NUTRITION KNOWLEDGE, DIETARY PRACTICES AND NUTRITION STATUS OF PREGNANT ADOLESCENTS IN MANDERA COUNTY, KENYA

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DECLARATION

"This thesis is my original work and has not been presented for a degree in any other University."

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DEDICATION

I dedicate my thesis to my supervisors, family and friends for their financial support and encouragement throughout the study period.

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LIST OF ABBREVIATION AND ACRONYMS

ANC	Antenatal Clinic
ASAL	Arid and Semi-Arid Lands
EAPR	East Asia and Pacific Region
EBF	Exclusive Breastfeeding
FGD	Focus Group Discussion Guide
IDDS	Individual Dietary Diversity Score
IUGR	Intrauterine Growth Restriction
KDHS	Kenya Demographic Health Survey
KFFSG	Kenya Food Security Steering Group
KNBS	Kenya National Bureau of Statistics
MCH	Maternal and Child Health
MOH	Ministry of Health
MUAC	Mid-upper Arm Circumference
UNICEF	United Nations Children's Fund
UTIs	Urinary Tract Infections
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Cultural factors -These refer to norms or beliefs on foods.

Dietary intake - This denotes the amount of food taken in the previous 24 hours.

Dietary practices – refers to number of meals, amount of nutrients consumed and frequency of food consumption

Knowledge – refers to the information related to nutrition that an adolescent mother has in respect to dietary practice.

Maternal factors – refers to age, education and occupation

Number of meals – refer to the number of meals taken focusing on both the main meals and snacks

Nutrition status –refer to MUAC of the pregnant adolescents

Pregnant adolescents - refers to females who are aged below 18 years and are pregnant

Snack – food eaten in between the main meals

ABSTRACT

Adolescent's pregnancy is on the increase. This consequently has led to high morbidity, mortality among the born child. Appropriate mother's nutrition status during pregnancy is essential for both the mother and the fetus. Dietary intake among pregnant adolescents is a key factor that influences their nutrition status and the birth outcome. Nutrition knowledge of the mothers has been shown to affect the dietary practices of the children. However, nutrition knowledge among pregnant adolescents is normally ignored. More research has focused on pregnant mothers in general with a little focus on those who are adolescents. In addition, there is inadequate information on nutrition status and dietary intake among pregnant adolescents. Thus, the study aimed to assess nutrition knowledge, dietary practices and nutrition status of pregnant adolescents. A cross sectional analytical design was used, to carry out the study in Mandera East Sub-County, Mandera County which is one of the ASAL areas in Kenya. A sample size of 258 pregnant adolescents visiting the various Health Facilities in Mandera East Sub-County was selected using a systematic sampling technique from hospital records. A researcher administered questionnaire was used for collecting data. Additional data was collected using focus group discussions guides and key informants interviews. Nutri-survey software was used to analyze dietary data for amount of nutrients consumed. Data was collected, entered and analyzed using SPSS. Pearson's correlation coefficient was used assess the relationships between non-categorical variables while chi-square was used for categorical variables. Logistical regression analysis was used to assess prediction among variables. A probability value <0.05 was taken as significant. Qualitative data was analyzed to indicate the emerging themes. Results show that the proportion of the pregnant adolescents (22.1%) were unmarried and with up to primary level education (68.4%). They were mainly casual workers or pastoralists earning an average monthly income of 6,934± 625 KES. The mean nutrition knowledge score was 46.4 ± 6.8 was low with majority (47.5%) having moderate nutrition knowledge. The mean number of meals was 2.95 ± 0.6. The mean energy intake was 1850.5 ±33. Intake of energy and other micronutrients were below the recommended daily allowance apart from fat. The mean individual dietary diversity score was 5.64 ± 2.32 food groups. Cereals and oils/fats, flesh meat and milk and milk products were the common foods consumed by most mothers. The nutrition status was poor 31.1% were underweight. About 36.1% of the mothers had been sick in the previous two weeks. The main illness were malaria and cough experienced by (33) 37.5% and (25) 28.4% of respondents, respectively. The nutrition knowledge score was shown to have a significant positive relationship with nutrition status (r=0.069; P<0.001) and morbidity status (χ^2 =121 df= 6, P= <0.001). There was a significant relationship (r=0.069; P<0.033) between the dietary diversity score and the nutrition status as well as with morbidity status (r = 0.526; p= 0.005). This study concludes that the nutrition knowledge of these mothers was low and led to poor nutrition status. The poor nutrition status was associated with inadequate dietary intake and frequent illness. The poor dietary practices were as a result of by low education level as well as low nutrition knowledge level which was in combination with lack of adequate income to procure food. The low education level and low income led to poor health seeking behavior and as such led to a higher morbidly status among the pregnant adolescents.This study recommends a policy on utilisation of the training package among health workers so as to help the mothers improve their care practices.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

A third of women in developing countries deliver below the age of 18 years (Langille, 2007). Most of the teenage births are in developing countries (Imamura, Tucker, Hannaford et al., 2007). Research shows that adolescent birth rate is still increasing (Sukrat, 2014). A study in forty-three developing countries in sub-Saharan Africa, show that childbearing among adolescents is high (Singh, 2008). In the majority of these countries, it is due to the fact that girls marry in their teens (Adebowale, Fagbamigbe & Okareh, 2012). In Kenya, based on the Kenya Demographic Health Survey (KDHS, 2014), 18% of young girls aged fifteen to nineteen years are already in child bearing age, 15% are mothers and an additional three percent are pregnant with their first child.

Teenage pregnancy occurs due to minimal protection to teenage girls (Symonds & Ramsay, 2010). Poverty triggers early marriage, where children are regarded as a strategy for economic survival. A girl may be given to an older man in marriage as a means of survival (Adebowale, Fagbamigbe & Okareh, 2012). According to Stewart et al. (2007), traditional attitudes lead to family heads making marital choices for their children without thinking of the implication on the health and welfare of the girl child (Kramer, 2008). Young girls with no education are more than three times likely to have started childbearing by the age of nineteen than those who have acquired secondary and higher education (Were, 2007).

Pregnancy among underage and adolescents girls puts them at the risk of nutrition challenges (Aguilar de Díaz Escobar, 2013). Teenage pregnancy is labeled as a major public health problem due to the associated birth outcomes like premature births, low

birth weight and maternal deaths (Imamura, Tucker & Hannaford et al., 2007). The main reason is that their bodies have low nutrition reserves due to poor dietary practices (Özünlü & Cetinkaya, 2013). Adolescent pregnancies affect the growth and health of mothers and the infant especially stunting which are never achieved later in life. An underweight mother transfers the effect to the infant (Singh, 2008). In Kenya, the main causes of underweight are due to food insecurity and low nutrition knowledge (Obare et al., 2012).

Many girls drop out of school as a result of pregnancy which affects their lives negatively (Rah, Christian & Shamim, 2008). Complications related to teenage pregnancies are the leading cause of death among girls in developing countries (Were, 2007). About 70,000 adolescents die each year (Stapleton & Keenan, 2009). Nutrition throughout pregnancy affects fetal growth and may also have far-reaching effects whereby the born child's mortality and morbidity are increased. Though no particular study has been conducted in North Eastern Kenya, high cases of mortality among infants born of adolescent's mothers have been reported in other parts of Kenya (Nderitu et al., 2015).

The nutrition knowledge of women prior to pregnancy is also of importance in increasing the maternal awareness. Studies have shown that nutrition knowledge relates to the quality of food consumed (O'Brien & Davies, 2007). It is important for women to have adequate nutrition knowledge on dietary practices.

This is important to guide on sources of nutritious foods. Appropriate dietary practices characterized by good nutrition practices during pregnancy is important for the pregnancy performance (Bawadia et al., 2010). The dietary behaviors are influenced by

various socio-demographic characteristics and nutrition knowledge is significantly associated with healthier choice.

The nutrition status of women of reproductive age is a determinant of pregnancy outcomes, including birth weight of the new born. A study by Ramachandran (2002), highlights that poor maternal nutrition is a major contributing factor to maternal mortality, infant mortality and low birth weight of infants. Nutrition status at conception is a determinant of status later in life, thus, a vital determinant of reproductive efficiency (Brown & Isaacs, 2011). Early pregnancies related complications are the leading causes of death to girls. A study has shown that it is important to have optimal nutrition status before and during pregnancy (Black et al., 2008).

ASAL regions are characterized by low rainfall and famine (Venton et al., 2012) with pastoralism being the main livelihood. Populations in these regions live in low socio-economic status (Venton et al., 2012). Mandera County is one of the counties in arid and semi-arid lands (ASAL) areas of Kenya. The areas are characterized by food insecurity. Early marriage seems more prevalent in the Northern part of Kenya than the other parts due to the effect of Muslim religion (Omwancha, 2012). This is risky especially in ASAL regions which has >15% of under nutrition among adolescents (Keino, 2014).

1.2 Problem Statement

Pregnant adolescents are more vulnerable to malnutrition because of their physiological requirements. There has been an increase in adolescent pregnancies (Sukrat, 2014). Pregnant adolescents are more vulnerable to malnutrition and infections. This causes a risk to the health of mother and child. As such, malnutrition is passed from one

generation to the next leading to vicious cycle. To break this viscous cycle, information specific to pregnant adolescents is needed. Most studies shows information about all pregnant mothers with minimal information on pregnant adolescents. Most of these studies have been conducted in developed countries with only a few in developing countries. In addition, information on prevalence of under nutrition has not been associated with the causative factors like nutrition knowledge. Pregnant adolescents are characterized with poor dietary practices and nutrition status. Studies have associated nutrition knowledge with pregnancy performance (Bookari, Yeatman & Williamson, 2013).

Studies focusing on pregnant adolescents have been scarce in Kenya. Thus, minimal information on how to design programs to intervene on this vulnerable group. This is more so in Mandera County which is an ASAL area. The population in this county is vulnerable due to food insecurity (Waithaka, 2015). This study thus assessed nutrition knowledge, dietary practices and nutrition status among pregnant adolescents in Mandera East Constituency, Mandera County.

1.3 Purpose of the Study

The study focused to assess nutrition knowledge, dietary practices and nutrition status among pregnant adolescents in Mandera County. This is with an aim to improving the dietary practices and thus the birth outcome.

1.4 Specific Objectives

The specific objectives to this study were to;

1. Establish the socio-economic characteristics in households with pregnant adolescents
2. Assess the nutrition knowledge of pregnant adolescents
3. Assess the dietary practices of pregnant adolescents
4. Determine the morbidity status of pregnant adolescents
5. Determine the nutrition status of pregnant adolescents
6. Establish the relationships between nutrition knowledge, dietary practices, morbidity and nutrition status of pregnant adolescents

1.5 Research Hypotheses

H_{O1}: There is no significant relationship between the social-economic characteristics of households with pregnant adolescents and nutrition status of pregnant adolescents

H_{O2}: There is no significant relationship between the nutrition knowledge and dietary practices of pregnant adolescents

H_{O3}: There is no significant relationship between the dietary practices and nutrition status of pregnant adolescents

H_{O4}: There is no significant relationship between the morbidity status and nutrition status of pregnant adolescents

1.6 Significance of the Study

Findings from this study are useful to Government of Kenya, Ministry of Health and other health sector organizations to enact policies aimed at improving dietary intake

among pregnant adolescents. The study may also contribute to knowledge on dietary intake and nutrition factors associated with pregnant adolescents in ASAL areas.

1.7 Delimitation of the Study

The study focused on pregnant adolescents of 10-19 years in Mandera County thus the findings can only be applied to a similar group and settings.

1.8 Limitation of the Study

The study was limited to pregnant adolescents in Mandera County thus the findings can only be replicated in similar settings. The tools and indicators used are majorly used for general mothers who are not adolescents and thus their use for this study might have been a limitation.

1.9 Conceptual Framework for the Study

Malnutrition among pregnant adolescents is a major health concern in the modern health programming. Pregnancy is a complex process involving various factors such as nutrition knowledge, dietary practices, socio-economic and demographic factors and cultural factors. These factors are related to each other. The conceptual framework identifies these factors. The education level, occupation and income are some of the factors that have been found to influence food security. These socio-demographic factors may also influence the nutrition knowledge. Dietary practices consequently influence the nutrition status. In addition, maternal nutrition knowledge affects the dietary practices adopted. The dietary practices are defined in terms of number of meals, dietary diversity score and amount of nutrients consumed. The dietary practices together with the morbidity status are immediate determinants of nutrition status.

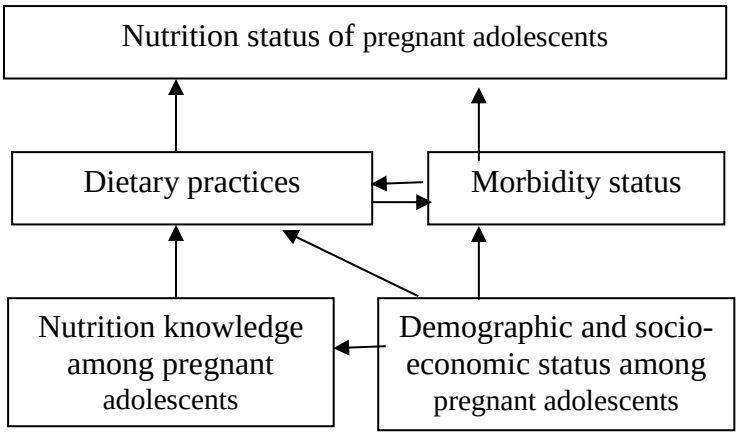


Figure 1.1: Conceptual framework on factors associated with nutrition status of pregnant adolescents.

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

CHAPTER TWO: LITERATURE REVIEW

2.1 Socio-demographic Characteristics among Pregnant Mothers

A third of women in developing countries deliver while below the age of 18 years (Langille, 2007) with 99% of teenage births being in developing countries (Imamura, Tucker, Hannaford et al., 2007). In Kenya, 18% of young girls aged fifteen to nineteen years have already begun childbearing (KDHS, 2014). The proportion in Mandera County is not documented.

Studies have shown that several socio-demographic characteristics namely; education level, the marital status and age are related to dietary practices and nutrition status of pregnant mothers (Ongosi et al., 2014). It is recommended that a woman be above 18 years before conception to ensure both physical and emotional maturity (Mahmoudfakhe et al., 2013). Age of pregnant women has been associated with nutrition status where the younger one is the more the likelihood of being under weight (Regassa & Stoecker, 2012; Shaw, 2013). Education level of mothers affect nutrition status, due to their ability to make better choices on appropriate foods (Al-Ali, Hussein & Helmy, 2012). Educated mothers have been found to adopt better dietary practices than those who are not (Naeeni et al., 2016). Another study found that educated mothers are found to understand the nutrition concepts than those who are not and thus are likely to practice good nutrition (Hiza, 2013). Education level influences the occupation of mothers (Faridah, Machfoed & Ernawati, 2018).

A study on rural pregnant adolescents showed poor nutrition status due to socioeconomic reasons such as illiteracy (Madhavi & Singh, 2011). Though the Muslim culture discourages the culture of unmarried women becoming pregnant, a research by

Daba et al. (2013a) found that a proportion of pregnant adolescents are not married. Contrary to this study, most adolescents in Kenya are married, but in polygamous families (KNBS & ICF Macro, 2010). Polygamous family affect the food habits due to the presence of many women and children in a house hold (Khodarahimi, 2015). The unmarried pregnant adolescents have no access to adequate resources as they are still depending on their parents.

A study by Khodarahimi (2015) has associated marital status with emotional stability which is important during pregnancy. In addition, there is polygamy leading to large families. This limits accessibility to resources for use as food. Rural women are vulnerable than those in urban areas (KNBS & ICF Macro, 2010). Women workload during pregnancy affects the weight of the mother where strenuous activities lead to weight reduction (Faridah, Machfoed & Ernawati, 2018; Jian-huan, 2010). Religion has been found to influence the marriage age, type of family whether monogamy or polygamy and level of women empowerment (Sorokowski et al., 2017). This study determined the education level, age and marital status of the pregnant adolescents.

2.2 Nutrition Knowledge Level of Pregnant Adolescents

According to Lutter (2000), dietary practices among pregnant mothers are influenced by maternal knowledge. A study by Byerly et al. (1999) in USA on nutrition knowledge of pregnant adolescents indicates that knowledge is key in determining the food intake. The study highlighted that mothers with higher nutrition knowledge are likely to make better food choices than those with low nutrition knowledge. The level of nutrition knowledge has a significant relationship with nutrition status as revealed in a study on association of nutrition knowledge and attitude with dietary practices and nutrition

status of females in Nairobi City (Kinyua, 2013). Increase on knowledge was related to high MUAC. Similarly, pregnant mothers in a study done in South Sumatera (Rahmiwati, 2015), show that an increase in knowledge led to improvement in nutrition status where increase on knowledge was related to high MUAC.

Low age among adolescents has been associated with low nutrition knowledge as well as understanding of contemporary issues in the society (Lee, Park & Han, 2015). Low nutrition knowledge was found to lead to poor dietary practices (AbuBaker, 2015). Nutrition knowledge associated significantly with nutrition status (Zhao, Zhang & Li, 2011). Pregnant women with high nutrition knowledge had a high dietary diversity (Liao, & Zhou, 2010). A study in Sudan, associated nutrition knowledge, attitude and dietary practices of adolescents where mothers with higher knowledge depicted better practices in terms of food choices and dietary diversity (AbuBaker, 2015). There is no documented study on nutrition knowledge of pregnant adolescents in Kenya.

2.3 Nutrient Needs and Dietary Practices of Pregnant Adolescents

Pregnancy is a critical period in the life cycle (Aaltonen et al., 2011). Energy increases needs by 13%, protein by 54% and vitamin and mineral by 0-50%. According to American Dietetic Association (ADA) (2008), women's needs for nutrient are high and affect the birth outcome especially if not met (ADA, 2007). According to Abebe (2014), pregnant mother should eat more during meal times or eat small frequent meals. This is in addition to snacks between meals. Fruits and vegetables should be plenty with adequate intake of water everyday (8 glasses or 1.5 liters). A lot of tea or coffee with meals should be avoided so as not to interfere with iron absorption leading to anemia. No study relates dietary intakes and practices among pregnant adolescents.

Pregnant women, pregnant adolescents included need a varied diet and supplemented with micronutrient to prevent the use of the body reserves (Khoushabi & Saraswathi, 2010). The increase in nutrients is mainly in the third trimester (Otten et al., 2006). The growth of the fetus requires carbohydrates, protein, fatty acids and micronutrients such as zinc, iron, magnesium, calcium, riboflavin and vitamin C (Sukchan et al., 2010). More nutrients are required among the adolescents because they require more nutrients for their growth and that of the child. The study sought to assess the nutrient adequacy of pregnant adolescent's diets. Nutrients deficiencies may lead to newborn death and birth defects (Abu-Saad & Fraser, 2010). Nutrient supplementations are recommended in addition to diversified diets. Fortified foods should also be provided (Singh, 2008).

Micronutrients deficiencies like for folic acid and iodine have been found to affect the fetus (Black et al., 2008). Dietary practices influence the weight of the pregnant mother whereby the low maternal weight of the mother and inadequate weight gain during the time of pregnancy lead to low birth weight and infants who are prone to prenatal mortality. Expectant women, in their first trimester, should avoid having an empty stomach so as to minimize the effects of nausea.

A study on effect of nutrition education on pregnancy specific nutrition knowledge and healthy dietary practice among pregnant women found that the number of meals relates to the dietary diversity, amount of energy and nutrients intake (Zelalem et al., 2017). In addition, the dietary diversity influenced the intake of vitamins and minerals intake. The consumption of fruits and vegetables was found to increase the intake of vitamins and minerals especially vitamin A iron and zinc. Also energy consumption relate to weight addition trends during pregnancy. No specific study has been found to document the effect of nutrition education on adolescents.

The amount of nutrients consumed has been found to influence the morbidity status of pregnant mothers. Good nutrition helps one to gain at least 12 kg during pregnancy with an average of 1 kg weight gain per month. It is also important to prevent anaemia which is common. The physical and mental development of baby is improved. It also decreases the chances of having a low birth weight baby, premature delivery or a stillbirth (Abebe, 2014).

2.4 Morbidity Status among Adolescent Pregnant Mothers

Pregnancy can make women more prone to some infections. With poor dietary practices, infections are more severe than they would otherwise be -Some infections during pregnancy can even lead to miscarriage, preterm labour, birth defects, or maternal death. In addition, the drugs used to treat some illness lead to hormonal changes. During pregnancy, there are some common conditions that pregnant women experience. Pre-eclampsia is a condition of high blood pressure the common symptoms of pre-eclampsia are high blood pressure, protein in the urine and retaining fluids. Urinary Tract Infections (UTIs) include infections of the kidneys, bladder, ureter or the urethra. Expectant mothers are at a great risk for UTIs because hormones during pregnancy change the urinary tract making it more susceptible to infections (Bawadia et al., 2010).

Anemia, occurs due to increase in the volume of blood during pregnancy resulting to a decrease in the concentration of red blood cells and hemoglobin in the body. This can also be due to the lack of dietary iron, low levels of folic acid or loss of blood. Gestational diabetes occurs due to hormones from the placenta interfering with the mother's ability to process insulin resulting in an increase in glucose levels. Adequate

nutritional intake during pregnancy has been recognized as an important factor for healthy pregnancy and desired birth outcomes (Bawadia et al., 2010). The nutritional knowledge of women prior to pregnancy is also of importance in increasing the maternal awareness.

Diseases have a negative relation on an individual's dietary practice (McDermid et al., 2014). Disease have been found to lead to poor nutrition status (WHO, 2014). When an individual has an infection, they may experience symptoms such as anorexia, nausea which all reduce the food intake by the individual (Couston, Boushey & Ferruzzi, 2013). This in turn reduces the nutrient intake thus predisposing them to malnutrition (WHO, 2014). A study by Akhter, Rutherford and Chu (2017) noted more illness among pregnant mothers than those who were not. The available information refers to all pregnant mothers. Focus on pregnant adolescents is minimal. In addition, due to the harsh environmental conditions such as drought and lack of health care services in Mandera, there is a great need for this study.

2.5 Nutrition Status of Pregnant Adolescents

Nutrition status of pregnant mothers is measured by use of MUAC. The MUAC of < 22cm is categorized as underweight while >22cm as overweight (Tang et al., 2016). The nutrition status of a mother is critical for a good pregnancy outcome (Black et al., 2008). Poor nutrition status provides a high risk of morbidity and mortality (KNBS & ICF Macro, 2010). High rates of under nutrition has been recorded in Mandera (Kopi, 2012).

Madhavi and Singh (2011) conducted a survey study on the nutrition status of pregnant adolescents in the fifteen villages of Hebbal area in India. Results showed that majority

of pregnant adolescents were underweight. Underweight pregnant adolescents tend to have stunted children (KNBS & ICF Macro 2010). Most pregnant women have iron-deficiency anemia. Low weight results to children with low birth weight, increasing the risk of death (Stewart et al., 2007). This creates a problem in the whole life cycle. The poor nutrition status leads to poor health of both pregnant adolescents and children (Adebowale, Fagbamigbe & Okareh, 2012). Pregnant adolescents have been found to have a poor nutrition status than other pregnant women (Wang et al., 2011).

A study by Perumal et al. (2013) in Western Kenya found a significant relationship between nutrition knowledge level and dietary practices (< 0.05). Another study noted a significant relationship between nutrition knowledge level and nutrition status of pregnant adolescents (Daba et al., 2013a; Bookari, Yeatman & Williamson, 2013; Zelalem et al., 2017). A study by Perumal et al. (2013) found a significant relationship between nutrition knowledge and morbidity status of pregnant adolescents.

Another study found a significant relationship between dietary practices and morbidity status of pregnant adolescents (Riang'a et al., 2017). A study by Vijayeta (2016) found a significant relationship between dietary practices, nutrition status of pregnant adolescents. Another study found a significant relationship between morbidity and nutrition status of pregnant adolescents (Chomat, 2015).

2.6 Summary of the Literature Review

This chapter provides a review of the existing literature regarding the objectives of the study, which strive to realize the main purpose of assessing nutrition status as well the dietary intake of pregnant adolescents in Mandera East Sub-County. The study looked at several prevailing factors that affect these adolescents in their pregnancy. This

include, socio-economic characteristics, nutrition knowledge, dietary practices and morbidity status. Additionally, the section reviewed the empirical studies conducted by other scholars in order to get a clear picture of magnitude of the work that ought to be done in regard to the study at hand.

Most studies shows information about all pregnant mothers with minimal information on pregnant adolescents. Most of these studies have been conducted in developed countries with only a few in developing countries. Studies focusing on pregnant adolescents have been scarce in Kenya. Thus, minimal information on how to design programs to intervene on this vulnerable group. Few studies have been done in Mandera County which is an ASAL area. In addition, information on prevalence of under nutrition has only been associated with the other causative factors but little on nutrition knowledge.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

The study used a cross-sectional analytical design. The design has been used in studies collecting data at one point in time and thus appropriate for this study on nutrition knowledge, dietary practices and nutrition status of pregnant adolescents in Mandera County, Kenya. The design is appropriate in assessment of factors associated with nutrition status. These are nutrition knowledge, demographic and socio-economic status and morbidity status of pregnant adolescents. This design also brings out the relationships between variables. Cross-sectional design looks at a portion of the population at a single point in time.

3.2 Study Variables

3.2.1 Independent Variables

The independent variables for this study include nutrition knowledge, demographic and socio-economic status of the households.

3.2.2 Dependent Variables

The dependent variables were dietary practices (number of meals, frequency of food consumption, dietary diversity) morbidity status and nutrition status as assessed by Mid Upper Arm Circumference (MUAC).

3.3 Study Area

Mandera East Sub-County is a sub-county in the larger Mandera County. It is located between longitude $41^0$53’ to the East and lies between latitude $03^0$55’ to the North. It is situated in the North Eastern part of the country and borders Somalia to the East,

Ethiopia to North, Isiolo and Marsabit Counties to the west and Wajir County to the South. Mandera East sub-county has a population of 119,420. The major livelihood activity is pastoralism. The sub-county experiences fragile food security most of the time which affect nutrition and dietary intake of the households in the area (KFFSG SRA, 2012). Mandera County is selected as one of the ASAL areas in Kenya.

3.4 Target Population

The study targeted all pregnant adolescents 10-19 years) attending Antenatal Clinics (ANC) at all the six health facilities in Mandera East Sub-county, Mandera County, Kenya. The health facilities are; Mandera referral hospital, Khadija dispensary, Shasshasey dispensary, Khalalio dispensary, Neboi and Kamor dispensary. Currently the figures stand at about 600.

3.4.1 Inclusion Criteria

The inclusion criteria for study subjects included residents of Mandera East Sub-county for a period of one year prior to the study. This period is enough for them to have experienced the nutrition and dietary intake challenges in the County. All ages (10-19 years) of adolescent pregnant mothers were included. The focus was on those who attending the 8 health facilities.

3.4.2 Exclusion Criteria

The exclusion criteria for the study was any known case of chronic diseases among target group which include HIV/AIDS, diabetes, hypertension and Tuberculosis as established from the clinical card. The pregnant adolescents who were 19 years and

above were excluded. Also excluded were those adolescent mother who were not on the first pregnancy.

3.5 Sample Size Determination

Sample size is calculated using Cochran formula (Mugenda & Mugenda (2003).

$$No = \frac{Z^2pq}{e^2}$$

No = the desired sample size

Z = standard normal deviate taken at 95% confidence level (1.96)

P = proportion of the population with given characteristics which is 600 (Simiyu, 2011).

e = desired level of precision (0.05) (since the prevalence rate is not known).

q =1-p; therefore

$$No = \frac{(1.96)^2(0.5)\ (0.5)}{(0.05)^2} = 384$$

A finite sample was calculated as the total target population is less than 10,000

$$n = \frac{no}{1+\frac{(n)}{(N)}}$$

$$n = \frac{384}{1+\frac{(384)}{600}}$$

n =234

Where n= sample size desired

N= the estimate of the population size

The sample size for the study was 234 respondents. A 10% of the population was added to cater for non-response. Thus a sample of 258.

3.6 Sampling Techniques

Mandera County was purposively selected while Mandera East Sub-County are randomly selected using simple random sampling. The selection is based on being ASAL area with high number of pregnant adolescents. All the health facilities in sub-county were identified and sampled. From the hospital records, all the pregnant adolescents attending the antenatal clinics were identified. The calculated sample size was divided among these facilities using proportionate to size sampling as per the health records (Table 3.1).

From each health facility, systematic sampling was adopted to randomly select the desired sample per health facility from a list of pregnant adolescents in the hospital records. The total number in a facility was divided by the number of respondents required per facility.

The first respondent was selected using the table of random numbers and then every n^{th} number was taken.

Table 3.1: Sample size distribution among health facilities

Health facility	Total population	Target	Actual reported
Mandera referral hospital	261	67	65
Khadija dispensary	148	38	37
Shasshasey dispensary	132	34	31
Khalalio dispensary	160	41	38
Neboi dispensary	124	32	31
Kamor dispensary	178	46	42
Total	**1003**	**258**	**244**

3.7 Research Instruments

3.7.1 Researcher-administered Questionnaire

A research-administered questionnaire was used for data collection on socio-economic characteristics information, dietary practices, morbidity status and nutrition status. A 24-hour recall and a food frequency questionnaire was used to collect information on dietary practices related information. The questionnaire also had a section for collecting data on nutrition status by use of MUAC. MUAC is a recognized method to depict the nutrition status of pregnant mothers (Al-Shammari et al., 2017).

3.7.2 Nutrition Knowledge Tool

The level of nutrition knowledge was determined by use of a recommended and modified nutrition knowledge tool with 10 questions regarding dietary practices and healthy eating during pregnancy (AbuBaker, 2015) (Appendix C). The respondents were allowed to choose correct answers by indicating whether a given statement was yes or no. The responses were then scored and computed for the nutrition knowledge variables. Nutrition knowledge score was calculated and categorized as low (<40), moderate (41-69) and high (>70) (AbuBaker, 2015).

3.7.3 Focus Group Discussion Guides (FGDS)

FGDs guides were used with pregnant adolescents to provide more information on their dietary practices. Two FGDs each with 10 participants were conducted among randomly selected pregnant adolescents. Two health facilities were randomly selected. From each health facility, 10 pregnant adolescents were randomly selected to participate in the FGD. The FGD was conducted in a room within the health facility for about one hour. The questions (Appendix D) were presented to them by the researcher.

The various responses were recorded and tape recorded. Key questions were formulated for discussion. The purpose for the FGDs was to get more in-depth information from the interviews.

3.7.4 Key Informant Interview

The key informant interview (KII) was used to collect more information. The KII was conducted among the medical personnel from the various health facilities in the sub-county. This included; a nutritionist, a nurse, a gynecologist and a social worker. The researcher administered the tool. The Key Informants were to respond to questions (Appendix E). The responses were recorded.

3.8 Pre-testing of Instruments

The tools were pre-tested on duration of administration, content and language. A sample of 27 respondents, which is 10% of the sample size, attending Ante-Natal Care at Mandera Sub-county Hospital in the Sub-County was used. The pretest sample was excluded from the main sample. This allowed for modifications to be effected on the questionnaires by correcting mistakes that may have been committed. The tools were adjusted accordingly so as to capture only the needed information.

3.8.1 Reliability of Data Collection Tools

A test-retest method was used for reliability analysis, where questions were reviewed to assess if they mean the same for all respondents. A Cronbach coefficient of 0.81 was obtained after pre-test which was above 0.70 recommended (Fraenkel, 2000).

3.8.2 Validity of Data Collection Tools

To ensure validity, a panel of nutrition experts from the department of food, nutrition and dietetics were involved in checking on the questionnaire to ensure that the questions elicit the required response.

3.9 Selection and Training of Research Team

Four female research assistants who were holders of Diploma in nutrition were recruited and trained. The training was conducted by the researcher for four days. The training materials were developed by the researchers. The content in the training materials included; purpose and objectives of the study, information required for each objective, selection of study areas, sampling and identification of study participants, data collection procedures for each data set and ethical issues during data collection (Appendix F). The training was conducted through role plays, mock interviews and demonstrations. They research team also participated in the pretesting exercise.

3.10 Data Collection Procedure

The research assistants were first to explain the study objectives to the respondents. After the informed consent was signed or a thumb print put, questionnaires was administered (Appendix A). Dietary practices were assessed by using 24-hour recall and food frequency questionnaire (FFQ). The 24-hour recall was used for determination of amount of energy and other nutrients consumed in a day. The foods consumed the previous day from waking up to sleeping time was assessed. The various types of foods consumed, the ingredients, the amount of ingredients used in dish preparation, volume cooked and consumed was established. The quantity of food consumed was determined

by measuring the actual food consumed using a food scale. The 24-hour recall was conducted for two days in a week and the average calculated.

To assess the frequency of food intake, a 7-day food frequency questionnaire (FFQ) was used. This was to collect data on the frequency of intake of selected foods. The FFQ consisted of a list of the commonly consumed foods. The pregnant adolescent stated the foods and the number of days she took them food in the previous seven days. The individual dietary diversity score (IDDS) was based on the 16 food groups as recommended (FAO, 2008). The respondents indicated the number of food groups that they consumed from the possible 16. A score of ≤3 was considered as low dietary diversity, 4-6 was considered as moderate while a score of >6 was considered as high dietary diversity (FAO, 2008).

Mid Upper Arm Circumference (MUAC) was taken using the adult MUAC tape. It was done on the left arm which is considered to be less active when the respondent is seated and relaxed. MUAC was measured in the midpoint of the upper arm. The mid- point was determined by measuring the distance between the two tips. The measurement was taken twice and recorded to the nearest 0.1cm. The MUAC of < 22cm was considered underweight and >22cm overweight (Tang et al., 2016). Responses from FDGs were recorded and tape recording for later transcription.

The nutrition knowledge of the pregnant adolescents was established to determine whether the adolescents have adequate nutrition knowledge. The level of nutrition knowledge was determined by use of a recommended and modified nutrition knowledge tool with 10 questions regarding dietary practices and healthy eating during pregnancy (AbuBaker, 2015). The tool comprised of a nutrition test given to the

mothers (Appendix C). Scores were awarded depending on how they answered the questions. The respondents were allowed to choose correct answers by indicating whether a given statement was yes or no. The responses were then scored and computed for the nutrition knowledge variables. Nutrition knowledge score was calculated and categorized as low (<40), moderate (41-69) and high (>70) (AbuBaker, 2015).

3.11 Data Analysis and Presentation

Completed questionnaires were checked, edited and coded before data entry. Data entry and analysis was done using SPSS version 22. Data from 24 hour recall were entered into Nutri-survey software and the amount of energy and nutrients consumed were derived. This was then compared with the recommended daily requirements by FAO and WHO to determine the adequacy of energy intake (FAO/WHO, 2001). The DDS was calculated from the 16 food groups. A score of ≤3 was considered as low dietary diversity, 4-6 was considered as moderate while a score of >6 was considered as high dietary diversity (FAO, 2008). Food frequency was considered regular if taken more than 4 times a week (Swindale & Bilinsky, 2006).

MUAC were used to assess the nutrition status of the respondents. To determine the nutrition knowledge, each correct response was coded as 1 and any incorrect response as 0. The total score was calculated from all correct responses with a maximum of 10. Overall knowledge level was the total of correct responses converted to percentages. Frequencies were used for non-continuous data like marital status while mean was used for continuous data like age.

Pearson correlation was used to assess relationships between the non-categorical variables. Knowledge score was correlated with the following variables; age, household income, dietary diversity score, number of meals and MUAC. The dietary diversity score was correlated with income, dietary diversity nutrient intake of selected nutrients and MUAC.

Chi-square tests was done to establish relationships between the categorical variables. Knowledge score was correlated with level of education and morbidity status. The dietary diversity score was correlated with level of education, marital status and morbidity status while morbidity status was correlated with level of education, income and MUAC

Logistical regression analyses was done identify the extent to which dietary practices (number of meals, dietary diversity), morbidity status predict nutrition status. The odds ratio was used to measure the level of risk to underweight due to less number of meals, low DDS and sickness status. Significance level was determined at 0.05 level of significance. Data from FGDs and KII was transcribed to depict emerging themes. The findings of the study are presented thematically based on the research objectives.

3.12 Logistical and Ethical Consideration

Ethical clearance was obtained from Kenyatta University Ethical Review Committee. A research permit was obtained from The National Commission for Science, Technology and Innovation (NACOSTI). This is after a letter of approval to conduct the study from Kenyatta University Graduate School. The respondent's parents gave a consent while the pregnant adolescents gave ascent. There were no risks associate with this study. The benefits were that the information gathered would be used to improve

on the dietary practices and nutrition status of pregnant adolescents. Confidentiality was assured before carrying out the research and maintained after research. Respondents were assured that the data would be kept in locked cabinets and would be used only for the purpose of the study. For those eligible but not included in the study, explanations were given that any outcome for research would be of benefit to all.

CHAPTER 4: RESULTS

4.1: Introduction

This chapter presents results of a study carried out in Mandera County. From a target sample of 258, of these 244 adolescent mothers responded making a response rate of 94.6%. The rest 14 had either incomplete interview or inconsistent data.

4.2: Socio-Demographic Characteristics of Households with Pregnant Adolescents

4.2.1: Demographic Characteristics

The age and marital status of the pregnant adolescents was assessed (Table 4.1). Results show that the proportion of ages with majority (36.1%) was age of 17 years. This was highlighted by FGD *"Girls marry at an early age. It is an agreement between my parents and my husband. I was not involved" (FGD, 2017).* Majority (65.5%) of the mothers were married, though there were some who were not married (22.1%).

Table 4.1: Demographic characteristics among pregnant adolescents

		N	**%**	**P value**
Age (n=244)	15	75	30.7	0.625
	16	81	33.2	
	17	88	36.1	
Marital status (n=244)	Married	155	63.5*	0.0031
	Single mother	54	22.1	
	Divorced/Separated	19	7.8	
	Widowed	16	6.6	
Status in marriage (n=155)	Only wife	25	16.4	0.011
	Second wife	76	48.8	
	Third wife	34	22.1	
	Fourth wife	20	12.7	

Majority of the married (63.5%) pregnant adolescents were from polygamous families, with majority (48.8%) being a second wife. All the respondents were Muslims. From

FGD, it was noted that religion played a role in the early marriages as highlighted *"Am a third wife. It is okay for him to have up to four", our religion has no problem with this. (FGD, 2017).*

4.2.2: Socio-Economic Characteristics

The socio-economic characteristics among pregnant adolescents is shown in Table 4.2. The study notes that majority of the respondents (68.4%) had education up to primary level. About 19.7% completed secondary school while 11.9% had no formal education. This was highlighted by FGD *"I could not continue beyond primary school as he was waiting to marry me immediately after class eight". (FGD, 2017).* There was a significant difference (p=0.016) in the pregnant adolescents in the various levels of education. Most of these mothers either were herding animals or were casual workers as represented by 34.0% and 29.9%, respectively. This was highlighted by FGD *"We don't have academic papers to get a job. Thus one can only be a housewife, casual labour or herd the animals". (FGD, 2017).* There was no significant difference (p=0.231) in the pregnant adolescents in respect to occupation.

Table 4.2: Socio-economic characteristics among pregnant adolescent

		N (244)	**%**	**P value**
Education	No formal education	29	11.9	0.016
	Primary	167	68.4	
	Secondary	48	19.7	
Occupation	Herding animals	83	34.0	0.231
	Casual worker	73	29.9	
	Business	54	22.1	
	House Wife	34	13.9	
Source of income	Business	75	30.7	0.004
	Wage	71	29.1	
	Sale of milk	57	23.4	
	Sale of livestock	41	16.8	

Findings for household income indicates that 29.5% of households earn less that 6,001-8000 KES with 11.5% earning <2000 and only 14.3% earned more than 10,000 (Figure 4.1). This income was mainly from business (30.7%), wages (29.1%) and sale of milk (23.4%) (Table 4.2). This was highlighted by FGD *"We have a lot of animals. But they are not sold as they are a sign of wealth" (FGD, 2017).* There was a significant difference (p=0.004) in the households pregnant adolescents as pertains to source of income.

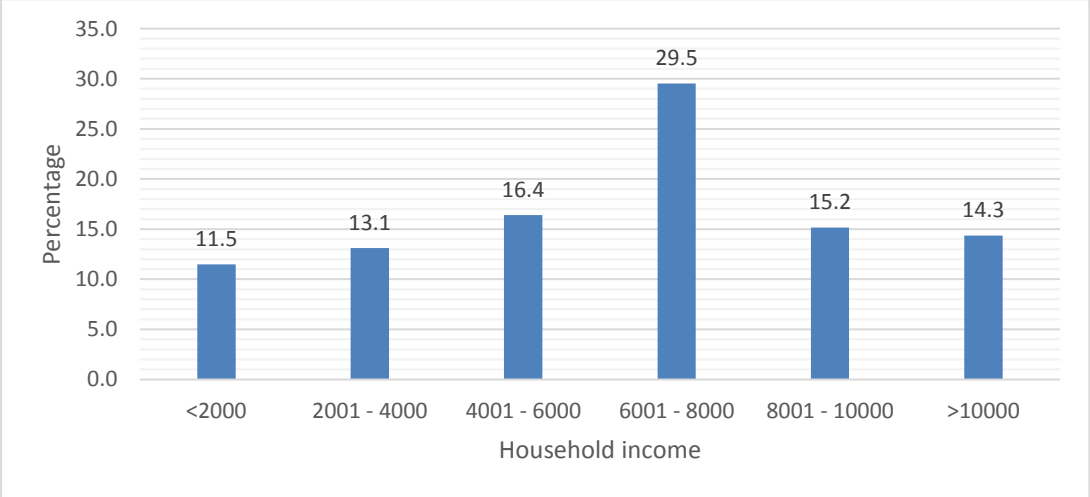


Figure 4.1: Monthly household income among pregnant adolescents

4.2.3: Proportion of Pregnant Adolescent in the various Trimesters

The proportion of pregnant adolescent in the various trimesters was assessed. It was noted that 51.2% were in the third trimester while 40.2% were in the second trimester (Figure 4.2).

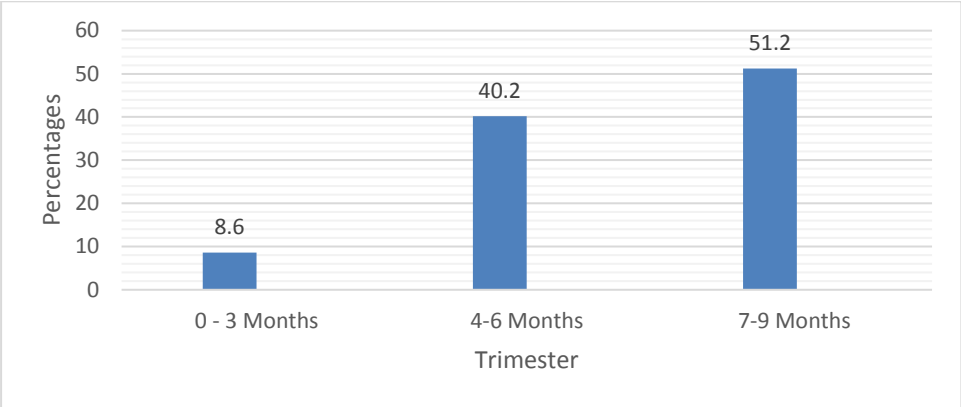


Figure 4.2: Proportion of pregnant adolescent in the various trimesters

4.3 Nutrition Knowledge Level of Pregnant Adolescents

4.3.1 Nutrition Knowledge on Various Aspects of Feeding Practices

Respondents were asked several questions related to nutrition during pregnancy. Results are shown in Table 4.3. Most of the respondents (73.8%) understood what comprised a balanced diet while 65.6% understood the food groups that best protects the body against illnesses. However, only a few (36.1% and 36.1%) knew the importance of increasing amount of energy and other nutrients during pregnancy, respectively. Only 33.6% knew the effect of poor dietary practices on birth weight of the child.

Table 4.3: Nutrition knowledge on various aspects of nutrition during pregnancy

	N (244)	**%**
Aware of what a balanced diet is	180	73.8
Aware of food groups that provide body with energy	121	49.6
Aware of food groups that are useful for body building	98	40.2
Aware of food groups that best protects the body against illnesses	160	65.6
Understands the importance of increasing energy during pregnancy	91	37.3
Understands the importance of increasing nutrients during pregnancy	88	36.1
Aware of various deficiency problems that arise due to inadequate intake of nutrients	87	35.7
Understand the effect of low energy intake	96	39.3
Understand the effect of poor dietary practices on birth weight of the child	82	33.6
Understand the effect of poor dietary practices on their health	76	31.1

4.3.2 Nutrition Knowledge Score

Nutrition knowledge score was calculated and categorized as low (<40), moderate (41-69) and high (>70) (Figure 4.2). The mean knowledge score was 46.4 ± 6.8. Slightly less than half of the mothers (47.5%) had moderate nutrition knowledge (Figure 4.3). Only 13.5% had a high knowledge.

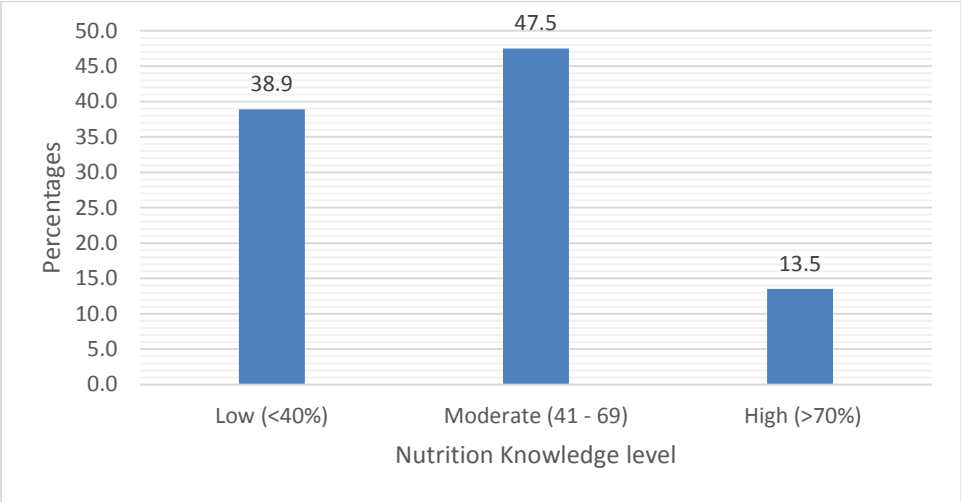


Figure 4.3: Nutrition knowledge score

The following statements from FGD confirms that most women had low nutrition knowledge. *"I have never heard that there is any nutrition requirement before pregnancy" (FGD, 2017). "A pregnant mother should eat a lot of food to cater for herself and for the baby" (FGD, 2017).* As highlighted by FGD *"Pregnant mother should take a lot of milk (FGD, 2017). "If good nutrition is not practiced, the mother will get a preterm baby" (FGD, 2017). "If good nutrition is not practiced, the mother will get a preterm baby" (FGD, 2017). "A sick mother will make the child sick" (FGD, 2017). "A sick mother can have a sick baby" (FGD, 2017). "The culture that if you over feed, the child will be too big and instead of normal delivery it will be caesarian section" (FGD, 2017). "Lack of eating enough food can lead to poor nutrition status" (FGD, 2017).*

4.4 Dietary Practices of Pregnant Adolescent

4.4.1 Number of meals consumed

The number of meals (both main meals and snacks) consumed by pregnant adolescents was determined (Table 4.4). Results show majority (47.1%) took 3 meals per day. As highlighted by FGD *"We normally eat three meals in a day. The hospital doctors tell us to eat more. This is not possible, I cannot be at home always to eat, have to work. Also where is this food to eat this many times" (FGD, 2017).* They also indicated that *"We eat what is available in the house. There is little money to buy more food" (FGD, 2017).* This was lower than the recommended 4-5 meals per day. The mean number of meals consumed per day was 2.95 ± 0.6. Frequent meals ensures adequate consumption as well as improving the diversity.

Table 4.4: Number of meals consumed per day by pregnant adolescents

Number of meals per day	N (244)	%	P value
2	79	32.4	<0.005
3	115	47.1	
4	37	15.2	
5	9	3.7	
6	4	1.6	

4.4.2 Amount of Energy and Selected Nutrient Intake

Energy intake as well as intake of protein, fat, vitamin B1, B2, B6, folic acid, iron and calcium were analyzed (Table 4.5). Results show that the mean energy intake was 1850.5 ±33. The mean intake of the nutrients by the mothers was all below RDAs for pregnant mothers apart from fat. Results show that majority did not meet their nutrients requirements for all the nutrients assessed (Table 4.5). It was notable that of the pregnant adolescents interviewed, almost all did not meet their RDA for vitamin B6, B2, B1 and A and calcium.

Table 4.5: Energy and nutrient intake

	RDA	**Mean**	**SD**	**Proportion meeting RDA**
Energy (Kcal)	1850.5	638.94	33	30.3
Protein (g)	45.5	18.11	41	37.6
Fat (g)	73.5	28.52	46	42.2
Vitamin. A (µg)	264.8	315.16	12	11.0
Vitamin. B1 (Mg)	0.76	0.42	16	14.7
Vitamin. B2 (Mg)	0.78	0.43	9.3	8.5
Vitamin. B6 (Mg)	0.79	0.44	10.6	9.7
Calcium (Mg)	447.4	253.71	6.5	6.0
Iron (Mg)	28.9	46.85	24.5	22.5

RDA as per WHO guidelines (FAO/WHO, 2001)

4.4.3 Individual Dietary Diversity Score

The number of food groups consumed are shown in (Table 4.6). This indicates the individual dietary score. The mean IDDS was 5.64 ± 2.32 food groups (Range; 3-11). Four (4) food groups were consumed by the largest proportion of respondents (30.3%).

Table 4.6: Individual dietary diversity score

Number of food groups consumed	**n**	**%**
3	7	2.9
4	74	30.3
5	56	22.9
6	42	17.2
7	39	16.0
8	21	8.6
10	5	2.0
Total	**244**	**100**

4.4.4 Frequency of Food Consumption

This study assessed the frequency of food consumption based on 7-day recall (Table 4.7). The most consumed food groups were cereals and oils/fats which were consumed by all mothers. Other common foods consumed by most mothers were sweets (94.7%) and vitamin A rich fruits (61.9%). Eggs and sea foods were rarely consumed (<2%).

Table 4.7: Food frequency consumption by food groups

Food group	N=244	%
Cereals	243	99.6
White roots and tubers	81	33.2
Vitamin A rich vegetables and tubers	74	30.3
Dark green leafy vegetables	81	33.2
Other vegetables	94	38.5
Vitamin A rich fruits	151	61.9
Other fruits	11	4.5
Organ meat	33	13.5
Flesh meat	188	77.0
Eggs	4	1.6
Fish and seafood	3	1.2
Legumes and nuts	101	41.4
Milk and milk product	181	74.2
Oils and fats	244	100
Sweets	231	94.7
Spices condiments, beverages	3	1.2

4.5 Nutrition Status of Pregnant Adolescents

The nutrition status of pregnant adolescents was done by use of MUAC. Results are as shown in (Figure 4.4). Results show that 31.1% and 68.9% were underweight and normal, respectively. This was also highlighted by FGD *"If you herd animals when you are pregnant, then you lose weight by walking especially" (FGD, 2017). "It doesn't matter whether pregnant or not, you have to fetch water, some water sources are far" (FGD, 2017). "The hospital is far. There are no roads or vehicles. I can't ride on*

motorbike. I walk for about 10 km to the hospital, to and fro makes it 20, how will I be big" (FGD, 2017).

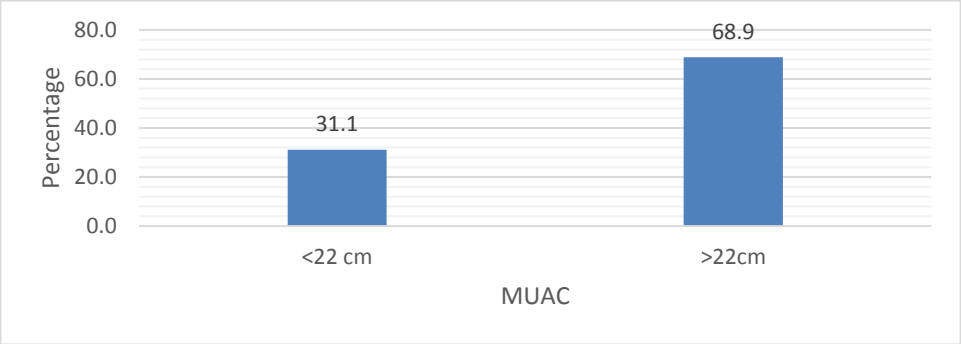


Figure 4.4: Nutrition status among pregnant adolescent

4.6 Morbidity Status of Adolescent Pregnant Mothers

The morbidity status of the adolescents' mothers was determined (Figure 4.5). Findings indicate that about a third of the respondents (36.1%) had been sick in the previous two weeks. The results for type of illness, seeking medical services information and place where medical services were sought are as shown in Table 4.8.

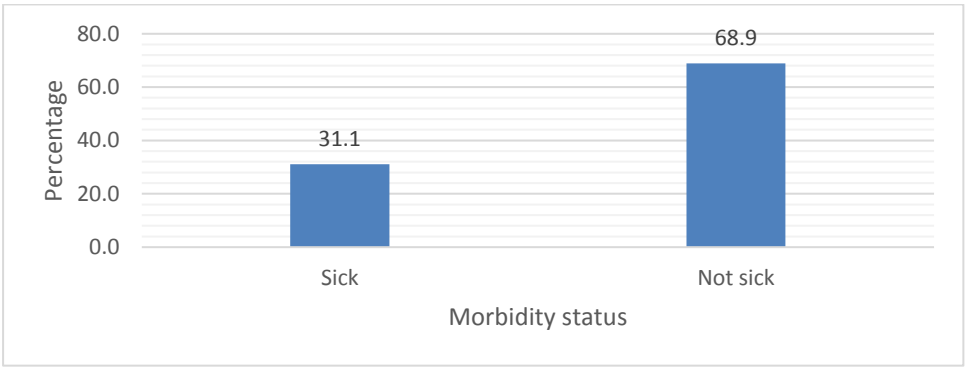


Figure 4.5: Morbidity status among pregnant adolescents

The common illnesses were malaria and cough experienced by 37.5% and 28.4% of respondents, respectively. About half (47.7%) of those sick sought medical attention. Of those who sought, it was in health facility (54.5%) self-medication at pharmacy (33.0%) and traditional healers (12.5%). Some of them instead of going to the hospital

sought medical attention from chemist as highlighted by FGD *"When I am sick, I go to hospital. But because of distance, sometimes I don't go and buy medicine form the chemist" (FGD, 2017).* There was no significant difference (p>0.05) in the pregnant adolescents noted with various illness.

Table 4.8: Morbidity status among pregnant adolescent

		n	%	P value
Illness (244)	Malaria	33	37.5	>0.005
	Cough	25	28.4	
	Common cold	18	20.5	
	Anemia	16	18.2	
	Stomach discomfort	12	13.6	
	Total	**88**	**100**	
Sought medical attention (n=88)	Yes	42	47.7	
	No	46	52.3	
	Total	**88**	**100**	
Place of seeking medical attention (n=88)	Health facility	48	54.5	
	Pharmacy	29	33.0	
	Traditional healers	11	12.5	
	Total	88	100	

The various distances to the health facility were established. Results are shown in Figure 4.6. It is noted that most pregnant adolescents walked for 1 to 5 km to access the health facility. However, some (13.1%) walked for >11 km.

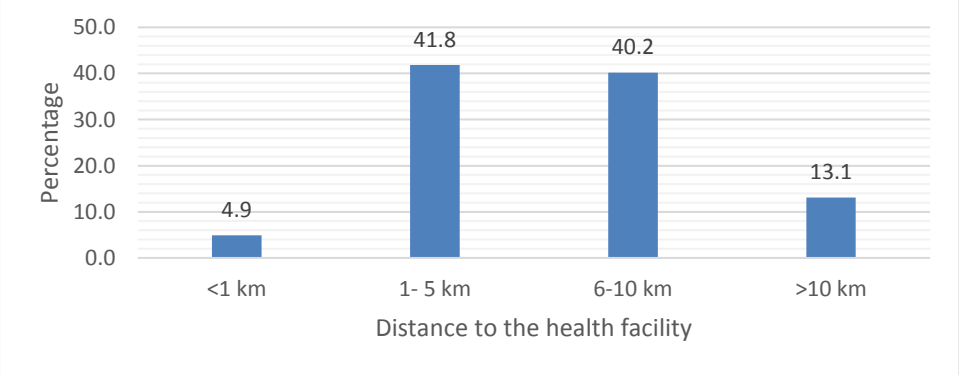


Figure 4.6: Distance to the health facility

4.7 Relationships between Nutrition Knowledge Level, Dietary Practices and Nutrition Status of Pregnant Adolescents

The relationships between the study variables is as shown in Table 4.9. This was by use of Pearson correlation for non-categorical variables and chi-square for categorical variables.

Table 4.9: Relationship between study variables

	Variable	Statistics
Relationship between knowledge score and other variables	Age	r = 0.153; p= 0.081
	Level of education	χ^2 =121 df= 6, P= <0.001
	Household income	r = 0.524; p= 0.004
	Dietary diversity score	r = 0.643; p= 0.014
	Number of meals	r = 0.485; p= 0.023
	MUAC	r = 0.345; p= 0.024
	Morbidity status	χ^2 =121 df= 6, P= <0.001
Relationship between dietary diversity score and other variables	Income	r = 0.315; p= 0.063
	Level of education	χ^2 =121 df= 6, P= <0.001
	Marital status	χ^2 =121 df= 6, P= 0.0314
	MUAC	r = 0.526; p= 0.005
	Morbidity status	χ^2 =121 df= 6, P= <0.001
Relationship between morbidity status and other variables	Level of education	χ^2 =121 df= 6, P= <0.001
	Income	χ^2 =121 df= 6, P= <0.001
	MUAC	χ^2 =121 df= 6, P= <0.001

The education level, income, number of meals, dietary diversity score, morbidity status and nutrition status significantly ($p<0.05$) related with the nutrition knowledge. There were significant relationships ($P<0.05$) between the dietary diversity score and education level, income, morbidity status and nutrition status. There was also a significant relationship ($P= <0.05$) between the morbidity status and education level, income and nutrition status. Age for this study was not an important predictor of nutrition knowledge ($P= 0.081$).

Table 4.10: Relationship between dietary diversity score and nutrient intake

	Variable	Pearson (r); p value
Relationship between dietary diversity score and nutrient intake	Protein (g)	0.214; 0.016
	Fat (g)	0.296; 0.024
	Vitamin A (µg)	0.455; <0.001
	Vitamin B1 (Mg)	0.463; <0.001
	Vitamin B2 (Mg)	0.435; <0.001
	Vitamin B6 (Mg)	0.472; <0.001
	Calcium (Mg)	0.525; <0.001
	Iron (Mg)	0.511; <0.001

On relating the dietary diversity score and nutrient intake, the notes significant relationships (P<0.005 between the dietary diversity score and the nutrient intake (Table 4.10).

4.8 Association between Nutrition Knowledge Level, Dietary Practices and Nutrition Status of Pregnant Adolescents

The odds ratio was used to measure the level of risk to underweight in relation to number of meals consumed, low IDDS and sickness status (Table 4.11). The ratio indicated that pregnant adolescent who had low nutrition knowledge (below 40%) were 1.721 times likely to be underweight than those with adequate nutrition knowledge (above 40%) (OR= 1.721; P= <0.001 CI, 1.15 to 1.97). The odds ratio indicated that pregnant adolescent who took less number of meals (≤3), were 1.447 times likely to be underweight than those with adequate number of meals (>4) (OR= 1.447; P= <0.001 CI, 0.98to 4. 051). The pregnant adolescent who had low DDS, were 1.216 times likely to be underweight than those with high IDDS (OR= 1.216; P=0.028 CI, 1.04 to 1.57). Similarly, results indicate that those who were sick were 1.324 likelihood of being underweight (OR= 1.324; P= <0.001 CI, 1.1-1.51).

Table 4.11: Risk of being underweight in relation to nutrition knowledge, number of meals consumed, dietary diversity score and sickness status

Variables	Normal weight	Underweight	Total	OR (p value)
Low nutrition knowledge	60(35.4%)	35 (46.5%)	95 (38.9%)	1.721 (<0.001)
Adequate nutrition knowledge	108 (64.29%)	41 (53.5%)	149 (60.92%)	
Total	**168 (100%)**	**76 (100%)**	**244 (100%)**	
Less number of meals	123(73.4%)	55 (72.3%)	178 (72.8%)	1.447 (<0.001)
Adequate number of meals (>4)	45 (26.6%)	21 (27.7%)	66 (27.2%)	
Total	**168 (100%)**	**76 (100%)**	**244 (100%)**	
Low DDS	57 (34.2%)	30 (39.9%)	88 (37.2%)	
Normal DDS	111 (65.8%)	46 (60.4%)	156 (62.8%)	1.216 (<0.028)
Total	**168 (100%)**	**76 (100%)**	**244 (100%)**	
Sick	66 (34.2%)	32(39.9%)	98 (37.2%)	
Not sick	102 (65.8%)	44 (60.4%)	1146 (62.8%)	1.324 (<0.001)
Total	**168 (100%)**	**76 (100%)**	**244 (100%)**	

CHAPTER FIVE: DISCUSION

5.1 Socio-Demographic Characteristics among Pregnant Adolescents

This study found out that women got pregnant at very young ages; mean of 16.63±0.6. This is a relatively young age taking into consideration that they are not fully developed to carry pregnancy. In addition, from KII, young mothers have no much experience. This was also noted by a study by Omwancha (2012), that note a high prevalence of early marriages in the Northern part of Kenya due to Muslim religion. It is recommended that a woman be above 18 years before conception to ensure both physical and emotional maturity (Mahmoudfakhe et al., 2013). Age of pregnant women has been associated with nutrition status with young mothers being underweight (Shaw, 2013). Early marriages are not in Kenya alone. A study by Adebowale, Fagbamigbe and Okareh (2012) in Nigeria show a case of Muslim girls marrying at a very early age.

Most adolescent mothers were in polygamous marriages. Though it is noted that Muslims are comfortable with polygamous family, the presence of many women and children in the household affect the food security and therefore dietary practices (Khodarahimi, 2015). Religion has been found to influence the marriage age, type of family whether monogamy or polygamy and level of women empowerment (Sorokowski et al., 2017).

About 21% of the mothers were not married, an indication of a pregnancy out of wedlock. This rate is high despite the fact that it is discouraged by the society, an indication of changing dynamics in the society. This is similar to a study done in Philippines that indicate a rise in the number of unmarried women among Muslim religion (Semorlan & Perez-Semorlan, 2013). A study by Khodarahimi (2015) have

associated marital status and emotional stability which is important during pregnancy. These findings are in agreement with a study by Daba et al. (2013a) who reported that most pregnant adolescents are not married. Over half of the pregnant adolescents had not gone beyond primary school educations. This is especially due to dropping out of school due to the pregnancy.

A study by Rah, Christian and Shamim (2008) confirms this phenomena by highlighting that pregnancy is one of the causes to girls dropping out of school. Studies have found that educated mothers have been found to adopt better dietary practices (Naeeni et al., 2016). Another study found that educated mothers are found to understand the nutrition concepts than those who are not (Hiza, 2013). Education level influences the occupation of mothers (Faridah, Machfoed & Ernawati, 2018).

Most of these mothers were found to be herding animals 32.4%. From KII, this never used to be the case before for women to herd animals. But the society has embraced it especially herding the animals that cannot move far from homestead. This is the main occupation in ASAL areas. A study by Fitzgibbon (2012) established that the main occupation in ASAL areas is pastoralism. Women workload during pregnancy affects the weight of the mother where strenuous activities lead to weight reduction (Faridah, Machfoed & Ernawati, 2018; Jian-huan, 2010). The average income reported in this study is 6934.43±625. This is very low income, barely enough to meet their daily needs. A similar study conducted in this region indicates high levels of poverty (Fitzgibbon, 2012).

5.2 Nutrition Knowledge Level of Pregnant Adolescents

Most women had low nutrition knowledge. These findings are similar to other studies that indicate low nutrition knowledge among young pregnant adolescents (Lutter, 2000). Low nutrition knowledge is also noted in studies by Kinyua (2013) and Rahmiwati (2015).

Low age among adolescents has been associated with low nutrition knowledge as well as understanding of contemporary issues in the society (Lee, Park & Han, 2015). Low nutrition knowledge was found to lead to poor dietary practices (AbuBaker, 2015). Nutrition knowledge associated significantly with nutrition status (Zhao, Zhang & Li, 2011). Pregnant women with high nutrition knowledge had a high dietary diversity (Liao, & Zhou, 2010).

5.3 Dietary Practices among Pregnant Adolescents

The number of meals consumed and IDDS was noted to be low. This is an indication that the diet lacked diversification. Diversified diets are necessary for pregnant mother to ensure availability of all the required nutrients to support the fetal growth. Pregnant adolescents have been shown to have poor dietary practices due to numerous challenges that affect their lives. A study by Kopi (2012) noted diets that lacked diversity. Dietary diversity was also shown to be low among adolescents' mothers in Ahvaz study by Vakili et al. (2013). A similar study conducted in rural Bangladesh reports low dietary diversification among adolescent pregnant girls (Rah, Christian & Shamim, 2008). A study in Australia also associates first time pregnant mothers with poor dietary practices especially the number of meals consumed per day (Wen, 2010).

Pregnant women, adolescents included; require more energy to prevent the use of the body reserves (Khoushabi and Saraswathi, 2010). The low energy intake noted in this study is in agreement with a study by Aaltonen et al. (2011) that indicated low energy intake. Other studies that show low dietary intake as a result of poor dietary diversification among pregnant women are by Abebe et al. (2014) and Kamau-Mbuthia (2007). A similar study in china indicated poor dietary intake of both energy vitamin A, iron and zinc among pregnant women (Cheng et al., 2009).

A study by Zelalem et al. (2017) found that the number of meals relates to the dietary diversity, amount of energy and nutrients intake. In addition, the dietary diversity influenced the intake of vitamins and minerals intake. The consumption of fruits and vegetables was found to increase the intake of vitamins and minerals especially vitamin A iron and zinc. Also energy consumption relate to weight addition trends during pregnancy. The amount of nutrients consumed influence the morbidity status of pregnant mothers.

5.4 Morbidity Status

The adolescent pregnant mothers were found to suffer from various illness. Though illnesses are common among pregnant women, it is documented by KNBS and ICF macro (2010) and Akoh (2017) indicates that they are more prevalent among young mothers. A study by Akhter, Rutherford and Chu (2017) noted more illness among pregnant mothers than those who were not. A study by Patel, Joshi and Patel (2013) also found high morbidity levels among young pregnant mothers. A similar study that found out that the prevalence of morbidity to be high was by Singh et al. (2013) in India. A study in Ethiopia show a high prevalence of anaemia among young women

(Abriha et al., 2014). A study by Lee (2015) on anaemia and pregnant adolescents indicate that anaemia occurred more among pregnant adolescents than the other pregnant mothers. Some of them instead of going to the hospital sought medical attention from chemist.

5.5 Nutrition Status

The nutrition status of adolescent pregnant mothers investigated in this study indicate that 31.1%) were undernourished. These rates are higher than the region rates which stands at 17% as reported in KDHS (KDHS, 2014). Undernutrition is detrimental to health of pregnant mothers, both their health and that of the fetus (Black et al., 2008). Results from a survey on the nutrition status of pregnant adolescents in India showed that majority of pregnant adolescents were underweight (MUAC <22 cm) (Madhavi & Singh, 2011). Poor nutrition status was also noted among young pregnant women in Bangladish (Hussan et al., 2013). Pregnant adolescents have been found to have a poor nutrition status than other pregnant women (Wang et al., 2011).

5.6 Relationships between Nutrition Knowledge Level, Dietary Practices and Nutrition Status of Pregnant Adolescents

This study found a significant relationship between social-economic factors and nutrition knowledge, dietary practices and nutrition status. The age of the mother has been found to be associated with nutrition status of the mother (Regassa & Stoecker, 2012). A study by Arkkola et al. (2006) in Finland found that education occupation and income affected the dietary intake.A study by Ongosi et al. (2014) elaborates on how marital status and age affect dietary practices and nutrition status of pregnant mothers.

A study on rural pregnant adolescents showed poor nutrition status due to socioeconomic reasons such as illiteracy (Madhavi & Singh, 2011).

This study found a positive significant relationship between dietary diversity and nutrient intake. A study by Perumal et al. (2013) found a significant relationship between nutrition knowledge level and dietary practices. A study by Arimond et al. (2010), noted a relationship between dietary diversity and micronutrient intake among poor rural women. In an addition, a study by Aikawa et al. (2006) note low dietary diversity as a cause of iron deficiency and consequently the occurrence of iron-deficiency anaemia among pregnant women Vietnam. A study in China highlights a relationship between dietary practices and nutrition status among pregnant women (Zhong Liu & Su, 2010). The results also are similar to a study by Byerly et al. (1999) on nutrition knowledge of pregnant adolescents which found out that knowledge is related food intake.

This study found a significant relationship between dietary practices and nutrition status. Dietary practices influence the weight of the pregnant mother whereby the poor the dietary practices the low maternal weight of the mother. A study by Vijayeta (2016) found a significant relationship between dietary practices, nutrition status of pregnant adolescents

A study by Daba et al. (2013b) associates dietary practices with nutrition status of mother in Ethiopia (Rahmiwati, 2015). In a study among pregnant women in South Sumatera noted that nutrition knowledge affected dietary practices and Nutrition Status. This study found a significant relationship between nutrition knowledge and dietary practices. A study by Kamau-Mbuthia and Elmadfa (2007) in Nakuru Kenya found a

strong relationship between nutrition knowledge and both dietary practices of pregnant mothers.

Another study noted a significant relationship between nutrition knowledge level and nutrition status of pregnant adolescents (Daba et al., 2013b; Bookari, Yeatman & Williamson, 2013; Zelalem et al., 2017). A study by Perumal et al. (2013) found a significant relationship between nutrition knowledge and morbidity status of pregnant adolescents. A study by Riang'a et al. (2017) found a significant relationship between dietary practices and morbidity status of pregnant adolescents. This study found a significant relationship between morbidity status and nutrition status. A study by Regassa and Stoecker (2012), reports morbidity status as a key determining factor in nutrition status outcome among pregnant women. Another study found a significant relationship between morbidity and nutrition status of pregnant adolescents (Chomat, 2015).

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATION

6.1 Summary

Most of the pregnant adolescents (63.5%) were married and with up to primary level education (68.4%). In terms of occupation, most of these mother either are casual workers or pastoralists. Majority earned less that 10,000 KES with only 19.7% earning more than 10,000. This income sources were from business (30.7%) and wages (29.1%).

The mean nutrition knowledge score was 46.4 ± 6.8 was low with majority (47.5%) having moderate nutrition knowledge. Most of the respondents (73.8%) understood what comprised a balanced diet, 65.6% understood the food groups that best protects the body against illnesses. The mothers were found not to understand the importance of increasing amount of nutrients consumed during pregnancy.

The mean number of meals was 2.95 ± 0.6. The mean energy intake was 1850.5 ±33. Intake of energy and other micronutrients were below the recommended daily allowance apart from fat and iron. The mean IDDS was 5.64 ± 2.32 food groups (Range; 3 - 11). Four (4) food groups were consumed by the largest proportion of respondents (30.3%). Cereals and oils/fats, flesh meat and milk and milk products were the common foods consumed by most mothers. Foods were rarely consumed were eggs and sea foods.

The nutrition status was poor where 31.1% were underweight. About 36.1% of the mothers had been sick in the previous two weeks. The main illness were malaria and cough experienced by (33) 37.5% and (25) 28.4% of respondents, respectively. The malaria illness manifested itself as diarrhea, vomiting and fever while cough as fever.

About half (47.7%) of those of those sick sought medical attention. Of those who sought, it was in health facility (54.5%) self-medication at pharmacy (33.0%) and traditional healers (12.5%).

The age, income and education level significantly ($p<0.05$) related with both the nutrition knowledge, dietary diversity score and nutrition status. The nutrition knowledge score was shown to have a significant strong positive relationship with nutrition status ($r=0.069$; $P<0.001$) and morbidity status (χ^2 =121 df= 6, P= <0.001). There was a significant relationship ($r=0.069$; $P<0.033$) between the dietary diversity score and the nutrition status (MUAC) as well as with morbidity status ($r = 0.526$; $p= 0.005$). There was also a significant relationship (χ^2 =121 df= 6, P= <0.001) between the dietary diversity score and the morbidity status. The morbidity status was shown to have a significant strong positive relationship with nutrition status (MUAC) (χ^2 =121 df= 6, P= <0.001).

6.2 Conclusion

This study noted that the education level of the pregnant adolescents was poor. This is because most of them dropped out of school due to pregnancy. As such some of them were not married. This consequently led to adoption of low profile careers like casual labour and herding of animals. This consequently resulted to low income which was barely enough to procure food.

The nutrition knowledge of these mothers was low. This is evidenced by the fact that they failed to understand even the basic aspect of nutrition during pregnancy. The low knowledge was attributed to low education level and poor health seeking behavior. The low nutrition knowledge translated to poor decision making in dietary practices.

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

Nutrition status among adolescent's mothers is poor. This is as indicated by MUAC. This low nutrition status is detrimental to their health. Determinants of dietary practices among adolescents' mothers are education level and income. In addition, the determinants of morbidity status among adolescents' mothers are education level, income and dietary practices. The nutrition status was found to be influenced by number of meals consumed, amount of kilocalories consumed and morbidity status.

Nutrition status among adolescent's mothers is poor among the pastoralist communities. This is due to drought, which affect the livestock. In addition, the presence of animals rarely translate to income or food. The low nutrition status was associated with inadequate dietary intake and frequent illness. The poor dietary practices were triggered by low education level as well as low nutrition knowledge level which was in combination with lack of adequate income to procure food. The low education level and low income led to poor health seeking behavior and as such led to a higher morbidly status among the pregnant adolescents.

From the research finding the hypothesis that there is no significant relationship between the social-demographic characteristics of households with pregnant adolescents and nutrition status of pregnant adolescents is rejected. The hypothesis that is no significant relationship between the nutrition knowledge and dietary practices of pregnant adolescents is rejected. The hypothesis that there is no significant relationship

between the morbidity and nutrition status of pregnant adolescents is rejected. Moreover, the hypothesis that there is no significant relationship between the dietary practices and nutrition status of pregnant adolescents is rejected.

6.3 Recommendations

6.3.1 Recommendations for Policy

- This study recommends that the Ministry of Health at national level to enhance the use of the existing training package and policy in counselling pregnant adolescents.
- To improve the nutrition knowledge level among the mothers, the Ministry of Health at national level should come up with a counselling package and policy for use in counselling these mothers.
- A policy should also be put in place by the Country Government to discourage the use of traditional healers and traditional birth attendants so as to improve the health seeking behaviour.

6.3.2 Recommendations for Practice

- Need for continued training to health workers on nutrition issues among pregnant mothers so as to help the adolescent mothers improve their care practices
- This study recommends that interventions geared towards improving the nutrition status of these young mothers such as supplementary feeding program by the Health Workers in the Country Government
- The study recommends continued provision of both formal education to adults and nutrition education by community health workers. This would enable the

mothers make appropriate decisions in dietary practices. This would also help to utilize the available income to buy nutritious foods.

6.3.3 Recommendations for Further Research

- A study on the effect of poor nutrition status among adolescent's mothers on birth outcomes
- Another research can be conducted longitudinally throughout the year to establish the seasonal variations in food intake.

REFERENCES

Aaltonen, J., Ojala, T., Laitinen, K., Poussa, T., Ozanne, S., & Isolauri, E. (2011). Impact of maternal diet during pregnancy and breastfeeding on infant metabolic programming: a prospective randomized controlled study. European journal of clinical nutrition, 65(1), 10.

Abebe, H., Abebe, Y., Loha, E., & Stoecker, B. (2014). Consumption of vitamin a rich foods and dark adaptation threshold of pregnant women at Damot Sore District, Wolayita, southern Ethiopia. *Ethiopian Journal of Health Sciences*, *24*(3), 219. doi:10.4314/ejhs.v24i3.5

Abriha A., Melkie Edris Y.,and Molla Mesele Wassie (2014).Prevalence and associated Factors of anemia among pregnant women of Mekelle town:a cross sectional Study. Department of Human Nutrition,college of medicine and health Sciences, University of Gonder,Ethiopia.

AbuBaker, H. (2015). Huda Abbas Mohammed Fadl 2015. Nutrition knowledge, attitude and dietary practices of adolescents and mothers of different socioeconomic backgrounds in Khartoum locality. *Ahfad Journal*, *32*(1), 71-72.

Abu-Saad K. & Fraser, D. (2010). *Maternal Nutrition and Birth Outcomes*. Epidemiologic. Review 32, 5-25.

Adebowale S. A, Fagbamigbe F. A, Okareh T. O (2012). Survival analysis of timing of first marriage among women of reproductive age in Nigeria: regional differences. Afr J Reprod Health; 16: 95–107.

Aguilar de Díaz Escobar, M. L. (2013). Adolescent Pregnancy: a Public Health Challenge. *Pediatría (Asunción)*, *40*(3), 207-208.

Aikawa, R., Khan, N. C., Sasaki, S. and Binns, C. W. (2006). Risk factors for iron-deficiency anaemia among pregnant women living in rural Vietnam. *Public health nutrition*, *9*(4), 443–448.

Akhter, S., Rutherford, S., & Chu, C. (2017). What makes pregnant workers sick: why, when, where and how? An exploratory study in the ready-made garment industry in Bangladesh. *Reproductive health*, *14*(1), 142

Akoh, C. C., Pressman, E. K., Cooper, E., Queenan, R. A., Pillittere, J., & O'Brien, K. O. (2017). Prevalence and risk factors for infections in a pregnant adolescent population. *Journal of pediatric and adolescent gynecology*, *30* (1), 71-75.

Al-Ali, F., Hussein, E. & Helmy, H. (2012). Assessment of Nutrition Status of Some females University Students in State of Kuwait.

American Dietetic Association (2008). International Dietetics and Nutrition Terminology (IDNT) *Reference Manual;* Scientific Affairs and Research, Chicago III.

American Dietetic Association (2007). *Nutrition Diagnosis and Intervention:* standardized Language for the Nutrition Care Process. Scientific Affairs and Research, Chicago III.

Arimond, M., Wiesmann, D., Becquey, E., Carriquiry, A., Daniels, M. C., Deitchler, M., Fanou- Fogny, N. et al. (2010). Simple food group diversity indicators predict micronutrient adequacy of women's diets in 5 diverse, resource-poor settings. *Journal of Nutrition, 140*(11), 2059S-2069S. doi:10.3945/jn.110.123414.

Arkkola, T., Uusitalo, U Pietikäinen, M Metsälä, J Kronberg-Kippilä, C., Erkkola, M Veijola, R Knip M, Virtanen S.M and Ovaskainen, M-L. (2006). *Dietary intake and use of dietary supplements in relation to demographic variables among pregnant Finnish women*. British Journal of Nutrition, Volume 96, Issue 05, pp 913-920.

Black R. E, Allen L. H, Bhutta Z.A (2008). For the Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet; published online Jan 17. DOI: 10.1016/S0140-6736(07)61690-0

Bookari, K., Yeatman, H., & Williamson, M. (2013). Exploring pregnant women's current level of nutrition knowledge, attitudes and readiness for dietary change during pregnancy. *Women and Birth*, *26*, S23.

Brown, J. E., & Isaacs, J. S. (2011). *Nutrition through the life cycle*. Belmont, CA: Wadsworth, CENGAGE Learning.

Bwadia, H.A., Al-Kuranb,O.,Al-Bastonia,L. A.,Tayyemc,R.F.,Jaradatd,A., Tuurie G., Al-Beitawif, S.N.,& Al-Mehaisenb, L. M.2010. Gestational Nutrition Improves Outcomes of Vaginal Deliveries in Jordan: An Epidemiologic Screeniing, Journal of Nutrition Research.

Cheng, Y., Dibley, M. J., Zhang, X., Zeng, L., & Yan, H. (2009). Assessment of dietary intake among pregnant women in a rural area of western China. *BMC Public Health*, *9*(1), 222. doi:10.1186/1471-2458-9-222.

Chomat, A. M., Solomons, N. W., Koski, K. G., Wren, H. M., Vossenaar, M., & Scott, M. E. (2015). Quantitative methodologies reveal a diversity of nutrition, infection/illness and psychosocial stressors during pregnancy and lactation in rural Mam-Mayan mother–infant dyads from the Western Highlands of Guatemala. *Food and nutrition bulletin*, *36*(4), 415-440.

Coulston, A., Boushey. C. & Ferruzzi, M. (2013). Nutrition in the Prevention and Treatment of Disease. 3rd edition

Daba, G., Beyene, F., Fekadu, H., & Garoma, W. (2013a). Assessment of knowledge of pregnant mothers on maternal nutrition and associated factors in Guto Gida Woreda, East Wollega Zone, Ethiopia. *Journal of Nutrition & Food Sciences*, *3*(6), 1.

Daba G., Beyene, F., Garoma, W. & Fekadu, F. (2013b). Assessment of Nutrition Practices of Pregnant Mothers on Maternal Nutrition and Associated Factors in Guto Gida Woreda, East Wollega Zone, Ethiopia. *The Star Journal.* 2(3), 105-113 women in south-eastern Tanzania. *BMC pregnancy and childbirth*, *12*(1), 16.

FAO. (2008). Guidelines for measuring household and individual dietary diversity. *ROME, ITALLY*, *4*, 1–21.

Faridah, U., Machfoed, I., & Ernawati, S. (2018). The Relationship between Type of Occupation and Nutritional Status of 2nd Trimester Pregnant Women in Mergangsan. *Jurnal Ners dan Kebidanan Indonesia*, *5*(3), 98-101.

Venton, C. C., Fitzgibbon, C., Shitarek, T., Coulter, L., & Dooley, O. (2012). The economics of early response and disaster resilience: lessons from Kenya and Ethiopia. Final report.

Hiza, H. A., Casavale, K. O., Guenther, P. M., & Davis, C. A. (2013). Diet quality of Americans differs by age, sex, race/ethnicity, income and education level. *Journal of the Academy of Nutrition and Dietetics*, *113*(2), 297-306.

Hussan B,Swarwar T,Raja S and Mnakter (2013)Nutritional status of pregnant women in Selected rural and urban area of Bangladish.*jounal of nutrition food Science.*2013,3:219.

Imamura, M., Tucker, J., Hannaford, P., Da Silva, M. O., Astin, M., Wyness, L., & Temmerman, M. (2007). Factors associated with teenage pregnancy in the European Union countries: a systematic review. *European Journal of Public Health*, *17*(6), 630-636.

Jian-huan, Z. H. A. O. (2010). Influence of pregnant women′ s occupation on pregnancy and childbirth: a report of 100 cases. *Jilin Medical Journal*, *4*, 054.

Kamau-Mbuthia, E., Elmadfa, I. (2007). Diet quality of pregnant women attending an antenatal clinic in Nakuru, Kenya. Ann Nutr Metab 20; 51:324–330

KDHS. (2014) *Kenya Demographic and Health Survey*. Nairobi: Kenya National Bureau of Statistics.

Keino, S., Plasqui, G., Ettyang, G., & van den Borne, B. (2014). Determinants of stunting and overweight among young children and adolescents in sub-Saharan Africa. *Food and Nutrition Bulletin*, *35*(2), 167-178.

Kenya National Bureau of statistics and ICF Macro. (2010). Kenya Demographic and Health Survey 2008-09. Calverton, Maryland: KNBS and ICF Macro.

Khodarahimi, S. (2015). The Role of Marital Status in Emotional Intelligence, Happiness, Optimism and Hope. *Journal of Comparative Family Studies*, 351-371.

Khoushabi, F., & Saraswathi, G. (2010). Association between maternal nutrition status and birth weight of neonates in selected hospitals in Mysore city, India. Pakistan Jounal of Nutrition, 9(12), 1124-30.

Kinyua, L. W. (2013). Association of Nutrition Knowledge and Attitude with Dietary Practices and Nutrition Status of Female Undergraduate Students Attending University Colleges within Nairobi Metropolis (Doctoral dissertation, University of Nairobi).

Kopi, S. S. (2012). Factors affecting nutrition interventions on malnourished children (6-59 months), pregnant and lactating mothers in Mandera East and North districts (Doctoral dissertation, University of Nairobi, Kenya).

Kramer K. L. (2008). Early sexual maturity among Pume foragers of Venezuela: Fitness implications of teen motherhood. Am J Phys Anthrop; 136: 338-350.

Langille D. B. (2007). Teenage pregnancy: trends, contributing factors and the physican´s role. Can Med Assoc J; 176: 1601-1602.

Lee, S., Guillet, R., Cooper, E. M., Westerman, M., Orlando, M., Kent, T., & O'Brien, K. O. (2015). Prevalence of anemia and associations between neonatal iron status, hepcidin and maternal iron status among neonates born to pregnant adolescents. *Pediatric research*, *79*(1-1), 42.

Lee, S. O., Park, K. Y., & Han, M. J. (2015). Comparing Nutrition Knowledge, Eating Habits and Neonatal Health Status of Primipara for Pregnant Women of Advanced Maternal Age Compared to Those of Younger Ages. *Korean Journal of Women Health Nursing*, *21*(4), 253-261.

Liao, Y., & Zhou, J. (2010). Study on the knowledge, attitude and practice on nutrition among pregnant women in floating population. *Modern Preventive Medicine*, *37*(1), 66-72.

Lutter, C. K. (2000). Breastfeeding Promotion. Short and long term effects of breast feeding on child health, 478, 355.

Madhavi, L. H., & Singh, H. K. G. (2011). Nutritional status of rural pregnant women. Religion, 2, 0-05.

Mahmoudfakhe, H., Movloudi, S., Fatahi, N., Raeisi, H., & Khaledian, M. (2013). Investigating a comparison of superstitions, mental health, emotional intelligence and self-esteem, in pregnant mothers and comparing it with normal mothers. *Self, 1*, 1.

McDermid, J., Spraggon, V., Oyier, B., Otticha, S., Onono, M. & Young, S. (2014). Appetite sensation scores and dietary intake of pregnant and lactating women in western Kenya (LB473). *The FASEB Journal.* 28(1), 473

Mugenda, O. and Mugenda, A. (2003). Research Methods: Quantitative and Qualitative Approaches. Nairobi, Kenya, KE. ACTS publishers.

Naeeni, M. R., Lotfi, R., Farid, M., & Tizvir, A. (2016). Can the modern methods of education be a good alternative for the traditional method in educating pregnant mothers?. *Shiraz E Medical Journal*, *17*(12).

Nderitu, C. M., Wanyoike-Gichuhi, J., Ondieki, D. K., & Odawa, X. (2015). Pregnancy outcome among adolescents and non-adolescents delivering at Kiambu Country Hospital, Kenya. *East African Medical Journal*, *92*(8), 381-388.

Obare, F., van der Kwaak, A., & Birungi, H. (2012). Factors associated with unintended pregnancy, poor birth outcomes and post-partum contraceptive use among HIV-positive female adolescents in Kenya. *BMC women's health*, *12*(1), 34.

Omwancha, K. M. (2012). The implementation of an educational re-entry policy for girls after teenage pregnancy: A case study of public secondary schools in the Kuria District, Kenya.

Ongosi, A., Gericke, G., Mbuthia, E. and Oelofse, E. (2014). Food variety, dietary diversity and perceived hunger among lactating women (0-6 months postpartum) in a low socio-economic area in nairobi, Kenya. *African journal for food agriculture nutrition and development*. 14(2), 8663-8675.

Otten, J. J., Hellwig, J. P., & Meyers, L. D. (2006). *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington. D.C: The National Academies Press.

Özünlü, T., & Cetinkaya, S. (2013). The relation between pregnant adolescents' attitude about nutrition and weight gain during pregnancy and hemoglobin level. *Open Journal of Obstetrics and Gynecology*, *3*(01), 172.

Patel, K., Joshi, H., & Patel, V. (2013). A study of morbidity and drug utilization pattern in indoor patients of high risk pregnancy at tertiary care hospital. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 372–378. http://doi.org/10.5455/2320-1770.ijrcog20130922

Perumal, N., Cole, D. C., Ouédraogo, H. Z., Sindi, K., Loechl, C., Low, J. & Oyunga, M. (2013). Health and nutrition knowledge, attitudes and practices of pregnant women attending and not-attending ANC clinics in Western Kenya: a cross-sectional analysis. *BMC pregnancy and childbirth*, *13*(1), 146.

Rah JH, Christian P, Shamim A. (2008). *Pregnancy and lactation hinder growth and nutrition status of adolescent girls in rural Bangladesh*. J Nutr; 138: 1505–1511.

Rahmiwati, A. (2015). Contributions Knowledge of Nutrition and Dietary Restriction to Nutrition Status of Pregnant Women in Ogan Ilir, South Sumatera. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, *24*(1), 342-349.

Ramachandran, P. (2002). Maternal nutrition—effect on fetal growth and outcome of pregnancy. *Nutrition reviews*, *60*(suppl 5), S26-S34.

Regassa, N. & Stoecker, B. (2012). Contextual risk factors for maternal malnutrition in a food- insecure zone in southern Ethiopia. *Journal of Biosocial Science.* 44(5), 537-548

Riang'a, R. M., Nangulu, A. K., & Broerse, J. E. (2017). "When a woman is pregnant, her grave is open": health beliefs concerning dietary practices among pregnant Kalenjin women in rural Uasin Gishu County, Kenya. *Journal of Health, Population and Nutrition*, *36*(1), 53.

Semorlan, A. A. P., & Perez-Semorlan, T. (2013). Kiyatindugan (Rising Up) of Mother and Child. The Experiences of Young Muslim Adults and their Single Mothers in Zamboanga City, Philippines. *International Journal of Behavioral Science*, *8*(1), 45-54.

Shaw, A. (2013). A Study on the assessment of iodine nutrition status of pregnant and lactating mothers with reference to healthy non-pregnant females of different age-groups.

Simiyu, S. (2011). *Effect of water sanitation and health education interventions on diarrhoeal morbidity among children in Mandera District, Kenya* (Doctoral dissertation).

Singh, R., Chauhan, R., Nandan, D., Singh, H., Gupta, S. C., & Bhatnagar, M. (2013). Morbidity Profile of Women during Pregnancy: A Hospital Record Based Study in Western Up. *Indian Journal of Community Health*, *24*(4), 342 – 346.

Singh S. (2008). *Adolescent childbearing in developing countries*: a global review. Stud Fam Plann; 29: 117-136.

Sorokowski, P., Randall, A. K., Groyecka, A., Frackowiak, T., Cantarero, K., Hilpert, P. & Bettache, K. (2017). Marital satisfaction, sex, age, marriage duration, religion, number of children, economic status, education and collectivistic values: Data from 33 countries. *Frontiers in psychology*, *8*, 1199.

Stapleton, H. and Keenan, J. (2009). *Bodies in the making:* Reflection on women's consumption practices in pregnancy in; *Infant and young child nutrition*: Challenges to Implementing a Global Strategy, eds F Dykes and V Hall Moran, pp 119-45. Wiley-Blackwell: Oxford.

Stewart, C. P., Katz, J., Khatry, S. K., LeClerq, S. C., Shrestha, S. R., West, K. P., & Christian, P. (2007). Preterm delivery but not intrauterine growth retardation is associated with young maternal age among primiparae in rural Nepal. *Maternal & child nutrition*, *3*(3), 174-185.

Sukrat, B. (2014). Thailand adolescent birth rate: trend and related indicators. *Thai Journal of Obstetrics and Gynaecology*, *22*(1), 15-21.

Sukchan, P., Liabsuetrakul, T., Chongsuvivatwong, V., Songwathana, P., Sornsrivichai, V., & Kuning, M. (2010). Inadequacy of nutrients intake among pregnant women in the Deep South of Thailand. BMC Public Health, 10(1), 572.

Symonds, M. E., & Ramsay, M. M. (2010). *Maternal-fetal nutrition during pregnancy and lactation*. Cambridge, UK: Cambridge University Press.

Tang, A. M., Chung, M., Dong, K., Terrin, N., Edmonds, A., Assefa, N., & Janjua, N. (2016). Determining a global mid-upper arm circumference cutoff to assess malnutrition in pregnant women.

Vakili.M, Abendi.P. Sharifi.M. Hosseini.M., (2013).Dietary diversity and its related Factors among the adolescents. Survey in Ahvaz-Iron. *Global journal of health science,* Vol 5 No 2:2013 ISSN 1916-9736 E-ISSN 19169744 Canadian Center of Science and Education

Vijayeta, P. (2016). A study to assess nutritional status, nutrition knowledge and dietary patterns of college going adolescent girls. *Asian Journal of Home Science*, *11*(1), 232-237.

Waithaka, M. G. (2015). *Analysis of household food insecurity and the implication of measurement error, Mandera county, kenya* (Doctoral dissertation, Kenyatta

Wang, J., Zhao, L., Piao, J., Zhang, J., Yang, X., & Yin, S. (2011). Nutrition and health status of pregnant women in 8 provinces in China. *Wei sheng yan jiu= Journal of hygiene research*, *40*(2), 201-203.

Wen LM, Flood VM, Simpson JM, Rissel C, Baur LA(2010).Dietary behaviors during Pregnancy: findings from first time mothers in southwest Sydney, Australia. Int J Behav Nutr Phys Act; 7(13):1–7.

Were M. (2007). Determinants of teenage pregnancies: The case of Busia Sub-countyin Kenya. Econ Hum Biol; 5: 322-339.

World Health Organisation. (2014). Nutrition disorders http://www.who.int/topics/ nutrition disorders/en/. Accessed 28th April 2014

Zelalem, A., Endeshaw, M., Ayenew, M., Shiferaw, S., & Yirgu, R. (2017). Effect of nutrition education on pregnancy specific nutrition knowledge and healthy dietary practice among pregnant women in Addis Ababa. *Clinics in Mother and Child Health*, *14*(3), 265.

Zhao, Y. Q., Zhang, X. X. & Li, D. (2011). Investigation on Nutrition Knowledge, Attitude and Practice of Pregnant Women and Lactating Mothers in Hanyuan County. *Modern Preventive Medicine*, *1*, 052.

Zhong, D.H.; Liu, C.H.; Su, S.P. (2010). Dietary analysis and nutrition status of pregnant women in China (in Chinese). *Today Nurse*, *4*, 28–30.

APPENDICES

APPENDIX A: LETTER OF INTRODUCTION AND INFORMED CONSENT

Informed consent

Dear Respondent,

My name is Mohamed Khalif, a student of Kenyatta University department of Food, Nutrition and Dietetics. I am undertaking a study on nutrition knowledge, dietary practices and nutrition status among pregnant adolescents in Mandera East Sub-County, Mandera County. This will help inform decision making for proper interventions among the pregnant mothers in the pastoralist communities.

The study is 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 x
2. Participation in the study is voluntary and was highly appreciated. There are no consequences of declining to participate in the study.
3. Confidentiality was highly maintained and any information obtained from this study will only be used for the purpose of this study only.
4. Please note that participation in this study has no financial or other personal benefits.

Procedure that was followed

You was requested to provide information related to nutrition knowledge, dietary practices and nutrition status among pregnant adolescents in Mandera County

Your MUAC measurement will also be taken by measuring the circumference of mid upper less active arm.

Discomforts and risks

Some of the questions asked during the interview may make you uncomfortable and in such a case you may decline to answer them. Further, you are free to discontinue with the interview at any time.

Benefits to the study participants

As a result of participating in this study you will benefit by understanding the various health and nutrition related factors affecting you as a mother.

Benefits to the community

As a result of this study the community benefits by understanding the various health and nutrition related factors affecting the pregnant adolescents. From this adequate interventions can be planned to mitigate any major aspect noted.

Care and protection of the research participant

The study procedures was carefully explained to the respondent to ensure and assure them that there are no risks associated with the procedure.

Community considerations

The study will ensure that the participants who was noted to be with poor nutrition status was given nutrition advice by the researcher and will further be referred to a health facility for interventions.

Confidentiality

The interviews was conducted in your household where you will find appropriate and any measurements taken in an appropriate setting. There was no direct reference of your name nor will your contact information be published at the end of the study. The information that was collected from you was treated with utmost confidentiality.
If you have any questions you may contact.

Mohamed Khalif
PO BOX 43844-00100,
Nairobi, Kenya.
Tel: +254-0722229076

Or
Chairman

Kenyatta University Ethical Review Committee
P.O. Box 43844-00100
Nairobi, Kenya.
Tel: +254(20)8714388
Fax: +254 20 8711575

Respondent's statement

I have understood the information above and the terms of my participation. I have been given a chance to ask questions for clarification and which has been answered satisfactorily. Therefore I voluntarily choose to participate in this study.

Signing or thumb printing

Date _____

Interviewer's statement

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 understand.

Name of interviewer _____

Interviewer signature _____ Date _____

APPENDIX B: QUESTIONNAIRE

Identification

Name of village	Contact/mobile number	Questionnaire ID No	Date of Interview (dd/mm/yy)	Name of interviewer

SECTION A: Demographic and socio economic characteristics of pregnant adolescents

S/NO	Age	No of Children	Education Level	Main occupation	Marital Status	Income 1Yes 2 No	Source Of income	Income Range	Tribe/ ethnicity

Key:

1. **AGE**: Age in years

2. **Education Level**:1 = No formal education 2= Primary incomplete 3= Primary complete 4= Secondary incomplete 5= Secondary complete 6= college certificate 7= College diploma 8= University degree 7=Adult education

3. **Occupation**: 1=Pastoralist, 2=Business, 3=Causal worker, 4=Housewife, 5=Civil servant, 6=Private sector, 7=Unemployed, 8=Any other specify.

4. **Marital status**: 1=Married, 2=Single mother 3=Divorced, 4=Windowed

5. **Source of income**: 1= sale of livestock 2= sale of animal milk 3= petty trade 4= Business 5= Formal employment 6= No income 7= Any other---------- (specify).

6. **Income**: Income per month **1**= <2,000 **2**=2,001-4,000 **3**=4,001-6,000 **4=**8,001-10,000 **5 =** >10,001

Pregnancy duration _____ months (From Clinical card)

SECTION B Animal ownership

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

Indicate whether you have the following animals and the numbers

SECTION C: Dietary intake

Part 1: 24- Hour recall: What drink/foods did you consume yesterday from the time you woke up to the time you slept?

Was the mother's diet:		Usual				
		Larger				
		Smaller				
				FOOD TAKEN (WT- GRAMS)		
Meal	Time	Food/recipe name	Ingredients	Empty plate/ cup	Cup+ food	Weight of food consumed

Section D: Dietary diversity

Write down (1) If any food was consumed in the last 7 days period in the given food group and write (0) if none of the food was consumed in the given food group.

Question number	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 vegetables 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 and 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.

food	1-YES 2-NO	Number of times	Food	1-YES 2-NO	Number of times
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		
Sorghum			Others		

Section G: MUAC

Measurement: 1st _____ 2st _____3rd _____Average _____

Section F: Morbidity status

1. Have you been sick for the last 2 weeks (Y/N)

2. If yes, fill the table below

Type of sickness	**Duration**	**Symptoms**	**Where Medication was sought**

3. Distance to the health facility _____km

APPENDIX C: NUTRITION KNOWLEDGE TOOL

1. Are you aware of what a balanced diet is
2. Are you aware of food groups that provide body with energy
3. Are you aware of food groups that are useful for body building
4. Are you aware of food groups that best protects the body against illnesses
5. Do you understand the importance of increasing energy during pregnancy
6. Do you understand the importance of increasing other nutrients during pregnancy
7. Do you understand of various deficiency problems that arise due to inadequate intake of nutrients
8. Do you understand the effect of low energy intake
9. Do you understand the effect of poor dietary practices on birth weight of the child
10. Do you understand the effect of poor dietary practices on their health

APPENDIX D: 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
    d) Effect of illness during pregnancy

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 is the main occupation of the pregnant adolescents and why

4. What are the dietary practices among pregnant adolescents?

5. What is the health seeking behaviour among pregnant adolescents?

6. Which factors do you think affect the nutrition status of pregnant adolescents?

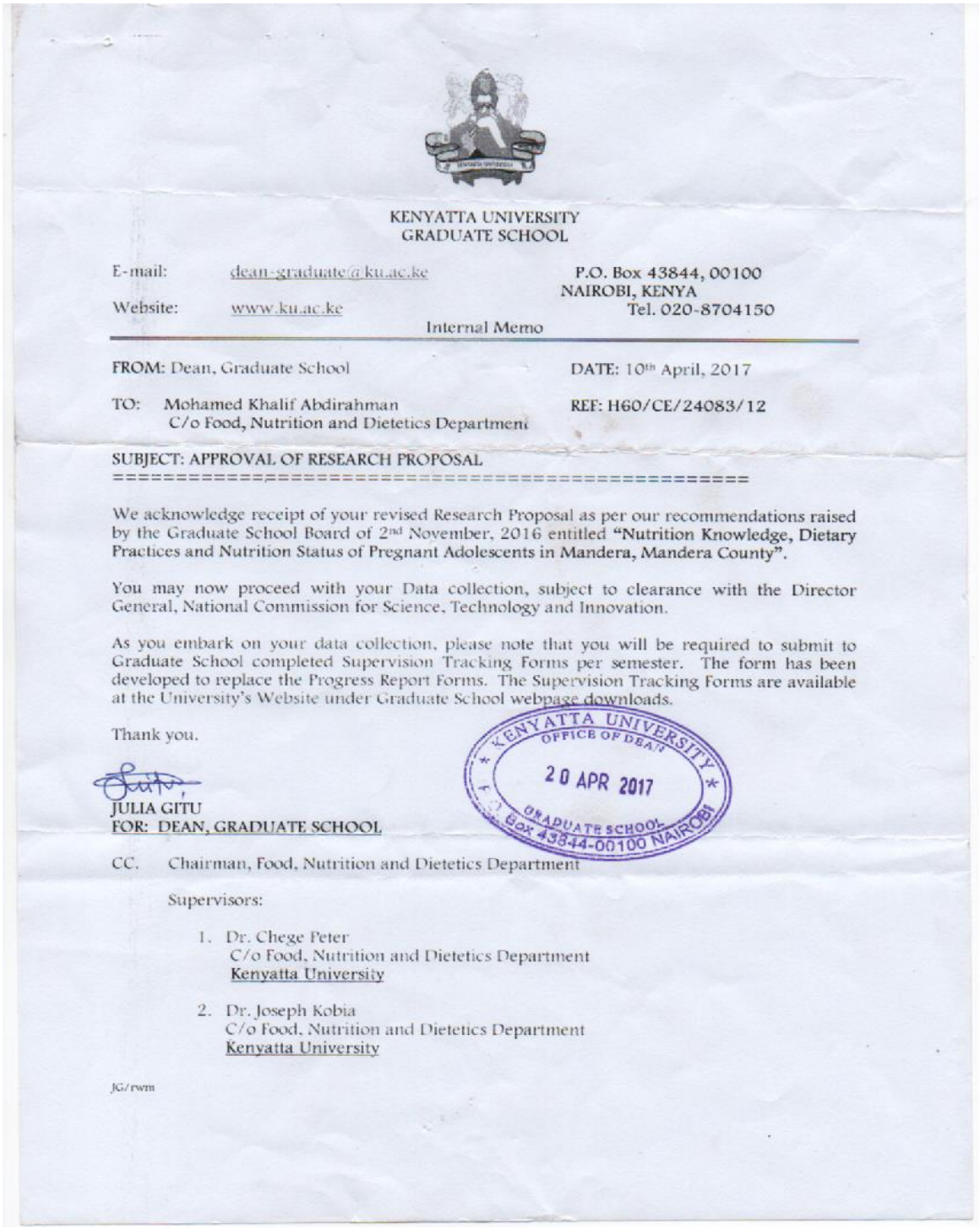
APPENDIX E: KEY INFORMANT INTERVIEW

1. What contributes to early marriages
2. Why do we have pregnant adolescents in the area
3. Why are most adolescents not well educated
7. What is the main occupation of the pregnant adolescents
8. What are the dietary practices among pregnant adolescents?
9. What is the health seeking behaviour among pregnant adolescents?
10. Which factors do you think affect the nutrition status of pregnant adolescents?

APPENDIX F: TRAINING SCHEDULE FOR RESEARCH TEAM

Day	Time	Activity
Day 1	7.00 am – 9.00 am	Arrival & registration
	9.00 am – 10.30 am	Introduction
	10.30 am – 11.00 am	Break
	11.00 am – 1.00 pm	Purpose and objectives of the study
	1.00 pm – 2.00 pm	Lunch break
	2.00 pm – 3.00 pm	Information required for each objective
	3.00 pm – 4.00 pm	Selection of study areas
	4.00 pm	Break and closure for the day
Day 2	8.00 am – 9.00 am	Recap for the previous day
	9.00 am – 10.30 am	Sampling and identification of study participants
	10.30 am – 11.00 am	Break
	11.00 am – 1.00 pm	Data collection procedures (1)
	1.00 pm – 2.00 pm	Lunch break
	2.00 pm – 3.00 pm	Data collection procedures (2)
	3.00 pm – 4.00 pm	Ethical issues during data collection
	4.00 pm	Break and closure for the day
Day 3	8.00 am – 9.00 am	Recap for the previous day
	9.00 am – 10.30 am	Role plays, mock interviews
	10.30 am – 11.00 am	Break
	11.00 am – 1.00 pm	Role plays & mock interviews
	1.00 pm – 2.00 pm	Lunch break
	2.00 pm – 5.00 pm	Field pretest
	5.00 pm	Break and closure for the day
Day 4	8.00 am – 9.00 am	Recap for the previous day
	9.00 am – 10.30 am	Pretest feed back
	10.30 am – 11.00 am	Break
	11.00 am – 1.00 pm	Modification of tools
	1.00 pm – 2.00 pm	Lunch break
	2.00 pm – 4.00 pm	Way forward
	4.00 pm	Closure

APPENDIX G: APPROVAL OF RESEARCH BY KENYATTA UNIVERSITY GRADUATE SCHOOL



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School

DATE: 10th April, 2017

TO: Mohamed Khalif Abdirahman
C/o Food, Nutrition and Dietetics Department

REF: H60/CE/24083/12

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your revised Research Proposal as per our recommendations raised by the Graduate School Board of 2nd November, 2016 entitled "Nutrition Knowledge, Dietary Practices and Nutrition Status of Pregnant Adolescents in Mandera, Mandera County".

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

KENYATTA UNIVERSITY
OFFICE OF DEAN
20 APR 2017
GRADUATE SCHOOL
P.O. Box 43844-00100 NAIROBI

JULIA GITU
FOR: DEAN, GRADUATE SCHOOL

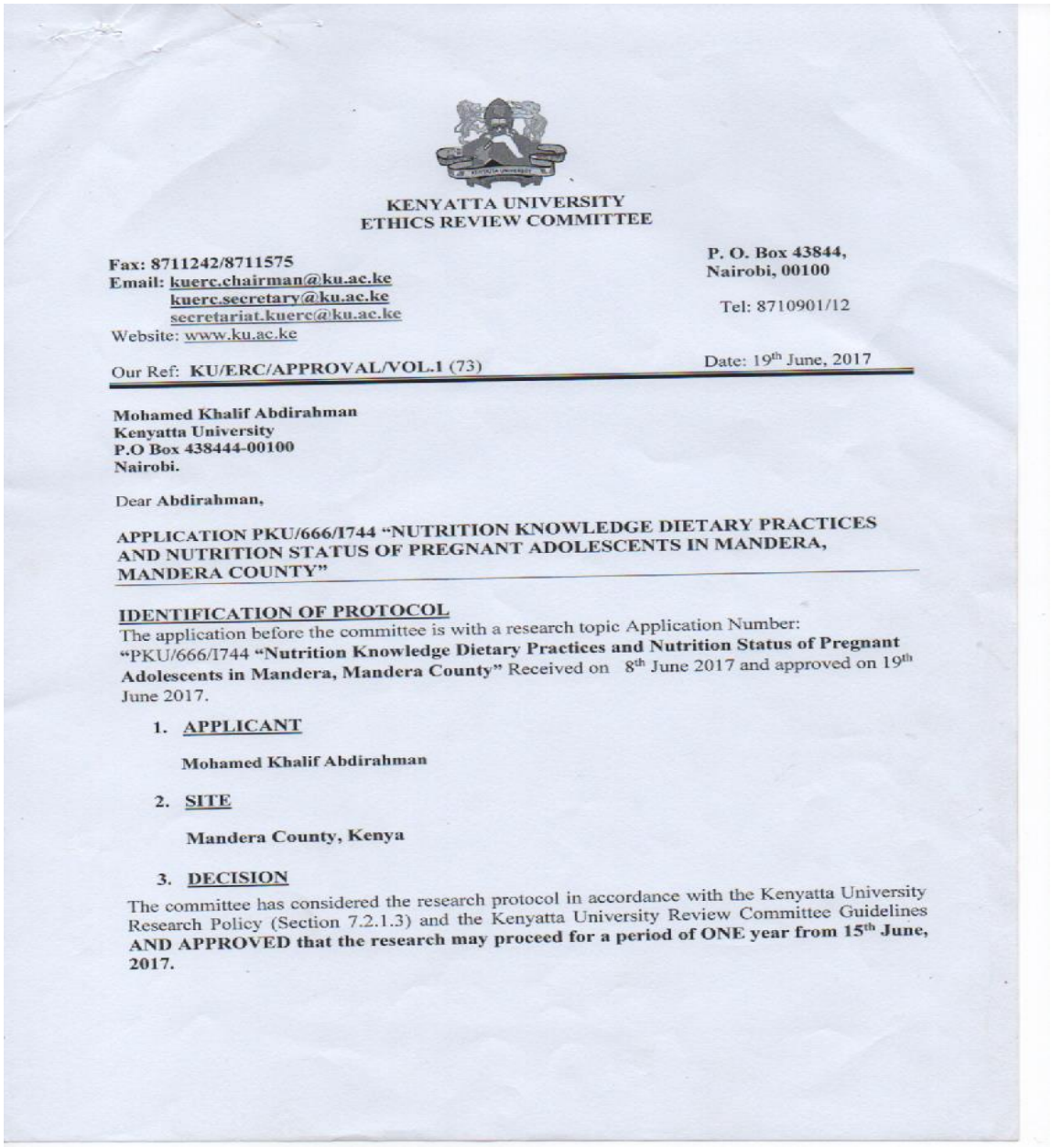
CC. Chairman, Food, Nutrition and Dietetics Department

Supervisors:

1. Dr. Chege Peter
   C/o Food, Nutrition and Dietetics Department
   Kenyatta University
2. Dr. Joseph Kobia
   C/o Food, Nutrition and Dietetics Department
   Kenyatta University

JG/rwm

APPENDIX H: APPROVAL OF RESEARCH BY KENYATTA UNIVERSITY ETHICAL REVIEW COMMITTEE



KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: kuerc.chairman@ku.ac.ke
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P. O. Box 43844,
Nairobi, 00100

Tel: 8710901/12

Our Ref: **KU/ERC/APPROVAL/VOL.1** (73)

Date: 19th June, 2017

Mohamed Khalif Abdirahman
Kenyatta University
P.O Box 438444-00100
Nairobi.

Dear **Abdirahman,**

APPLICATION PKU/666/I744 "NUTRITION KNOWLEDGE DIETARY PRACTICES AND NUTRITION STATUS OF PREGNANT ADOLESCENTS IN MANDERA, MANDERA COUNTY"

IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic Application Number: "PKU/666/I744 **"Nutrition Knowledge Dietary Practices and Nutrition Status of Pregnant Adolescents in Mandera, Mandera County"** Received on 8th June 2017 and approved on 19th June 2017.

1. **APPLICANT**

   Mohamed Khalif Abdirahman

2. **SITE**

   Mandera County, Kenya

3. **DECISION**

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (Section 7.2.1.3) and the Kenyatta University Review Committee Guidelines **AND APPROVED that the research may proceed for a period of ONE year from 15th June, 2017.**

ADVICE/CONDITIONS

i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space Provided below and return to KU-ERC a copy of the letter.

KENYATTA UNIVERSITY
OFFICE OF THE CHAIRMAN
ETHICS REVIEW COMMITTEE
03 JUL 2017

DR. TITUS KAHIGA.
CHAIRMAN ETHICS REVIEW COMMITTEE

I ..... accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of... 3/7/2017 .....2017.

APPENDIX I: APPROVAL OF RESEARCH BY NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

THIS IS TO CERTIFY THAT:
MR. MOHAMED KHALIF ABDIRAHMAN
of KENYATTA UNIVERSITY, 0-100
Nairobi,has been permitted to conduct
research in *Mandera County*

on the topic: *NUTRITION KNOWLEDGE, DIETARY PRACTICES AND NUTRITION STATUS OF PREGNANT ADOLESCENTS IN MANDERA, MANDERA COUNTY*

for the period ending:
24th July,2018

.....
Applicant's Signature

Permit No : NACOSTI/P/17/96787/18213
Date Of Issue : 25th July,2017
Fee Recieved :Ksh 1000

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