DETERMINANTS OF NON-COMPLIANCE TO IRON AND FOLIC ACID SUPPLEMENTATION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN NAKURU NORTH SUB-COUNTY, KENYA

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A Thesis Submitted to the Institute of Post Graduate Studies of Kabarak University in Partial Fulfilment of the Requirement for the Award of the Master of Science in Human Nutrition and Dietetics

KABARAK UNIVERSITY

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DECLARATION

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The research thesis entitled **"Determinants of non-compliance to Iron and Folic acid supplementation among women attending Antenatal clinic in Nakuru North Sub County, Kenya"** and written by **Jacinta Njambi Wambugu** is presented to the institute of Postgraduate Studies of Kabarak University. We have reviewed the research thesis and recommend it be accepted in partial fulfilment of the requirements for the award of the degree of Master of Science in Human Nutrition and Dietetics.

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DEDICATION

I wish to dedicate this work to my husband Benson Lukania and sons Joshua, James and Joseph.

ABSTRACT

Iron and folic acid are micronutrients that are essential for normal physiological function, growth and development as well as maintenance of life. Iron and folic acid supplementation (IFAS) is one of the most affordable and effective global intervention strategies for control of anaemia in pregnancy with resultant benefits of reduced maternal-child morbidity and mortality. Despite high prevalence of anaemia in Kenya, minimal information on determinants leading to IFAS non-compliance exists hence the need for this study. A mixed methods study targeting pregnant women in Nakuru North Sub County was carried out to establish the determinants of non-compliance. Systematic random sampling was used to obtain the study subjects based on the inclusion criteria targeting 279 respondents. A semi structured questionnaire was used to collect quantitative data while Key Informant Interview and Focus Group Discussion guides were used to collect qualitative data. Data was coded, cleaned, sorted, and entered into the statistical package for social sciences (SPSS), version 21 for analysis. Descriptive statistics were used to summarize the data, and the results presented using charts, graphs and tables. Bivariate analysis was conducted using Chi-square (at a significance level of P = 0.05), to ascertain the significance of association between various demographic and socio-economic characteristics of the women attending ANC. Finally, odds ratio was performed to determine the influence of the various factors on non-compliance of IFA supplements. Inferences were drawn based on the study findings at 95% level of significance. The qualitative data was organized, coded and combined into themes. The study findings revealed that 27.1% of the respondents were non-compliant. Reasons for non-compliance were given as side effects, bad taste and missed clinics. About a third (37.6%) of the participating pregnant women first visited the Antenatal Clinic when they were over four months pregnant and (31.8%) indicated that they had not received information on the benefits of IFAS. The HB levels of most (90.7%) of the participants were normal between 11.0 and 15.0g/dl. Chi square tests showed that there was a significant relationship between IFAS non-compliance status and HB levels (χ^2= 59.791, P value= 0.0271) while odds ratio indicated that pregnant women were more likely to comply if they did not have side effects (OR=1.47), initiated ANC early (OR=1.33) and there was a constant supply of IFAS (OR=1.24). Therefore, this study demonstrated that the mother related determinants of non- compliance were lack of knowledge about the benefits of IFAS, side effects and late ANC attendance while the facility related determinant was IFAS stock outs. Thus, the study recommends a review of the advice given to pregnant mothers visiting ANC to improve IFAS compliance and capacity building of health workers on proper forecasting to avoid stock outs.

Keywords*: Iron and Folic acid, Non-compliance, Maternal factors, Health facility factors*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ANC	Ante Natal Care
CHV	Community Health Workers
CI	Confidence Interval
ERC	Ethics Review Committee
FGD	Focus Group Discussion
IDA	Iron Deficiency Anaemia
IFA	Iron Folic Acid
IFAS	Iron and Folic Acid Supplement
KII	Key Informant Interview
KDHS	Kenya Demographic Health Survey
KNBS	Kenya National Bureau of Statistics
LBW	Low Birth Weight
MOH	Ministry of Health
MOPHS	Ministry of Public Health and Sanitation
OR	Odds Ratio
P	Significance Level
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Anaemia: Haemoglobin concentration below established cut off levels depending on age, sex and physical status. Hb concentrations of <110g/L among pregnant women

Non-Compliance: Taking IFAS tablets for less than 5 out of 7 days per week

Determinants: Factors which affect the nature or outcomes of compliance to IFAS.

Iron Deficiency: State of inadequate iron to maintain normal physiological functions of tissues.

Iron and Folic Acid (IFA) Tablet: A supplement containing a combination of 60mg ferrous sulphate and 400µg folic acid.

Nutritional Status: Haemoglobin levels of pregnant women attending ANC

Supplementation: Provision of specified doses of nutrient preparations, which may be in the form of tablets, capsules, oil solutions or modified foods for either treating identified deficiencies or preventing occurrence of such deficiencies.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Iron and folic acid are micronutrients that are essential for normal growth, development, physiological function as well as maintenance of life. Deficiencies for these micronutrients cause biochemical or physical changes especially anaemia and its consequences (WHO, 2011). Micronutrient deficiencies (hidden hunger) in Kenya are found even among population groups with enough food to meet the recommended daily allowances for energy requirements (MOH, 2013b). These deficiencies can have negative impacts on the health of the mother and their children before, and during pregnancy and after birth. Deficiencies of iron and folic acid are particularly common during pregnancy due to their increased maternal and foetal requirements (MOH, 2013b; WHO, 2012).

Iron deficiency anaemia is one of the most common form of micronutrient problem and most prevalent nutritional deficiency associated with morbidity and mortality globally (Jimenez *et al*., 2015). Anaemia in pregnancy is a leading cause of the world's burden of disease with iron deficiency anaemia being responsible for above half of the cases. The global prevalence of anaemia in pregnancy ranges from 41.8–43.8% with the greatest (61.3%) burden being found in Africa then South East Asia at 52.5% (Kamau *et al*., 2018). In Kenya, anaemia in pregnancy remains a public health problem, with the prevalence being persistently high, currently at 55.1%, resulting in estimated 10% maternal deaths and 20% perinatal deaths (Siteti *et al*., 2018); MOH, 2013).

In Kenya, anaemia in pregnancy is associated with estimated 1 in 5 perinatal deaths and 1 in 10 maternal deaths respectively (MOH, 2012). A great proportion of these deaths can be averted by strengthening Iron and Folic Acid Supplementation (IFAS) and

increasing its compliance by pregnant women. IFAS has been shown to be beneficial in reducing maternal and infant morbidity (including postpartum haemorrhage and poor birth outcomes, such as preterm births and low birth weights) and mortality associated with anaemia. Even though efforts have been put in place to control and prevent anaemia in pregnancy, this public health problem persists (WHO, 2017; Kamau *et al.,* 2018). Studies show that compliance with IFAS is generally poor and thus hindering IFAS success leading to poor maternal and child outcomes.

Iron and folic acid supplementation is one of the most affordable and effective global intervention strategies for control of anaemia in pregnancy with resultant benefits of reduced maternal-child morbidity and mortality. This is necessitated by the fact that the high body's nutrient demand in pregnancy is not met by the normal diet because of insufficient amounts and low bioavailability in diets (Nisar & Dibley, 2014).

Following the WHO guidelines, IFAS program was adopted by Kenya targeting to achieve 80% coverage by 2017. The implementation required a behaviour change communication strategy to communicate benefits of the intervention and management of side effects, along with provision of supplements of good quality and appropriate packaging. This was vital in improving the acceptability and compliance to the supplements. The strategy also encourages the use of dietary diversity and intake of food combinations that improve iron absorption (WHO, 2012)

Indeed, the IFAS tablets are currently routinely provided through all public health facilities in the course of antenatal care, without charge for daily use throughout pregnancy. Despite the government's effort to provide IFAS for free, compliance remains low. Reports show that only about 8% of pregnant women in Kenya take IFAS for more than 90 days (KNBS, 2015).

Although there have been increased efforts to promote IFAS, the number of women with anaemia has not shown a commensurate decline nor has it led to increased IFAS compliance in Kenya (MOH, 2013). Therefore, there is urgent need to focus on the factors affecting compliance and develop unique and creative strategies to increase IFAS coverage which will eventually, reduce the burden of anaemia in pregnancy for improved child and maternal health outcomes. There is however, very little information on the reasons for the very low compliance status of IFAS in Kenya. This study's' objective was therefore to determine the non-compliance status of pregnant women with IFAS and identify factors influencing their non-compliance.

1.2 Problem Statement

Iron and folic acid supplementation is a public health strategy which if improved, would go a long way in achieving Universal Health Coverage (UHC). This is as per the mission of UHC 2030 to accelerate both equitable and sustainable progress towards quality essential healthcare. Consequently, this will contribute to achievement of United Nations Sustainable Development Goal 3: Good health and well-being for all (Mithra *et al*., 2013).

Daily intake of IFAS during pregnancy helps to reduce the overall lifetime risk of any anaemia by 70% and iron deficiency anaemia by 57%, respectively (Lavanya *et al*., 2020). Even though interventions are often designed at both national and international level to combat anaemia in pregnancy by the introduction of iron supplements, complying to the regimen of taking the drugs daily and with the recommended dosage remains quite a challenge. Indeed WHO in issuing the guideline also recommended for future research on operational issues related to improving delivery and utilization of the intervention (WHO, 2012).

According to the Kenya Demographic Health Survey of 2014, compliance to iron/folate supplements by pregnant women in Kenya was low since nationally only 8% of pregnant women took Iron supplements more than 90 days of the recommended 180 days (KNBS, 2015). The statistics revealed that 5% of the participants took supplements for 60-89 days, 53% took the supplements for fewer than 60 days and 30% reported that they did not take iron supplements at all during their last pregnancy. Adherence to IFAS among pregnant women attending ANC at Thika hospital in Kiambu County was 24.5% (Dinga, 2013; Kamau *et al.,* 2018). Similarly, in Machakos County, only 18% of the women took IFAS (Juma *et al*., 2015). In Nakuru County, 99.2% of the women surveyed who carried pregnancy to full term between 2018 and 2019 were given IFAS. However, the mean consumption of the supplement during the entire pregnancy period was only 51.7 days (ISG Survey, 2020).

The effectiveness of the policy interventions on anaemia prevention in pregnancy is largely depended on the compliance to IFAS. Although the efficacy of daily IFAS supplementation has been demonstrated particularly in reducing anaemia (Ahmed *et al*., 2019), national IFAS programs in various countries which include Kenya have had difficulty in achieving levels of coverage and adherence necessary to effectively reduce anaemia (Siekmans *et al*., 2019). Many experts have come to believe that the major reason that the national supplementation programs has failed is the non- compliance to iron and folic acid policy by pregnant women (Kamau *et al*., 2018).

Despite efforts to control anaemia in pregnancy by adopting iron and folic acid supplementation, pregnant women who fail to adhere to the tablets intake according to the IFAS recommendation were likely to experience iron and folic acid deficiency which is associated negative effects on both maternal and neonatal health. There are very few studies which have been undertaken in order to find out the reasons associated with non-

compliance to IFAS among pregnant women in Kenya. Hence, this study assessed non-compliance with IFAS and its associated factors in Nakuru County.

1.3 Justification of the Study

Reducing anaemia is a vital component of achieving maternal-infant health as well the second global nutrition target for 2025 which calls for a 50 Percent reduction of anaemia in women of child bearing age (WHO, 2012).

Findings on the determinants of non-compliance to IFAS among pregnant women in Nakuru North Sub County will provide feedback to key stakeholders in the county and national government on the gaps in the intervention that lead to non-compliance and thus inform policy review and reforms. The information obtained, will also assist stakeholders of the health sector in developing social behaviour change communication strategies and materials aimed at influencing behaviour change towards effective IFAS uptake among pregnant women. This will assist in achieving Universal Health Coverage (UHC) and eventually contribute to achievement of United Nations Sustainable Development Goal 3: Good health and well-being for all.

1.4 Purpose of the Study

The purpose of this study was to investigate the determinants that influence non-compliance to iron and folic acid supplementation among pregnant women attending ANC in Nakuru North Sub County.

1.5 Objectives of the Study

The following objectives guided this study.

i. To assess the demographic and socio-economic characteristics of pregnant women attending ANC in Nakuru North Sub County.

ii. To identify the prevalence of IFAS non-compliance status among pregnant women attending ANC in Nakuru North Sub County.

iii. To determine the maternal factors influencing IFAS non-compliance status among pregnant women attending ANC in Nakuru North Sub County

iv. To determine the health facility factors influencing IFAS non-compliance status among pregnant women attending ANC in Nakuru North Sub County

v. To establish the haemoglobin (HB) levels of pregnant women going for ANC in Nakuru North Sub County.

vi. To determine the association between demographic and socioeconomic characteristics, HB levels and IFAS non-compliance status of pregnant women going for ANC in Nakuru North Sub County.

1.6 Research Hypotheses

Ho1: There is no association between demographic and socioeconomic characteristics and IFAS non-compliance status in Nakuru North Sub County.

Ho2: There is no association between the HB levels of pregnant women attending ANC and IFAS non-compliance status in Nakuru North Sub County.

1.7 Significance of the Study

This study's information will help policy makers in legislating appropriate strategies to aid in achieving good IFAS uptake. The health workers will be able to highlight on factors that influence IFAS compliance and provide targeted counselling leading to pregnant women taking the supplement as prescribed, gaining the benefits and lowering the prevalence of anaemia. The study will also contribute to knowledge for other studies aiming at reducing the rates of anaemia due to iron deficiency in pregnancy.

1.8 Limitation of the Study

There was recall bias and subjectivity because the study relied on verbal reports from the interviewees. The study design was cross-sectional and therefore the results did not determine a cause and effect relationship.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed the existing literature from studies previously done in this field of study both globally and locally. Literature was reviewed based on the study objectives and the gaps identified were highlighted.

2.2 Global Perspective of Micronutrient Deficiency

Micronutrient deficiency affects excess of two billion people world-wide (Rajput *et al*., 2021). Micronutrient deficiencies exist even in populations where food supply is adequate as far as meeting energy requirements is concerned. These deficiencies are most prevalent where the diet lacks variety, which is common in developing countries. Blindness and goitre are two of the most visible manifestations of micronutrient deficiency, however they present only a fraction of the problem, and sub-clinical deficiencies afflict a much larger proportion (Gödecke *et al*., 2018).

Grave consequences including continued and sustained loss of productivity, permanent mental disability, blindness, depressed immune system function and increased infant and maternal mortality can result from micronutrient deficiencies. The heaviest toll is borne disproportionately by women and children (Black *et al*., 2014).

The nutritional status of a woman has been found to be very important and critical as it determines and allows for a healthy pregnancy outcome (Khoushabi, 2010) (Black *et al*., 2008) Maternal intakes of micronutrients such as zinc, iron, magnesium, calcium, riboflavin and vitamin C have important effects on foetal growth affecting perinatal outcomes. However, developing countries such as Bangladesh, China, Sudan, and Nigeria and in developed countries such as the USA, have reported inadequacy of

micronutrient intake among pregnant women (Sukchan *et al*., 2010). Anaemia has been identified as the most common micronutrient deficiency (Siteti *et al.,* 2018).

2.3 Iron Deficiency Anaemia Scope

Iron deficiency anaemia is the most prevalent nutrition problem globally affecting both developing and developed countries with major consequence for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children. Iron deficiency anaemia was also identified as the most prevalent micronutrient problem in the world as it affected more than 2 billion people globally (Jimenez *et al*., 2015).

It is estimated that 52 Percent of pregnant women in developing countries are anaemic (Gautam *et al*., 2019). It has further been found that prevalence of anaemia in developed countries among pregnant women is 14 Percent. In developing countries, it is highest in India with ranges of between 65-75 Percent.(Bailey, 2015) (Karaoglu *et al*., 2010). According to WHO (2012), reducing anaemia is a vital component of achieving maternal as well as infant health and the second global nutrition target for 2025 which calls for a 50 Percent reduction of iron deficiency anaemia in women of child bearing age. When the prevalence rates of iron deficiency anaemia among pregnant women is 40 Percent or more, it is considered a public health problem of interest (Okube *et al*., 2016).

Anaemia is often considered the main deficiency of iron; however, it rarely comes in isolation. It sometime can be attributed to causes such as malaria. More than six types of malaria parasites have been identified as being responsible for causing malaria disease (Benedicto, 2020).Helminthes infection as well as nutritional deficiencies such as Vitamin B9, Vitamin A and B12, and hereditary or other related conditions that interfere

with haemoglobin production, erythrocytes production or survival of red blood cells have also been known to cause anaemia (Snook *et al*., 2021).

2.3.1 Significance of Folic Acid Deficiency in Kenya

Looking at folic acid deficiency prevalence among the pregnant women in Kenya, it stood at 32.1% and approximately 30.9% in non-pregnant women; however, there were slight differences in prevalence in pregnant women, in that women living in urban areas had a prevalence of 25.0 while those found in rural areas had a prevalence rate of 36.0 (MOH, 2011). Gebreamlak et al. (2017) noted that the largest population of women with anaemia is to be found in Africa followed by populations residing in the Southern and Southeast Asia. Iron deficiency anaemia brings about undesirable effects that impact not only on motor and cognitive development but also weakness of the body and reduced productivity. The negative effects of anaemia caused by iron deficiency are more dire during pregnancy as it could lead to delivery of low birth weight babies as well as increased risks of maternal and perinatal complications (Okube *et al*., 2016).

In patients with chronic kidney disease, anaemia is attributed to lowering their quality of life and increasing other undesirable consequences such as cognitive impairment, cardiovascular diseases, longer hospital stays and mortality (Gautam *et al*., 2019). Acute anaemia is associated with increased risk of infant and maternal deaths. About half of anaemia in expectant women can be traced to lack of iron supplementation though in areas where malaria is endemic the figure could be lower (Omotayo *et al*., 2018). Iron deficiency may also cause muscle wasting thus affecting physical functions and work output. The deficiency also causes low immunity and increased morbidity as a result of infections (WHO, 2012).

Folic acid is an important micronutrient during the growth and development of the foetus and has been recognized as playing a key role in the metabolism of homocysteine, α-amino acid methionine which is an essential amino acid including biosynthesis of nucleotides (Dinga, 2013). Anaemia due to folic acid and cobalamin deficiency is not as common as that of iron deficiency and is identified by measuring the mean volume of blood cells in a complete blood count (WHO, 2008a). Deficiency of folic acid leads to neural tube anomalies and other defects which include cleft palate. It has also been linked to other complications during delivery like miscarriages, preeclampsia and death of the foetus. In addition delayed milestones and premature deaths have also been associated with folate deficiency (Karaoglu *et al*., 2010). Other consequences of folic acid deficiency include macrocytic anaemia, congenital defects and low birth weight neonates that weigh less than 2500gms (Siteti *et al*., 2018). Most of this complications have been shown to occur between the 21st and 28th day after conception during the period of embryogenesis which in most cases is even before a woman realizes that she is carrying a pregnancy (Nisar & Dibley, 2014).

Studies recommend consuming either folic acid supplements or a combination of iron and folic acid supplements at least three months before embryogenesis. Doing this has been shown to reduce the risk of neural tube anomalies by up to 75% (Siteti *et al*., 2018). Positive correlation has also been documented between daily intake of iron and folic acid supplements during pregnancy and infant's birth weight. Twenty million neonates are estimated to be born with low birth weight annually (Seck & Jackson, 2007). Other studies that focussed on adults implied that deficiency of folate is linked to impaired cognitive function and in some cases dementia although evidence for beneficial results for supplementation with folate is inconsistent (Okube *et al*., 2016) .

2.3.2 Iron Deficiency Anaemia in Kenya

Iron and folic acid and other micronutrient deficiencies are highly prevalent in Kenya, particularly at crucial stages of the life cycle such as pregnancy which can negatively impact the health of both mother and child, before, during and after birth (Kamau *et al*., 2018). In Kenya, despite efforts to control and prevent anaemia in pregnancy, this public health problem persists, with a national prevalence of 55.1% resulting in estimated 10% maternal and 20% perinatal deaths respectively (MOH, 2011). The prevalence are similar to those found in Kenya, where the problem is the second highest cause of maternal deaths (Okube *et al*., 2016).

During pregnancy women are at a higher risk to anaemia due to a mix of factors that include but are not limited to body changes, poor food intake and dietary practices, insufficient knowledge and poverty related under nutrition as well as gender issues. Additionally, during pregnancy there is heightened micronutrient demand and especially for iron and folic acid which are essential for both the metabolism and foetal growth. Diet alone is not adequate due to intake of foods with low iron bioavailability (Benedicto, 2020).

2.3.3 Aetiology of Iron Deficiency Anaemia

Anaemia has been shown to result from a wide range of causes which can sometimes be isolated; however most of them are intertwined. Iron deficiency is thought to cause 50% of all the cases of anaemia in the world. It is therefore a notable contributor to anaemia such that often times iron deficiency anaemia and anaemia are used interchangeably (Ziegler *et al*., 2011), however, depending with local conditions there are variations among different groups of populations.

Risk factors associated with iron deficiency include suboptimal iron intake from diets which are high in phytate/phenolic compounds. A Kenyan study found that dietary adequacy for iron, zinc and calcium will be difficult to ensure using only local foods as consumed (Ferguson *et al*., 2016) and especially during periods of life requiring increased iron like during growth and pregnancy.

Parasitic infections that include schistosomiasis, ascaris and hookworms reduce the concentration of haemoglobin resulting in anaemia. Other chronic diseases such as tuberculosis, human immunodeficiency virus and cancer are also risk factors of anaemia. Notably micronutrient deficiencies of certain vitamins and minerals that include vitamin B12, vitamin B2, vitamin A as well as copper have also been identified as increasing the risk of being anaemic (Okube *et al*., 2016).

2.3.4 Health Consequences of Iron Deficiency Anaemia

Iron deficiency anaemia in pregnancy compromises both maternal and foetal health. It is associated with preterm delivery, caesarean delivery, blood transfusions, low birth weight, 5-minute Apgar score <7, neonatal intensive care unit admission and long-term effects on mental and psychomotor development in the child (Scholl, 1992; Drukker *et al*., 2015). In addition, the fact that it reduces physical performance like lowering work productivity means effort needs to be put in place to tackle it (Sarwar & Ayub, 2014).

2.3.5 Assessing Iron Deficiency Anaemia

The most accurate measure of anaemia in the population is haemoglobin (Hb) concentration. Other clinical measures are subjective and therefore more prone to errors. Another advantage of measuring haemoglobin concentration is that it is cost effective and easy to conduct; making it the most frequently used measurement for iron deficiency. Haemoglobin and ferritin are also currently considered the most efficient indicators of population response to iron interventions (Sarwar & Ayub, 2014).

Haemoglobin distribution in the normal range differs with chronological age, sex and physiological status, for example during pregnancy. During pregnancy women are termed as being anaemic when their HB levels are less than 110g/dl at sea level (Jimenez *et al*., 2015).

Table 1

Haemoglobin thresholds used to Define Anaemia

Age or Gender Group	Haemoglobin Threshold (g/l)
Children (0.50–4.99 yrs)	110
Children (5.00–11.99 yrs)	115
Children (12.00–14.99 yrs)	120
Non-pregnant women (≥15.00 yrs)	120
Pregnant women	110
Men (≥15.00 yrs)	130

Source: Adapted from (FAO/WHO, 2001)

2.4 Strategies of Addressing Iron Deficiency Anaemia

For decades now, awareness of the magnitude and seriousness of IDA has been rising, as has the commitment to alleviate these problems. The ICN held in Rome, 1992, clearly defined priorities and strategies that should be followed to reduce IDA in a sustainable manner (FAO, 1993). The existence of proven and low-cost methods for preventing IDA adds strongly to the case for controlling it widely and immediately. These options are briefly outlined below.

2.4.1 Dietary Sources

Dietary sources of iron are present in two forms, haem and non-haem iron. Haem-iron found in animal source foods such as meat fish and poultry has much greater

bioavailability (15-35%), than does non-haem iron found in cereals, pulses, fruits and vegetables, where the absorption rates range from 2-20%. Many dietary factors can either inhibit or enhance absorption of iron as follows (Snook *et al*., 2021):

Enhancers of iron absorption include:

i. Haem-iron present in meat, poultry, fish, and other seafood's.
ii. Ascorbic acid or vitamin C, present in fruits (especially citrus), potatoes, vegetables such as green leafy ones, cauliflower and cabbage, and some tubers.
iii. Some fermented or germinated foods and condiments like soy sauce (cooking, fermentation or germination of food reduces the amount of phytates)
iv. Inhibitors of iron absorption include:
v. Phytates present in cereal bran and grains, high extraction flour, legumes, nuts and seeds. Mixed flours increase the concentration of anti-nutrients in the diet, thus lowering the bioavailability of iron (Ndagire *et al*., 2015).
vi. Foods with high inositol content.
vii. Iron binding compounds (tannins). Foods that contain the most potent inhibitors, resistant to the influence of enhancers include tea, coffee, cocoa, herbal infusions in general and certain spices like oregano.
viii. Calcium, particularly from milk and milk products.

2.4.2 Food Fortification

Food fortification aims at increasing iron intake through the addition of suitable iron fortificants to commonly consumed processed foods. It has potentially large benefits because it can reach a large proportion of deficient populations and improve iron status relatively rapidly (Moazzen *et al*., 2021).

Based on the long-established experience of many industrialized countries and more recently policies of middle income and poorer countries where, populations are iron deficient, it is desirable to fortify staples or condiments with iron. The cost of iron supplements and fortificants per individual is low. However as with most public health programs, when taken to a national scale, and focused beyond treatment to prevention, the overall costs become substantial (Moazzen *et al*., 2021).

2.4.3 Supplementation

Nutrients are delivered directly by means of syrup or pills in this technical approach. It is appropriate for targeting populations with a high risk of deficiency or under special circumstances, such as during pregnancy or in an acute food shortage. Under normal circumstances, supplementation programs are used only as a short-term measure, to be replaced with long term, sustainable, food-based, measures such as fortification and dietary modification (Snook *et al*., 2021).

Distribution of daily supplements of iron tablets usually in the form of ferrous sulphate is widely necessary to reduce the extent of anaemia. This is especially among women in poor countries where prevalence of 50% or more are commonly observed. It is also recommended that where anaemia prevalence is high, iron supplementation should be given to women of childbearing age, and to children between 6-18 months, under conditions that can assure the intake of the supplements (Bailey, 2015).

IFAS increases haemoglobin levels therefore reducing anaemia rates and improving birth outcomes. Research shows that it reduces the threat of maternal iron deficiency at term by 70 Percent and 57 Percent respectively (WHO, 2011). Conversely, regarding supplementation programs to control anaemia, not many countries reported supplementation programs, indicating a need to expand coverage. Other research has also

noted poor compliance to supplementation through antenatal care (Kimiywe *et al*., 2017). Non-compliance has been attributed to cultural issues, environmental factors, lack of awareness, personal behaviours, side effects, inadequate service delivery and socio-demographic rank (Mithra *et al*., 2013).

2.5 Socio-Demographic and Socio-Economic Factors Influencing Non-Compliance

The non-compliance to iron and folic acid supplementation may be predisposed by the social, demographic, and financial factors facing pregnant women. This was well articulated by a study conducted in Kiboga district, Uganda on the determinants of prevalence of anaemia and poor uptake of IFAS (Mbule *et al*., 2013). The study shows that low income and insufficient nutrition and health education information contributed to low compliance to the recommendations of the public-health intervention package to combat anaemia in pregnancy. Further, from the study it was clear that that age, education level, marital status, and family size were no significant to the uptake of IFAS (Dinga, 2013).

Another study revealed that women who were more financially stable attended the antenatal clinics during pregnancy more than those less financially stable (Okube *et al*., 2016). Women with less money spend more on food and other pressing needs at the expense of their health status with some opting for traditional methods or non-formal medication as compared to those with better incomes. The study further revealed that women who with low socio-economic status were twice anaemic than those who had economic independence since they were not taking iron and folic acid supplements as recommended.

2.6 Prevalence of IFAS Non- Compliance among Pregnant Women

Non-compliance is one of the main factors that influence the efficacy of the IFAS program. Studies suggest 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 *et al*., 2019).

Compliance with IFAS is generally low. Mothers who need supplements most, comply least (Mbbs & Mbbs, 2006). In 3 consecutive KDH surveys, there have been consistently low compliance levels with less than 8% of the pregnant women taking IFAS for 90 or more days and over 30% not taking at all (KNBS, 2014). This was also noted in another study in Kiambu County, Kenya, which revealed that only 32.7% were compliant to IFAS (Kamau *et al*., 2018).

The above findings are comparable to those from the neighbouring countries of Ethiopia and Tanzania where non-compliance has been found to be high as well. The compliance prevalence was established to be only at 28.7 % and 20.3% respectively (Agegnehu *et al*., 2019). In contrast, studies from Asian countries indicate high compliance to IFAS. A study in India showed compliance rates of 64.7% while another in Sri Lanka reported 80.1% (Mithra *et al*., 2013).

A study done in Kenya concluded that increasing frequency of anaemia among pregnant women can be attributed to the high incidence of non-compliance (Mburu *et al*., 2020). The study revealed that 56% of the respondents had sometimes forgotten to take IFAS in the course of the pregnancy. Apparently, there is no clear cut-off for compliance but missing two or more doses consecutively is usually referred to as non-compliance (Sambili *et al*., 2016).

2.7 Non-Compliance to IFAS and Its Associated Factors

Several reasons have been associated with IFAS non-compliance including forgetfulness, birth order, travel, age, perceived side effects, socioeconomic status, supplement stock outs including lack of clear understanding on the relevance of IFAS in pregnancy due to insufficient counselling (Gebremedhin *et al*., 2014) (Mithra *et al*., 2013).

Other barriers identified include inadequate IFA distribution, poor access and utilization of ANC services, beliefs against use of drugs in pregnancy among others. However, concern for health of both maternal and infant influences higher compliance to IFAS (Pal *et al*., 2013) including improved physical wellbeing of the mother with the relief of consequences of anaemia, especially improved appetite and reduced fatigue.

Uptake of the required dose of IFAS is also influenced by other personal attributes like negative effects, low importance given to IFA including forgetfulness among others. Maintaining a blame free environment and praising patients for goal achievement are essential for attaining compliance. Other effective interventions include face to face, counselling, mobile texts, simplifying medicine regimes, using adherence packaging, minimizing side effects, helping with access and engaging team members (Benedicto, 2020)

2.7.1 Maternal Factors Influencing IFAS Non-Compliance

In Kenya at the moment, IFAS is provided during ANC visits only which are a key point for women to receive many preventive and health promotion services. Consequently, the adequacy and timing of ANC visits is a major determinant of IFAS utilization (Nisar & Dibley, 2014). ANC visits and acquiring knowledge on IFAS is important for pregnant women. This has led to the World Health Organization recommending a minimum of four ANC visits, preferably on 16, 24-28, 32 and 36 weeks of gestation. The organization

further recommends health promotion which includes nutrition counselling as an vital component. The women attending regular ANC are increased levels of information as well as markedly better attitudes and antenatal behaviour (Perumal *et al*., 2013). It is therefore important to understand health seeking behaviours during pregnancy as it is critical in ensuring effective ANC uptake.

Knowledge on how IFAS helps has also been shown to influence IFAS non-compliance. High compliance rates is credited to awareness of the importance of IFAS while poor compliance was associated with lack of knowledge of IFAS importance (Mithra *et al*., 2013). In Bangladesh a study established that women supplemented with IFAS during the course of pregnancy had improved both in health and physical strength. The women also perceived that the supplements boosted blood volume and led to nourishing the foetus and compensation of blood lost during delivery (Ahmed *et al*., 2019).

Birth order is also associated with non-compliance as seen in women who have given birth more than once who perceive that there is no necessity of taking IFAS since they have had successful pregnancies earlier (Gebremedhin *et al*., 2014). This is especially if they had not consumed IFAS in the previous pregnancy.

Side effects have traditionally been considered major obstacles to compliance, leading many to advocate for weekly instead of daily supplementation. Gastrointestinal discomfort has been the most commonly observed side effect. This is attributed mainly to high doses of iron ingested on an empty stomach. Symptoms include constipation, nausea, vomiting and diarrhoea; however, other studies have shown the side effects have a limited influence on compliance especially when it is not clear how women distinguish between side effects due to IFAS and those associated with pregnancy (Seck & Jackson, 2007).

The forgetfulness is also a factor in non-compliance (Mburu *et al*., 2020). They recommended that women be trained on setting reminders and have someone such as their spouse remind them to take IFAS so as to reduce the forgetfulness. Similarly, a study in Nepal concluded that forgetfulness was among the main challenges leading to poor compliance. Perception of support from family members through reminders however led to high compliance (Ss *et al*., 2016).

2.7.2 Health Facility Related Factors Influencing Non-Compliance to IFA

In third world countries, among the determinants of note to adherence to IFAS is access to the hospitals and availability of supplies. Conversely, inconsistent supply of iron folic acid commodities in addition to erratic distribution among pregnant women is an obstacle to adherence (Temcharoen & Imamee, 2011). A study conducted in Nyeri-Kenya informed that 54.6% of the women attending ANC failed to use iron and folic supplements. As informed by the study the utilization of the iron supplementation programme was low. The study further illustrated that women failed to take the iron supplements mainly due to insufficient supplies (Omotayo *et al*., 2018).

In many countries, ANC is where delivery of IFAS to pregnant women is done. Often, poor handling at ANC which includes giving minimal attention to nutrition, insufficient counselling and inadequate supplement supply make it hard for women to take the recommended numbers of IFAS tablets during pregnancy (Siekmans *et al*., 2019).

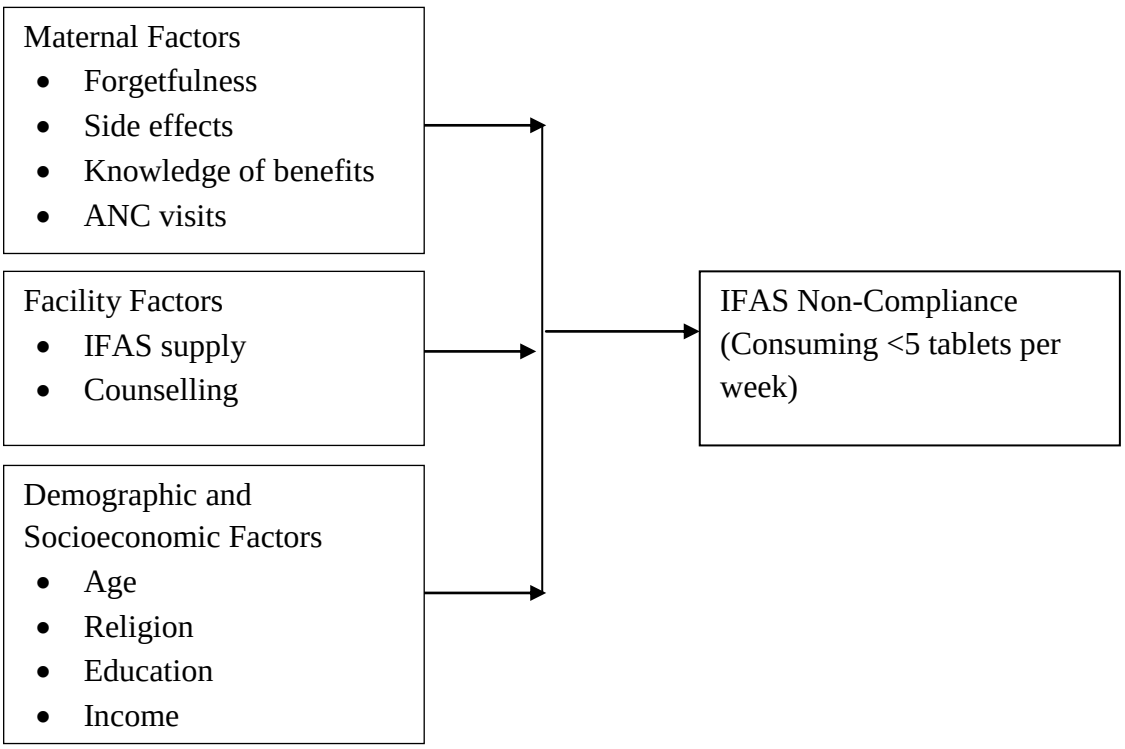
The efficiency of and success of the policy interventions on anaemia prevention in pregnancy largely depends on the compliance to iron and folic acid tablets usage. Studies have found that the major reason that the national supplementation programs have failed is non- compliance to iron and folate by pregnant women. Health system and patient factors determine adherence, and research is yet to be extensively done on these factors.

2.8 Conceptual Framework

The following conceptual framework shows the relationship between maternal factors, facility factors and socio-demographic factors as determinants of IFAS non-compliance.

Figure 1

The Conceptual Framework



Source: Adapted and modified from (Ade *et al*., 2016).

This study adopted a conceptual framework to guide the understanding of the factors that influenced IFAS non-compliance. The conceptual framework presupposed that the prevalence of IFAS non-compliance was influenced by socio-demographic and socio-economic factors such as age, religion, education and income. In addition, facility factors such as IFAS supply and counselling as well as maternal factors such as forgetfulness, side effects, Knowledge of benefits and ANC attendance were also associated with IFAS non-compliance.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methods that were used to investigate the determinants of non-compliance to iron and folic acid supplementation among pregnant women attending ANC. The chapter describes the study site, study design and data collection and explains the data collection, analysis, quality assurance management, and presentation procedures.

3.2 Research Design

The study adopted a cross-sectional study design using a mixed method approach. The design entails collection of data at one point in time and a variety of data is collected in a short duration. According to Shorten and Smith (2017), mixed methods approach is the collection and analysis of both quantitative and qualitative data within the same study. The basic premise of this methodology is that such integration permits a more complete and synergistic utilization of data than do separate quantitative and qualitative data collection and analysis (Mburu *et al*., 2020) . This approach allows researchers to explore different perspectives and relationships. It determines and reports the way things are as it attempts to study the effects of non-Compliance to Iron and folate supplementation during pregnancy.

3.3 Location of the Study

The study was conducted at six health facilities located in Nakuru north Sub County, namely Bahati sub county hospital, Dundori Health Centre, Kiwamu Health Centre, St. Anthony Health Centre, Engashura Health Centre and Kabatini Health Centre. Nakuru North is one of the eleven sub counties of Nakuru County. The sub county occupies 437sqKms and is divided into five wards namely Bahati, Kiamaina, Lanet, Dundori and

Kabatini. The six facilities are distributed within the five wards. The sub county is 5Km from Nakuru Town and neighbours Nakuru East and Subukia Sub-counties. The population of Nakuru North currently is 228,658 with a population growth rate of 2.48%. Women of reproductive age are estimated to be 61,509 (KNBS, 2019).

The sub county was selected on the basis of having the lowest IFAS coverage in Nakuru County at 57% according to the Kenya Health and Information System in the year 2019/2020. The study sites were the six high volume facilities in the sub county.

3.4 Population of the Study

3.4.1 Target Population

The target population was pregnant women attending antenatal care in level 4 and 3 facilities in Nakuru north Sub County. The study targeted pregnant women aged 18 – 49 years who had at least one prior ANC visit during the current pregnancy. It was assumed that those women would have had an encounter in ANC where they received IFAS. According to the Kenya National Bureau of standards in 2019, pregnant women in Nakuru north Sub County were estimated to be 5,854.

3.4.2 Accessible Population

The accessible population were the pregnant women attending ANC at the six high volume facilities in the sub county which currently serve approximately 1000 ANC clients per month (KHIS, 2020).

3.4.3 Inclusion Criteria

The study included pregnant women above 18 years who had attended at least one ANC and issued with IFAS during the visits.

3.4.4 Exclusion Criteria

Pregnant women who were severely sick and those below 18 years because consent by parent or guardian is required. In addition those not willing to participate in the study were excluded.

3.5 Sample Size and Sampling Procedure

3.5.1 Sample Size

The sample size was determined based on proportion of IFAS non-compliance and a level precision at 95% level of confidence using the formula by Fisher as follows:

$$n = \frac{z^2 pq}{d^2}$$

Where:

n = the desired sample size.

z = the standard normal deviate at the required confidence level.

p = the proportion in the target population estimated to have characteristics being measured = 0.327

q = 1-p (1-0.327 = 0.673)

d = the level of statistical significance set. (0.05)

$$n = \frac{196^2 * 0.327 * 0.673}{0.05^2} = 338$$

Since the total pregnant women in the study area were less than 10,000, the following correction formula was used to calculate the final sample size

$$n = \frac{n}{1+(n-1)/N(monthly\ attendance)} = \frac{338}{1+(338-1)/1000} = 253$$

An extra 10% was added to cater for any loss of information to give a sample size of 279.

10/100 * 253 = 25.3

Therefore 253 + 26 = 279

3.5.2 Sampling Procedure

Stratified sampling technique was used to distribute the sample among the six high volume facilities in the sub county proportionate to the average monthly ANC attendance using the following formula:

Participants per facility = $\frac{AMC}{N} * n$

Where:

AMC= Average monthly attendance

N = Total monthly attendance

n= Sample size

This is a method of getting representative data from a heterogeneous group in order to minimize the error of estimation (Neutens & Rubinson, 2014).

Table 2

Nakuru North Sub County Sampling Frame

Facility	Average Monthly Attendance (Amc)	Number Of Participants ($\frac{AMC}{N} * n$)
Bahati Sub County Hospital	390	109
Dundori Health Center	196	55
Engashura Health Center	157	44
Kabatini Health Center	87	24
St. Anthony Health Center	87	24
Kiwamu Heath Center	83	23
mm	1000 (N)	279

The participants from each health facility were selected using systematic random sampling. The sampling interval was: K=Sampling frame (N)/Sample size (n) = 1000/279=4. Thus, every fourth patient that met the inclusion criteria was selected minimizing selection bias. The first participant was picked randomly each day at the ANC and then every fourth woman who met the inclusion criteria until the required sample size was reached in each facility.

In order to collect qualitative data, four FGDs were conducted at Bahati sub county hospital and Dundori health centre based on health facility categories. Bahati sub county hospital was purposively selected as it was the only level 4 facility while Dundori health centre was randomly selected from among the 5 participating level 3 facilities. The participants from each of the facility were then clustered into two according to age, that is, below 30 years and above 30 years so as to avoid the younger mothers from being intimidated due to age.

For each cluster the pregnant women were consecutively recruited at the ANC and enrolled for participation in the focus group discussions on Mondays and Tuesdays which were the clinic days with the highest attendance according to the hospital records. For FGDs conducted at Bahati sub county hospital the FGD for below 30 years had 11 participants while the one for above 30 years had 9 participants. At Dundori health centre the FGD for below 30 years had 7 participants while for above 30 years had 8 participants.

Key informants were selected purposively from the MCH (a nurse and nutritionist) from the sub county hospital because they have first-hand encounters with mothers receiving IFAS. The sub county nutrition officer and sub county public health nurse also formed part of the four key informants.

3.6 Instrumentation

Quantitative data was collected using a pretested semi structured questionnaire developed with guidance from the university supervisors based on the objectives of the study. The questionnaire consisted of three parts. The first part had information on the socio-demographic characteristics of the mothers while the second part had their nutritional status in terms of MUAC measurements and HB as recorded in the Mother-Child booklets. The third part contained questions exploring IFAS intake and the factors influencing non-compliance. The questionnaire was researcher administered.

Qualitative data was collected using focus group discussions and key informant interviews. In focus group discussion, pregnant mothers who had not participated in structured questionnaire were selected. The sampled mothers participated in the FGDs using FGD guide on factors affecting compliance of iron and folate supplements. Key informants were interviewed using a key informant guide. The qualitative data was then organized, coded, and combined into similar themes in a cohesive manner.

3.6.1 Validity of the Instrument

The validation was done by having experts in the Department of Human Nutrition going through the questionnaire to assess its content, construct, criterion, and face validity. Their feedback was then used to refine the tool before using it for the actual data collection.

3.6.2 Reliability of the Instrument

To ensure reliability, a pre-test was done two weeks before the main study. The pre-test was conducted using 10% of the sample size in one of the public dispensaries-Bahati rural dispensary in Nakuru North. It involved the researcher administering the questionnaire to 28 participants who met the inclusion criteria. The purpose was to

ensure reliability of the questionnaire. Feedback from the pre-test was used to change the wording of some items of the questionnaire to make it clearer. This ensured that there were no ambiguities in the final questionnaire.

The reliability of the questionnaire was determined using Cronbach's alpha coefficient test. A correlation coefficient of 0.79 was established. Cronbach's Alpha reliability coefficient of at least 0.7 is considered acceptable (Cronbach & Shavelson, 2004)

3.7 Data Collection Procedure

On receiving the requisite approvals and authorization from Nakuru Department of Health, the researcher recruited two research assistants who were graduate interns in food nutrition and dietetics from local universities. They were informed on the nature of information to be collected and the objectives of the study. The researcher then took them through the entire questionnaire to familiarize them to its contents. They were also trained on how to administer questionnaires, data collection techniques and recording of FGDs and KIIs. They were further trained on how to obtain the secondary data from the mother-child booklets.

During field work, the researcher first visited the facility in-charges of the facilities where the study took place and informed them about the study. The researcher and research assistants then went to the maternal child health clinics (MCH) to recruit the participants. They explained to the study respondents the nature and objectives of the study after which informed consent was voluntarily obtained from the study participants by reading and signing the consent forms (Appendix 1).

The FGDs were conducted in private settings. The researcher facilitated the discussions while one of the research assistants took notes as the other observed. The key informant interviews were conducted by the researcher at an agreed time and place with each of the

identified health workers. The HB of the mothers was obtained as secondary data from the participant's mother-child booklets.

All the completed questionnaires in a particular day were checked by the researcher for completeness after which they were filed for safe custody awaiting analysis. The questionnaires were administered between March and May 2022 and covid-19 safety guidelines as prescribed by the Ministry of Health were adhered to at all times.

3.8 Data Management and Analysis

The quantitative data collected was coded, cleaned, sorted, and entered into the statistical package for social sciences (SPSS), version 21 for data analysis. Univariate analysis was done using descriptive statistics (frequencies and percentages) in order to summarize the data, and the results presented using charts, graphs and tables. Non-compliance to IFAS was assessed based on the reported number of IFAS tablets taken in the preceding week (seven days) before the interview. Pregnant women who had taken less than 70% of the expected IFAS tablets in the week preceding the interview, an equivalent of less than five tablets per week were considered non-compliant to (Sadore *et al*., 2015) (Dinga, 2013) (Lavanya *et al*., 2020).

Relationships were determined using Chi-square (at a significance level of alpha = 0.05), to ascertain the significance of association between various socio-demographic and socio-economic characteristics of the women attending ANC, their practices, nutrition status and level of compliance of IFAS. Odds ratio was conducted in order to determine the influence of the various factors on non-compliance. Significant levels were assessed at 95% level of significance.

Thematic analysis was used for qualitative data from FGDs and KIIs. The data was audio- recorded and a field diary kept for backup and to document the happenings. Audio recorded data was transcribed verbatim and translated in English. The transcripts

were typed using Microsoft word and the data used to generate codes. The codes were then arranged into similar subthemes that led to the emerging themes. After completion, both qualitative and quantitative data was compared to ensure triangulation.

3.9 Ethical Considerations

Anonymity of the participants was ensured by coding the questionnaires and ensuring no personal identifiers were used. In addition, the respondents were assured of confidentiality and that the information collected was to be used only for research purposes. Scientific and ethical approval were sought and obtained from Kabarak University Research and Ethics Committee (KUREC-030122). Research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI/P/22/15747) and authority to conduct the study obtained from Nakuru county department of health. The data collected was stored in a password protected computer.

CHAPTER FOUR

DATA ANALYSIS PRESENTATION AND DISCUSSION

4.1 Introduction

In this chapter, the study findings are presented as was derived from the study questionnaire, in the form of means, and percentages. The results on the socio-economic and socio-demographic statuses of the women, their non-compliance to IFAS intake guidelines, their practices and experiences with IFAS, the maternal and health facility factors influencing IFAS non-compliance, and the nutrition and health status of the participating pregnant women visiting ANC in Nakuru North Sub County are discussed in this chapter.

4.2 Socio-Demographic and Socio-Economic Characteristics of the Pregnant Women Attending ANC in Nakuru North Sub-County

A calculated sample size of 279 respondents was utilized for this study. A total of 258 questionnaires were well-filled (92.5%) and therefore valid for utilization in the retrieval of data for this study.

A majority (55%) of the pregnant women were aged between 20 and 29 years; while a minority (3.5%) was over forty years of age. The mean age was 27.69 (SD ± 6.0) years. Most (83.7%; n=216) were protestant Christians. Majority (88.8%) of the participating pregnant women were married, and slightly less than half (48.8%) listed secondary school as the highest level of education attained (Table 3). Less than half (41.5%) of the pregnant women were housewives, slightly more than a third (36.8%) were self-employed, and less than a quarter of the participants were employed and salaried (Table 3).

Table 3

The Socio-Demographic Characteristics of the Pregnant Women Attending ANC in Nakuru North Sub County

Socio-Demographic Characteristics			N=258	
Age			N	%
	<20 years		21	8.1
	20-29 years		142	55.0
	30-39 years		86	33.3
	>40 years		9	3.5
		Total	258	100.0
Religion				
	Protestant		216	83.7
	Catholic		42	16.3
		Total	258	100.0
Marital Status				
	Married		229	88.8
	Divorced/Separated		2	.8
	Single		27	10.5
		Total	258	100.0
Number of Children	0		65	25.2
	1		74	28.7
	2		59	22.9
	3		33	12.8
	4		21	8.1
	5		4	1.6
	7		2	.8
		Total	258	100.0
Gestation Categorized	<12 weeks		10	3.9
	12-24 weeks		69	26.7
	>25 weeks		179	69.4
		Total	258	100.0

Majority (45%) of the pregnant women earn between KES 6,000 and 10,000 per month while a minority (1.2%) of the participating pregnant women earned more than KES 51,000 per month (Table 4). At the time of the study, a cumulative majority (89.45%) of the study participants had one to three children, other than the one they were currently pregnant with. A minority (7%) of the participating pregnant women had seven other children. Most (69.4%) of the participants were over twenty-five weeks pregnant at the

time of their participation in the study. About a quarter (26.7%) of the pregnant women participating in the study were between twelve and twenty-four weeks pregnant.

Table 4

The Socio-Economic Characteristics of the Pregnant Women Attending ANC in Nakuru North Sub County

Socio-economic characteristics			N=258
Education Level	Primary	80	31.0
	Secondary	126	48.8
	College	40	15.5
	University	12	4.7
	Total	258	100.0
Occupation	Salaried	38	14.7
	Self-employed	95	36.8
	Housewife	107	41.5
	Student	8	3.1
	Others	10	3.9
	Total	258	100.0
Average Income (Ksh/month.)		N	%
	<5000	107	41.5
	6000-10000	116	45.0
	11000-20000	27	10.5
	21000-50000	5	1.9
	>51000	3	1.2
	Total	258	100.0

This data from socio-economic characteristics is emphasized by more information captured from FGDS, where participants indicated; *"Most women here are housewives. They just do household chores. We live in rented houses and we have no jobs. It is the husbands who earn money for the households. Those who are not housewives are in small business earning less than 10,000 KES per month" (Nakuru FGD, 2022).*

4.3 Prevalence of IFAS Non-Compliance Status among Pregnant Women Attending ANC in Nakuru North Sub County

One of the objectives of the study was to determine the prevalence of IFAS non-compliance among the women visiting ANC in Nakuru North Sub County. To gain data on this, the researcher asked various questions related to the intake of IFAS, compliance to the drug routines, and the reasons for non-compliance for those who were not currently taking IFAS at the time of the study. Majority (72.9%) of the study participants had taken IFAS for ≥ 5 days at the time of the study. Those that indicated taking IFAS for < 5 days and therefore not compliant were (27.1%); (Table 5). The participants who indicated that they were not taking IFAS daily were probed on their reasons for not using the micronutrient as prescribed. Adverse side effects (5%) and undesirable taste (3.9%) were listed as the most popular reasons why some of the pregnant women visiting the ANC in Nakuru North Sub County were not complying to the recommended IFAS guideline (Figure 2).

Table 5

Proportion of Women Complying with IFAS Intake in Nakuru-North Sub County

		N=258			
		Frequency	Percent	Valid Percent	Cumulative Percent
Number of days taken IFAS in previous week	0-4 days	70	27.1	27.1	27.1
	5-7 days	188	72.9	72.9	100.0
	Total	258	100.0	100.0	

The researcher asked the participants the formulation in which they were taking their IFAS. Most (85.3%) of the respondents were consuming combined iron and folate in

single tablet, and 0.8% (n=2) were taking iron and ferrous sulphate separately. The frequency of IFAS intake in the past one week of the study revealed that most of the respondents (72.9%) had taken between 5 and 7 tablets while 27.1.1% had taken less than 5 tablets. 14% were not consuming IFAS at all during the pregnancy (Table 6) All of the participants who were taking IFAS at the time of the study (86%; n=222) were getting their IFAS tablets from the health facility.

Table 6

IFAS Intake of Pregnant Women Visiting ANC in Nakuru North Sub County

IFAS intake			N=258
IFAS formulation		N	%
	Combined iron and folate	220	99.1
	Separate iron and ferrous sulphate	2	.9
	Total	222	100.0
Frequency of IFAS intake	Once per day	216	83.7
	Once per week	6	2.3
	Not taking IFAS	36	14.0
	Total	258	100.0
Tablets taken in the last one week	Zero	52	20.1
	Two	2	.8
	Three	9	3.5
	Four	7	2.7
	Five	10	3.9
	Six	9	3.5
	Seven	169	65.5
	Total	258	100.0

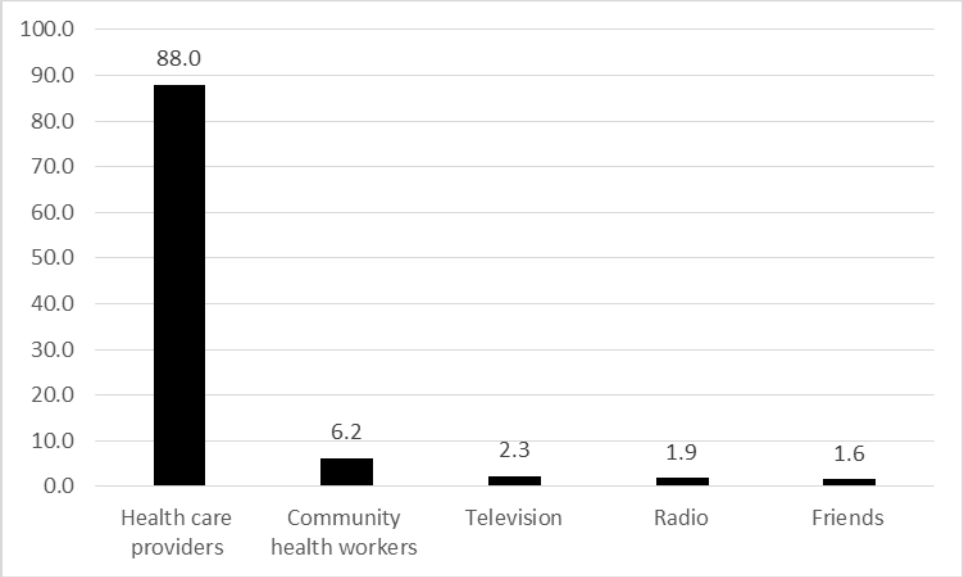
4.4 The maternal factors influencing IFAS compliance status among pregnant women attending ANC in Nakuru North Sub County

Another objective of the study was to determine the factors influencing the compliance to IFAS use for the women visiting ANC in Nakuru Sub County. As a guide to the level

of awareness on IFAS, the researcher probed the participating pregnant women on their knowledge of IFAS. A majority (96.1%; n=248) of the participants answered agreeably when asked if they have ever heard about IFAS (Table 7). Most (88%) of the participating pregnant women got their knowledge of IFAS from health care providers. Others heard about IFAS from the television and radio (n=6), community health workers (n=4), friends and other mothers (n=11) (Figure 2).

Figure 2

Source of Knowledge on IFAS for Pregnant Women in Nakuru North



The researcher also sought to know if the participants knew about the benefits of IFAS. A majority (89.1%) of the participants responded that they knew the specific benefits of taking IFAS during pregnancy (Table 7). Most, (78.7%) of the participants listed increasing blood as the most common benefits of IFAS intake. Other benefits listed by the participants included prevention of birth abnormalities (7.8%) and preventing low birth weight babies (2.7%). The health workers through KII indicated the main factors promoting the uptake of IFAS as the understanding of the benefits of IFAS as well the poor birth outcomes related to not taking IFAS.

About a third (37.6%; n=97) of the participating pregnant women first visited the Antenatal Clinic when they were over four months pregnant. However only (20.2%) of the participants went to the clinic first when they were zero to two months pregnant, and about a quarter (20.5%) first went to the clinic during their second or third month of pregnancy. For most (75.2%; n=194) of the pregnant women, this was not their first pregnancy. Majority of the respondents (84.5% (n=164) had taken IFAS during their last pregnancy while (15.5%) of the participating women did not take IFAS during their last pregnancy.

Half of the participating pregnant women who had had a previous pregnancy reported the birth weight of their infants to be between 2.8 and 3.5 kilograms (Table 7). The mean birth weight for the last infants of the participating women was 3.199 kilograms (SD: .4663). When probed on whether they have received IFAS during the pregnancy period, a majority (94.6%) of the participating pregnant women responded in the affirmative and less than a quarter (5.4%) presented that they had not received IFAS during their pregnancy.

Most (74.8%; n=193) of the women who responded affirmatively to taking IFAS during their pregnancy indicated that they would take it as prescribed by a physician. Unfavourable taste and side effects were listed as the most common factors causing the lack of adherence to the prescriptions of IFAS. This was in agreement with the KII where respondents said *"Some have stopped because they cannot tolerate it due to side effects. The mothers really don't like the taste of IFAS"* (Nakuru north KII, 2022)

Table 7

Clinical Information of Pregnant Women in Nakuru North Sub County

IFAS use Practices			N=258	
First ANC attendance			N	%
	0-2 months		52	20.2
	2-3 months		53	20.5
	3-4 months		56	21.7
	>4 months		97	37.6
		Total	258	100.0
first pregnancy	Yes		64	24.8
	No		194	75.2
		Total	258	100.0
IFAS used in the last pregnancy (for those with previous pregnancies)	Yes		164	84.5
	No		30	15.5
		Total	194	100.0
Birth weight categorized (kg)	<2.7		27	10.5
	2.8-3.5		129	50.0
	>3.5		38	14.7
	This is the first pregnancy		64	24.8
			258	100.0
		Total		
Received IFAS during pregnancy ever?	Yes		244	94.6
	No		14	5.4
		Total	258	100.0

The researcher also sought to understand the practices related to the timing of IFAS intake for the pregnant women visiting ANC in Nakuru North Sub County. A majority (75.6%; n=195) took their IFAS at bedtime, less than a quarter (16.7%; n=43) took IFAS in the morning, and the minority (2.4%; n=6) took their IFAS at lunchtime or other times (Table 8).

Less than half (41.1%) of the pregnant women participating in the study had taken IFAS for one to two months and more than a third (38.8%; n=100) had taken IFAS for three to four months in their pregnancy. Only 14.7% (n=38) had taken it for more than six months (Table 8).

The researcher then probed the participating women on the side effects (if any) they had experienced while consuming IFAS. Over half (57%) of the participating pregnant women showed that they did not deal with any side effects with the intake of IFAS supplements. Of those who experienced side effects, most (79%) listed nausea as the most common side effect. The other side effects that were commonly listed include bad taste (10%) and epigastric pain (9%). 12% of the pregnant women who took IFAS and experienced side effects stopped taking the supplement altogether; while 10.5% went back to hospital for assistance. Other approaches taken by the women experiencing symptoms were taking IFAS with meals (8.5%; n=22) or eating plenty of fruits and vegetables (0.8%; n=2).

Table 8

Practices of the Pregnant Women Visiting ANC at Nakuru North Sub County in Relation to IFAS Intake

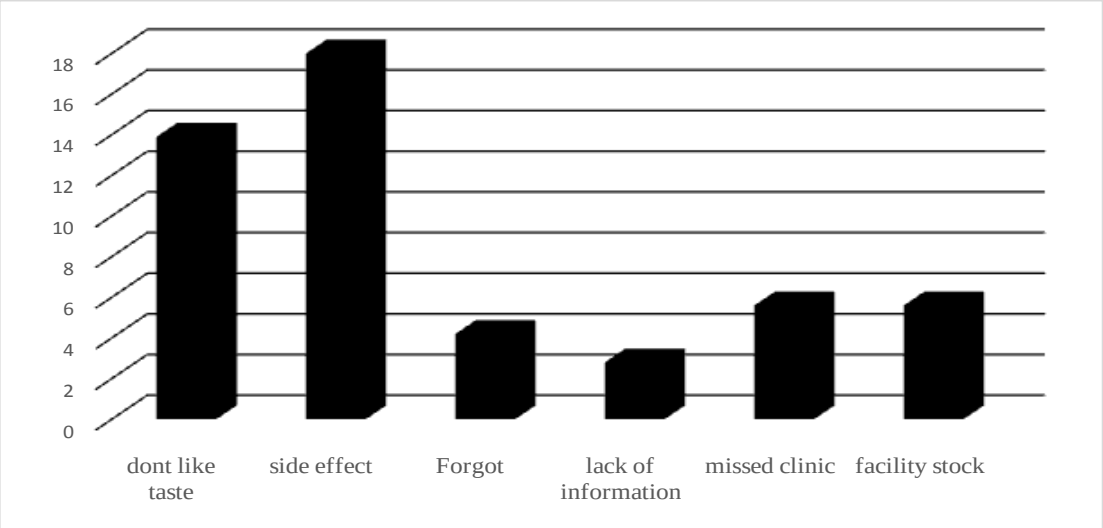
IFAS use Practices			N=258
Would take IFAS as prescribed		N	%
	Yes	193	79.1
	No	65	20.9
	Total	258	100.0
If not, why?	I don't like the taste	4	7.8
	Side effects	24	47.1
	Stock outs	8	15.7
	Forgetting	13	25.5
	Use of other alternative	2	3.9
	such as diet	51	100.0
When do you take your IFAS?	Morning	43	16.7
	Lunchtime	2	.8
	Bedtime	195	75.6
	Other	18	6.9
	Total	258	100.0
Period of IFAS intake for current pregnancy	1-2 months	120	46.5
	3-4 months	100	38.8
	>6 months	38	14.7
	Total	258	100.0
Experienced any side effects after taking IFAS?	Yes	97	37.6
	No	147	57.0
	Not taking IFAS	14	5.4

Less than half (44.2%; n=114) of the women taking IFAS indicated that they did not experience any challenges taking IFAS while (38%; n=98) stated that the side effects associated with IFAS intake were their greatest challenge. The minority (2.7%; n=7) listed stock-outs as the primary challenge, and 9.7% (n=25) stated that they had a challenge with forgetting to take their IFAS (Figure 3).

The health workers through KII indicated the main challenges to provision and compliance of IFAS as bad taste of the tablets, side effects, forgetting IFAS and lack of consistency in clinic attendance.

Figure 3

The Reasons for Not Using IFAS as Recommended for Pregnant Women Visiting ANC in Nakuru North Sub County



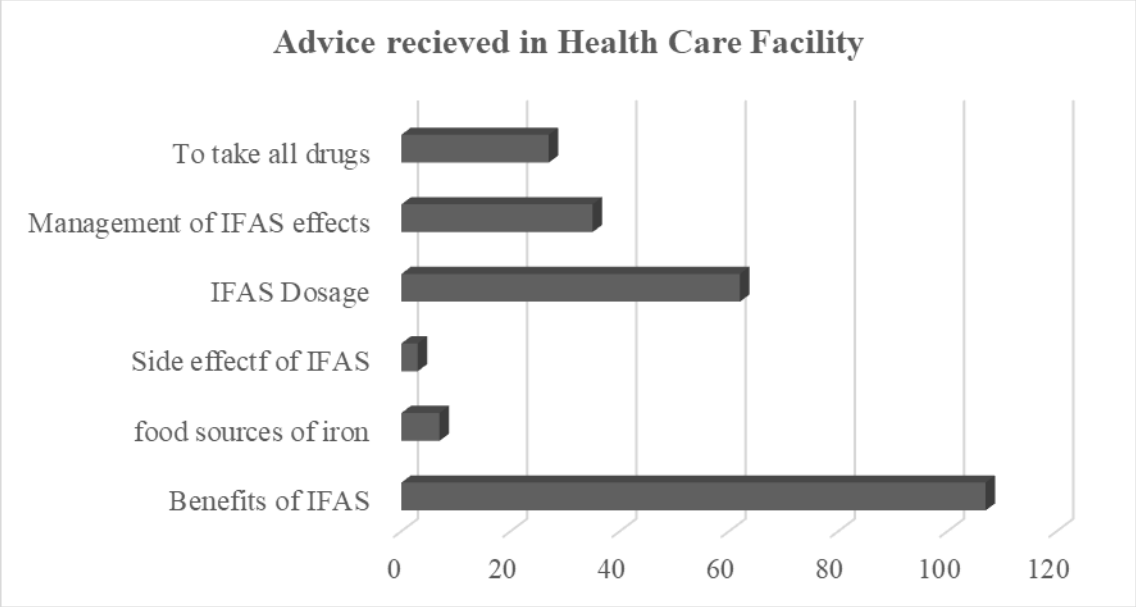
4.5 The health facility factors influencing IFAS compliance status among pregnant women attending ANC in Nakuru North Sub County

Nutrition education and counselling were also investigated as health facility factors that could influence compliance to IFAS intake. Slightly more than half (51.9%; n=134) of the participants had received nutrition education and counselling (Table 4.6). A majority (93.4%) of the participants stated that they received advice when receiving their tablets.

The forms of advice reported by the participants included benefits of IFAS (41.5%), the correct dosage of IFAS (24%), and the management of the side effects of IFAS intake should they experience any (13.6%). Other reported forms of advice included the intake of other drugs, the food sources of iron and the side effects of IFAS (Figure 4). From the KII a respondent said *"I counsel them on importance of taking IFAS; I also counsel them on how to manage side effects"* (Nakuru north KII, 2022).

Figure 4

The Type of Advice Pregnant Women Taking IFAS Received



More than half (65.1%) of the participating pregnant women provided that they had received information about the benefits of IFAS at a healthcare facility. Less than a third (31.8%) of the participants indicated that they did not get informed on the benefits of IFAS at the facility (Table 9). Further, a majority (86.8%) of the participants stated that they have always received IFAS tablets from a clinic.

Table 9

Health Facility Factors Influencing Pregnant Women's Approach to IFAS

Health Facility Factors		N=258	
Did you receive information on IFAS Benefits at health facility?		n	%
	Yes	168	65.1
	No	90	34.9
	Total	258	100.0
Do you always receive IFAS tablets from clinic?	Yes	224	86.8
	No	34	13.2
	Total	258	100.0

The maternal factors influencing IFAS compliance status as captured by FGDs are; "*Most pregnant mothers start attending ANC after 4th month. Some it is because they did not know they are pregnant due to previous irregular menses" (Nakuru FGD, 2022). "We had a challenge in taking the IFAS consistently in the previous pregnancies, but this current one we are okay" (Nakuru FGD, 2022). "I am currently not using IFAS as even in the last pregnancy I did not use them" (Nakuru FGD, 2022).*

Similarly, the health facility factors influencing IFAS compliance status as captured by FGDs are; "*the tablets are there in the hospital" (Nakuru FGD, 2022). "We know that IFAS help to increase blood. We got information about using IFAS from health people. They taught us the benefits and how to manage side effects" (Nakuru FGD, 2022). "For me, I don't know the importance of IFAS; they were just prescribed to me by the clinic Doctor" (Nakuru FGD, 2022).*

As part of the investigation on the challenges experienced, the researcher sought to find out the factors that would assist in ensuring all the pregnant women take IFAS. A

majority (79.5%) of the participants stated that intensified nutrition education on IFAS would work to ensure more people access and adhere to their IFAS supplement intake. Other efforts suggested as useful in ensuring that all pregnant women take IFAS included ensuring that IFAS is available at all times (11.2%; n=29), multiple IFAS channels (3.1%; n=8) and peer support (6.2%; n=16) as shown on Table 10 below.

Table 10

Efforts to Ensure That All Pregnant Women Take IFAS

	Frequency	Percent	Valid Percent	Cumulative Percent
Intensified nutrition education on IFAS	205	79.5	79.5	79.5
Multiple IFAS channels	8	3.1	3.1	82.6
Ensuring there are no stock-outs	29	11.2	11.2	93.8
Peer support	16	6.2	6.2	100.0
Total	258	100.0	100.0	

Information from FGDs and KII is in agreement with these findings from individual respondents; "*Most of us don't take IFAS because of side effects while others it is taste. The side effect and taste makes me not to take the tablets daily. The feeling of nausea is mainly what most women complain about. But the first time one takes them, there could be diarrhoea" (Nakuru FGD, 2022). "Most complain of abdominal discomfort" (Nakuru north KII, 2022).*

4.6 To Establish the Haemoglobin (HB) Levels of Pregnant Women Attending ANC in Nakuru North Sub County

To investigate the nutritional and health status of the pregnant women visiting ANC in Nakuru Sub County, the researcher sought to know the specific HB levels of the pregnant women in relation to IFAS intake. The HB levels of most (90.7%) of the participants were between 11.0 and 15.0g/dl (Table 11). Relating to the nutritional status of the pregnant women participating in the study, the researcher used the Mid-Upper Arm Circumference measurements. A majority (97.3%; n=251) of the pregnant women were within the range of twenty-one centimetres and above, which is indicative of normal nutritional status (Table 10). The mean MUAC measurement was 27.495 (SD: 3.6695) and the mean HB levels was 12.812 (SD: 1.4530).

Table 11

Haemoglobin (Hb) levels and Nutrition Status of Pregnant Women Attending ANC in Nakuru North Sub County

Nutritional Status of Pregnant women attending ANC			N=258
		N	%
Haemoglobin (HB) Levels categorized	<11.0g/dl	11	4.3
	11.0-15.0g/dl	234	90.7
	>15.0g/dl	13	5.0
	Total	258	100.0
MUAC categorized	Underweight (<21cm)	7	2.7
	Normal (>21cm)	251	97.3
	Total	258	100.0

MUAC=Mid Upper Arm Circumference

From FGDs a participant indicated that; "*The doctor assesses the blood levels. I was informed that I don't have enough blood and my child may have some problems" (Nakuru FGD, 2022).*

4.7 The association between demographic and socioeconomic characteristics, Haemoglobin levels and IFAS compliance status of pregnant women attending ANC in Nakuru North Sub County

The study findings were that there was a significant relationship between the length of gestation and the status of IFAS compliance among pregnant women attending ANC in Nakuru Sub County Hospital (χ^2= 4.796, P value= 0.187) (Table 12). As the gestation period increased, the compliance to IFAS supplementation increased. These findings present that at the .05 level of significance there is a strong positive association between the length of gestation and the pregnant women's adherence to IFAS supplementation dosages. There was a significant relationship (χ2= 9.998, P value= 0.040) between knowledge on benefit of IFAS and IFAS compliance status. These findings directed that the mothers' knowledge influences their uptake of IFAS (Table 12).

The study established that there was no significant relationship (χ^2= 4.796, P value= 0.118) between education level and IFAS compliance status. Additionally, there was no significant relationship (χ^2= 9.98, P value= 0.140) between income and IFAS compliance status (Table 12). Therefore, the education level and income of the pregnant women participating in the study did not influence their intake of IFAS supplements or their compliance to the supplementation. The study also noted no significant relationship between IFAS compliance status and age, religion, marital status, occupation and number of children (P>0.05).

The study found that there was a significant relationship (χ^2= 59.791, P value= 0.0271) between IFAS compliance status and haemoglobin (HB) levels. Those who complied with IFAS supplementation had better haemoglobin levels (Table 12).

Table 12

The Association between Demographic and Socioeconomic Characteristics, Haemoglobin Levels and IFAS Compliance Status

	Variables	Chi Square test	P value
IFAS compliance status	Length of gestation	10.732	0.045**
	Knowledge on benefit of IFAS	1.24	0.036**
	Education level	4.796	0.118
	Income	9.998	0.140
	Age	8.432	0.152
	Religion	7.564	0.063
	Marital status	12.856	0.273
	Occupation	7.264	0.087
	Number of children	5.731	0.367
	Haemoglobin (HB) levels	59.791	0.0271**

P Value $\leq$ 0.05

IFAS= Iron and Folic Acid Supplement.

4.8 Association between IFAS compliance status and some selected variables

The respondents advanced in their gestation were 1.28 times more likely to comply with IFAS than those in early gestation. The respondents with knowledge on IFAS were 1.31 times more likely to comply with IFAS than those without while those without side effects due to intake of IFAS were 1.47 times more likely to comply to IFAS than those with side effects. The participants who initiated their ANC visits early were 1.33 times more likely to comply with IFAS than those who did not. Constant supply of IFAS stocks at the health facility was 1.24 times more likely to increase compliance to IFAS than others. In addition, those who complied with IFAS were 1.53 times more likely to have a normal haemoglobin level than those who did not (Table 13).

Table 13

Association between IFAS Compliance Status and Some Selected Variables

Variable	OR	P value
Length of gestation	1.28	<0.001
Knowledge about the benefits of IFAS	1.31	<0.001
Side effects of IFAS uptake	1.47	<0.001
Timely ANC visits	1.33	<0.001
Facility stocks of IFAS	1.24	<0.001
Haemoglobin levels	1.53	<0.001

OR – Odds Ratio

IFAS – Iron and Folic Acid Supplements

ANC – Ante Natal Care

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter includes a summary of the study findings and conclusions based on key findings. Recommendations aimed at improving IFAS compliance are also presented as well as areas for further research.

5.2 Summary

In this section, a deeper discussion of the findings from the completed study is presented. The implications of the findings in terms of the relationships between variables, and their reference to the study objectives are discussed.

5.2.1 Socioeconomic and Socio-Demographic Attributes of Women Visiting ANC in Nakuru North Sub-County

The results of this study indicated that the mean age of the women visiting ANC in Nakuru Sub-County for iron and folic acid supplementation was 27 (±6.0) years. The results of the study further indicate that most of the women were 28 weeks pregnant at the time of the study. These findings lead the researcher to infer that most women visiting hospitals in Nakuru Sub-County for supplementation with IFAS are in their second trimester, and are young adults.

These findings are in line with those of a study that established that most of the pregnant women who suffer from iron deficiency anaemia and thus require supplementation are often middle aged in their second or third trimesters of pregnancy (Benedicto, 2020). A study investigating the prevalence of Iron-Deficiency Anaemia (IDA) also found that the first and second trimesters are the period when pregnant women are most predisposed to iron deficiency in Kenya (Kamau *et al*., 2018). In a study investigating the economic,

social, and demographic factors that may influence iron supplementation and compliance to the supplementation, found that factors such poverty and no access to crucial information are among the reasons for low compliance to IFAS supplementation among pregnant women (Mbule *et al*., 2013). In addition, the current study found that there was no significant relationship between the pregnant women's level of education and their incomes and their compliance to IFAS supplementation while visiting ANC in Nakuru North Sub County. These findings by the current study are supported by a research that also found that the level of education, age, level of income and marital status are not significantly associated with IFAS compliance (Dinga, 2013).

5.2.2 Prevalence of IFAS Non-Compliance Status among Pregnant Women Attending ANC in Nakuru North Sub County

An analysis of the prevalence of IFAS compliance among pregnant women attending antenatal clinic in Nakuru North Sub-County found compliance of IFAS to be high at 72.9%; while non-compliance was 27.1%. The researcher probed on the reasons for not taking IFAS for those who were not taking IFAS as recommended. Some of the reasons listed were, the undesirable taste, the negative side effects, ignorance, forgetting or an absence of IFAS in the facilities visited. The majority of those taking IFAS were taking the combined Iron and folate tablet; but some could not remember how often they took the tablets in a week. All the pregnant women taking the IFAS indicated that they sourced it from a health care facility.

The findings relating to the prevalence of IFAS intake, the formulation of the supplement, frequency of use and reasons for not taking are all in tandem with the findings among pregnant women that established that a poor quality or formulation of the IFAS supplement could inform low prevalence of compliance among pregnant women

(Siekmans *et al*., 2019). Additionally, the side effects and unavailability were also factors influencing the low prevalence of compliance to IFAS supplementation among pregnant women (Siekmans *et al*., 2019) . This was also in agreement with the findings from this study's' FGDs and KII.

The collective findings from this and other studies indicate that ultimately, a creation of awareness on IFAS supplementation and its importance is not enough to promote compliance of IFAS uptake among pregnant women. Even with the existence of suitable policies on IFAS distribution in health care centres, the prevention of anaemia is directly linked to the compliance of the pregnant women to the stipulated stages of intake and the dosage. Non-compliance to IFAS supplementation in Kenya is the leading cause of the failure of these programs, and a crucial contributor to the high prevalence and incidence of IDA among pregnant women in Kenya.

5.2.3 The Maternal Factors Influencing IFAS Compliance Status among Pregnant Women Attending ANC in Nakuru North Sub County

The study showed that pregnant women visit health care facilities for antenatal clinic care anytime from the first month of pregnancy. However, most women reported that they visited the health facility for the first time in their fourth month of pregnancy, which means that they come in after the end of the first trimester. Relating to the practice of IFAS intake, a majority of the participating pregnant women reported that they take their supplement at bedtime. Most had taken IFAS for their current pregnancy for up to five months at the time of the study.

The combined findings of the practices of the pregnant women attending ANC in Nakuru North Sub-County informed a clear channel of understanding on how and when the participants took their IFAS supplements. These findings are similar to a study that

established that a majority of women visited healthcare facilities for their antenatal care towards the end of their first trimester (Nisar & Dibley, 2014) even though a research showed that pregnant women attending ANC tend to be more informed and compliant with their IFAS supplementation uptake than those who do not, or those who delay their onset of seeking ANC are (Perumal *et al*., 2013).

The practices of pregnant women in relating to ANC and IFAS supplementation directly influence their compliance to IFAS uptake. For instance, if a pregnant woman does not go to the ANC at all during their pregnancy, they may never learn about IDA, folic acid or the supplementations of iron and IFAS; and their compliance to the same will be low. The contribution of the World Health Organization in the global context is that pregnant women should have at least four ANC visits in the continuum of their pregnancy, distributed through the sixteenth week, the twenty sixth week, the thirty second week and the thirty sixth week. These visits recommended by the WHO provide a reference point for the practices reported in the study, which shows a great deviation in the actual practices of the pregnant women visiting ANC in Nakuru North Sub County.

Side effects were investigated as one of the parameters to determine the experiences of the women visiting ANC in Nakuru North Sub-County with IFAS supplementation access and use. Most of the participants indicated that they did not experience any side effects with their intake of IFAS. Nausea was listed as the most common side effect experienced by those taking IFAS. To deal with the side effects, various approaches were reported; the most common being seeking medical advice, taking the IFAS with meals, taking plenty fruits and vegetables, and stopping the intake of IFAS altogether. The side effects of IFAS intake, forgetting to take the tablets, and stock-outs in health facilities were recorded as the most common challenges relating to IFAS intake adherence in the

completed study. When asked what efforts would work to ensure all pregnant women took IFAS and adhered to it, the participating pregnant women listed the promotion of the importance of IFAS intake through intensified nutrition education on IFAS as the most plausible approach. Other strategies identified through KII included having IEC materials, use of mass media, use of CHVs to make follow ups and having mother to mother support groups.

In a study investigating the uptake of ANC services by pregnant women in Mandera County, found that only sixty Percent of the mothers attended their clinics as scheduled after their first visit (Adow *et al*., 2020). The researchers attributed this to the experiences the pregnant women had while at the health care facility for their ANC. Some of the experiences reported in that study as the causes for poor uptake of the ANC services were pregnancy complications that required bed rest, gravida and parity, the distance of the health care facilities, and discouragements from an absence of important maternal information when they visited the health care facilities. These findings support those of the current study that pregnant women will fail to comply with recommended IFAS intake due to unfavourable experiences they may have in healthcare facilities as reported during an FGD. A similar study established that a majority of pregnant women did not go back to a health facility for their ANC after their first visit due to the poor form of information they received from healthcare professionals (Catherine & Bscn, 2019).

In tandem with these collective study findings, the study participants through the FGDs and KII cited improved maternal and nutritional information from healthcare professionals as the most plausible effort in helping to improve the compliance to IFAS supplementation.

5.2.4 The Health Facility Factors Influencing IFAS Compliance Status among Pregnant Women Attending ANC in Nakuru North Sub County

Various factors influence the adherence to any medication or supplementation, depending on those taking the supplements, and the institutions they are affiliated with. These were among the parameters investigated by the researcher in the study. Most of the participating pregnant women had known about IFAS supplementation prior to the study from health care providers. Thus, these findings indicate that the bulk of the knowledge on IFAS is availed to mothers in the health care setting. As such, these are some of the healthcare facility factors that may influence the adherence to IFAS supplementation; as the mothers need to be educated on the importance of folic acid and iron in the gestation period, and why it is supplemented from the healthcare facility. A majority of the mothers indicated that the benefits of IFAS that was most critical related to the increasing the quantity of blood; while a few presented some benefits to be prevention of birth abnormalities and low birth weight.

Nutrition education and counselling was also another healthcare facility factor that was investigated. About half of the participants indicated that they had received nutrition information and counselling and given some advice relating to the use, dosage and side effects while they were getting the IFAS tablets given to them. The findings of the study in relation to the health facility factors influencing IFAS compliance are similar to a study on the trends of ANC utilization by pregnant women in Rwanda (Rurangirwa *et al*., 2017). Their study found that inaccessible health care facilities were the primary reason most of the pregnant women did not make the recommended four ANC visits during their pregnancy. The findings further supported that they did not continue their visits when they realized that they were being given IFAS supplements with no instructions on usage, importance or possible side effects (Perumal *et al*., 2013).

5.2.5 The Nutrition Status and Haemoglobin Levels of the Pregnant Women Attending ANC in Nakuru North Sub County

IFAS supplementation will directly influence the haemoglobin levels of the mothers taking it. For this reason, the researcher utilized this parameter as a way to understand the influence of adherence to IFAS intake by pregnant women visiting the health departments within Nakuru North Sub County. A majority of the pregnant women participating in the study had Hb levels that were within the normal range; and had a normal BMI, which was indicative of proper nutritional practices during their gestation. These findings may be attributed to the compliance to IFAS supplementation.

The promotion of good maternal nutrition during pregnancy is similarly noted as one of the factors that directly influence the haemoglobin levels and nutrition status of pregnant women in Kenya (Ndagire *et al*., 2015). Since a majority of the pregnant women who visit ANC in Kenya are immediately expected to take IFAS supplements, the normal Hb levels reported by the participants in the study may be explained in this way. An indication of normal nutritional status and normal haemoglobin levels in the participants shows that even with the challenges in compliance with IFAS uptake, the participating pregnant women who attend ANC in Nakuru North Sub County are able to maintain their health statuses within the recommended thresholds.

5.2.6 The Association between Demographic and Socioeconomic Characteristics, Haemoglobin Levels and IFAS Compliance Status of Pregnant Women Attending ANC in Nakuru North Sub County

The study established that there was no significant association between the income and education level of the participating pregnant women and their compliance to IFAS. These findings support that the pregnant women who participated in the study would be compliant or fail to be compliant whether they earned highly, or had a high level of education or not. However, the study found that there was a significant relationship

between the knowledge of the benefits of IFAS and IFAS compliance status of pregnant women.

In similar findings, established that the adherence to IFAS supplementation among pregnant women in Sub-Saharan Africa is not influenced by their income levels or levels of education (Fite *et al*., 2021). However, in contrast to these findings, of a research in Kiambu found that the education level of pregnant women did influence their compliance to IFAS in Kiambu County, Kenya (Kamau *et al*., 2018). These contrasting findings provide a possible limitation, that the findings of the current study relating to the relationships between some demographic factors and compliance to IFAS uptake may not be reproduced as a true picture of other areas across Kenya.

The current study established that, pregnant women who were compliant with IFAS supplementation guidelines during the period of the study included those with low incomes and education level. Further, some of the participants were not compliant despite being highly educated, or earning high income. Informed by these findings, the hypothesis stating that there is no significant relationship between the income and education levels of the pregnant women attending ANC in Nakuru North Sub County and their IFAS compliance status was accepted.

A majority of the mothers who participated in the completed study were in their second trimester of their gestation. Thus, these findings indicated that they were either in their fourth, fifth or sixth month of pregnancy. Most of those who had attended ANC first visited a health care facility in their second trimester. The study established that there was a strong and significant association between the pregnant women's gestational stage, and their IFAS compliance status.

Findings of a research in Kiambu are in line with those of the study on this association (Kamau *et al*., 2018). It is likely that as the pregnancy progresses, the women tend to comply more to efforts employed to ensure safe and healthy deliveries, which may directly influence their adherence to set IFAS intake schedules. Additionally, in a study investigating pregnant women's adherence to iron and folate supplementation in Ethiopia, found that as the women progress with their pregnancy, their adherence to IFAS supplementation increases (Nisar & Dibley, 2014). These specific study findings support those of the current study that the gestation length will directly influence the compliance status of pregnant women on IFAS uptake. However, research posed that even though the prevalence of anaemia among pregnant women may be low, their level of gestation also contributes to their decreasing IFAS compliance statuses (Adow et al., 2020). In this case, the findings of this research by Adow are in conflict with those of the current study and others (Kamau *et al*., 2018) (Nisar & Dibley, 2014).

5.2.7 The Associations between HB levels, Nutrition Status and IFAS compliance Status of Pregnant Women visiting ANC in Nakuru North Sub County

As the IFAS compliance improves, the expectations of the intervention are that the HB and nutrition status of the recipient will improve. The current study established that there was a significant relationship between the nutrition status of the pregnant women attending ANC and their haemoglobin levels. Therefore, the inference of the researcher is that even with normal nutritional status based on their anthropometrics, the pregnant women may have abnormal or undesirable HB levels. However, the study established that there was a significant relationship between the IFAS compliance status of the pregnant women and their HB levels. These findings revealed that the pregnant women who attended their ANC visits faithfully and complied with their IFAS supplementation had better HB levels.

These findings are supported by a research that found that the adherence to IFAS supplementation among pregnant women visiting ANC in Thika Hospital led to better HB levels, supporting that there was a significant relationship between the two (Dinga, 2013). Similarly, a research among pregnant women visiting ANC clinics in Kiambu County reported that for pregnant women with high IFAS compliance, their HB levels were higher than those of pregnant women whose IFAS compliance status was low (Kamau *et al*., 2018). These collective findings demonstrated that high IFAS compliance among pregnant women visiting ANC in Nakuru North Sub County is among the factors that directly contributed to the reported normal HB levels.

5.2.8 Summary of the Findings

The study aimed at investigating the determinants of non-compliance to iron and folic acid supplementation among pregnant women attending antenatal clinic in Nakuru county-Kenya. Both qualitative and quantitative data forms were collected, analysed and utilized to make relevant conclusions and inferences relating to these factors for pregnant women in Nakuru County. The demographic, social and economic attributes of the pregnant women visiting ANC in Nakuru County were investigated and reported in this study. Further, the prevalence of IFAS non-compliance among the pregnant women visiting ANC in Nakuru County and the maternal and facility factors affecting this compliance were also established and discussed. Additionally, the study established the nutrition status and haemoglobin levels of the pregnant women visiting ANC in Nakuru County, and the relationships between the demographic and socioeconomic characteristics, HB levels and IFAS compliance status of pregnant women attending ANC in Nakuru North Sub County.

5.3 Conclusions

With the inferences made from the results of data analysis, and the responses provided by the participating pregnant women visiting ANC in Nakuru County, and an application of the study objectives the researcher concluded that majority of the women visiting ANC in Nakuru County were married, young adults, with zero to three other children, and were in their second trimester at the time of the study.

The study also concluded that the prevalence of IFAS non-compliance among pregnant women visiting ANC in Nakuru County was relatively low as a majority of the women reported having taken IFAS in their previous pregnancy, and were also currently taking IFAS supplementation during their current pregnancy at the time of the study.

Another conclusion was that the reported maternal factors influencing IFAS non-compliance status of pregnant women included side effects of IFAS uptake, late ANC visits and forgetfulness to consume IFAS daily.

Other conclusions were that the reported facility factors influencing IFAS non-compliance status of pregnant women included the inadequate information on IFAS provided to the visiting pregnant women and the facility stocks of IFAS. The haemoglobin levels of the pregnant women visiting ANC in Nakuru Sub County was reported to be normal, which was attributed to the relatively high IFAS compliance status of the pregnant women.

Finally the study concluded that there was a significant relationship between length of gestation and knowledge on the benefits of IFAS and the IFAS compliance status of the pregnant women; but no significant relationship was found to exist between their IFAS compliance status and their level of education or income as well as that there was a

significant relationship between the IFAS compliance status of the pregnant women and their haemoglobin levels.

5.4 Recommendations

5.4.1 Recommendations for Practice

i. The researcher recommends a review at national level of the advice given to pregnant mothers visiting ANC to ensure that it is up-to-date, comprehensive and impactful in influencing positive IFAS compliance statuses of the women.

ii. The researcher further recommends that efforts be developed at County level in Nakuru to capacity build health workers to be able to forecast IFAS requirements and avoid stock outs.

5.4.2 Recommendation for Further Research

The researcher recommends that subsequent studies are conducted to establish the impact of IFAS supplementation in reducing IDA prevalence among pregnant women in Kenya.

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APPENDICES

Appendix I: Consent Form

Hi. I am Jacinta Wambugu, a Master of Science Student in Human Nutrition & Dietetics at Kabarak University. I wish to conduct a study titled "**Determinants Of Non-Compliance To Iron And Folic Acid Supplementation Among Pregnant Women Attending Antenatal Clinic In Nakuru County-Kenya".**

I am going to give you information and invite you to be part of this research. Your decision to participate is purely voluntary. If you choose not to participate all the services you receive at this Centre will continue and nothing will change. Before you decide, you can talk to anyone you feel comfortable with about the research. There may be some words that you do not understand, you can ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask me or write directly to Kabarak University ethical review committee through the addresses I have provided at the end.

Study Procedures

This research will involve an interview, focus group discussion and Key Informant Interview. We are asking you to help us learn more about iron and folic acid supplementation in your community in terms of intake, practices and services provided by the health facility.

Benefits and Compensation

There will be no direct benefit to you, but your participation is likely to help us find out more about how to improve compliance to iron and folic acid supplementation. There may not be any direct benefit to the society at this stage of the research, but the community is likely to benefit from the findings.

Risks and Discomforts

We do not anticipate any serious risks or discomfort to you during this study. However you may become embarrassed, worried or anxious when answering some of the questions as they are of personal nature. Participation in this study will require you to commit your time.

Confidentiality and Privacy

With this research, something out of the ordinary is being done in your community. It is possible that if others in the community are aware that you are participating, they may ask you questions. We will not be sharing the identity of those participating in the research.

The information that we collect from this research project will be kept confidential. Information about you that will be collected during the research will be put away and no-one but the researchers will be able to see it. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will put that information under lock and key.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant_____

Signature of Participant _____

Date _____

If you wish to ask questions later, you may contact any of the following:

Jacinta Wambugu.
Kabarak University
Ethical Review Committee.
0721548981 OR Email kurec@kabarak.ac.ke.
wjacinta@kabarak.ac.ke
Contact Address: Box 20157 Nakuru

Kiambatisho I: Fomu ya idhini

Jambo, mimi ni Jacinta Wambugu, mwanafunzi wa shahada ya uzamili ya sayansi katika lishe ya binadamu katika chuo kikuu cha Kabarak. Ningependa kufanya utafiti unaoitwa **"Vizuizi Vya Kutofuata Utumizi Wa Nyongeza Za Ifa Miongoni Mwa Wanawake Wajawazito Wanaohudhuria Kliniki Katika Kaunti Ya Nakuru-Kenya".**

Nitakupa habari na kukualika kuwa sehemu ya utafiti huu. Uamuzi wako wa kushiriki ni wa hiari tu. Ukiamua kutoshiriki, huduma zote unazopokea katika kituo hiki cha afya zitaendelea na hakuna kitakachobadilika kamwe. Kabla ya kuamua, unaweza kuzungumza na mtu yeyote unayejiskia huru naye kuhusu huu utafiti. Huenda kuna baadhi ya maneno huelewi, unaweza kuniuliza nisitishe tunapopitia habari na nitachukua muda kukuelezea. Iwapo una maswali baadaye, unaweza niuliza au kuandika moja kwa moja kwa kamati ya ukaguzi wa maadili ya chuo kikuu cha Kabarak kupitia kwa anwani ambayo nimetoa mwishoni.

Taratibu za utafiti

Utafiti huu utahusisha mahojiano, majadiliano ya vikundi na usaili muhimu wa watoa taarifa. Tunakuomba utusaidie kujua zaidi kuhusu nyongeza za IFA katika jamii yako kuhusu ulaji, desturi na huduma zinazotolewa kwenye kituo cha afya.

Faida na Fidia

Hakutakuwa na manufaa ya moja kwa moja kwako, lakini ushiriki wako unaweza kutusaidia kupata maelezo zaidi kuhusu jinsi ya kuboresha utiifu wa kutumia nyongeza ya IFA. Huenda kusiwe na manufaa yoyote ya moja kwa moja kwa jamii katika hatua hii ya utafiti, lakini huenda jamii ikanufaika kutokana na matokeo ya utafiti.

Hatari na Usumbufu

Hatutarajii hatari zozote mbaya au usumbufu kwako wakati wa utafiti huu. Hata hivyo, unawezakuwa na aibu au wasiwasi unapojibu baadhi ya maswali kwa vile ni ya kibinafsi, Kushiriki katika utafiti huu kutahitaji kujitolea muda wako.

Usiri na Faragha

Kwa utafiti huu, jambo lisilo la kawaida linafanywa katika jamii yako. Inawezekana kwamba ikiwa wengine katika jamii wanafahamu kwamba unashiriki, wanaweza kukuuliza maswali. Hatutashiriki utambulisho wa wale wanaoshiriki katika utafiti.

Taarifa tunazokusanya kutoka kwa mradi huu wa utafiti zitawekwa siri. Taarifa zinazokuhusu zitakapokusanywa wakati wa utafiti zitawekwa kando na hakuna mtu isipokuwa watafiti wataweza kuziona. Taarifa yoyote kukuhusu itakuwa na nambari badala ya jina lako. Watafiti peke ndiyo watajua nambari yako ni ipi na tutaweka maelezo hayo chini ya kufuli na ufunguo.

Nimesoma habari inayotangulia, au imesomwa kwaangu, Nimepata fursa yukuuliza maswali kuhusu huu utafiti na maswali yoyote ambayo nimeuliza yamejibiwa kwa kuridhika kwangu. Nimekubali kwa hiari yangu kushiriki katika utafiti huu,

Chapisha jina la mshiriki_____
Saini ya mshiriki_____
Tarehe_____

Ikiwa ungependa kuuliza maswali baadaye, unaweza kuwasiliana na yeyote kati ya wafuatao:

Jacinta Wambugu.
Kamati ya ukaguzi wa maadili ya Chuo kikuu cha Kabarak
0721548981 AMA
Barua pepe kurec@kabarak.ac.ke.
wjacinta@kabarak.ac.ke
Anwani: Box 20157 Nakuru

Appendix II: Research Instruments

Questionnaire

This study aims at investigating non-compliance to iron and folic acid supplementation. The researcher is seeking your assistance in filling of this questionnaire. Kindly fill in the spaces provided or tick where necessary. Take note that the information given will only be used for the purpose of this research.

Questionnaire number: Date filled: Researcher Assistant:

Section I: Social Demographic and Socio- Economic Characteristics of women attending ANC:

1. Mother's age_____ D.O.B :(DD/MM/YR)

2. Residence: Location _____ Village _____

3. Religion:

1. □ Protestant Christian 2. Catholic Christian 3. □ Muslim 5. □Others

4. Marital status:

1. □ Married 2. □ Divorced/separated 3. □ Single 4. □ Widowed

5. Education level:

1. □ Primary 2. □ Secondary 3□. College 4. □University 5. □ None

6. Occupation:

1. □Salaried 2. □ Self-employed 3. □ Housewife 4. □ Student 5. □ Others

7. Average income per month in Kenya shillings

1. □ <5,000 2. □6,000-10,000 3. □ 11,000-20,000

4. □21,000- 50,000 5. □ >51,000

8. Number of children _____

10. Gestation in weeks (as per ANC card) _____

Proportion of Women of women taking IFAS:

11. Are you currently taking IFAS?

☐Yes 2. ☐ No

12. If no, indicate why

☐Didn't want to take them

☐Lack of information

☐Lack of IFAS

☐Experienced side effects

☐Others (specify)…….

13. Which combination/formulation are you taking?

☐Combined iron & folic acid

☐Separate iron/ferrous sulphate tablets and folic acid tablets

☐Syrup

14. How often do you take IFAS in a day?

☐Can't recall ☐Once per week

☐2-4 times per day ☐Don't Know

☐Once daily

15. How many tablets have you taken in the past week (7days)? _____

16. What is your source of IFAS?

☐Public health facility ☐Pharmacy

☐Private facility ☐Others (specify)……

Practices of women attending ANC towards IFAS Uptake:

17. When did you first attend ANC in this pregnancy?

☐ 0-2 Months 2. ☐ 2-3Months 3. ☐ 3-4Months 4. ☐Above 4months

18. Is this your first pregnancy?

1. ☐ Yes 2. ☐ No

If multigravida,

19. Did you take IFA during your last pregnancy?

1. ☐ Yes 2. ☐ No

20. What was the birthweight of the baby you delivered? _____

21. Have you ever received IFAS during this pregnancy?

1. Yes ☐ 3. No ☐

22. If you are taking IFA tablets, do you take them as prescribed?

1. Yes ☐ 3. No ☐

23. If no, what is the reason?

1. I don't like the taste ☐ 2. Side effect ☐ 3. Stock outs ☐ 4.I use other alternatives

e.g., diet☐ (Specify any side effects) ……

24. When do you usually take your IFA tablets?

1. ☐ Morning 2☐.lunch time 3. ☐ Bedtime 4. ☐Other

(specify)……

25. For how long have you been taking IFAS in this pregnancy?

1☐.1-2 months 2. ☐3-4 months 3. ☐ Other

(specify)……

26. Have you ever experienced any side effects after taking IFAS?

1.☐Yes 2. ☐ No

27. If yes, which side effects did you experience? (Multiple responses accepted).

1. ☐Nausea 2. ☐Bad taste 3. ☐Black stool 4. ☐Constipation

5. ☐ Diarrhoea 6. Epigastric pain

28. When you experienced the above side effects, what did you do?

1. ☐ Went back to hospital 2. ☐ Stopped taking IFAS 3. ☐ Took IFAS

with meals 4. ☐ Ate plenty of fruits and vegetables

29. What problems and challenges have you experienced in using IFAS?

1.☐None 2. ☐Side effects

3.☐Stock outs 4. ☐Forgetting to take IFA

30. In your opinion, what should be done to ensure all pregnant women are taking IFA in the recommended way?

1.☐Intensified nutrition education on IFAS

2.☐Multiple IFA distribution channel

3.☐Ensuring there are no stock outs

4.☐Others (Specify)…….

Health facility service environment Factors Influencing IFAs uptake

31. Have you ever heard about IFAS?

Yes ☐ No ☐

32. If yes, from where did you learn about IFAS?

1. TV☐ 2.Radio☐ 3.CHV ☐ 4.Health care provider☐ 5.Friends☐

6. Other mothers☐ 7. Other (specify)……...

33. Do you know the benefits of taking IFAS?

1.☐Yes 2. ☐ No

34. If yes, name them (Multiple responses accepted)

1.☐To increase blood 2.☐To prevent birth abnormality

3.☐ To prevent LBW babies 4.☐ Others (specify)……...

35. During this pregnancy, have you received any nutrition education and/or counseling?

1.☐Yes 2. ☐ No

36. What advice were you given as the IFA tablets were dispensed to you?

☐ Benefits of IFA ☐ Food sources of iron

☐ Side effects of IFA ☐ IFA dosage

☐ Management of IFA side effects ☐ Other (specify)

☐ None

37. Were you informed of the benefits of IFA at the facility when you were issued with the IFA tablets?

Yes ☐ No ☐

38. Have you always received IFA tablets from the clinic?

Yes ☐ No ☐

39. Is there anything you would like to know from me?

Nutrition status

40. Haemoglobin levels (check from mother-child booklet) _____

41. MUAC_____

Thanks for Your Cooperation.

Mother's Focus Group Discussion Guide

Study Title: Determinants of non-compliance to Iron and Folic acid supplementation among women attending Antenatal clinic in Nakuru County.

Date _____Venue _____

Name of moderator _____

Name of recorder_____

No	Initials if the respondents	Age	Occupation	Gestation(wk)	Parity	Marital status

What is anaemia and how can it be prevented?

What are the consequences of low blood levels in pregnancy?

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

From where/whom do you receive such information?

What do you think are the benefits of taking IFAS?

How do you find the taste, smell and size of IFA tablets?

When you take IFA tablet, have you experienced any side effects? Which are they? How are they managed?

What do people out there say about IFA tablets?

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

In this community, do you think mothers receive IFAS as recommended?

What are some of the locally available food sources of iron/folate? Are they affordable?

Are there reservations or groups of mothers who do not take IFAS? (Probe on any groupings such as for those educated, high status, slum dwellers etc.)

What problems does the community encounter as far as IFAS services are concerned?

How do you think IFAS services can be improved?

Key Informant Interview Guide for Health Care Workers

Date _____ Venue _____

Key informant _____

Time interview begins _____

a. Have you been trained on IFAS? Give details
b. Explain the recommended schedule for IFAS
c. What are some of factors that promote or hinder mothers from taking IFAS in this facility/area?
d. Which IEC resource materials/documents do you have on IFAS? Name all.
e. 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?
f. What are your experiences with IFAS supply/logistics in the hospital?
g. Please explain how you capture the records on IFAS? What do you think about the recording system for IFAS services? Any suggestions for improvement?
h. 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?
i. What problems/constraints have you encountered as far as IFAS services are concerned?
j. What's your general view about the entire IFAS program? Which strategy of distribution would you recommend?
k. What do you think can be done to improve IFAS services and achieve higher compliances?

Appendix III: KUREC Approval

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

Private Bag - 20157
KABARAK, KENYA
Email: kurec@kabarak.ac.ke

Tel: 254-51-343234/5
Fax: 254-051-343529
www.kabarak.ac.ke

OUR REF: KABU/01/KUREC/001/03/01/22

Date: 28th Jan, 2022

Jacinta Wambugu
Kabarak University,

Dear Jacinta,

RE: DETERMINANTS OF NON-COMPLIANCE TO IRON AND FOLIC ACID SUPPLEMENTATION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN NAKURU COUNTY-KENYA

This is to inform you that ***KUREC*** has reviewed and approved your above research proposal. Your application approval number is ***KUREC-030122***. The approval period is ***28/01/2022 – 28/01/ 2023.***

This approval is subject to compliance with the following requirements:

i. All researchers shall obtain an introduction letter to NACOSTI from the relevant head of institutions (Institute of postgraduate, School dean or Directorate of research)
ii. The researcher shall further obtain a RESEARCH PERMIT from NACOSTI before commencement of data collection & submit a copy of the permit to **KUREC.**
iii. Only approved documents including (informed consents, study instruments, MTA Material Transfer Agreement) will be used
iv. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KUREC***.
v. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KUREC*** within 72 hours of notification;
vi. Any changes, anticipated or otherwise that may increase the risk(s) or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KUREC*** within 72 hours;
vii. Clearance for export of biological specimens must be obtained from relevant institutions and submit a copy of the permit to KUREC.
viii. 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 and;
ix. Submission of an executive summary report within 90 days upon completion of the study to ***KUREC***

Sincerely,

KABARAK UNIVERSITY
JAN 2022

Prof. Jackson Kiteto PhD.
KUREC-Chairman

Cc Vice Chancellor
DVC-Academic & Research
Registrar-Academic & Research
Director-Research Innovation & Outreach
Institute of Post Graduate Studies

Appendix IV: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 533270

Date of Issue: 14/February/2022

RESEARCH LICENSE

This is to Certify that Ms.. JACINTA Njambi Wambugu-Lukania of Kabarak University, has been licensed to conduct research in Nakuru on the topic: DETERMINANTS OF NON-COMPLIANCE TO IRON AND FOLIC ACID SUPPLEMENTATION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN NAKURU COUNTY-KENYA for the period ending : 14/February/2023.

License No: NACOSTI/P/22/15747

533270

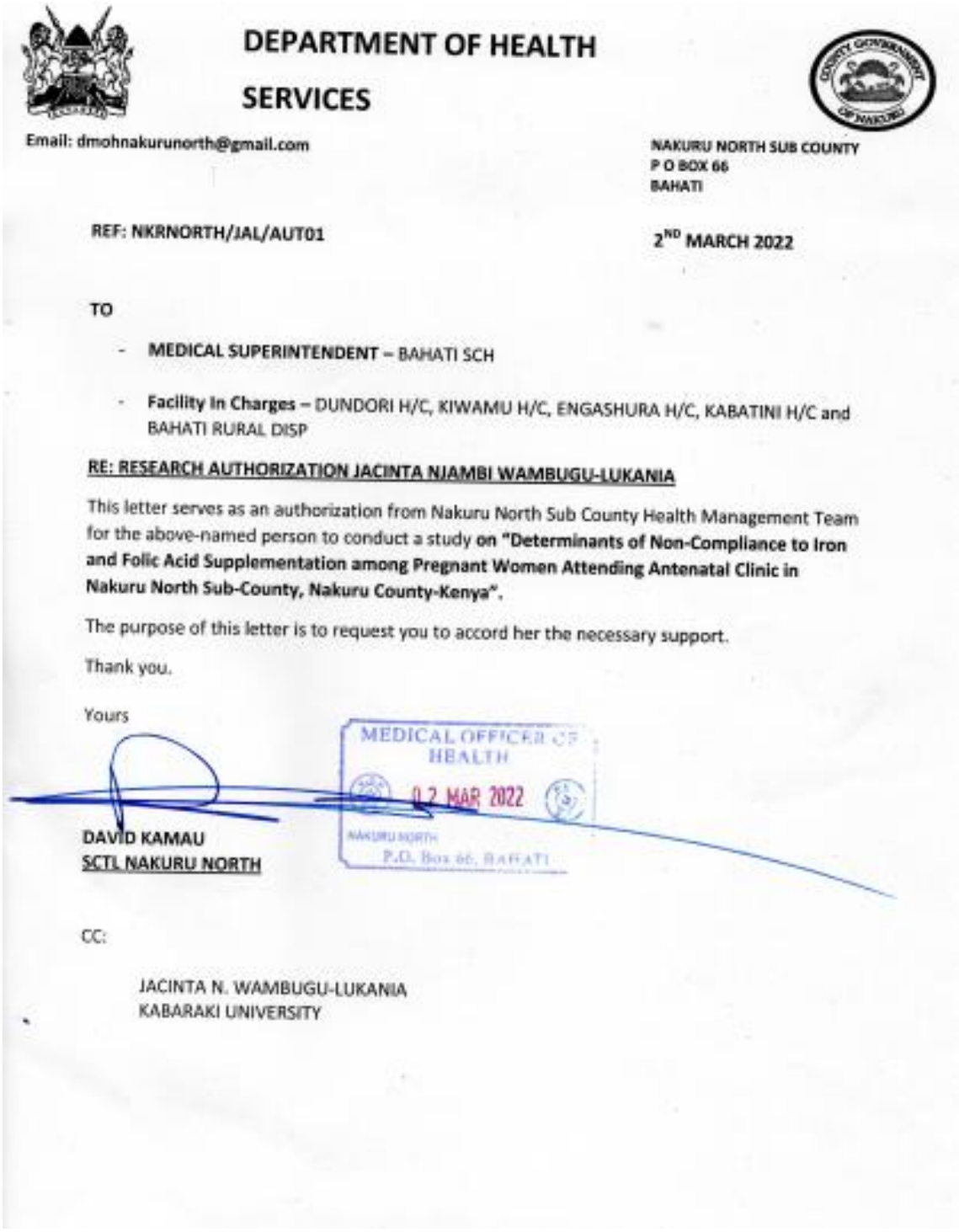
Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix V: Department of Health Nakuru Approval



DEPARTMENT OF HEALTH SERVICES

Email: dmohnakurunorth@gmail.com

NAKURU NORTH SUB COUNTY
P O BOX 66
BAHATI

REF: NKRNORTH/JAL/AUT01

2ND MARCH 2022

TO

- **MEDICAL SUPERINTENDENT** – BAHATI SCH
- **Facility In Charges** – DUNDORI H/C, KIWAMU H/C, ENGASHURA H/C, KABATINI H/C and BAHATI RURAL DISP

RE: RESEARCH AUTHORIZATION JACINTA NJAMBI WAMBUGU-LUKANIA

This letter serves as an authorization from Nakuru North Sub County Health Management Team for the above-named person to conduct a study **on "Determinants of Non-Compliance to Iron and Folic Acid Supplementation among Pregnant Women Attending Antenatal Clinic in Nakuru North Sub-County, Nakuru County-Kenya".**

The purpose of this letter is to request you to accord her the necessary support.

Thank you.

Yours

MEDICAL OFFICER OF HEALTH
02 MAR 2022
NAKURU NORTH
P.O. Box 66, BAHATI

DAVID KAMAU
SCTL NAKURU NORTH

CC:

JACINTA N. WAMBUGU-LUKANIA
KABARAKI UNIVERSITY

Appendix VI: List of Publication

Journal of Medical and Health Sciences

[ISSN 2958-1079]
Volume: 01 Issue: 01 | Nov-2022

MATERNAL DETERMINANTS OF NON-COMPLIANCE TO FOLIC ACID SUPPLEMENTATION AND IRON AMONG PREGNANT WOMEN IN NAKURU NORTH SUB-COUNTY, KENYA

Authors

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Cite this article in APA

Wambugu, J., Chege, P., & Muga, M. (2022). Maternal determinants of non-compliance to folic acid supplementation and iron among pregnant women in Nakuru North Sub-County, Kenya. *Journal of Medical and Health Sciences, 1*(1), 46-54. https://doi.org/10.51317/jmhs.v1i1.310

OPEN ACCESS

A publication of Editon Consortium Publishing (online)

Article history

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Scan this QR to read the paper online

Abstract

The objective of the study was to establish the maternal determinants of non-compliance. A cross-sectional study design was used targeting pregnant women aged 18 – 49 years attending antenatal clinic (ANC) in six health facilities in the Nakuru North sub-county. Non-compliance with IFAS was defined as taking supplements for less than 5 out of 7 days per week. The study findings revealed that 27.1 per cent of the respondents were non-compliant. Reasons for non-compliance were given as side effects, bad taste and missed clinics. About a third (37.6%) of the participating pregnant women first visited the Antenatal Clinic when they were over four months pregnant, and (31.8%) indicated that they had not received information on the benefits of IFAS. The odds ratio indicated that pregnant women were more likely to comply if they did not have side effects (OR=1.47) and initiated ANC early (OR=1.33). Therefore, this study demonstrated that the mother-related determinants of non-compliance were lack of knowledge about the benefits of IFAS, side effects and late ANC attendance. Thus, there is a need for a review of the advice given to pregnant mothers visiting ANC to emphasise the need for timely ANC visits, the benefits of IFAS and the management of side effects due to IFAS.

Key terms: Non-compliance, maternal determinants, Iron and Folic acid.

Appendix VII: Evidence of Conference Participation

KABARAK UNIVERSITY

Certificate of Participation

Awarded to

Jacinta Wambugu

for successfully participating in the 13th Annual Kabarak University International Research Conference held from 23rd – 24th June 2023 and presented a paper entitled ***"Determinants of non-compliance to iron and folic acid supplementation among pregnant women attending antenatal clinic in Nakuru north sub-county, Kenya."***

Conference Theme

Bridging the Gaps in Global Health

Dr. Pamela Kimeto
Dean, School of Medicine and Health Sciences

Dr. Moses Thiga
Director - Research, Innovation and Outreach

Kabarak University Motto Code

As members of Kabarak University family, we purpose at all times and in all places, to set apart in our's heart, Jesus as Lord.

(1 Peter 3:15)

Kabarak University is ISO 9001:2015 Certified

Appendix VIII: Map of the Study Area