuming. There is therefore need to address stock replenishing procedures to ensure consistent supply of IFAS throughout pregnancy.

The findings from this study strongly indicate and recommend that the time for integration of CBA into existing vertical health facility approach in provision of IFAS services is now. All the study participants suggested and desired sustenance of CBA of IFAS. It is clear from this study that, the potential of CHVs in the IFAS programme is not fully utilized. Through the community health strategy, CHVs should be involved more in IFAS programme. Nisar and colleagues (2014) recommended development of interventions that provide sufficient information and quality counselling to increase IFAS coverage, and CBA of IFAS is one of such (Nisar et al, 2014b).

Despite the contribution of CHVs in both preventive and curative services, work environment challenges and weakening characteristics influence their functionality and sustainability (Shakir, 2010). These include: supportive supervision, supplies and equipment, workload, and respect from the community and health system, which affect their productivity (Jaskiewicz & Tulenko, 2012). Working on voluntary basis without a regular compensation for services rendered is one of the setbacks in their active involvement as reported in this study. For the few who are active, they do not have specific tasks or records in relation to IFAS programme. Before this study, they had never been specifically trained on IFAS. Since CHVs are already working with communities to improve their general health, together with their leaders and the health facilities, they should come up with more specific IFAS related tasks, activities and terms of reference. Therefore, the Ministry of Health should formally recognize and officially absorb CHVs into the existing health care system.

5.7 Study Conclusions

The level of utilization of the existing IFAS policy guidelines and documents by HCP in provision of IFAS services is average (55%). From the study findings, the many already developed IEC materials on IFAS by the MoH headquarters were scarcely available at peripheral health facilities thus have not been fully disseminated to the grassroots. This shows there is a gap between what is available at the MoH headquarters for use and what is practically available in health facilities for use by those intended.

Implementation of a community-based approach of IFAS education improved the maternal knowledge on IFAS, with odds of being more knowledgeable being 3 times more at endline than at baseline. The various teaching methodologies applied especially professional-led by HCP and CHV-led by CHVs were a success. Follow-up by CHVs and their close interaction with pregnant women may have played a great role in these study findings, with better improvement in IFAS knowledge being recorded in the intervention group. During the study period, there was an increase in the percentage of pregnant women who received counselling information on various components of IFAS during their issuance at ANC room. Furthermore, the HCP involved reported that the approach had positive benefits to both clients and community in general. It is noteworthy that the HCP training conducted was the first ever done among nurses at the County level in the country and yielded positive results as evidenced by the high post-test scores after the training in comparison with the pre-test scores before the training. These were further transferred to clients as evidenced by their high knowledge scores, following the intervention.

Implementation of a community-based approach of IFAS education improved the positive attitude towards IFAS among pregnant women, with odds of having a positive attitude being 9 times more

at endline than at baseline. This was evidenced by strong agreement with positive statements that promote IFAS intake, and strong disagreement with negative statements that hinder IFAS intake.

Implementation of a community-based approach of IFAS education and provision improved the maternal compliance with IFAS. In addition, fewer side-effects as well as challenges were reportedly experienced following the intervention, with reported improvement in the management of side-effects.

Anthropometric measurements revealed respondents had good nutritional status before which improved further after the study. Implementation of a community-based approach of IFAS education significantly increased consumption of certain iron and folate sources of food in maternal diet, more so those locally available especially dark green leafy vegetables, legumes and cereals.

Anaemia in pregnancy was not a public health problem in this study owing to the limited levels of low haemoglobin levels. However, folate deficiency was quite substantial. It is not clear why the folate deficiency is so much higher compared to the low haemoglobin levels.

Findings from CHVs, nurses and pregnant women were all positive and supportive of the CBA of IFAS. The potential of CHVs in the IFAS programme implementation is not fully utilized and the role of CHVs in IFAS programme is not clearly defined in the current policy. Not all CHVs are active at community level. Working on voluntary basis without a regular compensation for services rendered was one of their setbacks in their active involvement. For the few that are active, they do not have specific tasks or records in relation to the IFAS programme. They had never been specifically trained on IFAS. Those involved in CBA of IFAS were pleased with the strategy,

reported that they learnt a lot and recommended its official inclusion to complement the existing health facility provision strategy.

In summary, using CHVs to implement a community-based approach of IFAS was a great success and increased supplement awareness and utilization. It is a potential approach for diversification of IFAS policy implementation in Kenya. It can be used to increase both demand and delivery of IFAS to pregnant women to improve the low compliance levels. It has the potential to increase the coverage and compliance if sustained.

Based on the lack of statistical significance in the improvement in IFAS knowledge and compliance among pregnant women, both null hypotheses have been accepted while both alternative hypotheses have been rejected. However, in practice, there was improvement in both IFAS knowledge and compliance. The lack of statistical significance was most probably due to the reduced sample size at endline as research indicates (Thiese et al, 2016). This was as a result of the high respondents' loss to follow-up despite mitigation measures of tracing them at home. It was caused by the prolonged industrial actions (strikes) among health care providers in the public health sector.

5.8 Study Recommendations

5.8.1 Recommendations for Practice

Knowledge should go hand in hand with practice to continually improve IFAS compliance among pregnant women.

There is need to improve both utilization and availability of IFAS guidelines and policy documents. Scarcity of the already developed IEC materials on IFAS in health facilities needs to

be practically addressed. Using the bottom-up approach, peripheral health facilities need to create demand for these IEC materials from the Ministry of Health headquarters. They need to create a demand on the ministry to disseminate the IEC materials on IFAS through constant communication, training and other relevant forums.

There is need for health facilities to consistently acquire and provide clients with brochures/leaflets to act both as a source of information as well as a reference where they can always refer to remind themselves. These can also be used effectively for peer education to teach and remind others about IFAS. The IFAS calendars meant for daily use by clients to record and monitor their IFAS use should also be acquired and consistently provided to pregnant women for their consistent use.

To continually improve IFAS knowledge and positive attitude among HCPs and consequently pregnant women, all HCPs ought to utilize the existing IFAS policy guidelines and documents in health education of clients on IFAS as well as provision of other IFAS services. The HCPs, in coordination with their management, need to organize continuous medical education sessions on IFAS including creating demand for update trainings and refresher courses on IFAS. This will offer opportunities to share information and ensure all HCPs are updated with current IFAS information for quality practices to improve the IFAS programme. The leadership in health facilities need to ensure continuous acquisition and display of the various posters and other IFAS related documents at different service delivery points. They should encourage and continually evaluate their use by all staff.

The management in health facilities ought to work with their staff to develop and improve evaluation tools for the IFAS programme. These should include evaluation tools for utilization of IFAS policy documents and an evaluation checklist for ANC counselling to ensure delivery of all key health messages on IFAS during counselling sessions.

To improve IFAS compliance, CHVs need to be involved more in the IFAS programme implementation. Since CHVs are already working with communities and this study found out that they do not have specific roles in relation to IFAS, together with their leaders and the health facility staff, they need to come up with more specific tasks and activities in relation to IFAS services, and terms of reference to enhance accountability among CHVs. Besides, the community need to be sensitized to create demand for the official recognition and inclusion of CHVs in the payroll as a compensation and motivation for the services rendered, to serve the community better.

5.8.2 Recommendations for Policy

The MoH, together with other stakeholders need to develop an evaluation tool to monitor and ensure utilization of the already developed policy guidelines and IFAS documents in the implementation of the IFAS programme. The ministry needs to first avail and disseminate all the developed IEC materials on IFAS in various forums from headquarters through the counties to the peripheral health facilities in the grassroots. All stakeholders and partners need to be involved to realize this.

A policy needs to be developed that mandates all those involved in provision of IFAS services to undergo prior training whether pre-service or in-service. Based on the findings from this study, a review of the pre-service curriculum in medical institutions is recommended. The regulators of pre-service training need to work with all medical training institutions to review the pre-service curriculum to include specific up to date information on IFAS. This will ensure all graduates are well equipped to enable them provide quality IFAS services.

The ministry, through the Division of Nutrition, needs to standardize health education messages given to clients on IFAS by developing an IFAS counselling checklist and including it in the

mother child health booklet. The checklist will serve as a guide on the health messages to pass to clients and should have a provision for ticking where the HCP will tick health messages provided. This will ensure that the clients receive similar information and all important areas with regard to IFAS are covered during ANC counselling without any being left out.

Findings from this study strongly indicate and recommend that the time for integration of CBA into existing vertical health facility approach in provision of IFAS services is now. The MoH needs to formally recognize and absorb CHVs into the existing health care system so that they can also receive remuneration for their services since voluntary services are not necessarily compensated for, leading to unavailability of CHVs. Their official inclusion involves developing specific tasks, activities and terms of reference with regard to IFAS programme as well as the other programmes they will be involved in.

Integration of CBA of IFAS into the existing antenatal distribution, by allowing CHVs to distribute IFAS supplements in the community is a policy initiative the researcher highly recommends for consideration, to diversify IFAS policy implementation in Kenya. The role of CHVs in IFAS programme implementation also needs to be specified. There is need to complement the antenatal IFAS distribution approach with CBA of IFAS to strengthen IFAS programme interventions to further increase supplementation coverage and consequently reduce deficiencies of these crucial micronutrients among women and children. The CBA may be a promising strategy because it immediately increases access to the supplements by pregnant women. It's high time the CBA of IFAS got integrated into the existing vertical health facility approach in provision of IFAS services.

5.8.3 Recommendations for Further Research

This research involved only one Sub-County. Similar research ought to be done involving more counties in the country with different characteristics to determine whether the effects will be the same and will improve IFAS supplementation.

This research was prone to recall bias and subjectivity because it heavily relied on verbal reports. In addition, the study was not randomized although a control group was used to minimize the effect of non-randomization. This was community-based study and used the natural setting and did not modify the environment of the respondents. Thus, a Randomized Controlled Trial (RCT) is recommended to determine effectiveness of CBA in more controlled environments with more objective tests.

The follow-up period for this study was too short to give significant findings on the haematological status of pregnant women. A high level of folate deficiency was observed in contrast to the low Hb levels. These findings require further investigation in more controlled environments with early initiation of IFAS to determine the outcome and factors associated with it.

REFERENCES

- Aamer, I. & Zulfiqar, A. B. (2012) Routine iron/folate supplementation during pregnancy: Effect on maternal anaemia and birth outcomes. *Paediatric and Perinatal Epidemiology*, 26(Suppl. 1), 168-177.
- Abdullahi, H., Gasim, G. I., Saeed, A., Imam, A. M. & Adam, I. (2014) Antenatal iron and folic acid supplementation use by pregnant women in Khartoum, Sudan. *BMC Research Notes*, 7(1), 498.
- Adam, I., Abdullahi, H., Gasim, G. I., Saeed, A. & Imam, A. M. (2014) Antenatal iron and folic acid supplementation use by pregnant women in Khartoum, Sudan. *BMC Res Notes*, 7(1), 498.
- Adanikin, A. I., Awoleke, J. O., Olofinbiyi, B. A., Adanikin, P. O. & Ogundare, O. R. (2015) Routine Iron Supplementation and Anaemia by Third Trimester in a Nigerian Hospital. *Ethiopian Journal of Health Sciences*, 25(4), 305-312.
- Aguayo, V. M., Koné, D., Bamba, S. I., Diallo, B. & Sidibé, Y. (2005) Acceptability of multiple micronutrient supplements by pregnant and lactating women in Mali. *Public Health Nutrition*, 8(1), 33-37.
- Ahamed, N. H. K., S.A.M;Hassanen, R.H. (2018) Knowledge and Attitude of Pregnant Women about Iron Deficiency Anemia in Assist University Women Health Hospital,Egypt. *Journal of Nursing and Health Science*, 7(3), 49-58.
- Aikawa, R., Ngyen, C. K., Sasaki, S. & Binns, C. W. (2006) Risk factors for iron-deficiency anaemia among pregnant women living in rural Vietnam. *Public Health Nutr*, 9(4), 443-8.
- Al-Akhfash, A. A., Abdulla, A. M., Osman, A. M., Abdulgafar, J. I. & Almesned, A. A. (2013) Maternal knowledge and use of folic acid among Saudi females. *Saudi Med J*, 34(11), 1173-8.
- Al-Hossani, H., Abouzeid, H., Salah, M. M., Farag, H. M. & Fawzy, E. (2010) Knowledge and practices of pregnant women about folic acid in pregnancy in Abu Dhabi, United Arab Emirates. *East Mediterr Health J*, 16(4), 402-7.
- Alam, A., Rasheed, S., Khan, N. U., Sharmin, T., Huda, T. M., Arifeen, S. E. & Dibley, M. J. (2015) How can formative research inform the design of an iron-folic acid supplementation intervention starting in first trimester of pregnancy in Bangladesh? *BMC Public Health*, 15(1), 374.
- Alwan, N. A., Greenwood, D. C., Simpson, N. A., McArdle, H. J., Godfrey, K. M. & Cade, J. E. (2011) Dietary iron intake during early pregnancy and birth outcomes in a cohort of British women. *Hum Reprod*, 26(4), 911-9.
- Ara, G., Khanam, M., Papri, N., Nahar, B., Haque, M. A., Kabir, I. & Dibley, M. J. (2018) Peer counselling improves breastfeeding practices: A cluster randomized controlled trial in urban Bangladesh. *Maternal & Child Nutrition*, 14(3), e12605.
- Arega Sadore, A., Abebe Gebretsadik, L. & Aman Hussen, M. (2015) Compliance with Iron-Folate Supplement and Associated Factors among Antenatal Care Attendant Mothers in Misha District, South Ethiopia: Community Based Cross-Sectional Study. *Journal of Environmental and Public Health*, 781973.
- Arkkola, T., Uusitalo, U., Pietikainen, M., Metsala, J., Kronberg-Kippila, C., Erkkola, M., Veijola, R., Knip, M., Virtanen, S. M. & Ovaskainen, M. L. (2006) Dietary intake and use of dietary supplements in relation to demographic variables among pregnant Finnish women. *Br J Nutr*, 96(5), 913-20.
- Atienza, A. A. & King, A. C. (2002) Community-based health intervention trials: an overview of methodological issues. *Epidemiol Rev*, 24(1), 72-9.
- Ayatollahi, S. (2012) A Systematic Review of Reference Values for Mid Upper Arm Circumference (MUAC) in Southern Iran. *Journal of Obesity and Weight Loss Therapy*, 1, 119.
- Barker, K., Omoni, G., Wakasiaka, S., Watiti, J., Mathai, M. & Lavender, T. (2013) 'Moving with the times' taking a glocal approach: A qualitative study of African student nurse views of e learning. *Nurse Education Today*, 33(4), 407-412.
- Barry Shane (2011) Folate status assessment history: Implications for measurement of biomarkers in NHANES. *The American Journal of Clinical Nutrition*, 94(1), 337S-342S.
- Bhutta, Z. A., Darmstadt, G. L., Hasan, B. S. & Haws, R. A. (2005) Community-based interventions for improving perinatal and neonatal health outcomes in developing countries: a review of the evidence. *Pediatrics*, 115(2 Suppl), 519-617.

- Bhutta, Z. A., Rizvi, A., Raza, F., Hotwani, S., Zaidi, S., Moazzam Hossain, S., Soofi, S. & Bhutta, S. (2009) A comparative evaluation of multiple micronutrient and iron-folic acid supplementation during pregnancy in Pakistan: impact on pregnancy outcomes. *Food Nutr Bull*, 30(4 Suppl), S496-505.
- Bigirwa, P. (2009) Effectiveness of community health workers (CHWS) in the provision of basic preventive and curative maternal, newborn and child health (MNCH) interventions: A systematic review. *Health Policy and Development*, 7(3), 162 - 172.
- Bilimale, A. & Anjum, A. (2010) Improving adherence to oral iron supplementation during pregnancy. *Australasian Medical Journal* 3(5), 281-290.
- Bilimale, A., Anjum, J., Sangolli, H. N. & Mallapur, M. (2010) Improving adherence to oral iron supplementation during pregnancy. *AMJ*, 3(5), 281-290.
- Birhanu, Z., Chapleau, G. M., Ortolano, S. E., Mamo, G., Martin, S. L. & Dickin, K. L. (2018) Ethiopian women's perspectives on antenatal care and iron-folic acid supplementation: Insights for translating global antenatal calcium guidelines into practice. *Maternal & Child Nutrition*, 14(S1), e12424.
- Blackburn, H. W. (1985) Minnesota Heart Health Program.
- Brierley, J. A. (2017) The role of a pragmatist paradigm when adopting mixed methods in behavioural accounting research. *International Journal of Behavioural Accounting and Finance*, 6(2), 140-154.
- Bruce, M. L., Smith, W., Miranda, J., Hoagwood, K. & Wells, K. B. (2002) Community-Based Interventions. *Mental Health Services Research*, 4(4), 205-214.
- C.D.I., S. G. (2010) Community-directed interventions for priority health problems in Africa: results of a multicountry study. *Bull World Health Organ*, 88(7), 509-18.
- Campaore, A., Gies, S., Brabin, B. J., Tinto, H. & Brabin, L. (2014) "There is iron and iron..." Burkinabè women's perceptions of iron supplementation: a qualitative study. *Matern Child Health J*, 18(8).
- Casey, G. J., Sartori, D., Horton, S. E., Phuc, T. Q., Phu, L. B., Thach, D. T., Dai, T. C., Fattore, G., Montresor, A. & Biggs, B.-A. (2011) Weekly Iron-Folic Acid Supplementation with Regular Deworming Is Cost-Effective in Preventing Anaemia in Women of Reproductive Age in Vietnam. *PLoS ONE*, 6(9), e23723.
- Centers for Disease Control (2014) *Community Based Interventions 2010–2013*
- Chakma, T., Vinay Rao, P. & Meshram, P. K. (2013) Factors associated with high compliance/feasibility during iron and folic acid supplementation in a tribal area of Madhya Pradesh, India. *Public Health Nutr*, 16(2), 377-80.
- Charles, C. V., Dewey, C. E., Daniell, W. E. & Summerlee, A. J. (2011) Iron-deficiency anaemia in rural Cambodia: community trial of a novel iron supplementation technique. *Eur J Public Health*, 21(1), 43-8.
- Charoenlarp, P., Dhanamitta, S., Kaewvichit, R., Silprasert, A., Suwanaradd, C., Na-Nakorn, S., Prawatmuang, P., Vatanavicharn, S., Nutcharas, U. & Pootrakul, P. (1988) A WHO collaborative study on iron supplementation in Burma and in Thailand. *Am J Clin Nutr*, 47.
- Cheng, Y., Dibley, M. J., Zhang, X., Zeng, L. & Yan, H. (2009) Assessment of dietary intake among pregnant women in a rural area of western China. *BMC Public Health*, 9(1), 222.
- Christian, P., Khatri, S. K., Katz, J., Pradhan, E. K., LeClerq, S. C., Shrestha, S. R., Adhikari, R. K., Sommer, A. & West, K. P., Jr. (2003a) Effects of alternative maternal micronutrient supplements on low birth weight in rural Nepal: double blind randomised community trial. *BMJ*, 326(7389), 571.
- Christian, P., Shrestha, J., LeClerq, S. C., Khatri, S. K., Jiang, T., Wagner, T., Katz, J. & West, K. P. (2003b) Supplementation with micronutrients in addition to iron and folic acid does not further improve the hematologic status of pregnant women in rural Nepal. *J Nutr*, 133.
- Clarke, V. & Braun, V. (2013) Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *Psychologist*, 26(2), 120-123.
- County government of Kiambu (2018) *Political Units*, 2018. Available online: <https://kiambu.go.ke/political-units/> [Accessed].
- Dairo, M. D. & Ige, O. K. (2009) Supplementation of micronutrient in community micronutrient deficiency prevention programmes. *Ann Ib Postgrad Med*, 7(1), 6-9.
- Dairo, M. D. & Lawoyin, T. O. (2006) Demographic factors determining compliance to iron supplementation in pregnancy in Oyo State, Nigeria. *Niger J Med*, 15.

- Das, A., Chatterjee, R., Karthick, M., Mahapatra, T. & Chaudhuri, I. (2016) The Influence of Seasonality and Community-Based Health Worker Provided Counselling on Exclusive Breastfeeding - Findings from a Cross-Sectional Survey in India. *PLoS ONE*, 11(8), e0161186.
- Dearing, J. W. (2009) Applying Diffusion of Innovation Theory to Intervention Development *Research on Social Work Practice*, 19(5), 503-518.
- Demidenko, E. (2008) Sample size and optimal design for logistic regression with binary interaction. *Stat Med*, 27(1), 36-46.
- Dinga, L. A. (2013) *Factors associated with adherence to iron/folate supplementation among pregnant women attending antenatal clinic at Thika District Hospital in Kiambu County, Kenya*. Master of Science in Applied Human Nutrition University of Nairobi.
- Elder, L. K. (2000) *Issues in programming for maternal anaemia*. Mother Care.
- Eneroth, H., El Arifeen, S., Persson, L. A., Lonnerdal, B., Hossain, M. B., Stephensen, C. B. & Ekstrom, E. C. (2010) Maternal multiple micronutrient supplementation has limited impact on micronutrient status of Bangladeshi infants compared with standard iron and folic acid supplementation. *Journal of Nutrition*, 140(3), 618-24.
- Fakier, A. (2015) *Mid-Upper Arm Circumference: A surrogate for Body Mass Index in pregnant women?* MMED in Obstetrics and Gynaecology University of Cape Town.
- FAO (2001) *FAO/WHO expert consultation on human vitamin and mineral requirements*. Rome:
- Fiedler, J., D'Agostino, A. & Sununtnasuk, C. (2014) *A rapid initial assessment of the distribution and consumption of iron-folic acid tablets through antenatal care in Nepal*.
- Fraser, D. M. & Cooper, M. A. (2009) *Myles Textbook for Midwives*. Edinburgh, UK: Elsevier.
- Galloway, R., Dusch, E., Elder, L., Achadi, E., Grajeda, R., Hurtado, E., Favin, M., Kanani, S., Marsaban, J., Meda, N., Moore, K. M., Morison, L., Raina, N., Rajaratnam, J., Rodriguez, J. & Stephen, C. (2002) Women's perceptions of iron deficiency and anemia prevention and control in eight developing countries. *Soc Sci Med*, 55.
- Galloway, R. & McGuire, J. (1994) Determinants of compliance with iron supplementation: supplies, side effects, or psychology? *Soc Sci Med*, 39.
- Gebremlak, B., Dadi, A. F. & Atnafu, A. (2017) High Adherence to Iron/Folic Acid Supplementation during Pregnancy Time among Antenatal and Postnatal Care Attendant Mothers in Governmental Health Centers in Akaki Kality Sub City, Addis Ababa, Ethiopia: Hierarchical Negative Binomial Poisson Regression. *PLOS ONE*, 12(1), e0169415.
- Gebremedhin, S., Samuel, A., Mamo, G., Moges, T. & Assefa, T. (2014) Coverage, compliance and factors associated with utilization of iron supplementation during pregnancy in eight rural districts of Ethiopia: a cross-sectional study. *BMC Public Health*, 14, 607.
- George, A., Young, M., Nefdt, R., Basu, R., Sylla, M., Clarysse, G., Bannicq, M. Y., de Sousa, A., Binkin, N. & Diaz, T. (2012) Community Health Workers Providing Government Community Case Management for Child Survival in Sub-Saharan Africa: Who Are They and What Are They Expected to Do? *The American Journal of Tropical Medicine and Hygiene*, 87(5 Suppl), 85-91.
- Getachew, M., Abay, M., Zelalem, H., Gebremedhin, T., Grum, T. & Bayray, A. (2018) Magnitude and factors associated with adherence to Iron-folic acid supplementation among pregnant women in Eritrean refugee camps, northern Ethiopia. *BMC Pregnancy and Childbirth*, 18(1), 83.
- Gill, C. J., Phiri-Mazala, G., Guerina, N. G., Kasimba, J., Mulenga, C., MacLeod, W. B., Waitolo, N., Knapp, A. B., Mirochnick, M., Mazimba, A., Fox, M. P., Sabin, L., Seidenberg, P., Simon, J. L. & Hamer, D. H. (2011) Effect of training traditional birth attendants on neonatal mortality (Lufwanyama Neonatal Survival Project): randomised controlled study. *BMJ*, 342.
- Gogia, S. & Sachdev, H. S. (2010) Home visits by community health workers to prevent neonatal deaths in developing countries: a systematic review. *Bulletin of the World Health Organization*, 88(9), 658-666B.
- Gonzales, G. F., Rubín de Celis, V., Begazo, J., Del Rosario Hinojosa, M., Yucra, S., Zevallos-Concha, A. & Tapia, V. (2018) Correcting the cut-off point of hemoglobin at high altitude favors misclassification of anemia, erythrocytosis and excessive erythrocytosis. *American journal of hematology*, 93(1), E12-E16.

- Gunaratna, N. S., Masanja, H., Mrema, S., Levira, F., Spiegelman, D., Hertzmark, E., Saronga, N., Irema, K., Shuma, M., Elisaria, E. & Fawzi, W. (2015) Multivitamin and iron supplementation to prevent periconceptional anemia in rural tanzanian women: a randomized, controlled trial. *PLoS One*, 10(4), e0121552.
- Haidar, J. A. & Pobocik, R. S. (2009) Iron deficiency anemia is not a rare problem among women of reproductive ages in Ethiopia: a community based cross sectional study. *BMC Blood Disord*, 9, 7.
- Haider, B. A., Yakoob, M. Y. & Bhutta, Z. A. (2011) Effect of multiple micronutrient supplementation during pregnancy on maternal and birth outcomes. *BMC Public Health*, 11 Suppl 3, S19.
- Haider, R. & Saha, K. K. (2016) Breastfeeding and infant growth outcomes in the context of intensive peer counselling support in two communities in Bangladesh. *International Breastfeeding Journal*, 11, 18.
- Harrison, G. G. (2010) Public health interventions to combat micronutrient deficiencies. *Public Health Reviews*, 32(1), 256-266.
- Heshmat, R., Azemati, B., Keshtkar, A., Salehi, F., Abdollahi, Z., Kolaahdouz, F., PourAram, H., Farivar, F., Bagheri, M., Sheykh-ol-Eslam, R. & Nadim, A. (2009) Comparison of Knowledge, Attitude and Practice of Urban and Rural Households toward Iron Deficiency Anemia in three Provinces of Iran. *Iranian J Publ Health*, 38(4), 83-90.
- Information Cradle (2018) *Lari Constituency*, 2018. Available online: <https://informationcradle.com/kenya/lari-constituency/> [Accessed.
- Ivanov, L. L. & Blue, C. L. (2008) *Public Health Nursing: Leadership, Policy & Practice*
New York: Delmar Cengage Learning.
- Jaskiewicz, W. & Tulenko, K. (2012) Increasing community health worker productivity and effectiveness: a review of the influence of the work environment. *Human Resources for Health*, 10, 38-38.
- Jayatissa, R. & Piyasena, C. (1999) Adolescent Schoolgirls: Daily or Weekly Iron Supplementation? *Food and Nutrition Bulletin*, 20(4), 429-434.
- Juma, M., Oiye, S. O. & Konyole, S. O. (2015) Predictors of optimum antenatal iron-folate supplementation in a low resource rural set-up in Eastern Kenya. *Journal of public health and Epidemiology*, 7(11), 337-345.
- Kamel, K. (2017) Quantitative, Qualitative or Mixed Research: Which Research Paradigm to Use? *Journal of Educational and Social Research*, 7(2), 15-24.
- Kanani, S. J. & Poojara, R. H. (2000) Supplementation with iron and folic acid enhances growth in adolescent Indian girls. *J Nutr*, 130(2S Suppl), 452S-455S.
- Kane, S., Gerretsen, B., Scherpbier, R., Dal Poz, M. & Dieleman, M. (2010) A realist synthesis of randomised control trials involving use of community health workers for delivering child health interventions in low and middle income countries. *BMC Health Serv Res*, 10.
- Kavle, J. A. & Landry, M. (2017) Community-based distribution of iron-folic acid supplementation in low-and middle-income countries: a review of evidence and programme implications. *Public Health Nutrition*, 21(2), 346-354.
- Kawai, K., Spiegelman, D., Shankar, A. H. & Fawzi, W. W. (2011) Maternal multiple micronutrient supplementation and pregnancy outcomes in developing countries: meta-analysis and meta-regression. *Bull World Health Organ*, 89(6), 402-411B.
- Kc, A., Thapa, K., Pradhan, Y. V., Kc, N. P., Upreti, S. R., Adhikari, R. K., Khadka, N., Acharya, B., Dhakwa, J. R., Aryal, D. R., Aryal, S., Starbuck, E., Paudel, D., Khanal, S. & Devkota, M. D. (2011) Developing community-based intervention strategies and package to save newborns in Nepal. *J Nepal Health Res Counc*, 9(2), 107-18.
- Kenya National Bureau of Statistics & Macro ICF (2015) *Kenya Demographic and Health Survey 2014*. Nairobi: Kenya National Bureau of Statistics.
- Khadvizadeh, T. (2002) Mid upper arm and calf circumferences as indicators of nutritional status in women of reproductive age. *East Mediterr Health J*, 8(4-5), 612-8.
- KIAMBU (2018) *County Government of Kiambu*, 2018. Available online: <https://kiambu.go.ke/political-units/> [Accessed.

- Klassen, T. P., MacKay, J. M., Moher, D., Walker, A. & Jones, A. L. (2000) Community-based injury prevention interventions. *Future Child*, 10(1), 83-110.
- KNBS & ICF International (2014) *Kenya Demographic and Health Survey (KDHS)*. Kenya National Bureau of Statistics.
- Knudsen, V. K., Hansen, H. S., Ovesen, L., Mikkelsen, T. B. & Olsen, S. F. (2007) Iron supplement use among Danish pregnant women. *Public Health Nutr*, 10(10), 1104-10.
- Kothari, C. R. & Garg, G. (2014a) *Research Methodology: Methods and Techniques*, Third edition. New Delhi: New Age International Publishers.
- Kothari, C. R. & Garg, G. (2014b) *Research Methodology: Methods and Techniques*, Third Edition edition. New Age International Limited Publishers.
- Lassi, Z. S., Haider, B. A. & Bhutta, Z. A. (2010) Community-based intervention packages for reducing maternal and neonatal morbidity and mortality and improving neonatal outcomes. *Cochrane Database Syst Rev*(11), CD007754.
- Leeman, J., Calancie, L., Hartman, M. A., Escoffery, C. T., Herrmann, A. K., Lindsay E. Tague, L. E., Moore, A. A., Katherine M. Wilson, K. M., Michelle Schreiner, M. & Carmen Samuel-Hodge, C. (2015) What strategies are used to build practitioners' capacity to implement community-based interventions and are they effective?: A systematic review. *Implementation Sci*, 1-15.
- Leupker, R. V., Rastam, L., Hannan, P., Murray, D. M., Gray, C., Baker, W. L., Crow, R., Jacobs, D., Pirie, P., Mascioli, S. R., Mittelmark, M. & Blackburn, H. (1996) Community education for cardiovascular disease prevention. Morbidity and mortality results from the Minnesota Heart Health Program. *American Journal of Epidemiology*, 144(4), 351- 363
- Lewin, S. A., Babigumira, S. M., Bosch-Capblanch, X., Aja, G., Van Wyk, B., Genton, C., Scheel, I., Zwarenstein, M. & Daniels, K. (2005) *Lay health workers (LHWs) in primary and community health care: A systematic review of trials*. Cochrane Database Syst Rev: Rev, C. D. S.
- Lewin, S. A., Babigumira, S. M., Bosch-Capblanch, X., Aja, G., van Wyk, B., Glenton, C., Scheel, I., Zwarenstein, M. & Daniels, K. (2006), *Lay health workers in primary and community health care: A systematic review of trials*.
- Liu, N., Mao, L., Sun, X., Liu, L., Yao, P. & Chen, B. (2009) The effect of health and nutrition education intervention on women's postpartum beliefs and practices: a randomized controlled trial. *BMC Public Health*, 9(1), 45.
- Lu, C.-H., Tang, S.-T., Lei, Y.-X., Zhang, M.-Q., Lin, W.-Q., Ding, S.-H. & Wang, P.-X. (2015) Community-based interventions in hypertensive patients: a comparison of three health education strategies. *BMC Public Health*, 15(1), 1-9.
- Lunet, N., Rodrigues, T., Correia, S. & Barros, H. (2008) Adequacy of prenatal care as a major determinant of folic acid, iron, and vitamin intake during pregnancy. *Cadernos de Saude Publica*, 24(5), 1151-1157.
- Maguire, M. & Delahunt, B. (2017) Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *All Ireland Journal of Higher Education; Vol 9, No 3 (2017)*.
- Mahmoud, A.-H. A. W. (2007) *Iron Deficiency Anemia among Pregnant Women in Nablus District; Prevalence, Knowledge, Attitude and Practices*. Master of Public Health Science An-Najah National University, 27/03/2007.
- Maina-Gathigi, L., Omolo, J., Wanzala, P., Lindan, C. & Makokha, A. (2013a) Utilization of folic acid and iron supplementation services by pregnant women attending an antenatal clinic at a regional referral hospital in Kenya. *Maternal Child Health Journal*, 17(7), 1236-1242.
- Maina-Gathigi, L., Omolo, J., Wanzala, P., Lindan, C. & Makokha, A. (2013b) Utilization of folic acid and iron supplementation services by pregnant women attending an antenatal clinic at a regional referral hospital in Kenya. *Matern Child Health J*, 17(7), 1236-42.
- Male, T. (2015) *Collecting Quantitative Data*, 192-208.
- Martin, S. L., Seim, G. L., Wawire, S., Chapleau, G. M., Young, S. L. & Dickin, K. L. (2017) Translating formative research findings into a behaviour change strategy to promote antenatal calcium and iron and folic acid supplementation in western Kenya. *Maternal & Child Nutrition*, 13(1).

Mary, S. F., Kathy, K., Atul, S., Richard, M. M., Andy, N., Mijna, H., Berthold, K. & Alan, L. (2008) How much loss to follow-up is acceptable in long-term randomised trials and prospective studies? *Archives of Disease in Childhood* 93, 458-461.

Maternal and Child Health Integrated Program (2014) *Community-based distribution for routine Iron/folic acid supplementation in pregnancy*. Maternal and Child Health Integrated Program, USAID, Nairobi: Program, M. a. C. H. I.

Matiri, E., Pied, E., Galloway, R., Wawire, S., Velez, O. & D, C. (2017) *Improving Iron-Folic Acid and Calcium Supplementation Compliance through Counseling, Reminder Cards, and Cell Phone Messages in Kenya*.

Matsuzaki, M., Megumi Haruna, Erika Ota, Satoshi Sasaki, Yasushi Nagai & Murashima, S. (2008) Dietary folate intake, use of folate supplements, lifestyle factors, and serum folate levels among pregnant women in Tokyo, Japan. *The journal of obstetrics and gynaecology research*, 34(6), 971–979.

Mbule, M. A., Byaruhanga, Y. B., Kabahenda, M. & Lubowa, A. (2013) Determinants of anaemia among pregnant women in rural Uganda. *Rural Remote Health*, 13(2), 2259.

McLeroy, K. R., Norton, B. L., Kegler, M. C., Burdine, J. N. & Sumaya, C. V. (2003) Community-Based Interventions. *American Journal of Public Health*, 93(4), 529-533.

Memon, S., Syed, S. & Qureshi, J. (2017) Philosophical and Methodological Aspects of a Mixed-Methods Research: A Review of the Academic Literature, 1, 31-49.

Milman, N. (2012) Oral Iron Prophylaxis in Pregnancy: Not Too Little and Not Too Much! *Hindawi Publishing Corporation: Journal of Pregnancy*, 2012, 1-8.

Ministry of Health (2011a) *Kenya National Micronutrient Survey*. Nairobi. : Ministry of Health.

Ministry of Health (2011b) *National Food and Nutrition Security Policy; Sessional Paper*. Nairobi. :

Ministry of Health (2012a) *Accelerating reduction of iron deficiency anaemia among pregnant women in Kenya: Plan of action 2012-2017*. Nairobi. :

Ministry of Health (2012b) *IFAS Dialogue guide for health care providers*. Nairobi. :

Ministry of Health (2013a) *Maternal, Infant and Young Child Nutrition: National operational guidelines for health workers*. . Nairobi. :

Ministry of Health (2013b) *National Iron and Folic Acid Supplementation; Communication Strategy, 2013-2017*. Nairobi. :

Ministry of Health (2013c) *National Policy Guideline on combined iron and folic acid (IFA) supplementation for pregnant mothers in Kenya*. Nairobi. :

Ministry of Public Health and Sanitation (2008) *The Kenya National Technical Guidelines for Micronutrient Deficiency Control*. Nairobi. :

Mithra, P., Unnikrishnan, B., Rekha, T., Nithin, K., Mohan, K., Kulkarni, V., Holla, R. & Agarwal, D. (2014) Compliance with iron-folic acid (IFA) therapy among pregnant women in an urban area of south India. *African Health Sciences*, 14(1).

MoH, D. o. N. (2012a) *Accelerating reduction of iron deficiency anaemia among pregnant women in Kenya, Plan of Action 2012-2017*. Nairobi:

MoH, D. o. N. (2012b) *IFAS Dialogue guide for health care providers*. Nairobi:

MoH, D. o. N. (2013) *National Iron and Folic Acid Supplementation; Communication Strategy, 2013-2017*. Nairobi:

Mohajan, H. K. (2014) Food and Nutrition Scenario of Kenya. *American Journal of Food and Nutrition*, 2(2), 28-38.

Mramba, L., Ngari, M., Mwangome, M., Muchai, L., Bauni, E., Walker, A. S., Gibb, D. M., Fegan, G. & Berkley, J. A. (2017) A growth reference for mid upper arm circumference for age among school age children and adolescents, and validation for mortality: growth curve construction and longitudinal cohort study. *BMJ*, 358.

Mugenda, O. M. & Mugenda, A. G. (2003) *18. . . Research Methods - Quantitative and Qualitative Approaches*. Nairobi: Acts Press.

- Mulambah, C. S., Siamba, D. N., Ogutu, P. A., Siteti, D. I. & Wekesa, A. W. (2014) Anaemia in pregnancy: Prevalence and possible risk factors in Kakamega County, Kenya. *Science Journal of Public Health* 2(3), 216-222.
- Muro, G. S., Gross, U., Gross, R. & Wahyuniar, L. (1999) Increase in compliance with weekly iron supplementation of adolescent girls by an accompanying communication programme in secondary schools in Dar-es-Salaam, Tanzania. *Food and Nutrition Bulletin*, 20(4), 435 - 444.
- Nisar, Y., Michael, J. D. & Ali, M. M. (2014a) Factors associated with non-use of antenatal iron and folic acid supplements among Pakistani women: a cross sectional household survey. *BMC Pregnancy Childbirth*, 14(1), 305.
- Nisar, Y. B., Alam, A., Aurangzeb, B. & Dibley, M. J. (2014b) Perceptions of antenatal iron-folic acid supplements in urban and rural Pakistan: a qualitative study. *BMC Pregnancy and Childbirth*, 14(1), 1-12.
- Nisar, Y. B., Dibley, M. J. & Mir, A. M. (2014c) Factors associated with non-use of antenatal iron and folic acid supplements among Pakistani women: a cross sectional household survey. *BMC Pregnancy Childbirth*, 14, 305.
- Nuno, L., Teresa, R., Sofia, C. & Henrique, B. (2008) Adequacy of prenatal care as a major determinant of folic acid, iron, and vitamin intake during pregnancy. *Cad. Saúde Pública, Rio de Janeiro*, 24(5), 1151-1157.
- Nyamathi, A., Hanson, A. Y., Salem, B. E., Sinha, S., Ganguly, K. K., Leake, B., Yadav, K. & Marfisee, M. (2012) Impact of a Rural Village Women (Asha) Intervention on Adherence to Antiretroviral Therapy in Southern India. *Nursing research*, 61(5), 353-362.
- Okube, O. T., Mirie, W., Odhiambo, E., Sabina, W. & Habtu, M. (2016) Prevalence and factors associated with anemia among pregnant women attending antenatal clinic in the second and third trimesters at Pumwani maternity hospital, Kenya. *Open journal of Obstetrics and Gynaecology*, 6, 16-27.
- Pal, P. P., Sharma, S., Sarkar, T. K. & Mitra, P. (2013) Iron and Folic Acid Consumption by the Ante-natal Mothers in a Rural Area of India in 2010. *International Journal of Preventive Medicine*, 4(10), 1213-1216.
- Pasricha, S.-R., Drakesmith, H., Black, J., Hipgrave, D. & Biggs, B.-A. (2013) Control of iron deficiency anemia in low- and middle-income countries. *BLOOD*, 121(14), 2607-2617.
- Passerini, L., Casey, G. J., Biggs, B. A., Cong, D. T., Phu, L. B., Phuc, T. Q., Carone, M. & Montresor, A. (2012) Increased Birth Weight Associated with Regular Pre-Pregnancy Deworming and Weekly Iron-Folic Acid Supplementation for Vietnamese Women. *PLoS Negl Trop Dis*, 6(4), e1608.
- Pathak, P., Kapil, U., Yajnik, C. S., Kapoor, S. K., Dwivedi, S. N. & Singh, R. (2007) Iron, Folate, and Vitamin B12 Stores Among Pregnant Women in a Rural Area of Haryana State, India. *Food and Nutrition Bulletin*, 28(4), 435-438.
- Pattanee, W. (2002) Prevention and Control of Anemia: Thailand Experiences. *Journal of Nutrition*, 132(862S-866S).
- Pena-Rosas, J. P., De-Regil, L. M., Dowswell, T. & Viteri, F. E. (2012) Intermittent oral iron supplementation during pregnancy. *Cochrane Database Syst Rev*, 7.
- Peña-Rosas, J. P., De-Regil, L. M., Dowswell, T. & Viteri, F. E. (2012) Daily oral iron supplementation during pregnancy. *Cochrane Database Syst Rev*, 12.
- Perry, H. & Zulliger, R. (2012) *How Effective are Community Health Workers? An Overview of Current Evidence with Recommendations for Strengthening Community Health Worker Programs to accelerate Progress in Achieving the Health-related Millennium Development Goals*. HRH Global Resource Center Health, J. H. B. S. o. P.
- Popa, A. D., Niță, O., Graur, L. I., Popescu, R. M., Botnariu, G. E., Mihalache, L. & Graur, M. (2013) Nutritional knowledge as a determinant of vitamin and mineral supplementation during pregnancy. *BMC Public Health*, 13(1), 1105.
- Rai, S. (2013) *Compliance and its Determinants Regarding Iron and Folic Acid Supplementation among Pregnant Women Attending Paropakar Maternity and Women's Hospital, Kathmandu, Nepal*. Nepal: Nepal Health Research Council.
- Ramakrishnan, U., Neufeld, L., Gonzalez-Cossi'o, T., Villalpando, S., Garcia-Guerra, A., Rivera, J. & Martorell, R. (2004) Multiple Micronutrient Supplements during Pregnancy Do Not Reduce Anemia or

Improve Iron Status Compared to Iron-Only Supplements in Semirural Mexico. *Journal of Nutrition*, 134, 898 - 903.

Rasmussen, K. M., Catalano, P. M. & Yaktine, A. L. (2009) New guidelines for weight gain during pregnancy: what obstetrician/gynecologists should know. *Curr Opin Obstet Gynecol*, 21(6), 521-6.

Redick, C., Dini, H. S. F. & Long, L. A. (2014) *The Current State of CHW Training Programs in Sub-Saharan Africa and South Asia: What We Know, What We Don't Know, and What We Need to Do*.

Ren, A., Zhang, L., Li, Z., Hao, L., Tian, Y. & Li, Z. (2006) Awareness and use of folic acid, and blood folate concentrations among pregnant women in northern China--an area with a high prevalence of neural tube defects. *Reprod Toxicol*, 22(3), 431-6.

Ricalde, A. E., Velasquez-Melendez, G., Tanaka, A. C. & de Siqueira, A. A. (1998) Mid-upper arm circumference in pregnant women and its relation to birth weight. *Rev Saude Publica*, 32(2), 112-7.

Rogers, E. M. (1983) *Diffusion of Innovations*, Third Edition edition. New York,: The Free Press.

Rogers, E. M. (2003) *Diffusion of Innovations*, Fifth edition. New York: Free Press.

Sadore, A. A., Abebe, G., L. & Aman, H., M. (2015) Compliance with Iron-Folate Supplement and Associated Factors among Antenatal Care Attendant Mothers in Misha District, South Ethiopia: Community Based Cross-Sectional Study. *J Environ Public Health*, 2015, 781973.

Samuel, T. M., Thomas, T., Finkelstein, J., Bosch, R., Rajendran, R., Virtanen, S. M., Srinivasan, K., Kurpad, A. V. & Duggan, C. (2013) Correlates of anaemia in pregnant urban South Indian women: a possible role of dietary intake of nutrients that inhibit iron absorption. *Public Health Nutr*, 16(2), 316-24.

Sanghvi, T. G., Harvey, P. W. & Wainwright, E. (2010) Maternal iron-folic acid supplementation programs: evidence of impact and implementation. *Food Nutr Bull*, 31(2 Suppl), S100-7.

Saprii, L., Richards, E., Kokho, P. & Theobald, S. (2015) Community health workers in rural India: analysing the opportunities and challenges Accredited Social Health Activists (ASHAs) face in realising their multiple roles. *Hum Resour Health*, 13, 95.

Seck, B. C. & Jackson, R. T. (2008) Determinants of compliance with iron supplementation among pregnant women in Senegal. *Public Health Nutrition*, 11(6), 596-605.

Shah, N. M., Brieger, W. R. & Peters, D. H. (2011) Can interventions improve health services from informal private providers in low and middle-income countries?: a comprehensive review of the literature. *Health Policy Plan*, 26(4), 275-87.

Shah, R., Mullany, L. C., Darmstadt, G. L., Mannan, I., Rahman, S. M., Talukder, R. R., Applegate, J. A., Begum, N., Mitra, D., Arifeen, S. E. & Baqui, A. H. (2014) Incidence and risk factors of preterm birth in a rural Bangladeshi cohort. *BMC Pediatrics*, 14(1), 1-11.

Shakir, F. (2010) *Community Health Worker Programs: A Review of Recent Literature*.

Shivalli, S., Srivastava, R. K. & Singh, G. P. (2015) Trials of Improved Practices (TIPs) to Enhance the Dietary and Iron-Folate Intake during Pregnancy- A Quasi Experimental Study among Rural Pregnant Women of Varanasi, India. *PLoS ONE*, 10(9), e0137735.

Siegfried, N., Irlam, J. H., Visser, M. E. & Rollins, N. N. (2012) Micronutrient supplementation in pregnant women with HIV infection. *Cochrane Database Syst Rev*(3), CD009755.

Singh, M. B., Fotedar, R. & Lakshminarayana, J. (2008) Micronutrient deficiency status among women of desert areas of Western Rajasthan, India. *Public Health Nutrition*, 12(5), 624-629.

Smitasiri, S. & Solon, F. S. (2005) Implementing preventive iron-folic acid supplementation among women of reproductive age in some Western Pacific countries: possibilities and challenges. *Nutr Rev*, 63(12 Pt 2), S81-6.

Sutton, J. & Austin, Z. (2015) Qualitative Research: Data Collection, Analysis, and Management. *The Canadian journal of hospital pharmacy*, 68(3), 226-231.

Tang, A. M., Dong, K., Deitchler, M., Chung, M., Maalouf-Manasseh, Z., Alison Tumilowicz, A. & Wanke, C. (2013) *Use of Cutoffs for Mid-Upper Arm Circumference (MUAC) as an Indicator or Predictor of Nutritional and Health Related Outcomes in Adolescents and Adults: A Systematic Review*. Washington DC: FHI.

- Taye, B., Abeje, G. & Mekonen, A. (2015) Factors associated with compliance of prenatal iron folate supplementation among women in Mecha district, Western Amhara: a cross-sectional study. *Pan Afr Med J*, 20, 43.
- Tenaw, Z., Arega, M. & Tachbele, E. (2018) Nutritional knowledge, attitude and practices among pregnant women who attend antenatal care at public hospitals of Addis Ababa, Ethiopia. *International Journal of Nursing and Midwifery*, 10(7), 81-89.
- These, M. S., Ronna, B. & Ott, U. (2016) P value interpretations and considerations. *Journal of Thoracic Disease*, 8(9), E928-E931.
- Tinago, C. B., Annang Ingram, L., Blake, C. E. & Frongillo, E. A. (2017) Individual and structural environmental influences on utilization of iron and folic acid supplementation among pregnant women in Harare, Zimbabwe. *Maternal & Child Nutrition*, 13(3), e12350.
- Titaley, C. R. (2014) Factors associated with not using antenatal iron/folic acid supplements in Indonesia: the 2002/2003 and 2007 Indonesia Demographic and Health Survey. *Asia Pacific Journal of Clinical Nutrition*, 23(4).
- Titaley, C. R., Dibley, M. J., Roberts, C. L. & Agho, K. (2010a) Combined iron / folic acid supplements and malaria prophylaxis reduce neonatal mortality in 19 sub-Saharan African countries. *American Journal of Clinical Nutrition*, 92(1), 235-243.
- Titaley, C. R., Dibley, M. J., Roberts, C. L., Hall, J. & Agho, K. (2010b) Iron and folic acid supplements and reduced early neonatal deaths in Indonesia. *Bull World Health Organ*, 88.
- Tontisirin, K., Guy, N. & Lalita, B. (2002) Food-based strategies to meet the challenges of micronutrient malnutrition in the developing world. In: Society, P. o. t. N. (ed.). Proceedings of the Nutrition Society.
- USAID (2003) *Anemia Prevention and Control: What Works; Part I : Program Guidance*.
- USAID (2014) *SPRING NUTRITION TECHNICAL BRIEF: A simple method for making a rapid, initial assessment of the consumption and distribution of iron-folic acid supplements among pregnant women in developing countries*.
- Uusitalo, U., Arkkola, T., Ovaskainen, M. L., Kronberg-Kippila, C., Kenward, M. G., Veijola, R., Simell, O., Knip, M. & Virtanen, S. M. (2009) Unhealthy dietary patterns are associated with weight gain during pregnancy among Finnish women. *Public Health Nutr*, 12(12), 2392-9.
- Vaughan, K., Kok, M. C., Witter, S. & Dieleman, M. (2015) Costs and cost-effectiveness of community health workers: evidence from a literature review. *Hum Resour Health*, 13, 71.
- Ververs, M., Antierens, A., Sackl, A., Staderini, N. & Captier, V. (2013) Which Anthropometric Indicators Identify a Pregnant Woman as Acutely Malnourished and Predict Adverse Birth Outcomes in the Humanitarian Context? *PLoS Curr*, 5.
- Waweru, J., Mugenda, O. M. & Kuria, E. (2009) Anaemia in the context of pregnancy and HIV/AIDS: a case of Pumwani maternity hospital in Nairobi Kenya. *African Journal of Food Agriculture Nutrition and Development*, 9(2), 748-763.
- Wendt, A., Young, M., Stephenson, R., Webb Girard, A., Ramakrishnan, U. & Martorell, R. (2014) Antenatal care and counseling measures increase iron and folic acid receipt among pregnant women in Bihar, India (256.3). *The FASEB Journal*, 28(1 Supplement).
- WHO (2013) *Essential Nutrition Actions: Improving maternal, newborn, infant and young child health and nutrition*. Geneva: World Health Organization.
- Wilson, A., Gallos, I. D., Plana, N., Lissauer, D., Khan, K. S., Zamora, J., MacArthur, C. & Coomarasamy, A. (2011) Effectiveness of strategies incorporating training and support of traditional birth attendants on perinatal and maternal mortality: meta-analysis. *BMJ*, 343.
- Winkleby, M. A., Feldman, H. A. & Murray, D. M. (1997) Joint analysis of three U.S. community intervention trials for reduction of cardiovascular disease risk. *J Clin Epidemiol*, 50(6), 645-58.
- Wiradnyani, L. A. A., Khusun, H., Achadi, E. L., Ocviyanti, D. & Shankar, A. H. (2016) Role of family support and women's knowledge on pregnancy-related risks in adherence to maternal iron-folic acid supplementation in Indonesia. *Public Health Nutrition*, 19(15), 2818-2828.

- Witmer, A., Seifer, S. D., Finocchio, L., Leslie, J. & O'Neil, E. H. (1995) Community health workers: integral members of the health care work force. *American Journal of Public Health*, 85(8_Pt_1), 1055-1058.
- World Health Organization (2012a) *Guideline: Daily iron and folic acid supplementation in pregnant women*. Geneva: World Health Organization
- World Health Organization (2012b) *Serum and red blood cell folate concentrations for assessing folate status in populations. Vitamin and Mineral Nutrition Information System*. Geneva: World Health Organization.
- World Health Organization (2013) *Essential Nutrition Actions: Improving maternal, newborn, infant and young child health and nutrition*. Geneva: World Health Organization.
- World Health Organization (2014) *Micronutrients*. Geneva: World Health Organization.
- World Health Organization (2017) *Nutritional Anaemias: Tools for Effective Prevention and Control*. Geneva: World Health Organization.
- World Vision (2006) *MICronutrients And Health (MICAHA) Program. Malawi final survey report*. World Vision.
- Yekta, Z., Ayatollahi, H., Pourali, R. & Farzin, A. (2008) Predicting Factors in Iron Supplement Intake among Pregnant Women in Urban Care Setting. *J Res Health Sci*, 8(1), 39-45.
- Yip, R. (1994) Iron deficiency: contemporary scientific issues and international programmatic approaches. *J Nutr*, 124(8 Suppl), 1479S-1490S.
- Yip, R. (2002) Iron supplementation: country level experiences and lessons learned. *Journal of Nutrition*, 132(859S-861S).
- Zavaleta, N., Caulfield, L. E. & Garcia, T. (2000) Changes in iron status during pregnancy in Peruvian women receiving prenatal iron and folic acid supplements with or without zinc. *American Journal of Clinical Nutrition*, 71(4), 956-961.
- Zavaleta, N., Caulfield, L. E., Figueroa, A. & Chen, P. (2014) Patterns of compliance with prenatal iron supplementation among Peruvian women. *Matern Child Nutr*, 10(2), 198-205.
- Zeng, L., Dibley, M. J., Cheng, Y., Dang, S., Chang, S. & Kong, L. (2008) Impact of micronutrient supplementation during pregnancy on birth weight, duration of gestation, and perinatal mortality in rural western China: double blind cluster randomised controlled trial. *BMJ*, 337.

APPENDICES

APPENDIX I: Questionnaire

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Questionnaire Number _____ Date of interview _____

SOCIO-DEMOGRAPHIC DATA

1. Mother's Age _____ D.O.B: (DD/MM/YR) _____
2. Residence (Village) _____
3. Occupation
0 = Unemployed
1 = Housewife
2 = Casual labourer
3 = Self-employed
4 = Formal employment
5 = Others _____
4. Highest education level
0 = No education
1 = Primary
2 = Secondary incomplete
3 = Tertiary
5. Marital status
1 = Married
2 = Single
3 = Widow/Separated/Divorced
6. Religion
1 = Protestant Christian
2 = Catholic Christian
3 = Muslim
4 = Others (Specify) _____
7. Average income per month in Kenya shillings _____
1 = <10,000
2 = 10,000-30,000
3 = 30,000-50,000
4 = 50,000-100,000
5 = Above 100,000
8. Parity (Number of pregnancies) _____

- 9.
- Number of living children _____
 - Number of bereaved children _____
 - Total children _____ (**Add the above**)
 -
10. When was your last menstrual period (LMP) _____ (**If known, go to Qn 12**)
11. Gestation in weeks (as per ANC card) _____ or Scan

MOTHER’S KNOWLEDGE ON IRON AND FOLIC ACID SUPPLEMENTATION (IFAS)

12. Have you heard about IFAS? / *Je umesikia kuhusu nyongeza (tembe) za IFAS?* _____
 0 = No / *la* (**If no, skip to question 24**)
 1 = Yes / *ndio* (**If yes, answer all the questions in this section**)
13. If yes, how did you get this information? (**Wait for answer before probing and check all mentioned**) (*tick all that apply*)
Kama ndio, ulipata hii habari wapi?
- Yes No Health care provider *mhudumu wa afya hospitalini*
 Yes No Community health worker / *mhudumu wa afya wa jamii (kijijini)*
 Yes No Posters
 Yes No Television / *televisheni*
 Yes No Radio / *radio*
 Yes No Other mothers, relatives, friends or neighbours / *Kina mama wengine, watu wa familia, rafiki au jirani*
 Yes No Community leaders / *viongozi wa jiji*
 Yes No Newspapers, magazines or books / *gazeti, jarida au vitabu*
 Others (specify) / *zingine* _____
14. Have you ever received any leaflet/brochure from the health facility on IFAS? / *Je, umewahi kupata kijikaratasi chochote kuhusiana na IFAS kutoka hospitalini?*
 0 = No / *la*
 1 = Yes / *ndio*
15. Were you informed the benefits of IFAS at the health facility? / *Je, ulielezewa umuhimu wa IFAS hospitalini?*
 0 = No / *la*
 1 = Yes / *ndio*
16. What are the benefits of IFAS? / *Nielezee ni yapi manufaa ya IFAS?* (**Do not prompt, check all mentioned**)
 0 = Don't know / *sijui*
- Yes No Prevents anaemia among pregnant women / *Huzuia upungufu wa damu kwa kina mama wajawazito*
 Yes No Protects mother from sicknesses / *hukinga mama kutokana na maradhi*
 Yes No Gives mother strength during delivery / *hupea mama nguvu wakati wa kujifungua*

Yes No Increases amount of blood / *huongeza kiwango cha damu*

Yes No Makes foetus grow healthy and strong / *hupea mototo aliye ndani ya tumbo la mama nguvu na afya*

Yes No Others (Specify) / *zingine* _____

17. How often should IFAS be taken? / *Nielezee jinsi ya kutumia kutumia IFAS?*

0 = Do not know / *sijui*

1 = Once every week / *mara moja kwa wiki*

2 = Once daily / *mara moja kila siku* ***

3 = 2-4 times a day / *mara mbili hadi nne kwa siku*

4 = Others (specify) / *zingine* _____

18. Were you informed for how long you should take IFAS at the health facility? *Je, ulielezewa unastahili kutumia IFAS kwa mda gani hospitalini?*

0 = No / *la*

1 = Yes / *Ndio*

19. For how long should you take IFAS? / *Nielezee unastahili kutumia IFAS kwa mda gani?*

0 = Don't know / *sijui*

1 = Before becoming pregnant / *kabla ya kupata mimba*

2 = At least 3 months / *kwa miezi kama mitatu hivi*

3 = Throughout pregnancy / *wakati wote wa uja uzito* ***

4 = During pregnancy and 6 weeks after delivery / *wakati wa uja uzito hadi wiki sita baada ya kujifungua*

5 = Others (Specify) / *zingine* _____

20. Have you been informed that you can experience some side-effects from taking IFAS? / *Ulielezewa ya kwamba unaweza kupata madhara baada ya kutumia IFAS*

0 = No / *la*

1 = Yes / *ndio*

21. What are the side-effects of IFAS / *Ni yapi madhara ya kutumia IFAS? (Check all mentioned)*

0 = None / Don't know / *sijui*

Yes No Epigastric pain / *maumivu ya tumbo*

Yes No Abdominal pain / *kuumwa na tumbo*

Yes No Nausea / *kichefuchefu*

Yes No Vomiting / *kutapika*

Yes No Diarrhoea / *kuendesha*

Yes No Constipation / *kuvimbiwa*

Yes No Faeces may turn black / *kinyesi kugeuka rangi na kuwa cheusi*

Others (specify) / *zingine* _____

22. Were you informed how you can manage the side-effects at the health facility / *Je, ulielezewa unawezaje kukabiliana na madhara haya hospitalini?*

0 = No / *la*

1 = Yes / *ndio*

23. How can you manage the side-effects / *Nielezee unawezaje kukabiliana na madhara haya? (Check all mentioned)*

0 = Don't know / *sijui*

Yes No Avoid taking high dose Vitamin C supplements together with IFA tablet / *epuka kutumia kiasi kikubwa cha Vitamini C supplement, pamoja na vidonge vya IFAS*

Yes No Eat plenty of fruits and vegetables / *kula matunda na mboga kwa wingi*

Yes No Take IFAS with meals / *meza IFAS wakati wa kula chakula*

Yes No Take IFAS while going to bed / *meza IFAS unapoenda kulala*

Yes No Stop using IFAS / *acha kutumia IFAS*

Yes No Go back to hospital / *rudi hospitali*

Others (specify) / *zingine* _____

24. What happens if you do not get enough iron and folic acid in the body during pregnancy?

(Prompt and Check all mentioned)

0 = No effect / *hakuna*

Yes No Anaemia/ Low blood levels / *upungufu wa damu*

Yes No Excessive bleeding during pregnancy/delivery / *kuvuja damu zaidi unapojifungua*

Yes No Baby gets congenital malformations / *mtoto hupata shida za kimaumbile*

Yes No Baby gets mental disability / *mtoto hupata upungufu wa akili*

Yes No Low birth weight baby / *kilo za mtoto za kuzaliwa hupungua*

Yes No Preterm baby / *mtoto huzaliwa kabla ya umri wake kufika*

Others / *zingine* _____

25. What are the signs and symptoms of anaemia (low blood levels) / *Nielezee dalili za upungufu wa damu mwilini ni gani?* **(Check all mentioned)**

0 = Don't know / *sijui*

Yes No Feels weak / *udhaiifu*

Yes No Looks pale / *kuchujuka rangi kwa kope za macho na viganja*

Yes No Palpitations / *kutoweza kupumua vyema*

Yes No Headaches / *kuumwa na kichwa*

Yes No Dizziness / *kisunzi*

Yes No Tiredness and easily fatigued / *uchovu*

Yes No Swells legs / *uvimbe kwa miguu*

Others (specify) / *zingine* _____

26. Can you tell me some food sources that increase the blood levels in the body during pregnancy? **(Check all mentioned)**

Niambie vyakula vyenye iron kwa wingi _____

0 = Don't know / *sijui*

Yes No Liver / *ini*

Yes No Red meat e.g. beef / *nyama nyekundu kama ya ng'ombe*

Yes No White meat e.g. chicken, fish / *nyama nyeupe kama kuku, samaki*

Yes No Dark-green leafy vegetables / *mboga zenye majani ya rangi ya kijani kibichi*

Yes No Whole grain cereals e.g. maize, sorghum / *mbegu nzima kama mahindi, mtama*

Yes No Legumes e.g. beans, peas / *mbegu kama maharagwe, njahi, minji*

Yes No Eggs / *mayai*
 Others (Specify) / *zingine* _____

27. In the last one month, how often did you eat the following foods? / *Nielezee jinsi unavyokula vyakula vifuatavyo, ni baada ya muda gani?*

Food Frequency

Type of food	Never or rarely	once a week	2-3 times a week	5-6 times a week	Daily
	0	1	2	3	4
Eggs / <i>mayai</i>					
Liver / <i>ini</i>					
Red meat e.g. beef, goat / <i>nyama nyekundu kama ya ng'ombe, mbuzi</i>					
White meat e.g. chicken, fish / <i>nyama nyeupe kama kuku, samaki</i>					
Avocado					
Orange/red fruits (ripe mango, papaya) / <i>matunda ya rangi nyekundu au majano</i>					
Dark-green leafy vegetables / <i>mboga zenye majani ya rangi ya kijani kibichi</i>					
Whole grain cereals e.g. maize, sorghum / <i>mbegu nzima kama mahindi, mtama</i>					
Legumes e.g. beans, peas / <i>mbegu kama maharagwe, njahi, minji</i>					
Nuts e.g. groundnuts, macadamia / <i>njugu kama vile njugu karanga, macadamia</i>					

THE 24 HOUR DIETARY RECALL

Was yesterday a feast day or a celebration day where you ate something unusual?

0 = Yes

1 = No

<p>What food did you consume in the past 24 hours (from this time yesterday to now? Include snacks)</p> <p>Food group</p>	<p>Did you consume food from any of these food groups in the last 24 hours?</p> <p>0 = No 1= Yes (Indicate which one)</p>	<p>Indicate source of food</p> <p>1. Own production 2. Purchases 3. Gifts 4. Food aid 5. Bartered</p>
Cereals and cereal products (e.g. maize, spaghetti, rice, bread, biscuits, wheat, porridge, noodles, foods from millet or sorghum)		
Root and tubers (e.g. potatoes, arrow roots, cassava, pumpkin, sweet potatoes)		
Pulses/legumes, nuts and seeds (e.g. beans, lentils, green grams, peanuts)		
Red meat, organ meat and offal (e.g. goat, beef, liver, kidney, heart)		
White meat e.g. fish, poultry like chicken		
Eggs		
Milk and milk products (e.g. goat/cow fermented milk, milk powder, cheese, yoghurt or other milk products)		
Dark green leafy vegetables (e.g. kales, traditional like managu etc)		
Red/orange and other vegetables (tomatoes, carrots, onions, cabbages)		
Fruits (e.g. water melons, mangoes, lemon, bananas, oranges,)		
Avocadoes		
Oils/fats (e.g. cooking fat, margarine, butter)		
Sweets (e.g. sugar, honey, sweetened soda or sugary foods such as chocolates, cake, sweets)		
Beverages e.g. tea, chocolate, coffee		
Miscellaneous (e.g. spices, salt, sauce, alcoholic beverages)		

ATTITUDES AND BELIEFS TOWARDS IFAS:

28. i) What do you think, feel and believe about IFAS? / *Je, unafikiria, kuhisi na kuamini nini kuhusu nyongeza za IFAS?*

ii) For the following statements, tick one of the choices indicated

Statement	Strongly/ agree <i>Nakubali sana/zaidi</i>	Agree <i>Nakub ali</i>	Neutral/ <i>Hapo Katikati</i>	Disagree <i>Sikubali</i>	Strongly disagree/ <i>Sikubali kabisa</i>
	+2	+1	0	-1	-2
I am very sure of the reasons for taking IFAS / <i>Najua kabisa sababu za kunywa nyongeza za IFAS</i>					
IFAS is useful for me and my baby / <i>IFAS ni muhimu kwangu na mtoto wangu</i>					
IFAS is only for those who are anaemic / <i>IFAS ni wenye upungufu wa damu pekee</i>					
I am willing to know more about IFAS / <i>Ningependa kuelezewa zaidi juu ya IFAS</i>					
IFAS has harmful effects on my baby / <i>IFAS iko na madhara mabaya kwa mtoto</i>					
I think IFAS is not really necessary if you are taking enough food in pregnancy / <i>Nafikiri IFAS sio ya umuhimu vile kama unakula vizuri wakati wa ujauzito</i>					
I believe I am not at risk of anaemia during pregnancy / <i>Naamini sina uwezekano wa kuwa na upungufu wa damu nikiwa na mimba</i>					
The only reason I take IFAS is because the health worker said so / <i>Nanywa IFAS kwa sababu tu daktari alisema ninywe</i>					
IFAS alone is enough for all iron & folate needs in pregnancy / <i>IFAS pekee inatosha kupeana mahitaji yote ya Iron na folate mwilini ukiwa ma mimba</i>					
IFAS side-effects are more than the benefits / <i>Madhara ya IFAS inazidi manufaa yake</i>					
I would advise other mothers to take IFAS / <i>Naweza himiza kina mama wengine wakunywe IFAS</i>					
It is possible to take IFAS throughout pregnancy					

Inawezekana kutumia IFAS kutoka mwanzo hadi mwisho wa kupata mimba					
We have discussed about IFAS with other mothers/people <i>Tumejadiliana juu ya IFAS na kina mama au watu wengine</i>					
It is better to have community health workers bring me the supplements at home rather than going for them in the hospital <i>Afadhali kuletewa IFAS nyumbani na CHWs kuliko kuendea hospitalini</i>					
I have heard negative statements about IFAS in the public (INDICATE THEM BELOW HERE) <i>Nimeyasikia maneno yasiyofaa juu ya IFAS kutoka kwa watu (Yaaandike hapa)</i>					

PRACTICES TOWARDS IFAS

29. Indicate whether

- 0 Primigravida
1 Multigravida

If Primigravida, skip to question 30

If multigravida:

Part 1: Did you take IFAS during your last pregnancy? /*Je, ulitumia nyongeza za IFAS wakati wa mimba yako iliyotangulia hii?*

- 0 = No / *La* (If no, go to part IV)
1 = Yes / *Ndio*

Part II: If yes, how often? / *kama ndio, ulizitumia vipi*

- 0 = Can't recall / *sikumbuki*
1 = Once every week / *mara moja kwa wiki*
2 = Once daily / *mara moja kila siku*
3 = 2-4 times a day / *mara mbili mpaka nne kila siku*
4 = Others (specify) / *zingine* _____

Part III: And for how long? *kwa muda gani?*

- 0 = Can't recall / *sikumbuki*
1 = Before becoming pregnant / *kabla ya kupata mimba*
2 = At least 3 months / *kwa miezi kama mitatu hivi*
3 = Throughout pregnancy / *wakati wote wa uja uzito*
4 = During pregnancy and 6 weeks after delivery / *wakati wa uja uzito hadi wiki sita baada ya kujifungua*
5 = Others (Specify) / *zingine* _____

Part IV: If no, why? / *Kama la, kwa nini* _____

Part V: What was the outcome of your last pregnancy (for both mother and baby) / *Matokeo ya hiyo mimba ilikuwa gani (kwa mama na mtoto)*

- i) Mother /mama _____
- 1 = Healthy mother / *mama mwenye afya*
 - 2 = Weak mother / *mama mdhaifu*
 - 3 = Mother with excessive bleeding / *mama aliyefuja damu sana*
 - 4 = Mother with other complications (**specify which**) / *Mama mwenya shida zingine zilizofuatia mimba (taja ni gani)* _____
 - 5 = Others (*Specify*) _____

- ii) Baby / *mtoto*
- 1 = Healthy baby / *mtoto mwenye afya*
 - 2 = Miscarried / *mimba ilitoka*
 - 3 = Still birth / *mtoto alizaliwa akiwa ameaga*
 - 4 = Baby died after birth / *mtoto aliaga badaye* **Indicate when** _____
 - 5 = Anaemic baby / *mtoto mwenye upungufu wa damu*
 - 6 = Baby admitted / *mtoto alilazwa hospitalini*

Birth weight (**Indicate**) / *Kilo za kuzaliwa (Andika)* _____

If admitted, indicate the reason for admission:

- 1 = Respiratory distress / *kushindwa kupumua*
- 2 = Jaundice / *kuwa na rangi ya majano*
- 3 = Congenital malformation / *Mtoto mwenye shida za maumbile* / (**Indicate**)_
- 4 = Prematurity / *mtoto mwenye hajafikisha umuri wa kuzaliwa*
- 5 = Neonatal sepsis / *ugonjwa wa maambukizi*
- 6 = Others (*Specify*) / *Zingine* _____

30. For all:

Have you taken IFAS in the current pregnancy? / *Je, umetumia nyongeza za IFAS wakati wa mimba hii?*

- 1 = No / *La*
- 2 = Yes / *Ndio*

If no, Indicate why / *kama la ni kwa sababu gani?* **Prompt**

- 0 = Did not want to take / *sikutaka kunywa*
- 1 = Lack of information / *Kukosa habari*
- 2 = Lack of IFAS / *kukosa tembe za IFAS*
- 3 = Experienced side effects / *kupata madhara ya IFAS*
- 4 = Others (*Specify*) / *Zingine* _____

If no, go to QN 42

If yes, / kama ndio,

31. Which combination/formulation were/are you taking?

- 0 = Combined iron and folic acid tablet / *IFAS iliyochanganywa*
- 1 = Separate iron/ferrous sulphate tablets and folic acid tablets / *tembe tofauti*
- 2 = Syrup / *Aina ya maji*

32. How often? / *unazitumia vipi?*

- 0 = Can't recall / *sikumbuki*

- 1 = 2-4 times a day / *mara mbili mpaka nne kila siku*
 2 = Once daily / *mara moja kila siku*
 3 = Once every week / *mara moja kwa wiki*
 4 = Do not know / *sijui*
 5 = Others (specify) / *zingine* _____
33. How many tablets have you taken in the past 1 week? / *Umekunywa tembe ngapi wiki iliyopita?* _____
34. When (timings) do you take them? / *Una zikunywa wakati mgani? Vipi?*
 0 Before meals / *mbele ya chakula* _____
 1 After meals / *baada ya chakula* _____
 2 Before bedtime / *mbele ya kulala* _____
 3 In the morning / *asubuhi* _____
 4 Any time / *wakati wowote* _____
 5 With some fluids / *pamoja na kinywaji* _____
 6 Others (specify) / *zingine* _____
35. What is your source of IFAS? / *Je, unatoa IFAS wapi? (Check all mentioned)*
 Yes No Public health facility / *hospitali ya serikali*
 Yes No Private health facility / *hospitali ya kibinafsi*
 Yes No Pharmacy/Chemist / *duka la dawa*
 Yes No Others (specify) / *zingine* _____
36. What advice were you given as the IFAS tablets were being given to you? (**Wait for answer then prompt, check all mentioned**)
 0 = None / *Hakuna*
 Yes No Nutrients needs in pregnancy / *mahitaji ya lishe bora wakati wa ujauzito*
 Yes No Benefits of IFAS / *manufaa ya IFAS*
 Yes No IFAS Recommended schedule / *Jinsi ya kutumia IFAS*
 Yes No Side-effects of IFAS / *madhara ya IFAS*
 Yes No Management of IFAS side-effects / *Kukabiliana na madhara ya IFAS*
 Yes No Causes, symptoms and effects of anaemia in pregnancy / *chanzo, dalili na madhara ya upungufu wa damu wakati wa ujauzito*
 Others (specify) / *zingine* _____
37. How many tablets were you given last visit (For how long were the tablets you were given to last?) / *Ulipewa tembe ngapi (za muda gani)*
 0 One month/ *mwezi mmoja*
 1 Two months / *Miezi miwili*
 2 Three months/ *Miezi mitatu*
 3 Others (specify) / *zingine* _____
38.
 a) Are there days you did not take IFAS / *Je, kuna siku ulikosa kutumia tembe za IFAS?*
 0 *No / La*
 1 *Yes / Ndio*
 b) If yes, why? / *Kama ndio, kwa nini?*
 1 = Not given at the facility (Specify reason e.g. stock-out, Hb tests _____
Sikupewa hospitalini. Sema ni kwa sababu gani _____
 2 = Experienced side effects / *nilipata madhara ya IFAS*

- 3 = Forgot to take / *nilisahau kunywa*
 4 = Stock given was over / *dawa ziliisha*
 5 = Others (Specify) / *zingine* _____
39. What side-effects you have experienced on taking IFAS? / *Umepata madhara gani ya IFAS?*
(Check all mentioned)
 0 = None / *hakuna*
 Yes No Epigastric pain / *maumivu ya tumbo*
 Yes No Nausea / *kichefuchefu*
 Yes No Diarrhoea / *kuendesha*
 Yes No Constipation / *kuvimbiwa na tumbo*
 Yes No Faeces may turn black / *kinyesi kugeuka rangi na kuwa cheusi*
 Others (specify) / *zingine* _____
40. How did you manage the above side-effects / *Ulikabiliiana na madhara haya vipi?* **(Check all mentioned)**
 0 = Did nothing / *Sikufanya chochote*
 Yes No Avoided taking high dose Vitamin C supplements together with IFA tablet / *kuepuka kutumia kiasi kikubwa cha Vitamini C supplement, pamoja na vidonge vya IFAS*
 Yes No Eat plenty of fruits and vegetables / *kula matunda na mboga kwa wingi*
 Yes No Took IFAS with meals / *kumeza IFAS wakati wa kula chakula*
 Yes No Took IFAS while going to bed / *kumeza IFAS nikienda kulala*
 Yes No Stopped taking IFAS / *niliacha kunywa IFAS*
 Yes No Went back to hospital / *nilirudi hospitali*
 Others (specify) / *zingine* _____
41. What problems and challenges have you experienced in using IFAS or what are you unhappy about IFAS? *Ni changamoto gani umepata kuhusiana na IFAS ama ni nini hakikufurahishi kuhusu IFAS* **(Prompt then check all mentioned)**
 0 = None / *hakuna*
 Yes No Stock-outs / *kukosa tembe*
 Yes No Lack of adequate information / *Kukosa maelezo yanayofaa*
 Yes No Serious side-effects / *madhara iliyoziidi*
 Yes No Forgetting to take IFAS
 Others (specify) / *zingine* _____
42. What strategy would you recommend for distribution of IFA supplements and why? *Ni njia gani inayofaa kutumiwa kupeana IFAS na kwa nini?*
 0 Health care providers / *muhudumu wa afya hospitalini*
 Why: _____
 1 Community health workers / *muhudumu wa afya wa jamii (kijijini)*
 Why: _____
 2 Self-bought / *mama ajinunulie mwenyewe*
 Why: _____
 3 Others (specify) / *zingine* _____
 Why: _____

APPENDIX II: Health Facility Desk Review and Observation Checklist

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Name of health facility:Name of observer

Contact person

ITEM TO REVIEW	COMMENTS
Put \checkmark for a YES and \times for NO in each of the following questions below	
Availability of IFAS documents <input type="checkbox"/> IFAS national policy guidelines <input type="checkbox"/> IFAS national communication strategy <input type="checkbox"/> Kenya national nutrition action plan 2012-2017 <input type="checkbox"/> Maternal, infant and young child nutrition: National operational guidelines for health workers <input type="checkbox"/> Accelerating reduction of iron deficiency anaemia among pregnant women in kenya: Plan of action 2012-2017 <input type="checkbox"/> HCP counselling guide <input type="checkbox"/> CHW counselling guide <input type="checkbox"/> MoH IFAS calendar <input type="checkbox"/> Mothers' leaflets/ brochures <input type="checkbox"/> Others (indicate)	
<input type="checkbox"/> If not, have you had any of the above documents at any time? Indicate	
Observe ANC services provision - Counselling session	
<input type="checkbox"/> Provision of IFAS to all pregnant women regardless of their Hb status	

<p>Observe: Nurses counselling mothers before administering IFAS (Indicate what they are told)</p> <input type="checkbox"/> Increased nutrient needs in pregnancy <input type="checkbox"/> Verifying IFAS utilization <input type="checkbox"/> IFAS –What it is <input type="checkbox"/> Benefits of IFAS <input type="checkbox"/> Recommended schedule <input type="checkbox"/> Common side-effects <input type="checkbox"/> Managing side effects of IFAS <input type="checkbox"/> Enhancers/Hindrances to iron/folate absorption <input type="checkbox"/> Food sources of iron <input type="checkbox"/> Food sources of folic acid <input type="checkbox"/> Anaemia – causes, symptoms, effects <input type="checkbox"/> Checking understanding <input type="checkbox"/> Others (indicate)	
<input type="checkbox"/> Any recording done? (Where? How?)	
<input type="checkbox"/> Poster on IFAS displayed anywhere in the facility (Where? How many? Indicate which)	
<input type="checkbox"/> IFAS national policy guideline or administration schedule displayed in the facility (Where? How many?)	
Ask:	
How often do you replenish the IFAS stock	
<input type="checkbox"/> Do you have adequate stock of IFAS for all your clients?	
<p>Have you experienced IFAS stock-outs:</p> <input type="checkbox"/> In the last three (3) months? <input type="checkbox"/> In the last six (6) months? <input type="checkbox"/> In the last (12 months) one year?	
<input type="checkbox"/> What do you do in case of stock-outs?	
<input type="checkbox"/> Do you check whether clients are complying to IFAS use (If yes, how)	1= Ask mothers 2= Individual client cards 3= Mother child booklet 4= Use of ANC register 5= Others (Specify)-----
<input type="checkbox"/> Do you have CHWs attached to your facility?	
If yes, what is their role in relation to IFAS?	
<input type="checkbox"/> Do you think CHWs can distribute IFAS?	
How many HCPs in this facility have been trained on IFAS (Indicate)	
What documents assist you in IFAS services	

APPENDIX III: Health Workers Key Informant Interview Guide:

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Date _____ Venue _____

Key informant _____

Time interview begins _____

1. Have you attended any training on IFAS? Give details
2. What do you know about Iron and Folic Acid Supplementation (IFAS)?
3. What are your perceptions, beliefs and attitudes towards IFAS?
4. What are some of the locally available food sources of iron/folate? Are they affordable?
5. What are the causes, symptoms and effects of iron/folate deficiency?
6. When was IFAS administration initiated in this facility and how is the progress? Any changes?
7. Explain the recommended schedule for IFAS
8. What are some of factors that promote or hinder mothers from taking IFAS?
9. Which IEC resource materials/documents do you have on IFAS? Name all.
10. What are your experiences with mothers in relation to IFAS? Do you counter-check if they are taking IFAS? How? What do you do if they are not taking?
11. What are your experiences with IFAS supply/logistics in the hospital?
12. Please explain how you capture the records on IFAS? What do you think about the recording system for IFAS services? Any suggestions for improvement?
13. Please explain about the administration/delivery process of IFAS services. What are the requirements before the mother can be given IFAS? When do you start administration? How? Advice given? On side-effects and managing the side effects?
14. What problems/constraints have you encountered as far as IFAS services are concerned?
15. What's your general view about the entire IFAS programme? Which strategy of distribution would you recommend?
16. What do you think can be done to improve IFAS services and achieve higher coverage?

Time interview ends _____

APPENDIX IV: Mother's In-Depth Interview Guide:

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Date _____ Venue _____

Time interview begins _____

Time interview ends _____

Key informant _____

1. What do you know about Iron and Folic Acid Supplementation (IFAS)?

Unajua nini kuhusu nyongeza za IFAS?

2. What are your perceptions, beliefs and attitudes towards IFAS?

Je, unaamini nini na una hisia zipi kuhusu nyongeza za IFAS?

3. Do you know the recommended schedule for IFAS? Outline it. How have you been taking?

Unajua ratiba inayofaa kutumiwa kupata nyongeza za IFAS? Nielezee. Umezitumia vipi?

4. Do you think it is possible to follow the recommended schedule throughout pregnancy? Why?

Unafikiri inawezekana kufuata ratiba inayopendekezwa mpaka wakati wa kujifungua? kwa nini?

5. What side-effects have you experienced with IFAS and what course of action did you take? /

Ni madhara gani umepata baada ya kunywa IFAS na ulikabiliana nayo vipi (ulifanya nini?)

6. What are your experiences at the hospital in relation to IFAS (with staff/supply)?

Nielezee mambo yaliyo kupata humu hospitalini kuhusiana na huduma za IFAS

7. What problems/constraints have you encountered as far as IFAS services are concerned?

Je ni shida gani umepata kuhusu huduma za IFAS?

8. What do you think can be done to achieve higher coverage and ensure all mothers use IFAS throughout pregnancy?

Unafikiri ni nini inahitajika kufanywa ili kuongeza idadi ya wamama wanaopata IFAS na kuhakikisha wote wametumia IFAS hadi wakati wa kujifungua?

9. Are there any foods/ drinks you should avoid while taking IFAS

Je, kuna vyakula ama vinywaji haustahili kutumia pamoja na IFAS?

10. Tell me about the causes, symptoms and effects of anaemia in pregnancy

Nielezee nini husababisha ukosefu wa damu, dalili zake na madhara yake

APPENDIX V: Mother's Focus Group Discussion Guide:

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Date _____ Venue _____

Name of moderator _____

Name of recorder _____

No.	Name of Respondents	Age	Occupation	Gestation (wks)	Parity	Marital Status
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

QUESTION GUIDELINE

1. What do you understand by Iron and Folic Acid Supplementation (IFAS)?

Unaelewa nini kuhusiana na nyongeza za IFAS?

2. From where/whom do you receive such information?

Unapata hii habari kutoka wapi

3. Do you think IFAS is important? Why?

Je, unafikiri nyongeza za IFAS ni muhimu? Kwa nini?

4. What are the causes, symptoms and consequences of iron/folate deficiency?

Nini madhara ya ukosefu wa iron na folate mwilini?

5. Do you think the community knows the recommended schedule for IFAS? Why? Which one?

Je, unafikiri jamoo inafahamu ratiba inayofaa kutumiwa kwa IFAS? Kwa nini? Gani?

6. In this community, do you think mothers receive IFAS as recommended?
Katika jamii hii, unafikiri watoto hupata vitamin A inavyokusudiwa?
7. What are some of the locally available food sources of iron/folate? Are they affordable?
Ni vyakula gani vyenye iron/folate kwa wingi ambavyo hupatikana mahali hapa? Vinanunulika?
8. How does the community perceive IFAS and what are their attitudes, views and beliefs towards IFAS?
Jamii hii inazichukulia vipi na kufikiria vipi kuhusu nyongeza za IFAS? Wanaamini nini kuhusu IFAS? Maoni yao kuhusu IFAS ni yapi?
9. What problems/side-effects do you encounter after taking IFAS and how do you manage them of this community about IFAS?
Ni yapi maoni ya kijiji hiki kuhusu nyongeza za IFAS?
10. Are there reservations or groups of mothers who receive IFAS? (*Probe on any groupings such as for those educated, high status, slum dwellers etc.*)
Je, kuna makundi ya wamama fulani ambao hupata IFAS pekee?
11. What problems does the community encounter as far as IFAS services are concerned?
Ni shida gani hukumba kijiji hiki kuhusiana na huduma za IFAS?
12. How do you think IFAS services can be improved?
Unafikiria huduma za IFAS zinaweza kuboreshwa vipi?

APPENDIX VI: Data Abstraction Form

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Physical examination findings: Date.....

Date/ Visit	Urine	Weight	Height	Blood pressure	Temp	MUAC	Edema	Pallor	Others e.g. jaundice

Abdominal Examination Foetal findings

Date/ Visit	Maturity	Fundal height	Presentation	Lie	Foetal heart	Foetal movement

LABORATORY TESTS

- i) Haemoglobin concentration g/dl
 - a. Trimester 1:
 - b. Trimester 2:
 - c. Trimester 3:
- ii) Folate levels
 - a. Trimester 1:
 - b. Trimester 2:
 - c. Trimester 3:

DETAILS OF BIRTH OUTCOME: MOTHER:
NEONATE

APPENDIX VII A: Informed Consent Information Sheet – English Version

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Introduction

You are asked to participate in the study because IFAS is one of the free nutritional intervention programmes given to all pregnant women nationally yet many pregnant women are still anaemic. I intend to use community health workers to deliver IFAS to mothers in the community.

Freedom of choice

This consent form gives you information about the study, the risks and benefits and the process that will be explained to you. Once you understand the study and agree to take part, you will be asked to sign or make your mark on this form. Before you learn about the study, it's important to note that; your participation in the study is totally voluntary, you are free to make enquiries to fully understand the study before you agree to participate and you may decide to terminate the study at any time without facing any consequences.

Purpose of the study

The purpose of the study is to implement a community-based approach for iron folic acid supplementation and education among pregnant women in Kiambu County. It will involve use of questionnaires, in-depth interviews with a few respondents and focus group discussions to collect data. Trainings will be conducted on health care providers, pregnant women and community health workers who will then follow the women in their homes and distribute IFAS tablets with education to them on a weekly basis.

Expectations during participation

I will ask you simple questions IFAS and if you wish, will participate in a deeper interview or a focus group discussion as well as follow-up at home where the IFAS education and tablets will be given to you by community health workers on a weekly basis until you deliver. You will be expected to avail your antenatal clinic attendance records and have your details on your progress taken during follow-up. You will also be expected to have your blood tested for Hb and folate levels every trimester.

Choice to withdraw or leave the study

You have the choice to or not to participate in this research study. If you choose not to participate or leave the study during the interview process, you may do so freely without any consequences against you.

Harm and/or risks and/or discomforts

We do not anticipate any serious risks or discomforts to you during this study. It is unlikely that any harm could happen to you as a result of being in this study. However, you may experience some inconveniences of being followed-up at home by community health workers and your details being taken every week. You may become embarrassed, worried or anxious when answering some of the questions as they are of a personal nature. Participation in the study will require you to commit your time. It will also be uncomfortable to be pricked every trimester for Hb and folate level blood tests. You are free to ask for further clarifications as need be.

Cost and payment for participation

Your participation in the study is totally voluntary. There is no cost for participating in the study and you will not be required to pay any money or anything to participate. No monetary gain will be given for participating in the study.

Benefits of participation

You will have a chance to get IFAS tablets throughout pregnancy being brought to your home by community health workers. You will also get education on IFAS and resource materials on IFAS to remind you of its importance. By participating in this study and answering our questions, you will help increase our understanding on implementation of IFAS, how to better improve the services and the possibility of using community health workers to deliver IFAS in the community.

It is expected that the findings will help the Ministry of health formulate policies to strengthen IFA supplementation programme interventions countrywide to further increase supplementation coverage and consequently reduce deficiencies of these crucial micronutrients among women and children.

Privacy of records

We will protect your privacy and confidentiality during your participation in the study. All information provided will be kept confidential by all means. You will only be identified by a code and personal information from the interview will not be released without your written permission. The information about you will be identified by the study number. You will not be personally identified in any publication of this study. You will not be required to write your name in the questionnaire. However absolute confidentiality cannot guaranteed because your records may be reviewed by the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee.

APPENDIX VII B: Informed Consent Information Sheet – Kiswahili Version

HABARI KUHUSU UTAFITI

KICHWA CHA UTAFITI: Utafiti kuhusu nyongeza za IFAS kijijini katikati ya kina mama waja wazito kwa Kaunti ya Kiambu

Utangulii

Umealikwa kushiriki katika utafiti huu kwa sababu IFAS hupeanwa bure nchi nzima kwa kina mama waja wazito lakini kina mama wengi waja wazito bado wako na upungufu wa damu mwilini. Natarajia kutumia wahudumu wa afya wa jamii kijijini kupeana tembe za nyongeza za IFAS kijijini.

Utafiti wa hiari

Kushiriki katika utafiti huu ni kwa hiari. Hii fomu inakuelezea zaidi kuhusu utafiti huu, lengo lake, madhara na manufaa yake na yanayohitajika kwako kama utashiriki. Uko na ruhusa ya kuuliza maswali yoyote uliyonayo. Unaweza kuacha kushiriki wakati wowote bila madhara yoyote kwako.

Kusudi la utafiti

Kusudi la utafiti huu ni kutumia wahudumu wa afya wa jamii kijijini kupeana tembe za nyongeza za IFAS kijijini pamoja na mafunzo kwa wamama waja wazito katika Kaunti ya Kiambu. Utafiti utafanywa kwa kuuliza maswali yatakayoulizwa na kushiriki kwenye majadiliano. Wahudumu wa afya hospitalini, wamama waja wazito na wahudumu wa afya wa jamii kijijini watafunzwa, watakaowafuata kina mama manyumbani mwao wakiwapea tembe za IFAS pamoja na mafunzo kila wiki.

Matarajio wakati wa kushiriki

Nitakuuliza maswali kuhusu IFAS na ukitaka unaweza kushiriki kwa majadiliano au kujibu maswali zaidi kuhusu IFAS kwa kujieleza kwa undani. Pia ukikubali, wahudumu wa afya wa jamii kijijini wataendelea kukufuata nyumbani mwako wakikuletea tembe za IFAS pamoja na mafunzo kila wiki mpaka wakati wa kujifungua. Utahitajika kupeana rekodi zako za kwenda kiliniki ya mama mja mzito na kupeana maelezo ya jinsi unavyoendelea kila wiki. Pia, utahitajika kupimiwa damu kila baada ya miezi mitatu kupima kiwango cha damu mwilini.

Chaguo la kuacha utafiti

Kushiriki katika utafiti huu ni kwa hiari. Unaweza kuacha kushiriki wakati wowote bila madhara yoyote kwako.

Madhara ya kushiriki kwa utafiti

Utafiti huu hauna madhara ya kutatiza zaidi yanayofahamika lakini unaweza kutofurahia kufuatwa na wahudumu wa afya wa jamii kijijini hadi kwa nyumba yako wakichukua rekodi zako kila wiki. Waweza ona haya ama uhisi umefadhaika unapojibu maswali ya kibinafsi. Utafiti huu utachukua mda wako kiasi. Pia, utahisi uchungu kidogo ukidungwa sindano ili kutoa damu iweze kupimwa kiwango chake kila baada ya miezi mitatu. Uko huru kuuliza maelezo zaidi wakati wowote ule.

Malipo ya kushiriki

Kushiriki katika utafiti huu ni kwa hiari na hauhitajiki kulipa pesa au chochote ili ushiriki. Hautalipwa pesa zozote ukishiriki.

Manufaa ya kushiriki

Kwa kushiriki katika utafiti huu, utapata nafasi ya kuletewa tembe za nyongeza za IFAS nyumbani mwako mpaka wakati utakapojifungua. Pia, utapata kuelimishwa na kupewa vjikatasi juu ya IFAS vya ukumbusho juu ya uzuri wake. Kwa kujibu maswali yetu, utasaidia kufahamu huduma za nyongeza za IFAS, jinsi zinavyoweza kuboreshwa na uwezekano wa kutumia wahudumu wa afya wa jamii kijijini kupeana tembe na mafunzo juu ya IFAS.

Matokeo ya utafiti huu yatatumika na wizara ya afya kusaidia kuweka mikakati inayofaa ili kuboresha huduma hizi kote nchini na kunufaisha jamii kwa jumla kwa kuongezeka kwa idadi ya kina mama wanaotumia IFAS hivyo basi kusaidia kupunguza idadi ya wamama na watoto walio na upungufu wa damu.

Kubaniwa kwa utafiti

Majibu yote ya utafiti yatawekwa siri. Utambulisho wako katika uchunguzi huu utawekwa siri. Haya maandishi yatakodiwa na nambari ya siri ambayo haitalinganishwa na jina lako. Jina lako halitatumika katika maandishi ya finali. Vitabu na makala yatakayotokana na utafiti huu hayatamjulisha mhojiwa yeyote. Hauhitajiki kuandika jina lako kwa fomu ya maswali. Hata hivyo, nambari yako ya usajili katika utafiti huu inaweza kuajiliwa na maafisa wa utafiti kutoka hospitali kuu ya Kenyatta wakishirikiana na chuo kikuu cha Nairobi.

APPENDIX VII C: Informed Consent Certificate – English Version

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Please read the information sheet provided on this study or have it read to you carefully before completing this consent form to agree to participate in this study. If you have any questions, please ask the investigator prior to signing the consent form.

In case of any questions, please contact me:

Mary Wanjira Njue-Kamau.

P.O. Box 10897 – 00100 Nairobi

Cell phone no: 0727736810. Email: mwkamau@gmail.com

If you have any questions about this research study and would like to talk to someone other than the researcher, you are encouraged to contact my lead supervisor:

Dr. Waithira Mirie

School of nursing Sciences, College of Health Sciences

University of Nairobi

P.O Box 19676 – 00202 Nairobi

Cell phone: 0727142385. Email: mirie@uonbi.ac.ke

Or

The Kenyatta National Hospital/University of Nairobi Ethics and Research committee (KNH-UoN ERC) secretariat on:

The Secretary,

KNH-UON ERC

College of Health Sciences

P.O. BOX 19676- 00202 Nairobi
Tel: (254-020) 2726300 Ext 44355
Email: uonknh_erc@uonbi.ac.ke

Declaration of volunteer

I, Mr/Miss/Mrs..... do hereby give consent to Ms Mary Wanjira Njue-Kamau to include me in the proposed study entitled; Community-based approach for Iron and Folic Acid Supplementation (IFAS) among pregnant women in Kiambu County.

I have read the information sheet. I understand the aim of the study and what will be required of me if I take part in the study. The risks and benefits if any have been explained to me. Any questions I have concerning the study have been adequately answered. I understand that I can withdraw from the study at any time if I so wish without any consequences. I Consent voluntarily to participate in this study.

Participant’s Name.....

Signature or left thumb print.....Date.....

Name of person taking consent.....

Signature.....Date.....

Name of Investigator

Signature.....Date.....

APPENDIX VII D: Informed Consent Certificate – Kiswahili Version

CHETI CHA RUHUSA KUSHIRIKI KATIKA UTAFITI

KICHWA CHA UTAFITI: Utafiti kuhusu nyongeza za IFAS kijijini katikati ya kina mama waja wazito kwa Kaunti ya Kiambu

Tafadhali soma fomu ya maelezo au hakikisha umesomewa na kuelewa kabla ya kutia sahihi kwa hii fomu ya kutoa ruhusa kushiriki katika utafiti. Kama uko na maswali yoyote, uliza kwa mtafiti kabla ya kutia sahihi.

Kwa maswali yoyote uliza mtafiti:

Mary Wanjira Njue-Kamau.

S.L.P. 10897 – 00100 Nairobi

Simu: 0727736810. Barua pepe: mwkamau@gmail.com

Ikiwa uko na maswali yoyote kuhusu utafiti huu na ungependa kuuliza swali kwa mtu mwingine isipokuwa mtafiti, unahimizwa ujulishe:

Dr. Waithira Mirie

Shule ya wauguzi

Chuo kikuu cha Nairobi

P.O Box 19676 – 00202 Nairobi

Simu: 0727142385. Barua pepe: mirie@uonbi.ac.ke

Au

Kamati ya maafisa wa utafiti kutoka hospitali kuu ya Kenyatta wakishirikiana na chuo kikuu cha Nairobi. Kwa anwani hii:

Kwa Karani

KNH-UON ERC

S.L.P 19676 - 00202 Nairobi

Simu: (254-020) 2726300 Ext 44355

Barua pepe: uonknh_erc@uonbi.ac.ke

Arifa ya mhojiwa wa hiari

Mimi Bw/Bi natoa rufusa kwa Bi Mary Wanjira Njue-Kamau anihusishe kwa utafiti wake kuhusu nyongeza za IFAS kijijini katikati ya wamama wawazito kwa Kaunti ya Kiambu.

Nimesoma habari zote kuhusu utafiti huu. Nimeelewa lengo la utafiti huu na yanayohitajika kwangu kama nitashiriki. Madhara na manufaa yake yameelezwa kinagaubaga kwangu. Maswali yote niliyokuwa nayo yamejibiwa. Nimeelewa kwamba naweza kuacha kushiriki wakati wowote bila madhara yoyote kwangu. Ninatoa rufusa kwa hiari nishiriki katika utafiti huu.

Jina la Mhojiwa

Sahihi au alama ya kidole gumba (Kushoto).....

Tarehe.....

Jina la anayepewa rufusa.....

SahihiTarehe

Jina la mtafiti.....

SahihiTarehe

**APPENDIX VII E: Assent Form Information Sheet for Emancipated Minors –
English Version**

INFORMATION SHEET FOR THOSE BELOW 18 YEARS OF AGE

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

I am doing a research study about using community health workers to give IFAS tablets and education among pregnant women in the community. This research study is a way to learn more about people especially pregnant women who will be participating in this research study with you.

If you decide that you want to be part of this study, you will be asked a few questions about IFAS tablets and then bring you the tablets at home every week through community health workers until you give birth. Your blood will also be taken to measure amount of blood in the body. You will not pay any money or anything to participate or be paid to participate.

There are some things about this study you should know. These include: you may feel uncomfortable being followed-up at home by community health workers or answering some of the questions as they are of a personal nature. Participation in the study will require you to commit your time. It will also be uncomfortable to be pricked every three months for blood tests.

Everyone who takes part in this study will benefit. A benefit means that something good happens to you. You will have a chance to get IFAS tablets throughout pregnancy being brought to your home by community health workers. You will also get education on IFAS tablets and reading materials to remind you.

When we are finished with this study we will write a report about what was learned. This report will not include your name or that you were in the study.

You do not have to be in this study if you do not want to be. If you decide to stop after we begin, that's okay too. Your parents know about the study too.

APPENDIX VII F: Assent Form Information Sheet for Emancipated Minors –

Kiswahili Version

HABARI KUHUDU UTAFITI KWA WALIO CHINI YA MIAKA 18

KICHWA CHA UTAFITI: Utafiti kuhusu nyongeza za IFAS kijijini katikati ya kina mama waja wazito kwa Kaunti ya Kiambu

Nafanya utafiti kuhusu kutumia wahudumu wa afya wa jamii kijijini kupeana tembe za nyongeza za IFAS kijijini na masomo kwa kina mama waja wazito. Utafiti huu utatujulisha kuhusu watu sana sana kina mama waja wazito, amabo watashiriki na wewekwa huu utafiti.

Ukiamua kushiriki katika utafiti huu, utaulizwa maswali kuhusu nyongeza za IFAS halafu mhudumu wa afya wa jamii kijijini atakuletea tembe za nyongeza za IFAS nyumbani pamoja na mafunzo yake mpaka ujifungue. Kiwango cha damu kitapimwa pia. Hautalipa wala hautalipwa chochote kushiriki.

Kuna mambo kadhaa unafaa ujue kuhusu utafiti huu. Utafiti huu hauna madhara ya kutatiza zaidi yanayofahamika lakini unaweza kutofurahia kufuatwa na wahudumu wa afya wa jamii kijijini hadi kwa nyumba yako wakichukua rekodi zako kila wiki. Waweza ona haya unapojibu maswali ya kibinafsi. Utafiti huu utachukua mda wako kiasi. Pia, utahisi uchungu kidogo ukidungwa sindano ili kutoa damu iweze kupimwa kiwango chake kila baada ya miezi mitatu.

Kila mwenye kushiriki kwa utafiti huu atapata manufaa fulani kama vile ya kuletewa tembe za nyongeza za IFAS nyumbani mwako mpaka wakati utakapojifungua. Pia, utapata kuelimishwa na kupewa vjikatasi juu ya IFAS vya ukumbusho juu ya uzuri wake.

Utafiti ukiisha, nitaandika ripoti kuhusu tulioyasoma. Jina lako halitaandikwa mahali popote na ripoti haitaonyesha kwamba ulishiriki.

Kama hutaki kushiriki, hautalazimishwa kamwe. Ukiamua kuacha kushiriki baada ya kuanza kabla ya kumalizia pia ni sawa. Wazazi/mume wako pia anajua kuhusu utafiti huu.

APPENDIX VII G: Certificate of Assent for Emancipated Minors – English Version

CERTIFICATE OF ASSENT FOR THOSE BELOW 18 YEARS OF AGE Please read the information sheet or have it read to you carefully before writing your name on this form. If you have any questions, please ask before signing.

In case of any questions, please contact me:

Mary Wanjira Njue-Kamau.
P.O. Box 10897 – 00100 Nairobi
Cell phone no: 0727736810. Email: mwkamau@gmail.com

If you have any questions about this research study and would like to talk to someone else, ask my supervisor:

Dr. Waithira Mirie
School of nursing Sciences, College of Health Sciences
University of Nairobi
P.O Box 19676 – 00202 Nairobi
Cell phone: 0727142385. Email: mirie@uonbi.ac.ke

Or

The Kenyatta National Hospital/University of Nairobi Ethics and Research committee (KNH-UoN ERC) secretariat on:

The Secretary,
KNH-UON ERC
College of Health Sciences
P.O. BOX 19676- 00202 Nairobi
Tel: (254-020) 2726300 Ext 44355
Email: uonknh_erc@uonbi.ac.ke

If you decide you want to be in this study, please sign your name.

I, _____, want to be in this research study.

(Sign your name here) (Date)

Name of interviewer _____

Signature _____ Date _____

APPENDIX VII G: Certificate of Assent for Emancipated – Kiswahili Version

CHETI CHA RUHUSA KUSHIRIKI KATIKA UTAFITI (CHINI YA UMRI 18)

KICHWA CHA UTAFITI: Utafiti kuhusu nyongeza za IFAS kijijini katikati ya kina mama waja wazito kwa Kaunti ya Kiambu

Tafadhali soma fomu ya maelezo au hakikisha umesomewa na kuelewa kabla ya kuandika jina lako kwa hii fomu ya kutoa ruhusa kushiriki katika utafiti. Kama uko na maswali yoyote, uliza kwa mtafiti kabla ya kutia sahihi.

Kwa maswali yoyote uliza:

Mary Wanjira Njue-Kamau.
S.L.P. 10897 – 00100 Nairobi
Simu: 0727736810. Barua pepe: mwkamau@gmail.com

Ukiwa na maswali yoyote kuhusu utafiti huu na ungependa kuuliza swali kwa mtu mwingine isipokuwa mtafiti, uliza:

Dr. Waithira Mirie
Shule ya wauguzi
Chuo kikuu cha Nairobi
P.O Box 19676 – 00202 Nairobi
Simu: 0727142385. Barua pepe: mirie@uonbi.ac.ke

Au

Kamati ya maafisa wa utafiti kutoka hospitali kuu ya Kenyatta wakishirikiana na chuo kikuu cha Nairobi. Kwa anwani hii:

Kwa Karani
KNH-UON ERC
S.L.P 19676 - 00202 Nairobi
Simu: (254-020) 2726300 Ext 44355
Barua pepe: uonknh_erc@uonbi.ac.ke

Ukiamua kushiriki kwa utafiti huu, andika jina lako hapa:

Mimi, _____, nataka kushiriki kwa utafiti huu.

(Andika jina lako)

(Tarehe)

Jina la anayepewa ruhusa _____

Sahihi _____ Tarehe _____

APPENDIX VIII A: Health Care Providers IFAS Training Programme

Duration	Topic	Content
Day One		
8.30 – 9.00am	Introduction	Climate setting, expectations
9 - 11.00am	Anaemia in pregnancy	Causes, symptoms and effects
11.00-11.30am	Tea Break	
11.30am – 1.30pm	Introduction to IFAS supplementation in pregnancy	Overview and purpose
1.30 - 2.30pm	Lunch Break	
2.30 – 4.30pm	IFA supplementation implementation through ANC	Dose, frequency and duration of IFA supplementation
Day Two		
8.30 – 9.00am	Recap of previous day	
9 - 11.00am	Side-effects	Common side-effects and their management
11 – 11.30am	Tea Break	
11.30am – 1.30pm	Precautions during IFA supplementation	What to avoid or encourage while taking IFAS
1.30 - 2.30pm	Lunch Break	
2.30 – 4.30pm	Food sources of iron	Locally available and rich sources of iron
Day Three		
8.30 – 9.00am	Recap of previous day	
9 - 11.00am	Food sources of folate	Locally available and rich sources of folate
11 – 11.30am	Tea Break	
11.30am – 1.30pm	Policy Guidelines on IFAS	Various documents, guidelines and IEC materials on IFAS
1.30 - 2.30pm	Lunch Break	
2.30 – 4.30pm	Community-based approach of IFAS	Overview of strategy and its implementation
4.30 – 5.00pm	Summary	Recap of training and Certificate presentation

APPENDIX VIII B: Health Care Providers IFAS Training Pre-Test/Post-Test

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Choose and circle the most correct answer for the following questions

1. To produce a healthy infant, the mother should ideally have an adequate diet;
 - a) During the 9 months she carries the infant
 - b) During the last trimester when the baby is growing so rapidly
 - c) During the second and third trimester of pregnancy
 - d) Beginning months before conception and continuing through the period of lactation
2. An increased requirement for which nutrients during pregnancy is related to their roles in the synthesis of red blood cells;
 - a) Vitamin E and vitamin C
 - b) Niacin and copper
 - c) Folate and Iron
 - d) Protein and calcium
3. To avoid constipation, a pregnant woman should increase her intake of;
 - a) Milk and dairy products
 - b) Whole grain, fruits and vegetables
 - c) Sugars and starches
 - d) Lean meat, poultry and fish
4. Which of the following would be an appropriate intervention to help a pregnant woman with nausea and vomiting maintain adequate nutritional intake?
 - a) Advise her to take daily laxatives to stimulate peristalsis and food digestion
 - b) Teach her to refrain from eating for at least 6 hours before bed time
 - c) Suggest she take small quantities of dry, bland or lightly salted foods, and boiled foods at frequent intervals
 - d) Advise her to avoid eating so as not to have nausea
5. Which of the following foods would be most appropriate for you to suggest to a pregnant woman if she has low blood levels?
 - a) Eggs, beans
 - b) Vegetable oil, fruits
 - c) Milk, whole grains
 - d) Green leafy vegetables, meats
6. If a 3 month pregnant woman has reported for her antenatal clinic, you should instruct her to do all these EXCEPT?
 - a) Eat foods rich in proteins, starches, and other nutrients to provide additional kilocalories each day
 - b) Increase her intake of carbohydrates to prevent protein metabolism
 - c) Eat small frequent meals to increase absorption and decrease nausea
 - d) Limit intake of eggs to avoid having a big baby

Indicate TRUE or FALSE for the following statements

1. Pregnant women need extra and varied food each day in addition to 3 extra meals to provide energy and nutrition for her and the growing baby
2. Food sources of folate include spinach, lentils and fortified grains
3. Folate is important for cell division and its deficiency may lead to gestational diabetes
4. Folic acid requirements increases during pregnancy in response to demands of maternal production of red blood cells and its deficiency is associated with neural tube defects
5. Taking tea and coffee immediately before and after taking meals hinders iron absorption
6. In populations where calcium intake is low, calcium supplementation is recommended for prevention of pre-eclampsia, particularly among those at risk of developing hypertension
7. Anaemia can result during pregnancy due to a deficiency of iodine in addition to iron
8. Anaemia can result during pregnancy due to a deficiency of Vitamin B₁₂ in addition to iron and folate
9. A pregnant woman is considered to be anaemic if her haemoglobin (Hb) concentration during the first and third trimester of gestation is lower than 11 g/dL
10. IFAS can harm the baby in one way or another
11. Pregnant women should take one tablet per day only if they have low Hb status (blood level)
12. One key benefit of IFAS during pregnancy is reduced risk of having low birth weight babies
13. Pregnant women should take one tablet per day from as early as possible and throughout pregnancy irrespective of their Hb status (blood level)
14. IFAS should be taken with fruit juice or fruit if possible to avoid ill feeling
15. Eating of vitamin-C rich foods like tomatoes and citrus fruits is an inhibiting factor to iron absorption in the body
16. Managing side effects of taking iron supplements is not one of the key counselling messages that must be given to pregnant women
17. Stock-on hand, consumption, losses, adjustments are the essential data elements for assessing stock status of IFAS commodities
18. Very few resource materials on IFAS have been developed
19. Community-based systems of IFA distribution can reach more women than antenatal (ANC) distribution alone
20. Kenya is currently using both community-based and antenatal based strategies of IFAS distribution
21. The Kenyan policy on IFAS recommends daily supplementation of combined IFAS
22. The new Kenyan policy on combined IFAS for pregnant mothers is not different from the previous policy guidelines
23. One of the benefits of supportive supervision is ensuring uniformity to set standards, identifying problems and solving them in a timely manner
24. Interpersonal communication, mass media and the community are some of the effective behavior change communication channels identified to support adoption of IFAS

APPENDIX IX: Community Health Volunteers Key Informant Guide:

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Date _____ Venue _____

Time interview begins _____

Time interview ends _____

Key informant _____

1. What do you know about Iron and Folic Acid Supplementation (IFAS)?
2. What are your perceptions, beliefs and attitudes towards IFAS?
3. What are some of the locally available food sources of iron/folate? Are they affordable?
4. What are the causes, symptoms and effects of anaemia?
5. Explain the recommended schedule for IFAS – doesage, frequency , duration
6. What are some of the side effects of IFAS and how can they be handled?
7. What are your experiences with mothers on IFAS? And supply/logistics in the hospital?
8. What are some of factors that promote or hinder mothers from taking IFAS?
9. What’s your general view about the entire IFAS programme? Which strategy of distribution would you recommend and why?
10. What problems/constraints have you encountered as far as IFAS services are concerned?
11. What do you think can be done to improve IFAS services and achieve higher coverage?
12. Have you attended any training on IFAS? Give details

APPENDIX X: Community Health Volunteer’s IFAS Distribution and Follow-Up Register

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

Name of community health worker..... CHU

Name of mother Qnaire No

NB: Use the codes below to fill the form. For other answers not included, please specify them

Date	Tabs Issued	Tabs Returned	Check Calendar (If filled)	Side-effects Experienced (Use code)	Action Taken (Use code)	Advice Given (Use code)	Comments	Sign

CODES

Side-effects Experienced (Madhara ya IFAS)	Action Taken due to side-effects	Advice Given
1 = None	1 = Did nothing / <i>Sikufanya chochote</i>	1 = Increased nutrient needs in pregnancy
2 = Epigastric pain / maumivu ya tumbo	2 = Stopped taking IFAS / <i>niliacha kunywa IFAS</i>	2 = Benefits of IFAS
3 = Abdominal pain / kuumwa na tumbo	3 = Went back to hospital / <i>nilirudi hospitali</i>	3 = Recommended schedule
4 = Nausea / kichefuchefu	4 = Took IFAS while going to bed / <i>kumeza IFAS nikienda kulala</i>	4 = Common side-effects
5 = Vomiting / kutapika	5 = Took IFAS with meals / <i>kumeza IFAS wakati wa kula chakula</i>	5 = Managing side effects of IFAS
6 = Diarrhoea / kuendesha	6 = Eat plenty of fruits and vegetables / <i>kula matunda na mboga kwa wingi</i>	6 = Enhancers/Hindrances to iron/folate absorption
7 = Constipation / kuvimbiwa	7 = Others (specify) /	7 = Food sources of iron
8 = Faeces may turn black / kinyesi kugeuka rangi na kuwa cheusi	7 = Others (specify) / <i>zingine</i> _____	8 = Food sources of folic acid
9 = Others (specify) / <i>zingine</i> _____		9 = Anaemia – causes, symptoms, effects
		10 = Checking understanding

APPENDIX XI A: Health Care Provider Experiences' Key Informant Interview Guide

This is just a guide. Ask open-ended questions and avoid leading the clients to the answers. Explore widely to get as much information from the client as possible.

PART A: Imagine the community-based IFAS distribution strategy through community health volunteers was beginning now;

1. What would be your expectations?
2. How would you want it to be done? (Probe for frequency of visits, modalities, counselling, other issues)
3. What benefit and advantage would it have?
4. What harm and disadvantage would it have?

PART B: Share your experiences on this community-based distribution of IFAS through community health volunteers

1. What were your experiences with the community health volunteers in getting supplements from the hospital
2. What are your perceptions about this approach?
3. What did you like about this approach?
4. What do you perceive as its benefits and advantages?
5. What did you not like about this approach?
6. What do you perceive as its failures and disadvantages?
7. Share the problems encountered in handling the CHVs
8. Share your challenges in using CHVs to distribute IFAS in the community
9. Compare using professional health workers and using CHVs for distribution
10. How would you want it to be done in future? Share other areas of improvement

APPENDIX XI B: Community Health Volunteers Experiences' Key Informant Interview Guide

This is just a guide. Ask open-ended questions and avoid leading the clients to the answers. Explore widely to get as much information from the client as possible.

PART A: Imagine you had not started taking IFAS to pregnant women in their homes and this programme was beginning now;

1. What would be your expectations?
2. How would you want it to be done? (Probe for frequency of visits, modalities, counselling, other issues)
3. What benefit and advantage would it have?
4. What harm and disadvantage would it have?

PART B: I would like you to think of your last home visit to the pregnant women and tell me about it

1. What were your experiences with taking IFAS to pregnant women in their homes? (Probe for the following:)(Nisar et al, 2014c)
 - i. Frequency of visits
 - ii. Content of visits
 - iii. Any counselling offered
 - iv. Content of counselling offered
 - v. Problems encountered
 - vi. Perceived benefits and advantages
 - vii. Perceived failures and disadvantages
2. What are your perceptions about this approach now that you have been involved in it?
3. What did you like about this approach?
4. What did you not like about this approach?
5. How would you want it to be done?

APPENDIX XI C: Antenatal Mothers Experiences' In-Depth Interview Guide

This is just a guide. Ask open-ended questions and avoid leading the clients to the answers.

Explore widely to get as much information from the client as possible.

PART A: Imagine you had not started getting IFAS through community health volunteers and the programme was beginning now;

1. What would be your expectations?
2. How would you want it to be done? (Probe for frequency of visits, modalities, counselling, other issues)
3. How would it benefit you?
4. How would it be harmful to you?

PART B: I would like you to think of your last home visit from the community health volunteer and tell me about it

1. What were your experiences with the community health volunteer bringing you the IFAS at home (Probe for the following:)
 - viii. Frequency of visits
 - ix. Content of visits
 - x. Any counselling offered
 - xi. Content of counselling offered
 - xii. Problems encountered
 - xiii. Perceived benefits and advantages
 - xiv. Perceived failures and disadvantages
2. What are your perceptions about this approach now that you have gone through it?
3. What did you like about this approach?
4. What did you not like about this approach?
5. How would you want it to be done?

APPENDIX XII: Research Assistants Training Programme

STUDY TITLE: Iron and Folic Acid Supplementation among Pregnant Women: A Community-based Approach in Kiambu County, Kenya

The purpose of the curriculum is to develop competencies to perform the specified job during research period. The minimum qualification for the assistant is basic health professional training. The training will take two days.

Objectives:

By the end of the training, the learner will be able to:

1. Demonstrate an understanding of the research objective of the study.
2. Explain the ethics and rights of the respondents.
3. Obtain consent from participant before interviewing them.
4. Carry out data collection procedures effectively
5. Interview respondents appropriately

Topic	Activity	Time	Materials
Day one			
Overview of study	Lecture	60 minutes	Flip charts, marker pens, notebooks, pens, pencils, MUAC tapes, sample questionnaires
Data collection procedures	Lecture and demonstrations	30 minutes	
Interview technique and persuasive skills	Lecture and demonstrations	30 minutes	
Ethical procedures and maintaining confidentiality	Lecture and brainstorming	60 minutes	
Obtaining informed consent/interviewing	Role play	5 hours	
Day two			
Review of questionnaire	Discussion	3 hours	
Pre-testing	Discussion/Practical/field exercise	5 hours	
Pre-testing	Field Exercise	8 hours	

APPENDIX XIII: Respondents' Contact/Locator Form

PARTICIPANT CODE: _____ DATE: _____
Constituency: _____ Ward: _____
Location: _____ Name of Chief: _____
Village: _____ Village Elder: _____
Community Health Unit _____
Affiliated Health Facility: _____
Affiliated Community Health Worker: _____

1. Personal Details:

Full name Name commonly used in the community?
Home Address: _____
Cellphone number: _____
Nearest Primary School: _____
Nearest Land mark: _____
Please describe how to get to your home from the Clinic (draw map on back if needed)

2. Contact Information (Please tell us names of two people who will always know how to find you even if you move. We will contact these people if needed, but we will not tell them why we are looking for you)

Contact 1: _____
Relationship to this person: _____
Address of this person: _____
Cellphone number for this person: _____
Contact 2: _____
Relationship to this person: _____
Address of this person: _____
Cellphone number for this person: _____

3. Workplace or School Details

Workplace or School Name _____
Workplace or School Address _____
Work or School Phone Number: _____
Can we visit you at work or school? _____
When are you usually at work or school? _____

4. Places frequently visited in community (Please tell us names and addresses of other places that you like to visit or where you often can be found such as markets, churches or social gatherings)

APPENDIX XIV: Ethical Clearance

ETHICS AND RESEARCH COMMITTEE APPROVAL (KNH-UON ERC)



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel: (254-020) 2725300 Ext 44355

Ref: KNH-ERC/A/91

Mary Wanjira Njue-Kamau
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Mary

Revised research proposal: Iron and Folic acid Supplementation among Pregnant Women: A community based approach in Kiambu County, Kenya (P706/ 11/2015)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH-UoN ERC) has reviewed and **approved** your above proposal. The approval period is from 8th March 2016 – 7th March 2017.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
 - b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH-UoN ERC before implementation.
 - c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
 - d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
 - e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
 - f) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
 - g) Submission of an executive summary report within 90 days upon completion of the study.
- This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism

For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>



E-mail: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: [@UONKNH_ERC](https://twitter.com/KNH_ERC) https://twitter.com/UONKNH_ERC



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 126300-0
Fax: 725272
Telegrams: MEDSJP, Nairobi

8th March, 2016

"Protect to discover"

MINISTRY OF HEALTH
KIAMBU COUNTY

Telegrams: "MEDICAL", Kiambu
Telephone: Kiambu (office) 2911051
When replying please quote
Mobile: 072/576644
Email address: office@kiambu@gmail.com



CHIEF OFFICER – HEALTH SERVICES
P.O. BOX 2044 – 01001
KIAMBU

Ref. No.: KBU/COUNTY/RESEARCH AUTH/NJUE-KAMAU/2016-04/06

Date: 6 Apr 2016

TO WHOM IT MAY CONCERN,

RE: CLEARANCE TO CONDUCT RESEARCH IN THE COUNTY OF KIAMBU

Kindly note that we have received a request by Ms. Mary Wanjira Njue-Kamau of University of Nairobi to conduct research on *"Iron and Folic Acid Supplementation Among Pregnant Women: A Community Based Approach in Kiambu County, Kenya"* in selected sub-counties of Kiambu County.

We have duly inspected the study documentation and found that it has been cleared by the KNH/UoN-ERC to proceed during 8th March 2016 – 7th March 2017. There is thus no need for further clearance with another regulatory body in order to conduct research within the county of Kiambu, and the County Health Research and Development Unit has no objection to this study proceeding as proposed.

However, it is incumbent upon the facility in which the research is being carried out to ensure that they are conversant with the remit of the study and operate in line with their institutional norms on conducting research. This note also accords the principal investigator the duty to provide feedback on the research to the county at the conclusion of the study.

A handwritten signature in black ink, appearing to read "Ndirangu".

Dr M. N. Ndirangu, MBChB, Mphil, CRD
County Health Research & Development Unit,
KIAMBU COUNTY

**RESEARCH CLEARANCE PERMIT: NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION**

**THIS IS TO CERTIFY THAT:
MS. MARY WANJIRA NJUE-KAMAU
of UNIVERSITY OF NAIROBI, 0-100
NAIROBI, has been permitted to conduct
research in Kiambu County**

**Permit No : NACOSTI/P/18/81499/22319
Date Of Issue : 15th May, 2018
Fee Received : Ksh 2000**

**on the topic: IRON AND FOLIC ACID
SUPPLEMENTATION AMONG PREGNANT
WOMEN: A COMMUNITY BASED
APPROACH IN KIAMBU COUNTY, KENYA**



**for the period ending:
15th May, 2019**

.....
**Applicant's
Signature**

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

CONDITIONS

1. The Licence is valid for the proposed research, research site specific period.
2. Both the Licence and any rights thereunder are non-transferable.
3. Upon request of the Commission, the Licensee shall submit a progress report.
4. The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.
5. Excavation, filming and collection of specimens are subject to further permissions from relevant Government agencies.
6. This Licence does not give authority to transfer research materials.
7. The Licensee shall submit two (2) hard copies and upload a soft copy of their final report.
8. The Commission reserves the right to modify the conditions of this Licence, including its cancellation without prior notice.



REPUBLIC OF KENYA



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

**RESEARCH CLEARANCE
PERMIT**

Serial No. A 18518

CONDITIONS: see back page

APPENDIX XV: Data Analysis Plan

In order to determine the effectiveness of a community-based approach of iron and folic acid supplementation and education among pregnant women in Kiambu County, both baseline and endline survey will be conducted. Qualitative and Quantitative data will be collected.

Quantitative data will be coded after collection then entered into the computer, cleaned, validated and analyzed using STATA statistical software version 14, while Qualitative data will be transcribed verbatim , Coded using N-VIVO software version 11 and reviewed within context of views and themes as described in the table below for each objective.

Table 1: Data Analysis Plan

Objectives	Methods	Variables	Data manipulation: recoding, computation of composite variables	Data Analysis process
1. To establish the level of utilization of existing IFAS policy guidelines by health care providers in antenatal clinics in Kiambu County	<p><u>Design: Quantitative</u></p> <p><u>Quantitative data</u></p> <p><u>Sampling: Purposive</u></p> <p>Sampling of health workers for the in-depth interview</p> <p><u>Data Collection</u></p> <p>Observation checklist for IFAS policy documents</p>	<p>Independent Variable</p> <p>Availability of IFAS policy guidelines documents</p> <p>Dependent variables</p> <ul style="list-style-type: none"> • Utilization of IFAS policy documents • Counselling content • Counselling practices 	<p>Tabulation of IFAS policy documents used in counselling, counselling content and counselling practices observed during a counselling session</p>	<p>Tabulation of data obtained from observation checklist and counselling content/ practices observed during counselling session</p> <p>Do proportions according to the health facilities involved in the study</p>

	and Observation of a counselling session			
2. To determine the effect of community-based IFAS education on the knowledge, attitude and practices of IFAS among the pregnant women	<p><u>Design: Mixed Methods Both Qualitative & Quantitative data</u></p> <p><u>Data Collection</u></p> <p>Baseline and Endline Data Collections</p> <p>Interviews using Semi-structured questionnaires</p>	<p>Independent Variables</p> <p>Socio-demographic characteristics</p> <ul style="list-style-type: none"> • Age, • Education • Occupation • Income <p>Pregnancy and related experiences</p> <ul style="list-style-type: none"> • Gravidity • Parity <p>Dependent variables</p> <ul style="list-style-type: none"> • IFAS knowledge score • IFAS attitude and beliefs score • Practices towards IFAS <p>Intervening variable</p> <p>Community-based education</p>	<p>Pregnant women’s knowledge score</p> <ul style="list-style-type: none"> • Qns 16,17,19,21,23-26 Correct choice = “1” Wrong choice = “0” Add up correct scores then use the median as the cut-off point • Score above the median will be considered high IFAS knowledge level • Score below the median will be considered low IFAS knowledge level <p>Pregnant women’s attitudes and beliefs Score:</p> <p>Qn 18: Table - In a scale of 1-5, add up the scores and use the median as the cut-off point</p>	<p>Cross tabulation to compare the effectiveness of community-based IFAS education using the baseline data and endline data as well as to compare IFAS knowledge level with various independent variables</p> <p>Both bivariate and Multivariate logistic regression analysis will be done</p> <p>Difference in Difference Analysis of knowledge score, then attitudes and beliefs score comparing baseline and endline data</p>

			Pregnant women's practices towards IFAS: describe practices in Qn 29- 42	
3. To determine the effect of community-based approach on the level of compliance with IFAS among the pregnant women	<p><u>Design:</u> Cross-Sectional</p> <p>Sampling : Simple random sampling of pregnant women attending ante-natal clinics in Lari Sub-County</p> <p><u>Data Collection</u></p> <p>Baseline and Endline Data Collections</p> <p>Interviews using Semi-structured questionnaires</p>	<p>Independent Variable</p> <p>Socio-demographic characteristics</p> <ul style="list-style-type: none"> • Age, • Education • Occupation • Income <p>Pregnancy and related experiences</p> <ul style="list-style-type: none"> • Gravidity • Parity <p>Dependent variable</p> <p>IFAS compliance level</p> <p>Intervening variables</p> <ul style="list-style-type: none"> • Mother's Knowledge on IFAS use • Community approach of IFAS distribution 	<p>IFAS compliance level:</p> <p>Qn: 33</p> <ul style="list-style-type: none"> • Pregnant mothers consuming at least five tablets per week, will be considered as compliant with IFAS, coded as "1" • Pregnant mothers consuming less than five IFAS tablets will be considered as non-compliant, coded as "0" 	<p>Cross tabulation to compare the effectiveness of community-based IFAS using the baseline data and endline data as well as to compare IFAS compliance level with various independent variables</p> <p>Both bivariate and Multivariate logistic regression analysis will be done</p> <p>Difference in Difference Analysis of compliance level comparing baseline and endline data</p>

<p>4. To determine the nutritional status (dietary, anthropometric, haemoglobin and folate levels) of pregnant women before and after a community-based approach of IFAS</p>	<p><u>Design:</u> Cross-Sectional</p> <p>Sampling: Simple random sampling of pregnant women attending ante-natal clinics in Lari Sub-County</p> <p><u>Data Collection</u></p> <p>Baseline and Endline Data Collections</p> <p>Interviews using Semi-structured questionnaires and data abstraction forms to record biochemical tests and clinic attendance measurements</p>	<p>Independent Variable</p> <p>Pregnancy and related experiences</p> <ul style="list-style-type: none"> • Gravidity • Parity <p>Dependent variables</p> <p>Dietary practices</p> <p>Nutritional status [anthropometrics (weight, height, mid upper arm circumference), haemoglobin and folate levels]</p> <p>Intervening variables</p> <ul style="list-style-type: none"> • Mother’s Knowledge on IFAS use • Community approach of IFAS education 	<p>Description of various parameters of the nutritional status [anthropometrics (weight, height, mid upper arm circumference), haemoglobin and folate levels] of pregnant women</p> <p>Frequency of intake of various food sources</p>	<p>Tabulation and description of the nutritional status [anthropometrics (weight, height, mid upper arm circumference), haemoglobin and folate levels] of pregnant women before and after intervention</p> <p>Frequency of intake of various food sources</p> <p>Difference in Difference Analysis of food sources comparing baseline and endline</p>
<p>5. To describe the experiences of pregnant women, community health workers and health care professionals involved in the</p>	<p><u>Design:</u> Qualitative</p> <p><u>Qualitative data</u></p> <p><u>Sampling:</u> Purposive</p>	<p>Experiences of pregnant women, community health workers and health care professionals of participating in a</p>		<p>Data will be transcribed verbatim, Coded using N-VIVO software and reviewed within context of views and themes.</p>

community-based approach of IFAS	Sampling of pregnant women, community health workers and health professionals for the in-depth interviews <u>Data Collection</u> Qualitative	community-based approach of IFAS		
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APPENDIX XVI: Study Timelines

MARY KAMAU'S PHD WORK PLAN: IFAS: A COMMUNITY-BASED APPROACH IN KIAMBU COUNTY, KENYA																													
	2015	2016										2017				2018				2019									
Activity	S-D	J-A	M	J	J	A	S	O	N	D	J	Feb-Oct	N	D	J	F	M	A	M	J-O	N-D	J	F	M	A-J	J-S	O	N-D	
Concept and Proposal Development	█	█																											
Ethical Approval Process			█	█																									
- Recruit, train research assistants				█	█																								
-Pre-test questionnaire				█	█																								
-Meet authorities				█	█																								

APPENDIX XVII A: Proposed Study Budget

Item	Units	Unit Price	Total (KSh.)
Laboratory costs for Hb levels	313	600 x 3	180,000
Laboratory costs for folate levels)	60	2000 x 3	360,000
Purchase of IFA supplements in case of stock-outs from GoK	100,000 tabs	50	500,000
CHWs allowances	30 persons	15,000	450,000
Research assistants allowances	5 persons	25,000	125,000
Phlebotomists allowances	2 persons	20,000	40,000
Transport for research assistants	10 months 5 Persons	10,000 x 5	500,000
Stationery	10 months	10,000	100,000
Data analysis	4 months	25,000	100,000
SUB-TOTAL			2,355,000
Contingencies		10%	235,500
Grand Total			Ksh 2,590,200

JUSTIFICATION FOR THE BUDGET AND SPONSORSHIP

The above budget was quite high due to the high cost of the laboratory tests for haemoglobin and folate levels which are very expensive. The CHVs weekly follow-up to respondents was quite expensive because they needed weekly facilitation. There has also been reported stock-outs of IFAS in the government facilities at times hence the need to buy them incases of stock-outs during the study. I was awarded a fellowship by Consortium for Advanced Research Training in Africa (CARTA), who partly sponsored the research study.

APPENDIX XVII B: Actual Study Budget

MARY NJUE-KAMAU – ACTUAL BUDGET				
	Item (as per original budget)	Description	Actual amount spent (KSh)	Budget Notes
A. Training research assistants and Pre-testing of study tools (questionnaires, checklist, interview guides)				
A.1	Printing and photocopy	Pages	2,860	More study tools were prepared than initially expected
A.3	Research assistants Lunch	Pax	5,000	During data collection
A.5	Transport for research assistants	Pax	2,500	To the study sites
A.6	Transport for Principal Investigator	Fuel Litres	12,000	A Taxi was initially used to show us the study sites
A.7	Data entry and analysis (pre-tested data)		10,000	Negotiated downwards to cater for other costs
A.8	Research Fee (Sub-County and ERC)		17,000	Ethical approval fee had not been factored in the budget
B. Laboratory costs				
B.1	Portable Haemoglobin (Hb) meter	Meter	15,000	For taking Haemoglobin levels
B.2	Cuvettes -Hb meter	Packs	36,000	Got a cheaper supplier
B.3	Lab supplies	Assorted	1650	Was subsidized by using supplies from health facilities
B.4	Folate level tests		155,260	Bought reagents and paid for labour to bring costs down instead of doing tests commercially
B.5	Lab technician cost	Person months	60,000	Labour costs at KNH were too high because of specialization of the test
C. Implementation				
C.1	Study tools printing & photocopy	Pages	38,011	This was more than had been budgetted for
C.2	Training (Conference package)			
	Health care providers	Pax	17,352	Trained during their usual monthly meetings to cut down cost

	Community health volunteers	Pax	39,800	Had to pay for their fare as well and lots of stationery for client follow-up
C.3	Purchase of IFA supplements in cases of stock-outs from government	Tabs	20,000	The cost per tablet was higher than expected
D. Follow-up Phase				
D.1	CHVs allowances (Follow-up phase)	Person months	236,050	Follow-up took longer than expected, was affected by health workers strikes so had to pay more to have the study continue
D.2	Transport for Principal Investigator	Fuel Litres	99,978	More trips were made than had been budgeted for due to increased study time
D.3	Research assistants transport	Person months	30,350	More trips were made than had been budgeted for due to increased study time
D.4	Lunch allowance for research assistants	Person months	177,100	This took longer than expected and sometimes affected by very low client turn-up
D.5	Airtime		10,000	Communication was more intense than expected
	Data entry		6,245	Done by professional statistician
	Data analysis		90,000	Done by professional statistician
	Report/Thesis Writing & Presentation & publishing		50,000	Costs for printing, photocopy and publication fees
	Contingencies		4,775	
	Total		1,142,931	

APPENDIX XVI: MOH IFAS Calendar and Tablets

