UTILIZATION OF ANTENATAL CARE SERVICES, NUTRITION STATUS AND DIETARY DIVERSITY IN PREGNANCY: A CASE STUDY OF PUMWANI MATERNITY HOSPITAL

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I SARAH WAWERU declares that this dissertation is my original work and has not been submitted to any other institution for any other award.

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To the most high God, my husband Benjamin and Our children Isaac, Abigail, and Samuel my

mum, Susan and late dad Nahashon.

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ABBREVIATIONS

AIDS   Acquired immunodeficiency syndrome

ANC   Antenatal care

BCC   Behaviour change communication

BMI   Body mass index

ESAR   Eastern and Southern Africa region

FANC   Focused antenatal care

HIV   Human immunodeficiency virus

IDA   Iron deficiency anaemia

IDD   Iodine deficiency disorder

IEC   Information education communication

KCAL   Kilocalories

LWB   Low birth weight

MUAC   Mid-upper-arm circumference

PMCT   Prevention of mother-to-child transmission

PNC   Postnatal care

SGA   Small for gestational age

SGDs   Sustainable development goals

VAD   Vitamin A deficiency

WRA   Women of reproductive age

ABSTRACT

A woman's nutritional status has a major bearing on whether her pregnancy has a healthy course and outcome. Nutrient adequacy and better health outcomes in pregnant women are determined by their dietary diversity which is the inclusion of different types of foods or food groups in one's daily dietary intake. Antenatal care provides the opportunity to learn about health and nutritious diets along with other clinical advice associated with pregnancy. This study evaluated the dietary nutrient intake of pregnant women in relationship to their general nutrition status. The validity and effectiveness of nutrition education as a component of the antenatal care service was also evaluated. The availability of water, sanitation and hygiene practices was also assessed.

The study used a cross-sectional design that involved random sampling 133 women attending antenatal clinic at Pumwani Hospital. Dietary intake was assessed using a food frequency table and a dietary diversity score. The height and mid- upper-arm circumference were assessed to determine the nutrition status of the women. Descriptive statistics together with graphical analysis were used to describe the basic features of the data and provide simple summaries about the sample. General linear and logit modelling and chi-square analysis methods were used to clarify and explain relationships between different variables that may be associated with the study data.

The study found that the women had much access to water and hygiene services however over a third (36.8%) of them still utilized untreated drinking water. Handwashing techniques among these women was also sub-optimal as a quarter (28%) of these women used water only. Awareness on micronutrient deficiencies among the women was low with over 50% of the women lacking awareness. The mean nutrition knowledge of the women was found to be 44.79±18.82% with the least knowledge scores of 29.17±22.49% and 37.89±24.37% recorded in micronutrients and nutritional deficiencies, respectively. The study also found that the DDS scores were 9.02±1.31.

Perception on health and nutrition problems and occupation of the women significantly (p<0.05) influenced the DDS scores. The most food groups were the fats, fruits, starchy cereals, vegetables and milk as they were consumed 5-6 times a week by 97%, 82.7%, 57.1%, 56.4% and 56.4% of the women respectively. Perception of the women on nutritional problems significantly (p<0.05) influences food frequency. The study also found that with a MUAC cut-off of <210mm, only 3.8% of these women were malnourished. The women had an average initial and current BMI of 27.34±4.30 and 27.74±4.57 kg M^2, respectively, which were significantly (p<0.05) influenced by the education level. Majority (80.0%) of the women were able to be attended to at the ANC under two hours. The waiting time significantly influenced (p<0.05) frequency of attendance in the ANC among the women. A large proportion of the women had not been trained on various health and nutrition issues including nutrition in pregnancy (70.7%), pregnancy related complications (79.7%), labour and delivery (94.0%), breastfeeding (84.2%) and care of the new born (94.0%) during the ANC visits. The clients observed that greater improvements were needed in customer care services, availability of gynaecologists and customer handling etiquette.

In conclusion, accessibility to nutrition services through the ANC services seem to serve a limited role for it is among the least utilized services. In as much as the women had a good nutrition status, gaps in terms of dietary and health practices require improvement. Outreach with nutrition and health education components of the ANC services need improvement that will improve their effectiveness.

CHAPTER ONE: INTRODUCTION

1.1 General Introduction

The World Health Organisation (WHO), defines maternal health as health care given from pregnancy, childbirth to the postpartum period (Anon 2012). Maternal nutrition health practices refer to the activities and dietary habits of women throughout these periods which impact their health (Save the Children 2013). The survival, healthy growth and development of a child is directly related to the mother's nutrition status (Lassi *et al* 2013). Maternal nutrition is also extremely important for a woman to live a healthy life. Poor maternal nutritional status along with maternal body composition, metabolism and placental nutrient supply, are the main factors that can negatively or positively influence foetal development and have been related to adverse pregnancy outcomes(Wu et al. 2004). There different factors that contribute to maternal nutrition such as biologic, socioeconomic, and demographic factors. Such vary across different populations, however they have an ultimate effect on both maternal nutrition and the overall birth outcomes(Wu et al. 2004).

Right from conception to birth, the nutritional requirements of an infant are met by the mother. An infant is fed through the mother's placenta, all the way to birth and ideally exclusively breastfed up to six months (Wu *et al.* 2004). The most vulnerable time in the life of an infant is found to be in the first 1000 days of life. It is therefore pertinent to promote maternal nutrition and health policies that will safe guard both the mother and child in this critical time. Preconception counselling of women in the reproductive age which lies between 15-49 years would promote good maternal nutrition before and during pregnancy. Good nutrition knowledge would change poor nutrition attitudes and practices in favour of a more diversified and healthy diet(Black et al. 2013). This would ensure better food choices, healthy diets and maintenance of healthy preconception weight. Nutritional interventions that can ultimately improve maternal nutrition and birth outcomes can only be effective if there is a clear

understanding of the association between maternal nutrition, pregnancy and birth outcomes. Such interventions would to a large extent improve the infants quality of life and thereby reduce mortality, morbidity and health-care costs (Black e*t al.* 2013).

There is a close relationship between the nutrition status of the mother, the birth outcomes and the later health outcomes of an infant. Under nutrition of the mother which is considered as a (body mass index (BMI) <18.5 kg/m^2) will lead to poor foetal growth, intra uterine growth retardation (IUGR) resulting to a low birth weight. On the other hand, overweight (BMI > 25 kg/m^2), may lead to gestational diabetes or hypertension which may lead to pre-eclampsia and pre-term births. Low birth weight increases the chances of an infant's morbidity, mortality, and is known to have long term irreversible cognitive, motor and health impairments.

Maternal infections especially malaria and HIV/AIDS also contribute majorly towards maternal under-nutrition and adverse pregnancy outcomes. According to the global burden of diseases 2010, child and maternal under-nutrition risk factors including maternal micronutrient deficiencies, suboptimal breastfeeding and childhood underweight are collectively accountable for almost 7% of the global disease burden contributing to at least a fifth of maternal deaths along with the increased probability of poor pregnancy outcomes (Maternal and Child Nutrition Study Group et al. 2013). These are most prevalent in the regions of Africa, South America and South East Asia, with some countries in Eastern and Southern Africa Region (ESAR) having maternal under-nutrition prevalence rate as high as 35%((Maternal and Child Nutrition Study Group et al. 2013).

Despite the declining trend over the past few decades, the prevalence of low BMI (<18.5 kg/m^2) among women of reproductive age (WRA) in Africa and Asia still looms higher than 10%. The eastern, northern and western African regions have shown some improvements; however, in southern Africa, the situation has not improved or might have even worsened. Simultaneously, the prevalence of overweight (BMI $\geq$ 25 kg/m^2) and obesity (BMI $\geq$ 30 kg/m^2)

among WRA has been rising in all regions of the world and reached more than 30% and 10% globally and in Africa respectively(Maternal and Child Nutrition Study Group et al. 2013).

1.2 Statement of the problem

Antenatal care is an important component of maternal health. The pillars of care are hinged on the principles of primary health care, with a focus on preventive and promotive services, treatment and rehabilitation. The antenatal care package comes with a number of services aimed at covering all this areas. The nutritional status and dietary diversity among pregnant women remains to be a challenge, characterised by insufficient food intake, micronutrient deficiencies, nutrition related deficiencies and poor diversified diets. Antenatal care services provide a good entry point for care to the pregnant woman from conception, gestation, and onset of labour which culminates to child birth and postpartum period. In spite of the known merits of antenatal care, services of the same are reported to be poorly executed and ANC is considered as a missed opportunity.

1.3 Justification

Antenatal care is specialized care that provides what is necessary for the health, welfare, maintenance and protection of the pregnant woman and unborn child. The onset of this care is from conception, through gestation culminating to labour and delivery and extends to the postpartum period. This care is provided by skilled health professionals to ensure a healthy outcome for both mother and child. The components of care are hinged on the primary health care pillars of disease prevention, health promotion, risk identification, treatment, rehabilitation and palliative care. Services at the ANC comprise of, physical examinations, blood tests, ultrasound, tetanus vaccine, gynaecological examinations and HIV/STD. Health education covers a wide range of topics such as nutrition in pregnancy, breastfeeding, pregnancy related complications, hygiene science, care of the new born, labour and delivery. This study will

appraise the actual utilization of ANC services as it assesses the nutritional status and dietary diversity of the pregnant women, attending the ANC clinic at Pumwani Maternity Hospital.

The study findings can be utilized by Pumwani Maternity Hospital management in drawing up staff performance indicators and work targets, which culminate to staff performance appraisal. The study will also benefit the hospital to identify strengths, weaknesses, opportunities and threats to quality service delivery at the ANC clinic. The study will also benefit Ministry of Health policy makers in developing, monitoring and evaluation tool kits for ANC country wide. The study findings will further contribute in the continuous nutrition curriculum development for the training of nutrition students at tertiary institutions of learning. The Ministry of Health through public private partnerships can glean from this study in the future and use it to develop health and nutrition programmes that are practical and sustainable.

1.4 Aim of the study

Make a contribution to maternal health and birth outcomes by improving women's nutritional status and dietary intake by promoting nutrition awareness among women.

1.5 Purpose of the study

This study will assess the nutrition status of pregnant women in relationship to individual dietary diversity as influenced by nutrition knowledge factors and the utilisation of antenatal care services, generating data that can be used in developing maternal nutrition programmes that are focused on addressing maternal under-nutrition.

1.6 Main objective

To assess the association between utilisation of antenatal care services, nutrition status and dietary diversity, of pregnant women attending antenatal care (ANC) at Pumwani Maternity Hospital.

1.7 Specific objectives

1. To determine the socio-demographic characteristics of women attending antenatal care clinic at Pumwani Maternity Hospital.

2. To appraise the utilization of antenatal care services offered at Pumwani Maternity Hospital.

3. To assess nutrition knowledge, attitudes, practices and water safety, hygiene and sanitation among pregnant women attending the antenatal care clinic.

4. To assess the nutritional status and dietary diversity of pregnant women attending antenatal care clinic at Pumwani maternity hospital.

1.8 Research questions

1. Is there an association between dietary diversity, utilisation of antenatal services and the nutrition status of a pregnant woman?

1.9 Expected benefits from the study

Understanding the factors necessary to achieve and maintain a diverse diet is important to every government. This study will provide insight into the limitations encountered by households in trying to achieve a diverse quality diet. It will be valuable input to the county government in developing effective nutrition intervention programmes that overcome such barriers.

At the community level, the feedback from the study will serve to inform households on the relationship between dietary diversity and overall health.

There is a great relationship between local perceptions and dietary habits, some of which are positive while others are restrictive of healthy dietary practices this study hopes to investigate on such subtle components which are determinants of health, in order to inform the health sector on ways in which nutrition policies and key messages on nutrition can be integrated with cultural belief to foster behaviour change.

The study will also provide a feedback to Pumwani Maternity Hospital on the acceptance of antenatal care services offered at the facility with regard to quality, professional behaviour of the medical staff and customer care service.

The study will benefit future researchers who can use this study to evaluate and find gaps upon which they can either build new studies or make improvements on similar studies.

CHAPTER TWO: LITERATURE REVIEW

2.1 Maternal health

Maternal health is defined as the health of women during pregnancy, childbirth and the postpartum period. Maternal nutrition and health practices refer to the activities and habits of women throughout these periods, which impact their health and that of the foetus.

The survival, growth, development of the foetus and ultimately the infant is linked to the nutritional status and wellbeing of a woman. The link between maternal nutrition, pregnancy outcome and maternal mortality is also triangulated.

Nutrition plays a major role in maternal and child health. Poor maternal nutritional status has been related to adverse birth outcomes; however, the association between maternal nutrition and birth outcome is complex and is influenced by many biologic, socioeconomic, and demographic factors, which vary widely in different populations (Abu-Saad & Fraser 2010). Understanding the relationship between maternal nutrition and birth outcomes may provide a basis for developing nutritional interventions that will improve birth outcomes and long-term quality of life and reduce mortality, morbidity, and health-care costs.

The importance and role of maternal nutrition to foetal development have adverse effects on the birth outcomes, specifically resulting in low birth weight, preterm birth and intra uterine growth retardation (IUGR). Such effects can have life-long repercussions on the growth and development of an infant (Abu-Saad & Fraser 2010).

Optimal maternal and foetal pregnancy outcomes are dependent upon the intake of adequate nutrients to meet maternal and foetal requirements ((Abu-Saad & Fraser 2010).

Maternal nutrition plays an essential role in influencing foetal growth and birth outcomes. It is a modifiable risk factor of public health importance in the effort to prevent adverse birth outcomes, particularly among developing and low-income populations.

2.2 New-born mortality global and regional

The events surrounding pregnancy, labour, delivery and the overall health of a woman are involved in the survival of the new born. A major contributor to perinatal and new born morbidity and mortality is the lack of antenatal care, and lack of skilled attendance at delivery. Worldwide about four million babies die in the first four weeks of life that being considered as the neonatal period, and many others are stillborn. The highest risk of neonatal death is within the first 24 hours of life, however about three quarters of all neonatal deaths worldwide occur within the first week of life. About (99%) of all neonatal deaths occur in low and middle income countries. The top three causes of new born death in all developing countries are severe infections (28%), Birth asphyxia (27%), and prematurity (29%). Causes of New born mortality in Kenya are highly attributed to asphyxia and birth trauma accounting for 29%, prematurity 28%, and sepsis 23%. (Kenya health situation and trends 1994-2010).

2.3 Dietary diversity and nutrient adequacy

Dietary diversity can be defined as the number of different foods or food groups consumed over a given reference period, nutrient adequacy in turn, refers to a diet that meets requirements for energy and all essential nutrients(Ruel,2003).A poor diet lacking in diversity and nutrient adequacy is a leading cause to macronutrient and micronutrient deficiencies that result to short and long term forms of malnutrition (Ngala, 2015). Dietary diversity is critical to nutrient adequacy, apart from breast milk which is holistic for the child in the first six months there is no other food which contains all the nutrients in totality to maintain health and good nutrition status (Ngala, 2015). Dietary diversity can be determined according to individual food and food group intake, nutrients only or nutrients and food taken together (Ngala, 2015). Dietary diversity is a complex function of many underlying currents such as nutrition knowledge, socio-economic, socio-demographic, environmental, market dynamics, gender, intra-

household food distribution and all this laced in cultural beliefs and taboos (Kamanzi *et al.* n.d.).

2.4 Implications for Maternal Under-nutrition

Worldwide, about 56.4 million pregnant women are affected by anaemia. Out of this, iron deficiency anaemia contributes to about 50% of all the cases (Wheeler *et al.* 2016).Approximately 18% and 5.4% of all pregnant women in the united states have been found to be ID and anaemic respectively. A two-time higher prevalence than observed among non-pregnant women of childbearing age (Wheeler et al. 2016).Iron deficiency anaemia during pregnancy has closely been associated with intrauterine growth retardation, premature delivery, low birth weight, postpartum depression, maternal morbidity and mortality(Wheeler et al. 2016). According to the Healthy People 2020 goals, it was noted that preventing iron deficiency among childbearing females between the age of 15-49 years must become an important public health goal (Wheeler *et al.* 2016).

An undernourished mother is at a higher risk of giving birth to a low birth. That is a small for gestational age infant either at term or preterm due to foetal growth retardation. Low birth weight infants are at a higher risk of both neonatal and postnatal death. They are likely to be stunted in childhood (Black et al 2013). A quarter of all new born deaths is caused by foetal growth restriction. Infants born weighing <2.5kg are vulnerable to all other neonatal and postnatal causes of death (Black et at 2008). Undernourished neonates are also at a higher risk of developing non-communicable diseases such type 2 diabetes in adulthood and heart conditions (WHO 2012a). Unlike developing countries, where foetal growth restriction is an outcome of maternal under-nutrition more often in the developed countries it's as a result of other maternal factors such as maternal smoking. (Black et al 2008).

2.5 Factors influencing maternal nutrition

Maternal nutrition is influenced by several factors such as maternal age, non-pregnant weight, gestational age, intervals between pregnancies, parity, educational status, violence during pregnancy, lack of antenatal care (ANC), very low socio-economic status low body mass index (BMI), short stature, anaemia and/or other micronutrient deficiencies are known to increase the risk of poor maternal nutrition (Kader & Perera 2014).A low BMI is a reliable indicator for protein-energy malnutrition, which affects foetal growth during pregnancy. Women with low socio-economic status are more likely to have inadequate food intake, unhygienic housing, lack of sanitation, reduced ability to seek medical care and purchase medicine/supplements, which then affects the birth weight of their infants (Kader & Perera 2014).Maternal nutrient stores may deplete as a result of short inter-pregnancy intervals reducing the birth weight of an infant. Culture and religion have a significance in terms of food acceptance and choices in pregnancy. Certain foods are considered culturally unacceptable during pregnancy.

2.6 Maternal nutrition deficiencies in developing populations

a.*Energy deficiency*-primarily occasioned by poor availability of food but also conditioned by anorexia and stress of infections plus the high requirements of physical labour.

b.*Iron-deficiency* *anaemia*-coupled with folate deficiency in some areas. Again the main cause is too low an intake of foods containing iron/folate, exacerbated by the increased needs of pregnancy. In hostile environments there is the added burden of reduced absorption, defective haemopoeisis, and increased blood loss.

c. *Vitamin A deficiency*-occasioned by low intake. As carotene is the main source for Third World mothers, vegetable consumption habits and seasonal availability are crucial. The most striking adverse effects are usually seen in the offspring of deficient mothers after the infants are weaned.

d. *Iodine deficiency*-leading to endemic goitre occurs in areas where the iodine content of the soil, water, and plants is low, especially in the presence of goitrogens, and where foods from outside the area are not consumed. Adverse effects on the mental performance of the offspring is a main concern.

e. *Deficiency of other micro-nutrients*, such as thiamine, niacin, and zinc, may still occur in certain geographic areas.

2.7 National guidance on maternal nutrition

Nutritional conditions of concern among women include micronutrient deficiency. Intervention activities contributing to this strategic objective include; carrying out nutrition education on consumption of healthy foods during pregnancy and strengthening supplementation of iron and folate in pregnant women. These activities are expected to result in; reduced mortality, anaemia, micronutrient deficiency, low birth weight and obesity (Anon 2012).

Improve knowledge, attitudes and practices on optimal nutrition: The importance of this strategic issue is to have provision of information as a precursor in adoption of positive attitude and practices on optimal nutrition by Kenyans. This is to be realized through development, dissemination and implementation of a National Nutrition Information, Education Communication and Behaviour Change Communication (IEC/BCC) strategy. In addition, this would involve training service providers on IEC/BCC and advocacy skills. This strategic issue is expected to contribute to improved nutrition practices in the lifecycle/lifespan(Anon 2012).

Micronutrient deficiencies are highly prevalent among children under the age of five years and women. According to 1999 national micronutrient survey in Kenya, the most common deficiencies include vitamin A deficiency (VAD), iron deficiency anaemia (IDA), iodine deficiency disorders (IDD) and zinc deficiency. Data on these deficiencies is as indicated VAD

among under-fives (84.4%); IDA among 6-72 month olds (69%) and among pregnant women (55.1%); IDD (36.8%); and zinc deficiency among mothers (52%) and among children under 5 years (51%). Iron deficiency is emerging as the most common condition among non-target groups with the prevalence of the deficiency among adolescents in refugee camps estimated at 46% and 21.1% among school girls in western Kenya(Anon 2012).

2.8 Maternal and new born nutrition situation in Kenya

Evidence shows there direct and indirect consequences of maternal nutrition on the immediate and later stages of growth and development in an infant. A typical "poor nutrition" scenario applicable to many women in parts of sub-Saharan Africa, including Kenya, is that she enters pregnancy undernourished, suffers from or develops iron deficiency anaemia and is adversely affected by other micronutrient deficiencies. Her poor micronutrient status may adversely affect foetal development in different ways ranging from brain development (iodine deficiency) and neural tube defects (folate deficiency). Her overall poor nutritional status is likely to predispose the developing foetus to nutritional consequences in infancy, childhood and all the way into his or her adult life. Poorly nourished women often give birth to a low birth weight infant who starts life at a disadvantage that is likely to affect his or her nutritional status and development through childhood and adolescence. Malnutrition is rooted in foetal growth; therefore, critical window when the malnutrition problems is in the first 100 days. The priority nutritional problems affecting maternal health are inadequate energy intake and micronutrient deficiencies. Close birth spacing, low mother's education, poor health seeking behaviour, inadequate water, hygiene and sanitation and poverty are the main social determinants of malnutrition((Anon n.d.)

2.9 National guidelines for quality obstetrics and perinatal care

The Sustainable Development Goal number 5 is to improve maternal health with a target of reducing maternal mortality rate(MMR) by 75%, for this to be attained there is need for a 5.5% decline in MMR annually(Ministry of Public Health and Sanitation & Ministry of Medical Services 2012).However, globally the reported annual percentage decline in MMR between 1990 and 2008 was only 2.3%. Among countries with an MMR ≥ 100 in 1990, it is evident that 30 countries have made insufficient or no progress. This list includes 23 countries from sub-Saharan Africa (WHO...Trends in Maternal mortality 1990-2008). Sadly, Kenya is among these countries with an MMR of 488 per 100,000 live births, with some regions reporting MMRs of over 1000 per 100 000 live births. (KDHS 2008/09).

2.10 Current trends

In Kenya, infant and under five mortality rates are declining, while the neonatal mortality rate(NMR) has stagnated and accounts for 60% of all infant mortality rate (KDHS 2008 /9). Addressing new born mortality in Kenya is likely to result in attainment of SDG 4 which is to reduce child mortality.

2.11 Underlying causes of maternal & neonatal mortality

There are three distinct levels of delay which contribute to maternal morbidity and mortality: (Thadaseus and Maine, 1994):

a. Delay in deciding to seek appropriate care.

This could be due to: socio-cultural barriers, ignorance in perceiving danger signs or disease severity and social economic factors such as cost implications. Diarrhoeal diseases, 2% Tetanus, 1% Pneumonia, 4% Prematurity, 28% Birth asphyxia and birth trauma, 29% Neonatal sepsis, 23% Congenital anomalies, 7% Other diseases and injuries, 5% Distribution of causes of death in Kenya within the neonatal period 2008 (WHO 2010) Neonatal infections 28%

Prematurity and low birth w eight 29% Birth asphyxia and birth trauma 27% Congenital anomalies 7% Neonatal tetanus 2% Diarrhoeal diseases 2% Other 5% 13 National Guidelines for Quality Obstetrics and Perinatal Care((Ministry of Public Health and Sanitation & Ministry of Medical Services 2012)

b. Delay in reaching an appropriate health care facility

This is due to long distance to a facility, poor condition of roads, lack of transportation and cost considerations

c. Delay in receiving adequate emergency care at the facility

This may be due to: Shortage of staff, supplies and basic equipment; unskilled personnel, user fees among others.

2.12 Focused antenatal care

According to the world health organization there are five recommendations relevant to FANC this being nutritional intervention, maternal and foetal assessment, preventive measures, interventions for common physiological symptoms and health systems interventions to improve the utilization and quality of FANC (Anon n.d.).

2.13 A situation analysis on maternal nutrition in Kenya

The nutrition and health status of a woman before and during pregnancy and when breastfeeding is the pillar in determining the health and survival of the mother and of her unborn baby((Anon 2012).There is a higher risk to both the mother and the unborn child if the pregnant woman is undernourished. Such risks range from obstructed labour to death during or after childbirth. Poor nutrition in pregnancy could also affect the growth of the foetus resulting to an underweight baby who is susceptible to diseases. An undernourished mother will also invariably produce low quality breast milk((Anon 2012).

There cyclic intergenerational consequences as a result of maternal malnutrition. Consequences such as low birth weight, prematurity, and low nutrient stores in infants is directly linked to malnutrition in utero. The cyclic intergenerational consequences come into play through stunting of such babies who in the future end up giving birth to low birth weight babies. Optimal maternal nutrition is therefore vital to break this inter-generational cycle(Anon 2012).

Much attention has not been given to women's nutritional needs in Kenya, and especially during pregnancy. Hence creating a gap in efforts to improve maternal and child health. The health and nutrition status of mothers may be influenced by factors such as; food insecurity, maternal nutrition knowledge, inadequate intake, recurrent infections, frequent parasites, poor health, heavy workloads, gender inequities, socioeconomic status among others((Ahmed 2015).

2.14 Maternal anthropometry and pregnancy

Women at risk of low birth weight of their infants can best be identified using their Mid-upper-arm circumference (MUAC). This is because MUAC has a relatively strong relationship with LBW and has a narrow range for its cut off values. It's also simple to measure especially in humanitarian settings because of its relatively strong association with LBW.MUAC is a good indicator for the nutritional status of the mother and is not determined by the gestational age of the foetus. A cut off point of MUAC values lying between <22 and <23 cm identifies most pregnant women at risk of LBW for their infants in the developing nations ((Ververs *et al.* 2013).

As a criterion of entry into a feeding programme, SPHERE guidelines recommend the use of MUAC as a screening tool for all pregnant women. According to the guidelines, cut-off points ranging from 21 cm to 23 cm have been prescribed as red flags in determining a pregnant

woman's nutrition status. However, this vary from one country to another. A MUAC of <21 cm is an appropriate cut-off that identifies pregnant women at risk for growth retardation during pregnancy and especially in emergencies((Ververs et al. 2013).

A body mass index (BMI) of 18.5 kg/m^2 for adult women, has been used as a cut-off point assuming it is applicable for pregnant women as an entry point to a feeding programme (Ververs *et al*. 2013).

2.15 Mid- Upper Arm Circumference and Body Mass Index

A MUAC ≥24cm safeguards against LBW whilst a MUAC>27cm denotes a low risk to LBW. A MUAC Cut-off values of <22 and <23 cm identify pregnant women at high risk for LBW. Cut-off values are not strongly linked to gestational age. Protein reserves in the body are best indicated by the MUAC parameters. Wasting which is a form of malnutrition is indicated by a lean arm as measured by MUAC. According to a study done by the world health organisation (WHO) in 1995 it revealed that a MUAC of <21 to 23 cm cut off as having significant risk for LBW. The reliability test of MUAC is hinged on the fact that it's rather insensitive to changes over the total period of pregnancy for adult women (Ververs et al. 2013). A BMI ranging from <18.5 kg/m2 to <20.5 kg/m2 is quite significant in terms of getting a LBW. There is however no cut off values associated with gestational age in pregnancy. BMI in pregnancy is not commonly used in determining the pregnant woman's nutrition status, however a BMI of <22.8 kg/m2 in pregnancy becomes of significance implying the possibility of a low birth weight. In pregnancy, there can be considerable variations in a woman's BMI often this can be an indicator of LBW. There is need for further research that could possibly identify BMI cut off points at the various gestational ages e.g. grouped according to the various trimesters to be used in identifying risk for LBW in pregnancy. Special research in determining BMI for pregnant women in the African context would be critical since currently there exists no particular cut off points relating to pregnancy(Ververs *et al.* 2013).

2.16 Maternal weight for gestational age

In previous studies a maternal weight ranging from <43.5 kg to <50 kg has been found to be statistically significant for LBW. Although there has been no clear cut-off value for maternal weight per trimester, it however seems that a maternal weight <45 kg is indicative for high risk of LBW, IUGR and PRB in Asian countries regardless of gestational age((Ververs *et al.* 2013). In developing countries there few studies and data that can establish the overall weight gain for pregnant women and relate it to LBW, PTB, and IUGR.

A study done by the WHO in 1995 related a weekly weight gain varying from 50-300 g in the fifth to the ninth months as indicative of LBW(Ververs *et al.* 2013). There is strong evidence supporting the association between low weight gain in pregnancy and LBW. A total weight gain of <11.5 to <12.5 kg in pregnancy for underweight women, in developing countries has been shown to increase the risks of LBW and PTB(Ververs *et al.* 2013).

2.16.1 Maternal height

LBW, PTB and IUGR has also been associated with women of a short stature in developing countries especially a maternal height ranging from <146 cm to <156 cm(Ververs *et al.* 2013).There is also a strong association of short stature in women with other birth complications such as obstructed labour due to cephalic-pelvic disproportion and infant underweight. It can then be conceived that there is a greater risk association of birth complications and LBW in women of short(Ververs *et al.* 2013).

2.17 Dietary diversity score

Simple measures of dietary diversity are increasingly used for assessment, especially in developing countries, as data collection and analysis are less time-consuming and less costly than quantitative food intake measures (Ngala 2015). Dietary diversity can be classified according to foods and food groups, nutrients only, or foods and nutrients taken together (Ngala

2015). In general, indices attributed to dietary diversity based on a combination of food groups and selected nutrients have been related to micronutrient deficiencies more directly than those based on individual nutrients or foods (Ngala 2015). The most commonly used dietary diversity score is defined as the number of food groups over a given specified time period (Ngala 2015).

In large surveys information on dietary diversity may be collected through qualitative 24hr-recalls (Ngala 2015), which are relatively straightforward for respondents, are not considered intrusive and do not impose burdensome demands on time and dependency on recall (Ngala 2015). A dietary diversity score (DDS) can be measured at the household (HDDS) or individual level (IDDS). At the household level, dietary diversity is usually considered as a measure of access to food, while at the individual level it reflects quality, mainly micronutrient adequacy, of the diet (Ngala 2015).

Dietary diversity scores can be used to: a) predict nutrient adequacy of vulnerable age groups; b) target the introduction or the promotion of certain food groups; c) use as advocacy and promotion tool to influence administrators into channelling their attention to the vulnerable communities, and what action they can take (Ngala 2015).

2.18 Gaps in knowledge

There is need for enhanced health education among women of reproductive age, to enhance the acceptance and utilization of the government free services in antenatal care and to improve overall care in pregnancy by skilled professionals. This could dramatically save life by reducing maternal and child morbidity and mortality. Lack of health education contributes to negative health seeking behaviours leading to a majority of women giving birth in privately owned, substandard, often unlicensed clinics and maternity homes. Such often have no quality of emergency obstetric care essential equipment, supplies, trained personnel, skills, and other support services which is also a leading cause of maternal death. Few studies in Kenya have

been published on the utilization of antenatal care service provision. There is need to appraise the quality of ANC care across Kenya to cross examine gaps with an intention of improving antenatal care services.

CHAPTER THREE: METHODOLOGY

3.1 Study area

Pumwani is an estate in Nairobi County, the capital city of Kenya. The Pumwani maternity hospital is located in Pumwani; it is the largest public maternity hospital situated in a low social income setting

Pumwani is also a name of a larger administrative area Pumwani division. The division is subdivided into five locations: Bahati, Eastleigh North, Eastleigh South, Kamukunji and Pumwani.

Pumwani division has identical borders with Kamukunji constituency. Pumwani maternity hospital located in Nairobi, is the largest centre that is dedicated in providing reproductive and neonatal health care in Kenya but also Central and East African region.

 The hospital has active antenatal clinic (ANC) and postnatal clinic (PNC) that provides specialist referral obstetric services to more than 30,000 maternity clients annually.
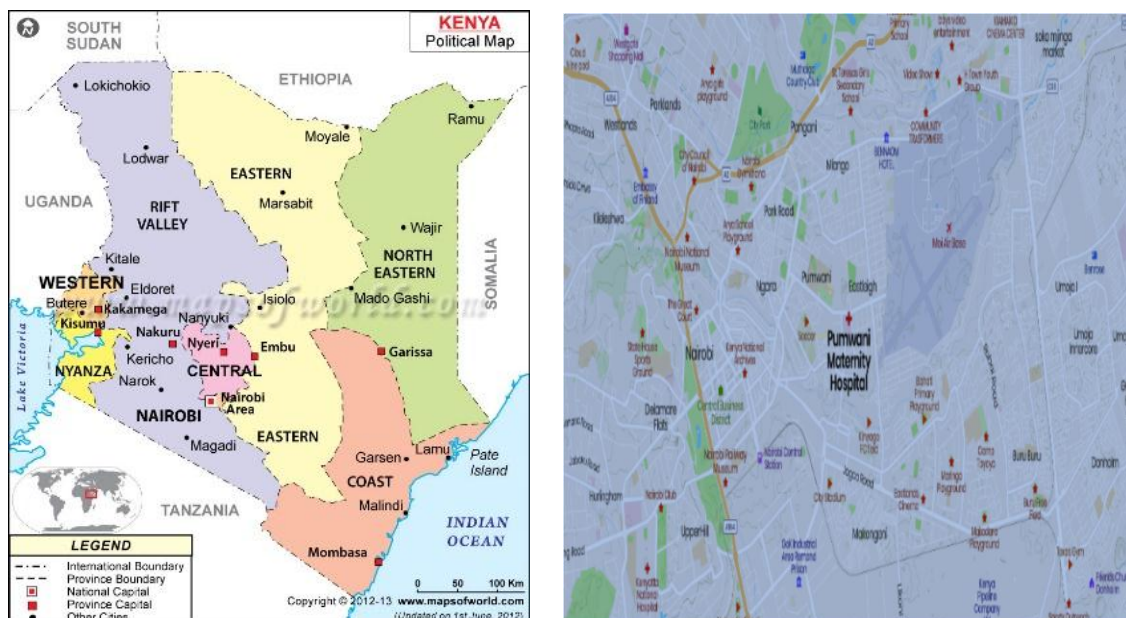
Figure 3.1: Map of study area

3.2 Study design

A Cross-sectional descriptive hospital based survey with an analytical component. The association between utilization of antenatal clinic to the overall nutrition status and dietary diversity of the pregnant women was determined.

3.3 Study population

The study population consisted of all pregnant women attending antenatal care at Pumwani maternity hospital with varying gestational ages and within the age brackets of 15-49 years. Most of the mothers resided within the environs of Kamkunji, Pumwani, Bahati, Eastleigh, with a few others coming from different parts of the country.

3.4 Inclusion criteria

The inclusion criteria consisted of all pregnant women attending antenatal care during the study period, which ran from 1st August 2018 month to 29th August 2018.

The women needed a confirmative pregnancy test result and an antenatal clinic attendance ministry of health card.

3.5 Exclusion criteria

Pregnant women who were sick or in labour.

3.6 Sample size determination

The sample size was determined using the Fischer's formula (Fischer *et al*., 1999)

Formula

$n = (z^2 \times p \times q) / d^2$

n= sample size

Z^2 = value from standard normal deviate corresponding to desired confidence level (Z=1.96 for 95% level of confidence)

p= expected true proportion of women attending ANC in Kenya = 96% (0.96)

d = desired level of precision = 5%

q= 1-p (proportion of the group not targeted) = 4%

n= $1.96^2 \times 0.96 \times 0.04 / 0.05^2$

= 59.01

= 60 pregnant women attending ANC

Attrition rate of 5% = $0.05 \times 60 = 3$

Total sample size; 60 + 3 =63

A total of 133 pregnant women were enrolled at the study site, this gave a better representation of the sample.

3.7 Sampling procedure

Pumwani hospital was purposively selected for the study. About ten pregnant women attended the antenatal care unit on a daily basis. A sample of one hundred and thirty-three pregnant women were systematically and consecutively selected and requested for consent to participate in the study, in a period of twenty-one days.

3.8 Participants selection and recruitment

The study participants were selected by the chief investigator and the research assistant on the basis of their ability to communicate in either the English or Kiswahili languages. Only pregnant women were involved in the study and their participation was not dependent on the pregnancy trimester. This ensured equity among the participants. The study was introduced to

the mothers during their morning health education sessions, which took place every morning before their normal routine check-ups. This allowed ample time for them to consider whether they would participate in the study with no undue pressure. After the initial briefing about the study to the mothers during the health education session, prospective volunteers within the antenatal clinic were allowed to initiate contact about the study either immediately or later. Personal rights to privacy and confidentiality were upheld for each volunteer and the chief investigator was responsible for this task. The interview process was done in a private room within the clinic setting where other participants were not able to listen in on individualised responses. This ensured privacy and encouraged participation. Recruitment was also done by approaching patients one-on-one within the clinic setting.

3.9 Consenting process

Informed consent was obtained from every participant. The informed consent document was used as a guide for the verbal explanation of the study to each of the participant. The consent process allowed ample time and opportunity for the researcher and the participant to exchange information and ask questions. The participants were given detailed information to ensure a thorough comprehension about the study and an opportunity to ask questions. After answering the participant's questions, time was given to the participants to consider all options with no undue pressure. This process facilitated obtaining of the participant's voluntary agreement to participate in the study. After the voluntary agreement and consent was given by the participants more information continued to be given during participation as the need arose. Participants who did not speak English were given a translated concept of the study in Kiswahili. This process was undertaken by the chief investigator and research assistant.

3.10 Data collection procedures

The study approach used individual, participant interview method to collect data. A structured questionnaire interview was verbally administered to participants who could not read and write. While for participants who could read and write, a structured questionnaire was administered to them to fill out. The participant's responses to the research questionnaire were recorded individually as the interview continued. Data collection took twenty-one working days, conducting six interviews on average each day. The principle investigator and the research assistants were responsible for conducting interviews and recording the participant's responses during the interview.

3.11 Data analysis plan

Descriptive statistics such as measures of central tendency, proportions, frequency distribution and inferential statistics were used for data analysis. Findings were represented in the form of tables and graphs.

3.12 Data collection tools

The researcher used anthropometric assessment methods, personal-in-depth-interviews and self-developed questionnaires to collect data from the respondents. The questionnaire was validated to ensure consistency and reliability of the instrument. The questionnaire consisted of a) demographic/personal data of the pregnant women b) knowledge and attitude of diet and practices c) factors affecting dietary practices, e.g. accepted and non-accepted foods d) antenatal care practices e) general services received at the ANC clinic f) nutrition's status assessment of the pregnant women g) economic/income generating activities and sources of food h) emotional and social support of the pregnant women at home and community level.

3.13 Outcome variables

There were four outcome variables in this study 1) nutritional knowledge score 2) health and health knowledge score 3) attitude score 4) dietary diversity and food frequency score. The primary independent variable was attendance of ANC clinic as a key resource for pregnant women to attain health and nutrition knowledge (Perumal *et al.* 2013). The dependent variable was dietary diversity.

3.14 Study questionnaires

The researcher used semi-structured interviews to administer the questionnaires to the pregnant women, both English and Kiswahili were used conveniently depending on the respondent's preference.

3.15 Personal in-depth interviews

Interviews using a question guide to illicit responses from participants, using open-ended, some partially categorised answers and some closed ended questions with a list of possible answers was used. This method offered a more detailed and rich finding on issues relating to meal variety, household food security, diversity scores, and nutrition and health knowledge.

3.16 Anthropometric assessment methods

Mid-upper arm circumference (MUAC) was used due to its association with low birth weight. This was used to classify underweight and at risk of bearing low birth weight babies among the pregnant women. Weight and height of the pregnant women was also measured to establish the avarage initial and current body mass index (BMI) respectively.

3.17 Assessment of dietary diversity

Dietary diversity being a qualitative measure of food consumption and a proxy for nutrient adequacy of individual diets, was assessed using a dietary diversity score,and a meal frequency

score. A list based method organized in sixteen food groups, to which the individual respondents responded with a yes or a no for groups consumed gave an average dietary diversity score, for the women attending the antenatal clinic. A daily meal frequency score was a proxy indicator for calorie adequacy. The food frequency score consisisting of a list of foods and beverages with response categories was used to assess the total individual food consumption patterns.

3.18 Water sanitation and hygiene

Availability of safe domestic and drinking water was assessed based on the water source,access,cost and water treatment methods before drinking. The availability of sanitation facilities mainly toilets and waste management was the measure for sanitation. Handwashing practices were weighted on hand washing knowledge and techniques.

3.19 Utilization of antenatal care services

Health services offered at the antenatal care clinic such as medical care, number of antenatal care visits during the pregnancy, physical examinations including weight, blood pressure and height,gynaecological examination, ultrasound, HIV/STD testing, blood tests, nutritional suppliment administration , tetanus vaccine together with health education and nutrition education were measured. This responces generated the ANC service provision and experience care scores.

3.20 Nutrition knowledge, attitudes and practices

 Respondents were appraised on relative questions based on general nutrition knowledge, attitudes towards health and nutrition related problems, attitudes towards an ideal nutrition related practice,knowledge on micronutrients and nutritional practices. Score for knowledge, attitude and practise were obtained by summing all scores for each variable.

3.21 Ethical and human rights consideration

The research proposal was being approved by the University of Nairobi and Kenyatta National Hospital Ethics and Research committee. Clearance and authority to carry out the research at Pumwani maternity hospital was sought at the hospital management level. The purpose and objective of the research was explained to the respondents and informed consent was obtained. Private and confidentiality was maintained by pre-coding the data collection tools. Information obtained from the research was used for this study only and has not been shared for any other purposes or projects.

3.22 Recruitment and training of research assistants

Training and recruitment of one research assistant with a diploma in nursing was done. The research assistant assisted the researcher in the administration of the questionnaires and took anthropometric measurement. The principle investigator gave the research assistant a one-day training that gave her an understanding of the research objectives. Some of the valuable characteristics that the researcher considered for this assistant were.

- Experience or affinity with study population (patients and/or professionals)

- Knowledge of, or experience with the research topic

- Experience with specific computer programmes

- Able to work accurately

- Able to work independently

- Have good communication skills

- Presentable

- Flexible

- Available for the whole study period

3.23 Pre-test of the data collection tools

The questionnaire was pre-tested with a small set of about 10 respondents from the population of interest. This established the likelihood of obtaining sufficiently sound consistent and relevant data.

3.24 Quality assurance procedure

During data collection the primary investigator ensured that the data recorded reflected the actual facts, responses, observations and events. Instruments to measure weight and height were well calibrated and tested before their use in the field. After each measurement, the instruments were tarred to give a zero start for each measurement and observation. Data was coded to ensure standardized and consistent procedures for data entry with clear instructions. Coding helped the researcher to reduce large quantities of information into a form that could be more easily handled especially by the computer programs used thus excel and spss. Data checking involved double checking coding of observations, responses and outliers. A double entry method was used to offer comparison of entries. The digital data entered was verified against the original data, statistical analysis such as frequencies, means, and ranges were used to detect errors and anomalous values.

3.25 Data entry and cleaning procedure

Data was transferred from the questionnaires immediately to a computer data file using a spread sheet program, Microsoft excel. The possible code cleaning process of checking to see that only codes assigned to the answer choices for each question appear in the data file was used. Cross checking of data with the original questionnaire was used to clarify any uncertainties of the data. Clarifications were also sort by communicating with the respondent in cases where any further clarification was needed.

3.26 Study limitations

Pumwani maternity hospital is basically the biggest hospital sponsored by the government and it is basically for low in-come groups. Many NGOs also contribute towards different programmes and research in the hospitals. It may be difficult to generalise the findings of this study to the general population in the country but only to people living under similar situations.

CHAPTER FOUR: RESULTS

4.1 Demographic characteristics of women attending ANC at Pumwani maternity hospital

Pumwani Hospital majorly serves women from Eastern Nairobi region as about eight in every ten (82.7%) women attending ANC at the hospital came from there. About nine in every ten (88.7%) women attending the ANC clinic are married, followed by single (10.5%) and separated pregnant women (0.8%). Majority (89.5%) of these women attained education beyond the primary school level. The average age of the women was 27.8±5.1 years where women (91.7%) of the youthful age (18-35 years) were the ones that were majorly served by the ANC clinic at the Pumwani hospital. Over ninety percent of the pregnant (95.5%) were of the Christian faith. The average household size of these pregnant women was 2.99±1.16 with a minimum and maximum of 1 and 7, respectively. **Table (4.1).**

Table 4.1: Demographic characteristics of women attending antenatal care clinic at Pumwani maternity Hospital

Demographic characteristics		Proportion (%, n=133)
Residence	Eastern region of Nairobi	82.7
	Northern region of Nairobi	8.3
	Southern region of Nairobi	3.0
	Western region of Nairobi	3.0
	Outside Nairobi County	3.0
Marital status	Married	88.7
	Single	10.5
	Separated	0.8
Level of education	Tertiary level and beyond	39.8
	Secondary level	48.1
	Primary level and below	10.5
	Vocational training	1.5
Age	<18 years	1.5
	18-35 years	91.7
	>35 years	6.8
Religion	Christian	95.5
	Muslim	4.5

4.2 Socio-economic characteristics of pregnant women attending ANC at Pumwani maternity hospital

The pregnant women had various occupation with the most being self-employed (42.1%) while the lowest were pregnant students at 6.0%. Majority of the study population (92.5%) lived in rented apartments, mostly were single rooms or bedsitter (43.6%) while less than 10 percent lived in own apartments (7.5%). The mean monthly payable rent of the women was KES 7506.01±6691.19 with a range of KES. 0.00 to KES. 55,000.00. Majority of the respondents (79.7%) used either gas or kerosene. Almost all the pregnant had a mobile phone (98.5%)

followed by ownership of a dining table (96.2%) while the lowest asset owned was the coffee table (54.9%) **(Table 4.2 and Table 4.3).**

Table 4.2: Socio-Economic Characteristics of pregnant women attending antenatal care at Pumwani maternity Hospital

Socio-economic status		Proportion (%, n=133)
Occupation	Trader/self employed	42.1
	Monthly salary/wage	24.1
	Unemployed	21.1
	Casual labourer	6.8
	Student	6.0
House ownership	Lives in rented apartment	92.5
	Single room/bedsitter	43.6
Size of the house	One bedroom	29.3
	Two bedroom and beyond	19.5
	Own house	7.5
	Double rooms	7.5
Source of fuel	Gas and kerosene	79.7
	Variety of fuel sources	19.5
	Charcoal	0.8

Table 4.3: Asset owned of pregnant women attending antenatal care clinic at Pumwani maternity Hospital

Asset	Proportion of women that owned it (%, n=133)
Mobile phone	98.5
Bed	96.2
Chairs	94.0
Television	93.2
Gas cylinder/cooker	90.2
Radio	84.2
Iron box	66.2
Coffee table	54.9
Fridge	45.0
Land	25.6
Microwave	25.0
Dining table	20.5
Toaster	19.2
Car/truck	13.7
Bicycle	7.6
Motorcycle	5.3
Livestock	3.8

There was no statistical difference (p>0.05) in the monthly payable rent based on the residence of the women. Test for correlation between monthly payable rent and the age of the women showed insignificant (p>0.05) relationship between the two variables. Tests for association showed that age and residence of the women was not significantly (p>0.05) associated with the occupation of the women. Most of the women attending the antenatal clinic at Pumwani

maternity hospital are from the Eastern region of Nairobi extending from Starehe, Mathare, Kamukunji and Makadara. This area is largely occupied by the middle and lower class population. The respondents largely having attained secondary education with no tertiary training engaged in self-employment as an economic means. The ownership of different household assets was an indicator of household economic wellbeing.

4.2.1 Water and Hygiene

The most utilized water source by women who attended ANC at the Pumwani Hospital was the water tap by up to 93.2% of them. Over three quarters (77.5%) of the women easily accessed the water source as it was within the compound or connected to their house. Majority (57.9%) of the women have a daily household water usage of about 20-100 litres. Drinking water for these women was majorly from the tap water as about 9 in every ten (88.7%) of them used tap water for drinking. Over a third (36.8%) of these women would apply no water treatment technique to the drinking water. The access and utilization of water did not significantly (p>0.05) differ by residential area of the women **(Table 4.4).**

Table 4.4: Access to water by pregnant women attending antenatal care clinic at Pumwani maternity Hospital

Variable		Proportion (%)
Main source of water	Water tap	93.2
	Borehole	5.3
	Tanker	1.5
Approximate time to water source	Within the compound/house	77.4
	1-10minutes	19.5
	>20 minutes	3.0
Average daily household water usage (20 litres container)	1-5	57.9
	5-10	30.1
	10-15	8.3
	>15	3.8
Main sources of drinking water	Water tap	88.7
	Mineral water	6.0
	Borehole	3.8
	Tanker	1.5
Water treatment techniques for drinking water	Does nothing	36.8
	Boiling	36.1
	Use chemicals	12.8
	Mineral water	8.3
	Filters	6.0

All (100%) the women had access to toilets. Flush toilets are the toilets that are mostly in use by these women by up to 94.7% of them. Slightly (51.1%) above half of the women use the family toilet whereas the rest (48.9%) rely on communal toilets. Slightly over a percent of the women would improperly dispose of faecal waste of the child by throwing it in a nearby bush. Seven in every ten (71.1%) of the women would use soap and water in handwashing whereas 28.9% use only water in handwashing. These women wash their hands majorly after visiting the toilet (89.5%) and before eating (79.7%), **(Figure 4.1).** The hygiene and sanitation practices of the women was not significantly (p>0.05) associated with age and residential area of the women **(Table 4.5).**

Table 4.5: Hygiene and sanitation practices of women attending ANC at Pumwani Hospital

Hygiene and sanitation practices		Proportion (%, n=133)
Availability of toilet	Yes	100
	No	0.0
Type of toilet	Flush toilet	94.7
	Traditional pit Latrine	3.8
	Bucket	0.8
	Ventilated pit latrine	0.8
Ownership of the toilet	Family	51.1
	Communal	48.9
Disposal of child faeces	Disposed of immediately/hygienically	57.9
	Collected by waste handling services	40.6
	Disposed in nearby bush	1.5
Water that is utilized in handwashing	Soap and water	71.2
	Water only	28.8
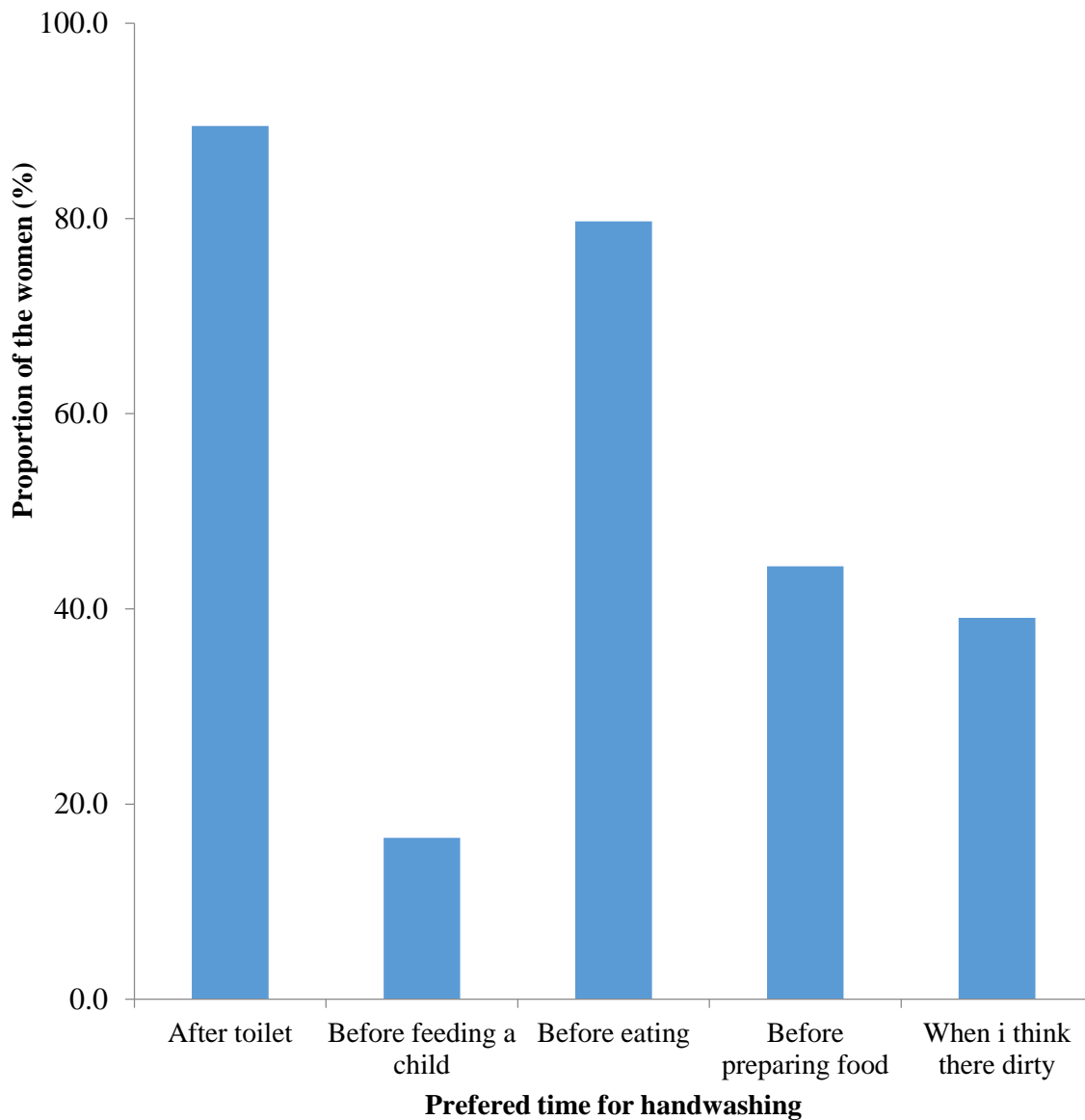
Figure 4.1: Most preferred time for handwashing by pregnant women attending ANC at Pumwani Hospital

4.3 Nutrition knowledge among pregnant women

Nutrition knowledge acquired from self and health practitioners were the most preferred sources at 44% and 39% respectively **(Figure 4.2)**. There was no significant association (p=0.315, χ^2=18.16, df=16) on the sources of nutrition knowledge and the residence of the women.
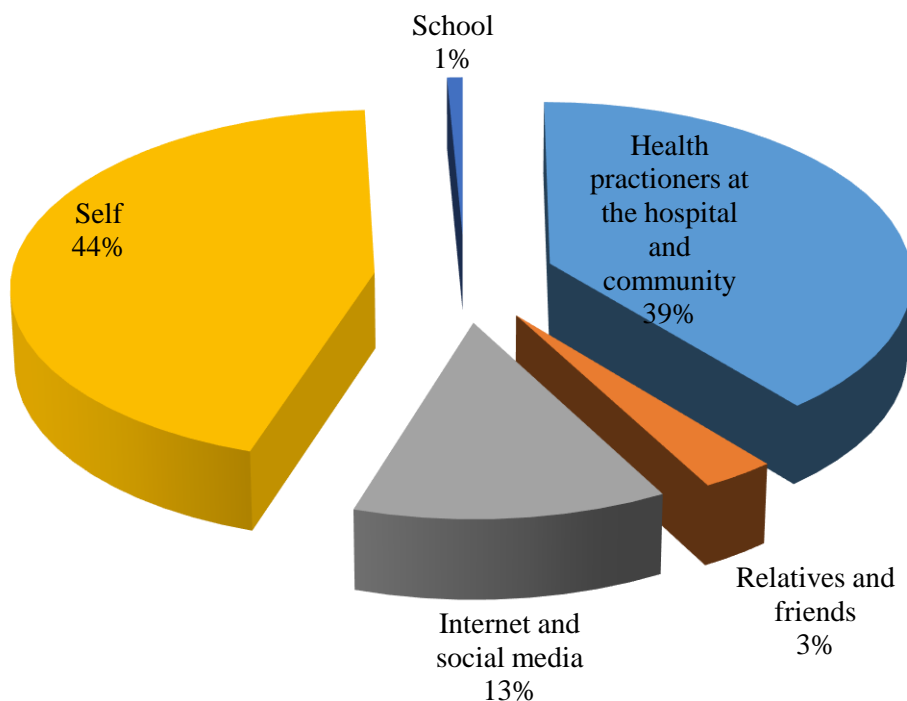
Figure 4.2: Source of nutrition knowledge among pregnant women in Pumwani Hospital

About two in every ten (18.0%) of the women had not heard or were unaware of iron deficiency anaemia. The awareness of iron deficiency anaemia did not significantly (p>0.05) differ with age, residential area or level of education.

About six in every ten of the women had not heard of vitamin A deficiency (60.9%) as well as iodine deficiency (58.6%). The awareness of vitamin A and iodine deficiencies among the women was not significantly (p>0.05) associated with their ages, residential areas and level of education.

The mean nutrition knowledge scores were 44.79±18.82% (range 4.76-85.71%). Majority (60.2%) of the women were rated as having medium knowledge whereas those who had low and high levels of knowledge were 26.3% and 13.5% respectively. The mean knowledge scores of the women on macronutrient, micronutrient and nutritional deficiencies were 63.72±19.09%, 29.17±22.49% and 37.89±24.37% respectively. The age of the women did not influence their knowledge scores on macronutrients, micronutrients and nutritional deficiencies.

The residential area, marital status, religion, level of education and occupation of the women was not significantly (p>0.05) associated with their knowledge on nutrition and health. However, knowledge on nutrition and health had significant association with the source of nutrition information of the women (p<0.05). A majority (65.7%) of those with low level of knowledge relied on themselves for information on health and nutrition as compared to those with medium and high level of knowledge **(Table 4.6).**

Table 4.6: Association between knowledge and source of information on nutrition and health

Source of information on nutrition and health	Knowledge on nutrition and health (%)			P-value (χ^2, df)
	Low	Medium	High	
Health practitioners at the hospital and community	25.7	46.3	33.3	0.045 (15.82, 8)
Relatives and friends	2.9	2.5	5.6	
Internet and social media	2.9	15.0	22.2	
Self	65.7	36.3	38.9	
School	2.9	0.0	0.0	

4.4 Dietary practices of the pregnant women

About 92.5% of the pregnant women consumed citrus fruits during pregnancy. Slightly below three quarters (73.5%) of these women would prefer to eat the citrus fruits either before a meal

or anytime of the day. About 86.4% drank either coffee or tea during their pregnancy. Slightly over half (52.2%) of the women who drank tea or coffee during their pregnancy took it during the meal, just after or before the meal or anytime of the day. All (100%) the women used iodized salt. About six in every ten (57.9%) of the women avoided some foods during their pregnancy. Only less than two in every ten women (16.5%) consumed soil during their pregnancy. The residential area of the women had no significant (p>0.05) association with the nutrition practices of the women (**Table 4.7**)

Table 4.7: Dietary practices of pregnant women attending ANC at Pumwani Hospital

Dietary practices		Residence (%)					Total (n=133, %)	P-value (χ^2,df)
		Eastern Nairobi	Western Nairobi	Northern Nairobi	Southern Nairobi	Outside Nairobi		
Consumes citrus fruits	Yes	93.6	75.0	90.9	75.0	100.0	92.5	0.529
	No	6.4	25.0	9.1	25.0	0.0	7.5	(3.18,4)
Time of eating citrus fruits	Before a meal	40.9	25.0	36.4	33.3	25.0	39.4	0.315
	During a meal	1.8	0.0	0.0	0.0	0.0	1.5	(18.16, 16)
	After meals	17.3	25.0	54.5	33.3	25.0	21.2	
	Anytime	37.3	25.0	0.0	33.3	50.0	34.1	
	Does not eat	2.7	25.0	9.1	0.0	0.0	3.8	
Drinks tea or coffee	Yes	84.5	100.0	90.9	133.3	75.0	86.4	0.529
	No	15.5	0.0	9.1	0.0	25.0	14.4	(3.18, 4)
Time of drinking tea or coffee	2 hrs before meal	45.7	100.0	60.0	25.0	33.3	47.8	0.590
	Right before meal	5.3	0.0	10.0	0.0	0.0	5.2	(14.11, 16)
	During meal	8.5	0.0	0.0	25.0	0.0	7.8	
	Right after meal	3.2	0.0	10.0	0.0	0.0	3.5	
	Anytime	37.2	0.0	20.0	50.0	66.7	35.7	
Use of iodized salt	Yes	100.0	100.0	100.0	100.0	100.0	100.0	N/A
	No	100.0	100.0	100.0	100.0	100.0	100.0	
Has food avoidance	Yes	59.1	25.0	63.6	75.0	25.0	57.9	0.368
	No	40.9	75.0	36.4	25.0	75.0	42.1	(4.30, 4)
Eats soil	Yes	18.2	0.0	9.1	25.0	0.0	16.5	0.434
	No	81.8	100.0	90.9	75.0	100.0	83.5	(3.80, 4)

4.5 Perception of the women towards nutrition and health

Majority (60.9%) of the women attending ANC clinic at the Pumwani hospital believed that they were not likely to suffer from anaemia. Slightly below two thirds of the women (63.8%) believed that they are not likely to suffer from anaemia for either their haemoglobin levels are good or they have never been anaemic. About a fifth of the pregnant women (18.0%) dislike iron-rich foods. Over half (54.9%) of the women were not sure of their likelihood to suffer from vitamin A deficiency. However, 90.2% of these pregnant women believed that vitamin A rich food is good. Almost all the women (99.2%) believed that vitamin A rich food are easy to access. Over 95.5% of pregnant women liked the idea of preparation of food with iodized salt. Over three quarters (76.7%) of the women believed that consumption of more food in pregnancy is good whereas only less than a fifth women (15.8%) viewed it as a bad habit.

The residential area the women lived in was significantly (p<0.05) associated with the perception of the women on the perception of the women on their likelihood to suffer from anaemia **(Table 4.8).** Majority of residents in Eastern and Northern region of Nairobi believe that they are less likely to suffer from anaemia **(Table 4.9).** The perception of the women on the ease of preparation of vitamin A rich food was significantly (p<0.05) associated with their age. Half of the women perceived that vitamin A rich food is difficult to prepare **(Table 4.10).**

Table 4.8: Nutrition related attitude of women attending ANC at Pumwani Hospital

Nutrition related attitude		Proportion of women(%, n=133)
Likelihood to suffer from anaemia	Not likely	60.9
	Not sure	30.8
	Likely	8.3
Reason for belief that they are not likely to suffer from anaemia	Haemoglobin levels are good	41.3
	Never been anaemic	22.5
	Eats iron rich food	15.0
	Eats balance diet	7.5
	Taking IFAS	7.5
	Eats vitamin C rich fruits	2.5
	Drinks plenty of water/ balanced diet	2.5
	No answer	1.3
Attitude towards iron rich food	Positive (like)	82.0
	Negative (dislike)	18.0
Likelihood to suffer from vitamin A deficiency	Not likely	40.6
	Likely	4.5
	Not sure	54.9
View on the use of vitamin A rich foods	They are good	90.2
	They are not good	6.0
	Not sure	3.8
Access to vitamin A rich foods	Easy	99.2
	Difficult	0.8
View on preparation of food with iodized salt	Good	95.5
	Not sure	4.5
Consumption of more food during pregnancy	Good	76.7
	Not good	15.8
	Not sure	7.5

Table 4.9: Association between belief of women on their likelihood to suffer from anaemia and residential area of the women

Perception on likelihood to suffer from iron deficiency anaemia	Residential area of the women (%)					P-value (χ^2, df)
	Eastern Nairobi	Western Nairobi	Northern Nairobi	Southern Nairobi	Outside Nairobi	
Not likely	62.7	50.0	81.8	25.0	0.0	0.029
Likely	7.3	0.0	0.0	50.0	25.0	(17.11,
Not sure	30.0	50.0	18.2	25.0	75.0	8)

Table 4.10: Association between the belief on the ease of preparation of vitamin A rich foods of the women and their age

Perception ease of preparation of vitamin A rich foods	Age (%)			P-value (χ^2, df)
	<18 years	18-35 years	>35 years	
Difficult	50	0	0	0.011
Easy	50	100	100	(9.00, 2)

Over six in every ten (63.2%) women believed they were not likely to get a low birth weight baby. Whereas almost a third (33.1%) were not sure of their likelihood to have low birth weight babies. Three quarters (75.9%) of the women who believed they are less likely to give birth to low birth weight babies saw healthy dieting as a preventive measure of such instances. Over three in every ten (31.8%) of the women were either not sure or had no perception on the severe effects of a low birth weight baby. Of the women who believed that low birth weight is not a

severe condition, two thirds (66.7%) believed that it results in easier delivery of the baby

(Table 4.11).

Table 4.11: Perception of the women on health and nutrition problems

Perception of health and nutrition problems		Age group (%)			Total (n=133, %)	P-value (χ², df)
		<18 years	18-35 years	>35 years		
Likelihood of getting low birth weight baby	Not likely	0.0	63.9	66.7	63.2	0.147
	Likely	50.0	3.3	0.0	3.8	(6.79, 4)
	Not sure	50.0	32.8	33.3	33.1	
Reasons for belief that they are less likely to give birth to low birth weight baby	Healthy eating and dieting	0.0	74.0	100.0	75.9	0.611 (5.41, 7)
	Healthy weight gain	0.0	1.3	0.0	1.2	
	No history of Low birth weight	0.0	20.8	0.0	19.3	
	Healthy results from ANC tests	0.0	3.9	0.0	3.6	
Severity of low birth weight	Serious	100.0	66.9	77.8	68.2	0.201
	Not serious	0.0	0.8	11.1	1.5	(5.98, 4)
	Not sure	0.0	32.2	11.1	30.3	
Reasons for perception of low birth weight as not severe	Good care of new born can speed up growth	0.0	50.0	0.0	33.3	0.306 (1.04, 1)
	Easier to deliver a small baby	0.0	50.0	100.0	66.7	

4.6 Dietary intake and diversity among pregnant women attending antenatal clinic at Pumwani maternity hospital

Women attending ANC clinic at the Pumwani Hospital had an average mean meal frequency of 4.23 ± 1.07 with a minimum and a maximum of 1 and 6 respectively. The meal frequency of these women was not significantly ($p>0.05$) correlated with their ages. ANOVA analysis also showed that the level of education, occupation and marital status did not significantly influence the dietary diversity among these women. Ninety-seven percent (97%) of the women consumed a minimum of five food groups.

The average DDS score of the women attending ANC at the Pumwani Hospital was 9.02 ± 1.31 with minimum and maximum scores of 3 and 10 respectively. A general linear model of the DDS scores response variable showed that socio-demographic factors were imperfect predictors ($R^2=0.001$) as shown in **(Table 4.12)**. Age, marital status, residence, level of education and household size had no significant ($p>0.05$) influence on the DDS scores. However, the occupation of the women influenced the DDS score of the women as shown in **(Figure 4.3).** Salaried employees consumed the least variety of foods as they had the least DDS score of 8.44 ± 0.33.

Table 4.12: General linear model of DDS scores as predicted by socio-demographic factors

Source	Type II sums of squares	Degrees of freedom	Mean squares	F-value	P-value
Corrected Model	36.21	21	1.72	1.01	0.459
Intercept	116.16	1	116.16	67.95	0.000
Residence	5.09	4	1.27	0.74	0.564
Marital status	1.714	2	0.86	0.50	0.607
Level of education	2.71	3	0.90	0.53	0.664
Religion	0.32	1	0.32	0.19	0.664
Household size	3.89	6	0.65	0.38	0.891
Source of income	18.69	4	4.67	2.73	0.033
Age	0.08	1	0.08	0.05	0.832
Residual	189.76	111	1.71		

The response variable is the DDS score, $R^2=0.001$
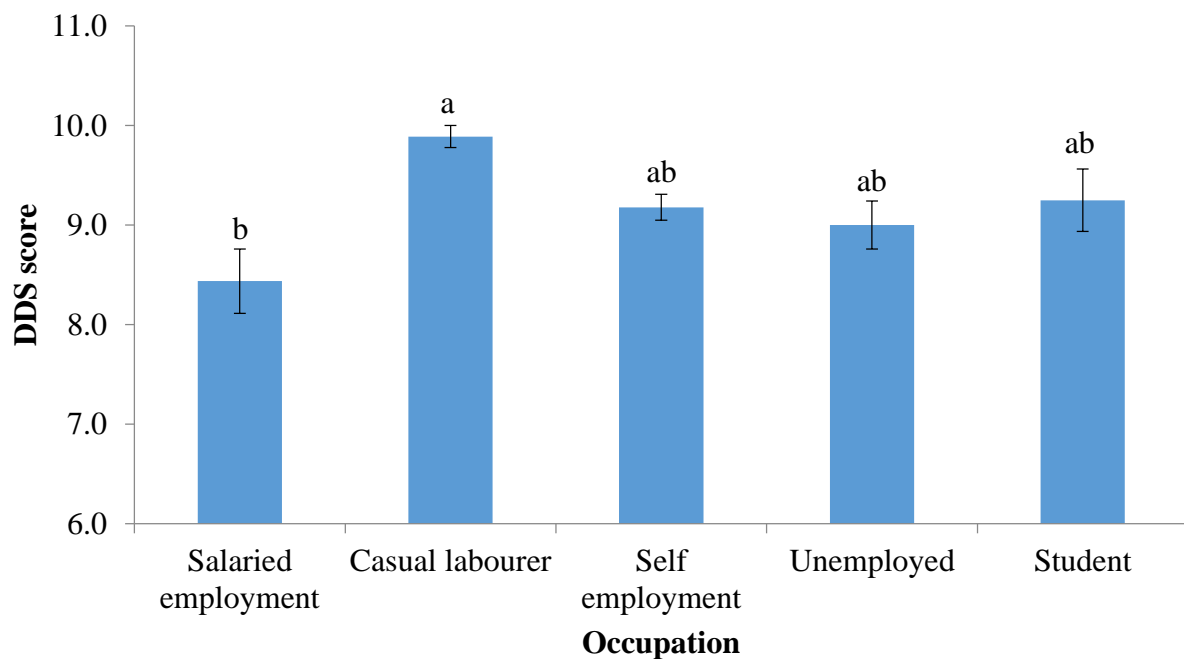
Figure 4.3: DDS score of women based on their occupation.

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The error bars indicate the standard error of the mean. Bars with different letters are statistically different at p<0.05.

Regression analysis showed that the nutrition practices of the women had no significant (p>0.05) influence on the dietary diversity score.

The DDS score of the women was significantly (p<0.05) associated with their attitude in terms of their perception of the likelihood to suffer from iron deficiency anaemia **(Table 4.13).**

Table 4.13: Association between perception of likelihood to suffer from iron deficiency anaemia and the DDS score

Perception of likelihood to suffer from iron deficiency anaemia	DDS score		P-value
	<5 food groups	≥5 food groups	(χ2, df)
Not likely	0.0	62.8	0.021
Likely	25.0	7.8	(7.74, 2)
Not sure	75.0	29.5	

Nutrition knowledge score had a significant positive correlation with the minimum DDS score (p<0.001, r=0.41).

The frequency of consumption of foods by the women attending ANC at Pumwani maternity hospital is as summarized in **(Table 4.14)**. The most food groups were the fats, fruits, starchy cereals, vegetables and milk as they were consumed 5-6 times a week by 97%, 82.7%, 57.1%, 56.4% and 56.4% of the women respectively. Eggs were the least consumed of the nine food groups as about four in every ten (37.1%) women either rarely or never consumed it.

Table 4.14: Food frequency of women attending ANC at Pumwani maternity Hospital

Food group	Frequency of intake						
	5-6 times a week	3-4 times a week	1-2 times a week	Fortnightly	Monthly	Rarely	Never
Starchy cereals	57.1	36.8	6.0	0.0	0.0	0.0	0.0
Starchy (non-cereals)	10.5	27.1	39.8	2.3	0.0	16.5	3.8
Legumes & nuts	13.5	34.6	42.9	0.8	1.5	5.3	1.5
Fruits	82.7	9.0	3.8	0.0	0.0	3.8	0.8
Eggs	9.0	15.8	35.3	2.3	0.0	20.3	17.3
Meat & fish	15.0	24.1	40.6	2.3	1.5	9.8	6.8
Vegetables	56.4	27.1	8.3	1.5	4.5	1.5	0.8
Milk and dairy products	56.4	10.5	9.0	0.8	0.8	7.5	15.0
Fats and oils	97.0	0.8	1.5	0.0	0.0	0.0	0.8

Perception of the women towards their likelihood to suffer from iron deficiency anaemia had significant ($p<0.05$, $\chi2=23.75$, df=12) association with the frequency of consumption of milk and dairy products **(Table 4.15).** Majority of the women who frequently consumed milk and dairy products believed they are not likely to suffer from anaemia.

Table 4.15: Association between frequency of intake of milk and dairy products with the perception of likelihood to suffer from iron deficiency anaemia

Frequency of intake of milk and dairy products	Perception of likelihood to suffer from iron deficiency anaemia			P-value (χ^2, df)
	Not likely	Likely	Not sure	
5-6 times/week	72.0	5.3	22.7	0.022
3-4 times/week	57.1	7.1	35.7	(23.75, 12)
1-2 time/week	58.3	25.0	16.7	
Fortnight	100.0	0.0	0.0	
Monthly	0.0	0.0	100.0	
Rarely	60.0	0.0	40.0	
Never	25.0	15.0	60.0	

Frequency of consumption of fruits was significantly associated with the intake of citrus fruits ($p<0.020$, $\chi^2=11.69$, df=4) as shown in **(Table 4.16).** Women who never consumed fruits and vegetables did not consume fruits and vegetable.

The frequency of consumption of milk and dairy product was also associated with the intake of citrus fruits ($p<0.014$, $\chi^2=15.96$, df=6) as shown in **(Table 4.16).** Women who consumed milk and dairy products once in a month did not consume citrus fruits **(Table 4.17).**

Table 4.16: Association between frequency of consumption of fruits and the consumption of citrus fruits among pregnant women

Frequency of consumption of fruits	Do you eat citrus fruits		P-value
	Yes	No	(χ^2, df)
5-6 times/week	95.5	4.5	0.020
3-4 times/week	91.7	8.3	(11.69, 4)
1-2 time/week	80.0	20.0	
Fortnight	0.0	0.0	
Monthly	0.0	0.0	
Rarely	60.0	40.0	
Never	0.0	100.0	

Table 4.17: Association between frequency of consumption of milk and dairy products and the consumption of citrus fruits among pregnant women

Frequency of consumption of milk and dairy products	Do you eat citrus fruits		P-value
	Yes	No	(χ^2, df)
5-6 times/week	97.3	2.7	0.014
3-4 times/week	92.9	7.1	(15.96, 6)
1-2 time/week	91.7	8.3	
Fortnight	100.0	0.0	
Monthly	0.0	100.0	
Rarely	100.0	0.0	
Never	75.0	25.0	

The level of knowledge on nutrition and health had no significant (p>0.05) association on the frequency of intake of food groups.

4.7 Morbidity in pregnancy among women attending ANC at Pumwani maternity Hospital

The morbidity levels among pregnant women attending ANC clinic at the Pumwani Hospital were as summarized **(Table 4.18).** About two in every ten (19.7%) of these women had been diagnosed with a disease in the last one month. The proportion of the women who had been ill in the last one month significantly differed (p<0.05) based on the residence of these women with three quarters of the women coming from outside the Nairobi region having the highest level of morbidity. Among the women who had been diagnosed with an illness in the last one month, nausea and vomiting and vaginal bleeding were the most common illnesses. About nine in every ten (88.5%) of the women that had been diagnosed with illnesses sought medical treatment. Of those women that sought medical attention, about three quarter (73.9%) preferred the public hospital. The residence of the women was not significantly (p>0.05) associated with the type of illnesses among these women, seeking of medical treatment and the preferred facility for treatment.

Table 4.18: Level of morbidity among pregnant women attending ANC at Pumwani Hospital

Morbidity		Region of residence of the women in Nairobi County (%)					Total (n=133, %)	P-value (χ^2, df)
		Eastern Nairobi	Western Nairobi	Northern Nairobi	Southern Nairobi	Outside Nairobi		
Incidence of disease in the past one month	No	80.7	75.0	90.9	100.0	25.0	80.3	0.048
	Yes	19.3	25.0	9.1	0.0	75.0	19.7	(9.58, 4)
Type of sickness experienced in the last one month	Nausea/ vomiting	23.8	0.0	0.0	0.0	33.3	23.1	0.884 (18.61, 27)
	Vaginal bleeding	4.8	100.0	0.0	0.0	0.0	7.7	
	High blood pressure	9.5	0.0	0.0	0.0	0.0	7.7	
	Stomach aches	19.0	0.0	0.0	0.0	0.0	15.4	
	Pelvic pain/backache	4.8	0.0	0.0	0.0	0.0	3.8	
	Amoeba	4.8	0.0	0.0	0.0	0.0	3.8	
	Vaginal infections	23.8	0.0	0.0	0.0	33.3	23.1	
	Itching of whole body	4.8	0.0	0.0	0.0	0.0	3.8	
	Chest pain	4.8	0.0	100.0	0.0	0.0	7.7	
	Cold/flu	0.0	0.0	0.0	0.0	33.3	3.8	
Sought medical attention	No	4.8	0.0	0.0	0.0	66.7	11.5	0.081
	Yes	95.2	100.0	100.0	0.0	33.3	88.5	(6.73, 3)
Medical facility where treatment was sought	Public hospital	75.0	100.0	100.0	0.0	0.0	73.9	0.327
	Private hospital	25.0	0.0	0.0	0.0	100.0	26.1	(3.91, 3)

4.8 Nutrition status of women attending ANC at Pumwani Hospital

The mean weight of the pregnant women attending ANC at the Pumwani hospital was 69.33±13.09 kg with a minimum and a maximum of 44 kg and 95 kg respectively. The mean weight gain over the course of gestational period of these women was 3.40±1.42 kg with a minimum and maximum of -4 kg and 8 kg respectively. The average height of the women was 158.41±6.04 cm with a minimum and a maximum of 131 and 177 cm respectively. The average initial BMI of the women and current BMI of the women were 27.34±4.30 (range 17.99-39.04 kg/m^2) and 27.74±4.57 kg/m^2 (range 18.19-39.86 kg/m^2) respectively. The average MUAC of the women was 284.52±36.10 mm (range 207-380 mm). Based on a cut-off <210mm, only 3.8% of these women were malnourished.

The socio-demographic factors had no significant influence ($p<0.05$) on the weight gain and the MUAC of the pregnant women. However, the education status of the women significantly ($p<0.05$) affected their initial and current BMI. Women who had undergone vocational training had higher initial and current BMIs compared to other levels of education (**Table 4.19 and Figures 4.4 and 4.5**).

MUAC (r=0.101, p=0.255), initial BMI (r=0.134, p=0.161) and current BMI (r=0.101, p=0.255) were all not correlated with dietary diversity scores.

Table 4.19: Distribution of anthropometric measures by   socio-economic and demographic characteristics

Sociodemographic	Anthropometric measures			
	Weight gain	**MUAC**	**Initial BMI**	**Current BMI**
Corrected Model	7233.0*	2411.61*	35.24*	38.63
Intercept	594.6*	93220.02*	1341.67*	1216.81
Residence	108.2	1154.96	18.71	13.97
Marital status	5295.3	3441.65	20.25	26.89
Level of education attained	25.8	2224.35	94.35*	108.72*
Religion	24.3	780.69	1.93	11.81
Household size	527.4	237.48	9.71	11.51
Age	1.7	2508.15	0.07	1.34
Occupation	156.1	1431.05	17.91	14.93
Ownership of a house	49.0	5125.86	10.83	12.41
Rent payable per month (KES)	3.9	589.57	0.02	1.88
Error	7651.0	1060.33	14.21	17.14
R^2	0.38	0.18	0.23	0.18

*significant at $p < 0.05$.
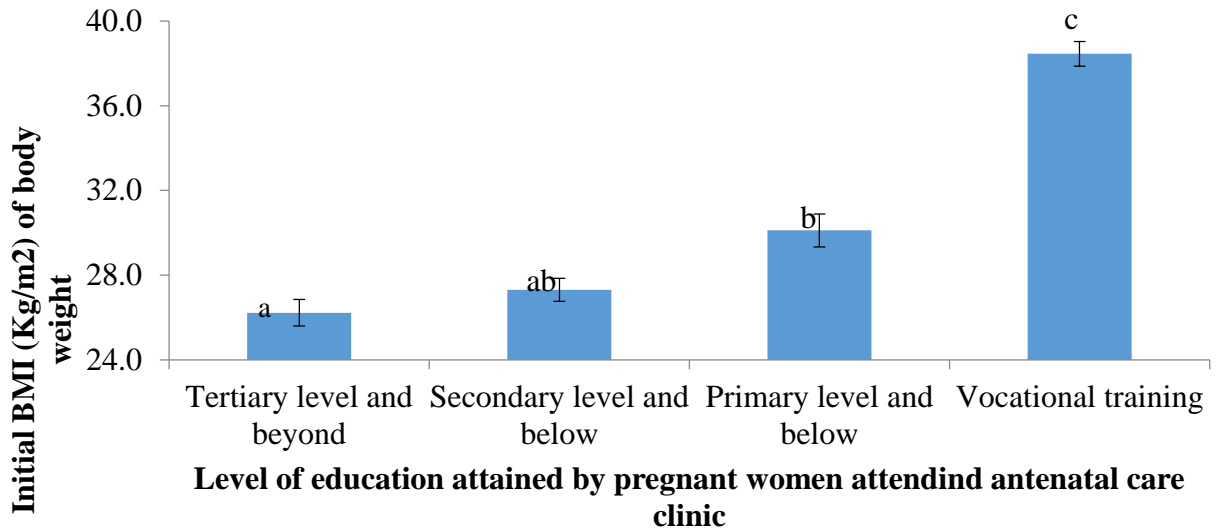
Figure 4.4: Mean of the initial BMI based on different level of education attained.

The error bars indicate standard error of the mean. Bars with different letters at the top indicate statistical difference in the means at $p<0.05$.
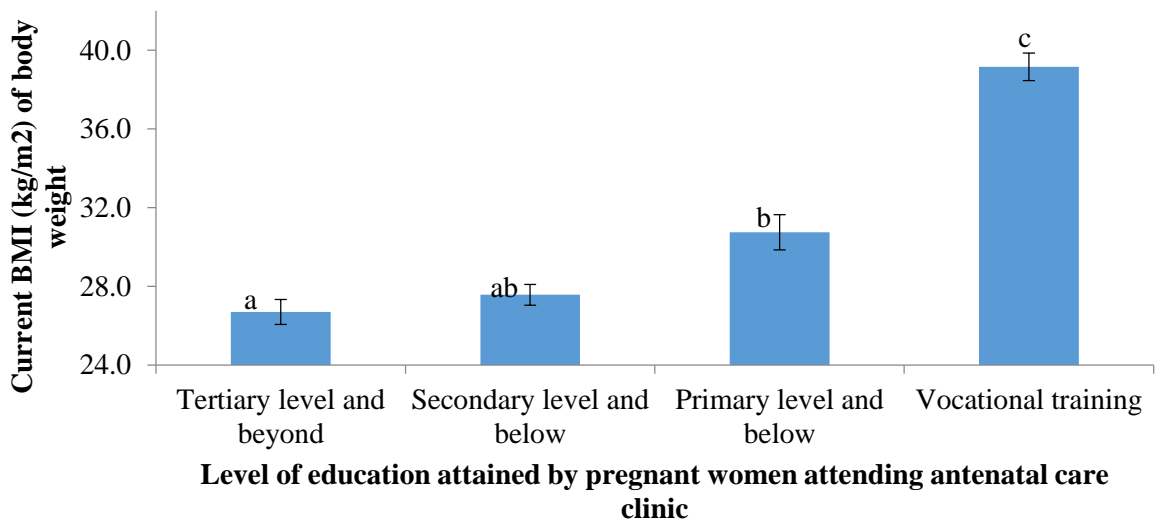
Figure 4.5: Mean of the current BMI based on different level of education attained.

The error bars indicate standard error of the mean. Bars with different letters at the top indicate statistical difference in the means at p<0.05.

4.9 Accessibility of antenatal services

ANC services at the Pumwani hospital are easily accessible to the women attending it there as over seven in every ten (72.9%) of these women spend less than an hour to make it there **(Table 4.20).** Most (88%) of the women rely on the public transport to access the facility. About eight in every ten (79.3%) take as little as under two hours waiting time before accessing the ANC services.

Table 4.20: Accessibility of Antenatal care services by pregnant women attending ANC at Pumwani maternity Hospital

Variable		Proportion (n=133, %)
Time taken to travel to Pumwani	Less than 30 mins	15.8
	30 mins - 1hr	57.1
	1hr- 1;30mins	26.3
	>2hrs	0.8
Mode of transport	Walking	12.0
	Public transport	88.0
Average waiting time	<30mins	14.3
	30min-1hr	22.6
	1hr-1:30mins	23.3
	1:30-2hrs	19.5
	>2hours	20.3

4.10 Utilization of antenatal care services for pregnant women at Pumwani Hospital

The women had average number of children of 1.01±1.00, range 0-11 children. The average number of pregnancies was 2.11±1.11. The women start the antenatal clinic visits at averagely 3.86±1.47 months (range 1-8 months). The age of the youngest children of the women was 4.13±3.67 years. The average waiting time before accessing the ANC services influenced the onset of ANC visits by the women (**Table 4.21**). Those who undergo shorter waiting time to access ANC services begin ANC visit at a very late gestational age compared to those who wait longer (**Figure 4.6**).

Table 4.21: Onset of Antenatal care visits by the pregnant women at Pumwani maternity hospital

Source	df	Mean of squares	P-value
Corrected model	8	4.036	0.053
Intercept	1	163.817	0.000
Time taken to travel to Pumwani	3	1.330	0.581
Mode of transport	1	5.213	0.111
Average waiting time	4	6.406	0.016
Residual	124	2.027	
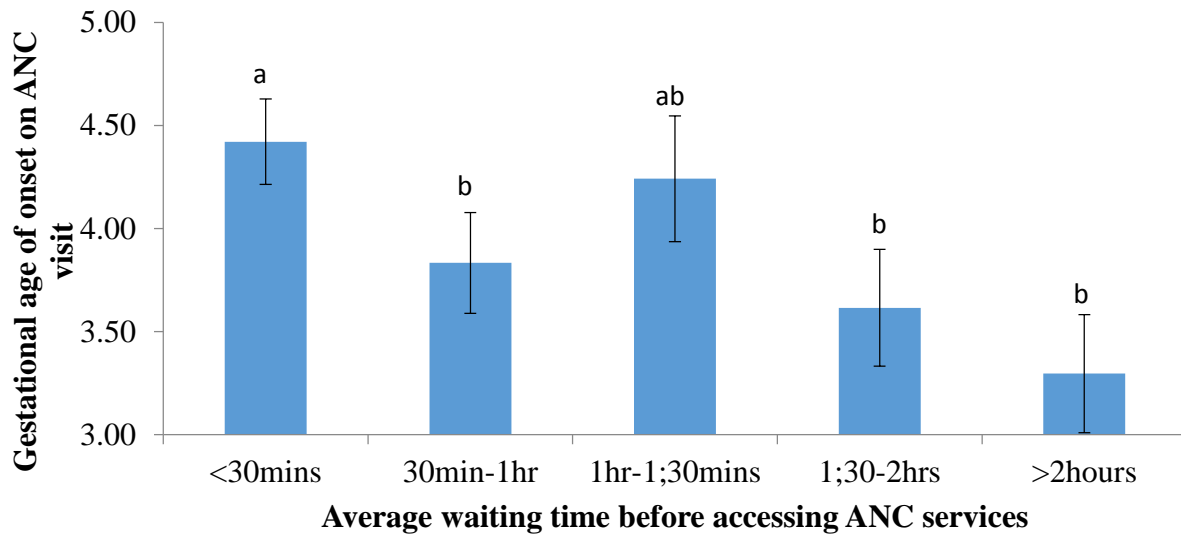
Figure 4.6: Average gestational age for Antenatal care visit based on waiting time encountered.

The error bars indicate standard error of the mean. Bars with different letters at the top indicate statistical difference in the means at $p < 0.05$.

Over two thirds (68.2%) of the women attending ANC at Pumwani hospital had delivered last child over two years ago. Eight in every ten (80.4%) of the women utilized ANC in their last pregnancy. Eight in every ten (81.2%) the women had preference for Pumwani hospital due to the quality of services offered at the facility. Slightly less than a quarter (24.1%) of the woman would attend ANC services at another facility. Over three quarters (78.8%) of the women were in good health at the time of the study. All (100%) the women were attended to by the midwives during their ANC visits (**Table 4.22**).

Table 4.22: Antenatal care practices among women attending Antenatal care at Pumwani Hospital

Antenatal service		Proportion (%, n=133)
Last birth before the current pregnancy	None	20.0
	1 year ago	10.0
	2 years ago	1.8
	Over 2 years ago	68.2
Used ANC services in the last pregnancy	None	18.7
	Yes	80.4
	No	0.9
Why prefer ANC at Pumwani Hospital	Close home	6.0
	Close to work	0.8
	Inexpensive	1.5
	Friendly staff	.8
	Convenient timing	6.8
	Quality services	81.2
	Recommended by a friend	3.0
Uses ANC services elsewhere	Yes	24.1
	No	75.9
Status of the health	Good health	78.8
	Recurring sickness	2.3
	Minor illness	15.9
	Seriously ill	3.0
Who examines you during ANC visit	Midwife	100.0

Only about one in every ten (11.3%) of the women had experienced pregnancy related complications during the gestation period. Referral of the cases with complications was not

common as over nine in every ten of the women (93.7%) with complications during pregnancy were not referred.

4.11 Medical and health service offered during ANC visits

The least administered medical regimen received by women attending ANC at Pumwani Hospital is gynaecological examination as less than one (8.3%) in every ten of the women get this service **(Table 4.23)**

Table 4.23: Proportion of women receiving medical regimen during Antenatal care visits

Medical service		Proportion of women (%, n=133)
Medical care in pregnancy	yes	33.3
	no	66.7
Physical examination	yes	99.2
	no	.8
Gynaecological examination	yes	8.3
	no	91.7
Ultrasound	yes	54.1
	no	45.9
HIV/STD test	yes	94.0
	no	6.0
Blood tests	yes	93.2
	no	6.8
Tetanus vaccine	yes	83.5
	no	16.5
Nutritional supplementation	yes	96.2
	no	3.8

A large proportion of the women had not been trained on various health and nutrition issues including nutrition in pregnancy (70.7%), pregnancy related complications (79.7%), labour and delivery (94.0%), breastfeeding (84.2%) and care of the new born (94.0%) as shown in (Table 4.24). Utilization of services offered at the ANC clinic by the mothers was not significantly correlated with their dietary diversity scores as shown in (Table 4). The anthropometric measures of the women was not influenced by the type of ANC services obtained as shown in **(Table 4.24).**

Table 4.24: Health and nutrition education given to mothers attending Antenatal care at Pumwani Hospital

Health and nutrition education given		Proportion of women (%, n=133)
Nutrition in pregnancy	yes	29.3
	no	70.7
Pregnancy related complications	yes	20.3
	no	79.7
Labour and delivery	yes	6.0
	no	94.0
Breastfeeding	yes	15.8
	no	84.2
Care of the new born	yes	6.0
	no	94.0

Table 4.25: Dietary diversity score and utilization of Antenatal care services

Health and nutrition education given		Dietary diversity score of women		P-value
		<5 food groups	>food groups	χ^2
Nutrition in pregnancy	yes	0.0	100.0	0.305
	no	4.3	95.7	0.105
Pregnancy related complications	yes	0.0	100.0	0.191
	no	0.0	0.0	0.71
Labour and delivery	yes	3.2	96.8	0.607
	no	0.0	100.0	0.264
Breastfeeding	yes	3.6	96.4	0.379
	no	0.0	100.0	0.773
Care of the new born	yes	3.2	96.8	0.607
	no	4.3	95.7	0.26

Table 4.26: The relationship of Antenatal care services and anthropometric measures of the women

Health and nutrition education given	Anthropometric measures (F-value)		
	MUAC	Initial BMI	Current BMI
Corrected model	1.0	1.2	1.6
Intercept	1083.5*	739.1*	777.7*
Nutrition in pregnancy	1.4	3.4	4.8
Pregnancy related complications	0.1	0.1	0.1
Labour and delivery	2.5	0.9	2.2
Breastfeeding	0.0	0.0	0.0
Care of the new born	0.4	0.5	0.0
Adjusted R^2	0.001	0.007	0.022

*Statistically significant at $p<0.05$

4.12 Nutritional supplementation during antenatal care

The nutrition practices of the pregnant women attending ANC in Pumwani hospital as shown in (**Table 4.27**). Majority (97%) of the women had access to IFAS, either they bought it or they were given. Up to a third (33.3%) of the women abandon IFAS within the first month of use. Slightly over half (52.4%) of the women that stopped use of IFAS cited their reaction to the drug as the reason for them abandoning the drug. Only five percent (5.3%) of the women were taking other nutritional supplements apart from IFAS.

Table 4.27: Nutrition supplementation in gestation

Nutritional practices		Proportion of women (%, n=133)
How did you obtain IFAS	Bought	48.5
	Given free	48.5
	Not given	3.0
Period of use of IFAS	Less than a month	33.3
	1-3 months	36.0
	More than 4 months	30.7
Reason for abandoning IFAS	Not given	23.8
	Ignored advise from health worker	4.8
	React to them	52.4
	First ANC appointment	19.0
Taking other supplements apart	Yes	5.3
from IFAS	No	94.7

4.13 Satisfaction with the services at ANC

More than eight in every ten (83.3%) of the women attending the antenatal clinic were satisfied with the services they received with 15.2% and 1.5% being partially satisfied or completely

dissatisfied with the services respectively. Results of the logit model analysis showed that the health and nutrition services offered at the clinic did not significantly ($p>0.05$, $R^2=0.32$) influence the satisfaction of the client.

Of those who were dissatisfied, the most frequently mentioned solutions were improving customer care services (33.3%), improve availability of gynaecologists (22.2%) and improved the handling of customers by attendants (33.3%).

CHAPTER FIVE: DISCUSSION

5.1 Socio-economic and demographic characteristics of women attending ANC at Pumwani hospital

The results showed that attendance of ANC at the Pumwani hospital was majorly by women of middle and low-income class and youthful age. The hospital is located in Nairobi County, the host to the Capital of Kenya thus serves the urban population majorly. The proof of stay in rented apartments with an average monthly payable rent of KES. 7506.01±6691.19 show that the women are of the middle and low-income segments of the population. The facility is the major maternity hospital in the county and serves the greatest population of the Kenyan capital (Opiyo et al. 2008). The fact that the women are largely from the middle and low-income class in Kenya makes the preference of this public health facility rather than the private ones.

The study area being the urban capital of Kenya, ownership of mobile phones, television and radio was highest of all the assets. House ownership among these women was very minimal for they largely lived in rented apartments. Majority of the city residents in sub-Saharan Africa rely on the rental houses for residents (UN-HABITAT 2011).

5.2 Factors influencing nutrition practices in pregnancy

Risky practices such as food avoidance especially protein-rich foods and consumption of soils was found to be a major practice among these women. Consumption of soil that was reported as 16.1% is lower than the values that were reported in another study by Ngozi (2008) where intake of soil among pregnant women was reported as 61.2%. Other studies done in South Africa by Macheka et al. (2016) and rural areas of Kenya by Kariuki et al. (2016) reported that intake of soil among pregnant women were 54.0% and 27.4% respectively. Pica including intake of soil has been

attributed to micronutrient deficiencies (Rono et al. 2019). Micronutrient supplementation has been reported to high among women attending ANC (Warvadekar et al. 2018). Rono et al. (2019) reported a negative correlation between intake of IFAS and the intake of soft stones and soil; this explains the lower figure reported among these women. Additionally, the intake of caffeine and tea was also showed to be a risky behaviour among these women. This too predisposes these women to micronutrient deficiencies (Obwocha et al. 2016). Avoidance of majorly protein-rich foods as reported in this study corroborates with the findings in a study Kariuki et al. (2016) who found that protein-rich foods like beef, fish, eggs and milk were the most avoided among pregnant women This was majorly for them to avoid nausea.

Besides the risky nutrition practices, positive practices such as consumption of citrus fruits and intake of iodized salt was also reported among these women. Recommendations of maternal nutrition recommend the intake of citrus fruits in pregnancy to improve the micronutrient status of these women and of the expected new born (Murphy et al. 2014; Starling et al. 2017).

5.3 Factors influencing perception of nutrition and health in pregnancy

The study found that the women perceive that they aren't at any major risk of suffering from vitamin A and iron deficiencies. The residential area and the age of the women greatly influenced this belief among women. It has already been established that the perception and belief either informed by cultural or religious beliefs determine the nutrition and dietary intake (Riang'a et al. 2017). The women who were below eighteen years perceived that they are not at a higher risk of suffering from vitamin A deficiency. Additionally, the women also perceived that the likelihood of giving birth to low birth weight babies were minimal. This was majorly informed their belief that they were on a healthy diet.

The occurrence of illness among the women differed with the area of residence. Vaginal infections, stomach aches and nausea were the leading ailments among the pregnant women. This is in contract to the prevalent diseases that were reported among pregnant women in Algeria included anaemia, hypertension, diabetes and inflammatory diseases (Taleb et al. 2011). The most preferred place for treatment was the hospital. Such a practices helps reduce maternal and child mortalities. The positive practice can possibly be explained by the enhanced maternal healthcare services that include free deliveries (Gitobu et al. 2018).

5.4 Water, hygiene and sanitation practices of pregnant mothers

The study reported greater accessibility to water and sanitation facilities among the pregnant women in the area. Facilities such as waste disposal places, toilets and clean water for use were accessible to the women. Good WASH practices manage the in-water and behaviour risk factors for contamination (Campbell et al. 2015).

The study also found that the women practiced hygiene such as handwashing a lot. However, risky behaviour such as improper waste disposal, lack of water treatment and poor handwashing techniques were reported. Handwashing among the pregnant women was found to be 28.8% which is higher than the household levels (15.1%) reported in Nairobi County by KNBS et al. (2014). Handwashing with soap has been shown to improve health and reduce diarrheal cases (Saba et al. 2017).

5.5 Nutrition knowledge among pregnant woman

The study also found that awareness on nutrition deficiency diseases such as vitamin A, iron and iodine was a bit low among these women. The belief was influenced by the fact that they have no records of these conditions. In as much as the women believe that they are less likely to suffer

from these nutritional deficiencies, a study by Othoo *et al.* (2019) reported that pregnant women were at a greater risk of iron and vitamin A deficiency with a proportion of 91.4% and 88.0% of pregnant women in Ndiwa Sub-County Hospital, Homabay County failing to meet the RDAs for iron and vitamin A respectively. National reports show that the prevalence of iron deficiency among pregnant women in Kenya stand at 42% (USAID 2014).

The knowledge among these women on nutrition was found to be just average. Perumal et al. (2013) in their study that included both women attending and not attending ANC clinic found that the women had average nutrition knowledge. However, it has also been established that the good nutritional knowledge do not necessarily translate into good nutrition practices (Ooreoluwa et al. 2018). The source of knowledge significantly associated with knowledge. The majority of these women largely relied on the information they had as the source of their nutrition knowledge. This calls for the strengthening of the nutrition education component in order to avert some of the micronutrient deficiencies these women are at a high risk of suffering from.

5.6 Determinants of dietary and food intake in pregnancy

Evaluation of dietary diversity of the women showed that they averagely took more than nine food groups. This score is above the set minimum of five food groups for women of reproductive age (FAO & FHI 360 2016). The value established in this study is higher than those established in others study in Laikipia (Kenya) and Oromia (Ethiopia) that gave DDS scores of 6.86±1.46 and 3.48 ± 2.46 respectively (Kiboi et al. 2017; Desta et al. 2019). Nutritional recommendations posit that in pregnancy women should eat diverse foods in order to meet their nutritional requirements (Marangoni et al. 2016). The occupation, perception on nutrition issues and nutrition knowledge of these women was a determinant of the dietary diversity among these women. In as much as, the salaried employees ate less diverse foods as compared to the casual labourers; both the two groups

ate a nutritionally acceptable diet of greater than five food groups. Other studies established additional factors such as occupation, age, household size, land ownership, household assets and monthly income as the socio-economic and demographic determinants of dietary diversity (Gitagia et al. 2019; Kiboi et al. 2017). The input of nutrition knowledge into improved dietary diversity has been shown by Yeneabat et al. (2019) who pointed out that improved nutrition awareness through nutrition education improved the dietary diversity among pregnant three folds.

Starches and fruits were the two most frequently consumed food groups among these women. The study also found that foods of animal origin such meat, eggs and milk had the frequency of consumption among these women. This is as a result of food aversion where the protein-rich foods of animal origin were greatly avoided. Riang'a et al. (2017) reported restriction of animal source protein foods to the tune of 60% in his study among the Kalenjin community. This was largely related to food taboos. Additionally, the low frequency of intake of animal source proteins among these women can be as a result of the high cost of these products in the market (Mala et al. 2012). They also reported widespread consumption of starches, vegetables and fruits. Belief and perception on nutritional deficiencies influenced the frequency of intake among the pregnant women. The beliefs of the pregnant women have been shown to have a great influence in the foods they eat (Kavle & Landry 2018; Riang'a et al. 2017).

5.7 Determinants of nutrition status of pregnant of women

Cases of underweight and malnutrition were found to be minimal among these women. The indicators of nutritional status among pregnant women include the weight gain, initial BMI and MUAC (Paula et al. 2012; Kemunto 2013; Joshi et al. 2017). Malnutrition levels reported in this study was 3.8% which is way lower than the values that were reported in West Pokot County (31.7%) in another study (Kemunto 2013). The level of education of the women was a determinant

of their current and initial BMI. A similar study in Bangladesh established that for pregnant women both in rural and urban areas, education level is a determinant of their nutritional status (Hossain et al. 2013).

5.8 Utilization and satisfaction with health and medical services among pregnant women

The women averagely began their ANC services in the second trimester of their pregnancy. The implication of this based on the findings by Verney et al. (2018) is that the ANC visits among the women would be limited to less than 4. The waiting time at the facility influenced the initiation of ANC visits among these women. These findings are consistent with those of Fotso *et al.* (2008) who reported that the late initiation of ANC visits among pregnant women in Kenya occasions limited visits to the facility. The challenge of late initiation of ANC visits cuts across the whole sub-Saharan African countries where the initiation of ANC visits in the first trimester stands at a mere 19.1% of the pregnant women (Emelumadu et al. 2014). Another study by Ochako et al. (2011) established other factors such as parity, age, residence, wealth, ethnicity and marital status were determinants of the onset gestational age of ANC visits, however the experience in the former pregnancy was not tested. Additionally, the study reported that women who initiate late visits at the ANC are at a disadvantage than those who initiate early in terms of access to professional services during delivery. This has been shown to expose the women to pregnancy related complications that can increase maternal and child morbidity and mortality (Riang'a et al. 2018).

Medical care in pregnancy and health and nutrition education in pregnancy were the least accessed services by the clients. This points to a worrying trend as medical care and nutrition in pregnancy are known to. Additionally, the result of this is reflected in the less utilization of nutritional supplements such as IFAS which are major determinants of the growth and health of child (Gernand et al. 2016). That notwithstanding, the level of client satisfaction with the services

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offered at the facility was very high. These findings agreed with the findings by Nyongesa *et al.* (2014) in a study that focused on the same facility. The satisfaction among the customers was found to be influenced by the shorter waiting time, staffing, attitude of the care givers and availability of drugs and other medical services. Staff conduct, physical facilities, resources, quick services, clean hospital and good handling of complications was reported determinants of satisfaction with health services in a hospital among Kenyans (Ogola-Munene et al. 2018). The low utilization of nutrition education component explains the facts established by Perumal et al. (2013) in a study done in Western Kenya where there was no difference in the nutrition knowledge and practices among women attending and those not attending ANC clinics.

5.9 Dietary diversity and utilization of antenatal care services

Utilization of antenatal care services offered at the clinic was not significantly correlated with the pregnant women's dietary diversity, as only 29.3% of these women had received health and nutrition education services in the course of attendance. A proportion of 70.7% of women attending the clinic had not received health and nutrition education. This finding is made more obvious by the source of nutrition knowledge among pregnant women attending the antenatal care clinic at Pumwani maternity hospital which affirms that majority of this women relied on self-sourced information on dietary practices and attitudes. Opportunities to improve maternal nutrition knowledge, attitudes and practices exist some of which could be improved through health and nutrition education promotion at the antenatal care clinics ((H Birungi, 2006). The lack of policy direction may be an indication of the gap in service provision at the ANC particularly in educational component ((H Birungi, 2006). As Nikiema et al. showed in a cross-country analysis of Demographic Health Survey data from 19 sub-Saharan countries, healthcare providers do not routinely provide women with information as part of ANC or fail to provide information in a way

that is remembered by women ((Nakiema B, 2009) , which further impedes the efforts to improve health and nutrition knowledge, among women. Van Eijk et al. found that 11% of the women, who attended ANC clinics prior to delivery, were receptive to the health information provided during their visits (Van Eijk AM, Reprod Heal. 2006, 3 (2):). In rural Nigeria, women identified midwives and nurses as the major source of health information on maternal and child health during focus group discussions (Akin-Otiko BO, 2012, 28 (6)). Recognizing the disparities in dietary diversity of pregnant women who attend ANC clinics has important implications for assessing the impact of education interventions provided through ANC services.

5.10 Utilization of antenatal care services and the nutrition status of pregnant women

The study findings indicate that only 3.8% of the women attending antenatal care clinic, at Pumwani maternity hospital were malnourished, based on a MUAC cut off of 210mm. The possible explanation of this findings is hinged on the notable high score in dietary diversity with a 97% of the women consuming a minimum of five food groups. Dietary diversity is a proxy indicator of dietary adequacy attributing to an overall good nutrition status and cushioning micronutrient deficiencies, this findings are in tandem with a nutrition survey conducted in the slums of Nairobi County which found minimum women dietary diversity score as 68.6% of the women surveyed having consumed 5 or more food groups. ((CWW), 2017). The women also had an average daily mean meal frequency of 4-6, a proxy indicator of daily calorie intake. This too was confirmed from a study in Nairobi whose result indicated that a majority of households in Nairobi had a good food consumption score ((CWW), 2017). The study is conclusive that the utilization of ANC services had no association with the good nutrition status outcome among pregnant women. However, there is need for more research with other prerequisite conditions affective of the good nutrition status among pregnant women in Nairobi city.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study's sociodemographic features of the women attending ANC at Pumwani maternity hospital are characterised by women of middle and low-income class and a number of pregnant teenagers. The proof of stay is rented apartments. The respondents have largely achieved secondary education and are engaged in small scale self-employment as a means of their livelihood. The ownership of common house hold assets such as furniture, mobile phones and electrical indicates a middle class population.

The most utilized services in the antenatal care package offered at Pumwani maternity hospital were physical examinations, HIVSTD testing, blood tests for anaemia and other infections, tetanus vaccination and nutritional supplementation of iron folic acid supplements (IFAS). However, the health and nutrition promotion services such as nutrition in pregnancy, pregnancy related complications, labour and delivery, breastfeeding and care of the new born were the least offered and utilized. Other services that were least utilized also included, gynaecological examination, and ultrasound. There was a clear gap in the service provision at the ANC particularly in the educational components. All the women had an access to safe drinking water and sanitation facilities. Many also acknowledged that within their residential setting, there was an organized waste management system by the Nairobi city water and sewerage company. There was a high awareness of hand washing hygiene among the women.

It was also clear that the women attending the ANC clinic at Pumwani maternity hospital had low to medium levels of nutrition knowledge, with a majority scoring higher on macronutrients, but low on micronutrients and nutritional deficiencies. A noteworthy number of this women were ignorant on antagonistic nutritional practices that are detrimental to the absorption and utilization

of micronutrients. Some of this practices include consumption of tea/coffee, which negatively interacts with iron absorption and utilizations, food aversions that are attitude based and Pica, which is consumption of non-food substances such as stones.

Women attending ANC clinic at Pumwani maternity hospital had an average mean meal frequency of five meals per day. They also had an average dietary diversity score of nine food groups this attributed to their general good nutritional status with very few cases of malnourished women in the study This study also concluded that the incidences of malnutrition among expectant women in the county are lower with proper nutrition, incidences of malnutrition are usually minimal.

The study also concluded that the utilization and optimal use of WASH practices of these expectant women promote their health. Adequate knowledge on nutrition and health in pregnancy among these women was not really translated into good nutrition and health practices. The delink calls for strengthening of the nutrition education and awareness component offered at the ANC.

The fact that the waiting time the women take in the ANC was found to be of influence in the frequency of attendance of the clinic proves that the quality of service can be used to promote ANC attendance. Lower frequency of attendance of ANC would work against the global and national goals of lowering maternal mortality. This is despite the fact that a higher satisfaction was registered among the women on the health and medical services they were offered at the facility.

6.2 Recommendation

Further in-depth research both quantitative and qualitative, that address the demographic, social and economic characteristics and diversity of pregnant women, is recommended to help in understanding people's knowledge, attitudes and practices on ANC care. These research will help in closing up the large variations, gaps and barriers existing in safe motherhood service utilization in Kenya, especially among women who are disadvantaged and marginalized.

Reducing maternal mortality requires much better access to emergency obstetric care services, but the quality and availability of care varies considerably from one health facility to another. There is a need to develop a national tool that can be cascaded down to health facilities in monitoring and evaluation of maternal and new born health. This tool will be essential in monitoring ANC indicators of services received by the pregnant mothers attending clinic. Indicator on number of visits, health and nutrition education, can be to assess performance of this programmes. This will promote the health and well-being of mother and child as it improves services provided at health facilities.

Developing appropriately packaged nutrition information that can be easily disseminated to women attending ANC and having nutrition related activities as part of the care package is recommended within the health facility setting. There is need for health care workers to promote preventive nutrition activities at the community level, such as community based food preparation activities including improved nutritional practices to promote maternal nutrition. The study also recommends an evaluation of this intervention's outcomes by assessing changes in knowledge, attitudes and practices related to maternal nutrition among women participating in the intervention.

Health promotion activities need to take on a very proactive role, the study recommends an input of water sanitation and hygiene activities within the ANC care package, these activities can be

done practically to promote hygiene science aspects such as hand, bath, domestic, oral, food, laundry, and waste disposal practices, which promote health and prevent disease.

The study recommends that nutritional awareness and education of the women on positive nutrition practices that promote their health and that of the baby be significant. Current efforts being outlined by organizations by increasing the maternity leave will go a long way in addressing the gap identified in this study as women of who are employed had lower diversity scores.

The nutrition education component of the ANC clinics in the public hospital must be promoted to improve the awareness on nutrition, micronutrient deficiencies and health related matters among the women. This however, would still be reliant on the success of improving the frequency of attendance.

Implementing behavioural change and communication (BCC) strategies to promote healthy practices and mitigate risk factors, particularly among target populations will bridge this gap. This can have done by instituting population-based, multi-sectoral, multidisciplinary, and culturally relevant approaches to promoting health, diet and physical activity.

Develop a monitoring and evaluation system with feedback mechanisms between the hospital management, health staff and customers.

Finally, adopting the Universal health coverage means much more than health care. It means ensuring that all Kenyans can get quality health services, where and when they need them, without suffering financial hardship, hence reducing out of pocket health expenditures. This can be achieved through strategic partnerships that focus on reproductive, maternal, neonatal, child and adolescent health, through preventive and primary health products

REFERENCES

Abu-Saad, K., Fraser, D., 2010. Maternal Nutrition and Birth Outcomes 32. https://doi.org/10.1093/epirev/mxq001

Ahmed, S., 2015. Socio-economic Factors Affecting Maternal Health and Nutrition in Developing Countries: Special Focus on Bangladesh.

Black, R.E., Alderman, H., Bhutta, Z.A., Gillespie, S., Haddad, L., Horton, S., Lartey, A., Mannar, V., Ruel, M., Victora, C.G., Walker, S.P., Webb, P., 2013. Maternal and child nutrition: building momentum for impact. Lancet 382, 372–375. https://doi.org/10.1016/S0140-6736(13)60988-5

Campbell, O.M.R., Benova, L., Gon, G., Afsana, K., Cumming, O., 2015. Getting the basic rights - the role of water, sanitation and hygiene in maternal and reproductive health: A conceptual framework. Trop. Med. Int. Heal. 20, 252–267. https://doi.org/10.1111/tmi.12439

Desta, M., Akibu, M., Tadese, M., Tesfaye, M., 2019. Dietary diversity and associated factors among pregnant women attending antenatal clinic in Shashemane, Oromia, Central Ethiopia: A cross-sectional Study. J. Nutr. Metab. 2019, 1–7. https://doi.org/10.1155/2019/3916864

Emelumadu, O., Ukegbu, A., Ezeama, N., Kanu, O., Ifeadike, C., Onyeonoro, U., 2014. Socio-demographic determinants of maternal health-care service utilization among rural women in anambra state, South East Nigeria. Ann. Med. Health Sci. Res. 4, 374–82. https://doi.org/10.4103/2141-9248.133463

FAO, FHI 360, 2016. Minimum dietary diversity for Women: A guide for measurement. FAO and FANTA, Rome, Italy.

Fotso, J.C., Ezeh, A., Oronje, R., 2008. Provision and use of maternal health services among urban poor women in Kenya: What do we know and what can we do? J. Urban Heal. 85, 428–442. https://doi.org/10.1007/s11524-008-9263-1

Gernand, A.D., Schulze, K.J., Stewart, C.P., West, K.P., Christian, P., 2016. Effects and Prevention in pregnancy worldwide: health effects and prevention. Nat Rev Endocrinol. 12, 274–289. https://doi.org/10.1038/nrendo.2016.37.Micronutrient

Gitagia, M.W., Ramkat, R.C., Mituki, D.M., Termote, C., Covic, N., Cheserek, M.J., 2019. Determinants of dietary diversity among women of reproductive age in two different agro-ecological zones of Rongai Sub-County, Nakuru, Kenya. Food Nutr. Res. 1, 1–12.

Gitobu, C.M., Gichangi, P.B., Mwanda, W.O., 2018. The effect of Kenya's free maternal health care policy on the utilization of health facility delivery services and maternal and neonatal mortality in public health facilities. BMC Pregnancy Childbirth 18, 1–11. https://doi.org/10.1186/s12884-018-1708-2

Hossain, B., Sarwar, T., Reja, S., Akter2, M.N., 2013. Nutritional status of pregnant women in selected rural and urban area of Bangladesh. J. Nutr. Food Sci. 03, 3–5. https://doi.org/10.4172/2155-9600.1000219

Joshi, P.G., Joshi, G.A., Jain, S., Dubey, V., 2017. Nutritional status of pregnant women reporting at Rural Health Training Centre. Int. J. Reprod. Contraception, Obstet. Gynecol. 6, 3846. https://doi.org/10.18203/2320-1770.ijrcog20173684

Kader, M., Perera, N.K.P.P., 2014. Socio-economic and nutritional determinants of low birth weight in India. N. Am. J. Med. Sci. 6, 302–8. https://doi.org/10.4103/1947-2714.136902

Kamanzi, O.U., Keisling, K., Lewis, E., Mwizero, C., n.d. Dietary Diversity and Determinants Survey Guide and User's Manual.

Kariuki, L., Lambert, C., Purwestri, R., Biesalski, H.K., 2016. Trends and consequences of consumption of food and non-food items (pica) by pregnant women in Western Kenya. NFS J. 5, 1–4. https://doi.org/10.1016/j.nfs.2016.09.001

Kavle, J.A., Landry, M., 2018. Addressing barriers to maternal nutrition in low- and middle-income countries: A review of the evidence and programme implications. Matern. Child Nutr. 14, 1–13. https://doi.org/10.1111/mcn.12508

Kemunto, M.L., 2013. Dietary diversity and nutritional status of pregnant women aged 15-49 years attending Kapenguria district hospital West Pokot County, Kenya. Kenyatta University.

KENYA 2011 NATIONAL FOOD AND NUTRITION SECURITYPOLICY, n.d.

Kiboi, W., Kimiywe, J., Chege, P., 2017. Determinants of dietary diversity among pregnant women in Laikipia County, Kenya: a cross-sectional study. BMC Nutr. 3, 1–8. https://doi.org/10.1186/s40795-017-0126-6

KNBS, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development, The DHS Program, I.I., KDHS, 2014. Kenya Demographic and Health Survey 2014, Central Bureau of Statistics (CBS) [Kenya] Kenya Demographic and Health Survey. https://doi.org/10.3109/03014460.2013.775344

Lwanga S.K and Lemeshow s, 1991. SAMPLE SIZE DETERMINATION IN HEALTH STUDIES. World Heal. Organ.

Macheka, L.R., Olowoyo, J.O., Matsela, L., Khine, A.A., 2016. Prevalence of geophagia and its contributing factors among pregnant women at Dr. George Mukhari academic hospital, Pretoria. Afr. Health Sci. 16, 972–978. https://doi.org/10.4314/ahs.v16i4.13

Mala, J., Tuitoek, P.J., Odhiambo, R.A., 2012. Effect of dietary intakes on pregnancy outcomes: A comparative study among hiv-infected and uninfected women at Nyanza Provincial General Hospital, Kenya. AJFAND 12, 6776–6793.

Marangoni, F., Cetin, I., Verduci, E., Canzone, G., Giovannini, M., Scollo, P., Corsello, G., Poli, A., 2016. Maternal diet and nutrient requirements in pregnancy and breastfeeding. An Italian consensus document. Nutrients 8, 1–17. https://doi.org/10.3390/nu8100629

Maternal and Child Nutrition Study Group, S., Cheung, Y., Cueto, S., al., et, Nisbett, N., Group, the M. and C.N.S., Lartey, A., Mannar, V., Ruel, M., Victora, C.G., Walker, S.P., Webb, P., 2013. Maternal and child nutrition: building momentum for impact. Lancet (London, England) 382, 372–5. https://doi.org/10.1016/S0140-6736(13)60988-5

Ministry of Public Health and Sanitation, Ministry of Medical Services, 2012. National Guidelines for Quality Obstetrics and Perinatal Care.

Murphy, M.M., Stettler, N., Smith, K.M., Reiss, R., 2014. Associations of consumption of fruits and vegetables during pregnancy with infant birth weight or small for gestational age births: A systematic review of the literature. Int. J. Womens. Health 6, 899–912. https://doi.org/10.2147/IJWH.S67130

Ngala, S.., 2015. Evaluation of dietary diversity scores to assess nutrient adequacy among rural Kenyan women S.A. Ngala. https://doi.org/ISBN 978-94-6257-423-6

Ngala, S.A., n.d. Evaluation of dietary diversity scores to assess nutrient adequacy among rural Kenyan women.

Ngozi, P.O., 2008. Pica practices of pregnant women in Nairobi, Kenya. East Afr. Med. J. 85, 72–79. https://doi.org/10.4314/eamj.v85i2.9609

Nutrition Matters, Your Right, Your Role, Act Now, 2012.

Nyongesa, M.W., Onyango, R., Kakai, R., 2014. Determinants of clients' satisfaction with healthcare services at Pumwani Maternity Hospital in Nairobi - Kenya. Int. J. Soc. Behav. Sci. 2, 11–17.

Obwocha, A.., Mbagaya, G.., Were, G.., 2016. Dietary Intake-Among Pregnant Women Attending Ante-Natal Clinic AtKisiiLevel 5 Hospital , Kenya. IOSR J. Environ. Sci. Toxicol. Food Technol. 10, 77–82. https://doi.org/10.9790/2402-1004017782

Ochako, R., Fotso, J.C., Ikamari, L., Khasakhala, A., 2011. Utilization of maternal health services among young women in Kenya: Insights from the Kenya Demographic and Health Survey, 2003. BMC Pregnancy Childbirth 11, 1–9.

Ogola-Munene, S., Thiani, S., Kalsi, S., Okumu, C., Baltazar, B., Gikonyo, S., Korir, J., Kaboro, S.M., Kioko, U., Oyugi, B., Ranji, M., 2018. A facility-based study of women' satisfaction and perceived quality of reproductive and maternal health services in the Kenya output-based approach voucher program. BMC Pregnancy Childbirth 1–10. https://doi.org/10.1186/s12884-018-1940-9

Ooreoluwa, F., Abosede, O., Fasola, F.A., 2018. Knowledge, attitude and practice of good nutrition among women of childbearing age in Somolu Local Government, Lagos State. J. Public Health Africa 9, 1–4. https://doi.org/10.4081/jphia.2018

Opiyo, N., Were, F., Govedi, F., Fegan, G., Wasunna, A., English, M., 2008. Effect of newborn resuscitation training on health worker practices in Pumwani Hospital, Kenya. PLoS One 3. https://doi.org/10.1371/journal.pone.0001599

Othoo, D., Waudo, J., Kuria, E., 2019. Dietary assessment of vitamin a and iron among pregnant women at Ndhiwa Sub-District Hospital – Kenya. AJFAND 36, 1–5. https://doi.org/10.1088/0256-307X/36/3/030302

Paula, A., Sato, S., Fujimori, E., 2012. Nutritional status and weight gain in pregnant women. Rev. Latino-Am. Enferm. 20, 462–468.

Perumal, N., Cole, D.C., Ouédraogo, H.Z., Sindi, K., Loechl, C., Low, J., Levin, C., Kiria, C., Kurji, 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 Childbirth 13, 1–12.

Riang'a, R.M., Broerse, J., Nangulu, A.K., 2017. Food beliefs and practices among the Kalenjin pregnant women in rural Uasin Gishu County, Kenya. J. Ethnobiol. Ethnomed. 13, 1–16. https://doi.org/10.1186/s13002-017-0157-8

Riang'a, R.M., Nangulu, A.K., Broerse, J.E.W., 2018. Perceived causes of adverse pregnancy outcomes and remedies adopted by Kalenjin women in rural Kenya. BMC Pregnancy Childbirth 18, 1–16. https://doi.org/10.1186/s12884-018-2041-5

Rono, B.C., Kombe, Y., Makokha, A., 2019. Multiple Micronutrients Versus Iron Folic Acid on Pica and Hemoglobin Levels Among Pregnant Women in Kenya. Cent. African J. Public Heal. 4, 95. https://doi.org/10.11648/j.cajph.20180404.11

Ruel, M.T., n.d. IS DIETARY DIVERSITY AN INDICATOR OF FOOD SECURITY OR DIETARY QUALITY? A REVIEW OF MEASUREMENT ISSUES AND RESEARCH NEEDS.

Saba, D., Ercan, A., Senkaya, I., Gebitekin, C., Ozkan, H., 2017. The impact of water, sanitation and hygiene on key health and social outcomes: Review of evidence, Turkish journal of trauma & emergency surgery : TJTES.

Starling, A.P., Sauder, K.A., Kaar, J.L., Shapiro, A.L., Siega-Riz, A.M., Dabelea, D., 2017. Maternal Dietary Patterns during Pregnancy Are Associated with Newborn Body

Composition. J. Nutr. 147, 1334–1339. https://doi.org/10.3945/jn.117.248948

Taleb, S., Kaibi, M., Deghboudj, N., 2011. Assessment of nutritional status of pregnant women attending the city Tebessa PMI (Algeria). Natl. J. Physiol. Pharm. Pharmacol. 1, 97–105.

UN-HABITAT, 2011. A policy guide to rental housing in developing countries: Quick Policy Guide Series - Volume 1.

USAID, 2018. Kenya: Nutrition Profile. United States Agency Int. Dev. 1–5.

Verney, A., Reed, B.A., Lumumba, J.B., Kung'u, J.K., 2018. Factors associated with socio-demographic characteristics and antenatal care and iron supplement use in Ethiopia, Kenya, and Senegal. Matern. Child Nutr. 14, 1–10. https://doi.org/10.1111/mcn.12565

Ververs, M.-T., Antierens, A., Sackl, A., Staderini, N., Captier, V., 2013. Which anthropometric indicators identify a pregnant woman as acutely malnourished and predict adverse birth outcomes in the humanitarian context? PLoS Curr. 5. https://doi.org/10.1371/currents.dis.54a8b618c1bc031ea140e3f2934599c8

Warvadekar, K., Reddy, J.C., Sharma, S., Dearden, K.A., Raut, M.K., 2018. Socio-demographic and economic determinants of adherence to iron intake among pregnant women in selected low and lower middle income countries in Asia: insights from a cross-country analyses of global demographic and health surveys. Int. J. Community Med. Public Heal. 5, 1552. https://doi.org/10.18203/2394-6040.ijcmph20181234

Wheeler, B.J., Taylor, B.J., Herbison, P., Haszard, J.J., Mikhail, A., Jones, S., Harper, M.J., Houghton, L.A., 2016. High-Dose Monthly Maternal Cholecalciferol Supplementation during Breastfeeding Affects Maternal and Infant Vitamin D Status at 5 Months Postpartum: A Randomized Controlled Trial. J. Nutr. 146, 1999–2006. https://doi.org/10.3945/jn.116.236679

WHO recommendations on antenatal care for a positive pregnancy experience WHO Library Cataloguing-in-Publication Data WHO recommendations on antenatal care for a positive pregnancy experience, n.d. . I.World Heal. Organ. from World Heal. Organ.

Wu, G., Bazer, F.W., Cudd, T.A., Meininger, C.J., Spencer, T.E., 2004. Maternal nutrition and fetal development. J. Nutr. 134, 2169–72.

Yeneabat, T., Adugna, H., Asmamaw, T., Wubetu, M., Admas, M., Hailu, G., Bedaso, A., Amare, T., 2019. Maternal dietary diversity and micronutrient adequacy during pregnancy and related factors in East Gojjam Zone, Northwest Ethiopia, 2016. BMC Pregnancy Childbirth 19, 173. https://doi.org/10.1186/s12884-019-2299-2

APPENDIXES

Appendix 1: Consent Form

Hello, my name is Sarah, the principle investigator in this research, and a Master's of science in applied human nutrition student, at the University of Nairobi. You have been chosen at random to be in a study that is seeking to establish the relationship between dietary diversity, among pregnant women attending antenatal care. In this study your height, weight, and mid-upper-arm circumference will also be measured to rapidly assess your nutrition status. There will be questions related to your food intake and choices, to give us a general overview of the adequacy of your nutrient and energy intake during this pregnancy. The results of this study will be used to improve health and nutrition education primarily in this clinic and other antenatal care clinics across the country. This will take about twenty minutes of your time. If you choose to be in the study, I will begin by taking your body weight, height and mid-upper-arm circumference. I will then proceed to ask you some relevant questions to the study of which you will be expected to answer to the best of your ability.

There are no foreseeable risks or benefits to you for participating in this study. There is no cost or payment to you. If you have questions while taking part, please stop me and ask. We will do our best to keep your information anonymous or confidential but we cannot guarantee absolute anonymity or confidentiality. We will link your answers to you initially by your name but this link will be removed later in order to protect you.

If you have questions about this research study you may contact the principle investigator Sarah at 0710628132, in the event of a research related injury. If you feel as if you were not treated well during this study, or have questions concerning your rights as a research participant call The Secretary/Chairperson KNH-UoN ERC on Tel. No. 2726300 Ext 44102.

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop. May I continue?

I certify that I have consented the participant (code no.) _____

Researcher's name: _____

Signature: _____

Date: _____

Appendix 2: Study Questionnaire

UTILIZATION OF ANTENATAL CARE SERVICES, NUTRITION STATUS AND

DIETARY DIVERSITY IN PREGNANCY: A CASE STUDY OF PUMWANI

MATERNITY HOSPITAL

A) SOCIAL-DEMOGRAPHIC CHARACTERISTICS

IDENTIFICATION

Name of interviewer _____   Date of interview_____

Respondent's name _____   Gender_____

Constituency _____   Estate_____

Respondent's mobile number_____ (Optional)

S/No	Name	Occupation	Age Year	Marital status codes	Education codes	Religion code

Marital status	Education	Source of income	Religion
1= Married	1= University/College	1= Full time employment	1= Christian
2= Separated	2= Completed secondary		2= Muslim
3= Widowed	3= Completed primary	2= Part time employment	3= Hinduism
4= Single	4= Polytechnic		4=Traditional

5= Divorced	5= Dropped from primary	3= Self	5=Atheist
6= Others	6= In primary	employment	6=Others
	7= In secondary	4= Not in paid	
	8= Adult education	employment	
	9= Illiterate	5=	
		Retiree/pension	
		6= Others	

SOCIO-ECONOMIC STATUS

1] What is your source of income?

1) Animal/animal product ( )

2) Crop sale (   )

3) Monthly salary/wages (   )

4) Casual labour (   )

5) Trader (   )

6) Others

B] Where do you reside?

1) Own house   2) Rented   3) others

C] How much do you pay for the rented house per month?

D] How many rooms is the house you are residing made of?

E] What is the roof of the house you are residing made of?

1) Iron sheet   2) Grass thatched   3) Tiles   4) Others

F] What is the wall of the house you are living in made of?

1) Mud and wooden poles   2) Cement and stone blocks   3) Burnt bricks

4) Blocks   5) Iron sheets   6) Un-burnt bricks and mud   7) others

G) What is the floor of the house made of?

1) Cement   2) Mud   3) Mud and cow dung   4) Wood   5) others

H) What source of fuel do you use when cooking?

1) Gas   2) Kerosene   3) Charcoal   4) Electricity   5) Saw-dust   6) Others

I) what do you use as source of lighting in your house?

1) Electricity   2) Solar   3) kerosene   4) Candles   5) Torch   6) Others

J) Do you own the following assets?

Assets	YES = 1 NO = 0	Assets	YES = 1 NO = 0
Bicycle		Mobile phone	
Motorcycle		Bed	
Radio		Land	
Television		Iron-box	
Car/Truck		Chairs/Sofas	
Fridge		Gas cylinder/cooker	
Microwave		Toaster	
Dining table		Coffee table	

K) Do you own any livestock?

YES = 1   NO = 0

SECTION C

DIETARY DIVERSITY 24 HOUR RECALL AND INDIVIDUAL DIETARY DIVERSITY SCORE

Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside home. Start with first food or drink of the morning

24 HOUR RECALL

Breakfast	Snack	Lunch	Snack	Dinner	Snack

INDIVIDUAL DIETARY DIVERSITY SCORE

Question number	Food group	Examples	YES = 1	NO = 0
1	CEREALS	Bread, noodles, biscuits, cookies or any other food made from millet, sorghum, maize, maize flour, dry white maize grains, white rice, nzenga, wheat flour e.g. ugali, nshima, porridge, (flour), chapati, mandazi, pancakes or pastes or other locally available grains		
2	VITAMIN A RICH VEGATABLES AND TUBERS	Pumpkin (leaves), carrots, squash, or yellow or orange fleshed sweet potatoes & other locally available vitamin A rich vegetables		
3	WHITE TUBERS AND ROOTS	White potatoes, white yams, cassava, or foods made from roots, arrow root, sweet potatoes		
4	DARK GREEN LEAFY VEGETABLES	Dark green/leafy vegetables, including wild ones & locally available vitamin-A, rich leaves such as cassava leaves, pumpkin leaves, sukuma wiki leaves, amaranth leaves, arrow root leaves, dhania		
5	OTHER VEGETABLES	Other vegetables, including wild vegetables like cucumber, green (French) beans, sweet pepper (pilipili hoho), eggplant, (red) onion, onion leaves, onion stem, tomato sauce, cabbage, spinach		
6	VITAMIN A RICH FRUITS	Ripe mangoes, &other locally available vitamin A rich fruits		
7	OTHER FRUITS	Other fruits including wild fruits, orange, guava, sweet fruit, avocado, passion fruit, banana-raw, banana-ripe, pineapple, pawpaw,		

		melon, apples, grapes, strawberries, kiwi fruit,
8	ORGANIC MEAT (IRON-RICH)	Liver, kidney, heart or other organ meats or blood-based foods e.g. mutura
9	FLESH MEATS	Beef, pork lamb, goat, rabbit, wild game, chicken, duck, or other birds
10	EGGS	Egg
11	FISH	Fresh or dried fish or shellfish
12	LEGUMES, NUTS, AND SEEDS	White bean, red bean, beans, cowpeas, peas, pigeon peas, white peas, lentils (dry), nuts, seeds or foods made from these
13	MILK AND MILK PRODUCTS	Cow milk, cheese, yoghurt, fermented milk(traditional) or other milk products
14	OILS AND FATS	Oil, fat or butter added to food or used for cooking
15	SWEETS	Sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies
16	COFFEE/TEA	Tea(black, green, herbal) or coffee, soya(powder)

List all foods that are not yet listed in the dietary diversity questionnaire but that are mentioned by the respondent

MORBIDITY

1) Any sickness for the past one month?

1) Yes   2) No

2) If yes which disease(s) is it?

………………………………………………………………………………

3) Were you given medical attention?

1) Yes   2) No

4) If yes, where did you seek the medical attention?

………………………… 1) Government hospital/ Dispensary (2) Private hospital/Clinic (3) Private

Doctor (4) Others

ANTHROPOMETRY

NO	MOTHERS NAME	PREV WT	CUR WT	WT GAIN	HT 1	HT 2	AV	MU 1	MU 2	AV

SOURCE OF NUTRITION INFORMATION

What is your source of knowledge and information in regards to nutrition and dietary

requirements in pregnancy?

1) Hospital nurses in the antenatal clinic

2) Qualified hospital nutritionist

3) Peers

4) Relatives e.g. mother, aunty, grandmother

5) Traditional midwife's/birth attendants

6) Internet/social media

7) Self

NUTRITION KNOWLEDGE ASSESSMENT

(1) How many food groups do you know of? 1. One   2. Two   3. Three   4. Four   5. Five   6.

Six   7. Seven   8. Eight

(2) What are the sources of carbohydrates? 1. Ugali   2. Chapati   3. Rice 4. Spaghetti 5.

Matoke   6. Yam   7. Arrowroot   8. Sweet potato   9. Others

(3) What are the sources of protein?   1. Eggs   2. Meat   3. Legumes   4. Milk   5. Others

(4) How should a pregnant woman eat in comparison with a non-pregnant woman to provide good nutrition to her baby and help him grow? Please tick four practices she should do.

 1. Eat more food (more energy)

 Eat more at each meal (eat more food each day)

 Or ¨ Eat more frequently (eat more times each day)

 2. Eat more protein-rich foods

 3. Eat more iron-rich foods

4. Use iodized salt when preparing meals

5. Other

6. Don't know (Preliminary analysis; Knows, does not know)

(5) Micronutrient supplements for pregnant women. Most women would benefit from two types of supplements, or tablets, during pregnancy. Which are they?

 1. Iron supplements

2. Folic acid supplements

3. Other

3. Don't know (Preliminary analysis; Knows, does not know)

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

1. Normal development of the nervous system of the unborn baby (brain, spine and skull)

2. To prevent birth defects/abnormalities the nervous system of the unborn baby (brain, spine and skull) ¨

3. Other

4. Don't know (Preliminary analysis; Knows, does not know)

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

1. Slower growth and development

2. Risks of infections/being sick

3. Risks of dying

4. Risks of being undernourished/having micronutrient deficiencies

5. Risks of being sick once adult/developing chronic diseases in adulthood (heart disease, high blood pressure, obesity, diabetes)

6. Other

7. Don't know (Preliminary analysis Knows Does not know Number of correct responses)

(8) It is recommended that a woman waits at least two or three years between pregnancies, that is before coming pregnant once again. Please can you tell me why this is recommended?

1. To rebuild/fill up their body stores of nutrients (fat, iron and others)

2. The mother to be healthier before having a new baby/to be prepared for the arrival of a new baby

3. Other

4. Don't know (Preliminary analysis; Knows, does not know)

Attitudes towards a health or nutrition-related problem

(1) How likely do you think you are to have a low-birth-weight baby?

1. Not likely

2. You're not sure

3. Likely

(2) If Not likely: Can you tell me the reason why it is not likely?

_____

_____

(3) Perceived severity; how serious do you think it is for your baby to have a low-birth-weight?

1. Not serious

2. You're not sure

3. Serious

(4) If Not Serious; can you tell me the reason why it is not serious?

_____

_____

Attitudes towards an ideal or desired nutrition-related practice

(1) How good do you think it is to eat more food during pregnancy?

1. Not good

2. You're not sure

3. Good

(2) If Not good: Can you tell me the reasons why it is not good?

_____

_____

(3) Perceived barriers; How difficult is it for you to eat more food during pregnancy?

1. Not difficult

2. So-so

3. Difficult

(4) If Difficult: Can you tell me the reasons why it is difficult?

_____

_____

KNOWLEDGE ON MICRONUTRIENT

(1) Have you heard about iron-deficiency anaemia?

1. Yes   2. No   3. Don't know/no answer

(2) If Yes: Can you tell me how you can recognize someone who has anaemia? __ 1. Less

energy/weakness   2. Paleness/pallor ¨ Spoon nails/bent nails) 3. More likely to become

sick (less immunity to infections) 4. Other   5. Don't know (Preliminary analysis Knows

Does not know Number of correct responses) _____

(3) What are the health risks for pregnant women of a lack of iron in the diet?

1. Risk of dying during or after pregnancy   2. Difficult delivery   3. Other 4. Don't know

(Preliminary analysis Knows, does not know)

 (4) What causes anaemia?

1. Lack of iron in the diet   2. Sickness/infection (malaria, hookworm infection, other

infection such as HIV/AIDS) 3. Heavy bleeding during menstruation   4. Other

5. Don't know (Preliminary analysis Knows, does not know Number of correct responses

_____

 (5) How can anaemia be prevented?   1.Eat/feed iron-rich

foods/having a diet rich in iron   2.Eat/give vitamin-C-rich foods during

or right after meals   3.Take/give iron supplements if prescribed

4.Treat other causes of anaemia (diseases and infections) – seek health-care assistance

5.Other   6.Don't know

(Preliminary analysis Knows, Does not know Number of correct responses)_____

(6) Can you list examples of foods rich in iron?

_____

_____

Organ meat ¨ Liver ¨ Kidney ¨ Heart, Flesh meat Beef Pork Lamb Goat Fish and seafood ¨ Fresh

fish ¨ Dried fish, omena, green leafy vegetables, legumes e.g. beans ndengu

(Preliminary analysis Knows   Does not know   Number of correct responses _____

(7) Certain foods help the body absorb and use iron. What are those foods? Vitamin-C-rich

foods, such as fresh citrus fruits (orange, lemons, etc.?   (Preliminary analysis 1.

Knows   2. Does not know)

(8) Some beverages decrease iron absorption when taken with meals. Which ones?

Coffee, Tea, soda etc. (Preliminary analysis   1. Knows   2. Does not know)

(9) Have you heard about vitamin A deficiency or lack of vitamin A? 1. Yes 2. No

If Yes: Can you tell me

(10) How you can recognize someone who lacks vitamin A in his or her body?

1. Weakness/feels less energetic   2. Be more likely to become sick   3. Eye problems:

night blindness (inability to see at dusk and in dim light), dry eyes, corneal damage, blindness

4. Other (Preliminary analysis   Knows, does not know, Number of correct responses _____

(11) What causes a lack of vitamin A in the body? 1. Poor variety of foods   2. Eat too little

food/not eat much (poor intake) 3 other (Preliminary analysis   Knows, does not know, Number

of correct responses

(12) Have you heard about iodine deficiency? 1. Yes   2. No

(13) What are the signs of iodine deficiency? 1. Apathy

(lack of motivation and excitement) 2. Having difficulty working or studying 3. Goitre

4. Other ¨ (Preliminary analysis Knows, does not know, Number of correct responses _____)

(14) What could be the consequences or health risks for the unborn baby of a lack of iodine in

the diet of a pregnant woman? 1. Risk of being mentally impaired 2. Risk of being physically

damaged 3. Other

(15) What causes iodine deficiency? 1. Poor or no intake of iodized salt 2. Other 3.

Don't know

(16) How can iodine deficiency be prevented? 1. Eat/prepare

foods with iodized salt 2. Other 3. Don't know

NUTRITIONAL PRACTICES

(1) Do you usually eat fresh citrus fruits, such as [oranges, lemons, passion fruits, pineapples], or drink juice made from them? 1. Yes 2. No

(2) When do you usually eat fresh citrus fruits? 1. Before a meal   2. During the meal   3. After a meal   4. Other (specify)

(3) Do you usually drink coffee or tea? 1. Yes 2. No

(4) When do you usually drink coffee or tea? 1. Two hours or more before a meal   2. Right before a meal   3. During the meal   4. Right after a meal 5. Two hours or more after a meal 6. Other (specify)

(5) Did you use salt to cook the main meal eaten by members of your family last night? 1. Yes 2. No   If Yes: What kind of salt did you use?   1. Iodized   2. Not iodized 3. No salt at home

(6) How difficult is it for you to buy and use iodized salt? 1. Not difficult   3. Difficult

If Difficult: Can you tell me the reasons why it is difficult?

_____

_____

(7) Have you found yourself avoiding certain foods during this pregnancy? 1. Yes 2. No

(8) Do you eat stones or soil? 1. Yes   2. No

NUTRITION AND HEALTH ATTITUDES

(1) How likely do you think you are to be iron-deficient/anaemic?   1. Not likely

2. You're not sure   3. Likely   If Not likely: Can you tell me the reason why it is not likely?

_____

_____

(2) How good do you think it is to prepare meals with iron-rich foods such as beef, chicken or liver? 1. Not good   2. You're not sure   3. Good   If Not good: Can you tell me the reasons why it is not good?

_____

_____

(3) How likely do you think you are to lack of vitamin A in your body? 1. Not likely   2. You're not sure   3. Likely

(4) How good do you think it is to prepare meals with vitamin-A-rich foods such as carrots, green leafy vegetables, sweet potatoes or liver? 1. Not good   2. You're not sure   3. Good

 (5) How difficult is it for you to prepare meals with vitamin-A-rich foods?   1. Not difficult 2. Difficult   If Difficult: Can you tell me the reasons why it is difficult?

(6) How good do you think it is to prepare meals with iodized salt? 1. Not good   2. You're not sure   3. Good

HOUSEHOLD WATER CONSUMPTION

(1) What is your main current water source for household use? _____   1. Water tap 2. Tanker   3. Borehole   4. Other

(2) How long does it take to go to the main source of water and come back? (Approx. in hrs or mins)

(3) On average, how many 20 litre Jerri cans of water does the household use per day?

(4) How much do you pay for the water you use in your household?   1. Per

20lt Jerri can   2. Per month   3. Free

(5) What is your main source of drinking water?   1. Water tap   2. Tanker   3. bore hole

4. Free   5. Other

(6) Do you do anything to the water before drinking it?   1. Boiling   2.use traditional herbs

3. Use chemicals   4. Filters/sieve   5. Decant   6. Other

SANITATION

(1) Does your household have access to a toilet /latrine facility?   1=yes   2=no

(2) If yes what type of toilet facility do you have?   1= flush toilet   2= bucket   3=

traditional pit latrine   4= ventilated improved pit latrine   5= other

(3) Is the toilet/latrine facility   1= communally shared   2. Family

(4) If there is no toilet/latrine where do you go/use?   1=bush   2= near

the river   3= behind the house   4= other

(5) How is children's faeces disposed? _____   1= disposed of immediately and hygienically

(in a toilet) 2= not disposed (scattered in the compound   3=disposed of immediately in a nearby

bush   4= other (specify)

(6) On what occasion do you wash your hands?   1= after using the toilet   2=before feeding a

child   3=before eating   4=before preparing food   5=when I think they are dirty

6=when water is available   7=other (specify)

(7) How do you wash your hands?   1= soap and water   2= water only   3= other

INDIVIDUAL FOOD FREQUENCY SCORE

FOOD (group)	SPECIFIED FOOD	5-6 times/ week	3-4 times/week	1-2 times/week	Fortnight	Monthly	Rarely	Never
Starchy (cereals)	Maize, rice, millet, wheat(chapatti, mandazi) sorghum							
Starchy (non-cereals)	Potatoes/sweet, cassava, yams, arrowroots, green bananas							
Legumes & nuts (fresh/dried)	French beans, green peas, all types of dried legumes e.g. beans, ndengu, amended, cowpeas, took, etc.							
Fruits	Oranges, melon, mangoes, plums, avocado, ripe banana, pawpaw, passion,							

	grapes, kiwi apples etc.						
Eggs	Chicken, duck, others						
Meat & fish	Beef, chicken, fish, pork, goat, rabbit etc.						
Vegetables	All green leafy vegetables, carrots, kales, spinach ,cassava leaves, manage, derma, chichi, terete, kinder, pumpkin leaves saga, cabbage & others etc.						
Milk	Fresh milk, yoghurt, mala, fermented milk						
Fats	Cooking oil, margarine,etc.						

Scale; 1=1-2 low diversity   2=3-4   middle diversity   3=5-6   high diversity

ANTENATAL CARE

(1) How many children do you have? _____

(2) When was the last time you gave birth (even if child is not alive)? 1. One year ago   2. Two years ago   3. Over two years ago

(3) Did you receive ANC in your last pregnancy? 1. Yes   2. No

(4) How old is your youngest child? _____

(5) What number of pregnancy is this? _____

(6) How many months pregnant are you? _____

(7) How many months pregnant were you when you first received antenatal care for this pregnancy? _____

(8) Why do you come for your ANC check-up here at Pumwani? 1. _____ Close home   2. Close to work   3. Inexpensive   4. Friendly staff   5. Convenient timing   6. Good quality of service   7. Others

(9) Had you received ANC anywhere else before you came to Pumwani? _____ 1. Yes   2. No

(10) In the last few months how has your health been? _____

 1. Good health   2. Experienced recurring sickness   3. Minor illnesses   4. Been seriously ill   5. Others

(11) Who examines you during your check-ups? _____ 1. Doctor   2. Mid-wife/nurse   3. others

ACCESSIBILITY

(12) How long does it take you to travel to this clinic? _____

1. Less than 30 min.   2. 30 min. to 1 hour   3. 1 hour to 1 ½ hours

(13) Which mode of transport do you use to come here? _____

1. Walking   2. Bicycle/bode   3. Public transportation   4. Car

(14) What is the average amount of time that you wait to see medical staff when you visit the

clinic? _____ 1. Less than 30 min.   2.30 min. to 1 hour   3. 1 hour to 1 ½ hours

4. 1 ½ to 2 hours   5. More than 2 hours

HEALTH SERVICES RECEIVED DURING PREGNANCY

(15) Have you received medical care during your pregnancy at this facility or any other

government primary health clinic? _____ 1. Yes   2. No

(16) How many times have you visited this clinic during your pregnancy? _____

1. 1 to 3 visits   2. More than 3 visits

(17) What health services have you received in the clinic during your pregnancy?   1. Yes

2. No

1. Physical examination (including weight, blood pressure, heart rate height, mica)

 2. Gynaecological examination   3. Ultrasound

  4. HIV/STD testing   5. Blood tests   6. Nutritional supplements   7. Tetanus vaccine

(18) Have any complications been detected during this pregnancy? _____ 1. Yes   2. No

(19) Were you referred to a secondary hospital for treatment of these complications? _____

1. Yes   2. No

(20) Were you given or did you buy the iron/folic acid supplement? _____ 1. Bought   2.

Given for free at the clinic

(21) How many days have you taken the iron/folic acid supplements? _____

(22) If no for iron/folic acid supplements ask: why did you not take iron /folic acid supplements?

1. Not given   2. Ignored advise from healthcare worker   3. threw them away   4.

React to them   5. Can't afford   6. Other

(23) Are you taking any other supplements? _____   1. Yes   2. No

(24) If yes what other supplements are you taking? _____   1. Herbal   2. Unimix

3.Rutf   4. Soil/mineral stones   5. Others

(25) During your ANC visits have you received any advice on any of the following?   1. Yes

2. No   A. Complications/problems

related to pregnancy   B. Nutrition during pregnancy   C. Labour and delivery   D.

breastfeeding   E. Care of the new-born (cord cleaning)

(26) Overall, how satisfied have you been with the maternal health services you have received in

this clinic? _____

1. Completely satisfied   2. Partially satisfied   3. Dissatisfied

SUGGESTIONS

 What are your suggestions for improving maternal health services at this hospital? (Open-ended)

_____

_____

_____

_____

Appendix 3: Recommended dietary allowance (RDA) for selected nutrients during pregnancy

Nutrient	Requirements
Energy (kcal)	2500
Protein (g)	60
Calcium (mg)	1000
Iron (mg)	30-60
Folate (mcg)	600
Vitamin B_{12} (mcg)	2.6

Source: National Academy of Sciences, National Academy Press 5th report Washington Dc

(2002)

Appendix 4: Research Clearance

NAIROBI CITY COUNTY

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P. O. Box 30075-00100
Nairobi
KENYA

COUNTY HEALTH SERVICES:
PUMWANI MATERNITY HOSPITAL:

PMH/DMOH/75/0403/2018

12TH JUNE 2018

To:
Sarah Njeri Waweru
Dept. of Food Science, Nutrition and Technology
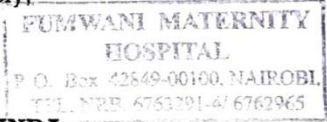Faculty of Agriculture
University Of Nairobi

RE: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that the research entitled "**The Relationship between Dietary Diversity, Utilization of Antenatal Care Services and the Nutrition Status in Pregnancy**" has been approved.

You are expected to pay Kshs. 6000/- only.

You are hereby allowed to collect data. We look forward to receiving a summary of the research findings upon completion of the study.

Yours sincerely,

PUMWANI MATERNITY
HOSPITAL
P. O. Box 42849-00100, NAIROBI.
TEL. NRB 6763291-4/6762965

DR. C. MUTINDA
MEDICAL SUPERINTENDENT