Dietary habits and prevalence of obesity among type 2 Diabetes patients seen at Scott Hospital, Morija, Lesotho.

Researcher: **Dr. Francis Opeyemi Adebayo**
MBBS, Dip HIV Man (SA).

Submitted in Partial fulfillment of the requirements for the M Med (Family Medicine) degree in the department of Family Medicine and Primary-Health Care, University of Limpopo (Medunsa Campus), South Africa.

Supervisor: **Prof G. A. Ogunbanjo**
MBBS, FCFP (SA), M Fam Med (MEDUNSA), FACRRM, FACTM, FAFP (SA).

DECLARATION

I, Dr. Francis .O. Adebayo hereby declare that the work on which this research is based is original (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being or is to be submitted for another degree at this or any other University.

Signed: ----------

Dr Francis Opeyemi Adebayo.

ACKNOWLEDGEMENTS

First of all I will like to thank my Supervisor, Prof. G.A. OGUNBANJO for his assistance, patience and encouragement.

I thank my facilitators, Mama Nomsa Malete & Dr M.A. Nkambule for their support through the years.

Also, my darling wife, Abiola and my sons, Adeoluwa and Adeayo for standing in the gap for me always.

Lastly, Praise be to the JEHOVAH GOD for the grace I received from HIM to complete this programme.

LIST OF TERMS

IDF – International Diabetes Federation

DM – Diabetes Mellitus

MOHSW –Ministry of Health and Social Welfare

ADA –American Diabetes Association

UKPDS –United Kingdom Prospective Diabetes Study

FAO –Food and Agricultural Organization

GL –Glycaemic Load

GI-–Glycaemic Index

HbA_{1C} – Glycosylated Hemoglobin

HDL –High Density Lipoprotein

BMI – Body Mass Index

WHO –World Health Organization

CONTENTS

LIST OF TABLES

ABSTRACT

Introduction: Diabetes Mellitus still remains an important non- communicable disease globally. The burden of the disease continues to rise even in the sub-Saharan Africa.

Aim: The study aimed to assess and describe the dietary practices and the prevalence of obesity among type 2 diabetic patients seen at Scott Hospital.

Methods: A descriptive cross- sectional study was conducted among type 2 diabetic patients at Scott Hospital, Morija, Lesotho. A simple random sample of 50 participants was selected and each completed an interviewer administered questionnaire. The administration of the questionnaire was done by the researcher and a research assistant. Socio- demographic characteristics of the participants were obtained, anthropometric measurements were height and weight of each participant with subsequent determination of the BMI. Dietary intake was assessed using questions from a modified food frequency questionnaire of 16 food groups that reflect the commonest food items available.

Results: The results showed that 86% (43/50) of the participants were females and 14% (7/50) were males with a female: male ratio of 6:1.

The majority (72%) were above age 50 years and with regards to educational status, 62% had primary school education as the highest level attained. Four percent (4%) had no formal education. Fifty percent (50%) of the participants were unemployed.

The mean weight of the participants was 84.22 ± 13.51 kg and the mean height was 157.76 ± 6.10 cm. The mean BMI was 33.97 ± 4.99 kg/m².

Seventy-eight percent (38/50) of the participants were obese, and 14% (7/50) of the participants who were females, were morbidly obese with BMIs ≥ 40kg/m². The prevalence of obesity when stratified by gender showed that 57% (4/7) of male participants and 81% (35/43) of female participants were obese.

According to the dietary assessments, food groups with the highest reported consumption per unit per month were; maize meals, breakfast-cereals and bread respectively.

Conclusion: The study showed a predominantly female and elderly population of type 2 diabetics at Scott Hospital, Morija, Lesotho.

The prevalence of obesity was high (78%) among the participants and this further supports the view that obesity is a major risk factor for type 2 diabetes.

Reported dietary intake showed a higher consumption of carbohydrates and a very low intake of dietary fibre as represented by legumes.

Keywords: Type 2 diabetes mellitus, dietary habits and obesity.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Diabetes Mellitus is an important non-communicable disease and is undoubtedly a rising condition globally. Sub-Saharan Africa is not immune as it is experiencing an ever-increasing burden of diseases, among which infectious diseases such as Tuberculosis and HIV. All these occur in a region in which over 40% of the population live on less than US $1/day (Levitt 2008).

Diabetes Mellitus (DM) comprises of a heterogeneous group of disorders caused by a relative or absolute insulin deficiency, resulting in abnormalities of carbohydrate and fat metabolism (WHO, 1994). It is sub-divided into two types, namely types 1 & 2, and classically characterized by hyperglycemia with other clinical presentations such as polyuria, polydipsia, polyphagia, fatigue and irritability. In type 2 DM, many patients are relatively asymptomatic initially. Hyperglycemia is the classical feature in both types of DM and the diagnostic criteria involve a fasting plasma glucose of ≥7mmol/L (≥126mg/dl) or 2hour post-prandial plasma glucose of ≥ 11.1mmmol/L (200mg/dl) (Skyler, 2004).

Type 2 DM accounts for 80-90% of all forms of diabetes and its prevalence is increasing in direct relation to an increase in the prevalence of obesity. (Ogunbanjo, 2006).

Given the double effect of increasing rates of obesity and the trend towards more sedentary lifestyles, diabetes is one of the most serious epidemics.

The disease constitutes an enormous economic burden with per capita expenditure by people with diabetes being 2.4 times that spent by the non-diabetic population (Skyler, 2004).

The current morbidity of diabetes is primarily due to high rates of microvascular complications including; retinopathy, nephropathy and neuropathy, while macrovascular complications like coronary artery disease, cerebrovascular disease and peripheral vascular disease, once rare, are becoming more common particularly in the urban setting.

Diabetes is a serious illness with multiple complications and premature mortality, accounting for at least 10% of total health-care expenditure in many countries (Roglic et al, 2005).

The excess global mortality rate attributable to diabetes in the year 2000 was estimated to be 2.9million deaths, equivalent to 5.2% of world all-cause mortality. Globally, diabetes is the fifth leading cause of death (Roglic et al., 2005).

1.2 PROBLEM STATEMENT

The researcher observed that each patient who attended the diabetic clinic kept asking the same question; “What food items must I avoid”? This became a recurrent and unresolved issue for the medical team during each clinic visit. The doctors and nurses often gave conflicting dietary advice to these patients. At times patients had to be sent to nurse educators to get proper dietary advice, but did not yield any appreciable results on the side of the patients as it was observed that the majority of them struggled with uncontrolled weight gain.

Hence, the researcher felt that there was a need to know the diets of these diabetic patients in order to provide appropriate information. This information would help in understanding the context of the population living with type 2 DM seen at his practice.

It is an established fact that obesity and diet are risk factors in type 2 DM, not only for determining the disease onset but also dictating its progression (WHO study group, 1994. The mainstay of treatment of type 2 diabetes is primarily diet and other forms of lifestyle modification (Joshi & Joshi 2009; Schwellnus et al., 2009). According to Russell-Jones & Khan (2007), over 80% of diabetics are obese. Hence the importance of weight reduction (Joshi & Joshi 2009; Russell-Jones & Khan 2007).

According to a survey conducted by the Ministry of Health and Social Welfare, Lesotho in 2001, the prevalence of diabetes in the country was 1.5%, a figure which included glucose intolerance. Furthermore, it was noted in the survey that type 2 diabetes mellitus was probably the most prevalent form in the country because 90% of the people with diabetes were above the age of 40 years (MOHSW, Lesotho 2001).

It is envisaged that this study will help to determine the prevalence of obesity and dietary habits of these DM patients so as to focus on the important issues that need to be addressed concerning their diet.

1.3 RELEVANCE OF THE STUDY.

There is no current study on the prevalence of obesity among type 2 diabetics in Lesotho. The demographic survey only addressed the prevalence of obesity in the general population (MOHSW, Lesotho 2001). Also, no studies on the dietary habits of diabetic patients have been conducted in Lesotho.

The researcher hoped that this study will achieve the following:

- Contribute to the body of knowledge on DM at Morija, Lesotho, on the dietary habits and prevalence of obesity among the diabetic patients studied.
- Benefit the physicians, nurse clinicians and nurse educators on the development of a more effective health education program.

1.4 COUNTRY PROFILE.

Lesotho is a small mountain kingdom situated in the southern part of Africa and completely surrounded by the Republic of South Africa.

The population of the country in 2003 was estimated at 2.2 million, with a total area of about 30,355 square kilometers of which about 10% is arable land (Lesotho Demographic & Health survey 2004).

The country can be distinguished by the high altitude terrain, which is why it is sometimes referred to as the “Mountain Kingdom” or “Kingdom in the Sky”.

Lesotho is primarily a country of subsistence farming, and crops grown are maize, wheat and sorghum as well as peas, beans and potatoes.

The country is divided into 10 administrative districts which form the basis for the operation of a District Health system operated by the District Health Management Boards (Lesotho Demographic & Health survey 2004).

1.5 STUDY SETTING – SCOTT HOSPITAL MORIJA

The study was conducted at the outpatient department of Scott Hospital, Morija Lesotho. It is a 120-bed hospital, with a busy outpatient department having an average patient consultations of 1200-1500 per month. The hospital is located at Morija which is about 45km south of Maseru, the capital of Lesotho. The facility serves Morija town and its neighbouring villages through fourteen primary heath care centres located in those villages.

CHAPTER 2

LITERATURE REVIEW

2.1 EPIDEMIOLOGY OF DIABETES MELLITUS

The number of people with diabetes globally will more than double over the next 25 years, increasing from 171 million in year 2006 to 366 million by 2030 (Rheeder, 2006). In addition, the prevalence of diabetes among all age groups world wide which was estimated to be 2.8% by the year 2000 has been projected to rise to 4.4% by 2030 (Rheeder, 2006; Wild, 2004).

The recently published International Diabetes Federation (IDF) Atlas (2009), points to a greater future problem by projecting that by 2010 about 285 million people worldwide will be affected, with a projected rise to 430 million by 2030. The report highlighted the fact that low and middle income countries (developing countries) will bear the brunt of the increase and Africa will contribute significantly to this rise.

Levitt (2008) reported that 10.8 million people had diabetes in sub-Saharan Africa in 2006 and that this would rise to 18.7 million by 2025, which is an increase of 80%, exceeding the globally predicted increase of 55%.

Also, a prevalence of 3.4% for the 24million South Africans between the ages of 20 and 79 in 2003, is expected to increase to 3.9% by 2025 (Rheeder, 2006). According to the Lesotho survey of 2001, the prevalence of diabetes was 1.5 % (MOHSW Lesotho., 2001).

The rise in the prevalence of type 2 diabetes which accounts for the majority of cases of diabetes globally has been linked to the increase in the prevalence of obesity (Rheeder, 2006; Ogunbanjo, 2006). Observational studies have also established that obesity is associated with a substantially increased risk of developing type 2 diabetes (Will et al., 2002; Ford, Williamson & Liu, 1997).

The World Health Organization (WHO) reported that more than 1 billion adults are overweight and at least 300 million are clinically obese. The problem of the rising prevalence of obesity is global and is now affecting the developing world (WHO., 2005).

In South Africa, the demographics and public health survey published in 2002 showed that, 29.2% of men were overweight or obese (≥25kg/m^2) compared to 56.6% of South African women (Puoane et al., 2002).

According to the 2001 Lesotho survey, the prevalence of obesity in the general population showed that 47.3% women, as against 18.8% men, were obese (MOHSW Lesotho., 2001).

2.2 DEFINITION AND AETIOPATHOGENESIS OF DM

Diabetes Mellitus comprises a group of metabolic disorders characterized by hyperglycemia arising as a consequence of relative or absolute deficiency of insulin secretion, resistance to insulin action or both (Skyler, 2004; Gerich, 2003; Kahn, 2003). Apart from the characteristic hyperglycemia, diabetes mellitus is also associated with underlying metabolic disorders such as altered metabolism of carbohydrates, fats and proteins. Although several pathogenic processes may be involved in the development of diabetes, the vast majority of cases fall into two main categories; type 1 diabetes and type 2 diabetes (Skyler, 2004).

Type 2 diabetes is the more common type and accounts for 80-90% of all forms of DM, and many of the affected patients are relatively asymptomatic initially (Ogunbanjo, 2006). This is usually a result of resistance to insulin action in the setting of inadequate compensatory insulin secretory response (Skyler, 2004; Gerich, 2003; Khan, 2003).

Insulin resistance is quite common because it arises as a consequence of obesity, a sedentary lifestyle, and ageing with resultant hyperglycemia and diabetes, blood pressure elevation and dyslipidaemia. Type 2 diabetes does not manifest in all persons with insulin resistance but rather only in those with a defective insulin secretory function which is presumably genetic in causation such that pancreatic insulin secretion fails to compensate for the insulin resistance. Ultimately, in type 2 diabetes, there is a

progressive loss of pancreatic islet beta cells resulting in insulin deficiency and the need to replace insulin (Skyler, 2004).

Although the pathogenesis of type 2 diabetes mellitus is not fully understood, there are at least three factors of importance: (WHO study group 1994; Zimmet 1992):

(1) Individual or ethnic genetic factors leading to susceptibility;

(2) defects in pancreatic beta cell function; and

(3) decreased action of insulin in insulin sensitive tissues (Insulin-resistance), including skeletal muscle, liver and adipose tissue.

Therefore the pathophysiology of the disease is primarily linked to the interplay of genetics with effects on obesity, β-cell capacity, insulin resistance and interaction with the environment in the form of inactivity, abundance of food with resultant insulin resistance, hyperinsulinaemia due to β-cell compensation and eventual decompensation of the β-cell with subsequent impaired glucose tolerance. This finally causes a decline of β-cell mass, severe hyperglycemia, hypoinsulinaemia and glucotoxicity manifesting as type 2 diabetes (Ogunbanjo, 2006).

Type 2 diabetes shows strong familial aggregation. Twin and family studies have provided firm evidence that the role of the genetic component is relatively strong (Bennett et al., 1992). Insulin resistance and associated hyperinsulinaemia in type 2 diabetes mellitus are closely associated with various cardiovascular risk factors such as hypertension, dyslipidaemia, generalized and central obesity (Zimmet, 1992).

Several suggestions have been made regarding the cellular mechanisms responsible for increased insulin resistance, including decreased activation of enzymes (e.g. glucokinase and glycogen synthase), reduced levels of cell membrane glucose transporters and increased levels of circulating fatty acids (WHO, 1994; De Fronzo and Ferrannini 1991).This is further supported by findings from studies that insulin resistance is accentuated in those with generalized and/or central obesity and in the physically inactive (WHO, 1994; De Fronzo and Ferrannini 1991).

According to the WHO health report of 2002, “about 58% of diabetes globally can be attributed to body mass index (BMI) above 21kg/m^2 ”. Hence, obesity and type 2 diabetes are closely linked with weight gain and obesity resulting in insulin resistance through several mechanisms (WHO, 1994). Environmental factors are also part of the interplay and several of these factors have been proposed but the major risk factors linked to the environment include: nutrition, obesity and physical inactivity. The association between physical inactivity and the risk of diabetes seems to remain even when adjusted for obesity, hypertension and family history of type 2 diabetes (WHO, 1994).

It has also been demonstrated that regular physical activity increases insulin sensitivity and improves glucose tolerance (Zimmet., 1992).

Recent prospective studies have also shown that physical activity is associated with a reduced risk of type 2 diabetes (Hu et al.,2004; Bassuk, Shan & Joan 2005).Thus,

exercise appears to have a protective effect against type 2 DM, possibly through improved insulin sensitivity, which can be accentuated by weight loss achieved through increased physical activity (WHO., 1994).

Obesity which is closely related to physical inactivity has been implicated as a risk factor for type 2 DM by several studies (Hu et al., 2003; Dunstan et al., 2004 & Bonora et al., 2004). The two conditions, obesity and diabetes are now inseparable to the extent that they may be compared to conjoined twins. Hence, obesity is the major risk factor for the development of diabetes. An estimated 60-90% of type 2 diabetes is related to obesity or weight gain (Wolf, 1998; Anderson, Kendall & Jenkins, 2003). Centralized distribution of fat otherwise referred to as abdominal, truncal or central obesity has been specifically implicated in the development of type 2 diabetes although the mechanisms by which it causes glucose intolerance are still poorly understood (WHO, 1994).

Nutrition is also a major risk factor in type 2 diabetes. Recent technological innovations, along with increased material well being and lifestyles that have allowed the exercise of dietary preferences, have led to major changes in the nutritional composition of the diet in developed, and even developing countries. This diet referred to as the “affluent” or western diet is characterized by an excess of energy-dense foods rich in fats, refined and simple sugars and deficient in complex carbohydrate foods (fibre). Studies have also shown that increased dietary intake of saturated fats and decreased intake of dietary fibre can result in decreased insulin sensitivity and abnormal glucose tolerance (Zimmet, 1992).

2.3 DIETARY THERAPY AND WEIGHT REDUCTION IN DM

Obesity or weight gain has such an important role in the pathophysiology of diabetes, that there is an urgent need to implement nutrition strategies to prevent, ameliorate and manage these problems (Ogunbanjo, 2006).

The immediate and long-term goal of diet therapy in the obese type 2 diabetic patient is weight reduction because hypocaloric diets leading to weight loss can improve short term glycaemic levels and also has the potential to improve long- term metabolic control. The United Kingdom Prospective Diabetic Study also showed that the level of blood glucose was greatly improved in type 2 diabetic patients who achieved weight reduction (UKPDS, 1998).

Population studies indicate that most diabetic cases either manifest with obesity in genetically predisposed persons or are caused by obesity. Hence, most overt cases of diabetes in obese patients are potentially either preventable or manageable by weight reduction provided that the diabetes has not been present for more than a few years vis-à-vis in its early stages (Robert, 1995). The problem with this approach is that most patients are either unable to achieve and/or maintain a weight that will reverse overt diabetes.

Weight loss as an intervention is very challenging as there are so many factors that make it difficult to achieve. Cultural perceptions of body size which is a concern may

well hinder measures to reduce the rates of obesity. In some Black rural communities especially in women, a larger body size may be associated with affluence, health, attractiveness and happiness (Puoane et al., 2005).

However, some evidence indicates that cultural perceptions of body size may be changing and that women may be willing to reduce their body size for improved health and social reasons (Duda et al., 2006). Furthermore, there is a stigma attached to the syndrome of weight loss and wasting associated with HIV/AIDS (Levitt 2008). All these factors contribute to a difficult weight reduction program for obese type 2 diabetics.

A realistic weight loss goal of between 5-10% of body weight has been proposed because it is associated with significant improvement in glycaemic control and there is no need in getting people to ideal body weight (Joshi & Joshi 2009). Therefore, attention should be paid to patient education and compliance.

This requires an assessment of the dietary habits of diabetic patients after a particular period of intervention to evaluate the effectiveness of the education they received concerning dietary therapy and to determine the extent of the patients' compliance.

In a 4-year follow-up study of fat intake in newly-diagnosed type 2 DM patients attending general practice in the Netherlands, it was shown that they had an unfavourable fat consumption at diagnosis, followed by a marked reduction in fat consumption after 8 weeks of intervention. These improved dietary behaviours were

sustained for another 4 years (Van de Laar et al., 2004). The long-term sustainability of this improved dietary behaviour was not established.

A guiding principle for formulating diabetic diets should be the recognition that individual food preferences must be respected whenever possible. The dietician should obtain the patient's preferred diet history and try to construct the diet around these preferences because issuing a standardized diet to the patient most times simply guarantees non-compliance (Robert, 1995).

The American Diabetes Association (ADA, 2008) also endorses the absence of specific diets for diabetes, because studies have provided no evidence to support an optimal macronutrient mix for the diabetic diet. The experts also recommended that diet plans be individualized by enquiring about the general eating patterns, preferences of the patients, advising them subsequently about what is acceptable and what needs to be changed (Joshi & Joshi 2009).

Generally, the emphasis should be on a low fat diet (by avoiding fried foods) and a more complex high fibre carbohydrate diet, including foods with soluble fibre such as leafy vegetables, fruits, cereals, roots and pulses. Brown bread or whole wheat bread, pasta, basmati rice and potatoes should be the main part of meals, avoiding the use of spreads. Saturated fats should be restricted and monosaturated fats (such as Olive oil) should be the replacement. "Diabetic foods" containing sorbitol or fructose are best

avoided or limited; they are expensive, and may contain many calories though not in the form of sugar.

Salt intake should be limited to <6gm/day and even less if the patient is hypertensive. Carbohydrates should be 55-60%, fats <30 %, (and lower if hyperlipidaemia is present), and proteins 10-15% of the daily intake (WHO, 1994; Joshi & Joshi 2009).

Since we live in a multicultural society with wide variations in eating patterns and individuals with different eating habits both in terms of timing and content, there is a need for studies on dietary habits of individuals in certain groups of the population. These are, however, lacking and it is as a result of the old paradigm in nutritional research that has focused on consumption of specific nutrients by people rather than the intake of food items. This has been challenged by experts who contend that people do not eat or consume specific nutrients but rather specific foods (Sichieri, 2002; Hu, 1999; WHO, 1998).

Therefore nutritionists have been advocating a change in the emphasis of the dietary recommendations from nutrients to patterns of dietary intake for a long time. The World Health Organization (WHO, 1998) also suggests that dietary allowances for populations should be based on food instead of nutrients.

Although some studies have addressed the dietary patterns of populations in different countries, these are little more than a summation of different types of dietary habits of people that make up the population. It is worthy to note that nutritional transition from a

traditional dietary pattern to a western dietary pattern which contains energy-dense foods has been associated with an increase in the prevalence of obesity in several populations under scrutiny. (Sichieri 2002; Paradis, Perusse & Vohl 2006).

Finally, individual dietary interventions alone might not produce the desired results. Hence an ecological approach to addressing the problems of diet and obesity has been proposed. It has been suggested that obesity should no longer be viewed traditionally as a personal disorder or problem, but should be regarded as “a normal response to an abnormal environment”.

The type of measures needed in this ecological approach involves modifying external factors; the food supply of a population which is complex and needs a multisectoral approach and collaboration for implementation (Nigele, Eugene & Alberti 2001).

In an ecological study, it was observed that in countries with a greater prevalence of obesity but with a high consumption of fish and sea food which are rich in omega-3 fatty acids, there was a reduction in the prevalence of type 2 diabetes when compared to other countries with lower fish and sea food consumption (Nkondjock & Receveus 2003).

2.4 ROLE OF CARBOHYDRATES IN THE DIABETIC DIET

The usage of the Glycaemic Index and Glycaemic load have proved to be a more useful nutritional concept than the chemical classification of carbohydrates into simple or complex sugars. The Glycaemic load (GL) is the product of the Glycaemic index (GI) and the dietary carbohydrate content (GL= GI x Dietary carbohydrate content).

Observational studies have shown that the chronic consumption of a diet with a high glycaemic load is independently associated with an increased risk of developing type 2 DM and certain cancers. Foods with high glycaemic index (GI) are said to cause a higher peak in post-prandial blood glucose and a greater overall blood glucose response in the first 2hours after consumption than foods with a low GI (Foster-Powell, Holt & Brand-Miller, 2002).

A committee of experts brought together by FAO and WHO in 1997 recommended the consumption of a high carbohydrate diet with >55% of energy from carbohydrates, the bulk of which should be rich in non-starch polysaccharides with a low-GI. Examples of low-GI diets are beans, peas, lentils (legumes), pasta, parboiled rice, barley & oats while for high GI diets examples are potato, wheat meal, white bread and high GI breakfast cereal (FAO/WHO, 1998).

There are studies which have provided evidence showing that low-GI diets are associated with improvement in insulin sensitivity and blood lipid concentrations (Frost et al, 1998). Some intervention studies also showed that low-GI diets improved glycated hemoglobin concentrations (Gilbertson et al., 2001; Giacco, Parillo & Rivellese, 2000). In addition, higher blood HDL cholesterol concentrations were observed in patients consuming low-GI diets independent of dietary fat adjustments in other studies (Toeller, Buyken & Heitkamp et al., 2001).

In a USA randomized controlled trial, comparing the effects of a low-GI or a high cereal fibre diet in type 2 DM, the intention-to-treat analysis revealed a decrease in HbA_{1C} of 0.5% in the low-GI diet arm compared to a 0.18% reduction in those who were randomized to a high cereal fibre diet (Jenkins et al, 2008).

Furthermore, a meta-analysis of randomized controlled trials also showed that low-GI diets reduced HbA_{1C} by 0.43% (95%CI 0.72-0.13) over and above that produced by high-GI diets (Brand-Miller, 2003). Hence, using low-GI foods to replace conventional or high-GI foods has a small but clinically useful effect on medium-term glycaemic control in patients with diabetes and a beneficial effect on their lipid profile (Brand-Miller, 2003).

2.5 SUMMARY OF LITERATURE REVIEW

The global prevalence of diabetes is on the rise and sub-Saharan Africa forms a significant part of the disease burden. Type 2 DM is the more common type and accounts for about 80-90% of all DM cases.

Type 2 diabetes mellitus is characterized by 4 major metabolic abnormalities; obesity, impaired insulin action, insulin secretory dysfunction, and increased endogenous glucose output which results partly from decreased insulin sensitivity of the liver (Weyer, 1999).

Obesity is a major risk factor for type 2 DM, the rise in its prevalence has also accounted for the increase in the prevalence of type 2 DM. Overweight and obesity are therefore strongly linked to the development of type 2 diabetes and complicate its management.

For overweight and obese insulin-resistant individuals, modest weight loss has been shown to improve insulin resistance and this is recommended for all such individuals who have or are at risk of developing diabetes. But moderate weight loss may not improve glycaemic control in all obese patients who have diabetes because patients with longstanding disease or severe pancreatic β-cell dysfunction are not as responsive to weight loss as those with less extensive disease (Klein et al, 2004).

However, the effect of controlling body weight in the reduction of risks related to diabetes is of great importance. Nutrition strategies are urgently needed to prevent, ameliorate and manage problems of obesity in diabetes. The limitation of most diets involves a scenario of poor long-term compliance and weight regain. As it is unlikely that one diet is optimal for all overweight/obese persons, dietary approaches should be individualized to allow for specific food preferences and individual approaches to reducing energy intake (Klein et al, 2004).

Food and nutrition interventions that reduce post-prandial blood glucose excursions are important in this regard since dietary carbohydrate is the major determinant of postprandial glucose levels. Low-GI carbohydrate diets seem to be a logical approach to lowering post-prandial glucose. Hence, the glycaemic index of carbohydrate foods was developed to compare the postprandial responses to constant amounts of different carbohydrate-containing foods (ADA, 2008).

The replacement of high-GI foods with low-GI ones is a clinically beneficial intervention in diabetes care, which is as effective as the pharmacological agents used in glycaemic control.

CHAPTER 3

METHODOLOGY

3.1 TITLE:

Dietary habits and prevalence of obesity among type 2 diabetic patients at Scott Hospital, Morija, Lesotho.

3.2 RESEARCH QUESTION

What are the dietary habits and the prevalence of obesity among type 2 diabetic patients at Scott Hospital, Morija, Lesotho?

3.3 AIM OF THE STUDY

The aim of the study was to determine the dietary habits and the prevalence of obesity among type 2 diabetic patients seen at Scott Hospital, Morija, Lesotho.

3.4 OBJECTIVES

- To describe the demographic characteristics of type 2 DM patients at Scott Hospital, Morija, Lesotho.
- To assess their dietary practices
- To determine the prevalence of obesity among them.
- To identify the relationship between their dietary practices with the prevalence of obesity.

3.5 STUDY DESIGN

This was a descriptive cross-sectional study.

3.6 STUDY SETTING

The study was carried out at the Outpatient department of Scott hospital, Morija, Lesotho from 26th June to 28th August 2008.

3.7 STUDY POPULATION/SAMPLING FRAME

The study population from which the sampling frame was derived included adults above the age of 30 years, and confirmed type 2 diabetic patients attending Scott hospital's outpatient department for monthly follow up visits for at least a year prior to the commencement of the study.

3.8 SAMPLE

The study population was 90 type 2 DM patients. The sample size was 50 using a 95% confidence level, study power of 80% and confidence interval of 10%. Simple random sampling was used to select the sample.

3.9 INCLUSION CRITERIA.

All patients with type 2 diabetes above the age of 30 years attending Scott Hospital's diabetes clinic for their monthly follow up visits for more than a year were included.

3.10 EXCLUSION CRITERIA

Patients with type 1 diabetes mellitus and those type 2 diabetic patients with concomitant debilitating illnesses, pregnant diabetic women, and patients with impaired memory or cognitive functions were excluded from the study.

3.11 DATA COLLECTION

The data for this study was collected from 26th June to 28th August 2008. The researcher trained a research assistant who is a qualified nutritionist and also proficient in the local language (Sesotho) to administer the questionnaire. The questionnaire was designed by the researcher with the assistance of the nutritionist.

The interviewer administered questionnaire was pretested with 10 type 2 diabetic patients who were not included in the study. It was then used as the sole instrument of data collection for this study. The majority of the questionnaires was administered in Sesotho by the research assistant, as participants were given the option to respond in English or SeSotho.

Prior to the administration of the questionnaire, each participant was given information on the aim and objectives of the study and allowed to decide about participation in the study. All the selected type 2 DM patients agreed to participate in the study. The informed consent form was then signed by each participant (Appendix A).

The questionnaire was divided into three sections :

3.11.1 Socio-demographic characteristics

Questions were completed by the participants with the aid of the research assistant and researcher. The information collected included age, sex, marital status, level of education, employment status. The year of diagnosis of DM was also documented for each participant.

3.11.2 Anthropometric Measurements

Participants stood and dressed in light clothing without shoes for anthropometric measurements. A calibrated stadiometer (beam scale with height rod graduated in centimeters) was used to obtain the weight and height. Weight was measured to the nearest 0.1kg and height was measured to the nearest 0.5cm.

The scale was calibrated each time for each participant. BMI was computed as weight in kilograms divided by height in metres squared. This was used in the classification of subjects as either being normal, overweight or obese.

Waist circumference was also estimated for each subject as a measure of central obesity. It was measured at the mid-point between the lower border of the rib cage and the iliac crests.

Obesity was categorized using the Body Mass Index as shown in table I:

Table I. Body Mass Index (BMI) Categories: (WHO 1997)

BMI Categories	Values(kg/m²)
Normal	18.5-24.9
Overweight	25 -29.9
Obese I	30 -34.9
Obese II	35 -39.9
Obese III	≥ 40

3.11.3 Dietary assessments and food groupings.

Dietary intake was assessed using questions from a modified food frequency questionnaire of 16 food groups that reflects the commonest food items available. It was designed by the researcher with the assistance of the nutritionist.

The evaluation of the food intake data was performed by grouping together similar food items. This was done for ease of analysis, since the sample size was relatively small. It might be difficult to detect any statistical significance if the food items were analyzed separately. The food grouping scheme was based on the similarity of nutrient profiles. Some individual food items were classified individually if their composition differed substantially from that of other foods (for example eggs, potatoes).

In order to have an idea about the amount of food items usually consumed by the participants, examples of portion sizes were provided as demonstration, using cups,

plates and spoons. Portion sizes were also provided for red meat, poultry, cakes, snacks, potatoes and dessert.

The food frequency questions was administered twice to each respondent to ensure reliability and there were very little or no variations in their responses.

Participants were asked how often they consumed each food item per day, per week, and per month and about the amounts usually eaten. Estimation of the average monthly consumption of each food group was made for each participant by multiplying the amount usually taken with the frequency of consumption either per week or per month. Consumption groups were then generated to facilitate analysis.

The 16 food groups were derived from common food items. The groups are listed in Table II :

Table II. Food Groupings

Foods/Food Groups	Food Items
Rice & Pasta	Rice, pasta
Bread	White bread, Brown bread.
Breakfast cereal	Porridge (Lesheleshele), motoho(kind of porridge in Sesotho)
Spread on Bread	Jam ,Peanut Butter, Margarine
Maize meals	Papa, Samp
Snacks	Makoenya (traditional snack made of flour)
Cakes	Cakes, other pastries
Red meat	Beef, Pork, Mutton, Russian
Poultry	Chicken.
Eggs	Eggs
Potatoes	Potatoes
Legumes	Beans, Lentils, Peas.
High-fat dairy products	Whole milk,

Desserts	Custard + jelly, Fruit Salads.
Sweets & Candies	Chocolate, candy, others.
High-energy drinks	Regular soda, fruit drinks, coke, others.

3.12 DATA ANALYSIS

Data was captured on Excel spreadsheets and exported to Epi-info 3.1 software and analyzed by a statistician. Simple descriptive analysis was done.

The variables used in the analysis were age, educational level, employment status and BMI.

Descriptive statistics of the anthropometric variables; weight, height, and BMI was done using mean, standard deviation and confidence intervals.

Comparison of categorical measurements was done using the chi-square test.

Statistical significance was set at $p<0.05$.

3.13 RELIABILITY AND VALIDITY

Reliability refers to the reproducibility and consistency of information or the degree to which a method gives the same results when used on more than one occasion with the same respondents under the same conditions (De Vos et al ,2002).

This was ensured by administering the same questionnaire over a short period and in the same season to minimize the effect of availability on food intake which is a natural variation.

Additionally, the questionnaire was administered twice to each participant to ensure the reproducibility of their responses.

Validity refers to the accuracy of a study and it is also the degree to which the measurement reflects the true value of the characteristic (De Vos et al, 2002). This was ensured by standardizing the weighing scale before the study.

Content validity, which is the degree of representativeness or sampling adequacy, was ensured by having an exhaustive list of food groupings which allowed the inclusion of a wide variety of food items relevant to the context of the participants for assessment (De Vos et al, 2002).

Also, variation in quantification of food items was minimized through the use of the same measuring standards, such as 250ml cups, tablespoons, serving plates, for all the respondents.

3.14 BIAS

This is defined as any effect at any stage of a research process, or influence that tends to produce results that depart systematically from the true values (Ogunbanjo, 2001).

The following types of bias that might have occurred in this study were:

3.14.1 Selection Bias

This was minimized by selecting all eligible Type 2 diabetic patients attending the hospital's outpatient department for random sampling. It was not possible to eliminate selection bias completely since the study was limited to one hospital.

3.14.2 Bias of Data Presentation/Interpretation

Bias introduced via technical errors from poor techniques, incomplete data and errors arising from inference and speculation which may stem from the researcher's failure to consider every interpretation consistent with the facts. This was minimized by requesting the assistance of a statistician and the supervisor in the data analysis.

3.14.3 Measurement Bias

This happens if the Instrument or measurement tool is not calibrated. The weighing scale was calibrated each day before weighing the patients. Also, the same food utensils were used in demonstrations to the participants throughout the study.

3.15 ETHICAL CONSIDERATIONS

All the participants signed the written consent form to participate in the study, after the aim and objectives of the study were explained. Participants were informed that their medical care at the hospital would be unaffected if they declined participation or withdrew from the study. Anonymity and confidentiality of the participants were maintained throughout the study by using only numbers on the questionnaires. Data

was analyzed as group data. The study was approved by the Medunsa Research and Ethics Committee (MREC) [Clearance Certificate Number: MCREC/M/109/2007: PG], of the University of Limpopo (Appendix B) and the Ministry of Health and Social Welfare, Lesotho. Permission was also obtained from the Hospital Management of Scott Hospital, Morija, Lesotho.

CHAPTER 4

RESULTS

The researcher considered the demographic data of the participants viz; age, sex, marital status, employment status, and level of education.

Anthropometric data such as, weight and height were also measured and used to determine their Body Mass Index (BMI).

The participants were further classified into BMI groups using the WHO classification (1997) to determine the prevalence of obesity.

After dietary assessment, the average monthly consumption of food items per food group was further classified into groups for ease of analysis and description.

4.1 Sociodemograhic Profile

This was a predominantly female population. Eighty-six percent (86%) were females and only 14% were males with a female-to-male ratio of 6:1. The majority of the participants were married (60%), followed by widows (32%). The dominant age group was that of above 60 year olds (40%), followed by age group 50-59 (32%). The majority of the participants (72%) were above the age of 50 years, that is, an elderly population of type 2 diabetics.

Educationally, the majority (62%) had primary school education as the highest level attained. Only 4% had no formal education, and the remainder had either-secondary (16%) or tertiary education (18%). Half of the participants were unemployed (50%) and this was followed by 34% of the participants who were either self-employed or had a part-time or full-time employment.

Table III: Distribution of participants by Age, Sex and Marital status.

VARIABLE	FREQUENCY	PERCENTAGE
SEX		
MALE	7	14%
FEMALE	43	86%
AGE GROUPS (YRS)		
1. 30-39	3	6%
2. 40-49	11	22%
3. 50-59	16	32%
4. >60	20	40%
MARITAL STATUS		
1. Single	2	4%
2. Married	30	60%
3. Divorced	2	4%
4. Widowed	16	32%

Table IV. Distribution of Participants by Educational and Employment status.

EMPLOYMENT STATUS	FREQUENCY	PERCENTAGE
1. Unemployed	25	50%
2. Self employed	6	12%
3. Fulltime employed	10	20%
4. Part-time employed	1	2%
5. Retired	5	10%
6. Others	3	6%
EDUCATION		
1.No formal education	2	4%
2. Primary school	31	62%
3.Secondary school	8	16%
4. Tertiary	9	18%

4.2 ANTHROPOMETRIC CHARACTERISTICS OF PARTICIPANTS

The mean weight of the participants was 84.22 ±13.51kg, and the mean height was 157.76± 6.10cm. The mean BMI was 33.97± 4.99kg/m².

The prevalence of obesity was derived among the participants and then stratified by age groups and sex using BMI group classification. Thirty-nine out of fifty participants were obese with BMI above 30. This translates to 78% of the participants as being "obese''. Seven participants (14%) were morbidly obese with BMI ≥ 40 and all were females.

When stratified by gender, four out of seven males were obese (57%) and thirty five out of forty three females (81%) were obese.

According to the age group strata, the prevalence of obesity was 100% in age group 30-39 years. Although the prevalence was lower in the other age groups, there was still a notable increase among the age groups from 72% to 80 % (Table VI).

Table V: Mean (SD) values of the Anthropometric variables.

Variables	Mean (SD)	95%CI
Weight (kg)	84.22 (13.51)	88.38-88.06
Height (cm)	157.76 (6.10)	156.02-159.49
BMI	33.97 (4.99)	32.55-35.39

Table VI: Prevalence of obesity among Participants

		Normal	Over Weight	Obese Class1	Obese Class2	Obese Class3	Total Obese	%
All participants		3	8	18	14	7	**39**	78%
Sex	Males	1	2	3	1	0	**4**	57%
	Female	2	6	15	13	7	**35**	81%
Age grp (yrs)	30-39	0	0	1	1	1	**3**	100%
	40-49	1	2	4	3	1	**8**	72%
	50-59	1	3	7	3	2	**12**	75%
	> 60	1	3	6	7	3	**16**	80%

4.3 DIETARY ASSESMENT OF PARTICIPANTS

4.3.1 Rice & Pasta

The maximum individual consumption reported was 24 cups per month.

The majority of participants, 37 (74%) reported consumption of less than 5 cups of rice or pasta in a month, while 7 (14%) of them consumed less than 10 cups per month. The remaining 6 (12%) consumed between 10-24 cups per month (p=0.40). These results are not statistically significant.

4.3.2 Breakfast Cereals

The maximum individual consumption reported was 168 tablespoons per month.

Almost half of the participants, 24 (48%) took less than 50 tablespoons of breakfast cereals per month while about one-third, 18 (36%) reported an intake of between 50-100 (<100) tablespoons per month. Only 8 participants (16%) consumed between 100-168 tablespoons per month (p=0.37). These results are not statistically significant.

4.3.3 Bread

The maximum individual consumption was 280 slices per month.

Twenty-two (44%) participants reported that they consumed less than 70 slices of bread per month, while 18 participants (36%) consumed less than 140 slices (70-139 slices) per month. The remaining 10 (20%) consumed between 140-280 slices per month (p=0.31). These results are not statistically significant.

4.3.4 Maize Meal

Maximum individual consumption was 420 tablespoons per month, the individual reportedly consumed 5 tablespoons of maize meal three times a day and for 7days in a week. Ten participants (20%) consumed less than 100 tablespoons per month while 16 (32%) of them took between 100-199 tablespoons per month. Eighteen participants (36%) reported consumption between 200-299 tablespoons per month. The remaining 6 (12%) took between 300-420 tablespoons per month. Majority (78%) of the participants reported intakes between 100-299 tablespoons per month (p=0.57). These results are not statistically significant.

4.3.5 Snacks

The maximum reported individual consumption of snacks per month comprised 24 pieces of the local snack (Makoenya) or flour balls. The majority of participants (94%) reported consumption of less than 6 pieces per month. One participant (2%) reportedly ate 6-11(<12) snack pieces per month while the remaining 2 participants (4%) ate

between 18-24 pieces of snacks per month (p=0.19). These results are not statistically significant.

4.3.6 Cakes

The maximum individual consumption was 16 pieces (a piece was equivalent to the size of a standard muffin). The majority, 44 participants (88%) reported that they ate less than 4 pieces of cake in a month while the remaining 6 (12%) ate between 8-16 pieces of cake per month (p=0.03). These results are statistically significant.

4.3.7 Red Meat

The maximum individual consumption reported was 36 average pieces (a piece = 100g) of red meat per month. Thirty-eight participants (76%) reported intake of less than 9 average pieces of red meat in a month. Seven participants (14%) reportedly consumed between 9-17(<18) average pieces of red meat per month. Five participants (10%) reportedly ate between 18-36 pieces per month (p=0.91). These results are not statistically significant.

4.3.8 Poultry

Maximum consumption per participant per month was 112 average pieces of poultry (a piece=100g). Forty-seven participants (94%) reported intake of less than 30 average

pieces (sizes) per month. Two participants (4%) reported intake of between 30-59 pieces per month. Two percent reported intake of between 90-112 pieces in a month (p=0.59). These results are not statistically significant.

4.3.9 Eggs

Majority of participants, that is, 36 in number (72%), reported consumption of less than 15 eggs per month. Thirteen participants (26%) reportedly ate between 15-29 eggs per month. One (2%) participant reported an intake of between 45-56 eggs in a month (p=0.003). These results are statistically significant.

4.3.10 Potatoes

The maximum individual consumption reported was 56 servings per month. A serving was defined as one-third of the size of a dinner plate. Almost all the participants, 49 in number (98%), reportedly had potatoes in quantities of less than 15 servings per month. Only one participant (2%) reportedly ate potatoes in quantities of 45-56 servings per month (p=0.76). These results are not statistically significant.

4.3.11 Legumes

The maximum individual consumption reported for legumes was 36 cups per month. A cup was 250ml in size.

Forty-four (88%) participants did take less than 9 cups of legumes per month. Two participants (4%) reportedly had 9-17cups (<18) per month. Four participants (8%) consumed between 18-36 cups per month (p=0.15). These results are not statistically significant.

4.3.12 Diary Products (Milk and Milk Products).

The maximum individual consumption was 112 cups of diary products such as whole milk and yoghurt in a month. The size of the cup was 250ml.

Forty-seven out of 50 participants (94%) reportedly had less than 30 cups per month. Two participants (4%) consumed between 30-59 cups per month. Only one participant (2%) reportedly had 90-112 cups per month (p=0.86). These results are not statistically significant.

4.3.13 Dessert

The maximum individual consumption was 84 servings of desserts such as custard, jelly and fruit salad per month. A serving was defined as one dessert spoon. Forty-five out of 50 participants (90%) reportedly consumed less than 20 servings of dessert per month. Four (8%), reported consumption of dessert in 20-39 servings per month while 2% reportedly had 60-84 servings per month (p=0.42). These results are not statistically significant.

4.3.14 Sweets & Candy

The maximum individual consumption of sweets/candy was 40 in a month. A piece was the size of a chocolate bar. Forty-two participants (84%) consumed less than 10 pieces per month.

Four (8%) consumed between 10-19 pieces per month. Three participants (6%) ate 20-29 pieces per month while 1 (2%) consumed between 30-40 pieces per month (p=0.18). These results are not statistically significant.

4.3.15 High Energy Drinks

The maximum individual consumption was 16 cups per month (the size of the cup was 250ml). Forty-seven participants (94%) consumed less than 4 cups per month. Only one participant (2%) drank between 4-7 cups (<8) per month.

The remaining 2 participants (4%) drank between 12-16 cups per month (p = 0.76). These results are not statistically significant.

Table VII: Dietary habits of the Participants.

Food Groups	Respondents	Proportion %	P-value
Rice & Pasta(cups) i. < 5	37	74	0.40
ii. <10	7	14	
iii. <15	1	2	
iv. <20	3	6	
v. 20-25	2	4	
Breakfast Cereals i. < 50 (tablespoons)	24	48	0.37
ii.<100	18	36	
iii.<150	4	8	
iv. <200	4	8	
Bread (slices) i. <70	22	44	0.31
ii.<140	18	36	
iii.<210	5	10	
iv.≤280	5	10	
Maize meals i.<100 (tablespoons)	10	20	0.57
ii.<200	16	32	

iii.<300	18	36	
iv.≤420	6	12	
Snacks (piece) i. <6	47	94	0.19
ii.<12	1	2	
iii.<18	0	0	
iv. ≤24	2	4	
Cakes & pastries (piece) i. <4	44	88	0.03*
ii.<8	0	0	
iii.<12	1	2	
iv.≤16	5	10	
Red meat (piece) i. <9	38	76	0.91
ii.<18	7	14	
iii.<27	3	6	
iv.≤36	2	4	
Poultry (piece) i. <30	47	94	0.59
ii. <60	2	4	
iii. <90	0	0	
iv. ≤112	1	2	

Eggs (piece) i.<15	36	72	0.003*
ii.<30	13	26	
iii.<45	0	0	
iv.<60	1	2	
Potatoes(serving) i.<15	49	98	0.76
ii.<30	0	0	
iii.<45	0	0	
iv.<60	1	2	
Legumes (cups) i.<9	44	88	0.15
ii.<18	2	4	
iii.<27	1	2	
iv.≤36	3	6	
Diary products (cups) i.<30	47	94	0.86
ii.<60	2	4	
iii.<90	0	0	
iv.90-112	1	2	
Dessert (servings) i.<20	45	90	
ii.<40	4	8	

iii.<60	0	0	0.42
iv.60-84	1	2	
Sweets & Candy i.< 10 (pieces)	42	84	
ii.<20	4	8	
iii.<30	3	6	
iv.30-40	1	2	0.18
High Energy Drinks i.<4 (cup)	47	94	
ii.<8	1	2	
iii.<12	0	0	0.76
iv.12-16	2	4	

NB: * Statistically significant

CHAPTER 5

DISCUSSION

5.1 SOCIO-DEMOGRAPHIC PROFILE

The population in this study was predominantly female and elderly with the majority of the participants (36/50; 72%) aged 50 years and above and a female-to-male ratio of 6:1. Similar findings relating to an elderly population with female predominance in a black South African diabetes peri-urban clinic was reported by Erasmus et al (1999).

Most of the participants were of low educational status and unemployed, more than half of the participants (62%) had primary school education as the highest level attained. Also, half of the participants were unemployed (50%). Khattato et al (1999) in a study on compliance in type 2 diabetic patients attending a family practice setting in Saudi Arabia reported that more than 50% of the patients studied were illiterate and unemployed. But none of these sociodemographic characteristics had any significant relationship to patients' compliance with diet or medication. Erasmus et al (1999) also reported that the majority (70.6%) of the black type 2 diabetics who attended clinic were of low educational status and that it had no significant relationship with their glycaemic control.

5.2 ANTHROPOMETRIC MEASUREMENTS

The prevalence of obesity among the type 2 diabetics was 78%, and among the males 57%, and 81% for females. It is important to note that 14% of the participants were morbidly obese and were all females. Daousi et al (2006), showed that 86% of type 2 diabetics in a secondary care diabetes clinic were either overweight or obese; 52% were obese and 8.1% morbidly obese. According to Daousi et al (2006), most class 3 obese (morbidly obese) patients were women. Russell-Jones & Khan (2007) also reported that 80% of the type 2 diabetic patients they studied were obese. Erasmus et al (1999) reported the prevalence of obesity to be 79.4% among the type 2 black South African diabetics studied at a peri-urban clinic. The occurrence of obesity in all the participants who were below 40 years of age in this study further supports the fact that obesity is a strong risk factor for type 2 diabetes.

Kruger et al (2002) reported that age group was significantly associated with BMI. This was also evident in this study with the prevalence of obesity increasing down the age groups.

Weight loss is therefore an important therapeutic option (as beneficial as drug therapy) for these patients in improving their glycaemic control. A moderate weight loss of 5% body weight can improve insulin action, decrease fasting glucose concentrations, and reduce the need for diabetes medications. Furthermore, improvement in fasting blood glucose is directly related to the relative amount of weight lost (Klein et al, 2004).

However, moderate weight loss may not improve glycaemic control in all obese patients who have diabetes because there is a possibility that patients with longstanding disease or severe pancreatic β-cell dysfunction are not as responsive to weight loss as those with less extensive disease. (Watts et al, 1990). In other words, moderate weight loss, though still advisable, might not achieve significant improvement in glycemic control in such category of patients (Dixon & O'Brien 2002).

For the morbidly obese type 2 diabetics, marked weight loss of about 30% body weight following gastric bypass surgery normalized glycaemic control in more than two thirds of the patients affected (Dixon & O'Brien 2002).

The effect of weight loss on glycaemic control in type 2 diabetic patients is still subject to the duration of the disease with resultant effect on pancreatic function and the degree of obesity (Klein et al., 2004).

5.3 DIETARY ASSESMENT

Food items with the highest consumption per unit per month included maize meal, bread and breakfast cereals, while snacks, pastries and cakes, sweets and candy, red meat, potatoes, eggs, legumes and high energy drinks had the lowest consumption rates per unit per month.

A statistically significant difference in consumption across the groups was only observed in the consumption of eggs (p=0.003) and cakes (p=0.03) respectively. For the remaining food items, no statistically significant differences were observed. This suggests that there can not be any prescription of an optimal mix for the diabetic diet as majority of the food items that are commonly eaten did not have any statistical significance with regards to the different consumption groups. These observations are also not likely to be “clinically’’ significant because of the very low consumption of these food items per unit per month.

The problem of under reporting in nutritional research has been reported and it is said to be particularly common among the obese. Hence, obese subjects are more likely than lean subjects to under report food consumption (Kruger et al, 2002; Klesges, Eck & Ray 1995). In a study in the United States, underreporting of food consumption was more common in subjects with a low educational level (Klesges, Eck & Ray 1995).

Therefore, it is likely that the majority of the participants in this study underreported their food consumption, as 78% were obese which has been linked with underreporting by other studies mentioned earlier. It was difficult therefore, to relate any dietary habit or consumption pattern to the prevalence of obesity among the participants.

Also, a low level of education among the participants could have contributed to the underreporting of food consumption in the study because only 34% had either secondary or tertiary education. The rest had only primary education or were not educated (66%).

Food items with the highest consumption per unit per month included; maize meal, breakfast cereals and bread. This was not unexpected as most of these items were grown or produced locally and commonly eaten.

But a remarkable finding was the consumption rate of legumes which was one of the lowest, with 88% of the participants reported consumption of less than 9 cups of legumes per month. Legumes such as beans, peas and lentils are diets with low GI, which had been recommended by studies as important components of the diabetic diet. Leguminous diets are actually a major source of fibre and contain significant amounts of slowly absorbed or complex carbohydrates shown to decrease blood glucose (Sichieri, 2002).

According to Sichieri (2002), a traditional diet of rice and beans was found to be protective against overweight and obesity, as opposed to the westernized diet that comprised deep fried snacks, milk products and added sugars among Brazilians. The protective role of this diet may be due to the low glycaemic index (GI) of beans, the low energy density of rice and beans, and higher fibre intake from beans. Leguminous diets of which beans is an example, are a major source of fibre because they contain significant amounts of slowly absorbed (complex) carbohydrates shown to decrease blood glucose. There is a need for greater emphasis to be placed on the role of legumes in the diabetic diet.

Breakfast cereals, one of the commonest foods consumed by the diabetics in this study, are a good source of whole grains and refined grains. The consumption of whole grains and whole grain products from breakfast cereals has been recommended as a strategy to maintain a healthy weight (Bazzano et al., 2005). As whole grains may have beneficial effects on weight control by promoting satiety, intake of breakfast cereals has therefore been related to weight control. A prospective study designed to examine the effect of breakfast cereals on weight revealed that higher intake of breakfast cereals was associated with a significantly smaller weight gain regardless of the grain type (whole or refined), baseline BMI, physical activity, age, history of high cholesterol and other co-variates over the course of 13 years of follow up (Bazzano et al., 2005).

The major source of protein appears to be eggs with 98% of the participants consumed approximately 1 egg per day. This was followed by dairy products with an intake of approximately 1 cup per day reported by 94% of the participants. Poultry followed the same trend of approximately 1 average piece per day reported by 94% of the participants. The consumption of red meat was however low in comparison to poultry.

Generally, the diet of the participants was high in carbohydrates (maize meals, breakfast cereals and breads), but it was low in fibre intake as evidenced by a very low consumption rate of legumes, an affordable source of dietary fibre for this population of diabetics (Table VII).

Similar findings were reported by Nthangeni et al (2001), in a study that assessed dietary intake and barriers to dietary compliance in black South African type 2 diabetic patients attending primary health-care services. The researchers showed high carbohydrate intake with low intake of fibres. The most commonly consumed foods were refined maize porridge, brown- bread and sorghum.

The findings of this study highlighted the fact that the diet of the diabetic patient is influenced by environmental and socio-economic factors because the commonly consumed foods were either locally grown or produced and hence relatively affordable.

The low consumption of certain food items in the study might be attributable to that these items were not affordable, and not only to cases of under-reporting because quite a significant proportion of the participants were unemployed.

5.4 SUMMARY

Obesity is the commonest risk factor for type 2 diabetes. This was further confirmed by the high prevalence of obesity among the participants in this study. The prevalence of obesity increased with age among the participants especially after the age of 40 years, which further supports the fact that, advancing age is a risk factor for type 2 diabetes.

The most common food items consumed by type 2 diabetics in this study were; maize meal, breakfast cereals, and bread. The majority of the participants under-reported their food intake and this was evident from the dietary assessment results which showed that for each food item apart from the commonly consumed ones mentioned , more than 70% of the participants reported to have consumed the lowest amounts of these food items listed.

5.5 STUDY LIMITATIONS

The following are limitations in this study:

a. The findings may not be generalizable due to the relatively small sample size and restricted to only one health facility in Lesotho

b. The reliance on self-reported food consumption made under-reporting a limitation in this study. This has been widely reported by various studies (Kruger et al, 2002; Klesges, Eck & Ray 1995). Hence, the interpretation of the observations may be difficult.

c. Difficulties were encountered in standardizing portion sizes of some food items and this may have contributed to the under-reporting by the participants.

d. Due to inappropriate responses, it was difficult to analyze “spread on bread’’ listed as one of the food groups.

e. Grouping of the food items made it difficult to explore the individual effect of each food item.

f. Recall bias due to participants' inability to recall their dietary intake accurately.

g. The cross-sectional study design which measured both outcome factors (obesity) and exposure factors (diet) did not allow for the exploration of causation. A prospective study design will be more suitable in this regard.

CHAPTER 6

CONCLUSIONS

6.1 The global burden of diabetes is on the increase, and sub-Saharan Africa is also experiencing an increasing disease burden probably due to westernization of the diets and more sedentary lifestyles.

There is a strong association between diet and obesity as risk factors for type 2 diabetes and their roles in the management of the disease cannot be over-emphasized.

The type 2 diabetic patients seen at Scott hospital, Morija, Lesotho were predominantly females and elderly. The prevalence of obesity was high among the participants in keeping with the association between type 2 DM and obesity.

The diet of the participants in this study consisted mainly of common carbohydrate foods that were either produced or grown locally and this demonstrated the vital role of ecological and socio-economic factors in the obesity epidemic since people tend to eat what is available and possibly affordable which can be sourced from their immediate environment.

However, no relationship could be identified between the participants' dietary practices and the prevalence of obesity because of widespread under-reporting. As a result, no

significant inference could be drawn and no prescription of an optimal mix of their diet could be made.

6.2 RECOMMENDATIONS

The recommendations based on the findings from this study are the following:

a. There is a need for ongoing individualized dietary education for the type 2 diabetics at Scott Hospital, Lesotho during their follow-up visits each month and emphasis should be placed on improving their intake of legumes which is an affordable source of dietary fibre with a low glycaemic index.

b. The Disease control unit of the Ministry of Health should develop educational materials on the effects of diet and obesity on type 2 diabetes in order to assist in the dietary management of type 2 diabetics in the country which will be relevant to the context of the people and should be standardized throughout the country.

c. Update courses or training should be conducted country wide for medical practitioners, nurse educators/clinicians on the concepts of diabetic diet which is culturally and economically acceptable to the general populace. This will help prevent sending of conflicting messages to the patients.

REFERENCES

Anderson JW, Kendall CWC, Jenkins DJA (2003): Importance of Weight management in Type 2 diabetes: Review with Meta- Analysis of clinical studies: Journal of the American college of Nutrition 22(5):331-339.

Bassuk S, JoAnn EM (2005): Epidemiological evidence for the role of physical activity in reducing the risk of type 2 diabetes and cardiovascular disease. J Appl Physiol 99:1193-1204.

Bazzano LA, Song Y, Bubes V, Good CK, Manson JE, Liu S. (2005) : Dietary Intake of Whole & Refined Grains, Breakfast cereals and Weight Gain in Men. Obesity Research 13: 1952-1960.

Bennett PH, Bogardus C, Tuomilehto J, Zimmet P (1992): The epidemiology of non-insulin dependent diabetes: non- obese and obese. In: Alberti KGMM et al, eds. International textbook of diabetes mellitus London, John Wiley.147-176.

Bonora E, Kiechl S, Willeit.J, Oberhollenzer F, Egger G, Meigs JB, Bonadonna RC, Muggeo M (2004): Population based Incidence rates & risk factors for type 2 Diabetes in white individuals. The Bruneck study. Diabetes 53(7): 1782-1789.

Brand-Miller J, Hayne S, Petocz P, Colgiuri S (2003):
Low-Glycemic Index Diets in the Management of Diabetes. A Meta- analysis of randomized controlled trials. Diabetes care 26(8):2261-2267.

Daousi C ,Casson IF, Gill GV, Macfarlane IA, Wilding JPH, Pinkney JH (2006): Prevalence of Obesity in type 2 diabetes in secondary care: association with cardiovascular risk factors. Postgrad Med J 82: 280-284.

De Fronzo, Ferranini (1991):
A Multifaceted syndrome responsible for NIDDM, Obesity, Hypertension, dyslipidaemia and atherosclerotic cardiovascular disease Diabetes care 14:173-194.

Dixon JB, O'Brien PE (2002): Health outcomes of severely obese type 2 diabetic subjects 1 year after laparoscopic adjustable gastric banding. Diabetes care 25: 358-363.

Dunstan.D, Salmon.J, Owen.N, Armstrong T, Zimmet PZ, Welborn TA, Cameron AJ, Dwyer T, Jolley D, Shaw JE (2004) : Physical activity and Television viewing in relation to risk of undiagnosed abnormal Glucose metabolism in Adults. Diabetes care 27(11):2603- 2609.

Erasmus RT, Blanco EB, Okesina AB, Gqweta Z, Matsha T (1999) : Assessment of glycaemic control in stable type 2 black South African diabetics attending a peri-urban clinic. Postgrad. Med. J. 75: 603-606. Available at http://pmj.bmj.com (accessed 8 September 2009).

FAO/WHO Expert consultation (1998) : Carbohydrates in human nutrition: Report of a joint FAO/WHO Expert consultation, Rome, 14-18 April, 1997. Rome: Food and Agricultural Organization, (FAO Food and Nutrition paper 66). 1-5.

Ford ES, Williamson DF, Liu S. Weight change and diabetes (1997): Incidence: findings from a national cohort. Am J Epidemiol. 146:214- 222.

Foster-powell .K, Holt.SH, & Brand-Miller JC (2002): International table of glycemic Index and glycemic load values: Am J Clin Nutr .76: 5-56.

Frost G, Leeds A, Trew G, Margara R, Dornhorst A (1998): Insulin sensitivity in Women at risk of coronary heart disease and the effect of a low glycemic diet. Metabolism 47:1245-51.

Gerich JE (2003): Contributions of Insulin-resistance and Insulin secretory defects to the pathogenesis of type 2 diabetes Mayo Clin Proc 78: 447-456.

Giacco R, Parillo M, Rivellese A ,Lasoreka G, Giacco A, D'Episcopo L, Riccardi G (2000): Long-term dietary treatment with increased amounts of fiber-rich low-glycemic index natural foods improves blood glucose control and reduces the number of hypoglycemic events in type1 diabetes. Diabetes care 23:1461-6.

Gilbertson H, Brand-Miller J, Thorburn A, Evans S, Chondros P, Werther G (2001): The effect of flexible low glycemic index dietary advice versus measured carbohydrate exchange diets on glycemic control in children with type 1 diabetes. Diabetes care 24:1137-43.

Hu FB, Rimm E, Smith-Warner SA , Feskanich D, Stampfer MJ, Ascherio A, Sampson L, Willet WC (1999): Reproducibility and validity of dietary patterns assessed with a food frequency questionnaire. Am J Clin Nutr 69(2):243-249.

Hu.G, Lindstrom.J, Valle.T, Eriksson JG, Jousilahti P, Silventoinen K, Qiao Q, Tuomilehto J (2004): Physical activity, body mass index and risk of Type 2 Diabetes in patients with normal or impaired Glucose tolerance. Arch Intern Med.164:892-896.

Hu.G, Qiao.Q, Silventoinen. K, Eriksson JG, Jousilahti P, Lindstrom.J, Valle.TT, Nissineri A, Tuomilehto J (2003): Occupational, commuting and leisure-time physical activity in relation to risk for type 2 diabetes in middle-risk for type 2 diabetes in middle-aged Finnish men and women. Diabetologia 46: 322-329.

International Diabetes Federation (2009): IDF Diabetes Atlas, 4th edition. Available at http://www.idf.org (accessed 10 December 2009).

Jenkins DJA, Kendall CWC, McKeown-Eyssen G , Jose RG, Silverberg J, Booth GL, Vidgen E, Jose AR, Nguyen TH, Corrigan S, Bamach MS, Ares S, Mitchell S, Emam A, Augustin LSA, Parker TL, Leiter LA (2008): Effect of a Low Glycemic Index or a High cereal Fiber diet on Type 2 Diabetes: A Randomized Trial. JAMA 300(23):2742-2753.

Joshi S, Joshi P (2009): Management of Type 2 Diabetes: Treatment targets and strategies. SA Fam Pract 5(1):5-9.

Kahn SE. (2003): The relative contributions of Insulin resistance and beta-cell-dysfunction to the pathophysiology of type 2 diabetes. Diabetologia 46:3-19.

Khattab MS, Abolfotouh MA, Khan MY, Humaidi MA, Alkaldi YM (1999): Compliance and control of diabetes in a Family practice setting in Saudi Arabia. Eastern Mediterranean Health Journal. 5(4): 755-65.

Klein S, Sheard NF, Pi-Sunyer X, Daly A, Wylie-Rosett J, Kulkami K, Clark NG (2004):Weight management through Lifestyle modification for the prevention and management of Type 2 Diabetes: Rationale and Strategies.
A statement of the American Diabetes Association, the North- American Association for the study of obesity, and the American- Society for Clinical Nutrition. Diabetes care 27(8):2067-2073.

Klesges RC, Eck LH, Ray JW (1995): Who under-reports dietary intake in a dietary recall? Evidence from the Second National Health and Nutrition survey. J Consult Clin Psychol 63:438.

Kruger HS, Venter CS, Vorster HH, Margetts BM (2002): Physical Inactivity Is the Major Determinant of Obesity in Black Women in the North West Province, South Africa: The THUSA Study. Nutrition 18: 422-427.

Lesotho Demographic & Health Survey (2004): Ministry of Health and Social Welfare/ BOS, Lesotho: 2-5.

Levitt N.S. (2008): Diabetes in Africa: Epidemiology, management and Healthcare challenges. Heart 94: 1376-1382.

Ministry of Health and Social Welfare: Disease Control division and Epidemiology unit (2001) . Survey report on the prevalence of hypertension and diabetes. MOHSW-Lesotho : 41-44.

Moy Foong Ming, Suriah A Rahman (2002): Anthropometry and Dietary intake of Type 2 diabetes patients attending an outpatient clinic. Mal J Nutr. 8(1): 63-73.

Nigele U, Eugene S, Alberti KGMM (2001): Type 2 Diabetes: The challenge of preventing a global epidemic. Diabetes International 11(1):4-8.

Nkondjock A, Receveus O. (2003): Fish sea food consumption, obesity and risk of type 2 Diabetes: an ecological study. Diabetes 29: 635-642.

Nthangeni G, Steyn NP, Alberts M, Steyn K, Levitt NS, Laubscher R, Bourne L, Dick J, Temple N (2002): Dietary intake and barriers to dietary compliance in black type 2 diabetic patients attending primary health-care services. Public Health Nutrition 5: 329-338.

Nutrition Recommendations and Interventions for Diabetes (2008). A position statement of the American Diabetes Association (ADA).
Diabetes care 31:1; s61-s78.

Ogunbanjo GA (2001): Statistics for general practitioners: what is “bias” in research? S Afr Fam Pract ; 23: 35.

Ogunbanjo GA (2006) Type 2 Diabetes: An evidence-based approach to its management by the Family Practitioner. CME; 24(10): 568-572.

Paradis A, Perusse L, Vohl M (2006) : Dietary patterns and associated lifestyles in individuals with or without familial history of obesity: a cross sectional study. International Journal of Behavioral Nutrition and Physical Activity; 3:38.
Article available from: http;//www.ijbnpa.org/Content/3/1/38 (accessed13 May 2009).

Puoane T., Steyn K, Bradshaw D, Laubscher R, Fourie J, Lambert V, Mbananga N (2002): Obesity in South Africa. The South African demographic and health Survey. Obes. Res 10:1038-48.

Rheeder. P (2006) Type 2 diabetes: the emerging epidemic. SA Fam Pract 48(10):20.

Robert I. Gregerman. Diabetes mellitus. In: LR Barker, JR Burton, PD Zieve.(1995) Principles of Ambulatory Medicine. Maryland, Williams& Wilkins. 984-985.

Roglic G, Unwin N, Bennett PH, Mathers C, Tuomilehto J, Nag S, Connolly V, King H (2005): The Burden of mortality Attributable to Diabetes. Realistic estimates for the year 2000. Diabetes28: 2130-2135.

Russell-Jones D, Khan R.(2007) : Insulin- associated weight gain in Diabetes- causes, effects and coping strategies. Diabetes, Obesity& Metabolism 7:799-812.

Schwellnus MP, Patel DN, Nossel C, Dreyer M, Whitesman S, Derman EW (2009): Healthy Lifestyle Interventions in General Practice. Part 4; Lifestyle and Diabetes-mellitus. SA Fam Pract 51(1): 19-25.

Sichieri. R. (2002): Dietary patterns and their association with obesity in the Brazillian city of Rio de Janeiro. Obesity Res.10:42-48.

Skyler JS (2004): Diabetes Mellitus: Pathogenesis and treatment strategies. J.Med.Chem 47(17): 4113-4117.

Toeller M, Buyken AE, Heitkamp G, Cathelineau G, Ferris B, Michel G (2001) : Nutrient intakes as predictors of body weight in European people with type 1 Diabetes. Int- J- Obes- Relat- Metab-Disord 25:1-8.

UKPDS Group (1998).UK Prospective Diabetes study7: Response of fasting-plasma Glucose to diet therapy in newly presenting type 2 diabetic patients. Metabolism 39:905-912.

Watts NB, Spanheimer RG, DiGirolamo M, Gebhart SSP, Musey VC, Siddiq YK, Phillips LS (1990): Prediction of glucose response to weight loss in patients with non-insulin dependent diabetes-mellitus. Arch Intern Med 150:803-806.

Weyer C, Borgadus C, Mott DM, Pratley RE(1999) The natural history of Insulin secretory dysfunction and Insulin resistance in the pathogenesis of type 2 diabetes mellitus. J Clin Invest 104: 787-794.

Wild S, Roglic G, Green A, Sicree R, King H (2004) Global prevalence of Diabetes: Estimates for the year 2000 and projections to 2030. Diabetes Care 7: 1047-53.

Will JC, Willcamson DF, Ford ES, Call EE, Thun MJ (2002) Intentional weight loss and 13year Diabetes Incidence in Adults. American Journal of Public Health 92(8):1245-1248.

WHO (2005) Obesity and overweight facts. http://www.who.int/hpr/NPH/docs/gs_obesity.pdf(accessed 25 June 2005).

WHO (1997) Obesity: preventing and managing the global epidemic. Report of a WHO consultation on obesity. Geneva, 3-5 June 1997. 1-3.

WHO (1994) Prevention of Diabetes mellitus. Report of a WHO study group. Geneva, 1994(WHO Technical Report Series, No. 844). 24-30.

WHO (1998) Report of a Joint FAO/WHO Consultation: preparation and use of food- based dietary guidelines. WHO Geneva, Switzerland. 80-92.

World Health Report; (2002) : Reducing risks, promoting healthy life. WHO, Geneva. 59-60.

Wolf A.(1998) Current estimates of the economic costs of Obesity in the United states. Obes.Res. 6: 97-106.

Zimmet .P.(1992) Challenges in diabetes epidemiology-from West to the rest. Diabetes care. 15:232—252.

APPENDIX A

RESEARCH PROTOCOL

TITLE: DIETARY HABITS AND PREVALENCE OF OBESITY AMONG TYPE II DIABETIC PATIENTS AT SCOTT HOSPITAL MORIJA, LESOTHO.

RESEARCHER: DR. FRANCIS OPEYEMI ADEBAYO. MBBS
DEPT. OF FAMILY MEDICINE AND PHC, UNIVERSITY OF LIMPOPO, (MEDUNSA CAMPUS).

SUPERVISOR: PROF. GA OGUNBANJO
MBBS, FCFP (SA), M Fam Med (Medunsa), FACRRM, FACTM, FAFP (SA)

NOVEMBER 2006

STUDY PROBLEM

The Title, “Dietary habits and prevalence of obesity among Type II Diabetic patients” in my practice actually came up as a result of an identified need for a more effective health education program in the management of Type II Diabetes Mellitus (DM). But before health education can have a remarkable impact on the patients by way of lifestyle modification and others, there is a need to get accurate and relevant facts and figures on the relevant issues like risk factors.

It is an established fact that obesity and diet are very important risk factors in Type II DM, not only by determining the disease onset but also by affecting the disease progression.[1] The researcher will like to determine its prevalence in his practice and by so doing, convince both the patients and health educators about the need for the development of intervention strategies. Also, collecting data on the prevalence of obesity and the dietary habits in Type II DM patients will serve as a tool for evaluating the effectiveness of health education as an intervention strategy.

According to a survey done by the Ministry of Health and Social Welfare, Lesotho in 2001, the prevalence of diabetes in Lesotho was 1.5% (including Glucose intolerance). Furthermore, it was noted that Type II DM was the most prevalent form in the country because the most affected age group were people above the age of 40.[2]

LITERATURE REVIEW

The number of people with diabetes globally will more than double over the next 25years, from 171million in 2000 to 366million by 2030. Most of this increase will occur as a result of a 150% rise in developing countries. This increase in diabetes has been linked to the worldwide increase in obesity.
The rapid increase in obesity in both developed and developing countries has been declared to be a reflection of declining levels of physical activity and the rising consumption of diets high in sugars and fats.

According to the World Health Organization (WHO) health report 2002, about 58% of diabetes globally can be attributed to body mass index (BMI) above 21kg/m^2 . Obesity and type 2 diabetes are linked, with weight gain and obesity resulting in insulin resistance through several mechanisms.[3]

As reported by the WHO, currently 1million people are overweight and with not less than 300million of this population being clinically obese.
Although, there is limited data on the epidemiology of diabetes in Africa, the Diabetes Atlas of the International Diabetes Federation reports a prevalence figure of 3.4% for South Africans in 2003.[4] According to a survey by the Ministry of Health and Social Welfare, Lesotho in 2001, the prevalence of diabetes was 1.5%.[2]

Hence, the immediate and long term goal of diet therapy in the obese type 2 diabetic patient is weight reduction because hypocaloric diets leading to weight loss could improve short term glycaemia levels and also has the potential to improve long term metabolic control.
A United Kingdom Prospective Diabetic study (UKPDS, 1998) on type 2 diabetic patients also found that the level of blood glucose was greatly improved in those who achieved weight reduction.[5, 6]
Although there are few studies that addressed the issue of dietary habits in relation to obesity in type 2 diabetics, a cross sectional study of type 2 diabetic patients assessed their anthropometry and dietary intakes in a Primary health care unit in Malaysia. It was observed from the studies that 66.8% of the patients were overweight and 15.8% were obese. No consistent pattern was however observed in the nutrient intake among the different age groups.[5]

Population studies indicate that most diabetic cases are either made manifest by obesity in genetically predisposed persons or are actually caused by obesity. Hence most overt diabetes in obese patients is potentially either preventable or curable by weight reduction provided that the diabetes has not been present for more than a few years viz- a – viz; early stages.[7]

The problem with this is that most patients are either unable to achieve and / or maintain a weight that will reverse overt diabetes.
Hence attention has to be paid to patient education and compliance. This however needs assessment of the prevalent dietary habits of diabetic patients after a particular period of starting treatment to evaluate the effectiveness of the education they got as touching their diets and how they have complied.

In a 4 year follow-up study in general practice of fat intake in-patients newly diagnosed with type 2 diabetes it was discovered that patients with newly diagnosed type 2 diabetes mellitus have an unfavourable fat consumption at diagnosis, there was a marked reduction in fat consumption at 8 weeks after and this improved dietary behaviour was sustained for another 4 years.[8]

A guiding principle for formulating Diabetic diets should be the recognition that individual food preference must be respected whenever possible.
The dietician should obtain patient's preferred diet history and try to construct the diet around these preferences because the issuance of a standardized diet to the patients most times simply guarantees non – compliance.[7]

According to a WHO study group; dietary intervention should have 5 aims:

(i) Correction of obesity.
(ii) Optimization of glycaemic control.
(iii) Control dyslipoproteinaemia
(iv) Salt restriction in those diabetics prone to Hypertension
(v) Protein restriction in people with Nephropathy. Generally it means,

- controlling energy intake,
- limiting fat intake to 30-35% of energy with saturated fat constituting less than 10% while the rest are polyunsaturated fatty acids and especially omega – 3 polyunsaturated fatty acids which is said to be beneficial in hypertriglyceridaemia.
- restricting daily cholesterol intake to less than 300mg
- limiting simple sugars and emphasizing unrefined carbohydrates. (i.e. a high proportion of the carbohydrate content of the diet should be from unrefined sources).[1]

As a result of this, individual based interventions has produced disappointing results and hence an ecological approach to addressing the problems of obesity and diet has been proposed and it was suggested that obesity should no longer be viewed traditionally as a personal disorder but should be regarded as "a normal response to an abnormal environment". The type of measures needed in this ecological approach involves modifying external factors like the food supply of a population which is complex and needs a multisectoral approach for implementation.[9] In an ecological study, it was observed that in countries with a greater prevalence of obesity but with a high consumption of fish and sea-food which is said to be rich in omega-3 fatty acids, there was a reduction in type 2 diabetes when compared to other countries with a lower fish and sea-food consumption. [10]

The Researcher hopes this study will reveal the present status of type 2 diabetes patients with regards to their anthropometry and its correlation to obesity and also, the association of certain dietary habits with obesity.

METHODOLOGY

(i)RESEARCH QUESTION

What are the dietary habits and what is the prevalence of Obesity among Type II Diabetic patients at Scott Hospital Morija?

(ii)AIM OF THE STUDY

To determine the dietary practices and prevalence of obesity among Type II DM patients at Scott Hospital, Morija Lesotho.

(iii)OBJECTIVES

(1) To determine the demographic characteristics of the Type II DM patients
(2) To assess their dietary practices
(3) To determine the prevalence of obesity among them.
(4) To identify the relationship of their dietary practices with the prevalence of obesity.

(iv) STUDY DESIGN

This will be a descriptive, cross sectional study.

(v) **STUDY POPULATION**

All Type II Diabetic patients attending Scott Hospital will form the study population

(Total - 90).

(vi) **STUDY SAMPLE**

With a study population of 90 using a 95% confidence level, 80% power and confidence interval of 10%, the sample size will be 47. This will be rounded up to 50 for

ease of analysis. The simple random sampling method will be used.

(vii) **INCLUSION CRITERIA**

This includes patients with known Type II DM, ages between 30—65 years with a duration of diabetes of at least 1year.

(viii) **EXCLUSION CRITERIA**

a. Presence of concomitant debilitating illness causing impaired nutritional status.
b. Impaired memory or cognitive functions, or presence of mental illness causing
   Inability to give appropriate or logical response to questions.
c. Pregnant women, due to inability to assess the actual values of their Anthropometric measurements.
d. Also, patients suffering from type I DM are excluded from the study.

(ix) **DATA COLLECTION**

After the aim and objective of the study have been explained to each participant,a signed consent form will be completed(Appendix A). Data will be collected using a questionnaire (Appendix B) . This will be administered by a research assistant (for the participants who only understand Sesotho), while the researcher will administer the English version for the participants conversant in English).The Researcher will train the assistant by explaining the study and use the questionnaire to explain how the data should be collected, thereafter the assistant will use the questionnaire under supervision so that errors detected during the questionnaire administration can be corrected.The training will be done with the assistance of a nutritionist. Participants will be allowed to choose in which language they will want to answer the questions. The questionnaire will address the following: demographic characteristics of the participants, anthropometric measurements and types of dietary habits. Data Collection will be done using the Epi-data.

(x) **DATA ANALYSIS**

This will be done using the Epi-info 6.3 by the researcher with the assistance of the supervisor who is conversant with the Epi Info software. Data will be

presented as frequency tables, graphs and bar charts. Association of variables will be analysed using the chi square test or student T-test, where applicable.

(xi) **VARIABLES FOR THE STUDY**

a. Socio-demographic variables: for the purpose of operational definition include; Age, Gender, Marital Status, Educational level, Occupation, Average monthly income.

b. Anthropometric Variables:

---- Body Mass Index (BMI); defined as Weight in Kilograms (kg) divided by Height squared (m^2).

This will be used in the determination of overweight and Obesity in the Subjects. The normal range of values is;

Males & Females: 18.5---24.99

Overweight: defined as BMI of 25—29.99

Obesity: defined as BMI of 30 and above.

---- Waist: Hip Ratio (WHR); a determinant of central obesity defined as Waist circumference/ Hip circumference.

Waist Circumference is the smallest circumference below the rib cage and above the umbilicus.

Hip Circumference is the largest circumference at the posterior extension of the buttocks measured with the patient standing.

Normal values are; 0.76-0.84 & 0.87-0.99 for females and males respectively.[11]

c. 16 Food groups derived from common food items. The groups are listed in the table below;

Table 1. Food Groupings

Foods/Food Groups	Food Items
Rice & Pasta	Rice, pasta
Bread	White bread, Brown bread.
Breakfast cereal	Porridge(Lesheleshele), motoho
Spread on Bread	Jam ,PeanutButter, Margarine
Maize meals	Papa, Samp
Snacks	Makoenya
Cakes	Cakes
Red meat	Beef, Pork, Mutton, Russian
Poultry Meat	Chicken.
Eggs	Eggs

Potatoes	Potatoes
Legumes	Beans, Lentils, Peas.
High-fat dairyproducts	Whole milk,
Desserts	Custard + jelly, Fruit Salads.
Sweets& Candies	Chocolate, candy,others.
High-energy drinks	Regular soda, fruit drinks, coke, others.

(xii) **RELIABILITY AND VALIDITY OF THE STUDY.**

RELIABILITY:

This refers to the reproducibility and consistency of information or the degree to which a method gives the same results when used on more than one occasion with the same respondents under the same condition.[12] This will be ensured by administering the questionnaire in the same season to minimise the effect of availability on food intakes which is a natural variation.

Also, reliability of the food intake of the participants will be ensured by using a test-- retest method, in which the questionnaire will be administered twice for each patient independently at different times. The use of a 7day-food diary for each patient the week prior to questionnaire administration can also be employed to address reliability.

VALIDITY:

This refers to the accuracy of a study and it is also the degree to which the measurement reflects the true value of the characteristic.[12]

-- This will be ensured through the recalibration of the weighing scale each day.

--To ensure content validity, which is the degree of representativeness or sampling adequacy; an exhaustive list of food groupings will be used in order to ensure that a wide variety of food items are included in the assessment.[12]

--The use of the same method of measuring food items like plates, cups and spoons for all Participants will help to minimise variation in food quantification.

(xiii) **BIAS**

This can be defined as any effect at any stage of a research process, or influence that tends to produce results that depart systematically from the true values.[13] The types of bias that may be encountered in this study are as follows:

Selection Bias

This will be minimized by selecting and randomization of all Type II Diabetic patients attending the hospital who meet the inclusion criteria.

Bias of Data presentation/Interpretation
Introduced via technical errors from poor techniques, incomplete data and errors arising from inference and speculation which may be from the failure of the Researcher to consider every interpretation consistent with facts and this will be minimized by requesting the help of my supervisor in the data analysis.

(xiv) **ETHICAL CONSIDERATIONS**
The Researcher will obtain signed informed consent from each participant which makes participation voluntary and also discontinuation from the study when they so wish without any penalty. Confidentiality and anonymity of the participants will be maintained by group data analysis. Ethics approval for the study will be obtained from the following:

a. Medunsa Campus Research & Ethics Committee (MCREC)
b. Hospital Management of Scott Hospital, Morija Lesotho.
c. Ministry of Health, Maseru Lesotho

PROJECT IMPLEMENTATION AND PROPOSED TIME FRAME FOR EXECUTION.

Study will start after approval from the Medunsa Research and Ethics Committee (MCREC) and the management of Scott Hospital.

PROPOSED TIME FRAME FOR PROJECT EXECUTION.

Oct 2007	Submission of protocol to MCREC
Nov 2007	Approval of protocol by MCREC
Dec 2007	Data collection
Jan- Mar 2008	Data analysis
April- June 2008	Write up of dissertation

BUDGET
The budget will be provided by the researcher:

Research assistant stipend	R 500
Photocopying	R 250
Binding of Dissertations	R1200
Miscellaneous	R 300
Total……..	R325

REFERENCES:

1. Prevention of Diabetes Mellitus. Report of a WHO study group. Geneva, 1994 (WHO Technical Report Series, No. 844)
2. Disease Control division, MOHSW, Lesotho. Survey Report on the prevalence of Hypertension and Diabetes. 2001
3. Diabetes Action Now: An initiative of the World Health Organization and the international Diabetes Federation. Geneva, Switzerland: World Health Organization; 2004.
4. Rheeder P. Type 2 diabetes: the emerging epidemic . SA Fam Pract 2006; 48(10):20
5. Moy Foong Ming, Suriah A Rahman. Anthropometry and Dietary Intake of Type 2 Diabetes Patients attending an Outpatient Clinic. Mal J Nutr 2002;8(1):63-73
6. UKPDS Group(1998). UK Prospective Diabetes study 7: Response of Fasting Plasma Glucose to diet therapy in newly presenting type 2 diabetic patients. Metabolism 39:905-912.
7. Robert.I.Gregerman. Diabetes Mellitus. In: LR Barker, JR Burton, PD Zieve, Principles of Ambulatory Medicine. Maryland, Williams& Wilkins, 1995: 984-985
8. Van de Laar et al. Fat intake in patients newly diagnosed with type 2 diabetes: a 4-year follow up study in general practice. British journal of General – Practitioners.2004, 54: 177-82
9. Nigel U, Eugene S, Alberti KGMM. Type 2 diabetes: the challenge of Preventing a global epidemic. Diabetes International 2001, 11(1): 4-8
10. Nkondjock A, Receveur O. Fish- Seafood consumption, obesity and risk of type 2 diabetes: an ecological study. Diabetes Metab 2003,29:635-42.
11. Molarius A et.al. Waist and Hip circumferences, and Waist-hip ratio in 19 populations of the WHO MONICA Project. Int.journal of obesity 1999,23(2):116-125.
12. De Vos AS, Strydom H, Fouche CB, Delport CSL . Research at grass roots. Pretoria, Van Schaik Publishers,2002:166-168.
13. Ogunbanjo GA. What is “bias” in research? SA Fam Pract 2001; 23(3): 35

Appendix A (ENGLISH)
(Using the standard University of Limpopo Consent form with slight modification)
Statement concerning participation in the Research Project

Title: Dietary Habits and Prevalence of Obesity among Type II diabetic patients at Scott Hospital, Morija, Lesotho.

I have read the information on the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.
I understand that participation in this study is completely voluntary and that I may withdraw from it at any time and without supplying reasons. This will have no influence on the regular treatment that holds for my condition neither will it influence the care that I receive from my regular doctor.
I know that this study has been approved by the Research and Ethics Committee of the Faculty of Medicine, University of Limpopo (Medunsa Campus). I am fully aware that the results of this study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.
I hereby give consent to participate in this study.

…….. ……. …….
Name of patient Signature of patient

…….. …….. ……
Place Date Witness

Statement by the researcher

I provided verbal and/or written information regarding this study.
I agree to answer any future questions concerning the study as best as I am able.
I will adhere to the approved protocol.

…… ……. …… ……..
Dr F.O. Adebayo Signature Date Place

Appendix B (SESOTHO)

(Phuputso ena e entsoe ho latela tumello ea University ea Limpopo ho kenyeletsoa le liphetoho tse seng kae)

Taba Mabapi le ho nka karolo mosebetsing oa phuputso

TABA: Mekhoa le litloaelo tsa ho ja le bothata ba 'mele o boima bakuling ba mofuta oa bobeli oa lefu la tsoekere sepetleleng sa Scott, Morija, Lesotho.

Ke balile tlhahiso-leseling ka litaba tabelo mabapi le boithuto bona bo lohothoang ho etsoa, me ke ile ka fuoa monyetla oa ho botsa lipotso le ho fuoa nako e le kaneng ho nahana ka taba ena. Litaba-tabelo tsa boithuto bona bo ntlhaketse hantle. Ha kea qobelloa ho nka karolo ka tsela efe kapaefe**.**

Ke utloisisa hantle hore ho nka karolo boithutong bona ke hoa boithaopo me nka ikhula ho eona neng kapa neng ntle le ho beha mabaka. Hona ho ke ke ha ama phekolo ea ka e tloaelehileng e amanang le bokulo baka, hape ho ke ke hoa ama tsoaro eo ke fuoang ke ngaka ea ka.

Ke na le tsebo ea hore boithuto , bona bo chaeletsoe monoana ke komiti ea liphuputso, botho le liphatlalatso ea lefapha la bongaka, la Unifesithi ea Limpopo(Campuseng ea Medunsa). Ke etse hloko ka botlalo hore sephetho sa boithuto bona se tla sebelisoa molemong oa merero ea tsa mahlale 'me e ka nna ea phatlalatsoa. Ke lumellana le sena, ha feela litaba tsa lukunutu tse nkamang li tla tsireletsoa.

Ke lumela mona ho nka karolo boithutong bona.

…….. ……
Lebitso la Mokuli Tekeno ea Mokuli

.... …….
Sebaka Letsasi Paki

Taba ka Mofuputsi

Ke fana ka tlhahiso- leseling ea molomo le/ kappa e ngotsoeng mabapi le boithuto bona.
Ke lumela ho araba lipotso tse ka botsoang mabapi le boithuto bona ka hohle ka moo nka khonang.
Ke tla ikamahanya le melaoana le litumellano.

……. ……. …….. …….
Dr F.O. Adebayo Tekeno Letsatsi Sebaka

Appendix B: QUESTIONAIRE (ENGLISH)

TITLE:

A STUDY OF THE DIETARY HABITS AND PREVALENCE OF OBESITY AMONG TYPE II DIABETIC PATIENTS AT SCOTT HOSPITAL, MORIJA, LESOTHO.

Instructions

Thank you for participating in this survey. I will like to find out what diabetic type 2 patients usually eat and drink. So it is important that you give us correct information so that we can determine the types of food you take.

I will like you to tell me all the types and quantities of foods and drinks you usually eat daily, weekly, and monthly.

To help you to estimate the quantities of the foods and drinks, you will be shown the household utensils that are normally used when serving the meals. The amounts can be reported in cups (c), teaspoon (t) and table spoon (T)

Also, measurements of your weight and height including waist and hip circumference will be taken.

DR F.O. ADEBAYO.
SCOTT HOSPITAL,
PRIVATE BAG,
MORIJA 190.

Appendix B (SESOTHO)

TABA

Boithuto ka mekhoa le litloaelo tsa ho ja ‘mele o boima haholo bakuling ba mofuta oa bobeli oa lefu la tsoekere sepetleleng sa Scott , Morija, Lesotho.

LITAELLO:

Kea leboha ho kenya letsoho lipatlisisong tsena.
Ke lakatsa ho tseba hore na bakuli ba mofuta oa bobeli oa lefu la tsoekere ba tloaetse ho ja le ho noaeng. Joale ho molemo ho fana ka tlhahiso leseling ea nete e le ho thusa hore ho tsejoe hore na u ja lijo tse nepahetseng bakeng sa bophelo ba hau kappa che.

Ke lakatsa le hore le mpolelle mefuta ea lijo le lino tseo le li jang ka letsatsi, ka beke, le ka khoeli le bongata ba tsona.

Ho u thusa ho lekanya bongata ba lijo le lino, tseo u li jang, u tla bontsoa lijana tse sebelisoang hangata bakeng sa ho fepa lijo. Bongata ba lijo bo ka bontsoa ka likopi(cups), khabana(teaspoon), le khaba(tablespoon).

Hape boima le bolele ba au , ho kenyeletsoa bolele ho pota pota letheka le lithopola li tla nkoa.

DR F.O. ADEBAYO
SCOTT HOSPITAL,
PRIVATE BAG,
MORIJA 190.

DEMOGRAPHIC DATA

Respondent no .....

Sex

1. **Male**
2. **Female**

Age Group:

1. **30 - 39**
2. **40 - 49**
3. **50 - 59**
4. **60 and above**

Marital status

1. Single

2. Married

3. Divorced

4. Widowed

What is your highest level of education?

1. No formal education

2. Primary School

3. High School

4. Tertiary

Employment status.

1. Unemployed
2. Self employed
3. Full time employed
4. Part-time employed
5. Retired
6. Others specify ……

When were you diagnosed?

……

Anthropometry

Weight ……..…kg

			.	

Height ……..cm

			.	

Waist circumference……..…cm

			.	

Hip circumference ……cm

			.	

DIETARY ASSESSMENT QUESTIONAIRE

Food Groups & Items	Description	Amt. usually Eaten	Per Day	Times eaten	
				Per Week	Per Month
RICE & PASTA					
Rice					
Pasta					
BREAKFAST CEREALS:					
Porridge(Lesheleshele)					
motoho					
Corn flakes					
BREADS					
White bread					
Brown bread					
SPREAD ON BREAD					
Jam					
Peanut butter					
Margarine					
MAIZE MEALS :					
Papa					
Samp					
SNACKS:					
Makoenya					
Others:					
CAKES & PASTRIES					
Cookies					
Cakes					
Others :					
RED MEAT:					
Pork					
Beef					
Mutton					
Russian					
POULTRY MEAT:					
Chicken					

Food items	Description	Amt. usually Eaten	Per Day	Per Week	Times eaten Per Month
EGGS					
POTATOES					
LEGUMES:					
Beans					
Lentils					
Peas					
HIGH-FAT DIARY PRODUCTS					
Whole Milk					
DESSERTS:					
Custard+Jelly					
Fruit Salads					
SWEETS & CANDIES:					
Chocolates					
Candies					
HIGH-ENERGY DRINKS					

JNIVERSITY OF LIMPOPO
Medunsa Campus

MEDUNSA CAMPUS RESEARCH & ETHICS COMMITTEE

FACULTY OF HEALTH SCIENCES

CLEARANCE CERTIFICATE

P O Medunsa
Medunsa
0204
SOUTH AFRICA

Tel: 012 - 521 4000
Fax 012 - 560 0086

MEETING: **06/2007** **PROJECT NUMBER: MCREC/M/109/2007: PG**

PROJECT	**Title:**	Dietary habits and prevalence of obesity among type II Diabetic patients at Scott Hospital Morija, Lesotho
	Researcher:	Dr. F.O. Adebayo
	Supervisor:	Prof. G.A. Ogunbanjo
	Hospital Superintendent:	A Makhalemele (Scott Hospital)
	Department:	Family Medicine & Primary Health Care
	School:	Medicine
	Degree:	M Med (Family Medicine)

DATE CONSIDERED: November 22, 2007

DECISION OF THE COMMITTEE:

REPC approved the project.

DATE: November 28, 2007

UNIVERSITY OF LIMPOPO
2007 -11- 28
RESEARCH
Medunsa Campus

PROF GA OGUNBANJO
DIRECTOR: RESEARCH & CHAIRPERSON

Note: i) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.

ii) The budget for the research will be considered separately from the protocol. PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.