DIETARY PRACTICES, IRON FOLIC ACID SUPPLEMENTATION AND IRON STATUS OF PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT NAROK COUNTY REFERRAL HOSPITAL, KENYA

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A Thesis Submitted to the Institute of Postgraduate Studies of Kabarak University in Partial Fulfilment of the Requirements for the Award of Master of Science in Human Nutrition and Dietetics Degree

KABARAK UNIVERSITY

2024

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ABSTRACT

Iron deficiency anaemia is one of the most prevalent nutritional deficiencies during pregnancy. Globally, there are an estimated 56 million anaemic women, with 75–80 percent suffering from iron deficiency anaemia. In Kenya, 48% of reproductive-age women suffer from anaemia. This proportion is higher among pregnant women from Arid and Semi-Arid Land. Minimal studies have been conducted on how dietary diversity influence the iron status of pregnant women especially among pregnant woman from Arid and Semi-Arid Land. This study sought to assess dietary diversity, iron folic supplementation and iron status of pregnant women attending antenatal clinic at Narok County Referral Hospital.This research adopted a cross-sectional analytical study design. The accessible population were all the women attending the antenatal clinic in Narok County Referral Hospital. The target sample was 192 while 178 pregnant mothers responded to the study. Narok county and Narok County Referral Hospital were purposively selected. Systematic random sampling was used to select the sample. The researcher administered a questionnaire and Key informant interviews were used to collect data. Data was cleaned and analysed by use of Statistical Package for Social Sciences Software Version 24. Descriptive statistics was used to describe the data. Chi square and Pearson correlation were used to show the association between categorical and non-categorical variables. Odds ratio was used to determine the likelihood of iron deficiency as influenced by the dietary diversity. AP values of <0.05 was used. Data from Key Informant Interview's was transcribed, coded and analysed to generate emerging common themes established. The study revealed that most of the pregnant women (44.4%) were aged 18-24 years, married (71.3%) and were in small businesses (52.2%). Most (68%) of pregnant women consumed four meals a day. The results revealed that the nutrient intake levels of the respondents was generally below recommendation since57.9% of pregnant women did not meet the minimum women dietary diversity score. About (68.5%) of the respondents were taking Iron Folic Acid supplementation with only 13.5% of respondents having adhered to the recommendation. The average HB levels were11.75±1.35with 52.2% having low haemoglobin levels of below 12g/dl. Marital status, parity, number of children and occupation were not associated with iron status. The study concluded that iron status of most mothers was low as evidenced by the low levels of haemoglobin. In order to reduce maternal anaemia, the study recommends more sensitization to be done by health workers.

Keywords: *Dietary Diversity, Iron Status, Antenatal Clinic, Haemoglobin Levels and Nutrition Status*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Clinic
BMI	Basal Metabolic Index
DDS	Dietary Diversity Score
FFQ	Food Frequency Questionnaire
GOK	Government of Kenya
HB	Haemoglobin Level
ID	Iron Deficiency
IDA	Iron Deficiency Anaemia
IFAS	Iron Folic Acid Supplementation
IDDS	Individual Dietary Diversity Score
KHDS	Kenya Demographic and Health Survey
MCH	Maternal Child Healthcare
MUAC	Mid Upper Arm Circumference
NACOSTI	National Commission for Science, Technology and Innovation
RDA	Recommended Daily Allowance
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children Education Fund
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Antenatal Clinic	A clinic that women attend when they are pregnant so that the medical staff can check the health of the baby and the mother.
Anaemia	A condition that results due to low iron intake evidenced by low haemoglobin levels.
Dietary Intake	Refers to the amount of food taken in the previous 24 hours
Dietary Diversity	This is the number of different food groups consumed.
Dietary Practices	Refer to the number of meals, amounts of nutrients consumed and frequency of food consumption
Haemoglobin levels	This is a measure of iron status
IntraUterine Growth	A condition that is associated with fatal growth that is less than normal.
Iron Status	An indicator showing the level of iron store in the body
Iron Deficiency	Refers to low iron intake. 12-16g/dl normal for females and below 11.9g/dl is considered low haemoglobin levels for women.
Nutrition Status	The MUAC of the pregnant mothers where <23cm referred to underweight and >23cm referred to a normal nutrition status.
Women Dietary Diversity Score	This is a qualitative measure of food consumption that reflects a woman's access to a variety of foods.

CHAPTER ONE

INTRODUCTION

1.1. Overview of the Study

This chapter discusses the background of the study, statement of the problem, purpose and objectives of the study as well as the research hypotheses. In addition, the justification, scope, limitation and assumptions of the study are addressed.

1.2. Background of the Study

Iron deficiency anaemia is one of the most prevalent nutritional deficiencies during pregnancy and has been regarded as a global challenge (Garzon et al., 2020). The case among pregnant women is dire because the requirement is for both the mother and the foetus (Akther et al., 2015). Iron deficiency anaemia is associated with many health problems for a pregnant woman, including prenatal deaths, low birth weight, premature birth and intrauterine growth retardation (Kemppinen et al., 2021). As a result of severe anaemia during pregnancy, it is hypothesized that intrauterine growth is impaired. Moderate anaemia during pregnancy reduces the placenta's surface area, volume and weight (Agbozo et al., 2020). Additionally, anaemia in pregnancy has been linked to neonatal deaths of 7%–10%, foetal losses of 20%–28% and prenatal deaths of 30% (McLean et al., 2009).

Across the globe, the prevalence of anemia among women constitutes a significant public health challenge. Current estimates suggest that approximately 56 million women are affected, with a substantial proportion, ranging from 75% to 80%, experiencing iron deficiency anemia (McLean et al., 2009). This issue is particularly pronounced in developing nations, where an alarming 80% of pregnant women fail to meet their Recommended Dietary Allowance (RDA) for iron, resulting in both clinical and subclinical manifestations of iron deficiency. In Africa, a region of heightened concern,

over half (57.1%) of pregnant women grapple with anemia, contributing to an overall global anemia prevalence ranging between 41.8% and 43.8% (WHO, 2020).

Turning our attention to Kenya, a pertinent national context, the burden of anemia among both reproductive-age women and pregnant individuals is striking, affecting approximately 48% and 55%, respectively (Kumar et al., 2022; Odhiambo & Sartorius, 2020). Iron deficiency emerges as the primary etiological factor underpinning this health challenge, stemming from various determinants such as insufficient dietary iron intake and the presence of diverse pathological conditions (Percy, Mansour, & Fraser, 2017). In light of these findings, urgent and concerted efforts are warranted to devise and implement comprehensive interventions aimed at addressing iron deficiency and ameliorating the associated adverse health repercussions, with particular emphasis on vulnerable cohorts like pregnant women.

Iron deficiency anaemia has a negative impact on the health of many pregnant women and their unborn children resulting in mental retardation, decreased work productivity and an increased risk of maternal mortality in pregnant women (Owais et al., 2021). Due to the increased risk of death from blood loss during delivery in anaemic women, iron deficiency anaemia during pregnancy may result in maternal deaths. Anaemia is associated with 20 percent maternal deaths during pregnancy (Owais et al., 2021). To protect the mother and her unborn child from the detrimental impact of iron deficiency anaemia, it is critical that all forms of iron deficiency whether severe, mild, or moderate in pregnancy be addressed to ensure the mother's and infant's health.

Inappropriate dietary practices among pregnant women, characterized by suboptimal nutritional intake, reduced meal frequency, and insufficient consumption of fruits and vegetables, are acknowledged as significant contributors to malnutrition, thereby exacerbating the risk of complications and adverse birth outcomes (Dörsam et al., 2019).

Ensuring adequate iron intake during pregnancy is of paramount importance, and it has been postulated that diversifying dietary choices across various food groups can effectively fulfill these requirements. However, pregnant women who predominantly consume starchy foods may still face the risk of iron deficiency if their diet lacks sufficient variety and nutritional depth.

Regrettably, there exists a noticeable dearth of comprehensive data concerning the iron status and dietary diversity among pregnant women, highlighting a critical gap in our understanding of maternal nutrition during gestation (Martínez-Galiano et al., 2019). Addressing this knowledge deficit is imperative for informing targeted interventions aimed at promoting optimal maternal dietary practices and ultimately enhancing pregnancy outcomes. As such, further research endeavors focusing on elucidating the interplay between dietary diversity, iron status, and pregnancy outcomes are warranted to inform evidence-based strategies for maternal health promotion.

The assessment of nutritional status among pregnant women, particularly with regard to Body Mass Index (BMI), stands as a topic of ongoing debate within the scholarly community. Despite this controversy, empirical evidence has consistently revealed concerning trends among pregnant individuals, characterized by notably low hemoglobin levels, insufficient dietary diversity, and inadequate iron intake.

The imperative to mitigate anemia emerges as a critical global health priority, with the potential to substantially augment both maternal and neonatal health outcomes throughout the course of pregnancy, as emphasized by Moller et al. (2019). Dietary diversification emerges as a prominent food-based strategy for addressing iron needs, involving the consumption of a varied array of foods encompassing diverse food groups, as posited by Nair, Augustine, and Konapur (2016).

Recognizing the multifaceted impact of anemia on maternal and neonatal health underscores the urgency of implementing comprehensive interventions aimed at preventing and addressing iron deficiency during pregnancy. By promoting dietary diversification and advocating for the consumption of a wide range of nutrient-rich foods, health initiatives can effectively bolster iron intake among pregnant women, thereby mitigating the risk of anemia and improving overall pregnancy outcomes. These strategies align with broader efforts to enhance maternal nutrition and contribute to the attainment of global health goals related to maternal and child health.

A plethora of socio-demographic factors have been posited as contributors to the observed insufficiencies in maternal dietary intake. These include socioeconomic disparities such as poverty, as well as deficits in nutrition literacy and educational attainment. Additionally, suboptimal attendance at Maternal and Child Health (MCH) services, often influenced by logistical challenges or cultural norms, further compounds the issue. Furthermore, the engagement of women in pastoralist lifestyles, characterized by nomadic or semi-nomadic livestock rearing, presents unique dietary challenges that may hinder adequate nutrient intake during pregnancy.

Given the persistently high prevalence of iron deficiency anaemia (IDA) and the existing lacunae in our understanding of dietary diversity and iron status among pregnant women, this study endeavors to undertake a comprehensive assessment of these parameters among attendees of the antenatal clinic at Narok County Referral Hospital. By addressing these significant knowledge gaps, the study aims to inform evidence-based interventions tailored to ameliorate maternal nutrition and health outcomes, thereby contributing to the broader global efforts aimed at optimizing maternal and neonatal well-being.

1.3 Statement of the Problem

Pregnant women are among the most vulnerable groups to anaemia. Pregnant women among pastoralist communities are more affected due to low dietary diversity as a result of the culture of overdependence on only animal products which vary over seasons amidst low socio-economic status to access other foods (Birhanu et al., 2021). Studies shows a strong positive relationship between the maternal dietary diversity and nutritional status and the birth outcome (Waweru, 2020). One aspect that affect them is iron deficiency anaemia. Iron deficiency anaemia is associated with morbidity and mortality among pregnant women(Iman, 2020).Numerous maternal deaths attributed to anemia have been documented in the literature (McLean et al., 2009), highlighting the grave consequences of this condition on maternal health. While there are various causes of anemia, dietary quality has emerged as a critical factor influencing nutrient intake. Additionally, the presence of underlying diseases has been linked to anemia, even in cases where dietary intake appears to be sufficient (Elstrott et al., 2020).

In Narok County, Kenya, the prevalence of iron deficiency anemia (IDA) is alarmingly high, estimated at 61.5% (Chepkorir et al., 2019). This concerning statistic has been associated with adverse birth outcomes within the county, including increased rates of underweight children and premature deliveries. The persistence of such poor health outcomes underscores the urgent need for further investigation and intervention. Addressing the root causes of IDA and its associated complications in Narok County is imperative to improve maternal and neonatal health and reduce the burden of preventable morbidity and mortality. This pressing public health issue serves as a key motivator for the present study, which aims to shed light on the factors contributing to IDA and poor birth outcomes in this region.There is scarcity of information on iron status among pregnant women in Kenya and the extent to which dietary diversity affect iron status.

Similarly, researches on food consumption patterns among pastoralist communities are minimal. Studies related to nutrition among mothers and children are minimal in Narok County. To fill this information gaps, this study sought to assess dietary diversity and iron status among pregnant women attending antenatal clinic at Narok County Referral Hospital.

Narok County, situated in the Arid and Semi-Arid Lands (ASAL) region of Kenya, is primarily inhabited by members of the Maasai and Kalenjin tribes. Traditionally, the residents of Narok County have predominantly engaged in pastoralism, with livestock rearing serving as a central aspect of their livelihoods. However, in recent years, there has been a noticeable shift towards small-scale farming and entrepreneurial ventures among the local populace (Chepkorir, Bor & Kipsaina, 2019).Culturally, pastoralism is deeply ingrained in the social fabric of Narok County, and it is practiced by both men and women. The traditional pastoralist lifestyle is characterized by nomadic practices, wherein individuals move with their herds in search of water and grazing lands. However, in response to various socioeconomic and environmental factors, some members of the community have transitioned to settled lifestyles, adopting approaches such as zero grazing to sustain their livestock.

This cultural heritage and livelihood strategy plays a significant role in shaping the dietary practices and nutritional behaviors of the residents of Narok County. Understanding the intersection of culture, livelihoods, and nutrition is essential for developing effective interventions aimed at improving health outcomes, particularly in addressing issues such as iron deficiency anemia prevalent in the region.

1.4 Purpose of the Study

The purpose of the study was to assess dietary practices, Iron folic acid supplementation and iron status of pregnant women attending antenatal clinic at Narok County Referral Hospital, Narok County, Kenya.

1.4.1 Specific Objectives of the Study

i. To determine dietary practices among pregnant women attending antenatal clinic at Narok County Referral Hospital.

ii. To establish IFAS utilization among pregnant women attending antenatal clinic at Narok County Referral Hospital.

iii. To establish iron status (hemoglobin levels) among pregnant women attending antenatal clinic at Narok County Referral Hospital.

iv. To establish the association between social-demographic characteristics, dietary practices and iron status (hemoglobin levels) among women attending Narok County Referral Hospital.

1.5 Research Hypothesis

$H0_1$: There is no significant relationship between social-demographic characteristics and iron status of pregnant women attending antenatal clinic at Narok County Referral Hospital.

$H0_2$ There is no significant relationship between dietary practices and iron status of pregnant women attending antenatal clinic at Narok County Referral Hospital

$H0_3$ There is no significant relationship between IFAS utilization and iron status of pregnant women attending antenatal clinic at Narok County Referral Hospital

1.6 Justification of the Study

Pregnancy is a critical period of growth in the human life cycle. The stage is associated with numerous health problems among them anaemia. Presence of anaemia has side effects to the health and nutrition status of both the mother and the child. To address this, evidence-based programming is needed to ensure that optimal health of mother and child. Thus, the need for such a study to generate information. There have been numerous interventions to reduce the prevalence of anaemia. However, little has been achieved as the prevalence is still high. It is thus recommended that more research be conducted in this area of iron intake and iron status. With this high prevalence of IDA in Narok (Chepkorir et al., 2019), urgent interventions are required to deal with both dietary diversity so as to reduce the prevalence of IDA. Moreover, this would reduce the birth outcomes that are still of public health concern.

1.7 Significance of the Study

Information from this study may be used by health workers and other stakeholders in Kenya for use in planning for appropriate interventions and policies to improve the health of women. The data generated will be useful in suitable interventions to improve maternal dietary practices and iron status so as to reduce the prevalence of IDA. This would reduce the birth outcomes that are still of public health concern.

1.8 Scope of the Study

This study was carried outin Narok County Referral Hospital. It included 178 pregnant women attending antenatal clinic at Narok County Referral Hospital. The study sought to establish the dietary diversity, iron folic acid supplementation as well as iron statusof pregnant women.

1.9 Limitations and Delimitations of the Study

i. By use of cross-sectional design, data was collected at one point in time and thus other matters arising during the pregnancy were captured. To mitigate this, data was collected from women of different gestation periods which brought out the variations. The variations involved ANC attendance and intake of IFAS.

ii. The interview method adopted focused on recall by the pregnant mothers. As such there could have been recall bias. By use of both quantitative and qualitative methods coupled with proper probing accurate information was collected.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focused on selected subtopics related to iron and iron status as well as issues related to pregnant mothers. The areas of focus are dietary diversity among pregnant women, maternal iron status among pregnant women, anaemia among pregnant women in pastoralist communities, determinant of maternal iron stores, and nutrition status of pregnant women, assessment and classification of iron status as well as dietary diversity assessment.

2.2 Empirical Literature Review

2.2.1 Dietary Practices of Pregnant Women Attending ANC in Narok Hospital

Across the global landscape, a heterogeneous array of dietary patterns prevails, shaped by multifaceted influences. It is pertinent to acknowledge that individuals' adherence to specific dietary regimens may not uniformly contribute to the enhancement of their nutritional status. Illuminating insights gleaned from a longitudinal inquiry carried out amongst gravid women in Brazil underscore the dynamic nature of dietary behaviors across successive trimesters of pregnancy. This scholarly investigation revealed discernible fluctuations in the consumption patterns pertaining to sugar, confectioneries, fruits, coffee, and fried snacks among the cohort under scrutiny (Santana et al., 2015).

In Nigeria, a comprehensive research endeavor aimed at evaluating the dietary patterns of pregnant women illuminated a discernible discrepancy in macronutrient distribution, notably showcasing a prevalence of carbohydrates over proteins within their diets (Olayiwola et al., 2015). Conversely, within the Kenyan context, maize emerges as the cornerstone of the dietary landscape, constituting a significant proportion of both staple food and overall caloric intake. According to Mohajan (2014), maize accounts for over

60% of total caloric intake from staple foods and 36% of the overall caloric intake, with an average annual consumption of 88 kilograms per individual. These empirical findings align closely with the assertions posited by Olielo (2013), who underscores the ubiquitous consumption of "ugali," a thick maize meal paste, among Kenyan households, with a staggering 88% adherence rate at a frequency of at least four times weekly. Furthermore, a comprehensive investigation encompassing pastoral and non-pastoral communities within Kenya delineated a diverse spectrum of 40 food items, albeit with only seven items being commonly consumed by at least half of the women across both ecological zones. Notably, this scholarly inquiry unveiled a concerning trend of suboptimal intake of essential food groups such as milk, meat, vegetables, and fruits among the studied cohorts (Olimba, 2018). It is imperative to acknowledge, however, that regional nuances may exist, as evidenced by the pronounced agricultural reliance observed in Othaya Constituency, potentially conferring distinct dietary dynamics not fully captured by broader national trends.

The socialization process significantly influences consumption patterns between genders in Kenya, as evidenced by scholarly research. This phenomenon introduces a gendered lens to dietary choices, wherein the designation of a specific food as a primary staple for either gender can profoundly impact nutritional outcomes, potentially fostering optimal health or deleterious effects on nutritional status. For instance, a study conducted by the University of Nairobi African Women's Study Centre delineated rice and *githeri/muthokoi* as predominant dietary staples among women, with consumption rates of 71% and 58.8%, respectively. Conversely, a higher proportion of men, constituting 61.9%, identified meat as their principal dietary component, while only 38.1% of women cited meat as their primary food choice. This discrepancy is attributed to entrenched gender roles, wherein men traditionally assume ownership of livestock, consequently

accessing and consuming prime cuts of meat, while women and children are left with offal, such as intestines and tongue (The University of Nairobi African Women's Study Centre, 2014). However, it is imperative to acknowledge that the aforementioned study did not delve into participants' dietary knowledge, a crucial aspect meriting exploration in future research endeavors. Moreover, the geographical diversity across study locations suggests that the findings may not be universally applicable, particularly to regions like Othaya Constituency, where distinct socio-cultural and dietary dynamics might prevail.

Increased nutritional demands characterize pregnancy and adequate dietary intake is essential for meeting the mother and foetus's high nutritional needs (Kocyłowski et al., 2018). Additionally, increased physiological requirements make pregnant women particularly nutritionally vulnerable necessitating a more nutrient-dense diet. During pregnancy, inadequate dietary diversity has negative consequences on the mother and the infant. However, most pregnant women do not have access to a nutritionally adequate diet (Restrepo-Gallego et al., 2021). Adequate nutrition during pregnancy has been linked to a lower risk of chronic diseases, improved infant development, healthier pregnancy and delivery, improved maternal and child health, and improved academic achievement for children (Elstrott et al., 2020).

Pregnant women require an additional 300 calories daily to maintain their health. A well-balanced diet containing protein, fruits, vegetables, and whole grains should be followed to achieve these calories (Lander et al., 2019). Pregnant women need to reduce the amount of sugar and fat in their diet. Adequate fluid consumption is very critical during pregnancy. Pregnant women should take sufficient amounts of fluids throughout the day by drinking eight or more glasses of water and the fluids found in juices and soups. Pregnant women must avoid all forms of alcohol.

During pregnancy, low dietary diversity significantly impacts the well-being of both the pregnant mother and the unborn child and after birth, throughout childhood and adulthood(Quezada-pinedo et al., 2021). Inadequate nutritional intake during pregnancy has been linked to impaired foetal growth, behavioural problems in the infant, spontaneous abortion, learning impairment, and inadequate pregnancy weight gain Quezada-pinedo et al., 2021).

2.2.2 Iron Status among Pregnant Women

Intake of adequate amounts of iron is crucial for a healthy pregnancy outcome. Iron requirements during pregnancy are increased with a daily and net iron requirement approximated at 30mg and 840mg respectively. Heme- iron is up to three times more readily absorbed in the intestines than non-heme iron. Consuming both heme and non-heme iron can increase non-heme iron absorption. Thus, diet diversification plays a considerable effect in determining the amount of absorbed iron(Quezada-pinedo et al., 2021).

Dietary components exacerbate the inability of non-heme iron to be absorbed. For instance, diets high in maize, legumes, and whole grains contain phytates that form iron chelates, inhibiting iron absorption and contributing to iron deficiency**.** However, numerous dietary factors have improved non-heme iron absorption, including citric, ascorbic tartaric, lactic acids, sugars such as sorbitol and fructose, fish, poultry, and meat and animal tissues that contain high amounts of myosin and actin, or their digestion products (Barad et al., 2022).

Adequate iron consumption is critical for a healthy pregnancy. There is an increasing need for public health programs to educate the public about the health benefits of a nutritious diet rich in iron before conception or getting pregnant (Kocyłowski et al.,

2018). This information must be integrated into educational courses, premarital counselling and prenatal care. This study seeks to close this gap given the critical nature of adequate iron consumption throughout pregnancy. Data on the percentage of pregnant women taking the recommended dietary iron throughout pregnancy is scarce. IFAS is given to pregnant women through ANC. There has been high level of non-compliance to IFAS (Siekmans et al., 2018). Factors that affect IFAS supplementation are; lack of supplies in Health facilities, poor utilization services and being forgetful (Pal et al., 2013).

2.2.3 Anaemia among Pregnant Women in Narok County

Anaemia is a substantial issue of public health concern in both industrialized and developing countries. The prevalence is more in pregnant women than in non-pregnant women and is a leading cause of maternal mortality. Anaemia caused by iron deficiency is the most frequent nutritional deficiency and haematological disorder during pregnancy, putting both mother and foetus at risk(Kumar et al., 2022). Between 12% and 28% of neonatal deaths are due to anaemia. Iron deficiency anaemia is associated with premature birth, maternal mortality and morbidity, and low birth weight(Mapesa et al., 2020).

Iron deficiency before conception and the initial stages of pregnancy has been associated with preterm premature membrane rupture. In contrast, the iron shortage has been associated with spontaneous premature labour in late pregnancy (Kumar et al., 2022).Iron deficiency anaemia is correlated with increased morbidity and foetal death during pregnancy and adversely affects the mother and foetal health(Georgieff, 2020). Mothers diagnosed with anaemia commonly experience tiredness, fainting, insomnia, palpitations, and difficulties breathing. Furthermore, they are at an increased risk of perinatal infection, hypertension and bleeding. Iron deficiency anaemia has been linked

to intrauterine growth retardation, preterm and low birth weight, cognitive impairment and behavioural problems. Iron deficiency during the first trimester has a more negative effect on embryonic growth than later-onset anaemia does. This also affirms valid of the possibility of preterm labour. Poor socioeconomic status has a crucial role in all dimensions of these entwined problems, particularly widespread in developing countries(Quezada-pinedo et al., 2021). These components must be considered for a public prevention or treatment program to be successful.

2.2.4 Pastoralist Communities in Narok County

Pastoralists' nutritional health changes according to season (Birhanu et al., 2021). Severe malnutrition occurs during droughts, which is worsened by growing climate change. Iron, folic acid and niacin are all micronutrient deficits (Korir, 2019). Pregnant mothers follow restrictive diets in the hope of reducing birth complications for an easier birth. This results in low birth weight which is believed to be as low as 13% among some pastoral communities. Breastfeeding and supplemental feeding are poorly understood. Infants are introduced to cow milk as early as the first few days of life, which increases their risk of malnutrition and morbidity (Thuc et al., 2019). Apart from chronic malnutrition, pastoralists bear a disproportionate disease burden and are underserved by health services. Malaria, respiratory tract infections and diarrhoea are the most prevalent ailments (Elstrott et al., 2020). Water contamination is a problem and water-borne diseases commonly afflict pastoralists.

The marginalization also has adverse nutritional repercussions for pastoralists such as insufficient housing and lack of safe drinking water. Efforts to overcome the problems should prioritize nutrition education regarding the necessity of proper weight gain during pregnancy, the benefits of exclusive breastfeeding and cleanliness in terms of safe

drinking water. All stakeholders should work collaboratively to deliver health and nutrition interventions in pastoralist regions at the community level. Interventions at the national level should prioritize both relief and resilience building and should be tailored specifically for pastoralist communities(Birhanu et al., 2021). It is necessary to establish the nutritional impact of such therapies.

2.2.5 Determinant of Iron Status by Use of Haemoglobin a Measure of Iron Status

Iron status in pregnancy is an essential micronutrient and also vital the synthesis of haemoglobin and in the brain development of the foetus. To curb the burden of iron deficiency, iron supplements are recommended during pregnancy as dietary iron intake is likely to be insufficient to meet the demands of pregnancy especially if the pregnant woman starts with inadequate body iron store at conception (Alwan & Hamamy, 2015).

Among the plethora of biomarkers available for assessing iron status, three have emerged as particularly robust indicators: blood ferritin levels, total iron binding capacity (TIBC), and serum iron levels, as extensively discussed by Pompano & Haas (2017). Blood ferritin serves as a reliable measure of the total iron stores within the body, offering valuable insights into the individual's iron status. Concurrently, TIBC provides valuable information regarding how iron binds to proteins, while serum iron quantifies the circulating iron levels in the bloodstream, collectively offering a comprehensive assessment of iron status.

Anaemia prevalence among pregnant women exhibits a notable correlation with gestational age, with those in the third trimester facing a significantly heightened risk compared to their counterparts in earlier stages of pregnancy, as delineated by Barad et al. (2022). Furthermore, the cumulative number of pregnancies experienced by a woman emerges as a salient predictor of anaemia risk, with each additional pregnancy

incrementally elevating the likelihood of anaemia attributable to iron deficiency, as underscored by Chepkorir et al. (2019).

Maternal haemoglobin levels during pregnancy play a pivotal role in shaping birth outcomes, with fluctuations observed from early to mid or late pregnancy stages. Notably, haemoglobin levels falling below the threshold of <11 g/dL during pregnancy signify low iron status, as outlined by Jwa et al. (2015). Severe anaemia in early pregnancy has been implicated in adverse birth outcomes such as low birth weight, highlighting the critical importance of early detection and intervention. However, it is noteworthy that women often underutilize healthcare facilities during the first trimester, as reported by Bakacak et al. (2014).In addition to haemoglobin levels, serum ferritin stands as a valuable measure of iron status, akin to its utility in assessing total serum cholesterol, as discussed by DePalma, Hayes & O'Leary (2021). These biomarkers collectively offer invaluable insights into the complexities of iron status and anaemia risk among pregnant women, thereby informing targeted interventions aimed at optimizing maternal and neonatal health outcomes.

Socio-economic factors such as family monthly income, education level and occupation have been linked to iron deficiency anaemia. There is a significant correlation between maternal anaemia and a woman's level of education. Women's literacy affects their use of antenatal care services. Well-educated women adopt healthier eating habits, are more likely to obtain well-paying jobs and thus have access to a nutritious diet, affecting their awareness and use of health services. Dietary practices such as dietary diversity, nutrition education, meat consumption and meal frequency are associated with anaemia (Barad et al., 2022).

2.2.6 Assessment of Dietary Practices and Dietary Diversity

The food frequency questionnaire is a concise list of foods (Dörsam et al., 2019). It has a place for participants to indicate how frequently they consume each food item during a given period (Dörsam et al., 2019). Regular food consumption is defined as at least three times per week, while irregular consumption is defined as consuming less than three times per week. One of the tools used to examine pregnant women's consumption of a variety of meals and to analyse their consumption of iron-rich foods a validated food frequency questionnaire (Lander et al., 2019). Comprehending the nutritional value of foods and the rationale behind their importance is paramount for instilling and sustaining healthy dietary behaviors, thereby fostering favorable health outcomes. Such awareness empowers individuals to make informed dietary decisions, guiding them away from practices that may compromise their overall well-being. Through a robust understanding of nutrition, individuals are equipped with the critical ability to discern the nutritional profiles of the foods they consume, thereby facilitating more conscientious dietary choices.

However, despite possessing this knowledge base, individuals' attitudes, beliefs, perceptions, and actual dietary selections may not consistently align with established nutritional principles, leading to disparities between nutritional knowledge and dietary practices. This incongruity underscores the complex interplay between cognitive understanding and behavioral enactment within the realm of dietary decision-making. Furthermore, it is pertinent to recognize the paucity of literature addressing the nature and efficacy of information dissemination and counseling pertaining to maternal nutrition during pregnancy (Kavle, J., & Landry, M., 2017). This critical gap in research underscores the importance of further exploration and evaluation of the informational needs and counseling interventions tailored to expectant mothers. Such endeavors are

essential for enhancing maternal and fetal health outcomes and promoting comprehensive maternal nutrition education initiatives.

A study conducted in Bangladesh, involving both pregnant and postpartum women, shed light on significant knowledge gaps concerning the consequences of malnutrition during pregnancy, alongside deficiencies in understanding the recommended quantity and types of foods essential for optimal maternal nutrition during this critical period (Salim & Begum, 2015). Similarly, investigations among pregnant women in India underscored a notable lack of awareness regarding key aspects such as anemia, the importance of iron-rich dietary sources, and the necessity of iron supplementation throughout pregnancy (NVidia K et al., 2016).

Furthermore, insights gleaned from a study in Marigat, Baringo County, Kenya, focusing on a cohort of 73 lactating mothers, revealed intriguing nuances in the relationship between nutritional knowledge, attitudes towards dietary practices, and actual behavioral outcomes. While there was a statistically significant positive correlation between nutritional knowledge and favorable attitudes towards nutrition, this alignment did not consistently translate into observable changes in actual nutrition-related practices (Bartunen, 2013). However, it's essential to acknowledge the potential limitations of these findings. For instance, the exclusive focus on lactating rather than pregnant women may influence the generalizability of the results, considering potential disparities in dietary decision-making between these two groups. Moreover, the distinct characteristics of Marigat, compared to other regions like Othaya, suggest that caution should be exercised in extrapolating findings, underscoring the imperative for context-specific research in diverse settings.

A study conducted in rural district Northern Ghana among pregnant mothers by Adjei-Banuah et al. (2021) found out that nutrition knowledge was the primary determinant of

consumption of foods rich in iron. The study conducted a 24-hour recall and findings reviewed those green vegetables (67.1%) and fish/ seafoods (70.6%). The study further indicated that only 9.1% of pregnant mothers were aware of beverages that inhibit iron absorption as only 22.4% of mothers consumed coffee/tea. However, a good number (78.2%) ate foods that boost iron absorption which included vitamin C-rich foods. Consumption of iron rich foods from animal sources was low predisposing pregnant women to risk of iron deficiency anemia (Adjei-Banuah et al., 2021).According to Young et al. (2018), consumption of iron rich foods depended on affordability and absorption of heme-iron is not much affected by other food components as compared to non-heme iron foods. Another study by Lane & Richardson (2014) stated that, foods rich in vitamin C such as fruits were recommendable during pregnancy as they boosted absorption and bio-availability of iron. These foods were commendable to be consumed along with meals or right after meals.

2.3 Summary of Literature Review and Gaps

The literature review underscores the persistent challenge of anemia among pregnant women on a global scale, with Kenya, including Narok County, being no exception. The multifaceted nature of the factors contributing to anemia necessitates a comprehensive, multi-sectoral approach to address this public health concern effectively. While existing literature has extensively examined the influence of dietary diversity on nutrient levels, there remains a notable dearth of information regarding its specific relationship with iron status among pregnant women in Narok County. This knowledge gap underscores the need for targeted research endeavors aimed at elucidating the intricate interplay between dietary diversity and iron status within this specific population group.

Given the critical role of dietary factors in shaping iron status, particularly during pregnancy, understanding how dietary diversity influences iron levels among pregnant

women in Narok County is paramount for informing evidence-based interventions aimed at mitigating anemia and optimizing maternal health outcomes. By bridging this gap in knowledge, future research endeavors can contribute invaluable insights towards the development of targeted strategies to address anemia and improve the overall well-being of pregnant women in Narok County and beyond.

During the delicate period of pregnancy, the significance of dietary diversity cannot be overstated, as its absence poses consequential ramifications for both maternal and infant health outcomes. Regrettably, access to nutritionally adequate diets remains a pervasive challenge, particularly among pregnant women residing in pastoralist communities situated in arid and semi-arid regions. Within these contexts, an over-reliance on milk products often translates to a dearth of essential fruits and vegetables in the maternal diet. Compounded by culturally ingrained dietary restrictions aimed at facilitating childbirth, pregnant women within these communities face heightened vulnerability to nutritional deficiencies, culminating in adverse birth outcomes such as low birth weight, with prevalence rates reportedly soaring as high as 13% among certain pastoral groups.

The augmented nutritional demands imposed by pregnancy render women uniquely susceptible to the specter of malnutrition, with ramifications extending far beyond the confines of the prenatal period to exert enduring influences on long-term health trajectories spanning childhood through adulthood. Consequently, elucidating the nuanced interplay between dietary diversity and iron status amidst a myriad of confounding variables emerges as an imperious imperative. Within this discourse, the attainment of adequate iron consumption assumes paramount importance in ensuring the maintenance of a healthy gestational trajectory. Indeed, diet diversification stands as a linchpin in determining the absorption dynamics of this vital micronutrient, with the

incorporation of both heme and non-heme iron sources pivotal in augmenting non-heme iron bioavailability, thereby bolstering maternal iron status.

Moreover, adherence to Iron and Folic Acid Supplementation (IFAS) protocols during pregnancy represents a cornerstone intervention in ameliorating maternal iron status and mitigating the risk of iron deficiency-related sequelae. By meticulously scrutinizing these multifaceted components encompassing dietary diversity and IFAS adherence, tailored interventions can be devised to optimize iron status among pregnant women, thereby engendering salutary maternal and neonatal health outcomes commensurate with the imperatives of academic rigor and evidence-based practice.

Maternal hemoglobin levels during the intricate journey of pregnancy stand as pivotal determinants of ensuing birth outcomes, reflecting the delicate interplay between maternal iron status and fetal development. These hemoglobin dynamics, subject to fluctuations across gestational stages, are intricately modulated by factors such as iron intake and supplementation. Of particular concern, hemoglobin levels below the clinically defined threshold of <11 g/dL signal compromised iron status, necessitating proactive intervention to avert adverse birth outcomes, notably low birth weight, particularly in instances of severe anemia during the early phases of pregnancy. In parallel, serum ferritin, a widely utilized marker of iron reserves, serves as a complementary tool alongside total serum cholesterol in delineating the intricate nuances of maternal iron status, thereby enriching our understanding of the physiological intricacies governing maternal-fetal health trajectories.

The specter of anemia looms large among pregnant cohorts, manifesting a significant association with gestational age, with discernible escalations in risk observed among third-trimester pregnancies vis-à-vis their first and second-trimester counterparts. Furthermore, the incidence of anemia exhibits a discernible correlation with the

cumulative burden of pregnancies experienced by women, underscoring the compounding impact of multiparity on maternal iron status. This multifaceted nexus between anemia prevalence, gestational age, and parity status underscores the imperative for nuanced, context-specific interventions aimed at mitigating the deleterious effects of anemia on maternal and neonatal health outcomes, thereby heralding an era of evidence-based practice rooted in academic rigor and clinical acumen.

2.4 Conceptual Framework

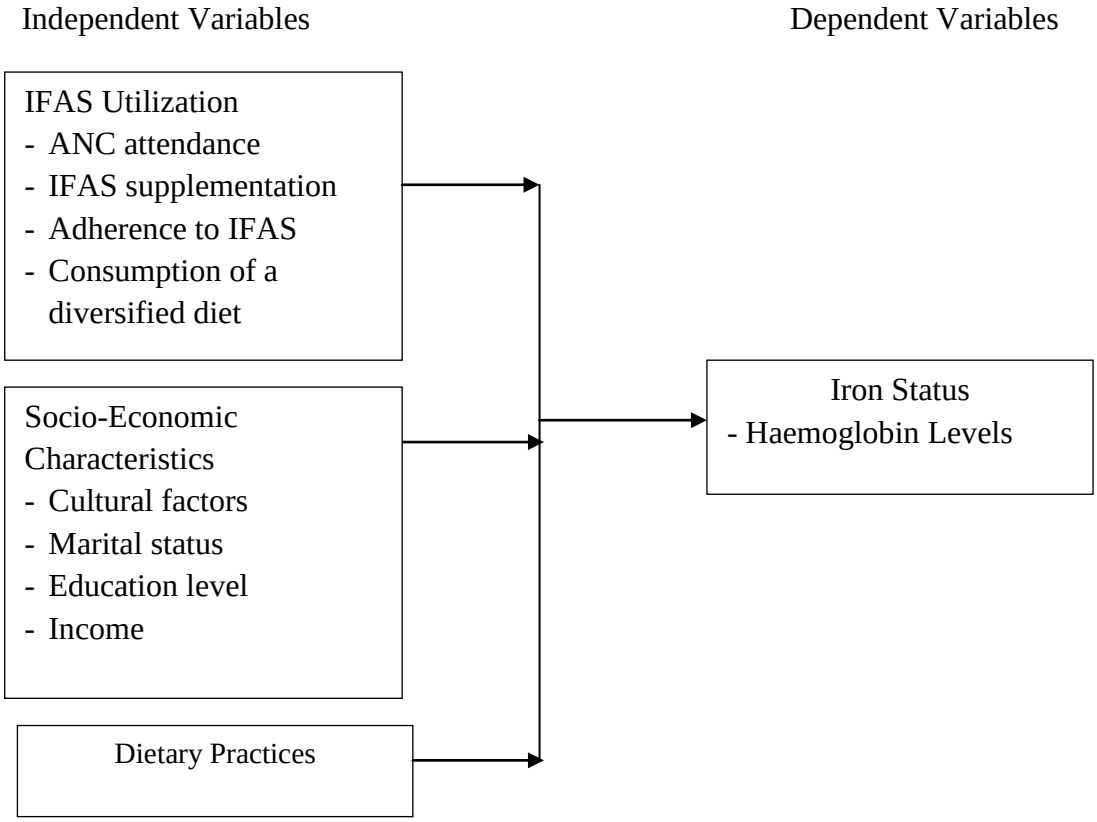
The intricate interplay between maternal health-seeking behavior and dietary diversity exerts a profound influence on the iron status of pregnant women, with ramifications extending across the spectrum of maternal and fetal health outcomes. While adequate iron intake is undoubtedly pivotal, its effective absorption and utilization may be compromised in the presence of concurrent illness, underscoring the multifactorial nature of iron homeostasis. Moreover, dietary diversity, emblematic of a balanced and nutritionally robust diet, serves as a linchpin in ensuring optimal nutrient intake, including iron. However, the attainment of dietary diversity is not an isolated phenomenon but is intricately intertwined with an array of socio-economic determinants, including educational attainment, income level, and cultural practices. These socio-economic factors, in conjunction with maternal health-seeking behavior, collectively shape the dietary choices and consumption patterns of pregnant women, thereby exerting a profound influence on their overall nutritional status.

Consequently, interventions aimed at ameliorating maternal iron status necessitate a comprehensive understanding of the intricate dynamics at play, encompassing not only dietary practices but also broader socio-economic contexts and health-seeking behaviors. By adopting a holistic approach that addresses the interwoven complexities of these factors, healthcare practitioners and policymakers can formulate targeted strategies to

enhance maternal nutrition and optimize health outcomes for both mothers and their offspring. Such endeavors, grounded in academic rigor and evidence-based practice, hold the promise of ushering in a new era of maternal health promotion, characterized by enhanced resilience and well-being across the perinatal continuum.

Figure 1

Conceptual Framework



Source: Adopted and modified from (Kodikara et al., 2005)

Socio-economic determinants, encompassing factors such as age, marital status, educational attainment, and income level, have emerged as significant predictors of dietary diversity among pregnant women. Extant literature consistently demonstrates that pregnant women with higher educational achievements are more inclined to adopt a diversified dietary pattern compared to their less educated counterparts. Similarly, a positive correlation has been observed between income levels and dietary practices, with

pregnant women hailing from affluent households exhibiting a greater propensity for dietary diversity relative to those from lower-income backgrounds.

Moreover, the multifaceted impact of dietary diversity extends beyond mere dietary habits to encompass broader ramifications on iron status and maternal nutrition during pregnancy. Pregnant women who adhere to a varied and balanced diet are more likely to maintain optimal iron levels and overall nutritional well-being throughout gestation, thus underscoring the intricate interplay between dietary practices and maternal health outcomes. Furthermore, the utilization of Iron and Folic Acid Supplementation (IFAS) among women of reproductive age is intricately intertwined with their health-seeking behavior. Positive health-seeking behaviors, including early initiation of Antenatal Care (ANC) visits, consistent adherence to IFAS supplementation regimens, and consumption of a diversified diet, have been empirically linked to enhanced iron status among pregnant mothers.

Importantly, the manifestation of health-seeking behavior is intricately linked to socio-economic characteristics. Maternal knowledge, a pivotal determinant of health-seeking behaviors, is notably influenced by socio-economic factors such as educational attainment, income level, and age. Higher levels of education, increased income, and advanced maternal age are frequently associated with augmented maternal knowledge, thereby fostering a proactive approach towards seeking and adhering to essential antenatal care services and dietary recommendations. This nuanced understanding of the socio-economic determinants of dietary diversity and health-seeking behaviors among pregnant women holds profound implications for the formulation of targeted interventions aimed at optimizing maternal and neonatal health outcomes.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design, study area, population of study, sample size, sampling techniques data collection procedures, ethical issues and data management protocols.

3.2 Research Design

This research adopted a cross-sectional analytical study design. The design focused on both quantitative and qualitative data. This design is justifiable as it was instrumental in describing the current status of the pregnant woman in terms of dietary diversity and iron status. Moreover, it enabled establishing the relationships and differences that exist between the study variables. Cross-sectional analytical study designs are considered appropriate where the aim was to describe the situation as it is (Portier et al., 2000).

3.3 Location of the Study

The study was conducted at Narok County Referral Hospital. This health facility is located in Narok town in Narok County, Kenya. Narok County is one of the 47 counties in Kenya. Narok County lies in the Southern part of the Rift Valley in Kenya. Narok is one of the arid and semi-arid counties in Kenya. According to areport by Houessou-Dossou et al. (2022), Narok County receives moderate to high rainfall of between 400 mm and 1800 mm annually. Its residents are mainly pastoralists though in the recent past they have embraced crop farming but to a small scale. However, there are large ranches of land used for wheat growing.

3.4. Population of the Study

The study population included all pregnant women in Narok County. The accessible population were all the pregnant women attending the antenatal clinic (ANC) in Narok County Referral Hospital.The inclusion criteria for study subjects included pregnant women (15-49 years) attending the antenatal clinicNarok County Referral Hospital. About 70% of women in Narok County practice hospital deliveries (KDHS, 2022). The focus was on pregnant women who were willing to participate in the study.Pregnant women with reported chronic illness, were excluded from the study. In addition, this study excluded the pregnant mothers who were above 49 years and those who declined to consent to participate.

3.5 Sampling Procedure and Sample Size

3.5.1 Sample Size Determination

To determine the sample size, the formula of Fisher et al. (1998) as quoted in Mugenda and Mugenda was used. Provided a referenced prevalence rate as the value of P.

Fisher *et al.*, formula was used to determine the sample size: $\mathbf{N=Z^2pq/\ d^2}$

Where:

N – it is the population sample

Z – it is the standard normal deviation which corresponds 95% confidence level (1.96)

p – it is the proportion of pregnant women who are anemic atNarok County Referral Hospital (it is 55%) = 0.55 (Odhiambo & Sartorius, 2020).

q- (1- p)= 0.45

d = 0.05 (statistically tolerated error)

N= 1.96^2 x 0.55 x 0.45 / 0.05^2 = 275

The population of pregnant women who were anemic were less than 10,000 (Source), and thus the sample was adjusted as follows:

Adjusted sample:

(nf) = n/1+n/N

Where:

n=275 (calculated sample size)

N=450 (The average number of pregnant women attending antenatal clinic Narok County Referral Hospital) (Muvengei, Karanja & Wanzala, 2021).

nf= 384/ 1+275/450 = 175

10% of the sample was added to cater for non-response. Thus,175+10% non-response=175+17=192. Thus, the study adopted a sample of 192 pregnant mothers.

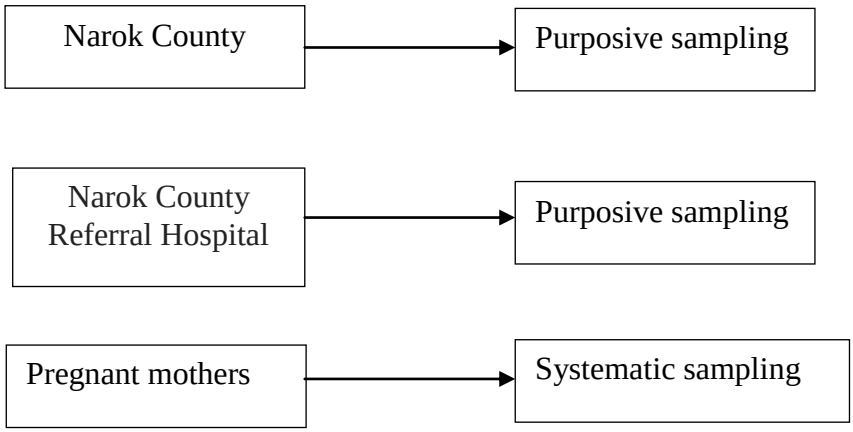
Key informant interviews were used to collect the qualitative data. Key informants ’interviews were conducted between a Nurse in MCH, a Nutritionist and one Community Health Volunteer.

3.5.2 Sampling Procedure

Narok County and Narok County Referral Hospital were purposively selected as it was the only referral hospital in Narok County. From the hospital records all the pregnant women attending antenatal clinics were identified. Systematic sampling was adopted to randomly select the desired sample from the list of pregnant mothers in the hospital records. The total number was divided by the number of respondents required (450/192=2). 2 is the nth term. By use of table of random numbers, the beginning point pregnant woman was established which was 6.Then every 2nd term was taken until the total sampled size of 192 was achieved.

Figure 2

Sampling Procedure for Pregnant Mothers at Narok County Referral Hospital



3.6 Instrumentation

A researcher administered questionnaire was used to collect quantitative data from the pregnant women. The questionnaire had four sections; section one for demographic and socio-economic characteristics, section two for dietary diversity, section three for nutrition status and section four for hemoglobin levels of pregnant women attending antenatal clinic. Key Informants Interviews (KIIs) were conducted for a nurse, Community Health Volunteer (CHV) and a Nutritionist (Appendix 3). It was used to collect additional information to explain some outcomes of the quantitative data. The data collection tools were translated during the interviews.

3.6.1 Pilot Study

A pre-test was carried out at Trans Mara West Sub-County Hospital. This was on a sample size of 10% of the sample, which translates to 24 respondents. The pre-test sample was taken through the data questionnaire. Any gap arising from the tools was identified and adjusted accordingly to improve on the validity and reliability of the tool.

3.6.2 Validity of the Study Instrument

The data collection tool was assessed for the validity. A team of nutrition experts were used to analyse the content of the tool. This was with an intention to assess if the tool was collecting only the information required. It ensured that no needed information was left out as well as no unnecessary information was collected.

3.6.3 Reliability of the Study Instrument

Cronbach alpha was used to establish the reliability of the questionnaire (Cronbach, 1951; Tavakol & Dennick, 2011). This was to test if the tool would collect the same information if repeated twice on the same respondent and on different respondents. Repeated tests and adjustments were done to ensure that the tools achieve a Cronbach alpha of >0.7. The tools were adjusted appropriately.

3.7 Data Collection Procedure

The data collection tools were administered to the target population. A24- hour recall was used to collect data on dietary diversity. To calculate the dietary diversity scores of the study respondents, guidance provided by FAO on measuring minimum dietary diversity score for women (FAO, 2013) was applied. The score was generated by computing the number of food groups consumed by the study respondents in the past 24 hours prior to the survey. The individual foods consumed by the study respondents were aggregated into groups and one point was awarded to each food group consumed over the reference period. The sum of all points was calculated for the dietary diversity score for individual study respondent categorized into three including low, medium, and high dietary diversity scores. A low score was assigned when the study respondent consumed less than three groups of foods, medium score when they consumed four to five groups and high dietary diversity scores when they consumed six or more groups. It should be

noted that the individual dietary diversity score as per FAO, (2013) guideline included only 9 food groups.

Food frequency questionnaire (FFQ) was used to assess the frequency of consumption of various foods especially iron rich foods. A list of foods based on food groups were generated. The respondents were required to indicate how often the foods are consumed. The iron status was assessed using haemoglobin (HB) concentration. The recommended laboratory procedures were used. This include obtaining blood through finger prick. 5ml of bloodsample was collected in a dust and light-free environment. Coolants were availed for the temporary storage of drawn blood samples. They were placed immediately into insulated coolers containing ice/cold packs at around 4^{o}c. The samples were then centrifuged at 2000rpm within 30 minutes to separate the serum from the clot.Serum was aliquoted and transferred into sterile cryo-vials.They were then labelled with codes allocated to each participant for proper identification. The blood sample was used for haemoglobin analysis which was analysed by use of HemoCue B-Haemoglobin analyser. Results were classified as haemoglobin<11.0 as Anaemic while > 11.0g/d as normal haemoglobin (Hendriks et al., 2020).

Key informants were selected purposively from the ANC (Nurse, nutritionist and community health volunteers), where three in each cadre were selected because they have first-hand encounter with mothers receiving IFAS. The qualitative data was organized, coded, combined into themes and combine similar themes in a cohesive manner. Data collectors were well trained in addition. All of the tools were translated during interview. Data collection was monitored continually. At the end of each data collection day, tools were checked for any inconsistency. Training of research assistants was done on three selected Nutritionists with at least a Diploma in Nutrition who were recruited to participate in the study. The research assistants were trained on the purpose

of the study and how to complete the questionnaires. The enumerators were trained on objectives of the study, how to administer the questionnaire and KIIs as well as ethical issues. After training, practical and role-plays on interview skills and taking anthropometrical data were undertaken. The data was kept in the directorate of research office Kabarak University to be used for further learning.

3.8 Data Analysis and Presentation

Quantitative data was cleaned and analysed by use of Statistical Package for Social Sciences (SPSS) software Version 24. The data was described using descriptive statistics like frequency, percentages and mean. Inferential statistics was used like Chi square and Pearson correlation were used to show the association between categorical and non-categorical variables, respectively. Nutri-survey Software (2007) was used to calculate daily energy and nutrient intake. Linear regression was used to determine relationships between independent and dependent variables.

Odds ratio was used to determine the proportion iron status that is influenced by the dietary diversity. P values of <0.05 was considered statistically significant. For qualitative data from KII, the data was transcribed, coded and analysed to bring out the emerging themes.

Table 1

Data Analyses Methods

Objective	Variables to be Measured	Specific Analyses
To determine dietary diversity among pregnant women attending antenatal clinic at Narok County Referral Hospital	-Dietary diversity	-Mean, frequency, percentages
To assess nutrition status among pregnant women attending antenatal clinic at Narok County Referral Hospital	-Nutrition status -Hemoglobin levels	-Mean, frequency, percentages
To assess hemoglobin levels of pregnant women attending antenatal clinic at Narok County Referral Hospital	-Nutrition status -Hemoglobin levels	-Mean, frequency, percentages
To establish the association between dietary diversity, hemoglobin levels and nutritional status among women attending Narok County Referral Hospital	-Dietary diversity -Nutrition status - Hemoglobin levels	-Chi- square - Pearson correlation - Logistical regression -Odds ratio

3.9 Ethical Considerations

Research permit was obtained from the Ethical Review Committee of Kabarak University. This was after approval by Kabarak University Graduate School. A permit from the National Commission for Science, Technology and Innovation (NACOSTI) was also obtained. The permit to conduct the research was sought from the management of

Narok County Referral Hospital. Informed written, signed or thumb printed consent was sought, and confidentiality of the data collected was assured by using codes rather than names. For those below 18 years assent was derived from the parents. Respondents were allowed voluntarily to agree to participate in the study before the interviews were conducted. The collected data was collected by use of initials and was kept confidential. The study also ensured that the data collection team were well protected.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the findings and interpretations of the data collected in line with the objectives.

4.2 Response Rate

Out of the 192 targeted respondents, 92.7% (178) responded to the study. The number of pregnant women who responded to the study were 178 out of 192 which formed 92.7% response rate.

4.2 Demographic Characteristics

4.2.1 General Demographics

The study found out that majority of the respondents (44.4%) were aged between 18-24 years with 12.4% of the respondents who were below 18 years. It was also noted that a relatively high percentage 36% were in the age category of 25-34 years. Majority (43.3%) of the respondents were Catholics, 37.6% Protestants, 7.3% Muslim and 11.8% were Traditional believers. More than two thirds (71.3%) of respondents were married, 2.2% and 1.7% were separated/Divorced and Widowed respectively.

> "*Due to school drop-outs there is increased early pregnancies and early marriages of our young children."* (Community Health Worker Chief-KII, Narok Town Ward)

Table 2

Demographic Characteristics of Pregnant Women in Narok County

Variable	Characteristics	n (178)	%
Age	< 18 years	23	12.9
	18-24	79	44.4
	25-34	64	36.0
	>39	12	6.7
Ethnicity	Maasai	102	57.3
	Kalenjin	32	18.0
	Kisii	16	9.0
	kikuyu	12	6.7
	Somali	9	5.1
	Others (Turkana, Kamba)	7	3.9
Religion	Protestant	67	37.6
	Catholic	77	43.3
	Muslim	13	7.3
	Traditional beliefs	21	11.8
Marital status	Married	127	71.3
	Separated/ Divorced	4	2.2
	Single	44	24.7
	Widowed	3	1.7

4.2.2 Socio-Economic Characteristics

The highest education level attained by majority (38.8%) was primary. Few 14% and 9.6% had college and university education respectively. Only 5.1% had no formal education. Slightly more than half (52.2%) of the respondents were in small business enterprises, 21.9% casual labourers and only 3.4% were pastoralist.

Table 3

Socio-Economic Characteristics of the Pregnant Women in Narok County

Variable	Characteristics	n (178)	%
Education level	Primary	69	38.8
	Secondary	58	32.6
	College	25	14.0
	University	17	9.6
	None	9	5.1
Occupation	Formal employment	18	10.1
	Casual labor	39	21.9
	Small Business	93	52.2
	Farming	22	12.4
	Pastoralism	6	3.4
Number of children	0	27	15.2
	1	48	27.0
	2	61	34.3
	3	23	12.9
	4	8	4.5
	5	6	3.4
	>6	5	2.8

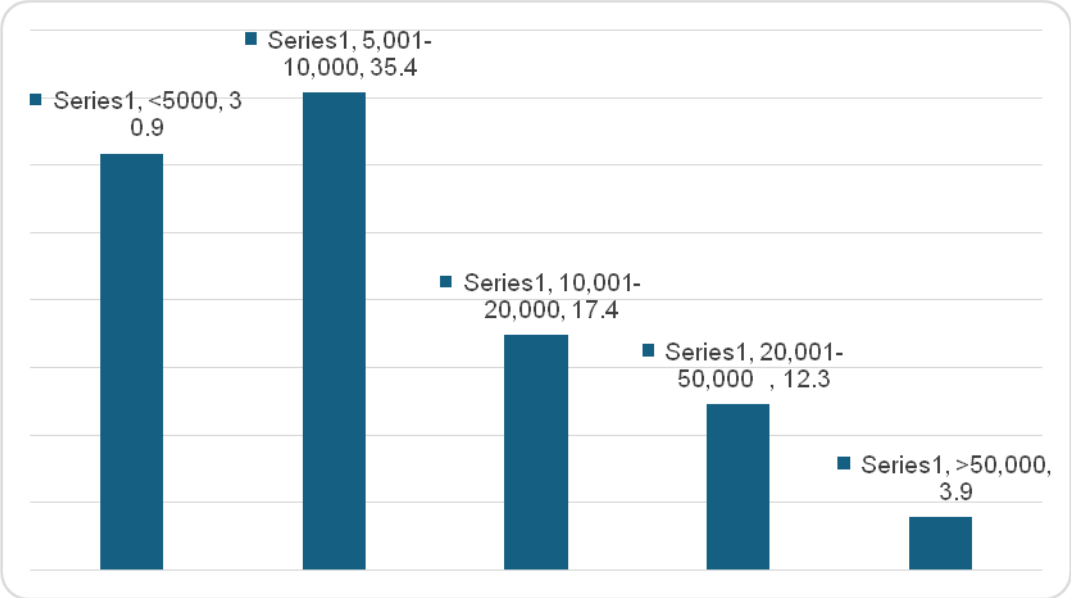
About 35.4% of respondents reported to earn a monthly income between Kshs. 5000-10,000 while 30.9% lived below Kshs 5000 average monthly income. Only 3.9% of the respondents earned an average monthly income of above 50,000 Kenyan shillings.

"***Some pregnant women live in slums with low income."*** **(Respondent-Narok*).***

Majority (34.3%) of respondents had 2 children, 15.2% had no child and 2.8% had more than 6 children.

Figure 3

Household Income among Pregnant Women in Narok County



4.2.3 Reproductive Health Characteristics

About 41% of study participants were between 13-24 gestational weeks, 21.3% were 12 weeks and below and only 9% of respondents were above 37 gestational weeks. In addition, 46.6% of study participants reported to first attend ANC when they were above 4 months of pregnancy. This was followed by those who first attended ANC at their 3-4 months pregnancy and very few (5.1%) who first attended when they were 0-2 months pregnant. Pregnant mothers were asked about their parity, 25.3% of respondents had 4 live births whereas 12.9% had given birth 2 and 5 times. Only 9.6% had not given birth.

> "*Most of the pregnant mothers come for Antenatal clinics in their second and third trimester and some after the first visit they only come again when in labour."* (Nurse-KII Narok Referral).

Table 4

Reproductive Health Characteristics among Pregnant Women in Narok County

Variable	Characteristics	n (178)	%
Gestational weeks	0-12 weeks	38	21.3
	13-24 weeks	73	41.0
	25-36 weeks	51	28.7
	>37weeks	16	9.0
When first	0-2 Months	9	5.1
attended ANC 1	2-3Months	21	11.8
	3-4Months	65	36.5
	Above 4months	83	46.6
Parity	0	17	9.6
	1	27	15.2
	2	23	12.9
	3	31	17.4
	4	45	25.3
	5	23	12.9
	>6	12	6.7

4.3 Dietary Practices among Women Attending Antenatal Clinic

4.3.1 Number of Meals and Nutrient Intake

The study revealed that majority (68%) of pregnant women had consumed four meals. A very low percentage of pregnant mothers (6.2%) had taken two and five meals. It was notable that a higher percentage (69.1%) of the respondents had adequate kilocalories of 2200 and above. In addition, 40.4% met the RDA for iron which is 30mg per day.

Table 5

Number of Meals and Nutrient Intake among Pregnant Women in Narok County

Variable	Characteristics		n (178)	%
Number of meals	2		11	6.2
	3		35	19.7
	4		121	68.0
	5		11	6.2
Kcal	<2200	Inadequate	55	30.9
	2200-2500	Adequate	123	69.1
Iron	<30 mg	Inadequate	106	59.6
	30 mg	Adequate	72	40.4

4.3.2 Minimum Dietary Diversity Score

From the findings, dietary diversity score was poorly achieved, since only 10.7% had met a high MDD score.

Table 6

Minimum Dietary Diversity Score

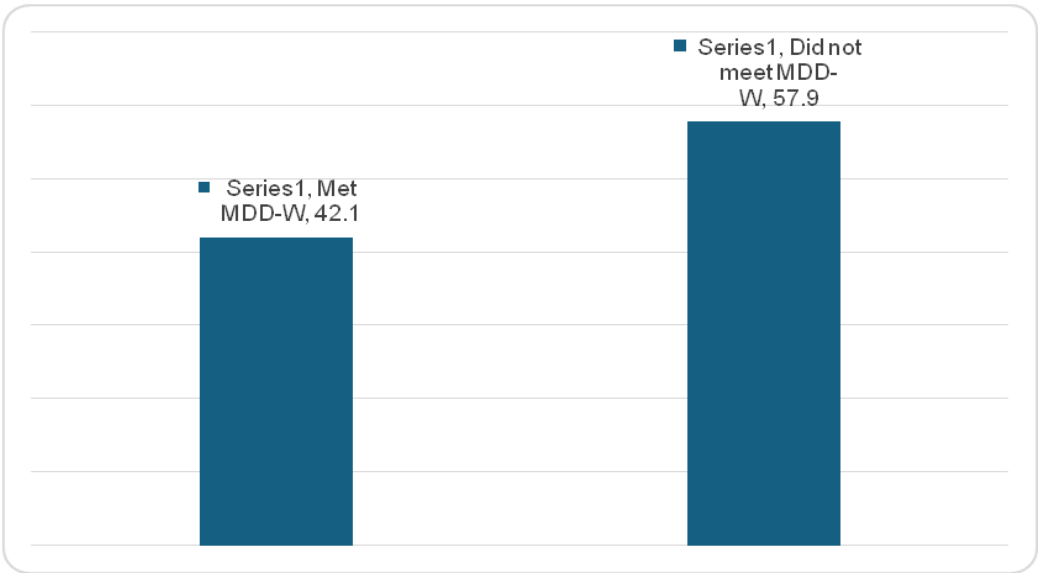
MDD-W	N (178)	%
Low	124	69.7
Moderate	35	19.7
High	19	10.7
Total	178	100

For minimum dietary diversity, 57.9% of pregnant women did not meet the minimum women dietary diversity score. This was for the reason that some women eat less so that they don't undergo caesarean during delivery.

> "*I eat the three meals and a snack only when it is available."* (Respondent-Narok).
>
> "*When we assess the dietary practices of the pregnant mothers, majority report to consume foods from a limited food groups based on availability and affordability. Foods from specific food groups are totally left out due to cultural taboos that limit consumption of certain foods during pregnancy*." (KII-Nutritionist Narok Hospital).

Figure 4

Minimum Dietary Diversity among Pregnant Women in Narok County



MDD-W-Minimum dietary diversity for women.

4.4.3 Food Groups Consumed by Women Attending Antenatal Clinic

Ten food groups were listed to observe the consumption rate. Starch (90.4%) and oils (87.6%) were consumed by the majority of the respondent. Legumes (79.8%) and milk/ milk products (75.3%) were also well consumed. Nuts and root tubers were poorly consumed by only 15.2% and 24.2%, respectively. Thus the mostly consumed food groups were cereals, legumes and milk/milk products.

Table 7

Food Groups Consumed

Food groups	N (178)	%
Starch/ cereals	161	90.4
Legumes	142	79.8
Milk & milk products	134	75.3
Vegetables	107	60.1
Fruits	73	41.0
Meat & meat products	93	52.2
Root tubers	43	24.2
Nuts	27	15.2
Oils	156	87.6
Sugars	124	69.7

4.4.4 Consumption of Iron Rich Foods

Most pregnant women consumed of iron rich foods. Legumes took the lead in consumption rate where 79.8% of the respondents had consumed. Meat and dark green vegetables were consumed by more than half of the respondents with 64.6% and 54.5% reporting, respectively. Nuts and seeds had low consumption as represented by 13.5%.

Table 8

Consumption of Iron Rich Foods among Women

	N (178)	**%**
Liver	71	39.9
Eggs	86	48.3
Meat e.g. red meat and organ meats	115	64.6
Nuts and seeds e.g. pumpkin seeds	24	13.5
Dark green vegetables e.g spinach	97	54.5
Legumes e.g. soy beans, peas, lentils	142	79.8

4.4.5 Consumption Iron Fortified Foods

Fortified flours, rice and salt were the commonly reported iron fortified foods consumed by pregnant women. Fortified flours were highly consumed by 87.6% of pregnant women.

Table 9

Iron Fortified Foods

	N (178)	%
Fortified flours e.g. wheat flour, maize flour	156	87.6
Rice	142	79.8
Salt	123	69.1

4.4.6 Consumption of Foods with Anti-Nutrients

Tea was commonly consumed by majority of the respondents (88.8%). Other anti-nutrients consumed were coffee and cocoa.

Table 10

Consumption of Foods with Anti-Nutrients

	N (178)	%
Coffee	133	74.7
Tea	158	88.8
Cocoa	81	45.5

4.5 Iron and Foliate Supplementation Status among Pregnant Women

More than half (68.5%) of the respondents were under IFAS Iron Folic Acid supplementation while 31.5% reported not to take IFAS. Only 13.5% of respondents had adhered well to intake of IFAS in the past week. However, majority (79.5%) reported to get IFAS from a public health facility with only 9% of respondents who bought from pharmacy.

> *"When we go rounds giving the IFAS most of the pregnant mothers say they don't take them because the drugs give them heartburn."* **(**KII-CHV Narok).

Table 11

IFAS Status among Pregnant Women in Narok County

Variable	Characteristics	n (178)	%
Are you currently taking IFAS?	Yes	122	68.5
	No	56	31.5
If yes, what is the compliance in	< 400 mg	154	86.5
the past week (7days)?	>400 mg	24	13.5
What is your source of IFAS?	Public health facility	97	79.5
	Pharmacy	11	9.0
	Private facility	14	11.5

4.6 Iron Status among Pregnant Women

The study noted that slightly half (52.2%) of respondents had low haemoglobin levels of below 12g/dl. A significant number (41.6%) of pregnant women had a normal haemoglobin level of between 12-16g/dl with a mean of 11.75±1.35.

> **"***Anaemia cases in pregnancy are there but the rate is declining as we are conducting many medical outreaches and pregnant mothers are among our target group."* (Nurse-KII Narok).

Table 12

Iron Status among Pregnant Women in Narok County

Variable	Characteristics	N	%
Hemoglobin levels g/dl	< 12 g/dl	93	52.2
	12-16 g/dl	74	41.6
	>16 g/dl	11	6.2
	Mean =11.75±1.35		
	Total	178	100

4.7 Association between Dietary Practices, IFAS Supplementation and Iron Status among Pregnant Women

There was a significant relationship (p= 0.001) between the number of meals consumed by pregnant women and their minimum dietary diversity for women. There was a significant association (p= 0.003) between education level and dietary diversity practice during pregnancy as a woman with high education level is believed to be knowledgeable about nutrition information hence likely to practice a diversified diet. Income was also associated significantly(p= 0.0234) with dietary diversified practice during pregnancy. A pregnant woman from a household with high wealth index was more likely to practice dietary diversity food compared to poor household. IFAS intake and its adherence had a direct positive significant association (p= 0.035) with the iron status of the pregnant

mother. This was also influenced by the gestation period including how early a pregnant woman visits antenatal clinics. The study did not find a significant association (p>0.05) between marital status and pregnant mother occupation with their iron status.

Table 13

Relationship between Study Variables and Iron Status Levels among Pregnant Women in Narok County

	Variable	P- Value
Hemoglobin levels	MDD-W	0.001*
	Number of meals	0.021*
	IFAS intake	0.035*
	Marital status	0.0674
	Gestation period	0.026*
	Parity	0.127
	Number of children	0.0942
	Number of children	0.0942
	Income	0.0234*
	Education level	0.003*

* Shows significant relationship

Women who met the dietary diversity score were 2.1 (OR=2.1) times more likely to have the recommended iron status than those who were not. Women who took iron folic acid supplementation utilization as recommended were 1.9 (OR=1.9) times more likely to have the recommended iron status than those who were not.

Table 14

Association between Variables

	Variable	OR	P values
Iron status	Dietary diversity score	2.1	0.001*
	Iron folic acid supplementation utilization	1.9	0.034*

* Shows Significant Relationship

4.8 Discussion of the Major Findings

4.8.1 General Demographic Findings

This study sought to assess dietary practices, IFAS supplementation and iron statusamong pregnant women attending antenatal clinic at Narok County Referral Hospital. Socio-economic status is associated with the dietary practices and nutrition status of the pregnant women. This contributes even to utilization of maternal nutrition services. According to Moldoon et al. (2011) pregnant mothers from wealthy households are more likely to access and use nutrition services than those from poor households. This was due to low priority given to health-seeking behaviour as compared to other daily basic needs, less formal education and unemployed status.

Education level determines the dietary intake of the pregnant mothers. Lack of inadequate knowledge on proper dieting during pregnancy may pose a high risk to pregnant or lactating women, thus predisposing poor growth to growing foetus leading to poor nutrition of children born to mothers (Okeyo et al., 2019). From our study findings the highest education level attained was primary education with few who had attained college and university level. This implies that there was low level of education. This was similar to a study conducted in Narok by Okeyo et al. (2019) which found that most of the pregnant adolescents had stopped going to school (30.3%) while 27.9% had completed primary school and only 9.2% were ongoing in tertiary level. In contrast, Kiboi, Kimiywe & Chege (2017) study found that (52%) of the respondents reported secondary education as their highest level of education.

Age is also a determinant in pregnancy. From our findings, majority 4.4% of the pregnant mothers were aged between 18-24 years followed by those who were in the age category of 25-34 years of age. This was comparable with a study by Kamau et al. (2019, which found that the youngest and the oldest mother were 16 and 49 years. Most of the

pregnant mothers were married. This was consisted with a study in Laikipia which reviewed that 89% of pregnant mothers were married (Kiboi, Kimiywe & Chege,2017); Kamau et al. (2019).Most of the pregnant women in our study were business women operating in small businesses but earning a monthly average of below 10,000. Contrary to this finding, Kiboi, Kimiywe & Chege(2017) study in Laikipia noted that about 40% of the household heads were in formal salaried employment. The study further indicated that most households had a monthly income of below Ksh 10,000 which was similar to our study findings.

In this study most, women had given birth to four live births which was inconsistent with Kiboi, Kimiywe & Chege (2017) study which indicated that the mean parity of the women was 2 children, with most mothers being primiparous. From our findings most women were in their 13-24 gestational weeks and first attended ANC clinics as from 4 months of pregnancy. This was consisted with the study in Laikipia which noted that (54%) of the pregnant women were in their second trimester at the time of examination (Kiboi, Kimiywe & Chege,2017). Our study also reviewed that most of the pregnant mothers were Christians with a very few percentages (1.1%) who were Atheist. This is similar to a study by Okeyo et al. (2019) which found that pregnant adolescents reported that 95.0% were Christians.

4.8.2 Dietary Practices among Pregnant Women

Dietary diversity is an intake of adequate foods from a variety of food groups for optimal health. During pregnancy there is increased nutritional needs, thus a pregnant mother is required to consume a diverse diet so as to meet the nutritional requirements. A nutritious diet comprising of macro and micronutrients is essential in this period. Optimal nutrition becomes essential to attain full growth potential for the foetus and the health of the mother. Adequate nutrition is imperative to meet the added demands of

nutrients for the growing foetus, mother's body and instils a strong biological basis for the present and coming health, productivity and well-being of the mother (Catalano et al., 2012). Nutritional deficiency at this formative stage of life can be detrimental to the individual's future health and even the offspring. Pregnant women are therefore advised to consume an optimally nutritious diet to reduce chances of deficiencies such as vitamin A deficiency which is susceptible during the third trimester (Okeyo et al., 2019). Therefore, dietary diversity intake meets requirements of minerals and vitamins of a pregnant woman and the growing of the foetus. According to Tolera, Mideksa & Dida (2018), Age, family size, education, occupation, monthly income and dietary knowledge affects the dietary practices of pregnant women. Globally, 99% of maternal deaths, most of them were related with inadequate food diversity intake and poor nutrition. Thus, inadequate dietary diversity intake among pregnant women leads to poor foetus development, and increases pregnancy related complications (Wu, Imhoff-Kunsch & Girard, 2012).

From the study the pregnant mothers had a low dietary diversity as majority had consumed four meals with a few who had taken two and five meals. This implies that most people had not consumed foods from various food groups. A study in Samburu County reported low dietary diversity among pastoralists (Lannotti & Lesorogol, 2014). Majority lived with a monthly of 5000-10,000 monthly income, with a good number who earned an average of 5000 or less. This translated to poverty in the households. According to Choudhary et al. (2010) poor people often face difficulties in accessing a diversified diet. This was similar to a study by Okeyo et al. (2019) which found that most of the pregnant mothers did not meet the minimum number of food groups (at least 4 groups) to reach the medium diet diversity.

According to Workicho et al. (2011) study, lack of maternal knowledge led to poor eating practices of the pregnant adolescents thus iron deficiency anaemia with concomitant episodes of micronutrient deficiencies that undesirably affects the health of the developing foetus. Their eating behaviours were inclined to factors such as personal and cultural beliefs, perceptions, peer influences, food preferences, media and cost of food.

From the study findings most of the pregnant women had primary level education with few who had college and university education level. There were also others who had no formal education. This implies that the mothers had low education status. This was similar to a study in Ethiopia by Jemal & Awol (2019) which found out that pregnant women who can read and write were 82% more likely to consumed diversified food than who cannot read and write. This was also supported by another study in Ethiopia which reviewed that pregnant woman who are educated primary school and above were 2.11 times more likely to eat dietary diversity food compared to no educated women. The study was also consisted with a study by Kiboi, Kimiywe & Chege (2017) which showed that more educated woman was 2.78 (95% times consumed minimum dietary diversity food than non-educated woman. Another study noted that pregnant women who had primary and above educated husband had no statistically significant practice of diversified dietary food consumption during pregnancy (Aliwo et al., 2019).

In this study majority had 2 children in the household. This translated to a family size of roughly 4. On the other hand, another study found that a household which had more than five family sizes is positively associated with diversified food practice (Desta et al., 2019).According to Tefera, Brhanie & Dereje (2020) a pregnant woman who had nutritional information was 4.1 times more likely practiced diversified food compared with a woman who had no nutritional information.

Demilew, Alene & Belachew (2020) study, noted that a pregnant woman who had good knowledge about dietary diversity food consumption was 3.4 times more likely to experienced diversified food than who had no knowledge. When pregnant mothers have information and knowledge on nutritional diversity, they have a chance to understand the benefits of consuming diversified food during pregnancy for their own babies' health.

Similar to our study, Aliwo et al. (2019) study found that a pregnant woman from a household with high wealth index was more likely to practice dietary diversity food compared to poor household. This was supported by a study in Kenya which found that a woman who belongs in high income household is 2.08 time more likely to consume a variety of food groups (Kiboi, Kimiywe & Chege, 2017). This was further explained by Desyibelew & Dadi (2019) and Nkurumwa, Mwangi & Kathuri (2010), which said that rich households have access to variety of foods in the household and hence a positive contribution diversified food consumption. In addition, Saaka (2013) study in Northern Ghana indicated that household wealth index was a major determinant of maternal dietary diversity. Similarly, a study in Bangladesh found that land ownership positively influenced women dietary diversity (Harris-Fry, 2015).

4.8.3 Iron Status among Pregnant Women

Iron Folic acid supplementation (IFAS) is one of the nutrition interventions given to pregnant women in order to reduce incident of anaemia in mother and low birth weight in neonates. Alongside IFAS, quality adequate nutritious diet is enhanced for the well-being of both the mother and the developing foetus (Imdad & Bhutta, 2012). From our study most of pregnant women had a low haemoglobin level. According to Woldeamanuel et al. (2019) mothers with lower haemoglobin level during pregnancy had an increased risk of delivering LBW babies. Low haemoglobin levels lead to abnormal placental angiogenic development, thus limited oxygen to the foetus hence

causing potential intrauterine growth and LBW (Figueiredo et al., 2018). Similar to this, another study by Verma & Shrivastava. (2016) indicated that anaemia during pregnancy was associated with a significantly increased risk of LBW. Nearly half of the pregnant women in the world are anaemic reason for recommendation for Iron supplementation during pregnancy.

However, major challenge to iron supplementation is compliance as most pregnant women present poor adherence to IFAS intake due to its side-effects and women's lack of awareness. Other studies have showed that women in higher socio-demographic groups had lower compliance to iron because they believed that they had an adequate diet. Although iron supplementation is an inexpensive and effective way of increasing haemoglobin levels, anaemia during pregnancy is still a major problem in developing countries (Mithra et al., 2014).

4.8.4 IFAS Supplementation among Pregnant Women

In this study most, pregnant women had taken 5 tablets of IFAS in a week. This indicated a gap in total adherence to the iron supplement. Similarly, to a study in Tanzania only 12.1% of pregnant women were reported to be “fully compliant, and the prevalence of anaemia among these women was high at 23.7%. On the other hand, initiating ANC in the 2nd or 3rd trimester and lower or no formal education were significantly associated with poor compliance (Konje et al., 2022). According to Oh, Keats & Butta (2020), adherence to iron supplements reduces the burden of anaemia. Owais et al. (2021) highlighted that persisting burden of anaemia is due to the physiological demands of pregnancy across trimesters. In addition, Young (2018) reviewed that anaemic women are more likely to experience detrimental outcomes during delivery and post-delivery poor compliance to the anaemia-preventive strategies

such as use of IFAS associated with late attendance to ANC and low education level. This is also seen in our study findings where most pregnant mothers attended first ANC clinic when they were above four months of pregnancy. This is also supported by a study in Tanzania where only 24% of pregnant women attending ANC clinics before the 24th week of their pregnancy (MOH, 2016). Initiation of ANC in the second or third trimester, however, could affect the health of the mother and the unborn baby, as prenatal conditions of concern may not be identified early (Arunda, Emmelin & Asamoah, 2017).

4.8.5 Association between Dietary Practices, IFAS Supplementation and Iron Status among Women

In regards to socio-demographics, our study found no significant association between marital status and occupation of the pregnant women with their dietary diversity and nutrition status during pregnancy. This was supported by Kiboi, Kimiywe & Chege (2017) study in Laikipia which did not find any statistically significant association. In contrast, Taruvinga, Muchenje & Mushunje (2013) study found an association between dietary diversity and demographic factors.

Another study conducted in Ethiopia found that association between primary school educated women with dietary diversity during pregnancy was insignificant. It was also found that the association between a husband who can read and writes with dietary diversity during pregnancy was statistically insignificant (Yeneabat et al., 2019). According to Desta et al. (2019) a woman who had more than five family members size were positively associated with diversified food practice. Thus, dietary diversity practice during pregnancy was not statistically associated with family size. This was comparable with our study which found out that number of children had no significant relationship with dietary diversity during pregnancy. Further studies showed a significant association between nutritional information and dietary diversity practice during pregnancy as a

woman who had nutritional information was 4.1 times more likely to practice diversified food regime compared with a woman who had no nutritional information.

Demilew, Alene & Belachew (2020) found a statistically significant association between dietary diversity food knowledge and dietary diversity practice. A woman who had good knowledge about dietary diversity food consumption was 3.4 times more likely to experience diversified food than one who had no knowledge. Tolera, Mideksa & Dida (2018) indicated that income was not statistically associated with dietary diversity practice during pregnancy. This was inconsistent with our study findings that found a significant relationship between income and dietary diversity during pregnancy. Aliwo et al. (2019) study found that a pregnant woman from a household with high wealth index was more likely to practice dietary diversity food compared to poor household. The study also noted that a pregnant woman from a household with medium wealth index was not associated with dietary diversity practice compared to poor household. Similarly, Harris-Fry(2015) found significant association between relative wealth, land ownership, livestock ownership and women dietary diversity in Bangladesh.

Parity is associated with birth weight of the baby and primiparous mother had a higher risk of delivering LBW babies. From our study most, mothers had four live births but parity had no significant relationship with the dietary diversity, haemoglobin levels and nutrition status of the pregnant mother. Amosu & Degun (2014) study found that primiparous mothers were shown to be at risk of delivering LBW babies. This study is supported by another study which revealed that physiological changes that occur during the first pregnancy increase uterine efficiency in the subsequent pregnancy. Moreover, lower birth weight among first-born infants could be a consequence of biological immaturity as compared to later-born infants (Hinkle et al., 2014).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the themes generated in detail, makes a conclusion and gives recommendations based on the findings.

5.2 Summary of the Major findings

The purpose of this study was to assess dietary practices, IFAS supplementation and iron status of pregnant women attending Narok County Referral Hospital. This chapter presents the findings of the study in relation to the objectives.

5.2.1 Dietary Practices among Pregnant Women

In regards to dietary practices and meal frequency, about two thirds (68%) had consumed four meals and majority had achieved adequate kcals. However, 69.7% had not met the minimum women dietary diversity. Majority 68.5% were on iron and folate supplementation largely given from public health facility though adherence was not as recommended. This resulted to low haemoglobin levels reported by slightly half (52.2%) of the pregnant women. The age, education level and income were insignificantly related with dietary diversity, iron status. Wealth index was significantly related to practice of dietary diversity. Parity was significantly associated with iron status and nutrition status.

The study findings shows that most of the pregnant mothers had a minimum dietary diversity score. This is supported by another study in Laikipia county Kenya, which reported that 85% of pregnant woman consumed more than four varieties of foods (Kiboi, Kimiywe & Chege, 2017). This is supported by another study in Ethiopia on Zinc deficiency which revealed that 59.9% women were faced zinc deficiency during pregnancy, which shows inadequate dietary diversity is high (EDHS, 2016).

5.2.2 IFAS Supplementation among Pregnant Women

IFAS supplementation should begin as early as possible in a pregnancy and continue throughout. If a woman is diagnosed with anemia during her pregnancy, her iron dose should be increased daily until her hemoglobin concentration is normalor higher.It is important to note that when providing IFAS supplementation in settings with endemic infections, such as malaria and hookworm, measures to prevent and treat these infections should be implemented (WHO 2016b).

Many countries provide IFAS supplementation to pregnant women through facility-based antenatal care, but in several countries, especially where antenatal care coverage is low, IFAS supplements may be provided through community-based programs (MCHIP 2011). IFAS supplementation for women of reproductive age (including adolescents) often relies on a community-based or other non-facility-based distribution model.

A barrier analyses on IFAS supplementation consumption, while usually not nationally representative, can provide important insight into a program's strengths and weaknesses. Quality of interpersonal counseling, and how side effects are addressed by health care providers, can also affect the implementation and effectiveness of an IFAS supplementation intervention. Concerns about side effects are one main reason for non-compliance with IFAS supplements among pregnant women; this may point to possible programmatic solutions, such as increasing women's and communities' awareness of the importance of supplements (Sadore, Gebretsadik, and Hussen 2015).

5.2.3 Iron Status among Pregnant Women

According to the WHO report on anemia, 24.5% of pregnant women aged 15–49 years have anemia that is predominantly caused by Iron deficiency. However, there has been a lack of European epidemiologic studies that have assessed iron status from early

pregnancy to delivery in women who were not taking iron supplements. Nowadays, such studies cannot be performed because of ethical concerns. Consequently, the best estimates of iron status are based on individuals who are not taking an iron supplement as have been reported from nationwide epidemiologic studies, from placebo controlled studies, and from cross-sectional studies in pregnant women who, for various reasons, were not taking iron supplements, although these latter types of studies pose interpretational challenges because of self-selection bias.

Iron status improved in ferrous iron–supplemented pregnant women compared with in women who were taking a placebo. In an overview of European iron-status studies in women Iron deficiency was reported in 25–77% of pregnant women, and IDA was reported in 6–30% of pregnant women with a lower prevalence in women who were taking iron supplements. In the controlled studies, geometric mean SF concentrations in the iron-supplemented groups varied with the supplemental dose late in term (32–39 wk gestation). Although it is difficult to generalize across the studies because of overlapping response ranges, a higher supplemental dosage seemed to result in slightly higher geometric mean SF concentrations, but within studies and across studies, no readily apparent relation could be characterized. Increasing the supplemental iron dosage, when considered across and within studies, appeared to result in decreased prevalence of Iron Deficiency and IDA although, again, the overlapping response ranges made it hard to discern a consistent dose-response pattern. The prevalence of ID and IDA was lower in iron-supplemented women than in placebo-treated women.

5.2.4 Association between Social-Demographic Characteristics, Dietary Practices and Iron Status among Pregnant Women

There was a significant relationship (p= 0.001) between the number of meals consumed by pregnant women and their minimum dietary diversity for women. There was a significant association (p= 0.003) between education level and dietary diversity practice during pregnancy as a woman with high education level is believed to be knowledgeable about nutrition information hence likely to practice a diversified diet. Income was also associated significantly (p= 0.0234) with dietary diversified practice during pregnancy. A pregnant woman from a household with high wealth index was more likely to practice dietary diversity food compared to poor household. IFAS intake and its adherence had a direct positive significant association (p= 0.035) with the iron status of the pregnant mother. This was also influenced by the gestation period including how early a pregnant woman visits antenatal clinics. The study did not find a significant association (p>0.05) between marital status and pregnant mother occupation with their iron status.

5.3 Conclusions

This study noted that education level was medium as most of the pregnant women had primary and secondary education. Majority of them being not in formal employment which resulted in low income that was barely enough to procure food especially from all food groups. Low dietary diversity was noted among many pregnant mothers as some foods from other food groups were rarely consumed. Therefore, dietary diversity, poor nutritional knowledge and poor dietary practice were significantly associated with under-nutrition. The iron status of most mothers was low evidenced by low levels of haemoglobin. This was influenced by poor adherence to iron folate supplementation. Anaemia due to pregnancy is a serious problem; routine iron supplementation can help to prevent iron deficiency anaemia but compliance is a major obstacle. Anaemia remains a

public health problem in pregnancy with observed poor compliance with the preventive strategies recommended by the WHO. In order to reduce maternal anaemia, women should be encouraged to initiate ANC during first trimester of pregnancy.

This study shows dietary practices among the pregnant adolescents. This is in terms of few number of meals consumed per day, low dietary diversity and infrequent intake of key nutrients responsible for good nutrition during pregnancy. This is contributed by poor nutrition knowledge and resulted to the high case of underweight.

5.4 Recommendations

5.4.1 Recommendations for Policy and Practice

The study recommends Ministry of health to ensure IFAS supplements are available at the facility and be provided to all the women coming to the health facility. A policy by ministry of health on free services for women of reproductive age is required to promote uptake of all services that targets women. There is need for health workers to have continuous training on nutrition issues among pregnant mothers so as to improve their care and practices. The study recommends provision of formal education and nutrition education on appropriate dietary practices. This would help pregnant mothers to make informed choices of available local nutritious foods. Health care workers are recommended to educate mothers on micronutrients supplementation such as IFAS during pregnancy, benefits and the importance of adherence as well as the outcome for deficiencies.

5.4.2 Recommendation for Further Research

The study recommends an exploration of possible reasons behind poor compliance in the use iron folic acid. Another study should be conducted in a different setup using the same variables with pregnant mothers.

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APPENDICES

Appendix 1: Introduction and Consent Form

Kabarak University Research Ethics Committee Adult Informed Consent Form

(The form is written in English language but can be translated to Kiswahili or any other appropriate language)

Study Title

DIETARY PRACTICES, IRON FOLIC ACID SUPPLEMENTATION AND IRON STATUS OF PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT NAROK COUNTY REFERRAL HOSPITAL, KENYA

PI: **SAHARA IBRAHIM ADAN**. Affiliated Institution: KABARAK UNIVERSITY

Co-investigator(s): 1) Dr. Peter Chege (PhD),

Affiliated Institution(s):Kabarak University.

2) Dr. Wesley Bor (PhD),

Affiliated Institution(s):Kabarak University

Introduction

You are invited to participate in this research study being undertaken by the above listed investigators. This form will help young a there information about the study so that you can voluntarily decide whether you want to participate or not. You are encouraged to ask any question regarding the research process as well as any benefit or risk that you may accrue by participating. After you have adequately been informed about the study, you will be requested to either agree or decline to participate. Upon agreeing to participate in the study, you will be further requested to affirm that by appending your signature/thumbprint on this form. Accepting or declining to participate in this study does not in anyway waive the following rights which you're entitled to:

a) Voluntary participation in the study;
b) Withdrawing from the study at any time without the obligation of having to give an explanation and;
c) Access to services which you're entitled to

A copy of this form will be provided to you for your own records Should I continue YES/NO_____

This study has been reviewed and approved by Kabarak University Research Ethics Committee (KUREC)

What is the Purpose of the Study?

The main reason(s) for conducting this study is to answer the following questions:

4 To determine dietary practices among pregnant women attending antenatal clinic at Narok County Referral Hospital.

5 To establish IFAS utilization among pregnant women attending antenatal clinic at Narok County Referral Hospital.

6 To establish iron status (hemoglobin levels) among pregnant women attending antenatal clinic at Narok County Referral Hospital.

7 To establish the association between social-demographic characteristics, dietary practices and iron status (hemoglobin levels) among women attending Narok County Referral Hospital.

(In order to answer these research questions, you are requested to voluntarily answer question(s)and/or accept some procedures performed on you)

Who can Take Part in the Study?

Inclusion criteria

The inclusion criteria for study subjects included pregnant women (15-49 years) attending the antenatal clinic Narok County Referral Hospital. About 70% of women in Narok county practice hospital deliveries (KDHS, 2022). The focus was on pregnant women who were willing to participate in the study.

Exclusion criteria

Pregnant women with reported chronic illness, were excluded from the study. In addition, this study excluded the pregnant mothers who were above 49 years and those who declined to consent to participate.

Sample size determination for qualitative data

Key informant interviews were used to collect the qualitative data. Key informants' interviews were conducted between a Nurse in MCH, a Nutritionist and one Community Health Volunteer

In Case You Agree to Participate in the Study, What Will Happen?

This is what is going to happen once you have agreed to participate in the study:

- *First, include a statement about the time commitments of their search for the participant including both the duration of the research and follow-up, if relevant.*

  The questionnaire is brief and should take no more than two minutes to complete, depending on the respondent.

- *Second,aqualifiedandwell-trainedinterviewerwillaskyouquestionsinaprivateplace where you will feel comfortable. In case there is any question you feel uncomfortable responding to, you will not be coerced to respond. The questions will be on the following areas: (list the areas below)*

  Section I: Social demographic and socio- economic characteristics of women of reproductive age attending ANC
  Section II: Dietary intake patterns
  Section III: Diet Diversity Questionnaire
  Section IV: Iron supplementation status
  Section V: Nutrition status
  Section VI: Iron status

- *Third,aftertheinterview,thefollowingprocedureswillbedone{detailedinformationon anyproceduresto be undertaken by the investigator(s)}*

  The investigators will collect contact information from respondents who voluntarily choose to provide it.

- *Last, you are requested to provide your contact details (phone number or any other reliable form of contact). This will help reach you in case new information regarding the study emerges. Other reason(s) for requesting your contact details is (are)*

Providing contact information is optional; please feel free to include it if you wish.

- *The contact details you will provide shall remain confidential to the lead researcher(PI).*

What Potential Risks are Associated with Participation in this Study?

Any research involving human subjects has the potential of imposing a number of risks /harms or discomfort including psychological, physical, emotional, environmental, cultural etc.

{*The risks depend upon the nature and type of study and the interventions. State and explain the risk to the participant. Explain to the participant how this risk will be mitigated*}

No Risks

Privacy & Confidentiality

Privacy is the right of an individual to have some control over how his or harpers on a information/data is collected, used, and/ or disclosed. Confidentiality is the duty to ensure information (data) is kept secret only to the extent possible/reasonable. {*Explain to the participant show privacy and confidentiality will be upheld. Explain to the participant any extra precautions, you will take to ensure safety and anonymity. How well data will be handled and after how long will the data be discarded and how the data will be discarded*}

As we embark on this research endeavor, it is essential to acknowledge that your participation may attract attention from other members of the community who become aware of your involvement. Consequently, you may encounter inquiries from individuals curious about your participation. However, it is imperative to reassure you that stringent measures will be implemented to safeguard your privacy and confidentiality throughout the duration of the study. Your identity as a participant will be held in strict confidence, and no personal information will be divulged to any external parties without your explicit consent.

In case you aren't comfortable answering any of the questions during the interview because of feeling embarrassed or uncomfortable, it will be within your rights to decline. Otherwise every measure has been taken to ensure that the interview is conducted in a private area with minimal to no interference so that you feel comfortable. Incase of clinical procedures: You may experience some discomfort/ pain after {*State the procedure*} N/A. This may even cause some {*state the effects of the procedure*}

If at all you suffer any injury, illness or complication(s) by participating in this study, kindly contact us immediately using the contact details provided at the bottom of this form. you will be attended to by the study clinician and if there is need for further assessment or treatment you will be referred accordingly.

What Benefits are you Going to Accrue by Participating in the Study

{*Benefits may be divided into benefits to the individual, benefits to the community in which the individual resides, and benefits to society as a whole as a result of finding an answer to the research question. Mention those that will be actual benefits not entitlements*}

{*Highlight the significance of the study*}

Information from this study may be used by health workers and other stakeholders in Kenya for use in planning for appropriate interventions and policies to improve the health of women. The data generated will be useful in suitable interventions to improve maternal dietary practices and iron status so as to reduce the prevalence of IDA. This would reduce the birth outcomes that are still of public health concern.

What Will it Cost You to Participate in the Study?

{*Will the participant incur any cost in order to participate in the study? Explain it clearly to the participant*}

Not Applicable

Will Any Expenditure that You Incur by Participating in the Study be Refunded? Or will you be Paid for Participating in the Study? {*Explain clearly to the participant whether or not they will be reimbursed*}

Your participation in this research is sincerely appreciated, although there will be no direct benefit to you. However, your involvement holds the potential to significantly contribute to our understanding of ways to enhance compliance with iron and folic acid supplementation among pregnant women. While there are no immediate direct benefits to society at this stage of the research, the broader community stands to gain from the eventual findings and insights generated by this study. By participating, you are contributing to the collective effort aimed at improving maternal health outcomes and fostering better healthcare practices for pregnant women, which in turn can positively impact the well-being of both mothers and their children. Your willingness to engage in this research is instrumental in paving the way for future advancements in maternal healthcare practices.

In Case I Have any Further Questions/ Concerns in Future Whom Should I Contact?

In the event that you need further clarification or questions regarding your continued participation in the study feel free to contact the PI {*Provide the contacts of the PI*}. In case of concerns regarding your rights and/or obligations as a research participant do not hesitate to contact the secretary, KUREC on {*KUREC contact*}

What Alternative Options are Available to Me? N/A

The decision on whether to participate or not is absolutely voluntary. You will be free to withdraw from the study at any point during the study without providing any explanation.

How Will the Findings of this Study be Communicated or Shared?

{*Provide a detailed plan of how feedback of the study findings will be given*}

The findings will be disseminated through publications and will be accessible to all interested parties.

Statement of Consent

I have comprehensively read the consent form or/the information has been comprehensively read to me by the researcher. I have understood what the study is about and all the questions and concerns that I had have been responded to in a clear and concise. The study benefits and foresee able risks have been explained to me. I totally understand that my decision to participate in this study is voluntary and I have

the right to withdraw at any point during the study.

I freely consent to participate in this study

Signing this form does not in any way imply that I have given up the rights am entitled to as a participant

I agree to participate in this research

YES_____

NO_____

I agree to provide my contact details for follow-up

YES_____

NO_____

Participant's Name _____

Participant's Signature/Thumbprint_____

Date _____

Appendix II: Questionnaire

The present study focuses on investigating "Dietary Intake and Iron Level Profiles among Pregnant Women Attending Antenatal Clinic at Narok County Referral Hospital." Through a comprehensive examination of dietary habits and iron status, this research aims to elucidate critical factors influencing maternal health outcomes in this specific demographic. By exploring the interplay between dietary intake and iron levels among pregnant women receiving antenatal care at Narok County Referral Hospital, this study endeavours to provide valuable insights that can inform more effective healthcare interventions and policies tailored to optimize maternal and foetal well-being.

Questionnaire No_____

Date: _____

Interviewer _____

Section I: Social demographic and socio- economic characteristics of women of reproductive age attending ANC:

1. Age of the mother (in completed years) Confirm from ANC card_____
2. Parity of the mother (Confirm from ANC card) _____
3. Residence: Ward _____
4. Religion: _____ □ Protestant 2. Catholic 3. □ Muslim 5. □Others
5. Marital status: _____ □ Married 2. □ Divorced/separated 3. □ Single 4. □ Widowed
6. Education level: □ Primary 2. □ Secondary 3□. College 4. □ University 5. □ None
7. Occupation: _____ □ Salaried 2. □ Self-employed 3. □ Housewife 4. □ Student 5. □ Others
8. Average income per month in KES _____ 1□ <5,000 2. □6,000-10,000 3. □ 11,000-20,000 □21,000- 50,000 5. □ >51,000
9. Number of children _____
10. Gestation in weeks (as per ANC card) _____
11. When did you first attend ANC for this pregnancy? _____ 1□ 0-2 Months 2. □ 2-3Months 3. □ 3-4Months 4. □Above 4months

Section II: Dietary intake patterns

24-hour recall

Kindly indicate what you consumed yesterday from waking up time to sleeping time

Time	Dish	Ingredients in dish	Amount of Ingredient	Preparation Method	Volume of dish cooked	Volume served	Left over volume	Volume consumed	Amount of ingredients Consumed (gms/ml)

Section III: Diet Diversity Questionnaire

Kindly indicate whether you consume foods in the following food groups and how often you consume them per week

2.1 Food group consumed	2.2 Did a member of your household consume food from any of these food groups in the last 24 hours? _____ 1-Yes 2-No	2.3 How many times did a member of your household consume food from any of these food groups in the last 7 days? _____ 1. (None), 2. (≤ 2 times a week), 3. (3-5 times a week), 4. (6 times a week).
Types of food		
1. Cereals & cereal products (sorghum, maize, spaghetti, rice, Wheat, bread, millet, chapatti) White tubers and roots (potatoes, white yams, cassava or foods from roots, white sweet potatoes)		
2. Nuts and seeds		
3. Vegetables: combination of vitamin A rich vegetables and tubers dark green leafy vegetables. (pumpkin leaves, Kunde leaves, Sukuma wiki, spinach, manage, mrenda)		
4. vitamin A rich fruits and vegetables (Ripe mangoes, papayas, watermelon; Others: oranges, tamarinds and wild fruits)		
5. Meat: combination of organ meat and flesh meat (Matumbo, poultry, cow goat, camel, sheep, game meat, liver, kidney, heart, tongue, or other meats or blood-based food, spleen) Fish and other seafood: Fresh or dried fish or shell fish or smoked, salted, fried		
6. Eggs		
7. Legumes, nuts and seeds (beans, lenticels, green grams, cowpeas, dried peas, groundnuts, macadamia		

nuts)		
8. Milk and milk products (goat, fermented milk, cow's milk, powdered milk)		
9. other vegetables		
10. Other fruits		

Section IV: Iron supplementation status

1. Are you currently taking IFAS? _____

   □Yes 2. □ No

2. If yes, how many tablets have you taken in the past week (7days)? _____
3. What is your source of IFAS? _____

□ Public health facility □ Pharmacy

□ Private facility □ others (specify)……

Section V: Nutrition status

MUAC (cm):1st Reading ……. 2nd Reading……. Average…….

Section VI: Iron status

Hemoglobin levels (check from mother-child booklet) _____ g/dl

Appendix III: Key Informant Interview Guide

1. Generally, what is the education level of this women?
2. Do pregnant women adhere to ANC visits in this hospital?
3. How would you rate IFAS supplementation to pregnant mothers in this hospital?
4. What are the challenges reported by pregnant women on IFAS adherence?
5. Do you think pregnant women attending this hospital understands the locally available foods rich in iron/folate?
6. If yes, from your perception, do they use those locally available iron/folate rich foods?
7. What is the nutrition status of most pregnant mothers attending ANC clinics?
8. Is there a trend of birth outcomes recorded in this hospital as a result of low hemoglobin levels in pregnant women?
9. Do you conduct sessions to teach women on dietary diversity?

Appendix IV: KUREC Approval Letter

KABARAK UNIVERSITY RESEARCH ETHICS COMMITTEE

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

Tel: 254-51-3452345
Fax: 254-051-343529
www.kabarak.ac.ke

OUR REF: KABU01/KUREC/001/080/06/23

Date: 13th June, 2023

Saharah Ibrahim,
Reg. No: GMNLVM/0628/05/21
Kabarak University,

Dear Saharah,

RE: DIETARY DIVERSITY AND IRON STATUS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT NAROK COUNTY REFERRAL HOSPITAL

This is to inform you that ***KUREC*** has reviewed and approved your above research proposal. Your application approval number is ***KUREC-080623.*** The approval period is ***13/06/2023 – 13/06/ 2024.***

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,

Prof. Jackson Kiiru PhD.
KUREC-Chairman

KABARAK UNIVERSITY
INSTITUTIONAL RESEARCH ETHICS COMMITTEE
13 JUN 2023
APPROVED
P.O. PRIVATE BAG - 20157, KABARAK

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

Appendix V: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 275526

Date of Issue: 25/July/2023

RESEARCH LICENSE

This is to Certify that Miss. SAFIARA IBRAHIM ADAN of Kabarak University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev 2014) in Narok on the topic: DIETARY DIVERSITY AND IRON STATUS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT NAROK COUNTY REFERRAL HOSPITAL for the period ending : 25/July/2024.

License No: NACOSTI/P/23/27038

275526

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.

See overleaf for conditions

Appendix VI: Evidence of Conference Participation

NUTRITION ASSOCIATION OF KENYA
NUTRITION AND DIETETICS ACADEMY (LTD)

Awards this

CERTIFICATE OF PRESENTATION

To

SAHARA IBRAHIM ADAN

For successfully presenting a Research Abstract during the
5th Scientific and Health Annual Conference held on 30th-31st October, 2023.
at Kenyatta National Hospital Training and Resource Centre - Nairobi

Chairman

Secretary General

Appendix VII: List of Publication

AFRICAN JOURNAL OF NUTRITION AND DIETETICS

https://doi.org/10.58460/ajnd.v2i1.51

Open Access

ORIGINAL ARTICLE

MJM BIOLABS

Dietary Diversity and Iron Status in Pregnant Women Attending the Antenatal Clinic at Narok County Referral Hospital, Kenya

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Article History

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Published Online: 31st October 2023

To read this paper online, please scan the QR code below:

ABSTRACT

Dietary diversity is widely acknowledged as a fundamental factor influencing the iron status of pregnant women. Iron deficiency anemia constitutes a pervasive nutritional concern on a global scale, particularly during pregnancy, and it is linked to an array of adverse consequences such as prenatal mortality, low birth weight, preterm birth, and intrauterine growth retardation. Despite this recognition, there exists a notable gap in our understanding of the dietary habits and iron status of pregnant women attending the antenatal clinic at Narok County Referral Hospital, Kenya. To address this gap, we conducted a cross-sectional study, targeting a cohort of 178 pregnant women receiving antenatal care at the aforementioned hospital. The study used a cross-sectional study design with a target population of 178 pregnant mothers attending the antenatal clinic (ANC) in Narok County Referral Hospital, Kenya. A researcher-administered questionnaire, focus group discussion guides (FGD) and key informant interviews (KII) were used to collect data. Logistical regression and Odds ratio were used to control for other factors that affect iron status, and the Odds ratio was used to determine the likelihood of iron deficiency as influenced by dietary diversity. The results revealed that a significant proportion of the pregnant women were aged between 18-24 years (44.4%), were married (71.3%), and engaged in small businesses (52.2%). Approximately one-third of the participants had two children, with 25.3% having had four live births. The majority (68%) reported consuming four meals daily, but the nutrient intake of pregnant mothers generally fell below recommended levels, with 57.9% failing to meet the minimum dietary diversity score for women. A considerable portion (62.4%) exhibited normal nutritional status, while 68.5% were under Iron Folic Acid Supplementation (IFAS); however, adherence to the supplementation regimen was poor. Moreover, 52.2% had hemoglobin levels below 12g/dl, indicating a potential issue with iron deficiency. This study uncovered significant demographic characteristics among pregnant women, particularly noting a significant presence of young, married individuals engaged in small-scale businesses. The dietary patterns highlighted a prevalent intake of four meals, but nutrient intake often fell short of recommended levels. Alarmingly, a substantial percentage exhibited low hemoglobin levels, underscoring the critical necessity for improved nutritional interventions. Specifically, enhancing iron supplementation and promoting dietary diversity is imperative to address the potential risk of iron deficiency among this vulnerable population.

Keywords: Dietary diversity, Iron status, Antenatal clinic, Haemoglobin levels and Nutrition status.