NUTRITION KNOWLEDGE, SOCIOCULTURAL PRACTICES AND NUTRITION STATUS AMONG PREGNANT AND LACTATING ADOLESCENTS IN TURKANA SOUTH SUB-COUNTY, KENYA

BY

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DECLARATION

Declaration by the candidate

This thesis is my original work and has not been submitted for an award of a diploma or conferment of a degree in this or any other institution. No part of this thesis may be reproduced without prior written permission of the author and/or University of Eldoret.

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Declaration by Supervisors

The thesis has been submitted for examination with our approval as the University supervisors.

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DEDICATION

This thesis is dedicated to my family, wife Nakwakipi Lyne and children Larry Namoit, Hiram Lochodo and Tukei, for their sacrifice and support in my academic journey. My acknowledgement also goes to friends and relatives for encouragement and motivation throughout my studies.

ABSTRACT

Worldwide, teen pregnancies are on the rise, with the majority of instances (99%) being recorded in poorer nations. The World Health Organization report in 2018 showed a global increase in teenage pregnancy at a rate of 46 births per 100 girls. In Kenya teenage pregnancy rate is at 18% and lactation at 12%. The cultural practices coupled with the high food insecurity status in the region tend to exacerbate the situation in Turkana risking major health conditions including malnutrition. This study investigated the nutrition knowledge, sociocultural practices and nutritional status of pregnant and lactating adolescents in Turkana South Sub-County. The study adopted a cross-sectional analytical design to collect primary data. The target population was adolescent girls aged 15-19 years (9,361) from which 384 respondents were selected. A multistage sampling technique was adopted to identify the respondents. Data was collected using researcher-administered questionnaires, focus group discussions and direct observations. Data collected was analysed using GENSTAT version 18.0. and Nutri-Survey version 20. Correlation between mothers' knowledge and their nutritional status was tested using Pearson's correlation. The results indicated that most respondents were unemployed (62.3%), and their households were in the poorest quintile (71.5%), negatively affecting their dietary diversity. Most (44.4%) of the respondents had no formal education and 67.3% had low nutrition knowledge, which directly affected their dietary diversity ($p<0.05$). Most respondents did not meet their daily caloric energy intake (725.06 and 805.29 kcal for pregnant and lactating women, respectively) and other vital minerals including calcium and iron, vital during pregnancy and lactation. While education level was positively associated ($p<0.05$) with nutrition knowledge, dietary diversity was significantly linked to it, likely due to cultural food restrictions and economic limitations. The low dietary diversity, coupled with cultural practices that limited the intake of nutritious foods, contributed to insufficient energy and nutrient intake among both pregnant and lactating mothers, leading to a high prevalence of underweight and suboptimal nutritional status among lactating (39.6%) and pregnant (75.8%) mothers respectively. The findings indicate that improving education, especially nutrition education among adolescent mothers could aid in promoting good eating practices and, hence, maintain proper health for the mother and baby. These findings underscore the urgent need for targeted interventions, including comprehensive nutrition education programs and improved access to nutritious foods, to address the complex challenges facing adolescent mothers in Turkana County and ensure the health and well-being of both mothers and their children.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASAL	Arid and Semi-Arid Lands
FFQ	Food Frequency Questionnaire
IREC	Institute of Research and Ethics Committee
KDHS	Kenya Demographic and Health Survey
KNMS	Kenya National Micronutrient Survey
KNBS	Kenya National Bureau of Statistics
MOH	Ministry of Health
MUAC	Mid Upper Arm Circumference
NACOSTI	National Commission for Science, Technology and Innovation
NGOs	Non-governmental Organizations
RDA	Recommended Dietary Allowance
SCT	Social Cognitive Theory
TP	Teenage Pregnancy
UNFP	United Nations Population Fund
UNICEF	United Nations Children's Fund
WHO	World Health Organization

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Teenage pregnancies (TP) have been on the rise worldwide, with more cases in developing countries where 99% of teenage births are domiciled (Abdirahman *et al*., 2019). Every year, 2 million adolescents under 15 years and 16 million females between the ages of 15 and 19 give birth to children (Monteiro *et al*., 2019; Kiani *et al*., 2019). A rise in worldwide TP rate to 46 births per 1000 girls was reported by the World Health Organisation, the United Nations Population Fund (UNFP), and the United Nations Children's Fund (UNICEF (2018). In Latin America and the Caribbean, one-third of women and more than half of women in Africa give birth before attaining 20 years. For instance, in Brazil, one in every five adolescent girls becomes pregnant (Monteiro *et al*., 2019). Recent studies in 43 sub-Saharan countries indicate that a third of women in this region give birth before they attain 18 years (Abdirahman *et al*., 2019). For instance, an alarming 43.1% of women in Nigeria were married between the ages of 15 and 19 while over 27% were married before 15 years (Adebowale *et al*., 2012).

Unfortunately, TP has since become an alarming public health issue globally and has been linked with inadequate healthcare and nutritional implications. It affects the social and economic well-being of affected persons, including the child, family and community (Appiah *et al*., 2021). Most cases are due to low education levels, and early and/or forced marriages, especially in cultures where girls are considered a source of wealth for the family and are married off to wealthy and influential men in the community (Were, 2007; Adebowale *et al*., 2012). Additionally, early pregnancy continues to be a significant cause of mother and infant death (Kiani *et al*., 2019). With

an estimated rate of about 70,000 per year, adolescents are prone to problems including eclampsia, puerperal endometritis, and systemic infections that ultimately impair their health or result in mortality (Abdirahman *et al*., 2019; Kiani *et al*., 2019).

Maternal nutrition, especially during the reproductive age, is an important indicator and criteria upon which pregnancy outcomes are based since it helps strike a balance between a child's growth and the optimal health of the mother. Dietary deficiency during this stage might result in pregnancy and birth-related complications (Barger, 2010; Weerasekara *et al*., 2020). Inappropriate diet practices are common for teen girls who engage in unhealthy eating habits such as consumption of nutrient-deficient foods, skipping meals and also lack a proper eating pattern (Weerasekara *et al*., 2020). The nutritional health of pregnant women can also be influenced by cultural practices because certain societies dictate the foods they are to eat while forbidding others (Lokossou *et al*., 2021).

The Kenya Demographic and Health Survey [KDHS] (2022) indicates that TP and motherhood rate is at 18% affecting 15–19-year-olds. An estimated 15% have been pregnant, 12% have given birth and 3% were pregnant by 2022. The number of pregnancies increase with age, from 3 to 31% among 15- and 19-year-olds respectively. Generally, 40% of the adolescents who have been pregnant have no education compared to only 5% with higher than secondary education. Additionally, adolescents from low-income homes had a larger (21%) chance of becoming pregnant than their peers from rich families, who had a lower (8%) risk (KDHS, 2022). The situation varies by county with some counties being more disproportionately affected than others.

One of the counties in Kenya with a high teenage pregnancy rate is Turkana, where around 18% of pregnant teens between the ages of 15 and 19 have been reported (KDHS, 2022). Of these, 15% had a live birth and 4.4% were pregnant by 2022 well above the national estimate. Of importance, is that despite being the largest county in Kenya, Turkana County is commonly affected by severe drought and famine (Oduor, 2012). Hence, food and nutritional insecurity (food poverty 81%) are experienced caused by the expanding gap between food requirements and supply (IPC, 2022). Also, cultural practices and beliefs about food which have been correlated with low socio-economic status and low school attendance (Mutea *et al*., 2022) exist in Turkana County where 68.7% of persons aged 3 years and above have never been to school (KNBS, 2019b). All these factors can aggravate the nutritional status of vulnerable pregnant teenagers. The current study therefore investigated the cultural practices, nutrition knowledge and the nutritional status among pregnant and lactating adolescents in Turkana County.

1.2 Problem Statement

Pregnant women are at risk of malnutrition occasioned by the increased nutritional requirements of the mother and the rapid foetal growth and development. Food insecurity, poor socio-cultural practices, and lack of nutritional knowledge coupled with poor dietary practices could exacerbate the situation. Teenagers who are pregnant are at risk since they need more calories and nutrients for both the developing baby and themselves. Although research has been conducted in Kenya to determine the association between pregnancy outcomes and the mother's dietary practices during pregnancy, there haven't been many studies that specifically focus on pregnant teenagers. There have also been limited linkages in studies trying to find out the relations between nutritional knowledge, sociocultural practices and pregnancy

outcomes as well as during lactation, especially among adolescents in marginalized communities such as those in Turkana. This study, therefore, investigated the nutrition knowledge, socio-cultural practices and the nutritional status of pregnant and lactating adolescents in Turkana South Sub-County.

1.3 Purpose of the Study

The focus of this study was to assess the nutrition knowledge, sociocultural practices and the nutrition status of pregnant and lactating adolescents in Turkana South Sub-County.

1.4 Objectives of the Study

1.4.1 Main Objective

To investigate the nutrition knowledge, socio-cultural practices and nutritional status of pregnant and lactating adolescents in Turkana South sub-County.

1.4.2 Specific Objectives

1. To assess the nutrition knowledge of pregnant and lactating adolescents in Turkana South Sub-County.
2. To establish the dietary practices among pregnant and lactating adolescents in Turkana South Sub-County.
3. To assess the socio-cultural practices affecting pregnant and lactating adolescents in Turkana South Sub-County.
4. To determine the nutrition status of pregnant and lactating adolescents in Turkana South Sub-County.

1.5 Research Questions

1. What is the nutrition knowledge of pregnant and lactating adolescents in Turkana South sub-county?
2. What are the dietary practices among pregnant and lactating adolescents in Turkana South sub-county?
3. What are the socio-cultural practices affecting pregnant and lactating adolescents in Turkana South sub-county?
4. What is the nutrition status of pregnant and lactating adolescents in Turkana South Sub- County?

1.6 Significance of the Study

Kenya Ministry of Health (MOH) and other stakeholders in health will gain from the study's findings as they help shape policy changes and legislation aimed at enhancing information sharing and food intake among pregnant and breastfeeding women as well as addressing adolescent pregnancies. The research also furthers our understanding of how sociocultural practices within communities affect pregnant and breastfeeding women's dietary consumption and nutritional status. The importance of excellent nutrition and the effects of bad dietary choices on the health of the unborn child also will be adequately explained to pregnant and nursing teenagers. Other stakeholders such as Non-governmental Organizations (NGOs) also benefit by being aware of the existing cultural practices and how they affect food choices which help them in making informed decisions on how to help the community members.

1.7 Limitations of the Study

Due to varying cultural beliefs and practices, variances in the sociodemographic traits of adolescent mothers, and varying levels of literacy in various parts of the country, the

results of the current study cannot be generalised to the entire nation. Since all pregnant teenage women in Turkana County have the same culture and practice, only the results applied to them.

1.8 Assumptions of the Study

The researcher assumed that all pregnant and lactating women visiting different antenatal and children's clinics in Turkana South sub-county were willing to share their experiences as well as give accurate and truthful information. The researcher also assumes that the adolescent mothers have no recall bias since some questions require remembering practices.

1.9 Theoretical Framework

The Social Cognitive Theory (SCT) (Smith *et al*., 2020) was adopted for this study. The theory assumes that people are driven by not only intrinsic factors but also extrinsic factors. It also emphasizes that human behaviour can be explained in a three-way interrelation of personal factors, environmental factors and behaviour often referred to as determinism.

In the current study, personal factors that contribute to the nutrition status of pregnant and lactating adolescents include; level of education, age, nutrition knowledge and socio-economic status. Contrarily, environmental factors which are extrinsic in this study are denoted as the sociocultural beliefs and practices which are determined by their families and community at large. This in turn affects their dietary practices and consequently their nutritional status. This study derived its conceptual framework from the SCT model analogy, seeking to explain how personal factors and environmental factors among adolescents/teen mothers affect their behaviour in terms of dietary

practices. The SCT can be used as an explanatory theory to elaborate on people's behaviour and an intervention theory to address behavioural changes including a change in dietary practices.

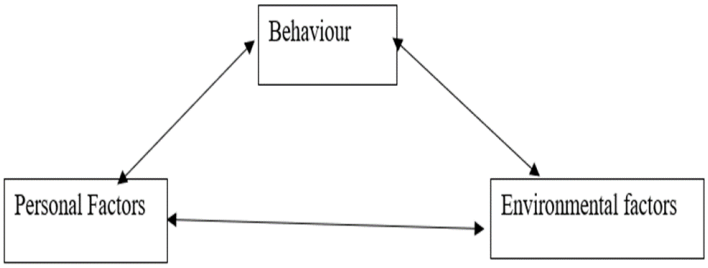

Figure 1. 1 Social Cognitive Theory model

1.10 Conceptual Framework

The need for nutrition increases during pregnancy and lactation for both the mother and the developing or nursing baby. However, the intake of these nutrients is affected by several factors such as the nutritional knowledge of the mother, sociocultural practices, and socioeconomic and also demographic factors. These factors are all interrelated and they can be linked together in a conceptual framework. They all have an impact on dietary habits and illness susceptibility in mothers, both of which have an effect on the nutritional condition of expectant and nursing mothers.

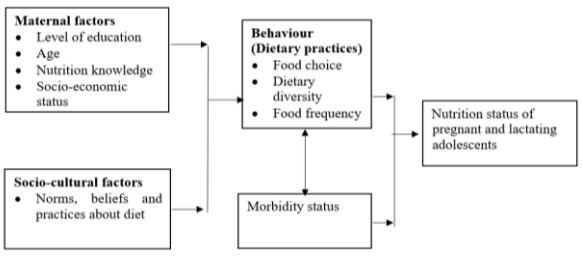

Figure 1. 2. Conceptual Framework on Factors Associated with The Nutrition Status of Pregnant and Lactating Adolescents.

Source: Adapted and modified from (Kemunto, 2013).

CHAPTER TWO

LITERATURE REVIEW

2.0. Overview

This chapter explores the nutritional challenges encountered by pregnant and lactating adolescents, highlighting the multifaceted impact of social, cultural, and educational factors on their dietary practices and nutritional status. By examining existing literature and research, the chapter aims to provides comprehensive insights of how various elements influence maternal and foetal health outcomes.

2.1. Adolescent Pregnancy Globally and in Kenya

Adolescence, a phase characterised by rapid physical, emotional, and social transformations, commences with the beginning of puberty and the maturation of sexual and reproductive abilities (Anino *et al*., 2024). Annually, the World Health Organisation (WHO) reports that over 16 million adolescent girls between 15 and 19 years, and around 1 million females under the age of 15, experience childbirth worldwide (WHO. 2023). The problem is most evident in Africa, where the incidence of adolescent births is predicted to be 92 births per 1,000 girls, which is twice the average rate worldwide (United Nations Population Fund [UNFPA], 2021). In Kenya, the occurrence of adolescent pregnancy, which refers to pregnancy in girls aged 10-19, has varied over time. Anino *et al*. (2024) observed a decline from 18.8% in 2014 to 12.2% in 2020. However, the Kenya National Bureau of Statistics (KNBS), noted a subsequent increase to 21% in 2019. This highlights the changing nature of this issue and need for continuous monitoring. The high rates of adolescent pregnancy in Kenya can be attributed to various causes, such as socioeconomic challenges like poverty and

limited educational opportunities, cultural factors like early marriage, and restricted access to reproductive health interventions (Anino *et al*., 2024).

Adolescent pregnancy is a complex problem that involves specific physiological and dietary factors. Pregnancy during adolescence requires higher energy and nutrient intake, especially for folate, iron and calcium, caused by continuous growth and development of the young mother (WHO, 2018). Moreover, teenage pregnancy causes alterations in body composition and variations in hormone levels (Anino *et al*., 2024). Adolescent girls are at a higher risk of negative health outcomes compared to adult women due to physiological changes, potential dietary inadequacies, and constrained access to healthcare (Ganchimeg *et al*., 2014). The potential consequences encompass preterm birth, low birth weight, preeclampsia, as well as enduring effects on the psychosocial, cognitive, and physical growth of both the mother and child (Ganchimeg *et al*., 2014). To effectively tackle adolescent pregnancy in Kenya, it is necessary to adopt a comprehensive approach that considers the complex interaction of biological, socioeconomic, cultural, and healthcare-related factors.

2.2. Nutrient Requirements During Pregnancy and Lactation

Numerous physiological shifts that happen during pregnancy and lactation need an increase in the mother's dietary needs. Women who are pregnant need increased caloric intake to support foetal growth and maternal physiological changes. Carbohydrates during this state should constitute 45-64% of the daily caloric needs whereas fats should comprise 20-25% of the daily caloric content; these are relatively similar to that of non-pregnant women (Abebe *et al*., 2014). During the second and third trimesters, the caloric needs at this time rise by around 300 kcal/day (Kominiarek & Rajan, 2016). However, the Recommended Dietary Allowance (RDA) for proteins in pregnancy is 60

g/day, which is an increase from 0.8 g/kg/day for those not pregnant (Jouanne *et al*., 2021). A systematic review by Pimpin *et al*.(2019) emphasizes that sufficient protein intake is linked to better birth outcomes, such as increased birth weight and a lower risk of preterm birth.

In pregnancy, the quality of fats consumed is more crucial than the total amount, particularly for foetus development and growth of the infant. Therefore, it is paramount to enhance the proportion of polyunsaturated fats instead of merely increasing total fat intake. Ensuring an adequate intake of omega-3 fatty acids, particularly docosahexaenoic acid (DHA, of the n-3 series) is vital for the development and growth of the brain and retina. A study by Muhihi, *et al*. (2019) found that the consumption of omega-3 rich foods was low among pregnant women in Kenya, primarily due to limited availability and high costs. They suggested promoting affordable sources of omega-3, such as flaxseeds and locally available fish. In addition to macronutrients, several micronutrients are important in the health of both the mother and the foetus. For example, iron is good for preventing anaemia, promoting increased blood volume, and facilitating oxygen transport to the foetus. Iron is an important nutrient requisite for hemoglobin, and hence the synthesis of red blood cells. Iron deficiency anaemia is common in pregnant women in Kenya, impacting the mother and child's health. A study by Odhiambo & Sartorius (2020) found that the prevalence of anaemia among pregnant women in Kenya was notably high, with many not meeting their iron needs through di*et al*one. The study documents the role of iron supplementation programs and diversification of diets to address anaemia. Folic acid is also essential for averting Neural Tube Defects (NTDs) and supporting production of DNA and cell division. A study by Viswanathan *et al*. (2017) confirms the essence of folic acid supplementation

in preventing NTDs, reinforcing its important role in prenatal care. In Kenya, the prevalence of folate deficiency among pregnant women remains high, according to Mgamb (2018). The study revealed that, despite awareness programs, actual folate intake through diet and supplementation is often inadequate, mainly due to economic constraints and limited access to fortified foods.

Calcium is also a crucial micronutrient for foetal bone development, while vitamins B complex and A support various metabolic processes and immune functions. Vitamin D promotes calcium metabolism and bone health. The recommended daily allowance for vitamin D during pregnancy and lactation is 600 IU (Jouanne *et al*., 2021). Emerging data suggests that vitamin D deficiency is associated with an increased risk of preeclampsia, gestational diabetes, and premature birth. A randomized controlled trial by Roth *et al*. (2017)) suggests that vitamin D supplementation can improve maternal and newborn outcomes, emphasizing the importance of optimal intake of vitamin D throughout pregnancy. A study by Gitau, Ngare, & Watitu (2020) indicated that vitamin D levels are often insufficient, potentially contributing to complications like preeclampsia and gestational diabetes. It recommends vitamin D supplementation as an essential step to improve maternal and foetal health outcomes. Long-term micronutrient deficits in women are worse for those of vitamin A, folate, calcium, zinc, and iodine (Suchdev *et al*., 2014). Furthermore, various micronutrients are important during pregnancy for the development and growth of the foetus as presented in Table 2.1.

Table 2.1. RDA, EAR and UL of Pregnant and Non-Pregnant Women

Nutrient	RDA (Non-pregnant women)	EAR (pregnancy)	RDA (pregnancy)	UL (pregnancy)
Vitamin A (µg/day	700	550	770	3000
Vitamin D (µg/day)	15	10	15	100
Vitamin E (mg/day)	15	12	15	1000
Vitamin K (µg/day)	90	-	90	None
Vitamin B1 (mg/day)	1.1	1.2	1.4	None
Vitamin B2 (mg/day)	1.1	1.2	1.4	None
Vitamin B3 (mg/day)	1.4	14	18	35
Vitamin B6 (mg/day)	1.3	1.6	1.9	100
Vitamin B9 (µg/day)	400	520	600	1000
Vitamin B12 (mg/day)	2.4	2.2	2.6	None
Vitamin C (mg/day)	75	70	85	2000
Calcium (mg/day)	1000	800	1000	1100
Iodine (µg/day)	150	160	220	45
Iron (mg/day)	18	22	27	300
Magnesium (mg/day)	320	290	350	350
Phosphorus (mg/day)	700	580	700	3500
Selenium (µg/day)	55	49	60	400
Zinc (mg/day)	8	9.5	11	40

Source: Adopted from (Jouanne *et al*., 2021; Kominiarek & Rajan, 2016)

Hydration is also crucial during pregnancy and lactation. Pregnant women are encouraged to increase their fluid intake to support the production of amniotic fluid and the expansion of blood volume. Lactating women need extra fluids to compensate for the fluids lost through milk production. The European Food Safety Authority [EFSA] (2010) recommends an additional 300 mL/day during pregnancy and 700 mL/day during lactation. Research by Ng'endo *et al*. (2017) showed that many women in rural Kenya do not meet their fluid requirements, primarily due to limited access to clean drinking water. The study highlighted the need for improved water infrastructure and education on the importance of hydration during pregnancy and lactation.

Globally, research has emphasized the goodness of meeting the elevated nutritional needs of pregnant and lactating women to prevent maternal malnutrition and ensure

optimal foetal growth and development. A study conducted by Kiani *et al*. (2019) highlighted the prevalence of teenage pregnancies and the associated nutritional challenges. The study underscored the need for targeted interventions to address the unique nutritional needs of pregnant adolescents. Nutritional requirements during pregnancy and lactation in Kenya are often unmet due to various socio-economic and cultural factors. Recent studies highlight the critical need for targeted nutritional interventions, including supplementation programs, dietary diversification, and improved access to nutrient-dense foods and clean water. Addressing these challenges is essential for improving maternal and infant health outcomes in Kenya.

2.3. Social Cultural Practices Among Pregnant and Lactating Adolescents.

Adolescent pregnancy and lactation are common public health issues across the world, especially in under-developed and developing countries. Sociocultural practices associated with these experiences can significantly impact maternal and child health outcomes. Social support is important in well-being of pregnant and lactating adolescents. Family, peers, and community networks provide emotional and practical support, which can mitigate the challenges faced by young mothers. A study by Mugo *et al*. (2021) in Kenya highlighted that adolescent with strong communal and household support were more likely to access prenatal care and adhere to recommended health practice.

In many contexts, adolescent mothers face stigma and discrimination, which prevents from seeking timely medical care. A study in India revealed that fear of judgment from healthcare providers was a significant barrier to accessing prenatal and postnatal services for adolescent mothers (Patel *et al*., 2021). In a similar study, Nambile *et al*. (2022) in Uganda found that pregnant adolescents described difficulty in going to

clinics because of feelings of being discriminated against and disrespected by health workers, and inadequate privacy when receiving health services were common barriers that hindered their access to maternal health services. Educational interventions aimed at reducing stigma and increasing awareness about maternal health have shown promise in improving health-seeking behaviours (Gupta *et al*., 2022).

Every society has its own set of cultural practices and beliefs concerning meals, including those served to adults and those served to children. These norms and attitudes are among contributors to feeding practices and have been shown to impact significantly on human nutrition (Bandyopadhyay, 2009). Food and nutritional habits greatly depend on one's culture. Women are at times expected to eat less or serve other family members first in some cultures.

Traditions and beliefs influenced utilization of maternal healthcare services. In a study done in South Sudan and Ethiopia, found that some women preferred to give birth at home and were reluctant to attend antenatal care visits and maternal health facilities (Dahab & Sakellariou, 2020)**.** The foods suitable to eat during pregnancy and lactation are determined by certain cultural beliefs, which frequently limit access to nutrient-dense foods (Lokossou *et al*., 2021). Additionally, cultural norms around marriage and fertility can influence maternal health outcomes by promoting early childbearing and large family sizes (Mutea, 2023)**.** Cultural practices and beliefs significantly impact the dietary and health behaviors of pregnant and lactating mothers in Turkana.

Taboos during pregnancy are widespread around the world because it is thought that they are primarily intended to safeguard the health of the expectant mother and her unborn child (Ekwochi *et al*., 2016). Traditional midwives and elderly ladies in the

community focus mostly on instructing and offering dietary guidance. They are significant in a pregnant woman's day-to-day existence. According to research carried out in western Kenya by Kariuki *et al*. (2017), foods such as crushed nuts and oil seeds, were among the primary foods avoided by pregnant women because they are thought to be high in saturated fats. The women also noted that they had received advice to cut back on their use of highly starchy foods like cereal and beans. Vegetables were thought to decrease postpartum milk production and induce rashes and skin sensitivities for the mother and infant. The consumption of animal products among the women within that region was impacted to the point that specific animal organs, like the chicken gizzard and the cow's backbone, were only consumed by men (Kariuki *et al*., 2017). Energy, protein, vitamin, and mineral consumption may be limited based on the taboos, which would be harmful to for the mother and the unborn child.

The taboos followed in other nations are nevertheless somewhat comparable. Pregnant women in the Gambia are not permitted to ingest eggs because it is thought that the child may grow up to be silent, stupid, or stammering (Martinez & Pascual, 2013). If ingested during the third trimester, calorie-dense meals such starchy foods (bananas, bread, millet, and ground almonds) may cause macrosomia to new-borns (Martinez & Pascual, 2013). Cultural conventions, taboos, and beliefs may have an effect on pregnant women's diets, which may affect the baby's birth weight and long-term health.

2.4. Nutrition Knowledge of Pregnant and Lactating Adolescents

Pregnancy and lactation are vital stages in a woman's life cycle, necessitating proper nutritional management to support the mothers health and fetal development. Adequate nutrition knowledge among pregnant and lactating adolescents is important for establishing optimum dietary choices, which impacts pregnancy outcomes and infant

health. There is limited information on pregnant adolescents because they are normally not included in national surveys, and their nutritional status around the world is limited (Appiah *et al*., 2021).

Research conducted worldwide emphasizes the need of nutrition education in pregnant and lactating adolescents. Crooks *et al*. (2022) investigated the nutritional knowledge of pregnant teenagers in poor countries, revealing significant knowledge gaps and miss-information about dietary requirements during pregnancy. Similarly, a review by Marshall *et al*. (2022) highlighted the need for focused nutrition education programs to enhance the nutritional status of pregnant and breastfeeding adolescents globally.

The food consumed determines how vital excellent nutrition is in supporting good health. Numerous variables influence food choices, with knowledge about and attitudes towards healthy nutrition playing a significant role. Adolescent girls are at a crucial point in their reproductive lives, thus it is necessary for them to eat healthy, especially to guarantee optimal birth outcomes (Stewart *et al*., 2007).

In sub-Saharan Africa, where adolescent pregnancies are prevalent, understanding nutrition knowledge is crucial for mitigating maternal and child health risks, however a study by Samuel *et al*.(2020) in Nigeria evaluated the nutrition knowledge of pregnant adolescents, revealing inadequate awareness of key nutritional concepts and practices. A study carried out in Ghana by Gyampoh *et al*. (2014) highlighted misconceptions surrounding dietary requirements during pregnancy among adolescents, emphasizing the need for comprehensive nutrition education programs.

A study by Tesfaye *et al*. (2024) in Ethiopia assessed the nutrition knowledge of pregnant adolescents attending antenatal care clinics, identifying knowledge gaps

related to micronutrient supplementation and dietary diversity. A study conducted in Tanzania by Mrema *et al*. (2021) explored the nutrition knowledge of pregnant adolescents in rural communities, revealing limited awareness of optimal dietary practices and micronutrient requirements during pregnancy. Teenage mothers have less power to provide a child with an adequate diet, safe water, and sanitary services due to inadequate financial resources. This findings were consistent with a study by Abdirahman *et al*. (2019) in Mandera, Kenya who examined the nutrition knowledge of lactating adolescents, emphasizing the importance of culturally appropriate nutrition education interventions to address knowledge gaps and improve maternal and child health outcomes.

Knowledge enhances positive attitudes concerning how the health consequences of unhealthy eating are viewed, the efficacy of eating healthy, and the food preferences among adolescents (Yeung, 2010). Adequate nutrition knowledge of women before pregnancy is associated with improved dietary practices during the conception period. Since an individual's nutritional demands are dictated by the rate of growth, nutrition knowledge has been demonstrated to have a significant role in promoting good eating habits, ensuring that nutrient needs throughout one's lifespan are sufficiently addressed (Kinyua, 2013).

There is a relationship between understanding nutrition and the level of quality of the food consumed. Having a basic understanding of nutrition can help you forecast when you’re eating habits will change, and giving pregnant women health information can help them eat more. According to a study on the nutrition knowledge of pregnant teenagers conducted in Kenya by Abdirahman *et al*. (2019), dietary practice among expectant mothers is impacted by maternal knowledge. It also shows that knowledge is

important in deciding how much food to eat and that woman who are more knowledgeable about nutrition are likely to choose healthier diets than mothers who are less knowledgeable about nutrition.

It was shown that there is a strong association between nutrition knowledge and nutrition status in a study by Kinyua (2013) that was done among women in Nairobi. The study attempted to ascertain the relationship between dietary practices, nutrition status, nutrition knowledge and attitude. According to a study finding by Ilir *et al*. (2015) in South Sumatra, knowledge increased with an improvement in dietary status and was associated with high MUAC. Similar findings were made by Perumal *et al*. (2013), who noted a strong correlation between women's nutritional status and level of nutrition knowledge with a p-value of 0.05.

The lack of dietary knowledge and awareness of current social concerns among adolescents is common (Lee *et al*., 2015). Low nutrition awareness is a contributing factor to poor eating habits. According to research by Liao *et al*. (2010), pregnant women with excellent nutrition awareness had a diverse diet. In a study conducted in Sudan, researchers linked teenagers' dietary practices, attitudes, and nutrition knowledge. Mothers with greater nutrition education demonstrated better nutritional diversification and food choice habits.

2.5. Nutritional Status of Pregnant and Lactating Adolescents

The nutritional requirements vary according to age and sex, which speaks to the relevance of a life-cycle approach when addressing nutrition needs. Attaining required nutrition is vital to sustain health of all age sets. Diets low in vital nutrients or excessive in others can harm health. The Mid Upper Arm Circumference (MUAC) measurement

is the recommended approach for establishing nutritional status in pregnant women. A study by Suresh *et al*. (2021) pointed out that a MUAC measurement of 19 cm and below is considered severely undernourished, 19-22 cm moderately undernourished, and >22 cm is normal. Since MUAC was found to be positively related with birth weight and crown heel in research by Ricalde *et al*. (1998), suggested that pregnant women utilise it to identify those at risk of having an unfavourable pregnancy result. In South Africa, research conducted among pregnant women revealed that MUAC was a reliable measure for assessing nutritional status (Fakier *et al*., 2017). According to a similar study conducted in Ethiopia by Assefa *et al*. (2012), mothers with low MUAC were more likely to conceive low-birth-weight children. In Laikipia County, Kenya, existing evidence indicates a correlation between MUAC and the nutritional status of pregnant women (Kahanya, 2016).

Maternal nutrition status is good for positive pregnancy outcome, and a mothers nutritional status before and during pregnancy affects foetal growth in the womb (Black, 2003). Adolescent pregnancies are associated with heightened nutritional risks due to the physiological demands of adolescence compounded by those of pregnancy and lactation. The World Health Organization (WHO) reports that pregnant adolescents are at a higher risk of experiencing complications such as anaemia, pre-eclampsia, and low birth weight (WHO, 2021). A study by Lee *et al*. (2014) found that adolescent mothers frequently consumed insufficient amounts of important nutrients such as iron, folic acid, and calcium, which resulted in poor pregnancy outcomes.

Poor nutrition status puts one at a higher risk of morbidity and mortality. Development of the foetus and perinatal outcomes are strongly influenced by nutritional adequacy, including consumption of macronutrients like carbohydrates, proteins, and fatty acids,

as well as micronutrients including zinc, magnesium, iron, calcium, and vitamin C (Baer *et al*., 2005). This guarantees that maternal reserves are not depleted after receiving enough nutrients to support both the mother's and the child's long-term health. According to a study conducted in Bangladesh, the weight of the new-born is influenced by the mother's health and nutrition during pregnancy, and maternal nutritional variables contribute to roughly 5% of intrauterine growth retardation in developing settings (Eneroth *et al*., 2010).

Women who are malnourished have lower levels of productivity, are more susceptible to infections, recover from illnesses more slowly, and are at higher risk for unfavourable pregnancies. Pregnant teenagers have been found to have worse nutritional status than pregnant women of reproductive age. Teens who are underweight and pregnant run the risk of experiencing health problems (Walters, 2019). Madhavi (2011) found that pregnant teenage women in a rural region of India were underweight due to inadequate protein and calorie intake during pregnancy, increasing the likelihood that they would give birth to stunted children. Underweight mothers give birth to children with lower birth weights, which raises the risk of death (Stewart et al., 2007). These kids will have issues for the rest of their lives. Throughout pregnancy, the mother's diet needs to provide energy and nutrition for her and the developing foetus. In a similar study by Monteiro *et al*. (2019) examined the dietary patterns of pregnant adolescents in Brazil, revealing significant deficits in macro and micronutrient intake. Their findings indicated that only a small fraction of the adolescents met the RDAs for key nutrients, highlighting the urgent need for targeted nutritional interventions.

According to a study by Muthaya *et al*. (2009), an expecting woman's nutrition status is good when she consumes food and nutrients more efficiently, which contributes to

the baby's ideal weight increase. Additionally, insufficient food intake causes maternal anaemia due to iron deficiency, which raises the risk of maternal morbidities, birth abnormalities, low birth weight and even deaths (Sukchan *et al*., 2010). Research conducted in the East Wollega Zone of Ethiopia by Fekadu Beyene (2013) discovered a substantial correlation between pregnant teenagers' nutritional condition and their degree of nutrition awareness. In Tanzania, Mramba *et al*. (2017) conducted a study on the nutritional status of pregnant adolescents in rural areas. The study found that 30% were stunted, an indicator of chronic malnutrition. The findings also indicated how socio-cultural factors, including taboos related to food, and marrying worsens the nutritional deficiencies.

2.6. Benefits of Optimal Diet during Pregnant and Lactating Adolescents

One factor that contributes to the unborn child's good health is eating a healthy diet. Micronutrient deficiencies may arise from an imbalance brought on by the typical meals that include fewer fruits, vegetables, and animal products and more grains and legumes. Illness can spread quickly when poor food and nutrition choices are coupled with risk factors like inactivity.

Good nutrition practices have a positive effect on women's nutritional status. For women to have the best pregnancy outcomes, their diet both before and during pregnancy is essential to their reproductive health (Nnam, 2015). During the critical time before conception, healthy eating habits that support the development of sufficient maternal reserves should be encouraged. Numerous pregnancy-related health risks, such as the risk of foetal and infant death, intrauterine growth retardation, low birth weight and preterm births, reduced birth defects, cretinism, poor brain development,

and an elevated risk of infections, can be mitigated by proper nutrition (Sackey, 2022). Adequate nutrition is essential for a woman's healthy growth and reproductive readiness (Kinyua, 2013).To meet their increased nutritional needs during pregnancy, expectant mothers need to eat a variety of foods and consume more nutrients overall. To guarantee that this population group has the proper amount of nutrients, particularly minerals and vitamins like iron and folic acid, for both the mother and the foetus, fortified foods and dietary supplements should be recommended.

The growing baby's access to nutrients is influenced by the mother's nutritional state. This depends on how much she eats, how much she stores, and whether she meets her requirements. The most important stage of the life cycle is pregnancy. The phase is characterised by increased food and energy requirements. According to 2008 research by the American Dietetic Association (ADA), pregnant women's higher dietary requirements have an impact on delivery outcomes, particularly if they are not satisfied. A diverse diet must be consumed by pregnant adolescents to satisfy their nutrient demands in order to meet the increased demand. Since dietary variety is a crucial element recognised in healthy diets, research has demonstrated that it relates to optimal nutrient intake (Black, 2003). Due to individual maternal dietary diversity scores' protective effects against low birth weight, prior research has linked dietary variety to better pregnancy outcomes (Saaka, 2012; Abubakari & Jahn, 2016).

In a study by Abebe *et al*. (2014), they discovered that pregnant and lactating women should eat smaller meals more often and consume a variety of meals as this has a protective effect against preterm delivery. Plenty of fruits and vegetables, with adequate water each day is essential to this group. Iron absorption is hindered when coffee and tea are consumed concurrently with meals, hence leading to anaemia. There are limited

studies linking dietary intake and practices among pregnant and lactating teenagers in Turkana.

Inadequate nutrition during pregnancy period is an even more marked problem among teenagers in developing nations (Kiani *et al*., 2019). To constantly replenish body reserves, pregnant women need a diverse diet, supplemented with micronutrients. This prevents the body from depleting body stores. During the third trimester, there is an increased need for nutrients. A majority of pregnant teenagers are from disadvantaged families hence, they have a greater need for nutrients for both their growth and the development of the baby. This can result in vitamin deficiencies, which have permanently damaging effects (Saaka, 2012). During the antenatal clinic visits, nutrient supplementation in addition to diversified diets is encouraged and supplements provided, and fortified foods with nutrients should also be provided to the expectant women, as a mitigation to nutrient deficiency (Eneroth *et al*., 2010). A study by Black, (2003) and the Kenya National Micronutrient Survey (KNMS) of 2011 found out deficiencies in micronutrients like iron and folic acid affected the foetus. During each trimester, an expectant woman should add on some weight, which is influenced by dietary practices.

The low maternal weight reflects insufficient weight increase throughout the course of the pregnancy, which ultimately results in low-birth-weight newborns and infants who are more vulnerable to prenatal death. Pregnant women's morbidity status is influenced by the number of nutrients consumed. Good nutrition helps one to gain about 12 kg for the entire trimester translated to about 1kg of body weight per month. Proper nutrition also prevents anaemia which is common among pregnant women, improves the physical and mental development of the growing foetus, and decreases the chances of

delivering preterm babies, stillbirths and those with low birth weight (Abebe *et al*., 2014).

2.7. Socio-Demographic and Economic Characteristics of Pregnant and Lactating Mothers

In Kenya, 15% of adolescent women age 15-19 have ever been pregnant. The Kenya Demographic and Health Survey (2022) shows that teenage pregnancy rates declined to 15 % in 2022, from 18 % in 2014. To address the health and nutritional issues faced by pregnant and lactating women, it is imperative to understand their sociodemographic factors. These traits significantly influence the health outcomes of mothers and their children in Turkana County, Kenya. Studies have shown that socio-demographic factors such as education level, marital status, age, socio-economic status, access to healthcare, cultural practices and beliefs impact the dietary habits and nutrition status of pregnant and lactating mothers (Wesołowska *et al*., 2019).

Young marriage is common in Turkana, with many girls getting married before they turn 18 (Agol et al., 2020). KDHS (2022) says that a lot of teen pregnancies happen in the county; 15% of girls aged 15–19 have already given birth, and 4.4% are currently pregnant. A study done in Nigeria by Callaghan (2015) shows that Muslim girls between the ages of 8 and 15 are getting married very young. Mutea's research in 2023 found that these high rates are partly caused by people getting married young, which is a cultural norm. This can then cause a lot of different social problems, such as school disruptions, health risks, economic dependence, psychological effects, the continuation of gender inequality, and bad things happening to children. The nutritional status of

pregnant women has been linked to their age, with young mothers being underweight (Huang et al., 2020).

A mother's health is strongly affected by how much schooling she has had. The level of education in Turkana is shockingly low—68.7% of people aged three and up have never been to school (KNBS, 2019). The KDHS Survey (2022) shows that the rates of pregnancy are very different between women with no education and those with secondary or higher education. This shows that education helps keep women from getting pregnant too soon. Turkana is one of Kenya's poorest counties, with a lot of people living in poverty and not having enough food. The Integrated Food Security Phase Classification (IPC, 2024) said that in Turkana, half of the people live in severe food and nutritional insecurity.

Turkana has limited access to health care services, which makes it harder for mothers and children to stay healthy. Access to prenatal and postnatal care is hard to come by because of the area's large, dry landscape and poor healthcare infrastructure (Appiah et al., 2021). A study by Mweemba *et al*. (2021) found that women in Kaputa, Zambia spent significantly more time traveling to health facilities, with poor roads and transport challenges cited as factors affecting service use. Financial difficulties exacerbate this lack of access, making it difficult for many women to receive medical care when they need it.

Compared to other pregnant women, adolescents who are pregnant and nursing have a lower likelihood of being well-nourished (Wang et al., 2011). The lack of nutrition for expectant and nursing mothers in Turkana is extremely concerning. Due to their inability to obtain food and their ignorance of proper eating habits, many people suffer

from malnutrition. Pregnant teenagers are particularly vulnerable because they are more likely to experience nutritional deficiencies, which can lead to complications during pregnancy and childbirth (Weerasekara et al., 2020). Their cultural customs, lack of easy access to healthcare, and low income all contribute to their nutritional issues (KDHS, 2022).

Early marriage, low education level, socioeconomic deprivation, cultural practices, and limited access to healthcare are just some of the factors that affect the sociodemographic of pregnant and nursing mothers in Turkana, Kenya. All these things add up to bad health outcomes for mothers and children. Addressing these challenges requires a multi-faceted approach that includes improving educational opportunities, enhancing access to healthcare, and promoting socio-economic development to ensure better health and nutritional outcomes for mothers and their children in Turkana.

2.8. Identified Gaps in Literature Review

In summary, the importance of nutrition knowledge, social cultural practices, nutrient needs and dietary practices cannot be overlooked, by the fact that they have a significant influence on the nutritional status of both the mother and foetal outcome. Socio-cultural factors have shown a strong correlation with decreased consumption of certain food groups. Additionally, it has been discovered from the studies that maternal characteristics including age, education level, nutrition expertise, and socioeconomic position have an impact on food consumption. There is a lack of knowledge, particularly regarding how sociocultural practices within communities affect dietary intake and nutrition status of pregnant and lactating women and pregnant adolescents, despite the importance of nutrition knowledge as an indicator of good nutrition status

having been demonstrated. The study, therefore, seeks to investigate the nutrition knowledge, sociocultural practices and the nutrition status of pregnant and lactating adolescents in Turkana South Sub-County.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1. Overview

Chapter Three outlines the methodology used to assess the nutritional knowledge, sociocultural practices, and nutrition status of pregnant and lactating teenagers in Turkana South Sub-County. It explains the study design, area, and population, including the sample size determination and sampling procedure. The chapter also outlines methods of collecting data, including interviews, anthropometric measurements, and focus group discussions, and data management, analysis techniques and ethical considerations.

3.2. Study Design

To evaluate the nutritional knowledge, sociocultural practices and the nutrition status of pregnant and breastfeeding teenagers in Turkana South Sub-County, a cross-sectional survey study design was used.

3.3. Study Area

The study was conducted in Turkana South sub-County. The Kenya Housing Census of 2019 outlines that Turkana South sub-County covers an extensive area of 7,045 Sq Km with an estimated population of 153,736 (Kenya National Bureau of Statistics [KNBS], 2019). The Sub-County has about 24,552 households with approximately 6 persons per household. The sub-County is located at 3^{o} 0’ N (Latitude) 36^{o} 45’ E (Longitude). The sub-county is made up of five major wards namely Kalapata, Katilu, Kaputir, Lobokat and Lokichar.

3.4. Study Population

Turkana South has a total population of 153,731 with 78,402 males and 75,329 females (KNBS, 2019).

3.4.1 Target Population

The target group consisted of all teenage girls in the sub-County, or around 9,361 people, who are between the ages of 15 and 19 years (KNBS, 2019).

3.5. Sample Size Determination

This study adopted the Fisher's (1999) statistical formula to determine the sample size. Since the population of girls between 15 – 19 years in Turkana sub-County is about 9,361. Calculation was as shown;

$$n = \frac{N}{1 + N*(e)^2}$$

Where:

n = the sample size when

N = total target population

e= confidence interval (95%)

$$n= \frac{9361}{1 + 9361*(0.05)^2}$$

n= **383.61**, approximately **384 adolescent mothers**

The sample size was distributed disproportionately using the following formula;

$$nh = \frac{Nh}{N} \times n$$

Where;

nh = sample size for cluster h

Nh = population size for cluster h

N= total population size

n= total sample size

Table 3.2: Sample Distribution in the Wards

Wards	**Population per ward (Nh)**	**Sample size calculation (nh)**	**Sample size per ward**
Kalapata	978	$\frac{978}{9361} \times 384$	**40**
Katilu	2916	$\frac{2916}{9361} \times 384$	**120**
Kaputir	1654	$\frac{1654}{9361} \times 384$	**68**
Lobokat	678	$\frac{678}{9361} \times 384$	**28**
Lokichar	3135	$\frac{3135}{9361} \times 384$	**128**
Total	**9361**		**384**

3.5. Sampling Procedure

A multistage sampling technique was used for this study (Sedgwick, 2015). The first technique used was purposive sampling, where Turkana County was deliberately selected due to its high incidence of teenage pregnancy and acute food and nutrition insecurity. Turkana sub-County was preferred as the area of the study since most change-oriented programs such as the promotion of kitchen gardening and establishment of irrigation schemes have been initiated in this sub-County in the recent

past by governmental and non-governmental organizations. Disproportionate sample distribution was used to divide the sample across the five wards as shown in table 3.1. The health facilities in each ward were selected following simple random sampling and used as the entry points to get the study participants. Simple random sampling was also used to identify all adolescent girls falling within the inclusion criteria were identified to be part of the study.

3.6. Inclusion and Exclusion Criteria

3.6.1 Inclusion Criteria

All pregnant and lactating adolescent girls within Turkana South Sub- County were included in the study.

3.6.2. Exclusion Criteria

Adolescent girls who were not pregnant nor breastfeeding within the study area were excluded in the study.

3.7. Data Collection Methods and Procedures

3.7.1. Data Collection Procedures

Interview schedules, direct observations and focus group discussions were used to gather primary data. From Turkana, ten enumerators who knew the local dialect and nutrition were chosen. Enumerators who have completed or are enrolled in a course related to nutrition were the preferred candidates. After being hired, the enumerators received a week of intensive training on the study's objectives and data collection methods. The enumerators had to become acquainted with the questionnaire as part of the training. Included in this were a thorough explanation of the questions and the process for completing the entries after the respondent had provided an answer.

The WHO (2017) recommendations for taking precise anthropometric measurements were also taught to the enumerators. This included instructions on how to take precise measurements for height and weight arm circumference using a height stadiometer, an adult mid-upper arm circumference (MUAC) tape and a bathroom scale.

3.7.1.1. Anthropometric Data

The nutrition status of pregnant and lactating adolescent mothers evaluation, anthropometric measurements were done which included; weight, height and mid-upper arm circumference (MUAC) as described by Salimar *et al*. (2022).

Weight: Body weight of the lactating adolescent mothers was measured using a weighing scale (SECA 874, China) with an accuracy of 0.1 kg. Every day, the weighing scale was calibrated using one kilogramme (kg) of sugar, and weight was recorded while wearing very little clothing. The mothers were told to stand in the middle of the scale platform, with their weight equally distributed between both feet. The results were recorded to the closest 0.1 kg after two measurements were taken and an average was calculated.

Height: Using a microtoise (SECA 213, China), the height of lactating adolescent mothers was measured. In order to measure their height, the mothers climbed the scale while wearing very little clothing and without shoes. They stood with their arms by their sides, their shoulders back, their legs straight, their heels together, and their gaze fixed on the future. The back of the head, heels, shoulder blades, and buttocks were all pressed up against a wall's vertical surface. Two precise measurements were taken with 0.1 cm accuracy.

MUAC: Only adolescent mothers who were pregnant were considered for measurements of the mid-upper arm circumference (MUAC). The mother's elbow was bent 90 degrees to take the measurement, and the mid-point of the upper arm was

measured with an adult MUAC tape to determine the mid-arm. Measurements were taken precisely to the nearest 0.1 cm after the tape was wrapped around the upper arm at the designated midarm.

3.7.2. Data Collection Tools

3.7.2.1. Nutrition Knowledge Data Collection

A questionnaire adapted and modified from the FAO standards for assessing nutrition-related knowledge, attitudes, and practices manual (Macías & Glasauer, 2014) was used to gauge the teen mothers' nutrition knowledge. Seven questions on breastfeeding practices, complementary feeding, meal consistency, dietary diversity, and feeding practices were included in the questionnaire to gauge the mothers' nutrition knowledge. The questionnaire answers were transformed into binary numbers, "1" and "0," where "1" stood for the right response and "0" for the incorrect response, which was indicated as "I do not know" (Matsumoto et al., 2020). Therefore, the sum of the mother's correct responses, which equals 7, was her overall score for nutrition knowledge. Teenage moms' nutrition knowledge was divided into three categories: low, moderate, and high (Kajjura et al., 2019; Matsumoto et al., 2020). Low nutrition knowledge was classified as a score of ≤ 2, moderate as a score between 3 and 4, whereas high nutrition knowledge was classified as a score of ≥ 4 (Kajjura *et al*., 2019).

3.7.2.2. Dietary Intake and Socio-Cultural Practices of Food Data

A semi-quantitative food frequency questionnaire with nine food groups (starchy staples, dark green leafy vegetables, other vitamin A rich fruits and vegetables, other fruits and vegetables, organ meat, meat and fish, eggs, legumes, nuts and seeds, milk and milk products) was used to evaluate information on the teenagers' dietary habits and intake. The enumerators recorded all the foods taken by the adolescents, portion sizes and their frequency.

3.7.2.3. Focus Group Discussions (FGDs)

Focused group discussions were also conducted in each of the five wards within Turkana South Sub-County: Kalapata, Katilu, Kaputir, Lobokat, and Lokichar. Each FGD aimed to find out about the socio-cultural practices associated with food intake during pregnancy and lactation. Each focus group discussion (FGD) included 8-12 participants who were chosen through purposive sampling to guarantee representation of various age groups, socio-economic backgrounds, and experiences with pregnancy and lactation. The participants consisted of pregnant and lactating teenagers, older women, and community elders who could offer insights into local practices. The discussions took place in community centres and clinics or local administration offices in each ward, creating a neutral and comfortable environment for participants. The seating arrangement was circular to encourage open dialogue and equal participation among all members. The information was captured through recording and note taking after which it was transcribed and interpreted.

3.8. Validity and Reliability

3.8.1. Pilot Study

Validity and reliability of instruments of data collection was tested using a pilot study. Five percent (5%) of the target population participated in the test, which was carried out in Turkana Central prior to the actual data collection (Gezimu et al., 2022). This aided in pre-testing the data collection instruments and assessing the real data collection procedure, including the effectiveness of the data collection instruments and the flow of the questions. The pilot exercise's outcomes yielded valuable input that aided in improving the data collection instruments. Additionally, the pilot study made it possible to test the reliability and accuracy of the data collection techniques.

3.9. Data Management and Analysis

Anthropometric data was recorded using Microsoft Excel, and the analysis done using GENSTAT version 18. Findings of the semi-quantitative food frequency questionnaire were categorised into the seven WHO-recommended food groups. The first dietary group consists of cereals, roots, and tubers; next are legumes and nuts; dairy, meat, eggs, and vitamin A-rich fruits and vegetables; and lastly, other fruits and vegetables. An analysis was conducted to classify the dietary diversity scores of the participants. Consuming no more than four of the seven food groups listed in the preceding month was considered minimum dietary diversity (Moura et al., 2020). Additionally, Nutri-Survey Software (Version 20) was used to enter and analyse data on portion sizes consumed from the FFQ.

GENSTAT version 18.0 was used to code and analyse the nutrition knowledge data that was gathered. Pearson's Correlation Coefficient was used to test the relationship between the mother's nutrition status and her knowledge (Chien et al., 2018). Lastly, a linear regression model was fitted to identify any significant association between nutrition status, knowledge and dietary patterns at $P<0.05$.

3.10. Ethical Consideration

Ethical approval was obtained from the Institute of Research and Ethics Committee (IREC), Mt. Kenya University (Approval No: MKU/ISERC/2959). A research permit was also issued by the National Commission for Science, Technology, and Innovation (NACOSTI) (permit No: NACOSTI/P/23/28458), allowing the researcher to carry out the study in Turkana South sub-County. Furthermore, the teenage mothers were asked to provide informed consent before the commencement of data collection. For

adolescents below 18 years, assent was given alongside informed consent from their caregivers before data collection. The research enumerators signed a confidentiality agreement which ensured the data collected was treated with the utmost confidentiality.

CHAPTER FOUR

RESULTS

4.1. Demographic Characteristics of Households with Pregnant and Lactating Adolescent Mothers

Demographic characteristics are as presented in Table 4.1. The response rate was 96% after removing data with missing information. Majority of the respondents were aged 19 years (62.9%) with 18-19 being the most common age bracket (52.6%) where most adolescent women got pregnant with their first child. However, it was noted that 4.9% of the respondents had given birth between the ages of 11-14. Most of the households comprised of 1-3 persons (79.4%) while others had 4-6 (19.8%) and above 6 people (0.8%). Approximately two-thirds of the respondents (69.6%) were married and living with their spouses, compared to only 0.5% who were divorced, 1.4% widowed, and 5.4% who had never been married.

Table 4.1. Demographic Characteristics of Pregnant and Lactating Adolescent Mothers

Variable		Percentage (%)
Age (N=369)	15	2.7
	16	11.1
	17	6.2
	18	17.1
	19	62.9
Age at first pregnancy (N=369)	11 – 14	4.9
	15 – 17	42.5
	18 - 19	52.6
Household size (N=369)	1 – 3	79.4
	4 – 6	19.8
	Above 6	0.8
Marital status (N=369)	Divorced	0.5
	Married living separately	23.0
	Married living with spouse	69.6
	Single/never married	5.4
	Widowed	1.4

4.2. Socio-economic Characteristics of Pregnant and Lactating Mothers

The socio-economic characteristics of the respondents, including their education level, income level, and occupation, were also collected, and the results are presented in Table 4.2. Majority of the respondents (44.4%) had no formal education, with only 6% having completed some tertiary training. Most respondents were low-income earners (90.8%) and unemployed (62.3%).

Table 4.2. Socio-Economic Characteristics of the Respondents

Variable		Percentage (%)
Level of education	Complete primary	4.1
	Complete secondary	16.8
	Incomplete primary	17.9
	Incomplete Secondary	10.8
	No formal education	44.4
	Tertiary	6.0
Level of income	Below Ksh.10,000	90.8
	Ksh.10,001 - 20,000	4.9
	Ksh.20,001 - 30,000	0.8
	Don’t know	3.5
Occupation	self-employed	23.8
	Casual worker	12.2
	Formal employment	1.4
	Full-time student	0.3
	Unemployed	62.3

4.2.2. Household wealth-index

Results of household wealth index were as presented in Figure 4.1. The household wealth index of the respondents was determined using factor reduction method. Wealth indicators such as household electrical ownership, animal ownership, sources of energy, sources of fuel, water, and sanitation facilities were incorporated into the model. The indicators were first analyzed to exclude variables with a prevalence below 3-5% or higher than 95-97%. Factor analysis was then carried out, and the scores ranked into five quintiles describing the household's wealth status, with the first quintile representing the poorest and the fifth quintile representing the wealthy (KDHS, 2022). Most respondents (71.5%) were in the lowest quintile compared to only 1.6%, who were in the highest quintile. On the other hand, 17.3% were second in the wealth quintile, 6% middle, and 3.5% fourth.

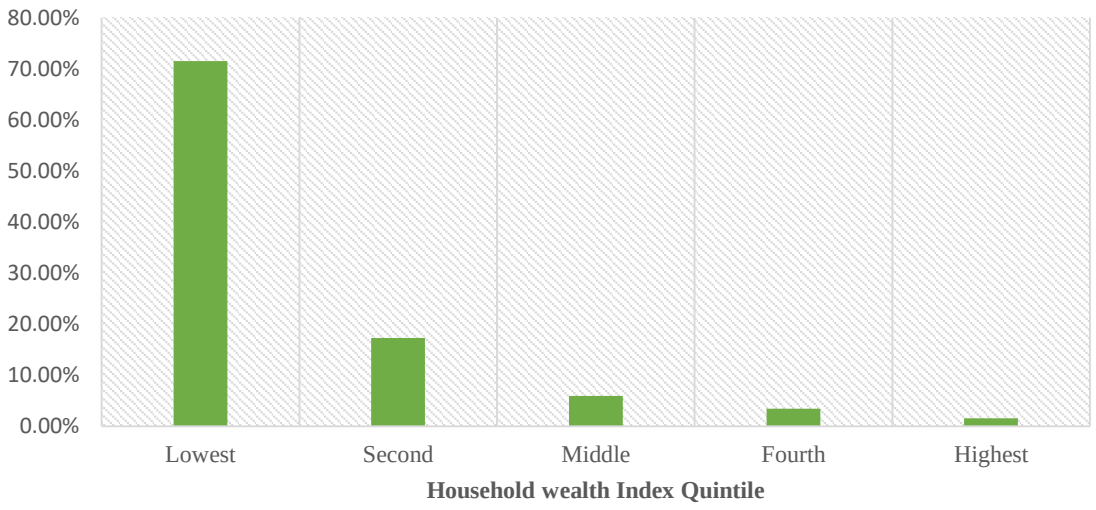

Figure 4.1. Household Wealth Index of Pregnant and Lactating Adolescent Mothers

4.3. Nutrition Knowledge of Pregnant and Lactating Adolescent Mothers

Results as presented in Figure 4.2 shows that most lactating adolescent mothers (67.3%) had low nutrition knowledge, while almost half of the pregnant adolescents (43.5%) had moderate nutrition knowledge. Fewer respondents from both categories had high nutrition knowledge, with 15.5% and 25.8% for lactating and pregnant adolescent mothers, respectively.

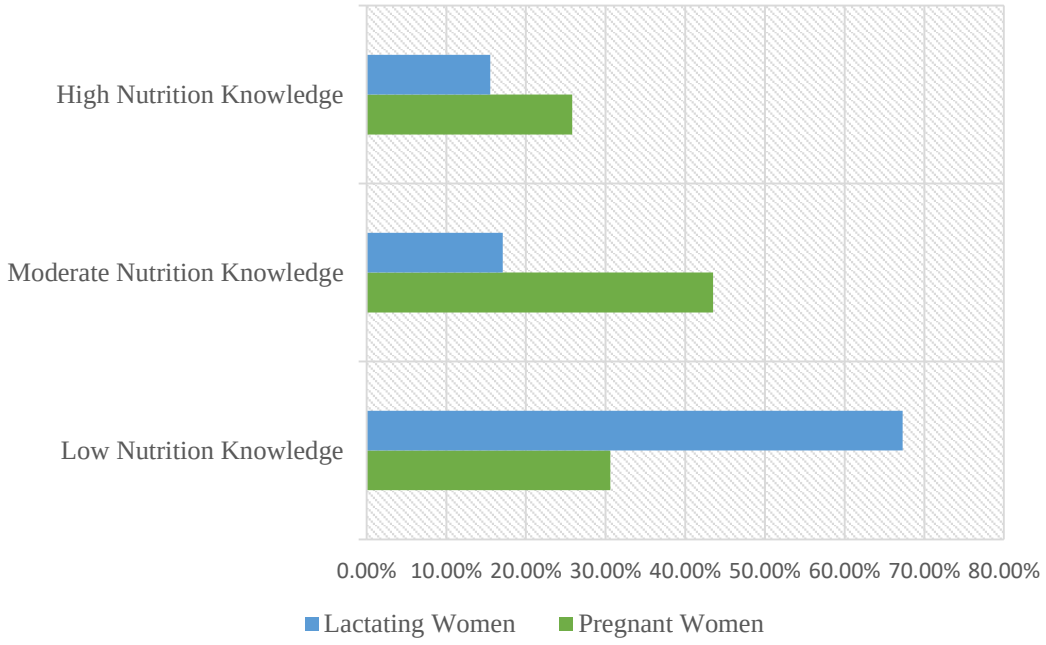

Figure 4.2. Nutrition Knowledge of Pregnant and Lactating Adolescent Mothers

4.3.1. Relationship Between Nutrition Knowledge and Education Level

The relationship between the education level of the respondents and their nutrition knowledge was tested using the fishers' exact test of independence as shown in Table 4.3. From the results, there was a statistically significant relationship between the respondents' education levels and nutrition knowledge, indicated by P=0.03148 and P=0.002 for lactating and pregnant adolescent mothers, respectively.

Table 4. 3. Relationship Between Nutrition Knowledge and Education Level

Variable (Level of education)	Low nutrition knowledge	Moderate nutrition knowledge	High nutrition knowledge	Fisher's exact test value	p-value
Lactating Women					
No formal education	31.0%	6.5%	5.7%		
Incomplete primary	13.9%	3.7%	2.4%		
Complete primary	3.7%	0.8%	0.8%	**18.686**	**0.03148***
Incomplete Secondary	6.5%	1.6%	1.2%		
Complete secondary	11.8%	2.9%	2.9%		
Tertiary	0.4%	1.6%	2.4%		
Pregnant Women					
No formal education	21.8%	20.2%	4.8%		
Incomplete primary	1.6%	6.5%	5.6%		
Complete primary	0.8%	0.8%	0	**24.814**	**0.002***
Incomplete Secondary	0.8%	7.3%	5.6%		
Complete secondary	4.0%	4.8%	6.5%		
Tertiary	1.6%	4.0%	3.2%		

*Statistical significance at $p<0.05$

4.4. Dietary Diversity of Pregnant and Lactating Adolescent Mothers

The dietary diversity of the respondents was assessed using the Household Dietary Diversity Score (HDDS) questionnaire. The food groups were categorized into nine significant groups, as proposed by FAO. (2010) to create the Women Dietary Diversity Score (WDDS). Results showed diverse food intake characteristics among the two groups as shown in Figure 4.3. The commonly consumed food groups were starch staples and dark green leafy vegetables while the least consumed food groups were eggs, organ meats and vitamin A rich fruits and vegetables.

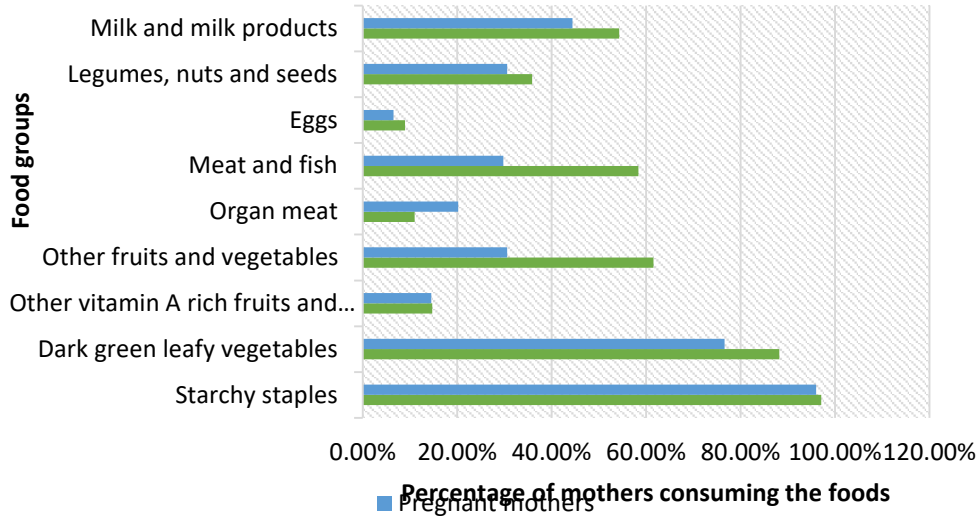

Figure 4.3. Women Dietary Diversity

Further analysis of the results was done too on the individual scores and ranked based on the groups consumed within 24 hours, with 1-3 groups being low diversity, 4-6 groups being medium diversity, and those above seven groups in a day having a high diet diversity. From the results presented in Figure 4.4, it was observed that most respondents had low diet diversity, with 56.7% and 77.42% representing lactating and pregnant adolescent mothers, respectively. Fewer respondents (11.4% and 6.45% for lactating and pregnant adolescent mothers, respectively) were recorded as having high diet diversity.

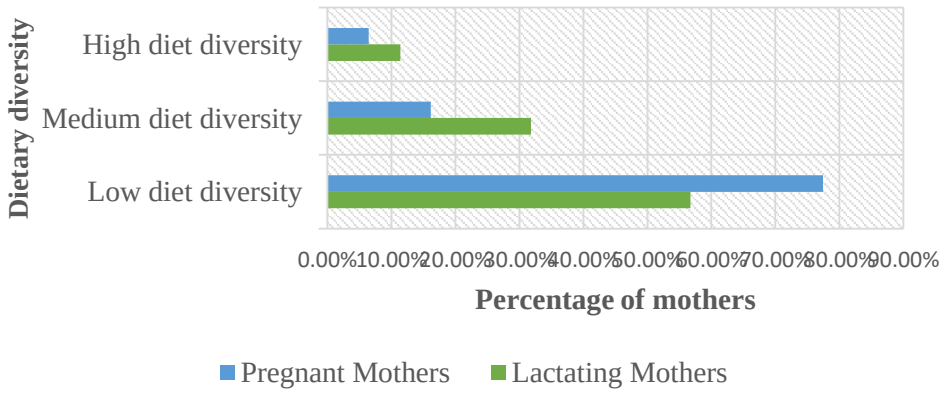

Figure 4.4. Dietary Diversity of Pregnant and Lactating Adolescent Mothers

4.4.1. Relationship Between Diet Diversity and Wealth Index

The relationship between dietary diversity and the wealth index of the respondents was tested using Fisher's exact test as shown in Table 4.4. From the results obtained, it was observed that there is a statistically significant relationship between dietary diversity and the wealth index of the respondents, represented by P=0.004 and P=0.025 for lactating and pregnant adolescent mothers, respectively.

Table 4.4. Relationship Between Dietary Diversity and Wealth Index

Variables (Wealth index)	Low diet diversity	Medium diet diversity	High diet diversity	Fisher's exact test value	P -value
Lactating Women					
Poorest	38.4%	18.4%	5.3%		
Second	12.7%	7.8%	2.0%		
Middle	4.1%	2.9%	0.8%	**20.934**	**0.004***
Fourth	0.8%	1.6%	2.9%		
Wealthiest	0.8%	1.2%	0.4%		
Pregnant Women					
Poorest	72.6%	13.7%	4.0%		
Second	4.0%	1.6%	1.6%	**9.902**	**0.025***
Middle	0.8%	0.8%	0.8%		

*Statistical significance at P<0.05

4.4.2. Relationship Between Dietary Diversity and Nutrition Knowledge

Fisher's exact test of independence was performed to determine the relationship between dietary diversity and nutrition knowledge of pregnant and lactating adolescent mothers as shown in Table 4.5. No statistically significant relationship was observed between lactating mothers' diet diversity and nutrition knowledge, as shown by P=0.556, while a mild significant relationship was observed among the pregnant women with a P-value of 0.066.

Table 4.5. Relationship Between Nutrition Knowledge and Diet Diversity for Pregnant and Lactating Adolescent Mothers

Variable (Nutrition knowledge)	Low diet diversity	Medium diet diversity	High diet diversity	Fisher's exact test value	P-value
Lactating mothers					
Low nutrition knowledge	37.6%	18.0%	7.8%		
Medium nutrition knowledge	10.2%	6.1%	1.6%		
High nutrition knowledge	9.0%	7.8%	2.0%	**3.036**	**0.556**
Pregnant mothers					
Low nutrition knowledge	42.7%	5.6%	0.8%		
Medium nutrition knowledge	22.6%	6.5%	3.2%		
High nutrition knowledge	12.1%	4.0%	2.4%	**8.193**	**0.066**

4.4.3. Energy and Nutrient Intake

4.4.3.1. Energy

The mean daily energy intake for pregnant mothers was 725.06 Kcal, whereas for lactating mothers, it was 805.29 Kcal (Table 4.6). Pregnant and lactating mothers' mean daily energy intake was lower than their RDA of 2300 Kcal and 2640 Kcal, respectively. Carbohydrates contributed 62.4% of the total daily energy intake of the pregnant mothers, with a mean of 452.08 Kcal (113.02 g). Similarly, among the lactating women, carbohydrates provided 60.3% of the total energy intake with a mean of 485.56 Kcal (121.39).

4.4.3.2. Protein

The mean daily protein intake for the pregnant and lactating mothers was 41.19 g and 38.77 g, respectively. This was relatively lower than the RDA values, 71 g/day for pregnant and lactating mothers. This inadequate intake of proteins puts the mothers at risk of protein deficiency.

4.4.3.3. Vitamin A

The mean daily intake of vitamin A for pregnant and lactating mothers was 792.54 µg and 666.42 µg, respectively. The pregnant women met their RDA for Vitamin A of 770 µg, whereas the lactating mothers were below their RDA of 1300 µg.

4.4.3.4. Folic Acid

Pregnant and lactating mothers' mean daily folic acid intake was 218.38 µg and 248.35 µg, respectively. Both groups were below half the RDA requirement of 600 µg.

Iron: Pregnant and lactating mothers' mean daily iron intake was 8.72mg and 8.02mg, respectively. The mean daily iron intake among the pregnant women was relatively lower than the RDA value of 27mg. However, the lactating mothers' mean iron intake was relatively higher and almost met their RDA of 8mg.

Table 4.6. Energy and Nutrient Intake for Pregnant and Lactating Adolescent Women

		Pregnant Women			Lactating Women	
Nutrient	**RDA**	**Mean**	**SD**	**RDA**	**Mean**	**SD**
Energy (Kcal)	2300	725.06	357.40	2640	805.29	352.01
Protein (G)	71	41.19	23.16	71	38.77	20.73
Carbs. (G)	290.7	113.02	73.71	290.7	121.39	51.00
Vit. A (µg)	770	792.54	662.72	1300	666.42	505.79
Vit. E (Eq.)(Mg)	15	2.16	1.85	19	2.26	1.61
Vit. B6(Mg)	1.9	0.69	0.41	2	0.67	0.36
Fol.Acid(µg)	600	218.38	153.61	600	248.35	145.25
Vit. C(Mg)	85	54.03	43.25	120	48.87	34.06
Sodium(Mg)	2000	426.42	262.58	2000	319.33	225.23
Potassium(Mg)	3500	1428.00	658.15	3500	1425.28	677.73
Calcium(Mg)	1000	208.71	144.84	1000	220.67	130.63
Phosphorus(Mg)	700	457.42	243.70	700	475.17	240.21
Iron(Mg)	27	8.72	3.94	9	8.02	3.78
Zinc (Mg)	11	4.95	3.47	12	4.47	2.62

4.5. Influence of Cultural Practices on Nutrition Among Pregnant and Lactating Adolescent Mothers

To determine the existing cultural practices and how they influence dietary practices among pregnant and lactating adolescent mothers, qualitative data was collected through Focused Group Discussions (FGDs). Two FGDs were organized in each ward across the sub-county, comprising not less than five participants per group. Data from the FGDs was coded and analyzed thematically using MAXQDA qualitative analysis software. From the results, it was recorded that several cultural practices affected food intake as well as how they are prepared. Some of the practices highlighted in the FGDs included restricted intake of protein-based foods such as meats, eggs, and organ meats

since they believe the baby might grow big and make it difficult during childbirth. Other restrictions were related to avoiding millet-based foods since they might become insane. The respondents also highlighted that pregnant woman are barred from taking meals beyond sunset, discouraged from sleeping during the day, and avoid too much sleep. The women should also stay on restricted diets to reduce caloric intake during pregnancy.

Some cultural practices related to breastfeeding discussed by the respondents included no breastfeeding before the naming of the child, first milk is considered unclean and unhealthy and should not be breastfed to the child, no breastfeeding in crowded places, twin children must be separated for them to grow and avoidance of eggs intake by the mother.

4.6. Nutrition Status of Lactating Mothers

Most (58%) of the lactating mothers had a normal nutrition status by weight, whereas a relatively high percentage (39.6%) of the lactating mothers were underweight as shown in figure 4.5. Lastly, 2.4% of the lactating mothers were classified as overweight.

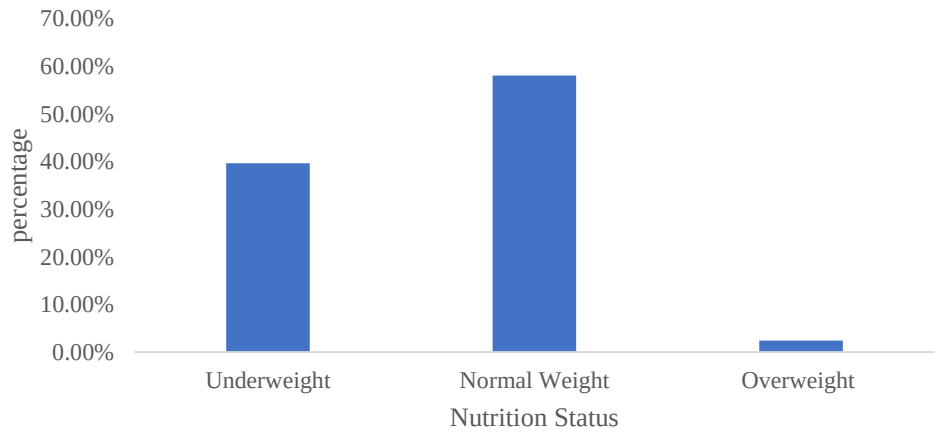

Figure 4.5. Nutrition status of lactating mothers

4.7. Nutrition Status for Pregnant Women

The study findings showed that most (75.8%) pregnant women had sub-optimal nutrition (MUAC <23.0 cm) status as shown in figure 4.6. In contrast, only 24.2% of the pregnant women had optimal nutrition (MUAC >23.0 cm).

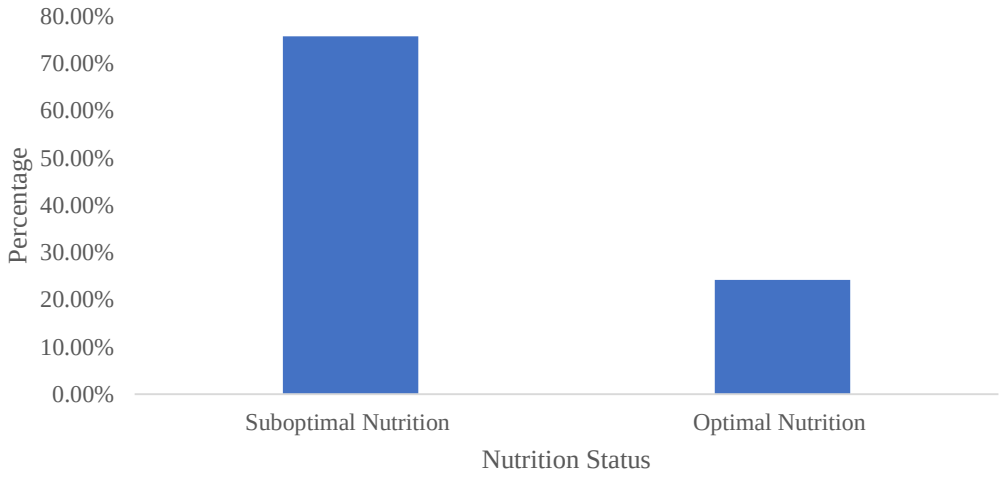

Figure 4. 6. Nutrition Status for Pregnant Mothers

4.8. Dietary Diversity and Nutrition Status of Lactating Mothers

Results of the relationship between dietary diversity and nutrition status of lactating mothers was presented in Table 4.7. 26.9% of the lactating mothers with low dietary diversity were also underweight. Similarly, 9.8% of the lactating mothers with a medium dietary diversity were also underweight. However, a conflicting finding was observed whereby 28.6% of the lactating mothers had a normal nutrition status. Upon statistical analysis, Fisher's exact test showed a statistically significant relationship between dietary diversity and the nutrition status of lactating mothers (P=0.017).

Table 4.7. Relationship Between Dietary Diversity and Nutrition Status for Lactating Mothers

Variable (Diet diversity)	Underweight	Normal weight	Overweight	Fisher's exact test value	P-value
Low diet diversity	26.9%	28.6%	1.2%		
Medium diet diversity	9.8%	21.6%	0.4%	**11.101**	**0.017***
High diet diversity	2.9%	7.8%	0.8%		

*Statistical significance at P<0.05

4.8.1. Linear Regression Model

A linear regression model was fitted to determine the relationship between dependent and independent variables as shown in Table 4.8. The analysis of variance for the model showed a significant relationship (P<0.05) between the nutrition status (dependent variable) and the predictor variables (diet diversity and wealth index). This implies that the nutrition status of the lactating mother's was affected by their dietary diversity as well as their wealth quantile.

Table 4.8. Analysis of Variance for The Regression Model Between Variables

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.168	2	1.584	5.806	.003[b]
Residual	66.032	242	0.273		
Total	69.200	244			

Dependent Variable: Nutrition Status

b. Predictors: (Constant), Diet Diversity, Wealth Index

4.9. Dietary Diversity and Nutrition Status of Pregnant Mothers

Most (61.3%) pregnant mothers with a low dietary diversity had sub-optimal nutrition as shown in Table 4.9. Despite this finding, the results indicated a statistically significant relationship between dietary diversity and the nutrition status of pregnant mothers (P=0.035).

Table 4.9. Relationship Between Dietary Diversity and Nutrition Status for Pregnant Mothers

Variable (diet diversity)	Optimal Nutrition	Sub-optimal Nutrition	Fisher's exact test value	P-value
Low diet diversity	16.1%	61.3%		
Medium diet diversity	4.0%	12.1%		
High diet diversity	4.0%	2.4%	**6.154**	**0.035***

*Statistical significance at P<0.05

CHAPTER FIVE

DISCUSSION

5.1 Socio-Economic Characteristics of Pregnant and Lactating Mothers

Most of the respondents (44.4%) had no formal education, and only 6% had completed some tertiary training. The low level of education among girls in Turkana County, Kenya was also highly documented by the KDHS (2022) report that 62.7% of women in the county had no formal education, which is the second highest after Mandera County (65.2%). The low levels of education could be due to economic and cultural barriers in the community where women and girls are often charged with a responsibility to take care of the families and siblings as the men are in search of food. Low levels of education affect women's ability to comprehend basic concepts of nutrition and adhere to diversification, as they will often rely on men to provide food for them. Most of the respondents were also low-income earners (90.8%) and unemployed (62.3%) due to the high number of unemployed respondents who earn a gross monthly income of less than Ksh. 10,000, their ability to meet basic household needs is hampered, including the purchase of food. These findings confirm Shaukat *et al*. (2020) study, which reported that 90% of households sampled in Turkana County were food insecure and 57.1% depended on harvesting and consuming indigenous wild edible plants due to insufficient finances to buy other foods. Most of the respondents (71.5%) were in the lowest quintile compared to only 1.6%, who were in the highest. The findings of this study confirm the report of the KDHS (2022) survey, which classified 75% of households in Turkana County in the lowest quintile and only 4.1% in the highest quintile, indicating that most of them are poor, and this affects their ability to access basic needs and commodities, including food.

5.2. Nutrition Knowledge of Pregnant and Lactating Adolescent Mothers

The study found that a majority of lactating adolescent mothers had low nutrition knowledge, while 43.5% of the pregnant adolescents had moderate knowledge, with smaller proportions demonstrating high knowledge levels. The low nutrition knowledge among the study participants can be attributed to the lack of formal education by majority of girls and women in the region as documented by KDHS and the current study findings. Several study findings have also documented low nutrition knowledge among pregnant and lactating adolescents from different countries which is often attributed to varied reasons ranging from socio-economic to cultural technicalities. For instance, a study conducted in India among adolescents by Ravula & Kasala (2022) found that the nutrition knowledge of pregnant and lactating adolescent mothers was inadequate, scoring less than 50%, indicating a gap in education and literacy regarding nutrition practices. Another study by Appiah *et al*. (2021) carried out in an Urban community, in Ghana noted low nutritional knowledge (44%) among pregnant adolescents.

Similarly, Abdirahman (2019) found out that pregnant adolescent mothers in Mandera County, Kenya, exhibited low nutrition knowledge, impacting their dietary practices and nutrition status, leading to poor health outcomes which also confirms the findings of the current study. Low nutrition knowledge especially for pregnant and lactating mothers impacts directly on their dietary practices which consequently results in poor nutrition status. Adolescent girls are often victims of low nutrition knowledge, especially in ASAL regions such as Turkana County where education for the girls is not considered high since they are viewed as a source of wealth and are married off without completing their education. A study by Lee *et al*. (2015) confirmed that

pregnant adolescents in Korea were associated with low nutrition knowledge as well as poor understanding of societal contemporary issues due to low access to education.

5.2.1. Relationship Between Nutrition Knowledge and Education Level

Education plays a crucial role in shaping individuals' understanding of health-related topics, including nutrition. The statistically significant relationship between education level and nutrition knowledge, for pregnant ($p=0.002$) and lactating ($p=0.031$) adolescents in the current study findings confirms this point. As the education level increased, there was a corresponding increase in the proportion of adolescent mothers with high nutrition knowledge and a decrease in those with low nutrition knowledge. This suggests that educational attainment positively influences nutrition knowledge among adolescent mothers. The current findings underline the importance of education in enhancing nutrition knowledge among adolescent mothers. Similar findings were recorded by Odiwuor *et al*. (2020) who concluded that good education results to improved behaviours and dietary practices among pregnant women which consequently has positive effect on their health as well as their unborn children.

Another study in Kenya by Abdirahman *et al*. (2019) also highlighted the pivotal role of education in improving dietary practices and health outcomes among pregnant and lactating women. Similarly, findings by Ilir *et al*. (2015) in South Sumatra demonstrated a strong association between nutrition knowledge and maternal dietary practices among adolescent mothers.

Furthermore, community-based interventions have proven to be effective in improving dietary practices and health outcomes among pregnant and lactating women (M. Abdirahman *et al*., 2019). Establishing community nutrition initiatives that provide

workshops, cooking demonstrations, and counselling sessions centred on nutrition for adolescent mothers could be advantageous for Turkana. These programs can be led by qualified nutritionists and community health workers to guarantee that correct and culturally relevant information is given. Improving access to nutrient-dense foods is essential for ensuring adequate nutrition among adolescent mothers, in addition to education and community-based interventions. Poor nutritional status in pregnant adolescents has been linked to food insecurity (Akunor-Sackey, 2022; Tesfaye, Adissu, et al., 2024). Thus, putting in place agricultural programs that encourage the raising of wholesome crops and livestock can aid in addressing Turkana's food insecurity. To guarantee access to a wide variety of nutrient-dense foods, these programs can be combined with food distribution initiatives aimed at disadvantaged groups.

5.3. Dietary Diversity of Pregnant and Lactating Adolescent Mothers

Evaluating the variety of foods consumed and the amount of nutrients utilized by pregnant and nursing teenage mothers in Turkana South Sub-County provided insight into their nutritional and dietary practices. The findings of the study shed light on how adequate their eating habits are and highlight areas where interventions can be used to improve the health of both mothers and children. The Women Dietary Diversity Score (WDDS), which measures dietary diversity, showed that the pregnant and lactating adolescents had a variety of food consumption patterns. Dark green leafy vegetables and starch staples were the most consumed food types, while vitamin A-rich fruits and vegetables, eggs, and organ meats were among the least consumed.

Similar to inadequate dietary diversity among adolescent mothers, pregnant women exhibited inadequate nutritional diversity, with minimal consumption of foods and

fruits derived from animals, according to a study done in Ethiopia by Azene et al. (2021). The limited availability of foods high in essential nutrients, rural living, food insecurity, poverty, and food cravings were the main causes of pregnant adolescents' low dietary diversity scores in Ghana, according to a study by Gyimah et al. (2021). These findings lend credence to the notion that teenage moms often struggle to achieve adequate dietary diversity, potentially impairing their nutritional health.

Contrarily, some research findings have shown that adolescents who are pregnant or nursing have a more varied diet. For example, pregnant adolescents in Ghana had comparatively higher dietary diversity scores, according to a study by Gyimah et al. (2021). This was explained by the availability of a variety of food options in urban areas. In a similar vein, a study conducted in Bangladesh by Fernández-Gómez et al. (2020) found that pregnant adolescents' dietary patterns varied depending on their cultural customs and food preferences. These findings suggest that dietary diversity among adolescent mothers may vary depending on contextual factors such as geographical location and cultural norms.

5.3.1. Relationship Between Diet Diversity and Wealth Index

The correlation between wealth index and dietary diversity among adolescent mothers is supported by the results of other studies concerning the relationship between dietary diversity and socioeconomic position. A study by Bikila *et al*. (2023) in Ethiopia found that higher household wealth was positively associated with dietary diversity among pregnant women. Similarly, research by Olatona *et al*. (2023) in Nigeria demonstrated that higher socio-economic status was associated with better dietary diversity among lactating adolescents. Tesfaye *et al*. (2024) highlighted that dietary diversity among pregnant adolescent mothers was directly associated with the wealth index of their

household and their level of education in central Ethiopia. Getacher *et al*. (2020), in their study to investigate factors associated with minimum diet diversity among lactating mothers, noted that low diversity was significantly related to education level, nutrition knowledge, food security status, and wealth status. These results elucidate how economic empowerment helps adolescent mothers have better access to a variety of nutrient-dense diets. In the context of Turkana, where economic challenges are prevalent, this study suggests that improving the wealth index could lead to better dietary diversity among lactating and pregnant adolescent mothers, potentially enhancing their nutritional intake and overall well-being.

5.3.2. Relationship Between Dietary Diversity and Nutrition Knowledge

This study's results indicated no statistically significant relationship between the pregnant and lactating mothers' dietary diversity and nutrition knowledge. This finding differs from the findings of Shrestha *et al*. (2021) in Nepal who found a significant relationship between dietary diversity of pregnant mothers and nutrition knowledge. The authors found that pregnant mothers with adequate nutrition knowledge were more likely to consume a diverse diet than their counterparts with low nutrition knowledge. The study results also contrast the findings of Shumayla *et al*. (2022) in rural India who found that good nutrition knowledge is a strong predictor of dietary diversity among lactating mothers. Research on the connection between dietary diversity and nutrition knowledge has produced contradictory findings. While some research has produced conflicting results, this study and others have found a somewhat significant correlation between dietary diversity and nutrition awareness in adolescent pregnant women. There was no discernible correlation between pregnant women's nutrition knowledge and dietary diversity, according to a study conducted in Ethiopia by Azene et al. in 2021.

Similarly, a study conducted in Ethiopia by Gebremichael (2023) did not find any connection between lactating adolescents' nutrition knowledge and dietary diversity.

This may not be the case in Turkana, most likely because of cultural beliefs that forbid eating certain foods while pregnant or nursing. Adolescent mothers may therefore be well-informed about nutrition, but the limitations imposed by their cultural practices and beliefs may prevent them from consuming a variety of diets. In addition, the majority of the adolescent mothers came from low-income families, which may prevent them from eating a variety of foods because of financial limitations. This is consistent with the findings of Agyei *et al*. (2021) in Ghana who also noted that 80% of the pregnant mothers had adequate nutrition knowledge but 30% of them cited difficulty in access to the foods. The climatic conditions experienced in Turkana characterized by prolonged drought and flash floods are another probable cause for the unavailability of desired foods. Therefore, the presence of these inconsistencies implies that dietary diversity among adolescent mothers may be influenced by variables beyond their nutrition knowledge, underscoring the necessity for comprehensive interventions.

5.4. Energy and Nutrient Intake

Results from this study revealed that the pregnant and lactating mothers' mean daily energy intake was lower than their RDA. This is consistent with the findings of Lee *et al*. (2013) who reported low energy and nutrient intake among pregnant mothers in low and middle-income countries. The authors noted that the mean and median intake of energy, fat, protein, and carbohydrates of pregnant mothers was significantly lower than that of pregnant mothers residing in the Caribbean and Central/South America. This finding differed from that of Motadi *et al*. (2020) who found that pregnant mothers in

rural areas of Limpopo met their RDA for energy, fats and carbohydrates. This low energy intake among pregnant and lactating adolescent mothers in Turkana could probably be due to their low dietary diversity and low household wealth index leading to inadequate consumption of energy-dense foods.

Adolescent mothers' inadequate dietary intake during pregnancy and lactation has been linked to various adverse outcomes for both mother and child. Previous studies have shown that inadequate nutrient intake can lead to low birth weight, preterm birth, and increased risk of maternal complications(Black *et al*., 2013; Seid *et al*., 2023). Similarly, the current study indicates that many pregnant and lactating adolescent mothers in Turkana South sub-county do not meet their daily caloric and micronutrient requirements. Factors that contribute to low dietary energy consumption during lactation may include poor nutritional knowledge, time restrictions, reduced intake of essential nutrients, and inadequate nutritional guidance from healthcare providers. Cultural practices within the Turkana community, including restricted intake of eggs and organ meats, might also be a contributing factor to the low intake of nutrients among pregnant and adolescent mothers. The community members believe that intake of these foods can jeopardize foetus health, making them grow big and consequently result in adverse pregnancy outcomes. The physiological demands of adolescents for energy and micronutrients are elevated during puberty, making it crucial to ensure adequate nutrition during pregnancy and lactation to prevent adverse health outcomes for both mother and child.

This study also indicated insufficient protein intake relatively lower than the RDA values. This is similar to the findings of Motadi *et al*. (2020) who found that pregnant women had a mean protein intake of 30.2g which is lower than half the RDA. Due to

cultural taboos and beliefs, the adolescent mothers in this study who were pregnant or nursing were not allowed to eat organ meat, eggs, or certain other foods derived from animals. The low protein intake observed in this study among adolescent mothers in Turkana County may be the likely result of these limitations. According to other research, low protein intake in pregnant and lactating women may be caused by the high price of foods high in protein that come from animals, particularly in developing nations where low-income households may not be able to afford them (Agyei et al., 2021; Lee et al., 2013; Motadi et al., 2020; Shrestha et al., 2021; Shumayla et al., 2022).

In this study, the pregnant women met their RDA for Vitamin A of 770 µg, whereas the lactating mothers were below their RDA of 1300µg. With regards to folic acid intake, both groups were below half the RDA requirement of 600 µg. The pregnant women did not meet their RDA for iron but the lactating mothers met their RDA for iron. These results are consistent with the findings of Motadi *et al*. (2020) who found that pregnant women in Zimbabwe did not meet their RDA for micronutrients such as zinc, iron, folic acid, magnesium, calcium, and the B complex vitamins. Lee *et al*. (2013) also reported low micronutrient intake among pregnant women in resource-poor countries. The authors explained that the low micronutrient intake could be attributed to diets being predominantly plant-based with infrequent consumption of nutrient-dense foods in these developing countries. The low dietary diversity noted among pregnant and lactating women in this study could probably explain the limited intake of various micronutrients. The poor adherence to iron and folic acid supplementation among pregnant women in Kenya and other Sub-Saharan countries could also explain the low intake of these two critical micronutrients during pregnancy (Fite *et al*., 2021;

Gebremariam *et al*., 2019; Kamau *et al*., 2018; Lyoba *et al*., 2020; Saragih *et al*., 2022; Sendeku *et al*., 2020).

5.5. Influence of Cultural Practices on Nutrition among pregnant and lactating adolescent mothers

The results showed that some of the Turkana cultural practices restricted the intake of protein-based foods such as meats, eggs, and organ meats since they believed the baby might grow big and make it difficult during childbirth. Other limitations included avoiding foods made from millet because they might go crazy. The respondents also emphasised that pregnant women in the Turkana community are discouraged from sleeping during the day, are not allowed to eat after sunset, and are advised to avoid getting too much sleep. In order to lower their calorie intake during pregnancy, the women should continue to follow restricted diets. Teenage girls who are pregnant suffer greatly from inadequate dietary intake as a result of these restrictions. According to Walters et al. (2019), approximately 35% of pregnant Malawian women avoid at least one food or beverage because of cultural beliefs.

Several cultural customs surrounding breastfeeding were documented in this study, such as the prohibition of breastfeeding prior to the child's naming, the belief that first milk is unclean and unhealthy and should not be given to the child, the prohibition of breastfeeding in crowded areas, the requirement that twin children be kept apart for growth, and the mother's avoidance of eating eggs. The idea that "the first milk is considered unclean and unhealthy and should not be breastfed to the child" is one of the cultural practices that prevents the newborn from receiving colostrum, and it has a significant negative influence on the child's development. Colostrum the milk produced

during the first days of life contains high concentrations of antibodies, immunoglobins, cytokines, enzymes such as lysozymes and lactoferrin, lipids and hormones that are vital in providing passive immunity and developing the baby's immune system (Palmeira & Carneiro-Sampaio, 2016). Therefore, this cultural taboo leads to the restriction of a critical component of breastmilk needed by a baby in their first days of life.

5.6. Nutrition Status of Pregnant and Lactating Mothers

5.6.1. Nutrition Status of Lactating Mothers

Results of this study indicated that 39.6% of the lactating mothers were underweight while 2.4% were overweight. This study's findings concur with that of Hundera *et al*. (2015) in Ethiopia who also found that 20.5% of the lactating mothers were underweight while 4.7% were overweight.

5.6.2. Nutrition Status for Adolescent Pregnant Girls

This result is greater than that of Salimar et al. (2022), who discovered that 20.2% of Indonesian adolescent mothers were wasted prior to pregnancy, and 26.1% of them had a low MUAC. Adolescents are in a critical phase of growth and development with increased nutrient needs and are thus at more risk of malnutrition and reproductive health problems if pregnant. This increased nutrient needs during adolescence and increased calorie needs during pregnancy put the girls at risk of suboptimal nutrition. In this study most of the adolescent pregnant mothers did not meet their RDA for energy, proteins and micronutrient intake this could explain the high rate of suboptimal nutrition status among them.

5.6.3. Relationship Between Dietary Diversity and Nutrition Status for Lactating Mothers

This study showed that 26.9% of the lactating mothers who had a low dietary diversity were also underweight. Similarly, 9.8% of the lactating mothers who had a medium dietary diversity were also underweight. There was a statistically significant ($p<0.05$) relationship between dietary diversity and nutrition status. The relationship between dietary diversity and nutritional status among lactating adolescent mothers is critical for both maternal and child health. For lactating mothers, who have increased physiological demands, a diverse diet is crucial to meet their nutritional needs and support the health and development of their infants. Research indicates that inadequate dietary diversity is linked to malnutrition and micronutrient deficiencies, which are prevalent among lactating women, especially in low-resource settings (Ruel & Alderman, 2013) which corroborates findings of the current study.

Recent studies have also highlighted the prevalence of inadequate dietary diversity among lactating mothers. For instance, a study conducted in Ethiopia by Tessema *et al*. (2020) found that only 24.5% of lactating mothers met the minimum dietary diversity criteria. Factors such as education level, household food security, and decision-making autonomy significantly influenced dietary diversity scores (Tessema *et al*., 2020). Another study reported that over half (55.6%) of lactating mothers had inadequate dietary diversity, correlating with a high prevalence of undernutrition, with 21% of participants classified as underweight (Yaya *et al*., 2021).

Various factors affect dietary diversity among lactating mothers.

5.6.3.1. Linear Regression Model

The analysis of variance (ANOVA) results indicated a statistically significant relationship ($P<0.05$) between the nutrition status of lactating mothers and two

predictor variables: diet diversity and wealth index. This suggests that both the diversity of a mother's diet and her wealth level played a role in influencing her nutritional status. Studies by Kant *et al*. (1993) and Arimond *et al.* (2010) have shown the importance of dietary diversity in ensuring adequate nutrition, particularly for vulnerable groups like lactating mothers.

5.6.4. Relationship Between Dietary Diversity and Nutrition Status for Pregnant Mothers

Most of the (61.3%) pregnant adolescent mothers who had a low dietary diversity also had sub-optimal nutrition. The results indicated a statistically significant relationship between dietary diversity and the nutrition status of pregnant mothers This concurs with the findings of Ahmed & Tseng (2013) who also found that 78% of pregnant adolescents who had low dietary diversity also had suboptimal nutrition status. Low dietary diversity predisposes pregnant teenagers to insufficient nutrient intake, particularly micronutrients that are critical for optimal pregnancy outcomes. This low dietary diversity noted among pregnant adolescents in Turkana County could be a result of low household income, food insecurity, food taboos and restrictions and low nutrition knowledge. In Ghana, 26% of the women who had low dietary diversity and chronic energy deficiency were underweight. The authors reported that just like many other low- and middle-income countries, Ghanaian pregnant women had low dietary diversity an indicator of poor-quality diets predominantly consisting of starchy staples.

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

1. The current findings noted that low education levels and poor economic status negatively affect the nutrition knowledge and dietary practices of pregnant and lactating adolescent mothers in Turkana South Sub-County.

2. Most study participants also recorded that they had less knowledge of nutrition, which negatively affected their food choices and, therefore, lower diet diversity, which was also documented by the demographic health survey.

3. Pregnant and lactating adolescents also had a lower intake of vital macronutrients and micronutrients from recommended values due to poor diversity and lack of the economic ability to access or purchase foods. Low intake of these nutrients might be of significant risk for both mother and child, and they are all predisposed to malnutrition or other health-threatening conditions.

4. The social-cultural practices of the Turkana people influenced the dietary intake of pregnant and adolescent mothers which included restriction from intake of certain parts of meats and eggs especially during pregnancy.

5. A significant number of lactating mothers were undernourished (39.60 %) and similarly, 75.80% of the pregnant adolescent mothers had sub-optimal nutrition status.

6.2. Recommendations

1. The ministry of health should formulate and implement national policy guidelines on adolescent maternal nutrition targeting counties such as Turkana.

2. Improved nutrition knowledge could have a positive effect on diet habits during

pregnancy and lactation if efforts are made to increase girls' access to high-quality education in the county.

3. By giving girls the information and skills they need to make decisions about their future and health, better access to high-quality education can reduce the number of adolescent pregnancies

4. It is possible to mitigate the negative consequences of malnutrition during pregnancy and lactation by putting in place targeted education programs that cover important nutrition concepts tailored to the needs of teenage moms and offer details on local, healthful food options

5. It is also crucial to emphasise that while providing young mothers with services and support is important, this does not imply that underage pregnancies are acceptable or condoned.

6. Future longitudinal studies are recommended to investigate the long-term impact of adolescent maternal nutrition on both the mother and child including the infant's milestone development and future pregnancy implications for the mother.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION AND INFORMED CONSENT

My name is Namuya Ngipuo Benjamin, a student at the University of Eldoret, Department of Family and Consumer Sciences pursuing a Master's degree in Community Nutrition. I am undertaking a study project titled; **Nutrition Knowledge, Sociocultural Practices and Nutrition Status Among Pregnant and Lactating Adolescents in Turkana South Sub-County.** The study will also help inform decision-making for proper interventions among pregnant and lactating mothers in Arid and Semi-Arid Areas.

The study will seek to ask the mothers several questions for about 45-60 minutes.

1. The study will collect data on the demographic, socio-economic characteristics of the household
2. Participation in the study is voluntary and will be highly appreciated. There are no consequences for declining to participate in the study.
3. Confidentiality will be highly maintained and any information obtained from the study will only be used for research.
4. Please note that participation in this study has no financial or other personal benefits.

Risks and Benefits

The risk to you if you participate in this survey is minimal. We could ask you questions that you might find difficult to respond to. You are allowed to refuse to answer any questions that make you feel uneasy. Your participation in the study in voluntary and we as the research team might not compensate for your time and efforts but however, a small token of appreciation will be provided. An advantage of participating is that the

data you give us will help in advancing proper nutrition during pregnancy and lactation in the region.

Confidentiality

The interviews will be conducted within your household or any other place where you will feel comfortable. Furthermore, there will be neither direct reference to your name nor will your contact information be published in this regard. The information to be collected will be treated with utmost confidentiality.

If you have any questions, you may contact me.

Namuya Benjamin Ngipuo

0726257371

Respondent Consent

I agree to participate in the study having understood its purpose. I have been given a chance to ask questions and I understand the procedures to be undertaken and any risks that might be involved. Therefore, I have freely given my consent to take part in the study.

Name of Respondent (optional) _____ Signature _____

Telephone: _____

Date _____

Interviewer's Consent

I, the undersigned have explained to the respondent the procedures in the study, the benefits and the risks involved in participating in the study in a language she understands.

Name of interviewer _____

Interviewer signature _____ Date _____

APPENDIX II: HOUSEHOLD QUESTIONNAIRE

Survey code:	__/_ _/_ _ _/_ _ _ (Ward /HH No)
Interviewer's name:	First name Family name
Interview date:	_ _/_ _ /_____ (DD/MM/YEAR)
HH address:	Ward Village
Consent obtained:	1=Yes 2=No *(if no, ask if you can come back some other day or time)*

SECTION A: Introductory Questions

1. What is your current age (in complete years)? _____

2. What was your age during your first conception? _____

SECTION B: Demographic characteristics

Household characteristics

1. How many people currently live in this household including yourself?
   _____

2. For every member of the household above, complete the following details

Name	Age	Relationship to HH	Education level	Marital status	Occupation
		1 = HH 2 = spouse 3 = daughter/son 4 = daughter/son-in-law 5 = grandchild 6 = father/mother 7 = brother/sister 8 = stepchild 8 = Other relatives 9 = servant	1 = no formal education 2 = incomplete primary 3 = Complete primary 4 = incomplete secondary 5 = complete secondary 6 = tertiary level	1= single 2 = married living with a spouse 3=married living separately 4=widowed 5= divorced 97 = other 98= don't know	1=Pastoralist 2=Business 3=Causal worker 4=Housewife 5=Civil servant 6=Private sector 7=Unemployed 8=Any other specify

SECTION C: Family Socio-Economic Status

1. What is your average monthly household income?

   1 = below Ksh. 10,000 2 = Ksh. 11,000 – 20,000 3 = Ksh. Ksh. 21, 000 – 30, 000 4 = above Ksh. 31,000

2. Indicate whether you have the following animals and the numbers

ANIMAL	1= YES 2=NO	NUMBER
Cattle		
Camel		
Goats		
Sheep		
Chicken		
Donkey		
Others (Specify)		

3. Which of the following does your household own?

Items/description	1=Yes 2=No
Stove	
Gas cooker	
Electric cooker	
Jiko	

Fridge	
Freezer	
Watch	
Phone (mobile)	
Radio	
Television	
Bicycle	
Motorcycle/scooter	
Car	
Truck	
Animal-drawn cart	
Boat with a motor	
Boat without motor	

4. Sources of energy

The main source of energy used for cooking (use list below)	The main source of energy for lighting (use list below)
1 = electricity 2 = natural gas 3 = biogas 4 = kerosene 5 = solar 6 = firewood 7 = torch 8 = other (specify)	1 = electricity 2 = natural gas 3 = biogas 4 = kerosene 5 = solar 6 = firewood 7 = other (specify)

5. What type of toilet facility does your household use?

   - ☐ Flush toilet
   - ☐ Improved latrine
   - ☐ Unimproved latrine (without slab/open pit)
   - ☐ No facility/open bush
   - ☐ Other

6. Does your household share the toilet facility with other households?

   - ☐ Yes
   - ☐ No

7. What is the main water source for the household?

   - ☐ Tap/pipe
   - ☐ Well
   - ☐ Spring
   - ☐ River, lake or other body of water
   - ☐ Vendor/truck

8. Does your household share the water source with other households?

   ☐ Yes

   ☐ No

9. Do you treat water before drinking?

   ☐ Yes

   ☐ No

10. If yes, what do you do?

    ☐ Boiling

    ☐ Filter

    ☐ Chlorination

    ☐ Others

SECTION D: Household Dietary Diversity

Write down (1) If any food was consumed in the last 24 hours period in the given food group and write (0) if none of the food was consumed in the given food group.

S/NO	FOOD GROUP	EXAMPLES	YES=1 NO=0
1	Cereals	Maize, rice, wheat, sorghum, millet or other grains or foods made from these (e.g. bread, chapattis, noodles, porridge, Ugali)	
2	White roots and tubers	White potatoes, white yams, white cassava, arrowroots or white sweet potatoes other food made from roots	
3	Vitamin A rich vegetables and tubers	Pumpkin, carrots, squash or yellow sweet potato and other locally available vitamin A rich vegetables	
4	Dark green leafy vegetables	Dark green leafy vegetables, including wild forms plus vitamin A rich vegetable such as amaranth, cassava leaves, kales, spinach	
5	Other vegetables	Other vegetables (e.g. tomatoes, onions eggplant) plus other locally available vegetables	
6	Vitamin A rich fruit	Ripe mangos, Cantaloupe, apricot (fresh or dried) ripe papaya, dried peach and 100% juice made from these juices plus other locally available vitamin A rich fruits.	
7	Other fruits	Other fruits, including wild fruits and 100% fruit juices made from these fruits	
8	Organ meat	Liver, kidney, heart or other organ meats or	

		blood-based Foods	
9	Flesh meat	Beef, Pork, Lamb, goat, rabbit, game, chicken, duck, other birds, insects	
10	Eggs	Eggs from chicken, duck guinea fowl or any other egg	
11	Fish and seafood	Fresh or dried fish or shellfish	
12	Legumes and nuts	Dried beans, dried peas, green grams, cowpeas, lentils, nuts seeds or food made from these (e.g peanut butter)	
13	Milk an d milk product	Milk, cheese, yoghurt or other milk product	
14	Oils and fats	Oils, fats or butter added to food or used for cooking	
15	sweets	Sugar, honey sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies. cookies and cake	
16	Spices condiments, beverages	Spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages.	

Section E: Food frequency table

Indicate whether you have consumed the following foods in the last 7 days? If yes, how many days and approximate the portion sizes

Food	1- **YES** 2- **NO**	**Number of times**	**Average portion size per serving**	**Food**	1- **YES** 2- **NO**	**Number of times**	**Average portion size per serving**
PROTEIN				Irish potatoes			
Beef				Millet			
Chicken				Bread			
Game meat				Green banana			
Goat meat				Pasta			
Camel meat				Rice			
Mutton				Chapatti			
Tripe (*Matumbo*)				Raw banana			
Liver				Amaranth grain			
Fish				Others			
Milk				**Roots and tubers**			

Milk products				Sweet potatoes			
Eggs				Yam			
Beans				Arrowroot			
Black beans				Cassava			
Green grams				Others			
Lentils				**Fruits and vegetables**			
Dry peas				Kales			
Pigeon peas				Cabbage			
Peas				Spinach			
Others				Carrots			
Fats /oils/sugar				Tomatoes			
Cooking oil				Cowpea leaves			
Cooking fat				Amaranth			
sugar				Ripe banana			
Animal fat				Pawpaw			
Cereals and grains				Mangoes			
Maize flour				Loquats			
Maize grain				Oranges			

Section F: Anthropometric Measurements

Measure	First reading	Second reading	Third reading	Average
MUAC				
WEIGHT				
HEIGHT				

CLINICAL ASSESSMENT (Observations ONLY)

1. Skin: Dry and flaky skin, brittle nails, and hair loss could indicate a lack of essential nutrients such as vitamins A, C, and E.

   ☐ Yes

   ☐ No

2. Eyes: Pale or yellowish conjunctiva could indicate anemia or a lack of vitamin A.

   ☐ Yes

   ☐ No

3. Mouth: Bleeding gums, mouth ulcers, and a swollen tongue could indicate a lack of vitamin C or iron.

   ☐ Yes

- ☐ No

4. Breastfeeding: The mother's milk production should be observed to ensure she is producing enough milk to meet the baby's needs.

   - ☐ Yes

   - ☐ No

APPENDIX III: NUTRITION KNOWLEDGE TOOL

Question 1: Women's nutrition during pregnancy and breastfeeding

For a pregnant woman:

How should a pregnant woman eat in comparison with a non-pregnant woman to provide good nutrition to her baby and help him grow?

Please list four practices she should do.

For a lactating woman:

How should a lactating woman eat in comparison with a non-lactating woman to be healthy and produce more breastmilk?

Please list four practices she should do.

_____
_____
_____
_____
_____
_____

- ☐ *Eat more food (more energy)*
  - ☐ *Eat more at each meal (eat more food each day)*

    Or
  - ☐ *Eat more frequently (eat more times each day)*
- ☐ *Eat more protein-rich foods*
- ☐ *Eat more iron-rich foods*
- ☐ *Use iodized salt when preparing meals*
- ☐ *Other*
- ☐ *Don't know*

Question 2: Micronutrient supplements for pregnant women

Most women would benefit from two types of supplements, or tablets, during pregnancy. Which are they?

- ☐ *Iron supplements*
- ☐ *Folic acid supplements*
- ☐ *Other*
- ☐ *Don't know*

Question 3: Recommendation of folic acid supplements

Can you tell me why it is so important to take folic acid supplements during pregnancy?

What is the health benefit for taking folic acid supplements/tablets?

- ☐ *For normal development of the nervous system of the unborn baby (brain, spine and skull)*
- ☐ *To prevent birth defects/abnormalities the nervous system of the unborn baby (brain, spine and skull)*
- ☐ *Other*
- ☐ *Don't know*

Question 4: Health risks for low-birth-weight babies

When a pregnant woman is undernourished, she is at risk of having a low-birth-weight baby, meaning that the baby is small or has a low birth weight. What are the health risks for these babies?

- ☐ *Slower growth and development*
- ☐ *Risks of infections/being sick*
- ☐ *Risks of dying*
- ☐ *Risks of being undernourished/having micronutrient deficiencies*
- ☐ *Risks of being sick once adult/developing chronic diseases in adulthood (heart disease, high blood pressure, obesity,*

diabetes)

☐ *Other*

☐ *Don't know*

Question 5: How good do you think it is to eat more food during pregnancy?

☐ *Not good*

☐ *Not sure*

☐ *Good*

If not good:

Can you tell me the reasons why it is not good?

_____

_____

_____

_____

Question 6: How difficult is it for you to eat more food during pregnancy?

☐ *Not difficult*

☐ *So-so*

☐ *Difficult*

If Difficult:

Yes

_____

_____

_____

_____

APPENDIX IV: FOCUS GROUP DISCUSSION GUIDE

1. What do you know about the following;
    a) Pre-pregnancy nutrition
    b) Good nutrition practices for a pregnant mother
    c) Consequences of poor nutrition

2. Why do the following happen among girls in this area?
    a) Marry at an early age,
    b) Marry as second or third wife
    c) Drop from school early

3. What are the major dietary practices among pregnant adolescents?

4. Are there any interventions currently that in place to help teenage mothers improve their nutrition and pregnancy outcomes?

5. What are some of the socio-cultural practices related to diet during pregnancy?

6. What are some of the socio-cultural practices related to breastfeeding?

7. Which factors do you think affect the nutrition status of pregnant adolescent?

APPENDIX V: ETHICS CLEARANCE

Mount Kenya University

REF: **MKU/ISERC/2959**
TO: **NAMUYA NGIPUO BENJAMIN**

Date: 27 July 2023

REG: **SAGR/FCS/M/001/21**

Dear Sir/Madam,

RE: NUTRITION KNOWLEDGE, SOCIOCULTURAL PRACTICES AND NUTRITION STATUS AMONG PREGNANT AND LACTATING ADOLESCENTS IN TURKANA SOUTH SUB-COUNTY

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **2003.** The approval period is **27/07/2023 - 26/07/2024.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. 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
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

APPENDIX VI: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **310287**

Date of Issue: **16/August/2023**

RESEARCH LICENSE

This is to Certify that Mr.. Namuya Ngipuo Benjamin of University of Eldoret, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Turkana on the topic: NUTRITION KNOWLEDGE, SOCIOCULTURAL PRACTICES AND NUTRITION STATUS AMONG PREGNANT AND LACTATING ADOLESCENTS IN TURKANA SOUTH SUB-COUNTY for the period ending : 16/August/2024.

License No: **NACOSTI/P/23/28458**

310287

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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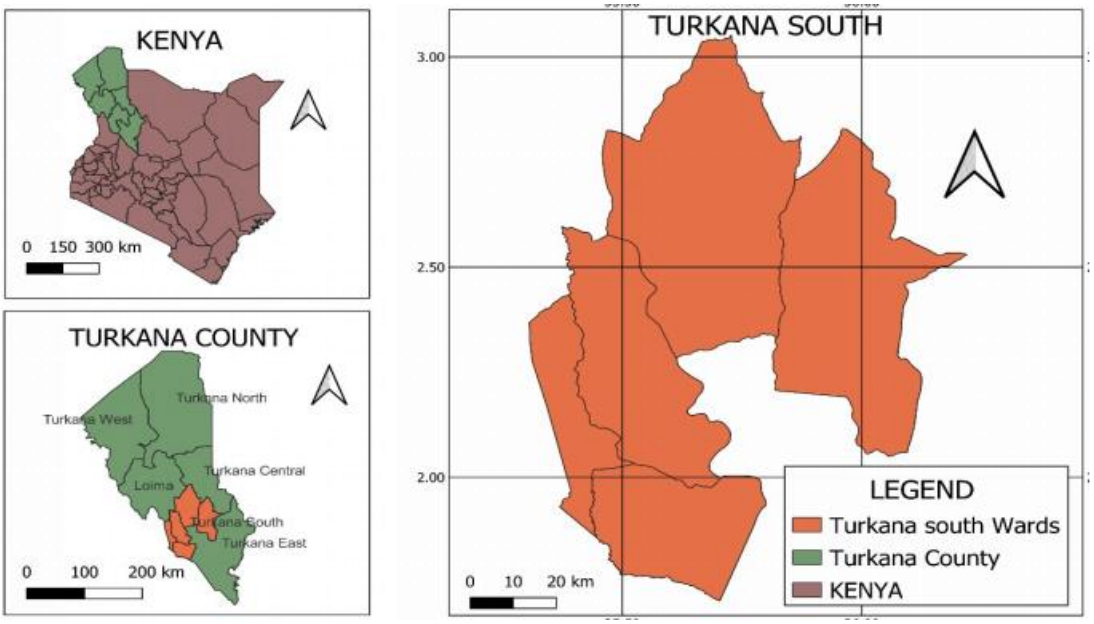
See overleaf for conditions

APPENDIX VII: MAP OF STUDY AREA



APPENDIX VIII: SIMILARITY

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