

**FACTORS INFLUENCING DIET ADHERENCE AMONG DIABETES MELLITUS
TYPE 2 PATIENTS ATTENDING CLINIC AT MOI TEACHING AND REFERRAL
HOSPITAL, KENYA**

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DECLARATION

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

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DEDICATION

I would like to dedicate this work first and foremost to my parents Joseph Kamau and Felisters Warigia for the encouragement and confidence in my academic journey. I would also like to appreciate my dear husband Silas Magonya and children Ian Magonya, Zawadi Otero, Llyod Kamau and Zaria Warigia for the patience and love they gave me during this period.

ABSTRACT

Non-communicable diseases are the leading cause of death globally and Diabetes Mellitus is the fourth contributor. In 2017 there were 458,200 cases of Diabetes Mellitus in Kenya with more than 85% being Diabetes Mellitus Type 2. Complications resulting from poor glycemic control seen in Kenyan hospitals could be attributed to poor dietary practices. Therefore, the main objective of this study was to determine factors that influence diet adherence among patients with Diabetes Mellitus Type 2 at the Cancer and Chronic disease Centre diabetic clinic Moi Teaching and Referral Hospital. The specific objectives of the study were to assess diet adherence of the Diabetes Mellitus Type 2 patients, determine the factors influencing diet adherence at individual, small group, organizational or health care system, community and policy levels and to determine the relationship between factors at individual level, small group, organizational or health system, community and policy and diet adherence using the ecological approach. A cross-sectional study design was conducted at the Cancer and Chronic Diseases Center at Moi Teaching and Referral Hospital in Eldoret, with a sample size of 241 respondents derived from the target population of 412. Data was collected using questionnaires, food frequency questionnaire and a three-day food record for assessing diet, and interviews for health workers as key informants. Descriptive statistics was used to assess diet adherence, chi-square and odds ratio used to identify factors at individual, small group, organizational or health care system, community and policy levels influencing diet adherence, relationships between diet adherence and the four levels perceived to influence diet adherence was determined using multiple linear regression. The mean level of adherence to recommended dietary guidelines for Diabetes Mellitus Type 2 patients was 48.6%. Chi-square results indicated that at individual level factors that influence diet adherence were, marital status $\chi^2 (1) = 2.113$, $p \leq .05$, monthly income $\chi^2 (2) = 1.461$, $p \leq .05$, duration of Diabetes Mellitus $\chi^2 (4) = 3.931$, $p \leq .05$, frequency of monitoring blood sugar levels $\chi^2 (1) = 4.551$, $p \leq .05$, treatment for Diabetes Mellitus $\chi^2 (2) = 10.503$, $p \leq .05$ and BMI $\chi^2 (10) = 18.997$, $p \leq .05$. However there was no significant association with cognitive and psychological factors at individual level perceived to influence diet adherence $p > 0.05$. There was also no significant association with diet adherence and factors perceived to influence adherence at small group, organizational or health care system, and community and policy levels. However multiple linear regression results indicated that 43% of variance in diet adherence can be explained by individual, small group, organizational or healthcare systems, community and policy level factors collectively, $F (4,241) = 2.142$, $p < .05$. Factors at individual level had the largest standard coefficient value ($\beta = .160$, $t = 2.332$, $p = .018$) indicating greatest relationship with diet adherence. Results from this study indicate that though individual factors greatly determine diet adherence, individual behaviour is influenced by factors in the environment. Therefore health professionals and policy makers should incorporate factors at small group, organizational or healthcare system, community and policy levels in improving the nutrition care process of diabetic patients.

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LIST OF ABBREVIATIONS/ACRONYMS

ADA	American Diabetes Mellitus Association
AIDS	Acquired Immune Deficiency Syndrome
BMI	Body Mass Index
CHD	Coronary Heart Disease
CKD	Chronic kidney Disease
DASH	Dietary Approach to Stop Hypertension
DKA	Diabetes Mellitus Ketoacidosis
DM 2	Diabetes Mellitus Type 2
FBS	Fasting blood sugar
FFQ's	Food Frequency Questionnaires
HIV	Human Immunodeficiency Virus
HGM	Home Glucose Monitoring
IDF	International Diabetes Mellitus Federation
KNH	Kenyatta National Hospital
MTRH	Moi Teaching and Referral Hospital
NCDs	Non communicable Diseases
RBS	Random Blood Sugar
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Adequate intake: was consumption which was within the recommended dietary guidelines for Diabetes Mellitus type 2.

Community and policy level: physical environment and policies, and factors expected to influence diet adherence included food availability and accessibility.

Diabetes Mellitus Type 2: was patient's status of Diabetes Mellitus measured using WHO criteria that is a Fasting Blood Sugar of ≥ 7.0 mmol (table 1.1) with symptoms of Diabetes Mellitus Type 2 as indicated in the medical records of the patient.

Diet Adherence: was defined as patients' ability to follow recommended dietary guidelines in the management of Diabetes Mellitus type 2.

Ecological Framework: model was used to determine factors influencing adherence at different levels which include individual, small group (family and friends), organizational or health care system, community and policy, and the relationship between diet adherence and four levels.

Fasting Blood Sugar Normal: blood glucose target after one has had nothing to eat or drink for 8 hours range for diabetics according to American Diabetes Mellitus Association (ADA) should be 5.0 mmol/l to 7.2 mmol/l.

Food Variety: number of times food items in a food group are consumed by a patient and will be measured by use of food frequency.

Individual Level Factors: are those intrapersonal factors that are expected to influence diet adherence which include; socio-demographic, health, cognitive and psychological factors i.e. age, self-motivation, knowledge of Diabetes Mellitus, will power, determination, achieving a goal, religious beliefs, fear of death, self-responsibility and highly regulated up-bringing.

Organizational or Health Care System level Factors: are interpersonal relations with health care systems expected to influence diet adherence which include, support from health care provider, trust in health care provider, and distances from hospital.

Over-intake: was consumption above individual recommended dietary guidelines for Diabetes Mellitus type 2 patients.

Random Blood Sugar Normal: blood glucose target after meals should be < 10 mmol/l according to American Diabetes Mellitus Association (ADA).

Recommended Dietary Guidelines: were plans for food serving's intake, starches and bread, vegetables, fruits, milk and milk products, meat and meat substitutes, fats, fiber; calorie intake,

number of meals consumed, reduced intake of sugar and salt, avoiding alcohol consumption and smoking.

Serving: was defined as the recommended portion of food to be eaten by an individual depending on nutritional assessment and was derived from daily individual calorie requirements.

Small group level: are interpersonal factors which were expected to influence diet adherence which include support from spouse, other family members and friends.

Under-intake: was consumption below the recommended dietary guidelines for Diabetes Mellitus type 2 patients.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Non-communicable diseases (NCDs) kill 41 million people globally each year (WHO, 2018). The four main NCDs are cardiovascular diseases (CVDs), cancer, Diabetes Mellitus, and chronic lung diseases (WHO, 2016). Diabetes Mellitus is increasing rapidly in the world. According to International Diabetes Federation (IDF) there were 463 million people aged 20-79 years living with diabetes globally. These numbers are predicted to rise to 642 million by 2045, with the highest increase occurring in low to middle income levels countries (IDF Atlas 2017). According to WHO, premature death from any one of the four NCDs decreased by 18% globally between 2020 and 2016. Most rapid decline was in chronic respiratory disease (40% lower), followed by chronic vascular diseases and cancer (both 19% lower). However Diabetes is showing a 5% increase in premature death during same the same period (WHO 2022).

In 2019 the International Diabetes Federation Africa Region (AFR) estimated that there were 19.4 million adults aged 20-79 years living with diabetes, with a regional prevalence in 3.1% (IDF Atlas, 2019). In the same year 366,200 deaths related to Diabetes Mellitus were reported in Africa. According to Ganiyu et al. (2013) Diabetes Mellitus type 2 (DM2) account for 70% to 90% of Diabetes Mellitus cases in Africa. According to WHO (2014), the prevalence of Diabetes mellitus in Kenya is 3.3% and is expected to be 4.5% by 2025. Christensen et al. (2009) recorded a Diabetes prevalence of 4.2%, with 12% prevalence in urban areas compared to 2% in rural areas. In 2017 there were 458,900 cases of Diabetes in Kenya while the undiagnosed cases were estimated at over 160,000. In the same year there were 7864 deaths that resulted from Diabetes Mellitus among adults (IDF Atlas, 2017). Magdeline (2012) in a study done in Kenya found that 85% to 90% of diabetes cases were those of DM2. The prevalence of Diabetes in Kenya is 4.2% which is higher than that of Africa (3.1%). Also in Kenya the percentage of DM2 compared to other types of Diabetes mellitus cases is much higher than even that of Africa, 85% against 70%, this indicates that DM2 is a national burden.

Patients diagnosed with DM2 are required to adhere to a medical, diet and exercise regime. Recommended diabetic diet comprises of food high in fibre, fruits and vegetables, lean meats, poultry and fish, low-fat milk and dairy products and small amounts of fats, oils, refined sugars

and salt diet. Diabetes mellitus type 2 can be adequately managed by following recommended diabetic diet. Following dietary guidelines minimizes the burden of DM2 and the morbidity and mortality associated with the disease's consequences (Parajuli *et al.*, 2014). However, several studies have indicated that most patients find it difficult to stick to a diet plan. According to Mumu *et al.* (2014) several studies in Bangladesh indicated that non-adherence rates were 48% to 77%. In Oman, a research found that 12% of patients acknowledged to not following all of the dietician's diet advice, 63% said they followed their diet occasionally, and only 25% fully followed the diet (Al-Sinani *et al.*, 2010). According to a cross-sectional study conducted in Ethiopia, 74% of individuals had poor adherence to dietary recommendations, while just 26% showed high adherence (Ayele *et al.*, 2018). In Zimbabwe at Harare Central Hospital 10% had very poor adherence, 81% had poor adherence, 7% had good adherence, and 0% had very good adherence (Mukonka *et al.*, 2016).

Few studies on diet adherence among Diabetes Mellitus type 2 (DM2) patients have been done in Kenya. A study by Maina *et al.* (2010) of the general population in four provinces Coast, Nairobi, Eastern, and Central, revealed that 75% of the participants had bad food habits. According to Omondi *et al.* (2010), DM2 patients in Kenya and other developing countries have challenges in meeting dietary requirements. Mugo (2018) in a study in four hospitals in Nakuru County indicated that dietary compliance level for DM2 patients was 59.6%. However a study by Musee *et al.* (2016) at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) on levels of diet adherence indicated that 73% of the patients had good adherence while 22% had excellent diet adherence. In a study at Moi Teaching and Referral Hospital by Jepkemoi *et al.* (2018), 80% of the respondents partly adhered to dietary recommendations. According to Jones (2013) while information on the prevalence of uncontrolled DM2 is limited in Kenya, foot ulcers are seen frequently at many tertiary clinics and are associated with poor glycemic control which is an indication of poor diet adherence.

The Social Ecological model, can be used to identify factors influencing diet adherence, since it tackles many levels of adherence: individual, small group (family and friends), organizational or health system, as well as community and policy (Ebrahim *et al.*, 2014). At individual level factors include socio-demographic, health characteristic, cognitive and psychological. Miller and DiMatteo (2013) in an American study identified patient's marital status and living arrangements

as factors influencing diet adherence. Higher levels of education, living in rural areas, and attending Diabetes Mellitus education sessions were related with improved adherence in a Bangladesh study (Mumu *et al.*, 2014). In India Patel *et al.* (2012) linked diet adherence to visiting a dietician, having a high level of education. South African researchers identified diet education as important in improving dietary compliance (Muchiri *et al.*, 2012).

At small group level Miller and DiMatteo (2013) concluded that functional social support from family and friends was associated with diet adherence. In a study conducted in Iran, family influence was identified as the most important factor in patients' dietary choices (Azar *et al.*, 2014). At the organizational or health care system level a study of South Asians, including Indians, Pakistanis, Malaysian-Indians, and Bangladeshis, found that trust in healthcare providers was an important factor in enabling diet adherence (Sohal *et al.*, 2015). A study in South Africa indicated that a documented food plan and a support group were as important in influencing diet adherence (Muchiri *et al.*, 2012). Community and policy level factors within the environment also influence diet adherence. A study at Cape Town clinic in South Africa using the ecological model, identified cultural events, the cost of food and culturally appropriate diet as factors influencing diet adherence (Ebrahim *et al.*, 2014). According to Muchiri (2012) accessibility and availability of healthy foods within ones environment influences dietary habits. Ayele *et al.* (2018) in a study at an Ethiopian hospital reported that 78% of respondents identified affordability of foods as a barrier to following recommended diet.

Few studies on factors influencing diet adherence in Kenya have been done especially those that have used the ecological model to understand dietary behaviour. This study therefore set out to establish factors influencing diet adherence among patients with Diabetes Mellitus Type 2 (DM2) at Moi Teaching and Referral Hospital (MTRH) using the ecological model.

1.2 Statement of the Problem

The prevalence of in Diabetes Mellitus in Kenya is 4.2% (Christensen *et al.* 2009) which is much higher than the regional prevalence of 3.1%. In Kenya 85-90% of Diabetes cases are those of Diabetes Mellitus Type 2 (DM2). Adherence to a diet regime which is the cornerstone in management of DM2 helps to prevent or postpone diabetic complications by enhancing and retaining glycemc regulation (Ganiyu *et al.*, 2014). In Kenya information on the prevalence of uncontrolled glycemc levels is unavailable however studies have shown that, complications

resulting from poor glycemic control are common among patients with DM2 (Nyoyo *et al.*, 2016). Poor glycemic control can be associated with poor diet adherence.

This study therefore focused on investigating factors influencing diet adherence using the ecological model. The model uses a holistic approach by emphasizing the environmental and policy contexts of health behavior, while incorporating social and psychological influences. According to the ecological model adherence to dietary recommendations is influenced by several factors that may emanate either from the individual, family and other relations, the organizational or health care system, the community and policy. This approach may inform health professions on building interventions that are holistic considering interconnections of behaviors across the multiple levels of influence. In Kenya most studies done on DM2 have focused on the complications of the disease. Information on diet adherence and factors influencing adherence to diet for Diabetes Mellitus Type 2 patients is scanty.

1.3 Main Objective

To determine factors that influence diet adherence among patients with Diabetes Mellitus Type 2 at the Cancer and Chronic Disease Centre Diabetic Clinic Moi Teaching and Referral Hospital (MTRH).

1.3.1 Specific Objectives

- i. To assess diet adherence of Diabetes Mellitus Type 2 patients attending clinic at MTRH.
- ii. To establish factors at individual, small group, organizational or health care system, community and policy levels influencing diet adherence.
- iii. Determine relationship between factors at individual, small group, organizational or health care system, community and policy levels and diet adherence.

1.4 Research Questions

- i. What is the diet adherence level of the Diabetes Mellitus Type 2 patients attending clinic at MTRH?
- ii. What are the factors at individual, small group, organizational or health care system, community and policy levels influencing diet adherence?
- iii. What is the relationship between diet adherence and factors at individual, small group, organizational or health care system, and community and policy level?

1.5 Justification of the Study

Diet adherence is an important factor in the control and management of Diabetes Mellitus type 2 (DM2) in the early stages and later stages of the disease. The management of the disease is important as it prevents the occurrence of complications and death. However, studies done have shown that many patients are admitted to hospital with complications resulting from Diabetes Mellitus indicating poor glycemic control. Despite these facts few studies in Kenya have addressed factors that influence diet adherence which is one of the important lifestyle changes in patients with DM2. Research and literature on factors influencing diet adherence on DM2 patients in Kenya is limited. The study therefore sought to determine factors that influence diet adherence which is the cornerstone in management of DM2.

Studies on dietary management are important as they will help health practitioners understand the factors that may influence diet adherence. Knowledge on the factors influencing diet adherence may be useful to health care practitioners while giving individual nutrition counseling to the diabetic patients. Effective counseling leads to a greater understanding by patients on the importance to diet adherence, which will greatly improve their health.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter contains a review of literature which looks at an overview of Diabetes Mellitus, assesses the global prevalence and effects of the disease, dietary patterns of diabetic patients, factors influencing diet adherence and the relationship between the factors and adherence.

2.2 Overview of Diabetes Mellitus

World Health Organization (2013) defines Diabetes Mellitus (DM) as a chronic disease that occurs either when the pancreas does not produce enough insulin or the body does not use the insulin produced effectively. The symptoms of Diabetes Mellitus are weight loss, increased hunger, frequent urination, dehydration, dry mouth, thirst, blurred vision, increased infections and fatigue (DeBruyne & Pinna 2013). Diabetes Mellitus is divided into three types: type 1 (which accounts for 10% of all cases), type 2 (which accounts for 85% of all cases), and gestational Diabetes Mellitus (which accounts for 5% of all cases) (Jones, 2013). Diabetes Mellitus is diagnosed using plasma glucose, which is taken either after fasting (Fasting Blood Sugar) or randomly during the day (Random Blood Sugar), as shown in Table 2.1. Oral glucose tolerance tests (based on a two hour post 50 or 70 grams oral glucose load) can also done , with symptoms confirming the diagnosis (DeBruyne & Pinna, 2013). Poor glycemic control may result in complications such as coronary heart disease (CHD), hypertension, retinopathy, nephropathy, and neuropathy (DeBruyne & Pinna, 2013). Short term complications of Diabetes Mellitus include hypoglycemia, hyperglycemia, infections and Diabetes Mellitus ketoacidosis (Ganiyu *et al.*, 2013). The risk of complications is higher in Diabetes Mellitus type 2 than type 1 (Ganiyu *et al.*, 2013).

Table 2.1 WHO Diabetes Mellitus Diagnostic Criteria

Condition	2 hour Glucose	Fasting Glucose	Hemoglobin A1C(HbA1c)
Unit	mmol/l(mg/dl)	mmol/l(mg/dl)	%
Normal	<7.8(<140)	<6.1(<110)	<6.0
Impaired fasting glycemia	>7.8(<140)	≥6.1(≥110) & <7.0(<126)	6.0-6.4
Impaired glucose tolerance	≥7.8(≥140)	<7.0(<126)	6.0-6.4
Diabetes mellitus	Mellitus ≥ 11.1 (≥200)	≥7.0(≥126)	≥ 6.5

Source: DeBruyne & Pinna, (2013)

Non communicable diseases (NCDs) account for 41 million deaths each year worldwide with almost three quarters translating to 28 million occurring in low middle income countries (WHO, 2018). Cardiovascular diseases (CVDs), cancer, Diabetes Mellitus, and chronic lung diseases are the four main NCDs (WHO, 2016). Globally the probability of premature death from any one of the four NCDs is said to have decreased by 18% between 2020 and 2016. Chronic lung diseases were reported to have the most rapid decline (40% lower), followed by cardiovascular diseases and cancer (both 19% lower). Diabetes Mellitus was however showing a 5% increase in premature death during the same period (WHO 2022).

There were 463 million people in the world aged 20 to 79 who had Diabetes Mellitus in 2019 with a global prevalence of 9.3%, according to data from the International Diabetes Mellitus Federation (IDF Atlas 2019). These numbers are predicted to rise to 642 million by 2045, with the highest increase occurring in low to middle income levels countries (IDF Atlas 2019). Globally the incidence of Diabetes Mellitus type 2 (DM2) is increasing rapidly due to increasing obesity and sedentary lifestyles (Ganiyu *et al.*, 2013). In Africa the International Diabetes Mellitus Federation (IDF) estimates that 19.4 million adults aged 20-79 years had Diabetes Mellitus in 2019, with a regional prevalence of 3.1% (IDF atlas 2019). Majority of the Diabetes Mellitus cases in Africa are those of Diabetes Mellitus type 2 (DM2) at between 70% and 90% followed by type 1 at 5% to 20% (Ganiyu *et al.*, 2013).

In Kenya according to Kipkalom (2019) non-communicable diseases account for more than 50% of hospital admissions and over 55% of hospital deaths. In 2017, there were 458,900 cases of Diabetes Mellitus in Kenya, with undiagnosed cases estimated at 165,000 (IDF Atlas, 2017). According to WHO (2014), the prevalence of Diabetes Mellitus in Kenya is 3.3% and is expected to be 4.5% by 2025. In a study by Christensen *et al.* (2009) on prevalence of Diabetes Mellitus in Kenya, out of a sample of 1459 prevalence was 4.2 % with 12% prevalence in urban areas compared to 2% in rural areas. The prevalence of Diabetes Mellitus in Kenya is much lower than the world prevalence; however Kenya has a higher prevalence than the regional prevalence of Diabetes Mellitus in Africa (3.1%). In 2017, there were 7864 deaths that resulted from Diabetes Mellitus among adults in Kenya (IDF Atlas, 2017). A report from Kenyatta National Hospital (KNH) indicated that diabetic ketoacidosis (DKA) accounted for 8% of diabetic admissions and 30% of these patients died within 48 hours of presentation (Jones, 2013).

Foot ulcers are commonly seen in many Kenyan tertiary hospitals, linked with impaired glycemic regulation (Jones, 2013). In another study done at Embu Referral hospital the overall prevalence of Diabetic retinopathy was 41% (Njambi, 2012). About 60%-70% of patients with renal cardiac complications respectively were as a result of Diabetes Mellitus (Jalang'o *et al.*, 2014). According to the Kenya association for the blind, diabetic retinopathy is responsible for 3% of all blindness incidents (Mwangi *et al.*, 2011). Another study on prevalence of diabetes related complications in Kenya by Otieno *et al.* (2021) indicated that, microvascular complications were prevalent in 35.3(n=65) of the 187 participants. The most frequent complications been neuropathy (n=41, 21.5%) and microalbuminuria (n=27, 14%). The study further indicated that the most common comorbidities were dyslipidemia (n=125, 73.5%) and hypertension (n=123, 65.8%). Diabetes Mellitus is therefore a national and global burden which requires rigorous management to avert complications and mortality attributable to the disease.

2.3 Blood Glucose Control in Diabetes Mellitus

The main goal in the management of Diabetes Mellitus is to ensure blood glucose levels are maintained within the desirable range so as to prevent complications (DeBruyne & Pinna, 2013). Several clinical studies have found that Diabetes Mellitus therapy that regulates blood glucose levels can improve nephropathy, retinopathy and neuropathy occurrence and intensity (DeBruyne & Pinna, 2013). Interventions to promote adequate glycemic regulation in diabetic patients are cost-effective approaches to minimize morbidity and mortality, but glycemic management in both industrialized and developing countries is low. In 2005, a Swedish study noticed that only 34% of patients with type 2 Diabetes Mellitus surveyed had good glycemic regulation (HbA1c 7%) (Shamsi *et al.*, 2013). In India the main level of HbA1c in diabetic patients was 8.9% and United Arab Emirates it was at 38% (Shamsi *et al.*, 2013).

In sub-Saharan Africa most people find it difficult to achieve and maintain the desired glycemic level (Ganiyu *et al.*, 2014). While there is limited data available in Kenya regarding figures about the prevalence of uncontrolled Diabetes Mellitus type 2 a study done in 2013 indicated that foot ulcers were seen frequently at many tertiary clinics in Kenya and are associated with poor glycemic control, infection, hypertension and dyslipidemia (Jones, 2013). A study at Mathari National Teaching Hospital Kenya, indicated that 122(81.6%) out of 149 participants had poor glycemic control with mean HbA1c of 9.1, 90.6% also having elevated FBS. Poor glycemic

control is an indication of problems in disease management that may include poor dietary practices.

2.4 Dietary Management for Diabetes Mellitus Type 2 Patients

Patients living with Diabetes Mellitus type 2 (DM2) will adopt a prescribed diet and fitness plan if appropriate. Modifications in diet and lifestyle practices are the foundation of DM2 treatment which helps to prevent or postpone diabetic complications by enhancing and retaining glycemic regulation (Ganiyu *et al.*, 2014). Recommended diet for DM2 includes having nutritionally balanced meals from all food groups, increased intake of vegetables and fruits, whole grains, legumes and nuts (WHO 2015). It also includes consuming frequent small meals 6 times a day while observing portion sizes. Patients are also required to reduce sugary foods, salt, foods high in fat, avoid alcohol intake and cigarette smoking.

A broad variety of solutions to Diabetes Mellitus meal preparation or eating habits have been found to be clinically efficient, but there are no perfect percentage of calories from carbohydrates, protein or fat that are suitable for all Diabetes Mellitus patients (Evert *et al.*, 2014). Meals for diabetic patients can be planned and prepared by using dietary patterns such as the Mediterranean diet, Dietary Approach to Avoid Hypertension (DASH), vegetarian or vegan, low carbohydrates and low fat (Evert *et al.*, 2014). For overweight adults, focus should be on reducing total caloric intake and saturated fat intake, while increasing dietary fiber intake for Diabetes Mellitus patients (Rivellese *et al.*, 2008). Diabetic patients should therefore follow an individualized meal plan developed in conjunction with a qualified health worker (dietician, diabetes nurse or physician) for proper dietary management.

2.5 Diet Adherence of Diabetes Mellitus Type 2 Patients

Following a diet or changing one's lifestyle in accordance with accepted guidelines for disease management, according to World Health Organization (WHO), constitutes adherence (Power, 2018). Biological markers, which are more sensitive yet intrusive, are employed to monitor adherence, as well as self-reporting and questionnaires (Garcia-Perez *et al.*, 2013). Information on feeding pattern, i.e. type and quantity of food and liquids consumed meal and snack times, and current energy and macronutrient and micronutrient consumption are reviewed in detail in patients with Diabetes Mellitus Type 2 (DM2) when assessing diet compliance (Shamsi *et al.*, 2013).

In Italy a study on dietary habits done among 504 patients with DM2 concluded that caloric intake was elevated, there was high intake of saturated fats and low intake of fibre, making compliance to dietary recommendations unsatisfactory (Rivellese *et al.*, 2008). A cross-sectional study in Western India by Patel *et al.* (2012) evaluated diabetic diet using a 3 day dietary history and concluded that 73% of the patients were consuming diabetic diet. In the same study results indicated that only 2% counted calorie intake, 36% used boiling and roasting as their method of cooking and 88% of the participants reported taking low fat or skimmed milk. According to Mumu *et al.* (2014) several studies in Bangladesh have indicated that non adherence was high (48-77%) than previously thought. At King Khalid University Hospital in Saudi Arabia, only 32% of the patients with DM2 were adherent to dietary advice. In this study adherence was measured using a 7 day scale and adherence was following a diet for 5 days in the previous 7 days (Al-Rasheedi, 2014). In Qatar and Oman it was reported that only 56% of the DM2 patients were adherent to diet recommendations (Adem *et al.*, 2014). In another study in Oman 11 patients (11.6%) admitted they were non adherent to all diet advice by the dietician, 63.2% followed their diet sometimes with only 25.2% strictly following the diet (Al-Sinani *et al.*, 2010). In Bahrain a study by Shamsi *et al.* (2013) revealed that most patients had average to good dietary habits. Out of 385 Nepalese patients with DM2, 87.5% did not comply to dietary guidelines, while 12.5% did not adhere at all (Parajuli *et al.*, 2014). A study in Yemen by Alhariri *et al.* (2016) participants studied on rate of diet adherence indicated that 21%, 46.7%, and 32.4% showed good adherence, partial, and non-adherence respectively.

A study conducted in South Africa, indicated that majority of patients appeared to be aware of the dietary recommendations, but self-reported dietary practices revealed issues with adequate fruit and vegetable intake, portion control, meal regularity, balanced meal consumption, and the use of saturated fats (Muchiri *et al.*, 2012). In a study conducted in Botswana by Ganiyu *et al.* (2013) results indicated that 37% failed to follow dietary guidelines. Two studies conducted in Ethiopia by Worku *et al.* (2015) and Berhe *et al.* (2013) found that 51.4% and 78.85 respectively of respondents had unhealthy eating habits. Another study in Ethiopia 49.1% of the 116 had good dietary practices while 33.62% had poor and 17.4% were average (Adem *et al.*, 2014). In an Ethiopian hospital, 74.3% of participants had poor adherence, while only 25.5% had excellent adherence (Ayele *et al.*, 2018). In the same study 63.8% of the total DM2 patients admitted that they were unable to follow doctor's recommendations and 84% had a problem

remembering eating foods according to doctors' advice (Ayele *et al.*, 2018). A study in Zimbabwe at Harare Central Hospital on adherence to life style changes on diet, found out that 10.9% of the patients had very poor adherence, 81.5% poor adherence, 7.5% good and 0% very good (Mukonka *et al.*, 2016).

Few studies on diet adherence among Diabetes Mellitus type 2 (DM2) have been done in Kenya. In a study of the general population in four provinces, namely Coast, Nairobi, Eastern, and Central, revealed that 75% had bad food habits (Maina *et al.*, 2010). According to Omondi *et al.* (2010), DM2 patients in Kenya and other developing countries continue to meet dietary challenges due to poor perceived knowledge on appropriate diet. A study conducted by Mugo (2018) in Nakuru indicated that the dietary compliance level for DM2 patients was 59.6%. In Lamu in a study by Abdulrehman *et al.* (2016) participants associated Diabetes Mellitus to sugar terming it “ugonjwa wa kisukari” which is a misconception. Results from the same study indicated that many participants associated dietary restrictions with avoiding simply sugars contained in sweet tea, desserts, and juices. Portion control was also a problem and most of the participants didn't know how much of each food group should be consumed daily and none of them was familiar with calorie counting. Another study done at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOTRH) on levels of diet adherence indicated that 73.9% had a diet adherence level of 80% and only 22.3% had 100% diet adherence level (Musee *et al.*, 2016). In a study at Moi Teaching and Referral Hospital by Jepkemoi *et al.* (2018), 80% of the respondents partly adhered to dietary recommendations. The same study found a high intake of saturated fats especially from animal sources. However a study by Muhabuura (2014) at Kenyatta National Hospital indicated that 96.15% of the respondents were adherent to dietary practices. Poor food choices and lack adherence to dietary recommendations is a major challenge for DM2 patients in Kenya and around the world.

2.6 Factors Influencing Diet Adherence

Adherence to diet is influenced by various factors and the ecological conceptual framework of health behavior can be used to identify these factors. This framework emphasizes the environmental and policy contexts of behaviour, while incorporating social and psychological influences (Glanz *et al.*, 2008). Individual, interpersonal, organizational, societal, and public policy behaviors are influenced by various variables in ecological models. Health professionals

can build more complete interventions by considering the interconnections of behaviors across these multiple levels of influence (Caperon *et al.*, 2019). Since it tackles individual, small group (family and friends), organizational or health care system, as well as community and policy levels, according to Ebrahim *et al.* (2014) the ecological model is a helpful tool that may be used to uncover factors that influence adherence. The current study will use the ecological model to identify and understand the interconnections between the multiple levels of influence.

2.6.1 Individual Level Factors

According to the ecological framework individual factors influencing diet adherence are intrapersonal characteristics which include demographics, social, cognitive, psychological and health factors. Research in American indicated that family structure i.e. patients' marital status, living arrangements or living with others has a positive effect on adherence especially on behavioural regimes like diet (Miller & DiMatteo, 2013). A study by Jaworski *et al.* (2018) in Poland found that among health variables, type of treatment and regular blood glucose monitoring ($\beta=0.305$, $t=3.024$, $p=0.003$) was associated with diet adherence. Diabetes Mellitus diet intake among patients in India was connected with secondary education and a family history of Diabetes Mellitus (Patel *et al.*, 2012). In a study at Bangladesh by Mumu *et al.* (2014) high school graduates were three times more likely than others to adhere to their diets (OR=3.25; 95% CI: 1.28-8.62). In the same study rural residents were also more likely to stick to their diet than those in urban and semi-urban settings (OR=2.95; 95% CI: 1.25-6.95). However a study in Yemen by Alhariri *et al.* (2017) concluded that urban inhabitants were more likely to adhere (OR=2.2; 95% CI: 1.2-4.2).

Among Nepalese Diabetes Mellitus Type 2 patients the following factors were associated with higher adherence level; those from nuclear families; those who lived closer to the hospital; respondents from the upper middle class; patients with a higher educational level (Parajuli *et al.*, 2014). However in the same study increasing age was associated with decreased adherence. A study in Yemen indicated that patients with Diabetes Mellitus for less than 5 years ($p=0.040$) were more diet adherent than those with Diabetes Mellitus for more than 5 years (Alhariri *et al.*, 2017). In the same study, those employed had a greater rate of adherence (OR=3.3; 95% CI: 1.4-7.9). Another study in Oman by Al-Sinani *et al.* (2010) concluded that women did all cooking and were more likely to adopt to change as they prepare family meals. Men on the other hand

lived a more sedentary life and were more likely to attend social events where they eat foods high in calories, fat and sugar. Studies by Al-Rasheedi (2014) in South Arabia and by Parajuli et al. 2014 in Nepal indicated that male participants had a higher rate of adherence than females. Patients who received practical help from family and friends were 27% more likely to stick to their treatment plan (Miller & DiMatteo, 2013).

A study done in a clinic at Cape town in South Africa revealed that factors influencing adherence at the individual level include self-responsibility, fear of death, achieving a goal, will power, determination, religious beliefs, highly regulated upbringing, self-motivation and knowledge of diabetic diet (Ebrahim *et al.*, 2014). Another study done in South Africa by Muchiri et al. (2012) on needs and preferences for nutrition education revealed that knowledge of appropriate and inappropriate foods was considered important in dietary self-care. A study at Harare central hospital Zimbabwe identified diet education, dislike of recommended foods, attending functions, visiting, lack of satiety, tempting foods, and failing to adjust as factors influencing diet modification (Mukonka *et al.*, 2016). A study done in Botswana by Ganiyu et al. (2013) indicated that non-adherence factors to diet were poor self-discipline and lack of information on diabetic diet. In a study at an Ethiopian hospital on barriers to recommended diet, 87% of the participants cited lack of knowledge or lack of diet education as a barrier, 67% did not believe diet controls blood sugar, 57% mentioned difficulty in remembering recommended diet, and 46% stress (Ayele *et al.*, 2018). In the same study respondents with no formal education were 2.5 times more likely than those with higher education to have poor adherence and those in rural areas were 2.4 times less adherent to dietary practices.

Mbutiti et al. (2016) in a study at Nyeri Provincial Hospital in Kenya, cited belief that adherence was effective in reducing illness and belief that it was their responsibility to take care of themselves as factors facilitating diet adherence. Mugo (2018) in a study on selected hospitals in Nakuru identified knowledge on appropriate foods and perceived benefits and expected results as diet adherence facilitators. A study by Jepkemoi et al. (2018) at Moi teaching and Referral hospital found a positive association between income and frequency of clinic attendance with diet adherence. Another study done at the Kenyan coast on cultural influences of self-management of Diabetes Mellitus identified educational factors (limited knowledge and misconception of DM2), religious beliefs (fasting), social events and cultural values and beliefs

systems as important factors affecting management and treatment (Abdulrehman *et al.*, 2016). The same study also identified economic factors as important in determining adherence. At the individual level researchers have identified several factors which influence diet adherence. Health and socio-demographic factors include, type of treatment, blood glucose monitoring and disease duration, marital status, living arrangements (joint or extended family), gender, age, secondary/higher education, rural area. Other factors identified as enablers are self - responsibility, fear of death, achieving a goal or results, will power, determination, knowledge of appropriate and inappropriate foods.

2.6.2 Small group Level Factors

Researchers in America connected diet adherence to social support from family and friends (Miller & DiMatteo, 2013). Further, functional social support had a greater impact on diet adherence, demonstrating that quality of support is more important than physical presence (Miller & DiMatteo, 2013). Similarly a study done in Iran highlighted family influence as the most important domain in the dietary habits of patients (Azartol *et al.*, 2014). In Oman support from family and friends was important for diet adherence (Alrahbi & Alghenaimi, 2017).

A study in South Africa by Muchiri *et al.* (2012) identified social support from family and support groups as facilitators of following dietary recommendations. In another study in South Africa, diabetic patients reported that receiving support from family members helped them adhere, however half of the patients cited lack of support with regard to meal preparation leading to non-adherence (Ebrahim *et al.*, 2014). A study at Harare central hospital in Zimbabwe identified support from family as a factor influencing diet modification (Mukonka *et al.*, 2016).

In Kenya in a study in Nakuru County among patients with Diabetes Mellitus type 2 concluded that majority (65%) reported family support as a facilitator to diet compliance (Mugo, 2018). Another study in Kenya at Nyeri Provincial Hospital on factors associated with self-care practices cited family and friends support as linked to adherence (Mbutiti *et al.*, 2016). On the other hand Muhabura (2014) in a study at Kenyatta National Hospital identified lack of support from spouse, family members and friends were reasons for non-adherence to diet (Muhabuura, 2014). Family support and that from friends is identified by several researchers as fundamentally important in facilitating diet adherence. The current study will address spouse, other family members and friends support at this level as factors perceived to influencing diet adherence.

2.6.3 Organizational or health care system Level Factors

Sohal et al. (2015) in a study done among South Asians that is Indians, Pakistanis, Malaysians, and Bangladeshi concluded that trust in health care providers was a facilitator for diet adherence. In the same study barriers to adherence included language and communication discordance with health care providers and lack of specific details on south Asian tailored diabetic diet. A study done in India on factors associated with consumption of diabetic diet revealed that visits to dietician were associated with consumption of diabetic diet (Patel *et al.*, 2012). Nepalese Diabetes Mellitus Type 2 (DM2) patients identified distance from hospital, and advice by others rather than physicians as factors influencing adherence (Parajuli *et al.*, 2014). A study in Oman concluded that support from health care providers was an important factor influencing adherence. In the same study long time waiting before being taken to see health care providers were barriers (Alrahbi & Alghenaimi, 2017). In a study in Bahrain the main barriers to adherence included lack of professional dietary assessment, follow up, advice and motivation (Shamsi *et al.*, 2013).

A study in South Africa concluded that health care providers and knowledge that was acquired through education were facilitators of diet adherence (Muchiri *et al.*, 2012). In the same study a participant identified a written meal plan can assist in adherence and the health workers suggested support groups as good facilitators (Muchiri *et al.*, 2012). In another study in South Africa in a Cape Town clinic, patients felt that supportive health care providers who gave services and information encouraged patients to follow self-care management recommendations (Ebrahim *et al.*, 2014). The same study revealed that most patients were satisfied and trusted dieticians on diet related information. Worku et al. (2015) in a study done in Ethiopia poor adherence was significantly associated with nutrition education in hospitals. This study recommended the integration of diabetic based nutrition education with motivation and home gardening in facilitating diet adherence. At Nyeri Provincial Hospital in Kenya a study on factors associated with self-care practices cited availability of doctors and nurses and good relationship with the health care team as factors facilitating adherence (Mbutiti *et al.*, 2016). Lack of documented diet guidelines, according to a study at Kenyatta National Hospital, was a major factor in non-adherence to a diet plan (Muhabuura, 2014). Support by health care providers to patients' especially at the hospital is considered as critically important in diet adherence. Patients' with Diabetes expect to get vital information on disease management from the health

workers. At the organizational and health care level researchers have identified support from health care providers, trust in health care providers and distance from the hospital as factors influencing diet adherence.

2.6.4 Community and Policy Level Factors

A study at Cape Town clinic community or policy level factors influencing diet adherence were cultural events, the cost of food and culturally appropriate diet (Ebrahim *et al.*, 2014). According to Muchiri (2012) in a study done in South Africa barriers to adhering included food insecurity, cost of appropriate foods, physical environmental which also influence accessibility and availability of healthy foods. Others barriers from the same study included distance to supermarkets and high cost of healthy foods. Ayele *et al.* (2018) in a study at an Ethiopian hospital reported that 78% of respondents identified affordability of foods as a barrier to following recommended diet. Worku *et al.* (2015) indicated that facing difficulty in choosing foods, non-availability of fruits and vegetables, and high cost of foods led to non-adherence.

In Kenya, a study done in Nakuru reported that 14% of the patients identified challenges in accessing good quality food in the area as a barrier to diet adherence. Respondents in this study reported that government support could lessen the burden of medication which in turn would lead to more money to buy food (Mugo, 2018). Availability and accessibility to food determines the choices individuals make when purchasing food. This in turn influences eating habits and eventually helps to manage one's health. At community and policy level the factors identified as playing a major role in influencing diet adherence by authors are availability and accessibility to appropriate food.

2.7 Relationship between Factors at individual, Small group, Organizational or Health Care Systems, Community and Policy and Diet Adherence

The interaction between the various factors at the different levels and how they influence diet adherence can lead to a greater understanding of how to formulate and implement intervention programmes (Townsend & Foster, 2011). The socio-ecological model proposes that factors at individual, small group, organizational or health care, community and policy levels work in concert to influence food choices (Townsend & Foster, 2011). McLaren and Hawe (2005) explained that in ecology, adaptation of behaviour is a collective, system level process rather than individual process. This highlights the synergistic nature of these levels in influencing

dietary choices as proposed by the socio-ecological model. Jaworski et al.(2018) in an ecological study done in Poland indicated that patients' inherent predispositions to dietary recommendations have a stronger impact on diet adherence than external circumstances. According to the same study, social support encourages patients to take action, but on its own, it won't make a difference. However a study by Ebrahim et al. (2014) concluded that the individual does not function alone but is affected by other system level processes which influence diet adherence. For Diabetes Mellitus management to be successful Ebrahim et al. (2014) indicated that resources and support should be applied at these levels. This means that there should be individual assessment and collaborative goal setting at the individual level, family support and encouragement at the small group level, group services and programmes that enhance skill and provide support at the organizational or health care system level, and support and resources at the community and policy level (Ebrahim *et al.*, 2014). The relationship or interconnections between the multiple levels of influence help to bring a greater understanding on the diet behavior.

2.8 Conceptual Framework

Factors influencing Diabetes Mellitus type 2 (DM2) patients' dietary adherence was examined in this study. According to Ebrahim et al. (2014) the ecological perspective provides a good framework for examining diabetic self-care management. Factors influencing diet adherence were identified using this framework. The framework considers several levels of influence individual, small group, organizational or health care system, community and policy.

Individual qualities such as demographic, social, health, motivation, Diabetes Mellitus knowledge, determination, willpower, goal achievement, religious views, fear of death, upbringing, and self-responsibility all have a role in adherence to diabetic diet. Support and trust in the health care practitioner were factors at the organizational or health care system level, as well as distance from the hospital. Food availability and accessibility were considerations at the community and policy levels.

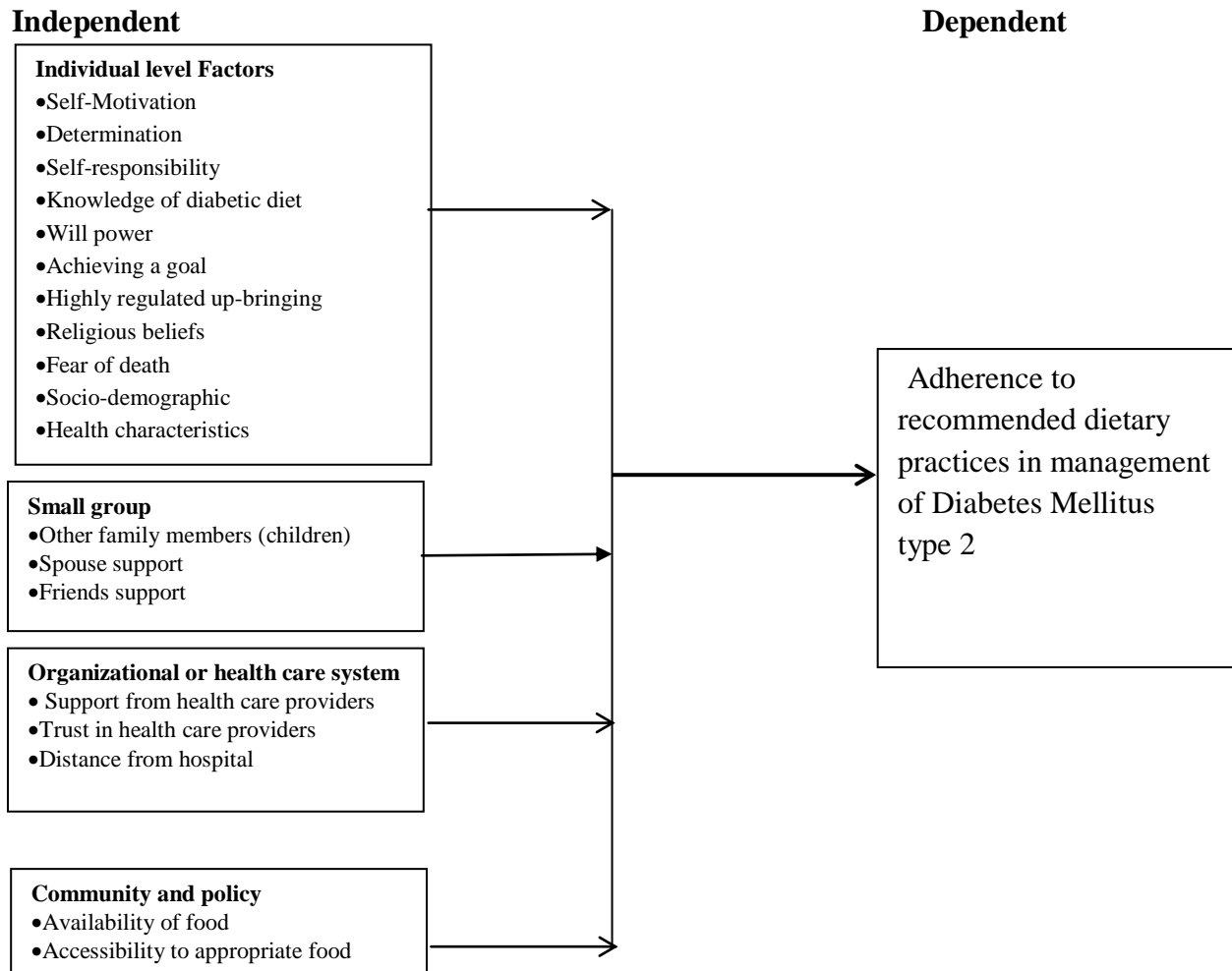


Figure 2.1 : A Conceptual Framework showing Social Ecological Model for factors influencing adherence to diet. (Adopted from Ebrahim, *et al.*, 2014).

2.9 Summary of literature review and Gaps addressed

Diabetes Mellitus is both a global and national burden which requires proper management to avert possible complications and mortality attributed to the disease. Adherence to recommended dietary practices ensures that glycemic levels are maintained within the desirable range. Studies done have indicated that patients with Diabetes Mellitus type 2 (DM2) face challenges in adhering to recommended diet. In Kenya, some studies indicate that most patients with DM2 partly adhere to diet recommendations, however complications resulting from DM2 are a challenge. Poor dietary practices result in poor glycemic control resulting in morbidity and mortality. Identifying factors that influence diet adherence can help bridge the gap which can help develop holistic intervention programmes that enhance diet adherence.

In this study the ecological approach was adapted, which establishes factors influencing diet adherence at various levels that is individual, small group, organizational or health care system, community and policy. The interconnections between the multiple levels of influence can also help build more effective interventions for diabetes diet management. Also there is limited information on factors influencing diet adherence among Diabetes Mellitus type 2 patients in Kenya.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter explores the methodological approach and covers the study setting, study population, research design, sample size determination, sampling procedures, research tools, data collection procedures, validity and reliability, measurement of variables and data analysis.

3.2 Study Setting

The study was conducted at the Moi Teaching and Referral Hospital's Cancer and Chronic Disease Centre, in Kenya (Appendix I). Eldoret National Referral Hospital is the second largest hospital in Kenya after Kenyatta National Referral Hospital (KNH). There are 800 beds in the hospital and patients come from western Kenya, eastern Uganda, and southern Sudan to be treated there. The clinic is anticipated to treat 1000 patients a day for a variety of diseases, based on current estimates. In Uasin Gishu, there are 894,179 inhabitants, with 50 percent men and 50 percent women, according to the 2009 National Statistics. Uasin Gishu is largely a cosmopolitan region with the dominant ethnic group being the Kalenjin. Other communities living in the region are Luyha, Kikuyu, Luo, Kamba, Kisii among others. Although traditionally pastoralists, modern Kalenjin communities are mainly large scale wheat and maize farmers earning the County the name "Kenya's bread basket". Other crops cultivated are barley, sunflower, coffee, wheat, beans, millet, sorghum, Irish potatoes, tomatoes, kales, cabbages, carrots, onions, local vegetables, passion fruit, and avocado. Dairy farming is also done in large scale in most parts of the county.

The study was conducted at the Diabetic clinic located at the cancer and chronic disease center which operates on Monday, Thursday, and Friday Diabetes Mellitus clinic. An average of 34 patients with Diabetes mellitus type 2 (DM2) visit the hospital per clinic day. The clinic has one resident doctor, two nutritionists and two nurses. Patients visiting the clinic for the first time are charged 300 Kenya shillings and a blood sugar test is 150 Kenya shillings. Patients return for revisits after 3 or 6 months and are charged 200 Kenya shillings for consequent visits.

3.3 Study Population

The population comprised of adult male and female patients 30 years and above diagnosed with Diabetes Mellitus Type 2 (DM2) for at least 6 months and were attending outpatient clinic at

Moi Teaching and referral Hospital. This age was targeted because according to the clinic records, most of the DM2 patients were 30 years and above. DM2 is associated with older adults with onset age been >45 however younger people are also developing the disease due to obesity and other life style changes. The age has also been used in other research work in DM2 patients (Ganiyu *et al.*, 2013; Adem *et al.*, 2014; Mohammed, 2010, Musee *et al.*, 2016). The age group is also considered to be independent in decision making including when and what they eat (Musee *et al.*, 2016).

3.3.1 Inclusion Criteria

Male and female patients 30 years and above diagnosed with DM2 at least 6 months prior to the start of the study. They had received diet counseling either from a nutritionist or any other health worker and had visited the clinic more than once.

3.3.2 Exclusion Criteria

Patients who were too weak to respond to questions were excluded from the study and those with chronic kidney disease (CKD) and on dialysis.

3.4 Study Design

The study employed a descriptive cross-sectional study design where the researcher sought to collect information from a number of respondents.

3.5 Sample Size Determination and Sampling Procedures

3.5.1 Sample Size Determination

A sample of 203 respondents was calculated using the Yamane's method formula (Yamane, 1967) which was the minimum sample size required for the study. Records obtained from the hospital, indicated that 412 patients with Diabetes mellitus type 2 (DM2) were expected to visit the clinic during the data collection period. The sample size was determined as follows using the Yamane's method formula in equation (i).

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

Where:

n = the desired sample size

N = the total population which was 412

e = the level of statistical significance level which was

$$n = \frac{412}{1 + 412(0.05^2)}$$

Therefore the total sample size = 203 respondents

An additional 38 patients were included after consideration of non-response was done at 18% giving a total sample of 203+38=241 respondents.

3.5.2 Sampling Procedures

All the Diabetes Mellitus Type 2 (DM2) patients expected to visit the clinic during the four week period were given an equal opportunity to participate. Simple random sampling was used to avoid bias in selecting the respondents for the study and to give each respondent an equal chance. From the hospital records 34 patients who met the inclusion criteria were expected to visit the clinic on each clinic day. This sampling frame was used to recruit 20 respondents per day. All the 34 patients expected to visit the clinic per day were assigned random numbers ranging from 1 to 34. A random number table was used to pick respondents using 2 digit numbers. After a starting point was determined a direction was established for movement and the first 20 numbers with 2 digits were selected until the desired sample of 20 was reached.

3.6 Data Collection Instruments

3.6.1 Quantitative

3.6.1.1 Questionnaire

Questionnaire was used to obtain information on patient's details, socio-demographic, health factors, and the factors that influence adherence at the various levels i.e. individual, family and small group, organization and health system, community and policy (Appendix III).

3.6.1.2 Food Frequency Questionnaire

A food frequency checklist was adapted from FANTA and was used to assess the variety of food consumed by the respondents (Appendix IV).

3.6.1.3 Food Record

A three day food record of two week days and one weekend (adapted from Rivellesse *et al.*, 2008 and Alhassan *et al.*, 2008) was used to collect dietary information from the respondents. The food record collected information on food consumed by the patients' by type and amount of food and beverage, time of eating, and method of cooking. The food record was used to derive servings of starches and bread, vegetables, fruits, milk and milk products, meats and meats products, of individuals (Appendix V).

3.6.2 Qualitative

3.6.2.1 Key Informant Interview Guide

Key Informant Interview guide was used to gather information from one diabetic nurse and one doctor who were attending to the diabetic patients and lastly the head nutritionist stationed at the clinic, and therefore conducting a total of 3 interviews (Appendix VI).

3.7 Data Collection Procedures

3.7.1 Quantitative

3.7.1.1 Questionnaire

A questionnaire with both closed and open-ended questions was administered to the respondents to gather information on patient's details, socio-demographics and identify factors perceived to influence diet adherence using the ecological model. The researcher and four trained research assistants administered the questionnaire (Appendix III). Where translations were required, they were done in Kiswahili for clarity. Translation from English to Kiswahili version was done using a translation machine by an expert in language and African studies.

3.7.1.2 Food Frequency Questionnaire

The researcher administered Food Frequency Questionnaire [FFQ] (Appendix IV) adapted from FANTA to identify variety and frequency of foods consumed by the respondents. The check list was divided into eight sections (food groups) i.e. cereals and cereal products, legumes, roots and tubers, fruits, vegetables, meats and meat substitutes, fats and oils and sweets and beverages. The FFQ was categorized to collect information on frequency of consumption of foods of high fiber or low fibre cereals and cereal products, high and low fibre legumes, high and low fibre roots and tubers, high fiber fruits and low sugar fruits, high fibre and low fibre vegetables, low fat and high fat animal products, animal and vegetables fats and oils and lastly sweets and beverages

with low and high sugar. Respondents were required to tick against the various foods indicating frequency of consumption as follows: always, sometimes, occasionally or never.

3.7.1.3 Food record

During recruitment of the respondents telephone contacts were retrieved from the records at the clinic. Respondents who met the inclusion criteria were called and verbal consent was sought after explaining the purpose of the study. They were instructed to record all food and drinks consumed for three consecutive days one day been a weekend. The respondents were to clearly indicate the time and quantities of food and beverages consumed and method of preparation. A follow up call was made two days before patient's next visit. On the scheduled clinic day the patients brought a three day food record which is a written report of food consumed daily (Appendix V) to the clinic, and clarification was done on the record, confirming record done of food consumed and quantities using photographs of pre-weighed foods (Appendix XVI).

3.7.2 Qualitative

3.7.2.1 Key Informant Interview

A resident doctor attending to diabetic patients and the head nurse trained to manage diabetic patients were selected as key informants. The head nutritionist involved in diet counseling especially after diagnosis and when the doctor felt that the patients were having challenges meeting their dietary requirements was also recruited as a key informant. Interviews were scheduled on different days and a Key Informant Guide (Appendix VI) was used during the interview. The discussion was recorded and notes were taken on important point highlighted. All the three interviews were conducted by the researcher 2 weeks before interviews with patients begun. Information gathered from the interview consisted of; dietary recommendations for the Diabetes Mellitus type 2 patients, the view of the health workers on adherence of diet by the patients and factors influencing diet adherence.

3.8 Pre-testing

A pilot study was done to test the instruments which according to Mugenda & Mugenda (2003) 10% to 30 % can be used depending on the sample size. In this study 10% of the sample size was used in the pilot study and it included patients with Diabetes Mellitus Type 2 attending the diabetic clinic at Moi Teaching and Referral hospital. Patients recruited in the pretest sample were those visiting the clinic one month before the data collection period, and their next clinic

day was outside the data collection period. Pretesting was done to assess whether the questions asked were clear and were interpreted in the same way by the respondents. The respondents gave feedback and adjustments were done where necessary.

3.9 Validity and Reliability

The term validity means that inferences based on study results are accurate, trustworthy, and relevant (Mugenda, 2008). The supervisors' expert judgment was used to confirm the instruments' content validity, which resulted in an improved instrument that could collect accurate and relevant information.

Research instruments are judged on their capacity to produce consistent results or data over a period of time (Mugenda, 2008). A reliability test of Cronbach's alpha was generated to determine whether the questions were answered in the same way. The results of the test was $\alpha=0.79$ (n=24) which indicated an acceptable internal consistency.

3.10 Measurements of Variables

3.10.1 Dependent Variable

Adherence was the dependent variable and was measured by respondents' ability to follow the recommended dietary guidelines. Reference for recommended diet was made to guidelines provided at the clinic by health professionals (Appendix XVII). Aspects of adherence that were assessed included those obtained from self-reporting using a questionnaire that is reduced intake of sugar and salt, avoiding alcohol consumption and smoking (Appendix III). It also included ideal consumption of servings of starches and bread, vegetables, fruits, milk and milk products, meat and meat substitutes, fats, fiber, caloric intake and number of meals consumed obtained from food dairies (Appendix V). This 9 attributes were selected as proxy since there is no standard way of assessing diet adherence.

Food diaries were used to determine adherence to individual ideal consumption of serving for starches and breads, vegetables, fruits, milk and milk products, meat and meat substitutes, fats, fibre and caloric intake for (Appendix V). First the Harris Benedict equation was used to calculate Basal Metabolic Rate (BMR) requirements for each of the 241 respondents using weight in kilograms, height in centimeters and age in years. Total energy requirements were obtained by multiplying BMR and the activity level. With reference to Kenya National Clinical

Nutrition and Dietetics manual, the number of exchanges from each food group based on individual energy requirements were identified (Appendix XII). The calculated servings were then transferred into individual score sheets with each sheet bearing the code that appears on the corresponding questionnaire. The number of servings from each food group was calculated by converting the portion sizes into exchange servings. This was done for all the three days and an average was derived for the three days (adapted from Rivellese *et al.*, 2008 and Alhassan *et al.*, 2008). All the food servings were then converted into energy consumed by the respondents by multiplying the number of exchanges consumed by the kilocalories per serving (Appendix XII). Consumption over the recommended dietary guideline received a score of 2; those consuming within the recommended dietary guideline were awarded 1 point; and zero points were awarded for intake less than recommended dietary guideline. Final adherence score was obtained from 13 aspects scoring criteria for DASH diet adherence adopted from Epstein *et al.* (2012). Diet adherence level for each individual was obtained by calculating a percentage from the 13 aspects. A diet adherence score of <50% was considered as non adherence with 50-75% been partial adherence, and a score of >75% been good adherence. An average of the respondents percentages was calculated to determine mean diet adherence level.

3.10.2 Independent Variables

3.10.2.1 Individual Level Factors

The ecological model was applied in identifying individual factors that influence diet adherence. A questionnaire was used to assess the level of agreement by respondents for factors perceived to influence diet adherence at the individual level (Appendix III). The factors included self-motivation, determination, self-responsibility, knowledge of diabetic diet, will power, achieving a goal, highly regulated up-bringing, religious beliefs, and fear of death. A five point likert scale was used to measure the level of agreement of respondents on perceived factors that influence diet adherence ranging from 1=strongly disagree, 2=disagree, 3=undecided, 4=agree and 5=strongly agree (Appendix III).

Socio-demographic characteristics of the respondents were also investigated to establish association. They included marital status, monthly income, sex, age, type of family, education status, residential area, and employment status. Others were health factors, duration of Diabetes Mellitus, duration of Diabetes Mellitus, treatment for Diabetes Mellitus, frequency of monitoring

sugar levels, body mass index (BMI), frequency of seeking nutrition advice, healthy diet in control of Diabetes Mellitus, are your sugar levels controlled, consumption of alcohol, smoking status. BMI was calculated using height and weight while current blood sugar level was obtained from patients' hospital record on the clinic day.

3.10.2.2 Small Group Level Factors

Using the ecological model factors which may influence diet adherence included support from spouse, support from other family's members and friends. Respondents were required to indicate their level of agreement for the factors as presented in (Appendix III).

3.10.2.3 Organizational or Health Care Systems Level Factors

These are those factors that emanate from the health system according to the ecological model. They included support from health care provider; trust in health care provider, and distance from hospital. These were also measured using a five point likert scale (Appendix III).

3.10.2.4 Community and Policy Level Factors

In the ecological model factors in this level include availability and accessibility of food and were determined from close ended questions with ordinal items as perceived by the participant (Appendix III).

3.11 Data Analysis

3.11.1 Qualitative

Qualitative data obtained from key informant interviews was studied and analyzed thematically. The information collected was analyzed based on study objectives.

3.11.2 Quantitative

Data collected was coded and entered into IBM SPSS software version 22 (Illinois Chicago) for statistical analyses. Frequencies and percentages were calculated for socio-demographic and health factors and comparisons with diet adherence done using chi-square and odds ratio. Level of diet adherence was analyzed using a 13 point score which was converted into a percentage for each respondent. Mean diet adherence for the entire population was obtained by an average of all respondents individual percentages.

Factors perceived to influence diet adherence at the various levels were obtained by tallying all the responses from the respondents. Frequencies and percentages were then calculated. Chi-square test was used to further analyze the association between diet adherence and these factors at the various levels in isolation. Socio-demographic and health characteristics were tested for association to diet adherence by using chi-square. To determine relationship between the factors perceived to influence diet adherence at the individual, small group, organizational or health care system, community and policy multiple linear regression was used. Confidence level at 95% was used to show precision and a P-value of ≤ 0.05 was considered statistically significant. Data was presented using tables of frequencies and percentages as well as verbatim reporting.

Table 3.1: Summary of Data Analysis

Objectives	Data collection technique	Data analysis and presentation
To assess diet adherence of Diabetes Mellitus Type 2 patients attending clinic at MTRH.	Food frequency Questionnaires Food Record Key informant Interview	a.Descriptive statistics i.e. frequencies and percentages. Frequencies table. b.Key informant summary. c. Content analyses
To establish the factors at individual, small group, organizational or health care system, community and policy levels influencing diet adherence.	Questionnaires Key informant interview	a.Descriptive statistics i.e. frequencies and percentages. Frequencies tables. b.Inferential statistics chi-square. odds ratio
Determine relationship between factors at individual, small group, organizational or health care system, community and policy levels and diet adherence.	Questionnaires Food record	a.Descriptive statistics i.e. frequencies and percentages. b.Inferential statistics i.e. multiple linear regression,

3.12 Ethical Considerations

Approval to carry out the study was sought from the School of Graduate Studies (SGS). Ethical clearance was sought from the Maseno University Ethics Review Committee (MUERC). Hospital approval was sought and ethical clearance granted by Institutional Research and Ethics Committee (IREC) at Moi Teaching and Referral Hospital. Verbal and written informed consent was sought from respondents before data collection begun. Confidentiality was assured by respondents not being required to indicate their names on the questionnaires; instead a number was given to the respondent which was indicated on the questionnaire. Permission was sought

from the hospital to access patient's records during recruitment to identify type of Diabetes Mellitus, duration of illness, number of times patient had visited the clinic, and patients' contacts. Blood glucose levels, age, height and weight were obtained from the respondents during data collection. Data collected was stored in the researchers' computer which was secured with a password and hard copies looked up in cabinets.

CHAPTER FOUR

RESULTS

4.1 Introduction

In this chapter findings of the study are presented under the following sub-headings: Socio-demographic, health and nutritional characteristics of the respondents; diet adherence of the respondents; factors influencing adherence; the relationship between the characteristics/factors and diet adherence.

4.2 Socio-demographic and Health Characteristics of the Respondents

4.2.1 Socio-demographic Characteristics of the Respondents

A total 241 respondents participated in the study with the majority being female 150 (62%). The mean age of the respondents was of 57.5 years. A total of 44.8% respondents had attained only primary school education and 11.2% had no formal education. More than half of the respondents lived in urban area 122 (51%). Of the 241 respondents those married were 203 (84%) with most living in nuclear family settings 90.8%. Those reporting having an income of ≤ 5000 and those with no income were 64% as shown in Table 4.1.

Table 4.1: Socio-demographic Characteristics of Respondents n=241

Characteristic	Gender				Total	
	Male		Female		n	%
	n	%	n	%		
Age						
≤30 years	1	(0.4)	1	(0.4)	2	(0.8)
31 – 40 years	13	(5.4)	9	(3.7)	22	(9.1)
41 – 50 Years	14	(5.8)	25	(10.4)	39	(16.2)
51 – 60 Years	27	(11.2)	55	(22.8)	82	(34.0)
60 ≥ years	36	(14.9)	60	(24.9)	96	(39.8)
Marital Status						
Single	3	(1.3)	9	(3.7)	12	(5.0)
Married	86	(35.7)	117	(48.5)	203	(84.2)
Divorced	0	(0)	1	(0.4)	1	(0.4)
Widow/widower	2	(1.0)	22	(9.1)	24	(10.4)
Separated	0	(0)	1	(0.4)	1	(0.4)
Educational Status						
Primary	35	(14.5)	73	(30.3)	108	(44.8)
Secondary	28	(11.6)	34	(14.1)	62	(25.7)
Tertiary	25	(10.4)	19	(7.9)	44	(18.3)
None	3	(1.3)	24	(10.0)	27	(11.2)
Kind of Family						
Nuclear	86	(35.7)	133	(55.1)	219	(90.8)
Extended	5	(2.1)	17	(7.1)	22	(9.2)
Employment Status						
Unemployed	13	(5.4)	31	(12.8)	44	(18.2)
Employed	16	(6.6)	11	(4.6)	27	(11.2)
Self Employed	49	(20.3)	42	(17.4)	91	(37.8)
Casual	5	(2.1)	7	(2.9)	12	(5.0)
Pensioner	8	(3.3)	5	(2.1)	13	(5.4)
House Wife	0	(0)	54	(22.4)	54	(22.4)
Monthly Income						
≤5000 Kshs.	30	(12.4)	43	(17.8)	73	(30.2)
5001 – 10000 Kshs.	5	(2.1)	14	(5.8)	19	(7.9)
10001 – 15,000 Kshs.	12	(5.0)	2	(0.8)	14	(5.8)
15001 – 20000 Kshs.	6	(2.5)	8	(3.3)	14	(5.8)
≥ 20000 and above	26	(10.8)	13	(5.4)	39	(16.2)
None	12	(5.0)	70	(29.0)	82	(34.0)
Area of Residence						
Urban	46	(19.1)	76	(31.5)	122	(50.6)
Rural	45	(18.7)	74	(30.7)	119	(49.4)

Key: n = Frequency; % Percentage

4.2.2 Health Characteristics of the Respondents

Almost half of the respondents 109 (45%) had Diabetes Mellitus Type 2(DM2) for 5 years. Majority of the respondents 70% had normal blood glucose levels and 92.6% reported having controlled sugar levels. Most of the respondents 62.7% sought dietary advice from the nutritionists, however only 33% sought advice always on clinic days. Almost all of the respondents 96.2% believed that a healthy diet helps control diabetes. In relation to treatment 97.9% controlled diabetes through use of medication and a diet regime. More than half of the respondents 57.3% monitored blood sugar levels occasionally mainly during clinic visits. Results indicated that 74% of the respondents had a BMI of $>24\text{kg/m}^3$ (overweight and obese). Alcohol consumption and smoking was avoided by majority of the respondents 95.9% and 98.3% respectively as shown in Table 4.2.

Table 4.2: Health Characteristics of Respondents n=241

Characteristics	Gender					
	Male		Female		Total	
	n	%	n	%	n	%
Blood glucose level(ADA)						
High- (FBS>7.2, RBS>10mmol/L)	28	(11.6)	37	(15.4)	65	(27.0)
Normal- (FBS≤7.2, RBS≤10mmol/L)	62	(25.7)	107	(44.4)	169	(70.1)
Low- (<3.9 mmol/L)	1	(0.4)	6	(2.5)	7	(2.9)
Duration since diagnosis of DM2						
0-5years	40	(16.6)	69	(28.6)	109	(45.2)
>5years-10years	16	(6.6)	39	(16.2)	55	(22.8)
>10years	35	(14.5)	42	(17.4)	77	(31.7)
Whom do you seek dietary advice from?						
Doctor	20	(8.3)	30	(12.4)	50	(22.2)
Nurse	2	(0.8)	13	(6.7)	15	(6.2)
Clinical Officer	1	(0.4)	5	(2.1)	6	(2.5)
Nutritionists	61	(25.3)	90	(37.4)	151	(62.7)
Family member	7	(2.9)	9	(2.5)	16	(5.4)
Others (friends, books, internet, magazines other DM2 patients)	0	(0.4)	3	(1.3)	3	(1.7)
Frequency of advice at clinic						
Always	35	(12.1)	49	(20.9)	84	(33.0)
Occasionally	49	(21.3)	87	(31.0)	136	(52.3)
Never	7	(2.9)	14	(5.8)	21	(8.7)
Healthy diet helps control Diabetes Mellitus						
Yes	90	(36.8)	145	(59.4)	235	(96.2)
No	1	(0.4)	5	(3.4)	6	(3.8)
Treatment for Diabetes Mellitus						
Medication and diet	90	(37.3)	146	(60.2)	236	(97.9)
Diet only	1	(0.4)	4	(1.7)	5	(2.1)
Are your sugar levels controlled?						
Yes	88	(36.5)	135	(56.0)	223	(92.5)
No	3	(1.2)	15	(6.2)	18	(7.5)
Frequency of monitoring your blood sugar levels?						
Always	45	(18.7)	58	(24.1)	103	(42.7)
Occasionally	46	(19.1)	92	(38.2)	138	(57.3)
BMI						
Under weight <18.5kg/m ²	4	(1.7)	4	(1.7)	8	(3.4)
Normal 18.5-24.9kg/m ²	29	(12.0)	26	(10.8)	55	(22.8)
Over weight 25-29.9kg/m ²	41	(17.0)	52	(21.5)	93	(38.6)
Obese 1 30<35kg/m ²	15	(6.2)	43	(17.8)	58	(24.0)
Obese 2 35<40kg/m ²	2	(0.8)	18	(7.5)	20	(8.3)
Obese 3 <40kg/m ²	0	(0.0)	7	(2.9)	7	(2.9)
Alcohol intake						
Yes	9	(3.7)	1	(0.4)	10	(4.1)
No	82	(34.1)	149	(61.8)	231	(95.9)
Smoking status						
Yes	4	(1.7)	0	(0)	4	(1.7)
No	87	(36.1)	150	(62.2)	237	(98.3)

Key: n = Frequency; % Percentage

4.3 Diet Adherence among Diabetes Mellitus Type 2 Respondents

Adherence to recommended dietary guidelines for Diabetes Mellitus type 2 (DM2) was determined using a 13 point score of which a percentage was obtained. The aspects of adherence included ideal consumption of servings of starches and bread, vegetables, fruits, milk and milk products, meat and meat substitutes, fats, fiber, calorie intake and ideal frequency of meals. Others included reduced salt and sugar intake, avoiding consumption of alcohol and smoking as shown in Table 4.3. The results indicated that the average adherence level was 48.6%. Health works reported on dietary practices of the respondents. A nutritionist reported “*Good adherence 70% especially the educated ones, non-adherence very few and partial adherence could be at 30%*”. A doctor reported challenges in diet adherence “*40% partially adherence to dietary practices*” this was also collaborate by a nurse. Results further indicated that, 182 (75%) of the respondents consumed more than the recommended individual requirements of starches and bread. Majority of the respondents 214 (88%) had less than the recommended intake of fruits while 177 (73%) had less than the recommended intake of milk and milk products. Under intake of meat and meat substitutes was also observed in 49% of the respondents. Most of the respondents 88.8% and 57.2% consumed less than recommended requirements of fruits and vegetables respectively. For fiber 66% of respondents consumed adequate amounts. Elevated calorie intake was observed among 48% of the respondents. Majority of the respondents 95% adhered to frequency of meals as recommended per day. Reduced intake of salt and sugar intake was observed as shown in Table 4.3.

Table 4.3: Adherence to recommended dietary guidelines for respondents with DM2

Dietary guidelines	AI n (%)	UI n (%)	OI n (%)
Starches and bread (6-11 servings per day)	48 (19.9)	11 (4.6)	182 (75.5)
Vegetables (3-5 servings per day)	99 (41.1)	138 (57.2)	4 (1.7)
Fruits (2-4 servings per day)	27 (11.2)	214 (88.8)	0
Milk and milk products (2-3 servings per day)	63 (26.2)	177 (73.4)	1 (0.4)
Meat and meat substitutes (2-3 servings per day)	82 (34.0)	119 (49.0)	40 (17.0)
Fats (use sparingly less than 2 servings per day)	143 (59.3)	69 (28.6)	29 (12.1)
Fiber (22-35 grams per day)	158 (66%)	83 (34.0)	0
Caloric intake (1500-2500)	85 (35.3%)	40 (16.0)	116 (48.1%)
Frequency of meals per day (6 meals)	230 (95.0)	11 (5.0)	0
Reduced salt (\leq 2400mg per day)	229 (95.0)	0	12 (5.0)
Reduced use of sweetened foods and beverages	231 (96.0)	0	10 (4.0)
Alcohol (avoid)	231 (94.9)	0	10 (4.1)
Smoking (avoid)	237 (98.3)	0	4 (1.7)

Food frequency questionnaires were used to assess the frequency with which various foods were habitually consumed by the respondents in general (Appendix XI). Study results indicated that most of the high fiber foods were not consumed as frequently (always) by the respondents. In the study 31% of low fiber cereals and cereal products compared to 23.1% of high fiber foods were consumed always by respondents. Most of the high fiber legumes 41.4% were never consumed by the respondents. Only 26.7% of roots and tubers high fiber were always consumed by the respondents. Also 29% of fruits containing high fiber were always consumed compared to 24.3% with low fiber. However 54% of high fiber vegetables were always consumed by the respondents. Further results indicated that 62% of high fat foods from meats and animal products were never consumed by the respondents. However 92% of the respondents used oils high in saturated fats mainly from palm oil while cooking. Results from this study indicated that 86% of high sugar foods were never consumed by the respondents as shown in Table 4.4.

Table 4.4: Types of food and Frequency of Consumption by Respondents

Food Group	Always	Sometimes	Occasionally	Never
Cereals and cereal products				
High Fiber	387(23.1%)	339(20.1%)	118(7.15)	829(50.0%)
Low fiber	296(31.0%)	265(27.7%)	93(9.7%)	302(31.6%)
Legumes				
High fiber	428(26.0%)	424(25.3%)	129(7.7%)	692(41.4%)
Roots & tubers				
High fiber	295(26.7%)	350(29.3%)	140(11.7%)	410(34.3%)
Low fiber	115(16%)	116(16.2%)	71(10.1%)	415(57.9%)
Fruits				
High fiber	744(29.0%)	1173(45.8%)	143(5.6%)	502(19.6%)
Low sugar	58(24.3%)	46(19.2%)	19(7.9%)	116(48.5%)
Vegetables				
High fiber	1336(53.9%)	415(16.7%)	214(8.6%)	515(20.8%)
Low fiber	218(45.6%)	43(9.0%)	25(5.2%)	192(40.2%)
Meats & animal products				
Low fat	366(21.9%)	410(24.5%)	180(10.8%)	717(42.9%)
High fat	336(15.6%)	357(16.6%)	114(5.3%)	1344(62.5%)
Fats and oils				
Animal fats	24(10.0%)	16(6.7%)	4(1.7%)	195(81.6%)
Vegetable oils	220(92.1%)	12(5.0%)	3(1.3%)	4(1.7%)
Sweet & beverages				
Low sugar	285(59.6%)	23(4.8%)	9(1.9%)	161(33.7%)
High sugar	24(1.3%)	119(6.2%)	108(5.6%)	1661(86%)

Methods used in cooking were assessed and results indicated that vegetables were cooked mainly by stir frying and sautéing. Most of the respondents boiled green vegetables i.e. *Murere, Mito, Thisaga, Kunde, Managu* then fried them in oil or fat with onions and tomatoes, some added cream or fresh milk. Meats, poultry and meat products were mainly stewed while roots and tubers were cooked using boiling, steaming and stewing. For legumes the results indicated that stewing was the most popular method of cooking.

Table 4.5: Frequencies of Methods of Cooking Used by Respondents

Food group	Method of cooking	n %
Vegetables	Steaming	9 (4.0)
	Boiling	7(3.1)
	Sautéed/Stir Frying	208(91.6)
	Eaten raw	3(1.3)
Meats, poultry and meat Products	Boiling	11(8.85)
	Stewing	69(55.0)
	Shallow frying	31(24.8)
	Deep frying	13(10.4)
	Grilling	1(1.0)
Roots and tubers	Boiling/steaming	70(59.8)
	Frying	13(11.1)
	Stewing	31(26.5)
	Roasting	2(1.7)
	Eaten raw	1(0.8)
Legumes	Stewing	84(59.5)
	Roasting	6(4.3)
	Frying	40(28.4)
	Boiling	11(7.8)

Table 4.6: Diet Adherence level by Gender

Gender	< 50% diet adherence level	≥ 50% diet adherence level	Total
Male	39 (16.2%)	52(21.6%)	91
Female	62 (25.7%)	88(36.5%)	150
Total	101 (41.9%)	140 (58.1%)	241

4.4 Factors Influencing Diet Adherence among Diabetes Mellitus Type 2 Respondents

4.4.1 Individual level Factors

According to the ecological model at the individual level, factors influencing adherence include socio-demographic, health, cognitive and psychological. To determine whether socio-demographic factors influence diet adherence, analyses was done using chi-square test of goodness fit. Chi-square results indicated that there was significant association between marital status $\chi^2 (1) = 2.113$, $p \leq .05$, monthly income $\chi^2 (2) = 1.461$, $p \leq .05$ and diet adherence as shown in Table 4.7. A doctor attending to patients reported that “*Factors are level of education, income, sex and age. I also feel that more women than men adhere to diabetic diet, female patients are more responsive to what is required of them when it comes to diet. Then there is age, young and*

older people tend to adhere more than people in their middle age. Alcohol and drug abuse which is common in men is responsible for non-adherence”. A nurse attending to patients reported that “education and sex influence adherence”. A nutritionist reported that “income and knowledge influence adherence”.

Table 4.7: Association of Socio-demographic Factors and Diet Adherence to recommended dietary guidelines of respondents

Variables	χ^2	Df	p-value
Age	0.173	1	0.674
Marital status	2.113	1	0.014*
Education status	0.572	1	0.450
Kind of family	1.401	2	0.496
Employment status	1.774	5	0.183
Monthly income	1.461	2	0.048*
Residential area	0.856	1	0.335

Key: $p \leq 0.05$

Further analysis between socio-demographic factors and diet adherence was done using odds ratio. Results showed that those with income (OR 3.117; 95% CI: 1.578, 6.398) were more likely to adhere to the diet than those with no income as shown in Table 4.8.

Table 4.8: Association of Socio-demographic Factors and Diet Adherence.

Characteristic	Comparison	OR value	(95% CI)
Sex	Female		
	Male	0.560	(0.293-1.097)
Age	61 years and above		
	30-60 years	0.742	(0.323-1.360)
Marital status	No spouse		
	With spouse	0.914	(0.452-2.171)
Type of family	Extended		
	Nuclear	1.201	(0.398-3.623)
Education status	No formal education		
	With formal education	0.696	(0.261-1.855)
Current employment status	Unemployed		
	Employed	1.513	(0.809-2.828)
Income status	No income		
	With income	3.177	(1.578-6.398)*
Residential area	Rural		
	Urban	1.562	(0.664-3.673)

To determine whether health factors influence diet adherence chi-square goodness of fit test was done. Results indicated that there was significant association between duration of Diabetes Mellitus $\chi^2 (4) = 3.931$, $p \leq .05$, treatment for Diabetes Mellitus $\chi^2 (2) = 10.503$, $p \leq .05$, frequency of monitoring blood sugar levels $\chi^2 (1) = 4.551$, $p \leq .05$, and BMI $\chi^2 (10) = 18.955$, $p \leq .05$ and diet adherence as shown in Table 4.9.

Table 4.9: Association of Health Factors and Diet Adherence

Variable	χ^2	Df	<i>p</i>-value
Blood sugar levels	2.519	2	0.250
Duration of Diabetes Mellitus	3.931	4	0.040*
Whom do you seek dietary advice from	2.276	5	0.810
Frequency of dietary advice at clinic	0.285	3	0.963
Healthy diet helps control Diabetes Mellitus	0.497	1	0.451
Treatment for Diabetes Mellitus	10.503	2	0.005*
Are your sugar levels controlled	0.299	1	0.584
Frequency of monitoring blood sugar levels	4.551	1	0.033*
BMI	18.997	10	0.040*
Alcohol intake	1.164	2	0.559
Smoking status	0.310	2	0.856

Key: $p \leq 0.05$, BMI - Body Mass Index

Further analysis between health factors and diet adherence was done using odds ratio. Results indicated that respondents on medication and diet were more likely to adhere to the recommended diet than those on diet only (OR .076; 95% CI: .007, 0.780) as shown in Table 4.10.

Table 4.10: Association of Health Factors and Diet Adherence

Characteristic	Comparison	OR	(95% CI)
BMI	$\geq 25 \text{ kg/m}^2$ $< 25 \text{ kg/m}^2$	1.252	(0.688-2.280)
Duration of Diabetes Mellitus	More than 6years 5 year and less	0.541	(0.230-1.271)
Frequency of seeking nutrition advice	Rarely Frequently	0.886	(0.498-1.575)
Healthy diet in control of Diabetes Mellitus	Yes No	0.758	(0.176-3.253)
Frequency of monitoring sugar levels	Occasionally Always	1.202	(0.685-2.109)
Are your sugar levels controlled	No Yes	0.744	(0.255-2.171)
Treatment for Diabetes Mellitus	Medication and diet Diet only	0.076	(0.007-0.780)*
Do you consume alcohol	No Yes	0.826	(0.151-4.504)
Do you smoke	No Yes	0.286	(0.014-5.975)
Sugar level	Normal High/low	1.080	(0.606-1.925)

Descriptive data analyses for cognitive and psychological factors under the individual level perceived to influence diet adherence was indicated 91% of the respondents identified self-motivation, determination, and self-responsibility as factors influencing diet adherence. Knowledge of Diabetes Mellitus diet was identified by 90% of the respondents as influencing adherence, achieving a goal and will power were identified as factors by 87% of the respondents. Highly regulated up bringing in childhood was identified by 66% as important and 60% of the respondents believed that religious beliefs played a role in diet adherence. Fear of death was indicated by 51% of the respondents as reason for changing dietary habits. A chi-square test was performed to examine the relation between diet adherence and the psychological and cognitive factors perceived to influence diet adherence. Results indicated that there was no significant association between diet adherence and factors in isolation at this level $p > 0.05$ Table 4.11.

4.4.2 Small Group Level Factors

At this level factors perceived to influence diet adherence are interpersonal which form relationships of which the individual is a participant. Majority of the respondents 82% identified family members especially support from their adult children as a major factor contributing to diet adherence. Spouse support and friends support was identified by 76% and 66% of the respondents respectively as factors influencing diet adherence. Chi-square results indicated spouse support $\chi^2 (4) = 1.765, p > .05$, friends support $\chi^2 (4) = 4.552, p > .05$ and other family member support $\chi^2 (4) = 8.391, p > .05$ were not statistically significant as shown in Table 4.11. However a nutritionist reported *“The factors that I feel influence adherence mainly is support from the family members but in most cases men don’t support their spouse, but adult children do”*.

4.4.3 Organization/ health System Level Factors

At this level the ecological environment includes the interpersonal relations with the health system. Descriptive analysis indicated that 93% of the respondent’s believed support by health care providers was a factor influencing diet adherence. Trust in health care providers was identified by 91% as a factor while distance from the hospital was identified by 62% of the respondents as a factor influencing diet adherence. However chi-square results indicated that there was no significant association between diet adherence and support from health care providers $\chi^2 (4) = 4.796, p > .05$, trust in health care providers $\chi^2 (4) = 4.796, p > .05$, and distance from hospital $\chi^2 (4) = 3.760, p > .05$ Table 4.11. A doctor reported that, *“Good counseling especially from nutritionist is very important in ensuring that patients understand what is required of them”*. A nurse reported *“Another factor that I feel is also important are outreach programmes for patients, especially education on kitchen gardens which helps promote food security even those in town can produce their own food.”* A nutritionist reported *“Also seminars for patients organized by the hospital, support groups and outreach for patients can help”*.

4.4.4 Community and Policy Level Factors

According to the ecological framework the physical environment and policy are likely to influence availability and accessibility to food. Results indicated that 93.3% and 92% of the respondents believed that availability and accessibility to food were factors influencing diet adherence Table 4.11. Chi-square results indicated that there was no association between diet

adherence and availability to food $\chi^2 (3) = 2.563, p > .05$), and accessibility to food $\chi^2 (3) = 3.059, p > .05$) as shown in Table 4.11. However a nurse reported that “*availability and affordability of food promotes adherence*”.

Table 4.11: Association of Individual, Small Group, Organizational and Health Care Systems, Community and Policy Factors Perceived to influence Diet Adherence.

Factors	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Chi-square	Sig
<i>Individual level</i>							
Self-motivation	8(3.3%)	4(1.7%)	6(2.5%)	126(52.7%)	95(39.7%)	5.699	0.223
Knowledge of diabetic diet	2(0.8%)	8(3.3%)	13(5.4%)	129(54.0%)	87(36.4%)	1.511	0.825
Will power	2(0.8%)	2(0.8%)	25(10.5%)	128(53.6%)	82(34.3%)	0.579	0.965
Determination	3(1.3%)	2(0.8%)	25(10.5%)	120(50.2%)	98(41.0%)	2.109	0.716
Achieving a goal	2(0.8%)	4(1.7%)	22(9.2%)	119(49.8%)	92(38.5%)	2.470	0.650
Religious beliefs	35(14.6%)	24(10.0%)	35(14.6%)	108(45.2)	37(15.5%)	7.209	0.125
Fear of death	80(33.5%)	16(6.7%)	20(8.4%)	85(35.6%)	38(15.9%)	2.369	0.668
<i>Highly regulated upbringing</i>							
Self-responsibility	6(2.5%)	17(7.1%)	57(23.8%)	125(52.3%)	34(14.2%)	5.252	0.26
<i>Family and small group</i>							
Spouse support	12(5.0%)	17(7.1%)	27(11.3%)	93(38.9%)	90(37.7%)	1.843	0.765
Friends support	25(10.5%)	27(11.3%)	29(12.1%)	103(43.1%)	55(23.0%)	4.552	0.340
Other family members support	8(3.3%)	17(7.1%)	18(7.5%)	100(41.8%)	96(40.2%)	8.391	0.078
<i>Organization/health system</i>							
Support from health care provider	1(0.4%)	5(2.1%)	11(4.6%)	103(43.1%)	119(49.8%)	4.796	0.309
Trust in health care provider	2(0.8%)	5(2.1%)	14(5.9%)	96(40.2)	122(51.0%)	4.796	0.309
Distance from the hospital	17(7.1%)	16(6.7%)	57(23.8%)	115(48.1%)	34(14.2%)	3.760	0.440
<i>Community and policy</i>							
Availability of food	6(2.5%)	10(4.2%)	-	118(49.4%)	105(43.9%)	2.563	0.464
Accessibility to food	1(0.4%)	4(1.7%)	14(5.9%)	116(48.5%)	104(43.5%)	3.059	0.383

4.5 Relationship between Individual, Small Group, Organizational or Health Systems, Community and Policy Level Factors and Diet Adherence

Multiple linear regression analyses was used to further investigate factors perceived to influence diet adherence at the various levels. The results indicated that 43.2% of the variance in diet adherence can be explained by individual, small group, organizational or health systems, community and policy level factors collectively, $F(4,241) = 2.142, p < .05$. When looking at the individual contribution of the factors at the various levels, individual level factors ($\beta = .160, t = 2.332, p = .018$) and small group ($\beta = .139, t = 2.243, p = .021$) had a positive relationship with diet adherence which was significant. There was a significant association between diet adherence and organizational or health care systems level factors ($\beta = -.116, t = -2.346, p = .018$) which was negative. There was no significant association between diet adherence and community and policy level factors ($\beta = -.036, t = -.401, p = .689$). When order of relationship was considered individual level factors ($\beta = .160, t = 2.332, p = .018$) was first followed by small group ($\beta = .139, t = 2.243, p = .021$), organizational or health systems ($\beta = -.116, t = 2.346, p = .018$) and finally community and policy ($\beta = -.036, t = 0.401, p = .068$) Table 4.12.

Table 4.12: Association between factors at individual, small group, organizational or health care system, community and policy levels Perceived by Respondents and Diet Adherence.

Independent variables	Unstandardized Coefficients		Standardize d Coefficients	t	Sig.
	B	Std. Error	Beta		
Individual	2.954	1.26	.160	2.332	.018
Small group	1.785	0.795	.139	2.243	.021
Organizational or health care system	-2.827	1.205	-.116	-2.346	.018
Community and policy level	-.817	2.039	-.036	-.401	.068
Constant	42.01				
R ²	= 0.432				
F-ratio	= 2.142 $p \leq 0.05$				
SEE	= 1.529				
n	= 241				

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The study was carried out to assess the dietary practices of Diabetes Mellitus type 2 (DM2) patients and identify the factors that influence adherence at Moi teaching and referral Hospital (MTRH). In this section the findings are discussed in relation to relevant literature.

5.2 Socio-demographic and Health Characteristics of the Respondents

5.2.1 Socio-demographic Characteristics of the Respondents

Several socio-demographic factors were assessed in this study. These were age, marital status, educational level, kind of family, employment status, monthly income and area of residence. Majority of the respondents were female 62%, while the mean age was 57.5 years. Other studies among DM2 patients have also indicated a high number of female respondents Museet al. (2016) and Mukonka et al.(2016). This could be attributed to health seeking behaviour where female patients tend to seek more qualified care for NCDs as indicated in a study in Kenya by Wanjiku (2021). In this study the mean age was 57.5 years which comparable to that in Singapore Cheng et al.(2018) and Nepal in Parajuli et al. (2014) mean age was 58 and 54.4 years respectively. Most of the respondents were within the age bracket of 30-60 years at 59% similar results with (Berhe *et al.*, 2013). This indicates that mean age of persons living with Diabetes Mellitus is lowering hence not only older persons may be at risk. Further results indicated that 64% of the respondents had ≤ 5000 or no monthly income.

5.2.2 Health Characteristics of the Respondents

Most of the respondents 53% had Diabetes Mellitus type 2 (DM2) for more than 6 years which is in contrast with a study in Nyeri, Mbutiti et al .2016 where 51% had DM2 for a period of 1 and 5 years. In the current study most of the respondents 71% had a BMI of $>25\text{kg/m}^2$ confirming overweight and obesity could be a risk factor for Diabetes Mellitus type 2 (DM). The high prevalence in overweight and obesity among patients with DM2 is comparable to other studies; a study in Singapore by Cheng et al. (2018), 68% were overweight or obese; a study in Western India by Patel et al. (2012) 69% of the participants were overweight or obese; in Harare Central hospital Zimbabwe a study by Mukonka et al. (2016) indicated 61% had a BMI $>25\text{kg/m}^2$; a study in Ghana by Mogre et al. (2017) overweight and obesity was prevalent in 72% of the

participants. In the current study only 42.7% of the respondents monitored blood sugar levels frequently. Most of the respondents were not able to purchase a glucometer due to the high cost and would only have a blood glucose test at the hospital during scheduled visits. A study in Western India by Patel et al. (2012) also revealed problems with blood sugar monitoring whereby only 37% of the respondents performed regular self-testing for blood sugar.

At Moi Teaching and Referral Hospitals 60% of the respondents had visited a nutritionist for advice which could be due to hospital policy whereby all newly diagnosed persons must visit the nutritionist. In Western India Patel et.al (2012) indicated that only 39% of the participants reported visiting a dietitian since diagnoses with Diabetes Mellitus. Participants in the Western Indian study mainly sought advice from doctors and family physicians. In the current study alcohol and cigarette smoking was avoided by majority of the respondents results similar to a studies by Adulrehman et al. (2016); Mbutiti et al. (2016); Berhe et al. (2013) and Patel et al. (2012).

5.3 Diet Adherence of the Respondents

The mean diet adherence level of the respondents in this study was 48.6% which is comparable to some studies in Kenya. In a study by Mugo (2018) the average adherence level was 56.7% which is suboptimal. However another study at Moi Teaching and Referral Hospital 80% of respondents partially adhered to dietary guidelines. Further analysis of dietary practices in the current study indicated that there was over consumption of starches and breads mainly low fiber foods as was observed by FFQs results. Patients with Diabetes Mellitus type 2 can increase dietary fiber by choosing whole grains, and starchy vegetables high in fiber can help dietary fiber. Dietary fiber slows down the time it takes carbohydrates to be absorbed into the bloodstream helping to regulate sugar levels.

More than half of the respondents consumed less than the recommendation requirements for vegetables and fruits. According to FFQ results only 29% of high fiber fruits were always consumed and 53% of vegetables with high fiber. Results also indicated that 34% of respondents were not able to meet their fiber requirements. Others studies have also reported problems with following recommended intake for, vegetables, fruits and fiber requirements. A study done in Lamu indicated that participants mainly consumed starchy foods with very little, vegetables and fruits (Adulrehman *et al.*, 2016). In South Africa patients' had problems with sufficient fruit and

vegetable, and low fiber intake (Muchiri *et al.*, 2012). All fruits and vegetables contain dietary fiber and getting the recommended amount per day helps increase fiber intake. Elevated calorie intake was also observed in 48% of the respondents, which could be as a result of over intake of breads and starches, this is comparable to study done in Italy by Rivellese *et al.* (2007). Starches contribute to 4 calories per gram consumed. High calorie intake leads to high blood sugar levels. Most of the respondents seemed to consume fats within the recommended requirements however results from FFQs indicated that cooking was done using oils high in saturated fats. Consumption of saturated fats is related to insulin resistant resulting in uncontrolled glycemic levels. Another study at Moi Teaching and Referral Hospital respondents consumed foods high in saturated fats especially from animal sources (Jepkemoi *et al.*, 2018). Use of saturated fats was also reported in studies by Rivellase *et al.* (2007) and Muchiri *et al.* (2012).

Methods of cooking that reduce use of fats and oils that is grilling, stewing, steaming and boiling are preferable for DM2 patients. However in this study methods of cooking mainly used were stir frying, stewing, boiling, shallow and deep frying. Stir frying, shallow and deep frying incorporates fats or oils in preparation increasing fat intake. In an Indian only 36% used boiling while cooking results contrast to the current study (Patel *et al.*, 2012).

5.4 Factors Influencing Adherence of the Respondents

5.4.1 Individual Level Factors

According to the ecological model factors under the individual level include socio-demographic, health, cognitive and psychological. Chi-square test performed to examine the association between diet adherence and socio-demographic factors indicated that, there was significant association between income status $\chi^2 (2) = 1.461$, $p \leq 0.05$ and diet adherence. This is further collaborated by the odds of non adherence being lower in those with a higher income. This indicates that availability of money can be used to purchase appropriate foods. Also according to the health workers at the clinic income was an important factor that influences adherence.

Among the health characteristics the following was observed after chi-squares test was done. The study found out that there was significant association between diet adherence and type of treatment for DM2, results similar to those by Jaworski *et al.* (2018) in Poland. Further the study revealed that those on medication and diet were more likely to adhere to the recommended diet

than those on diet only. Psychological and cognitive factors identified by respondents to influence diet adherence included self-motivation, knowledge of diabetic diet, will power, determination, achieving a goal, self-responsibility, religious beliefs, fear of death, highly regulated upbringing. However chi-square results indicated there was no association between diet adherence and any of the psychological and cognitive factors. However a study done by Ebrahim et al. (2014) in a Cape Town clinic using the ecological model indicated that, self-motivation, knowledge of diabetic diet, will power, determination, achieving a goal, self-responsibility, religious beliefs, highly regulated upbringing were factors influencing diet adherence. However in the same study by Ebrahim et al. (2014) fear of death emerged as a common theme which was a barrier to adherence. Dietary knowledge on DM2 was important in determining dietary behaviour and this has been collaborated by other researchers, Ebrahim et al. (2014); Omondi et al. (2010); Mukonka et al. (2016); (Ayele et al. (2018) and (Ganiyu et al. (2013).

5.4.2 Small Group Level

At the small group level respondents identified spouse support, friends support and support from other family member as influencing diet adherence. Results from key informants indicated that family support was important in enhancing diet adherence. However chi-square test results indicated no significant association between diet adherence and the factors at small group level. Practical support by family members especially that which came from adult children was perceived as a very vital factor in enabling diet adherence and general management of Diabetes Mellitus type 2 (DM2). Respondents who had supportive relatives agreed that it helped them adhere to the doctor's recommendation. Studies by Miller & DiMatteo, (2013); Alrahbi & Alghenaimi (2017); Ebrahim et al. (2014) and Azar et al. (2014) all described social support from family members as linked closely to diet adherence. Some of the respondents in the current study also felt that their friends were instrumental in giving information and positive support as they control DM2 results similar to Alrahbi & Alghenaimi (2017). However, a study by Mukonka et al. (2016) found out that friends had a negative influence on patients' diet modification practices. Some male and female respondents in this study felt that, family members especially their spouse and those preparing meals were not supportive findings similar to those of Ebrahim et al. (2014) and Mukonka et al. (2016). Some female respondents felt that their spouses did not provide enough to ensure that they followed the correct diet while others reported that their

husbands demanded that the family food should not change to fit the patients' requirements. A female respondent reported been discriminated with another reporting been rebuked by her relatives. A male respondent reported that his spouse never prepared food for him as per the requirements and she had never accompanied him to the clinic during his scheduled visits.

5.4.3 Organizational or Health Care Systems Level Factors

At organizational or health care systems level factors perceived by respondents as influencing adherence were support from health care providers, trust in health care providers, and distance from hospital. However chi-square results indicated that there was no association between diet adherence and factors under the organizational level. Results for key informants indicated that support by health care providers either by counseling, education and outreach programmes could promote diet adherence. Support and trust in health care providers was also identified by respondents as a major enabler of adherence to diet in studies done by, Sohal et al. (2015); Alrahbi & Alghenaimi, (2017); Ebrahim et al. (2014) and Mbutiti et al. (2016). However, some respondents felt that the health care providers were not supportive and some were too harsh sentiments also expressed by respondents in a study by Alrahbi & Alghenaimi (2017), which they perceived as a barrier to diet adherence. One female respondent did not trust the health care providers with diet information and reported using the internet for information. A male respondent relied on information from a company selling nutrient supplements. A doctor attending to the patients at the clinic put emphasis on the importance of good counseling by the health-care providers, more so by nutritionists as a major facilitator which was also identified as a factor promoting consumption of diabetic diet in a study by Patel et al. (2012). In the study done at Moi teaching and referral hospital (MTRH) health workers identified outreach programmes, seminars for patients and support groups as promoters of diet adherence result similar to those of Muchiri et al.(2012);Worku et al. (2015). The nurse at MTRH recommended nutrition education and home gardening results similar to Worku et al. (2015).

5.4.4 Community and Policy Level

Factors at community and policy level perceived to influence diet adherence were availability to food and accessibility to food. However chi-square results done to determine relation indicated that there was no association between diet adherence and the factors under this level. A nurse at the hospital reported that availability and affordability of food helps to promote diet adherence.

Other studies have also identified affordability and accessibility to diet as factors influencing diet adherence, Muchiri et al. (2012); Ebrahim et al. (2014); Ayelet al. (2018) and (Worku et al. (2015).

5.5 Relationship between Individual, Small Group, Organizational or Health Care Systems, Community And Policy Factors And Adherence

All factors under individual (psychological and cognitive), small group, organizational or health care system, community and policy levels were analyzed further collectively using multiple linear regression. According to the results 43.2% of the variance in diet adherence can be explained by individual, small group, organizational or health systems, community and policy level factors collectively. However, of these, individual level factors had the highest (beta weight) standard coefficient value indicating greatest relationship with diet adherence, followed by small group, organizational or health care system finally community and policy.

Jaworski et al. (2018) indicated that patients' individual predispositions to dietary recommendations were determined to have greater influence on diet adherence than external factors. Further, Jaworski et al. (2018) concluded that social support does boost patients' actions but will not bring any change on its own. However, studies by Ebrahim et al. (2014) and Townsend & Foster (2011) indicated that all the four levels can be used to understand patients' dietary behavior. Townsend & Foster 2011 further indicated that there is a synergistic nature of these levels in influencing dietary choices.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter gives a summary of findings a conclusion of the study, and recommendations for practice, policy and further research.

6.2 Summary of Findings

In this study the mean diet adherence level was 48.6% which is suboptimal. Results also indicated that 75% of the respondents consumed more than their daily requirement for starches and breads which can led to elevated blood sugar levels. Further 88.8% and 57.2% of the respondents consumed less than the required amounts for fruits and vegetables respectively, while 34% were not able to meet requirements for fiber. Dietary fiber helps regulate blood sugar levels. Elevated calorie intake was also observed among 48% of the respondents. There was use of oils or fats high in saturated fats while cooking by more than 90% of the respondents.

Factors influencing diet adherence were established by use of the ecological model which emphasizes the environmental and policy contexts of behaviour, while incorporating social and psychological influences. At Individual level chi-square results showed a significant association between diet adherence and marital status and income, duration of illness, frequency of monitoring blood sugar levels, treatment for Diabetes Mellitus and BMI. However odds ratio results indicated that those with an income and those on medication for diabetes treatment and diet were more likely to follow dietary recommendations. There was no significant association between diet adherence and cognitive and psychological factors at the individual level. At small group level there was no significant association between diet adherence and support from family members, spouse support and friends support. At organizational or health care system level there was no significant association between diet adherence and support and trust in health care providers, distance from hospitals. Also at community and policy level there was no significant association between diet adherence and availability and accessibility to food. This is when factors expected to influence adherence were looked at in isolation.

On comparing relationships between diet adherence and factors at the various levels i.e. individual, small group, organizational or health care systems, community and policy using

multiple linear regression, results indicated that collectively 43% of diet adherence can be explained by factors at the four levels

6.3 Conclusion

This study established that respondents at Moi Teaching and Referral Hospital (MTRH) faced challenges in adhering to dietary guidelines recommended for Diabetes Mellitus type 2 (DM2). Results indicated respondents faced challenges in consumption of starches and breads, fruits and vegetables, while 34% were not able to meet requirements for fiber. Elevated calorie intake was also observed among 48% of the respondents.

According to the results factors at all the four levels were perceived by most respondents as influencing diet adherence. However further analysis indicated that among the socio-demographic factors having an income was associated with a higher diet adherence level. This is an indication that for an individual to acquire appropriate foods money must be available. Among the health characteristics results showed those on medication and diet had higher diet adherence level.

Multiple linear regression was done to determine the relationship between diet adherence and factors influencing diet adherence at individual, small group, organizational or health care systems, community and policy levels. Results indicated that 43% of variance in diet adherence can be explained collectively by factors at the four levels. Of these, individual level factors had the largest effect. These results suggest that though diet adherence is apparently related closely to individual factors, dietary behaviour can be understood more by looking at relations between the individual and the environment and the interdependent relations between the two.

6.4 Recommendations

6.4.1 Recommendation for Practice

There is need to be empower patients on the importance of diet adherence in the management of Diabetes Mellitus type 2 (DM2). Emphasis during diet education for patients' should be put on aspects of diet which patients face challenges in. These aspects include adequate intake of starches and breads, fruits and vegetables, fiber intake, calorie intake and low consumption of saturated fats. Since most of the patients at Moi Teaching and Referral Hospital (MTRH) reported having very little income or none at all, nutritionists can educate patients on improving

food security at household level. Foods such as fruits and vegetables can be grown in kitchen gardens ensuring availability at all times. Patients socio-demographic and health characteristics that is marital status, income status duration of DM2, body mass index, type of treatment for DM2, frequency of monitoring sugar levels had a significant association with diet adherence. Therefore these factors should be put into consideration when planning for in dietary management for effective uptake of recommended diet.

Since dietary behaviour is influenced by an individual's environment, health care providers should consider the synergic nature of the factors in influencing diet adherence for more effective results. For instance there is need to consider the role family members, health care providers, and the community and policy in influencing diet adherence.

6.4.2 Recommendation for Policy

Policy makers must ensure that when planning for dietary management of diabetic patients the relations between the individual and the contextual systems which include small group, organizational or health care, community and policy are incorporated. This would ensure a more holistic approach in diet management programmes for Diabetes Mellitus type 2 patients (DM2).

6.4.3 Future Research

Further longitudinal studies can investigate interactions between the individual and factors at small group, organizational or health care system, community and policy levels. An in depth analysis on factors that facilitate diet adherence that is socio-demographic and health characteristics to recommended dietary practices is recommended. Future research can be done to investigate aspects of dietary guidelines not understood well by patients for instance consumption of large portions of starchy carbohydrates that are high in glycemic level, high consumption of saturated fats or oils in cooking and low intake of fruits.

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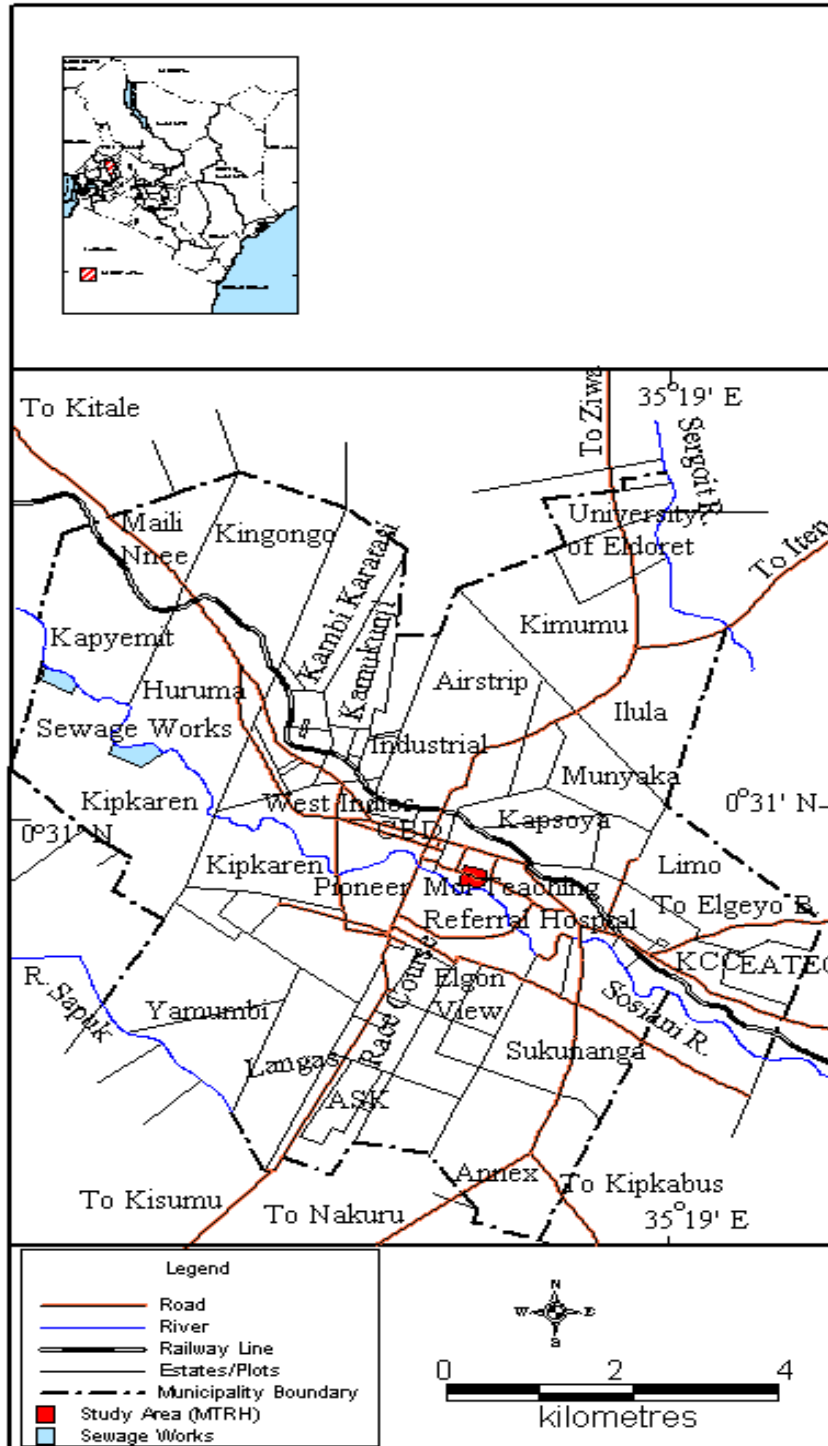
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APPENDICES

Appendix I: Map showing location of Moi Teaching and Referral Hospital in Eldoret Town



Appendix II: Consent Form

Study Objectives

You have been selected to participate in this study which aims to determine the factors influencing diet adherence among patients with Diabetes Mellitus Mellitus Type 2 in Moi Teaching and Referral Hospital. You will be required to participate in an interview and fill in a questionnaire in which your views will be sort on your dietary practices and the factors that enable you to adhere to the recommended diet.

Confidentiality

Your opinions will be kept strictly secret. To ensure that the information you provide is kept private, your name will not be recorded; instead, a number will be provided to you to identify you. Only the researcher, study assistants, and review boards will have access to any study information. There will be no mention of your name in any public reports.

Risks and benefits

There are no risk associated with participating in this exercise. The questionnaire should take no more than 30 minutes to complete, and you can stop at any moment if you become exhausted. The information you submit in this study will be used to improve care for Diabetes Mellitus mellitus type 2 patients in the community and across the country.

Participation

Your participation in this study is voluntary and you may refuse to answer any question or participate in any activity. If you feel uncomfortable you can withdraw from the study without any penalties.

.....
.....
.....

CERTIFICATE OF CONSENT

I have read and understood the above information and by signing and returning this consent form, I have agreed to participate in this study voluntary.

.....

Patients' Number, Signature and Date.

Witness' Statement

I have witnessed the accurate reading of the consent form to the potential participant; i confirm that the individual has consented to participate in the study freely.

.....

Name, Signature and Date.

Appendix III: Questionnaire

This questionnaire seeks to gather information on the factors influencing adherence to diet recommendations of patients with Diabetes Mellitus type 2 for the purpose of research. All information given will be kept confidential. Please tick and fill appropriate answers.

Section One: Patients Details

Patients Number.....
Height (cm).....
Weight (kgs).....
BMI.....
Blood glucose level..... Age.....

Section Two: Socio-demographics

Please tick or fill appropriate answers

1. Indicate your Sex

01= Male

02= Female

2. Please indicate your age group

01= ≤ 30

02= 31- 40 years

03= 41-50 years

04= 51-60 years

05= ≥ 61 and above

3. Please indicate your marital status by ticking in the right place.

01= Single

02= Married

03= Divorced

04= Separated

05= Widowed

06= Co-habiting

4. Indicate your educational level by ticking the appropriate place.

01= Primary

02= Secondary

03= Tertiary

04= None

5. What is your employment Status.....

01= Unemployed

02= Employed

03= Self employed

04= Pensioner

05= House wife

6. Please indicate your monthly income

01= ≤ 5000ksh

02= 5001-10000kshs

03= 10001-15000kshs

04= 15001-20000kshs

05= 20000 and above

06= None

7. Indicate your residential area

01= Uasin Gishu

02= Bugoma

03= Vihiga

04= Kakamega

05= Busia

Others indicate.....

Section Three: Factors that promote diet adherence

8. For how long have you had Diabetes Mellitus?

01= 6 months -5 years

02= 6 years – 10 years

03= 11 years and more

9. What kind of family do you live in?

04= Nuclear

05= Extended

10. Of the following whom do your mainly seek dietary advice from?

01= Doctor

02= Nurse

03= Clinical Officer

04= Nutritionist

05= Family members

06= Others

11. How frequently do you seek dietary advice when you visit the clinic?

01= Always

02= Occasionally

03= Never

12. Do you think that healthy dietary habits help to control blood glucose?

01= Yes

02= No

13. The list below indicates reasons for adherence to dietary recommendations indicate your degree of agreement in the box provided by; 1= strongly disagree, 2= Disagree, 3= Undecided, 4 =Agree, 5= strongly agree.

Individual level	1=strongly disagree	2= Disagree	3= Undecided	4= Agree	5=Strongly agree
Self-motivation					
Knowledge of diabetic diet					
Will power					
Determination					
Achieving a goal					
Religious beliefs					
Fear of death					
Highly regulated upbringing					
Self-responsibility					
Family and small group					
Spouse support					
Friends support					
Other family members support					
Organization/ health system					
Support from health care provider					
Trust in health care provider					
Distance from the hospital					
Community and policy					
Availability of food					
Accessibility to food					

Others (please indicate).....

HOJAJI YA KIJUMLA

Maagizo

Tafadhali jaza nafasi katika hojaji uliyopewa.Haina haja uandike jina.Hojaji hii inakusudia kukusanya habari kuhusu mambo yanayochangia uzingatiaji wa mapendekezo yalishekwa

wagonjwa wa kisukari wa inaya 2.Maelezo utakayotoa yatatumiwa tu kwa kusudi la uchuguzi huu na yatahifadhiwa sana wakati na baada ya utafiti.Tafadhali jaza majibu yafaayo.

SEHEMU YA Kwanza: Habari Kuhusu Mgonjwa.

Nambari ya Mgonjwa.....

Urefu (cm).....

Uzito (kgs).....

BMI.....

Kiwango cha Sukari kwa damu.....

SEHEMU ya Pili: Habari Zaidi kuhusu Mgonjwa

Tafadhali jibu kwa kuteua jibu mwafaka. Please tick or fill appropriate answers

1.Onyesha Jinsia yako

01= Kiume

02= Kike

2.Tafadhali onyesha rika la kokwa kukadiria umri wako kwa miaka.

01= \leq miaka 30

02= miaka 31- 40

03= miaka 41-50

04= miaka 51-60

05= \geq miaka 61na zaidi

3.Tafadhali onyesha hali yako ya ndoa kwa kuteua jibu mwafaka.

01= Sija (oa) lewa

02= Nie (oa) lewa

03= Nimetaliki (wa)

04= Nimeteng (w)a

05= Mjane

06= Ndoa-bahatisha

4.Unaishi katika familia /jamii ya aina gani?

01= Familia/jamii asili

02= FamiliaUmma

5. Onyesha kiwango chako cha elimu kwa kuteua jibu mwafaka.

01=Shule ya Msingi

02=Shule ya Sekondari

03= Vyuo vya Anuwai

04= Sijasoma

6. Je, hali yako ya ajira ni gani?

01= Sijaajiriwa

02= Nimeajiriwa

03= Nimejiajiri

04= Nimestaafu

05= Ajira ya nyumbani

7. Onyesha mshahara wako wa kila mwezi

01= ≤ Shilingi 5000

02= Shilingi 5001-10000

03= Shilingi 10001-15000

04= Shilingi 15001-20000

05= Shilingi 20000 nazaidi

06= Sina ajira

8. Unaishi wapi.....county.....

01= Urban(give name of place)

02= Rural(give name of place)

Sehemu ya Tatu: Mambo yanayo himiza uzingatiaji wa lishe

9. Je, umekuwa na ugonjwa wa kisukari kwa muda upi?

01= miezi6-miaka5

02= miaka6 – miaka10

03= miaka11nazaidi

10. Miongoni mwa hawa, ni nani anayekushauri kuhusu lishe?

01= Daktari

02= Mwuuguzi

- 03= Mhudumu Kliniki
- 04= Mshaurilishe
- 05= Jamaa wa familia
- 06=Wengineo

11. Unapewa ushauri kuhusu lishe kwa kiasi gani unapoenda zahanatini? How frequently do you seek dietary advice when you visit the clinic?

- 01= Kilamara
- 02= Mara chache
- 03= Huwasipati

12. Je, kwa maoni yako, mitindo yalishe bora husaidia kudhibii kiasi cha sukari katika damu?

- 01= Ndio/Naam
- 02= Hapana

13. Ifuatayo ni orodha ya sababu za kuzingatia lishe bora. Onyesha kiwango chako cha kukubalianana yokwa kuteua sababu katika sanduku iliyopo hapo chini;

14. 1= Sikubaliani kabisa, 2= Sikubaliani, 3= Sijaamua, 4 =Nakubaliana
5= Nakubaliana kabisa.

Kiwango cha mtu binafsi	1=Sikubalian ikabisa,	2= Sikubaliani	3= Sijaamua	4= Nakubaliana	5= Nakubalian akabisa
Motisha ya kibinafsi					
Habari kuhusu Kisukari					
Utashi/ari/nia					
Bidii					
Kufikia lengo fulani					
Imani ya kidini					
Hofu ya kifo					
Malezi makali					
Uwajibikaji wa kibinafsi					
Kiwango cha Familia na makundi madogo					
Msaada wa mchumba					
Msaada wa marafiki					

Msaada wa wanafamilia wengine					
Asasi au mfumo wa kiafya					
Msaada wa mhudumu wa afya					
Imani kwa mhudumu wa afya					
Umbali wa Hospitali					
Jamii na Sera					
Uwepo wa lishe/vyakula					
Upatikanaji wa lishe/uyakula					

Mengineyo (Tafadhali onyesha).....

.....

.....

Appendix IV: Food Frequency Checklist

This check list is intended to assess the dietary patterns of the patients (adopted from FANTA).

Please indicate how frequently you consume the food items indicated below.

FOOD GROUP	Yes	No	Always	Sometime	Occasionally	Never	Remarks	Score
Section 1								
Cereals and cereal products								
<i>High fibre</i>								
Porridge finger millet								
Brown Ugali								
Brown Chapati								
Whole grain rice								
Sorghum porridge								
Whole wheat bread								
Oat meal porridge								
<i>Low fibre</i>								
White bread								
White ugali								
White rice								
White chapatti								
Others specify								
Section 2								
Legume sources								
<i>High fibre</i>								
Peas								
Pea nut								
Beans								
Cowpeas								
Black beans								
Soya beans								
Green grams								
Others specify								
Section 3								
Roots and tubers								
<i>High fibre</i>								
Pumpkin								
Butter nut								
Carrots								
Sweet potatoes								

<i>Low Fibre</i>								
Arrow roots								
Yams								
Cassava								
Section 4								
Fruits								
<i>High Fibre</i>								
Paw paw								
Pineapple								
Oranges								
Avaocado								
Mango								
Gauva								
Lemon								
Apples								
<i>Low sugar</i>								
Lemon								
Others specify								
Section 5								
Vegetables								
<i>High fibre</i>								
Cabbage								
Kales								
Cowpeas (kunde)								
Spinach								
Thisaga (spider herb)								
Pumpkin leaves								
Murere (Tiliaceae)								
Nderema								
Miro(sunnhemp)								
Managu								
<i>Low fibre</i>								
Mushroom								
Tomatoes								
Others specify								
Section 6								
Meats								
<i>Low fat</i>								
Lean beef								
Chicken without skin								
Boiled egg								
Low fat milk								
Skimmed milk								
Tilapia								
Omena								

<i>High fat</i>								
Fatty beef								
Chicken with skin								
Fatty pork								
Oily fish								
Fatty Mutton								
Fatty goat meat								
Egg yolk								
Fried eggs								
Whole milk								
Others specify								
Section 7								
Fats and Oils								
Animal fat								
Vegetable fat								
Section 8								
Sweets & beverages								
<i>Low sugar</i>								
Tea no sugar								
Soya no sugar								
<i>High sugar</i>								
Candy								
Sweet soft drinks								
Cakes								
Chocolate								
Jam								
Honey								
Soda								
Tea with sugar								
Soya with sugar								

Frequency: Always [4] Sometime [3] Occasionally [2] Never [1]

Other practices associated with diabetic diet

1.a) Do you consume alcohol?

1= Yes 2.No=

b)If yes how much?

1= one drink

2= two drinks

3= more than two drinks

Any other.....

c)How frequently do you drink

- 1= every day
- 2= weekly
- 3= once a month
- 4= occasionally
- Any other.....

2.a) Do you smoke?

- 1= Yes No

b)If yes how many in a day

- 1= one cigarette
- 2=more than two cigarettes
- Any other.....

3. Do you add salt to food while cooking?

- 1= Yes 2= No

4.a) Do you add salt to food while eating?

- 1= Yes 2= No

b)If yes how much

- 1= A pinch
- 2= one teaspoon
- 3= three teaspoons
- Any other.....

5.a) Do you add sugar to soft and hot drinks such as juice, tea, porridge?

- 1= Yes 2= No

b)If yes how much?

- 1= one teaspoon
- 2= two teaspoons
- 3= more than two teaspoons

Appendix V: Three-Day Food Record

The record is intended to measure diet adherence of the patients.

Carefully fill in the following Food record

Patients No:.....

Instructions for keeping your Three-Day Food record

Keep your record for three days consecutively.

Include two week days and one week end.

Record what and how much was served and what and how much was eaten.

To measure estimates use cups, spoons, plates.

Day 1	Date:			
Time of Meal or Snack	Type of Food or Beverage Offered	Amount Eaten	Method of Preparation or Brand	Comments (e.g. amount of food served, too tired to eat)
Breakfast				
AM Snack				
Lunch				
PM Snack				

Dinner				
Evening Snack				

Was this day's intake considered: [] good adherent [] partial adherent [] non- adherent

Day 2	Date:			
Time of Meal or Snack	Type of Food or Beverage Offered	Amount Eaten	Method of Preparation or Brand	Comments (e.g. amount of food served, too tired to eat)
Breakfast				
AM Snack				
Lunch				
PM Snack				

Dinner				
Evening Snack				

Was this day's intake considered: [] good adherent [] partial adherent [] non- adherent

Day 3		Date:		
Time of Meal or Snack	Type of Food or Beverage Offered	Amount Eaten	Method of Preparation or Brand	Comments (e.g. amount of food served, too tired to eat)
Breakfast				
AM Snack				
Lunch				
PM Snack				

Dinner				
Evening Snack				

Was this day's intake considered: [] good adherent [] partial adherent [] non- adherent

Scoring Criteria for Diabetic diet

Gender

Male

Female

Type of person 01=A (1200-1600kcal) 02=B (1600-2000kcal)03= 2000–2400 appendix VII

Food Group	Number of servings (per day as required by an individual)	Number of servings consumed	Score
Starches and breads	6-11 servings per day		2
			1
			0
Vegetables	3-5 servings per day		2
			1
			0
Fruits	2-4 servings per day		2
			1
			0
Milk and milk products (low fat)	2-3 servings of milk per day		2
			1
			0
Meat and meat substitutes	2-3 servings per day		2
			1
			0
Fat	use sparingly.		2
			1
			0
Fiber	22-35 grams per day		1
			0
Caloric intake	(insert adequate figure here)	insert what the respondent took here	2
			1
			0
Total score			

2= over intake

1= adequate intake
0=under intake

MEALS PER DAY	Tick where appropriate
3	
2	
1	
0	
SNACKS PER DAY	Tick where appropriate
3	
2	
1	
0	

Appendix VI: Key Informant Interview guide

Interview schedule

This interview intends to collect information on the dietary patterns, rate of adherence and the factors influencing adherence of Diabetes Mellitus Type 2 patients. All information will be kept confidential kindly answer all questions. The interview will be recorded for purposes of analysis.

Socio-demographics

1. Indicate sex
2. Indicate age
3. What is your level of education?
4. Do you have any training on nutrition and Diabetes Mellitus management?
5. Where and when were you trained?

Assess the dietary patterns of diabetic patients

1. What diet is recommended for the patients attending the diabetic clinic?
2. Who gives diet counseling to the patients?
3. How often are patients scheduled to visit the clinic and how often do they receive diet counseling?
4. How would you categorize feeding patterns of your patients?
5. What are the problems associated with dietary practices?

Determine the rate of adherence

6. How would you rate adherence of your patients?

Identify factors influencing adherence and the relationship between the factors and adherence

7. What are the factors that influence adherence as per your observations?
8. What are the factors patients identified as promoters and hindrance to diet adherence?
9. Which of these factors do you feel are mainly responsible for adherence?
10. Is there any follow up on diet progress done by the hospital staff once the patient leaves the hospital?

Appendix VII: School of Graduate Studies Proposal Approval Letter



MASENO UNIVERSITY SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: MSC/PH/00040/14

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 6th February, 2018

TO WHOM IT MAY CONCERN

**RE: PROPOSAL APPROVAL FOR MARY WANGARI KAMAU —
MSC/PH/00040/2014**

The above named is registered in the Master of Science in Community Nutrition and Development Programme in the School of Public Health and Community Development, Maseno University. This is to confirm that her research proposal titled "Factors Influencing Diet Adherence among Diabetes Mellitus Type 2 Patients attending Clinic at Moi Teaching and Referral Hospital, Kenya." has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.


Prof. J. G. Agure

DEAN, SCHOOL OF GRADUATE STUDIES



Maseno University

ISO 9001:2008 Certified



Appendix VIII: Ethical Approval Letter from MUREC



MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext. 3050
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariat@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 17th August, 2018

TO: Mary Wangari Kamau
PG/MSc/PH/00040/2014
Department of Nutrition and Health
School of Public Health and Community Development,
Maseno University
P. O. Box, Private Bag, Maseno, Kenya

REF: MSU/DRP/MUERC/00523/18

RE: Factors influencing Diet Adherence among Diabetes Mellitus type 2 Patients Attending Clinic at Moi Teaching and Referral Hospital, Kenya. Proposal Reference Number MSU/DRP/MUERC/00523/18

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 17th day of August, 2018 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 16th August, 2019. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 15th July, 2019.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 15th July, 2019.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advise MUERC when the study is completed or discontinued.

Thank you.

Dr. Bonuke Anyona,
Secretary,

Maseno University Ethics Review Committee.



Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED



Appendix IX: Approval Letter from Institutional Review and Ethics Committee (IREC)



MU/MTRH-INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)
MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 334711/2/3
Reference: IREC/2018/218
Approval Number: 0003177



MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET
6th December, 2018

Mary Wangari Kamau,
Maseno University,
School of Public Health,
P.O. Box 3275-40100,
KISUMU-KENYA.



Dear Ms. Kamau,

RE: FORMAL APPROVAL

The MU/MTRH- Institutional Research and Ethics Committee has reviewed your research proposal titled: -

"Factors Influencing Diet Adherence among Diabetes Mellitus Type 2 Patients Attending Clinic at Moi Teaching and Referral Hospital, Kenya".

Your proposal has been granted a Formal Approval Number: **FAN: IREC 3177** on 6th December, 2018. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; hence will expire on 5th December, 2019. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date. You will be required to submit progress report(s) on application for continuation, at the end of the study and any other times as may be recommended by the Committee.

Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. You will also be required to seek further clearance from any other regulatory body/authority that may be appropriate and applicable to the conduct of this study.

Sincerely,

DR. S. NYABERA
DEPUTY-CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
 Principal - CHS Dean - SON Dean - SOD

Appendix X: Approval to Conduct Research from MTRH



An ISO 9001:2015 Certified Hospital



MOI TEACHING AND REFERRAL HOSPITAL

Telephone : { +254)053-2033471/2/3/4
Mobile: 722-201277/0722-209795/0734-800461/0734-683361
Fax: 053-2061746
Email: ceo@mtrh.go.ke & directorsoffice@mtrh@gmail.com

Nandi Road
P.O. Box 3 – 30100
ELDORET, KENYA

Ref: ELD/MTRH/R&P/10/2/V.2/2010

4th January, 2019

Mary Wangari Kamau,
Maseno University,
School of Public Health,
P.O. Box 3275-40100,
KISUMU-KENYA.

APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

"Factors Influencing Diet Adherence among Diabetes Mellitus Type 2 Patients Attending Clinic At Moi Teaching and Referral Hospital, Kenya".

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.


DR. WILSON K. ARUASA, MBS
CHIEF EXECUTIVE OFFICER
MOI TEACHING AND REFERRAL HOSPITAL

cc - Senior Director, (CS)
- Director of Nursing Services (DNS)
- HOD, HRISM

All correspondence should be addressed to the Chief Executive Officer

Visit our Website: www.mtrh.go.ke

TO BE THE LEADING MULTI-SPECIALTY HOSPITAL FOR HEALTHCARE, TRAINING AND RESEARCH IN AFRICA

APPENDIX XI: Completed Food Frequency Checklist

FOODS	ALWAYS		SOMETIMES		OCCASIONALLY		NEVER	
	F	P	F	P	F	P	F	P
Cereal and cereal products								
<i>High Fibre</i>								
Finger millet	92	38.2	90	37.2	28	11.7	31	13
Brown ugali	74	30.7	55	22.8	17	7.1	95	39.4
Brown chapatti	59	24.5	80	33.2	26	10.8	76	31.5
Whole grain rice	21	8.7	35	14.5	16	6.7	169	70.1
Sorghum porridge	19	7.9	17	7.1	9	3.7	196	81.3
Whole wheat bread	122	50.6	59	24.5	22	9.1	38	15.8
Oat meal porridge	7	2.9	6	2.5	3	1.2	225	93.4
<i>Low fibre</i>								
White bread	32	13.3	64	26.5	24	10	121	50.2
White ugali	131	54.4	53	22	10	4.2	47	19.5
White rice	85	35.3	78	32.4	29	12	49	20.3
White chapatti	52	21.6	73	30.3	31	12.9	85	35.3
Legumes								
<i>High fibre</i>								
Peas	69	28.6	89	36.9	33	13.7	50	20.8
Pea nuts	62	25.7	78	32.4	28	11.6	73	30.1
Beans	131	54.4	68	28.2	18	7.5	24	10.0
Cow peas	24	10	27	11.2	10	4.2	180	74.7
Black beans	31	12.9	49	20.3	14	5.8	147	61
Soya beans	26	10.8	28	11.6	5	2.1	182	75.5
Green grams	92	38.2	92	38.2	21	8.7	36	14.9
Roots and tubers								
<i>High fibre</i>								
Pumpkin	50	20.8	76	31.5	36	14.9	79	32.8
Butter nut	22	9.2	29	12.1	13	5.4	175	73.2
Carrots	113	46.9	85	35.3	15	6.2	28	11.6
Sweet potatoes	55	22.8	79	32.8	29	12	78	32.4
Green bananas	60	24.9	82	34	47	19.5	52	21.6
<i>Low fibre</i>								
Arrow roots	65	27	55	22.8	24	10.0	97	40.3
Yams	18	7.5	27	11.2	20	8.3	176	73
Cassava	36	14.9	36	14.9	27	11.2	142	58.9
Fruits								
<i>High fibre</i>								
Paw paw	83	34.4	74	30.7	35	14.5	49	20.3
Pineapple	71	29.5	72	29.9	18	7.5	80	33.2
Oranges	135	56	74	30.7	11	4.7	21	8.7

Avacado	120	49.8	77	32	12	5	32	13.3
Mango	119	49.4	75	31.1	13	5.4	34	14.1
Guava	30	12.5	38	15.8	23	9.5	150	62.2
Water melon	118	49	67	27.8	14	5.8	42	17.4
Apples	77	32	49	20.3	17	7.1	98	40.7
<i>Low sugar</i>								
Lemon	58	24.1	48	20	19	7.9	116	48.1
Vegetables								
<i>High fibre</i>								
Cabbage	169	70.1	52	21.6	8	3.3	12	5.0
Kales	126	52.3	37	15.4	13	5.4	65	27
Cowpeas(kunde)	132	54.8	47	19.5	14	5.8	48	20
Spinach	174	72.2	42	17.4	9	3.7	16	6.6
Thisaga	123	51	46	19.1	20	8.3	52	21.6
Pumpkin leaves	126	52.1	51	21.2	17	7.1	47	19.5
Murere	102	42.3	41	17	14	5.8	84	34.9
Nderema	129	53.5	39	16.2	14	5.8	61	25.3
Miro	75	31.1	36	14.9	9	3.7	121	50.2
Managu	198	82.2	24	10.0	6	2.5	13	5.4
<i>Low fibre</i>								
Mushroom	14	5.8	29	12	17	7.1	181	75.1
Tomatoes	208	86.3	14	5.8	8	3.3	11	4.6
Meats and animal products								
<i>Low fat</i>								
Lean beef	72	30	85	35.3	43	17.8	41	17
Chicken no skin	52	21.6	60	24.9	34	14.1	95	39.4
Boiled egg	47	19.5	74	30.7	34	14.1	86	35.7
Low fat milk	30	12.5	26	10.8	7	2.9	178	73.9
Skimmed milk	36	14.9	21	8.7	4	1.7	180	74.7
Tilapia	77	32	86	35.7	31	12.9	47	19.5
Omena	58	24.1	60	24.9	27	11.2	96	39.8
<i>High fat</i>								
Fatty beef	6	2.5	15	6.2	5	2.1	215	89.2
Chicken with skin	55	22.8	39	16.2	20	8.3	127	52.7
Fatty pork	1	0.4	14	5.8	12	5.0	214	88.8
Oily fish	3	1.2	19	7.9	13	5.4	206	85.5
Fatty mutton	8	3.3	45	18.7	11	4.6	177	73.4
Fatty goat meat	12	5.0	40	16.6	8	3.3	179	75.1
Egg York	33	13.7	69	28.6	18	7.5	121	50.2
Fried eggs	48	20	80	33.2	20	8.3	93	38.5
Whole milk	172	71.4	36	15	7	2.9	26	10.8
Fats and oils								
Animal fat	24	10.0	16	6.6	4	1.7	197	81.7
Vegetable fat/oil	222	92.1	12	5	3	1.2	4	1.7

Sweet & beverages								
<i>Low sugar</i>								
Tea no sugar	224	92.9	4	1.7	1	0.4	12	5.0
Soya no sugar	63	26.1	19	7.9	8	3.3	151	62.7
<i>High sugar</i>								
Candy	2	0.8	18	7.5	33	13.7	188	78
Sweet soft drinks	2	0.8	10	4.2	6	2.5	223	92.5
Cakes	-	-	14	5.8	18	7.5	209	86.7
Chocolate	1	0.4	5	2.1	1	0.4	234	97.1
Jam	1	0.4	5	2.1	2	0.8	233	96.7
Honey	11	4.6	49	20.3	17	7.1	164	68.1
Soda	-	-	13	5.4	30	12.4	198	82.2
Tea with sugar	7	2.9	5	2.1	1	0.4	228	94.6
Soya with sugar	3	1.2	-	-	-	-	238	98.8

F= Frequency

P= Percentage

Appendix XII: Summary of food servings, Calories, Sex, Age, Height and Weight for respondents

Code	DAY	STA	VEG	FRUIT	MILK	MEAT	FAT	FIBRE	KCALS	Sex	AGE	HT	WT
1	AVE	16	2	2	2	3	4	26	2023	M	64	160	80.5
2	AVE	18	2	2	1	5	3	53	1852	M	69	153	60.5
3	AVE	16	1	0	1	0	2	22	1332	M	83	185	82.6
4	AVE	20	1	0	1	3	3	19	1764	M	58	164	69.5
5	AVE	12	2	0	2	0	0	20	1310	M	78	173	102.5
6	AVE	20	2	0	2	2	2	31	2025	M	64	165	62
7	AVE	20	2	1	1	0	2	39	1955	M	53	173	57.5
8	AVE	17	2	0	1	2	1	32	1520	M	50	181	67
9	AVE	17	2	0	1	1	2	26	1720	M	47	171	80.5
10	AVE	30	2	0	0	0	0	24	2850	M	62	169	75.7
11	AVE	26	4	0	0	4	2	45	2590	M	51	161	69
12	AVE	7	1	0	1	2	1	12	1285	M	68	180	124.5
13	AVE	13	2	0	1	2	2	25	1345	M	61	172	83
14	AVE	24	2	1	2	2	1	67	3515	M	57	173	93.5
15	AVE	15	1	0	1	5	2	21	1635	M	49	172	97.6
16	AVE	5	4	1	1	9	2	42	1470	M	70	177	74.8
17	AVE	24	2	1	1	2	4	54	2785	M	51	177.5	63.7
18	AVE	25	1	0	2	0	1	21	2623	M	30	162	50
19	AVE	16	1	2	1	7	4	35	2285	M	54	160	89
20	AVE	12	3	0	2	0	2	25	1412	M	65	169	55
21	AVE	13	1	0	1	3	2	18	1184	M	66	173	94.5
22	AVE	12	2	1	1	1	3	21	1355	M	63	160.5	65.5
23	AVE	20	0	0	1	0	0	32	1905	M	33	168	73.5
24	AVE	8	1	3	1	6	2	30	1610	M	67	164	64
25	AVE	19	1	0	3	3	2	30	2690	M	66	162	79
26	AVE	11	2	2	2	5	4	24	1830	M	43	175	50
27	AVE	23	2	0	1	3	2	38	2443	M	31	174	88.8
28	AVE	13	2	0	2	0	2	16	1635	M	51	174	84
29	AVE	24	3	1	2	5	4	44	2995	M	35	167	77.8
30	AVE	18	1	2	1	8	2	34	2915	M	55	175	87.5
31	AVE	14	1	0	2	3	1	19	2105	M	58	171.5	89.5
32	AVE	25	15	1	2	11	2	38	2640	M	61	166	70.6
33	AVE	13	2	0	2	2	3	17	1615	M	59	163	93
34	AVE	25	3	0	1	0	4	25	2320	M	31	169	71
35	AVE	13	2	0	1	1	4	34	2640	M	61	177	78
36	AVE	13	2	0	1	1	4	18	2039	M	52	183	82
37	AVE	18	1	0	2	8	2	14	1550	M	56	190	96.8
38	AVE	15	3	3	1	4	4	28	2295	M	60	171	75
39	AVE	13	1	0	2	0	0	24	2330	M	58	178	87
40	AVE	27	1	0	1	4	3	19	1445	M	46	171	77.3
41	AVE	24	2	0	0	2	0	33	3175	M	61	156	56
42	AVE	33	1	0	1	0	2	26	2520	M	78	170	76
43	AVE	13	2	1	1	3	5	24	3225	M	65	160	73.6
44	AVE	22	2	2	1	0	3	39	1675	M	46	181	79.3
45	AVE	17	2	0	2	4	4	30	2295	M	51	172	72.5
46	AVE	14	2	0	2	1	2	33	2522	M	33	178	49.5
47	AVE	9	2	1	2	4	2	19	1560	M	51	163	86.5
48	AVE	18	11	0	1	0	1	29	1246	M	32	156.5	71
49	AVE	18	2	3	1	8	1	17	1677	M	61	162.5	53.5
50	AVE	7	2	3	1	8	2	32	2855	M	54	164	53.5
51	AVE	13	0	0	0	2	0	51	1475	M	74	157	71
52	AVE	17	3	0	0	1	1	13	1010	M	64	171	98.4
53	AVE	28	3	0	3	0	2	24	1635	M	43	189	116
54	AVE	26	2	0	2	2	0	32	2780	M	35	172	66.5

55	AVE	13	3	0	1	4	5	26	2860	M	62	170	76
56	AVE	27	2	0	1	1	2	27	1748	M	62	175	74.3
57	AVE	23	2	0	1	0	1	28	2910	M	49	172	83.2
58	AVE	13	1	1	1	0	0	24	2090	M	69	164	59
59	AVE	19	2	0	2	0	2	18	1510	M	35	180.5	74.3
60	AVE	16	1	0	1	6	4	23	2115	M	46	162	76.4
61	AVE	11	2	0	2	2	2	25	2165	M	77	168	78.5
62	AVE	11	1	0	2	0	1	20	1470	M	58	174.5	94.5
63	AVE	13	1	1	2	4	1	14	1065	M	74	165	69.3
64	AVE	16	4	1	0	0	1	23	1895	M	58	166	76
65	AVE	21	3	0	1	3	1	27	1730	M	62	164	72.5
66	AVE	11	2	0	1	1	1	31	3020	M	62	164	69.4
67	AVE	18	3	0	2	0	2	16	1335	M	69	174	98
68	AVE	14	1	0	1	4	3	42	1770	M	33	171	79.8
69	AVE	21	2	1	2	0	2	26	2447	M	47	163	66.1
70	AVE	20	2	0	1	3	2	27	1697	M	49	172	78.6
71	AVE	16	3	0	2	1	2	34	2482	M	47	163	66.1
72	AVE	10	2	1	2	2	2	25	2312	M	49	172	78.6
73	AVE	10	2	0	0	0	2	29	1812	M	79	169	70
74	AVE	10	2	0	0	0	2	16	1487	M	43	161	73
75	AVE	9	0	1	0	8	2	16	1082	M	59	172	68
76	AVE	11	1	0	0	2	2	19	1300	M	51	168	77.7
77	AVE	16	2	0	0	4	3	19	1952	M	58	172	76
78	AVE	16	1	0	1	2	1	19	1527	M	79	168	61.8
79	AVE	17	1	0	1	6	2	21	1860	M	67	165	44.5
80	AVE	9	3	2	1	2	2	40	1027	M	67	178	67.5
81	AVE	16	1	1	0	1	1	24	1358	M	62	169	76.5
82	AVE	16	1	0	1	5	1	24	1804	M	58	159	69.4
83	AVE	14	1	0	1	2	2	18	1379	M	65	175	75.6
84	AVE	16	2	0	0	0	1	48	1397	M	32	158	70.6
85	AVE	16	4	0	1	4	4	43	2032	M	32	165	70.9
86	AVE	16	2	0	1	0	1	22	1395	M	66	165	66.4
87	AVE	16	2	0	0	5	1	42	2060	M	33	171	86
88	AVE	17	2	0	1	0	1	25	2471	M	63	160	82.9
89	AVE	19	2	0	1	4	1	23	1972	M	57	173	69
90	AVE	21	2	0	2	2	2	35	2296	M	59	177	73.6
91	AVE	22	3	0	1	2	4	39	2630	F	60	184.5	111.8
92	AVE	12	1	1	1	2	3	9	1325	F	84	164	83.5
93	AVE	16	3	1	1	0	2	21	1388	F	59	170	69.5
94	AVE	16	2	0	1	0	1	39	1415	F	65	166	83
95	AVE	10	5	1	1	3	3	20	1397.5	F	80	149	71
96	AVE	5	1	1	2	2	2	13	1015	F	62	157	68
97	AVE	13	5	0	3	0	3	17	793	F	52	161	94.5
98	AVE	7	3	0	0	0	2	11	885	F	36	162	64
99	AVE	7	2	0	1	0	0	24	2085	F	73	156	57
100	AVE	24	1	0	1	1	1	17	2020	F	80	151	69
101	AVE	23	2	0	1	2	1	25	3050	F	55	172	93
102	AVE	25	2	0	5	0	2	26	2560	F	51	158	90
103	AVE	16	1	1	2	4	1	21	1280	F	57	150	53.3
104	AVE	21	1	0	1	2	0	11	1850	F	43	178	110
105	AVE	13	2	0	3	0	1	24	1482	F	60	161	68
106	AVE	10	2	1	1	4	3	29	2220	F	30	160	107
107	AVE	20	2	0	1	4	1	25	2920	F	37	162	61.7
108	AVE	24	1	0	1	3	1	31	2183	F	56	157	61
109	AVE	16	1	0	1	5	1	31	2462.5	F	41	170.5	118
110	AVE	12	1	2	1	2	1	20	1134	F	86	144	61.9
111	AVE	13	2	0	2	2	2	27	1555	F	63	160	72.7
112	AVE	12	3	2	1	3	4	35	1568	F	68	167	81
113	AVE	13	2	0	2	0	4	26	1638	F	47	170	92.5
114	AVE	15	1	0	1	3	1	22	1533	F	71	140	54
115	AVE	15	1	2	1	2	3	25	1945	F	65	153	82.5
116	AVE	20	1	0	1	1	1	16	2115	F	56	160	76

117	AVE	19	3	0	2	0	2	36	1998	F	54	152	75
118	AVE	32	3	0	0	0	4	44	3295	F	67	164	77
119	AVE	12	1	0	1	2	3	26	1660	F	55	169	82
120	AVE	14	1	1	1	1	2	30	1205	F	65	160	76
121	AVE	14	3	0	2	5	4	32	2068	F	65	154	69.6
122	AVE	13	1	0	1	0	1	13	1110	F	73	163	96
123	AVE	15	2	0	1	2	2	26	1795	F	35	166	68
124	AVE	16	2	0	2	2	1	17	1642	F	54	165	71.6
125	AVE	21	1	1	1	0	1	26	2213	F	53	164	73.6
126	AVE	4	0	0	1	1	2	10	635	F	60	155	49.7
127	AVE	11	1	0	1	1	2	20	1220	F	50	158	65
128	AVE	17	1	0	1	5	4	19	2325	F	42	171	97.5
129	AVE	8	3	1	1	3	4	28	1330	F	56	160.5	86.5
130	AVE	14	1	0	1	5	2	27	1733	F	67	154	59.3
131	AVE	20	2	0	1	2	4	14	2353	F	52	163	103.5
132	AVE	12	1	2	2	1	2	29	1575	F	56	164	82.4
133	AVE	12	2	1	1	3	2	29	1715	F	59	163	67
134	AVE	19	1	0	1	1	2	34	1807	F	50	166.5	79.2
135	AVE	15	2	0	1	0	2	26	1515	F	81	160	68.3
136	AVE	9	1	3	1	0	2	37	1325	F	58	172	58
137	AVE	15	1	0	1	9	2	57	2655	F	70	160	59
138	AVE	19	2	0	2	3	2	24	2150	F	74	167	71
139	AVE	14	2	0	1	2	2	24	1600	F	46	163	100
140	AVE	20	17	0	1	7	1	35	2737	F	64	167	93.5
141	AVE	14	3	0	1	0	2	54	1645	F	65	161	78
142	AVE	20	2	0	2	2	1	16	2635	F	59	151	53
143	AVE	12	1	0	2	0	0	17	1290	F	81	152	72
144	AVE	5	1	1	1	0	0	11	530	F	71	154	61
145	AVE	9	2	2	1	0	1	28	1073	F	72	157	67.5
146	AVE	9	2	0	3	2	3	24	1665	F	81	150	69.6
147	AVE	12	2	0	1	0	2	24	1548	F	59	162	79.3
148	AVE	16	4	2	1	4	0	44	1855	F	62	161	80.5
149	AVE	17	1	0	2	2	0	14	1810	F	78	161	63
150	AVE	18	1	0	2	0	2	27	1990	F	78	162	62.5
151	AVE	29	1	0	2	0	2	25	2475	F	58	163	69
152	AVE	19	2	0	1	0	2	26	1495	F	46	152	71.5
153	AVE	17	1	1	1	3	3	30	1490	F	57	155	94
154	AVE	24	2	0	2	3	0	30	2900	F	61	156	78.5
155	AVE	10	2	3	2	0	2	29	1420	F	52	156	69
156	AVE	11	2	1	3	4	3	26	2135	F	83	155.1	44.1
157	AVE	21	2	0	1	3	2	35	2136	F	54	169	74
158	AVE	19	2	0	1	8	2	32	2405	F	68	153	76
159	AVE	18	2	2	0	4	0	26	2032	F	57	163	62.5
160	AVE	14	2	0	1	4	1	19	1665	F	56	163	61.5
161	AVE	6	1	0	1	2	3	19	705	F	68	148	56
162	AVE	13	1	0	1	0	3	23	1430	F	55	165	92.2
163	AVE	9	2	1	1	3	2	50	1425	F	48	156	70
164	AVE	22	3	1	1	0	2	33	2640	F	32	163	33.6
165	AVE	24	1	0	1	0	2	76	2405	F	71	156	65.2
166	AVE	12	3	0	0	2	2	34	1195	F	63	165.5	73.4
167	AVE	14	3	0	1	0	1	32	1680	F	43	172	86.5
168	AVE	8	1	0	1	0	1	19	1255	F	45	159	72.1
169	AVE	19	4	0	1	2	1	26	2280	F	76	157	70.5
170	AVE	15	2	2	0	3	2	31	1680	F	58	164	63.3
171	AVE	15	1	0	1	0	1	12	1340	F	49	168	93.3
172	AVE	15	3	0	1	0	2	28	1595	F	71	151	72.4
173	AVE	5	1	0	0	2	1	19	628	F	47	154	64.4
174	AVE	19	3	0	1	3	0	31	2045	F	46	164	79.7
175	AVE	8	3	0	1	6	1	23	1500	F	64	148	96.2
176	AVE	14	1	0	1	2	1	12	1557	F	57	165	61.8
177	AVE	13	2	0	1	0	2	26	1175	F	50	161	73.9
178	AVE	25	3	0	1	2	2	27	2932	F	60	164	87.2

179	AVE	20	3	1	1	2	3	18	1590	F	57	163	72.7
180	AVE	8	2	1	1	8	5	38	1640	F	51	163	98
181	AVE	7	1	2	3	1	2	29	1320	F	70	162	76
182	AVE	8	1	0	0	0	2	13	1420	F	67	158	86.2
183	AVE	24	2	0	3	5	1	58	3240	F	67	158	69.5
184	AVE	22	1	0	1	0	2	18	1945	F	50	170	62
185	AVE	20	2	3	1	7	3	32	2320	F	49	162	75.2
186	AVE	24	1	0	1	1	4	72	2585	F	49	159	74.8
187	AVE	20	2	0	1	1	4	24	1677	F	65	162	113.4
188	AVE	9	1	0	1	1	2	17	955	F	70	152.2	90.4
189	AVE	9	2	1	1	4	2	15	1450	F	70	182	64.2
190	AVE	10	1	0	1	1	1	12	875	F	63	168	91
191	AVE	21	3	0	2	2	3	22	2371	F	59	159	66
192	AVE	17	1	0	1	2	3	17	2585	F	59	155.5	82.9
193	AVE	12	2	0	1	2	4	23	1508	F	58	164.5	84.7
194	AVE	12	2	0	1	4	2	17	1732	F	52	142	60.9
195	AVE	13	2	0	2	0	0	18	1234	F	55	160	90.5
196	AVE	23	2	0	2	5	0	32	2566	F	54	172	58.3
197	AVE	17	1	0	2	2	3	15	1895	F	66	154	53.1
198	AVE	9	2	0	3	0	4	16	1412	F	59	155	67
199	AVE	30	2	0	2	2	1	33	3561	F	56	163	119.2
200	AVE	13	2	1	2	2	5	19	1641	F	45	155	81
201	AVE	25	2	0	1	3	4	29	2633	F	67	152	95.6
202	AVE	23	3	1	1	1	2	24	2317	F	40	165	100.5
203	AVE	18	2	2	1	3	3	20	2104	F	72	159	81.6
204	AVE	16	2	0	1	4	2	33	1873	F	70	158.5	90
205	AVE	14	2	0	1	2	2	16	1348	F	74	160	74.9
206	AVE	8	2	1	1	0	1	19	943	F	63	155	81.4
207	AVE	18	1	0	2	0	2	22	1790	F	67	150	42.4
208	AVE	17	4	1	2	0	4	32	2028	F	64	161	81.5
209	AVE	18	1	0	2	2	2	16	2052	F	47	161	84.6
210	AVE	8	2	0	2	2	1	24	1271	F	54	156	71.5
211	AVE			14	1	1	1	1	0	F	2	18	1630
212	AVE	17	2	1	1	0	1	36	1691	F	48	158	78.4
213	AVE	17	2	1	1	3	2	28	1639	F	54	161	76.1
214	AVE	4	0	0	2	4	2	11	1050	F	61	164.5	94
215	AVE	21	2	0	1	2	2	31	2640	F	49	162	107.5
216	AVE	7	1	2	2	2	1	15	1223	F	48	169.5	87.1
217	AVE	8	2	2	2	1	1	24	1170	F	55	160	75.5
218	AVE	17	2	0	1	4	2	24	2102	F	59	163.3	81
219	AVE	19	2	1	1	4	3	38	2059	F	64	160	89.5
220	AVE	14	2	1	3	3	2	23	1757	F	52	164	85.4
221	AVE	14	3	0	1	0	2	16	1114	F	67	159	58.7
222	AVE	19	3	0	0	2	1	42	1715	F	36	146.5	78.1
223	AVE	7	2	0	2	2	1	16	1203	F	57	166.5	83.5
224	AVE	15	3	0	1	3	3	23	1746	F	65	164	70
225	AVE	15	2	0	1	3	2	28	1540	F	81	164	82
226	AVE	14	1	1	1	0	1	25	1163	F	46	174	95.2
227	AVE	7	1	0	1	0	5	9	992	F	64	160	96
228	AVE	20	1	0	1	3	1	17	2262	F	50	159	72.7
229	AVE	9	0	0	2	0	1	8	876	F	54	163	81
230	AVE	13	1	0	1	3	2	30	1657	F	43	164	75.4
231	AVE	14	1	0	1	0	2	15	1337	F	53	158	110.7
232	AVE	20	1	0	2	3	1	58	2175	F	54	170	115
233	AVE	19	2	0	1	6	2	36	2186	F	68	156	51
234	AVE	10	2	1	2	2	3	23	1507	F	47	168	65.6
235	AVE	14	1	0	1	0	2	15	1202	F	70	165	97
236	AVE	23	1	2	2	0	1	24	2513	F	34	159	53.4
237	AVE	24	1	0	2	0	1	20	2434	F	47	161	93
238	AVE	15	1	0	1	6	2	17	1680	F	60	165	103.5
239	AVE	14	1	0	2	0	1	13	1323	F	65	163.5	43.2
240	AVE	19	1	1	2	4	3	29	1420	F	48	161	83

241	AVE	16	1	1	2	4	3	16	1760	F	65	158	54
		3814	474	108	308	531	477	6349	443737		13898	39488	18311.3
		15.8257	1.9668	0.44813	1.278	2.20332	1.9793	26.344	1841.23		57.67	163.85	75.980498

Key:

- STA- Number of starch and bread servicing.
- VEG- Number of vegetable servings
- FRUIT- Number of fruit servings
- MILK- Number of milk and milk products servings
- MEAT- Number of meat and meat substitutes servings
- FAT- Number of fat servings
- Fiber- Amount of fiber intake.
- AVE- Average from three day food diary

APPENDIX XIII: Number of Exchanges per kilocalorie needs

Food group	Kcal 800	Kcal 1000	Kcal 1200	Kcal 1500	Kcal 1800	Kcal 2000	Kcal 2200	Kcal 2500	Kcal 3000
Milk	1	2	2	2	2	2	2	3	4
Vegetables	2	2	2	2	2	3	3	3	5
Fruit	2	2	3	3	3	4	4	4	6
Starch	3	4	5	7	9	10	12	13	14
Meat	4	4	4	6	7	7	7	8	9
Fat	0	1	2	2	3	4	5	6	8

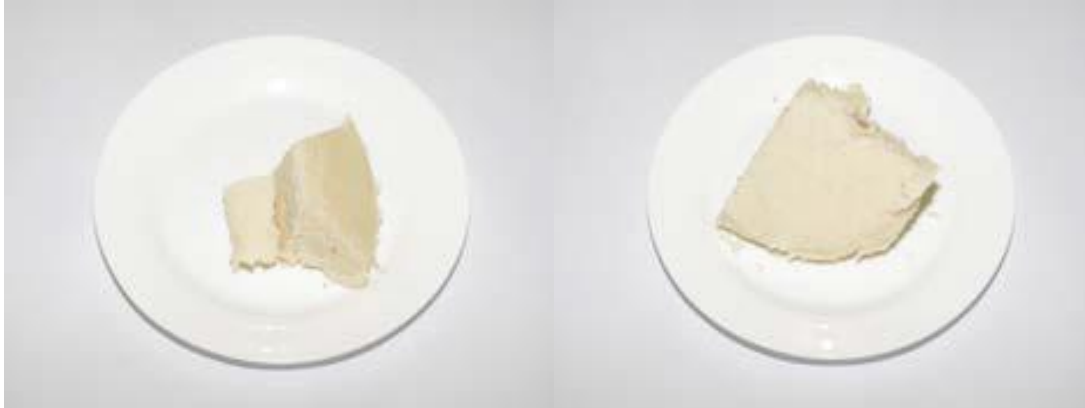
Source: Kenya National Clinical Nutrition and Dietetics Reference Manual 2010

APPENDIX XIV: Exchanges for Carbohydrates, Proteins, Fats and Energy Values

List	Portion size per serving	Amount (ml or g)	CHO	PRO	Fats	Kcal/ serving
<i>Starch</i>	1/3 cup arrowroots	30g	15		-	80
	1/3 cup Ugali		15		-	
	1 slice bread,		15		-	
	1/3 cup cassava		15		-	
	1/2 cup cooked bananas		15		-	
	1/2 cup dried cooked beans		15		-	
	1/2 cup cooked rice,		15		-	
	1/2 cup cooked pasta,		15		-	
	1/2 cup sweet potatoes,		15		-	
	1/2 cup porridge,		15		-	
	1/2 cup Irish potatoes, 1/2 chapatti		15		-	
<i>Milk</i>	1 cup fresh milk,	250 ml	12		Trace	90
<i>Nonfat</i>	1/4 cup ice cream,	250ml	12			120
<i>Low fat</i>	75 ml or one scoop,	250ml	12			150
<i>Whole</i>	1 cup yoghurt					
<i>Meat</i>	Size of matchbox meat,	30g	-		3	55
<i>Lean</i>	palm size of fish,	30g	-		5	75
<i>Medium fat</i>	a leg, thigh or breast chicken,	30g	-	7	8	100
<i>High fat</i>	2 tbsp peanut butter,	30g	-	7	3	75
<i>Egg</i>	1/2 cup fresh beans, 1/2 cup Omena					
<i>Vegetables</i>	1/2 cup cooked vegetables,	100-	5	2	-	25
	1 cup raw vegetables, 1 gram tomato,	150g				
<i>Fruits</i>	1 small apple, peach, orange or pear, 1/2 cup orange, apple or grape fruit juice(pure juice) 3/4 cup diced fruits	Varies	15	-	-	60
<i>Fats</i>	1 tsp margarine or oil, 10 large peanuts, 1/8 medium avocado, 1 slice bacon, 1 tbsp shredded coconut, 1 tbsp cream cheese, 1 tablespoon salad dressing, 5 large olives		-	-	5	45
<i>Sugar</i>	1 tsp		5			20

Source: Kenya National Clinical Nutrition and Dietetics Reference Manual 2010.

APPENDIX XV: Photographs of Pre-Weighed Foods



Maize meal Ugali 190g

Maize meal Ugali 380g



Mixed flour ugali/Millet/sorghum 134g

Mixed flour ugali/Millet/sorghum 240g



Maize porridge 347g (Full cup)

Mixed flour porridge/millet/sorghum 330g



Mixed flour porridge/millet/sorghum 328g Mixed flour porridge/millet/sorghum 347g



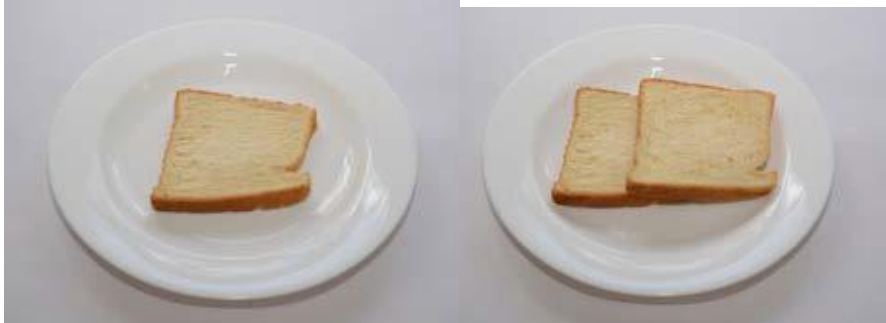
Boiled white rice 102g Boiled white rice 204g



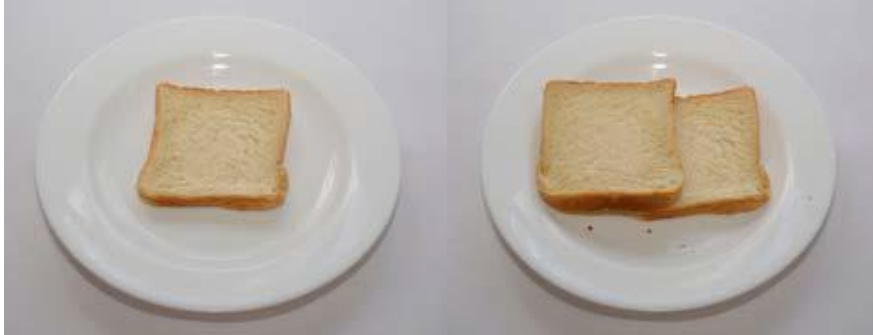
Spaghetti 104g Spaghetti 209g



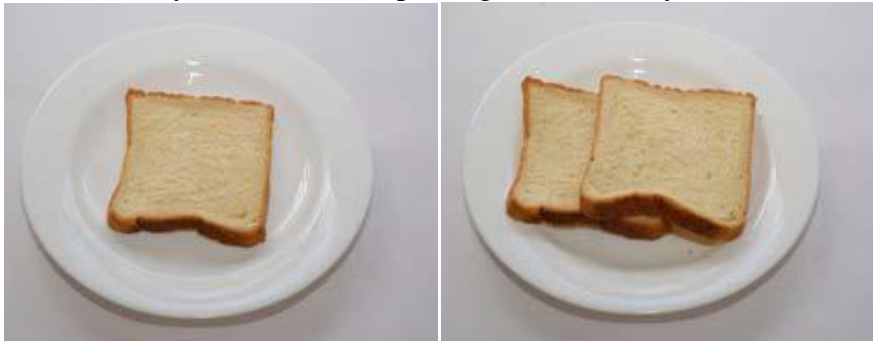
Weetabix 20g Weetabix 40g Cornflakes 21g



White/sweet/yellow bread-600pkt 27g White/sweet/yellow bread-600pk 54g



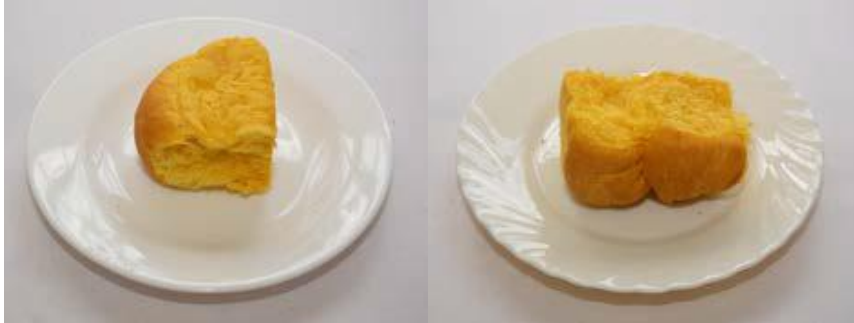
White/sweet/yellow bread-400pkt 26g White/sweet/yellow bread-400pkt 52g



White/sweet/yellow bread-800g pkt 37g White/sweet/yellow bread-800g pkt 74g



Brown bread 400g pkt 26g Brown bread 400g pkt 52g

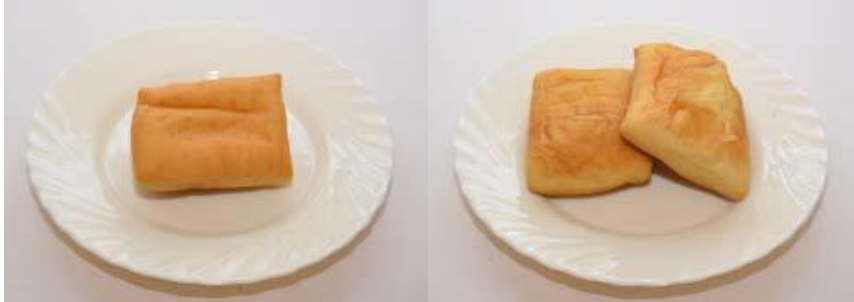


Scones 32g Scones 72g



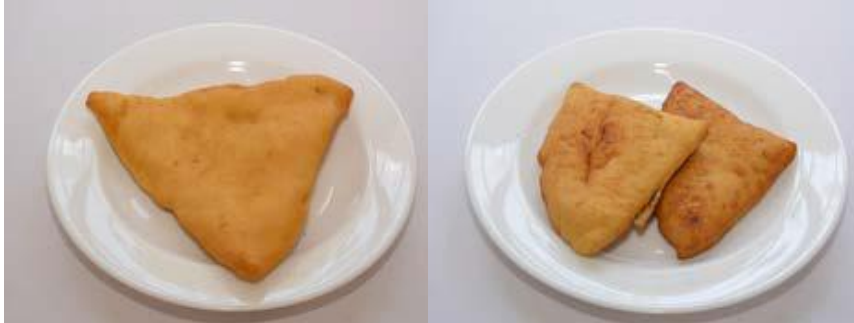
Round mandazi (Kaimati) 60g

Round mandazi (Kaimati) 120g



Squared mandazi supermarket 62g

Squared mandazi supermarket 124g



Triangular mandazi supermarket 94g

Mandazi-street/locally made 144g



Pan cake-home made 71g



Pan cake-supermarket 175g



White chapatti home made 107g



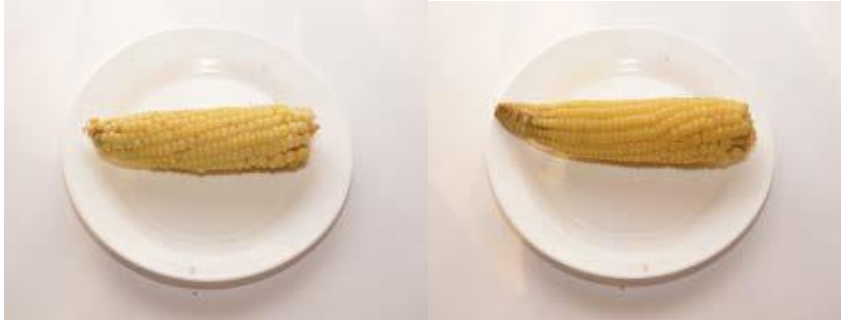
Brown chapatti homemade 113g



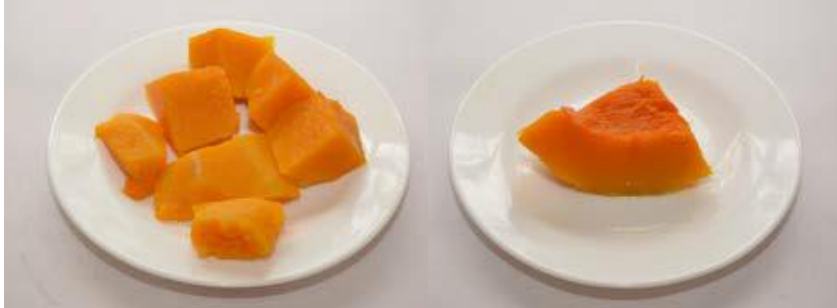
Pumpkin chapatti 149g



Roasted maize without cob 148 (three quarters)



Boiled maize 246g Boiled maize 303g



Boiled butternut 205g Boiled pumpkin 99g



Stewed green bananas 211g Stewed green bananas 359g



Boiled sweet potato 214g Boiled sweet potato 239g



Stewed beans 73g Stewed beans 145g



Stewed green grams 69g Stewed green grams 138g



Kales 70g Kales 140g



Mixed traditional vegetables 102g Mixed traditional vegetables 204g



Stewed beef/goat/mutton 56g

Stewed beef/goat/mutton 111g



Stewed liver 69g

stewed liver 128g



Stewed matumbo 50g

Stewed matumbo 100g



Stewed chicken 80g

stewed chicken 159g



Scrambled egg with onions and tomatoes 89g Scrambled egg with onions and tomatoes 178g



Fried fish 53g Fried fish 92g Fried 146



Fried omena 53g Fried omena 105g



Fried Githeri 100g Fried Githeri 200g

Source: Photographic food atlas for Kenyan adolescents (9-14 years) Anono *et al.*,2018.

Appendix XVI: Diabetic instruction sheet f



An ISO 9001:2015 Certified Hospital



MOI TEACHING AND REFERRAL HOSPITAL

NUTRITION DEPARTMENT

DIABETIC INSTRUCTION SHEET

People with diabetes should see a dietician or Nutritionist for proper counseling on diet.

Diabetes can be managed by:-

- Diet and insulin
- Diet and oral hypoglycemic drugs
- Diet alone

Make sure meals are nutritionally balanced - having the food from each group i.e. energy giving, body building and protective foods.

GENERAL INSTRUCTIONS

- Do NOT use sugar or sugary foods
- Reduce the consumption of fried food and foods high in fat - use preferably stewed, grilled, steamed, boiled foods.
- Increase physical activity (exercise)
- Reduce the intake of salt and processed foods especially preserved with sodium
- Increase the intake of green leafy vegetables.
- Take plenty of water - (8 - 10 glasses per day)
- Eat small frequent foods 6 times a day - 3 meals and 3 snacks
- Do not skip meals
- Avoid alcohol intake
- Do not smoke.

DO NOT USE THE FOLLOWING

- | | |
|--|----------------|
| - Cakes | - Sugar |
| - Sugar cane | - Squash |
| - Honey | - Soda |
| - Chocolate | - Sugar syrups |
| - Ice cream | - Glucose |
| - Lucozade | |
| - Milk, drinking chocolate. | |
| - Biscuits | |
| - Bottled / tinned /packed juice/fruits which sugar has been added | |

FOODS TO USE

ENERGY GIVING FOODS

Rice	-	1 cup
Bread	-	2-3 slices
Chapati	-	1
Cassava	-	1 cup
Arrow roots	-	1 cup
Irish potatoes	-	1 cup
Spaghetti	-	1 cup