HEALTH SEEKING BEHAVIOUR AND PATTERN OF ADHERENCE TO TREATMENT AMONG PATIENTS WITH TYPE-2 DIABETES MELLITUS IN CENTRAL HOSPITAL WARRI, DELTA STATE

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DEDICATION

To my late father MR WILSON AGOFURE for the opportunity he gave me to be educated. Also to my mother and all my siblings.

ABSTRACT

Type-2 Diabetes mellitus (T2DM) could be well managed if patients adhere strictly to treatment regimen. Adherence to treatment (ATT) is a major challenge among patients with T2DM partly because the disease requires lifelong management to prevent the onset of complications. Previous studies on ATT have not been linked with studies on Health Seeking Behaviours (HSBs). Consequently, a study on HSBs and factors influencing ATT of patients with T2DM will be useful for its effective management. This study was therefore designed to investigate HSBs and pattern of ATT among T2DM patients in Central Hospital Warri, Delta State.

A cross-sectional study was conducted among 350 purposively selected patients with T2DM. A semi-structured questionnaire was interviewer administered to obtain information on respondents' socio-demographic characteristics, HSBs, level of ATT, factors influencing ATT and suggestions on ways of improving ATT. A 14-point scale graded; poor (0-8) and good (>8) was used to measure HSBs. A 24-point scale graded; partial (0-13) and strict (>13) was used to measure ATT. Descriptive statistics, Chi-square test and logistic regression were used to analyse the data with level of significance set at 0.05.

Mean age of respondents was 57.9 ± 9.8 years, 60.9% were females and 78.0% were married. More than 95.0% exhibited good HSBs and 58.0% adhered strictly to treatment. Analysis of the determinants of non-adherence to treatment showed that taking alternative traditional medicines (herbs) for treatment of the disease was the major contributing variable (OR = 2.5, 95% CI = 4.55-1.69). Factors that hindered adherence included difficulty in sticking to prescribed diets (69.1%) and the least was busy schedule of doctors to listen to patients' complaints (0.3%). Respondents who were diagnosed with T2DM at mid-adulthood (40-49 years) did not significantly exhibit strict ATT (27.7%) more than those (15.4%) who were diagnosed at late-adulthood (50-59 years). Suggestions on ways of improving ATT included self discipline (46.9%) and encouragement from healthcare personnel (44.0%). Lack of awareness about the disease (42.6%) was a major challenge confronting patients with T2DM.

One of the ways of overcoming the challenges of T2DM was creation of awareness as suggested by 39.1% of respondents.

Respondents exhibited good health seeking behaviour but use of alternative medicine (herbs) remains a major challenge among patients with type-2 diabetes mellitus. Health education on diabetic care with emphasis on adherence to treatment regimen, among other strategies, should be organised regularly for diabetic patients.

Keywords: Type-2 Diabetes mellitus, Health seeking behaviour, Treatment compliance
Word count: 392

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CERTIFICATION

I certify that this work was carried out by Mr. Agofure Otovwe in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria.

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TABLE OF CONTENT

CHAPTER ONE: INTRODUCTION

CHAPTER TWO: LITERATURE REVIEW

CHAPTER THREE

CHAPTER FOUR: RESULT OF ANALYSES

CHAPTER FIVE: DISCUSSION OF RESULTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BMI	Body Mass Index
CVA	Cerebral Vascular Accidents
DAWN	Diabetes Attitudes Wishes and Needs study
DCCT	Diabetes Control Complications Trial Research Group
DFU	Diabetic foot ulcers
DM	Diabetes mellitus
FDA	Food and drug administration
FPG	Fasting Plasma Glucose
HBAIC	Glycosylated haemoglobin
HDL	High density lipoprotein
HIV	Human Immuno-deficiency virus
IDDM	Insulin-dependent diabetes mellitus
IDF	International diabetes federation
IFG	Impaired Fasting Glycaemia
IGT	Impaired Glucose Tolerance
LDL	Low density lipoprotein
NCD	Non-communicable disease
NIDDM	Non-Insulin dependent diabetes mellitus
OGTT	Oral glucose tolerance test
PRECEDE	Predisposing reinforcing and enabling constructs in education/ecological diagnosis and evaluation
SEMDSA	Society for Endocrinology Metabolism and Diabetes of South Africa
TB	Tuberculosis
UK	United Kingdom
UKPDS	United Kingdom Prospective Diabetes Study
UNAIDS	Joint United Nations Program on HIV/AIDS
US	United States
WHO	World Health Organization

Key concepts and working definitions

A number of concepts and working definitions have been adopted in this dissertation which includes:

- **Diabetic patients:** It refers to an individual who have been diagnosed with diabetes mellitus and he/she is already attending hospital for treatment.

- **Adherence to treatment:** It refers to how diabetic patients adhere to medication, dietary, exercise and other treatments prescribed by health care personnel.

- **Health-seeking behaviour:** Health seeking behaviours refers to all those things humans do to prevent diseases and to detect diseases in asymptomatic stages.

- **Health related behaviour:** This consists of activities or actions carried out by patient and his/her family and/or social networks (individuals) to prevent illness, to restore, maintain or improve health. Health related behaviour may also include those activities that have a negative impact on individual health including smoking, alcoholism, inactivity and unhealthy food intake. It also involves poor adherence to prescribed medication following disease diagnosis.

- **Alternative care services:** The term refers to a variety of therapies that are provided to patients outside the "biomedical mainstream" to treat the signs and symptoms of diabetes and enhance wellness. These therapies may include use of medication from herbalists, self medication (use of non prescribed treatment), and or use of services from traditional and faith healers.

- **Scope of the study:** The study focuses on diagnosed Type-2 diabetes mellitus patients and their diabetes management behaviour.

CHAPTER ONE
INTRODUCTION

1.1 Background of the study

Diabetes is a chronic disease primarily defined by high levels of blood glucose, (hyperglycaemia) giving rise to risk of tiny blood vessel damage (retinopathy, nephropathy and neuropathy). It is associated with reduced life expectancy, significant morbidity due to specific diabetes related microvascular complications, increased risk of macrovascular complications (ischaemic heart disease, stroke and peripheral vascular disease) and diminished quality of life (WHO, 2008).

Diabetes is the sixth leading cause of death worldwide (Morbidity Mortality Weekly Report, 2002) while the number of diabetes cases worldwide has increased significantly in the last decade (Zeck and McIntyre, 2008), thus it is now regarded as a global epidemic with more than 230 million people worldwide living with the disease (Silinik, 2007). Each year, 3.2 million people around the world die from complications associated with diabetes. In countries with a high diabetes incidence, such as those in the Pacific and the Middle East, as many as one in four deaths in adults aged between 35 and 64 years is due to the disease (IDF, 2006).

According to ''Beran and Yudkin'' (2006); the number of adults with diabetes in the world will rise from 135 million in 1995 to 380 million in the year 2025. In United States, more than 13.8 million Americans have diabetes and Type-2 diabetes accounts for 90% to 95% of the diagnosed cases with 800,000 new cases reported each year (Silinik, 2007). China with its large population of 1.3 billion has 30 million diabetic adults, while India has 35.5 million (Jordan and Osborne, 2006).

In 1901 diabetes was virtually unknown in Africa. In 2003 Africa had 7 million people with diabetes. In 2005 there were 15 million people with diabetes in Africa. Currently, there are 10.4 million individuals with diabetes in Sub-Sahara Africa, representing 4.2% of the global population with diabetes (IDF, 2006). By 2025, it is estimated that this figure will increase by 80% to reach 18.7 million in this region, with a higher prevalence in the urban areas (Kengne

et al., 2005). In Africa, the traditional rural communities still have low prevalence of 1-2% (except in specific high risk groups) while 1-13% or more adults in urban communities have diabetes (Sobngwi, Maurvis-Jarvis and Mbanya, 2007; Kolawole, Adegbenro, Ayoola and Opebiyi, 2005). Current prevalence rate estimates of diabetes in Nigeria have been tagged at 2.5% compared to its 2.2% rate in 2003 (WHO, 2009).

Diabetes is one of the chronic illnesses for which self-management plays a central role in care. To optimize their health, individuals with diabetes may be advised regarding diet and exercise, frequent medical examinations, annual specialized examinations of their eyes and feet, and for many, prescribed multiple oral or injected medications every day (Okolie, Ehiemere, Ezenduka and Ogbu, 2010). Until there is a cure for diabetes, these behaviours must be sustained for a lifetime (Schechter and Walker, 2002). However, the problem of diabetes management in sub-Saharan Africa is characterized by late and poor clinic attendance, delayed diagnosis and poor quality care (Mbanya, Ngogang, and Salah, 1997).

The prognosis of diabetes in sub-Saharan Africa is reported to be poor (McLarty, Pollitt and Swai, 1990) and so is the quality of care (Neuhann, Water-Neuhann, Lyaruu, and Msuya, 2002). The observed reasons for these trends are poor clinic accessibility and drug availability, high costs of treatment and care, inadequate supplies of trained staff and equipment, as well as the use of alternative health care providers, for example traditional healers and/or herbalists (Beran and Yudkin 2006). Furthermore, poor patient education on the management of diabetes including self-monitoring and control of glycaemia, non-adherence to treatment regimen, together with unhelpful health-related beliefs on the management of this disease have been reported to contribute to poor diabetes care and treatment outcomes (Dagogo-Jack, 2006; Kiawi, Edwards, Shu, Unwin, Kamadjeu, and Mbanya, 2006).

Adherence is defined as the extent to which a person's behaviour (in terms of taking medications, following diets or executing lifestyles changes) coincides with medical or health advice (Haynes, Taylor, and Sackett, 1979). Adherence to treatment has become a major challenge among diabetic patients because the disease requires long term therapies and daily

self-management to prevent or delay the development of complications. Poor adherence to diabetes treatment leads to poor glucose control and increases the risk of disease complications. Thus, it is imperative that patients adhere to their prescribed drug regimens to minimize the burden of the disease on the health systems (Blanca, Blanca and Ernesto, 2001; Lo, 1999). Studies have emphasized the importance of achieving optimal glucose control through strict adherence to medications and dietary recommendations in order to minimize serious long term complications (Kravitz et al., 1993; Anderson, Fitzgerald and Oh, 1993).

Health seeking behaviours refers to all those things humans do to prevent diseases and to detect diseases in asymptomatic stages. Given its chronic nature, most diabetes care takes place in the everyday life of the person with diabetes, their private sphere, rather than in the public sphere of the health care system. Studies from the patient's perspective with an emphasis on self care practices are therefore important in order to understand factors affecting diabetes management in Africa (Kolling, Winkey and Von-Deden, 2010). The determinants of health-related behaviours and burden of diseases are important for health promotion. Furthermore, health behaviours may have synergistic effects on the risk of disease (Berrigan, 2003). This study investigated how patients cope with the illness in a resource deprived environment where access to and availability of the means to control diabetes are limited. This study investigated the level of health seeking behaviour, level of adherence to medication and dietary treatment, factors influencing adherence to treatment, attitude towards medication and dietary treatment and participants' opinion on ways of improving adherence to medication and dietary treatment among diabetic patients.

1.2 Statement of the problem

Currently the number of cases of diabetes worldwide is estimated to be around 150 million (WHO, 2003). This number is predicted to double by 2015 (a prevalence rate of about 5.4%) (WHO, 2003).

Although increase in both the prevalence and incidence of Type-2 diabetes have occurred globally, they have been especially dramatic in societies in economic transition, in newly industrialized countries and in developing countries. Previously a disease of the middle aged

3

and the elderly, Type-2 Diabetes has recently escalated in all age groups including adolescents, especially in high risk populations (WHO, 2003). This means, that in developing countries, the majority of diabetic patients acquire the disease during the most productive period of their lives. This will have major implications with respect to health care needs and costs as they will live up to an older age to develop chronic complications of diabetes. Diabetes and its complications impose significant economic consequences on individuals, families, health systems and countries (WHO, 2009). The threat is growing; the number of people, families and communities affected is increasing. This growing threat is an under-appreciated cause of poverty and hinders the economic development of many countries (WHO, 2009). Diabetes takes a staggering toll on the people of Nigeria and the economic burden is heavy (Popoola, 2005).

The life expectancy of a child with Type-1 diabetes is as low as seven months in rural African country like Nigeria caused mainly by limited access to insulin and its cost and a lack of infrastructure within the healthcare system (IDF, 2006). Recent research on common causes of inpatient hospitalizations in Nigeria showed that of 1,327 patients admitted to the medical wards, diabetes mellitus related admissions comprised 15% of the entire medical admissions and the case fatality rate was 16% (Ogbera, Chinenye,Onyekwere and Fasanmade, 2007).

Issues about adherence became a topic of considerable research by multidisciplinary teams beginning in the 1970s when studies showed that as many as 50% of patients diagnosed with hypertension were not taking sufficient amounts of their antihypertensive medications. (Morisky, Ang, Krousel-Wood and Ward, 2009). Globally non-adherence to medication is becoming a major problem, in the US approximately 125,000 deaths annually are attributed to non-adherence to medication, or twice the number killed each year in automobile accidents. Up to 11% of hospital admissions and 40% of nursing home admissions are due to lack of adherence with medication therapy. The direct and indirect costs of non-adherence to medication total approximately $100 billion per year in the United States. (Medication Compliance Aids, 2004; American Pharmacists Association, 2003). Regimen adherence

problems are common in individuals with diabetes, making glycaemic control difficult to attain (Okolie et al., 2010).

A systematic review of adherence to medication for diabetes showed that average adherence to oral anti diabetes medications ranged from 36% to 93% (Cramer, 2004). Expectedly, patient non adherence to prescribed hypoglycaemic medications and diet could decrease treatment effectiveness (Helmrich, Rayland and Leung, 2007; Rozenfeld, Hunt, Plauschinat and Wong, 2008). In   Nigeria, the problem of non-adherence to medication has led to high morbidity and gradually rising mortality among diabetic patients, especially among the elderly. Thus, it is imperative that patients adhere to their prescribed regimens to minimize the burden of the disease on the health systems (Adisa, Alutundu and Fakeye, 2009).

Health-seeking behaviour is a part and parcel of a person's, family or community identity being the result of an evolving mix of personal, experiential and socio-cultural factors. It varies for the same individuals or communities when faced with different diseases (Tipping and Segall, 1995; Ahmed, Adams, Chowdhury and Bhuiya, 2000; Outwater et al., 2001). Chronic lifestyle diseases have been recognized as the dominant causes of morbidity and mortality in industrialized and less developed countries (Murray and Lopez, 1997). Studies have shown that unless people deem a condition as serious, feel vulnerable to it and feel that they can do something to avoid it, they are unlikely to take preventive measures (Schwartzer, 1992). Risk and health seeking behaviours are largely determined by an individual's knowledge, attitude, beliefs and health practice. Individuals often adjust their lifestyle within the framework of their cultural influences, economic status, knowledge and resources, regardless of clinical recommendations (Cohen, Tripp-Reimer, Smith, Sorofman and Lively, 1993).

Health-seeking behaviour studies acknowledge that understanding human behaviour is prerequisite to change behaviour and improve health practices (Hausmann-Muela, Ribera, and Nyamongo, 2003). The view is often that the desired health care seeking behaviour is for an individual to respond to an illness episode by seeking first and foremost help from a trained allopathic doctor, in a formally recognized health care setting. Yet a consistent

finding in many studies is that, for some illnesses, people will chose traditional healers, village homeopaths, or untrained allopathic doctors above formally trained practitioners or government health facilities (Ahmed et al., 2001).

1.3 Justification of the study

Disease prevention and health promotion depend on knowledge of the prevalence of health behaviours and associations among such behaviours. Furthermore, health behaviours may have synergistic effects on the risk of disease (Berrigan, 2003).

Previous studies have found adherence to diabetes treatment to be sub-optimal <50% (Rubin and Peyrot, 2005; Delameter, 2007; Lo, 1999; Harris, 2001). Studies have emphasized the importance of achieving optimal glucose control through strict adherence to medications and diets in order to minimize serious long-term complications (Mason, Matsuyama, and Jue, 1995; Blanca et al., 2001). Furthermore, previous studies have not successively linked health-seeking behaviour, adherence to treatment and morbidity in people with diabetes (McGinn, Rosamond, Goff, Taylor, Miles, and Chambless, 2005, Mayer and Rosenfeld, 2006).

In view of the need to prevent or delay the development of diabetes complications, diabetic patients in a resource limited setting such as the study area should be empowered to manage their illness better by helping to determine the level of adherence to medication and dietary treatment and identify factors influencing their adherence to medication behaviour, thus increasing the understanding of the management of the disease and contributing to the long-term reduction of the disease burden on the health systems which is already overburdened with communicable diseases. Consequently, facilitating health workers, particularly health educators in designing strategies to adopt in subsequent interventions towards improving health seeking behaviour and treatment adherence among diabetes patients.

1.4 Research Questions

The following research questions have been generated

1) What is the level of health seeking behaviours among study participants?
2) What is the level of adherence to medication and dietary treatment among study participants?
3) What are the factors influencing adherence to treatment among study participants?
4) What is the attitude of study participants towards medication and dietary treatment?
5) How can participant's self-efficacy to improve treatment compliance be improved?

1.5 General Objective

The broad objective is to investigate health seeking behaviour and pattern of adherence to treatment among patients with Type-2 diabetes mellitus in Central hospital Warri, Delta State.

1.5.1 Specific Objectives

1) To assess the level of health seeking behaviours among study participants.
2) To determine the level of adherence to treatment among study participants.
3) To identify factors influencing adherence to treatment among study participants.
4) To assess the attitude of study participants towards medication and dietary treatment.
5) To examine participant's self-efficacy to improve treatment compliance.

1.6 Research Hypotheses

1) There is no significant relationship between socio-demographic characteristics such as age, sex, educational status and adherence to treatment among study participants.
2) There is no significant relationship between age of participants at first diagnosis and adherence to treatment.
3) There is no significant relationship between period of accessing medical treatment for diabetes mellitus and adherence to treatment among study participants.

7

1.7 Overview of the Dissertation

This thesis is organized into five main sections. These include chapters one, two, three, four and five.

Chapter one presents an introduction into the issues of diabetes mellitus, adherence to treatment and health seeking behaviour; the statement of the problem and significance of the study.

Chapter Two provides an overview of the literature related to the key concepts and issues covered in the study. It sets the overall research context. The chapter presents background information on diabetes, adherence to treatment and health seeking behaviour.

Chapter three presents the methodology which includes the study design, description of the study area; methods of data collection, analysis and limitations of the study.

Chapter four presents the results of the study.

Chapter five contains discussions of the findings and conclusions. Lastly, recommendations made on the basis of the findings are presented.

CHAPTER TWO

Literature Review

Diabetes mellitus (DM) is one of the most common non-communicable diseases, and its epidemic proportion has placed it at the forefront of public health challenges currently facing the world (WHO, 2003). Each year, 3.2 million people around the world die from complications associated with diabetes (International Diabetes Federation, 2006). The risk of death from cardiovascular diseases is approximately threefold for patient with type-2 diabetes; and their risk of death from all causes is increased by 75% compared to patients without diabetes (Beckman et al., 2002; Huxley et al., 2006). The morbidity and mortality resulting from micro- and macro-vascular complications of type-2 diabetes place considerable financial burden on individual patients and society (Zimmet et al., 2001).

Evidence abound that the most important predictor of reduction of morbidity and mortality due to diabetes complications is the level of glycaemic control achieved (American Diabetes Association, 1999; Diabetes Control and Complications Trial Research Group, 1996; UK Prospective Diabetes Study (UKPDS) Group, 1998). The main goal of therapy for patients with diabetes is to optimize quality of life and to prevent acute metabolic and long-term complications with reduction of premature morbidity and mortality (Working Group of the National Diabetes Advisory Board (SEMDSA, 1997), thus the full benefit of the many effective medications that are available will be achieved only if patients follow prescribed treatment regimens reasonably closely (Steiner and Earnest, 2000).

According to the World Health Organization, non-adherence with long-term medication for condition such as diabetes is a common problem that leads to compromised health benefits and serious economic consequences in terms of wasted time, money and uncured disease (Bartels, 2004). Consequently, practitioners should always look to improve adherence by emphasizing the value of a patient's regimen, making the regimen simple, and customizing the regimen to the patient's lifestyle. Asking patients non-judgmentally about medication-

taking behaviour is a practical strategy for enhancing adherence (Osterberg and Blaschke, 2005).

2.1 Literature Review Approaches

The review focused on various publications on health seeking and related behaviour and adherence to medication and dietary treatment for type-2 diabetes mellitus from different disciplines including public health, psychology, anthropology, medicine, epidemiology, social policy and population studies.

2.2 Data Sources

An extensive literature review of books, computer databases and related scientific journals was carried out in the initial stages and throughout the study. The purpose of this review was to assess and evaluate the studies on health seeking and related behaviour and adherence to treatment for type-2 diabetes mellitus. The reviews began with a global scope, then concentrated on developing countries, specifically Sub-Saharan Africa, then ended with Nigeria where such data are available. Different strategies were used in the literature search and review. Key words such as diabetes mellitus, adherence to treatment, adherence to medication, adherence to dietary, non-adherence to treatment, attitude to treatment among diabetes patients. Also health seeking behaviours among diabetes mellitus patients and health related behaviours were used to search for available literature from multiple bibliographic databases.

2.3 Observed gaps in the reviewed studies

Most of the diabetes studies reviewed in this chapter are both from developed and developing countries including sub-Saharan Africa and Nigeria. Majority of the studies reviewed were quantitative and few were qualitative which were based on clinical and hospital observations. Of the reviewed literature carried out in Nigeria, few studies on diabetes have been carried out in South-South Nigeria especially the study location. In addition most of the reviewed studies either worked on adherence to treatment or health seeking behavior as two separate research topics. Similarly most of the studies collected qualitative data through either In-depth interview or Focus group discussions from respondents.

10

Hence the current study therefore was intended to fill this gap. Firstly, the study was conducted in Warri where few studies on diabetes have been carried out. Also the study researched the diabetes management behaviour and adherence to treatment and finally observational checklist was used to assess the current health status of the respondents.

This section is considered under the following headings:

1. Definition of diabetes mellitus
2. Symptoms of diabetes mellitus
3. Classification of diabetes mellitus
4. Diagnosis of diabetes mellitus
5. Prevention and treatment of diabetes mellitus
6. Epidemiology and treatment of diabetes mellitus
7. Risks factors of diabetes mellitus in sub-Saharan Africa
8. Care and management of diabetes mellitus
9. Challenges in care and management of diabetes in developing countries and sub-Saharan Africa
10. Health seeking behaviour
11. Factors affecting health seeking behaviour
12. Adherence to treatment
13. Measures of adherence
14. Epidemiology of medication taking behaviour
15. Identifying poor adherence
16. Problems associated with poor adherence to diabetic treatment
17. Barriers to adherence
18. Conceptual framework
20. Summary of literature reviewed

2.4 Definition of Diabetes Mellitus:

According to ''WHO'' (2006); the term diabetes mellitus describes a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism in the body resulting from defects in insulin secretion, insulin action, or both. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the β-cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient insulin action results from inadequate insulin secretion and/or diminished tissue responses to insulin at one or more points in the complex pathways of hormone action (Palestinian Guidelines for Diagnosis and Management of Diabetes Mellitus, 2003).

2.5 Symptoms of diabetes

Symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss, sometimes with polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute, life-threatening consequences of diabetes are hyperglycemia with ketoacidosis or the hyperglycemic hyperosmolar state. Long-term complications of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputation, and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction. Glycation of tissue proteins and other macromolecules and excess production of polyol compounds from glucose are among the mechanisms thought to produce tissue damage from chronic hyperglycemia.

Patients with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral vascular and cerebrovascular disease. Hypertension, abnormalities of lipoprotein metabolism and periodontal disease are often found in people with diabetes. The emotional and social impact of diabetes and the demands of therapy may cause significant psychosocial dysfunction in patients and their families (Palestinian Guidelines for Diagnosis and Management of Diabetes Mellitus, 2003).

2.6 Classification of diabetes mellitus

There are two major clinical classes (Table 2.1) of diabetes mellitus: **type-I diabetes,** or insulin-dependent diabetes mellitus (IDDM), and **type-II diabetes,** or non-insulin-dependent diabetes mellitus (NIDDM), also called insulin-resistant diabetes.

In type-I diabetes, the disease begins early in life and quickly becomes severe. This disease responds to insulin injection, because the metabolic defect stems from a paucity of pancreatic β cells and a consequent inability to produce sufficient insulin. IDDM requires insulin therapy and careful, lifelong control of the balance between dietary intake and insulin dose.

Type-1 diabetes mellitus has two forms:

Immune–mediated diabetes mellitus: Results from a cellular mediated autoimmune destruction of the beta cells of the pancreas.

Idiopathic diabetes mellitus: Refers to forms of the disease that have no known etiologies.

Type-II diabetes is slow to develop (typically in older, obese individuals), and the symptoms are milder and often go unrecognized at first. This is really a group of diseases in which the regulatory activity of insulin is defective: insulin is produced, but some feature of the insulin-response system is defective. These individuals are insulin-resistant.

Table: 2.1 Clinical characteristic of type-1 and type-2 diabetes

Characteristic	Likely Type-1 diabetes	Likely Type-2 diabetes
Age	< 30 years	> 30 years
Peak age	10-14 years	50-60 years
Urinary ketones	Moderate to large	None to low
Body weight (BMI)	Usually thin (< 25)	Usually over weight (>27)
Clinical onset	Usually sudden	Usually gradual
Treatment	Insulin essential	• Lifestyle interventions + oral agents often effective. • Insulin for secondary failure.

Source: Palestinian guidelines for diabetes 2003

2.7 Diagnosis of diabetes mellitus

Diabetes mellitus is characterized by recurrent or persistent hyperglycaemia. The WHO diagnostic criteria for diabetes are as shown in Table 2.2.

Table 2.2: WHO Diagnostic criteria for diabetes mellitus

Stage	Fasting plasma glucose	Random plasma glucose	Oral glucose tolerance test
Diabetes	FPG $\geq$ 126 mg/dl	$\geq$ 200 mg /dl plus symptoms	2h-PG $\geq$ 200 mg/dl
Impaired glucose homeostasis	Impaired Fasting Glucose (IFG) = FPG $\geq$ 110 mg/dl and less than 126 mg/dl		Impaired Glucose tolerance (IGT) = 2h-PG $\geq$ 140 mg/dl and less than 200 mg/dl
Normal	FPG less than 110 mg/dl		2h-PG less than 140 mg/dl

Source: WHO, 2006

It is also recommended that the oral glucose tolerance test (OGTT) should be used in individuals with fasting plasma glucose of 6.1–6.9mmol/l (110–125mg/dl) to determine their glucose tolerance status (WHO, 2006). Impaired Fasting Glycaemia (IFG) is an elevated non diabetic fasting blood glucose level. It is defined by fasting plasma glycaemia (FPG) ≥6.1−<7.0mmol/l, (and if measured) 2-hour plasma glucose <7.8mmol/l. Impaired Glucose Tolerance (IGT) is defined by 2-hour plasma glucose ≥7.8 to 11.1mmol/l (and if measured) fasting plasma glucose (FPG) <7.0mmol/l and diabetes is diagnosed by FPG ≥7.0mmol/l and /or 2-hour plasma glucose ≥ 11.1mmol/l (WHO, 2006). Both IFG and IGT are transitional stages in the development of type-2 diabetes.

2.8 Prevention and Treatment of Diabetes mellitus

Diabetes is a chronic disease with no cure to date. It is associated with an impaired glucose cycle and altered metabolism. The short-term management of this disease aims at lowering and stabilizing mean blood sugar levels, while long-term aims focus on avoiding hyperglycaemia and ketoacidosis as well as later complications, all of which result from high blood sugar levels (Gerstein et al., 2001; Teuscher, 2007). Management of sugar levels calls for strict adherence to a medical regimen which may include use of a special diet, exercising, taking oral diabetes medication and using some form of insulin. Management of blood sugar levels may be complicated by other external factors such as stress, illness, menses, injection site scarring, dietary habits and other physiological factors unique to individual patients (Gerstein et al., 2001).

Type-1 diabetes mellitus must be treated life-long with insulin replacement therapy. Treatment must be continued indefinitely. Treatment may not significantly impair normal activities, if there is sufficient patient training, awareness, appropriate care and discipline in testing; allowing self management of blood glucose levels (Teuscher, 2007). Type-2 diabetes mellitus is initially treated by adhering to recommended diet, exercise, and by weight loss particularly among obese patients. The amount of weight loss which improves the clinical picture is sometimes modest (2-5 kg or 4.4-11 lb). This is almost certainly due to currently poorly understood aspects of fat tissue activity, for instance chemical signaling (especially in visceral fat tissue in and around abdominal organs). In many cases, such initial efforts can

16

substantially restore insulin sensitivity. In some cases strict diet and physical activity can adequately control the glycaemic levels. However, in many cases oral anti-diabetic drugs are required, and in about 30% of cases insulin injection may be necessary (Gerstein et al., 2001).

The prevention and treatment of diabetes usually includes the following:

2.8.1 Education of patients

Education is an essential part of diabetes management as it helps to improve compliance to treatment and will also help people with diabetes to cope with the disease and its various demands such as diet adjustment, injections, monitoring and social adjustment. It also helps to make persons with diabetes and their families as knowledgeable and self sufficient as possible.

The short-term goal of diabetic education is to maximize diabetes control, and the long-term goal is to minimize the impact of chronic complications of diabetes. Basically diabetes education should include education on diabetes and its treatment as well as instruction on the prevention of complications of diabetes, such as hypoglycemia and foot problems. Education should be targeted at a level which the individual patient can understand, using different methods as lecturing, instruction, demonstration and teaching by example (Palestinian Guidelines for Diagnosis and Management of Diabetes Mellitus, 2003).

2.8.2 Dietary treatment

Diabetes is a condition that is difficult to treat and expensive to manage (Wild et al., 2004), thus the type of food consumed is a fundamental determinant in the management of the disease. Diet alone constitutes a crucial aspect of the overall management of diabetes which may involve diet alone, diet with oral hypoglycaemic drugs or diet with insulin. Diet is individualized depending on age, weight, occupation and many other factors. Dietary guidelines exist for the management of the diabetic population, in order to promote an overall nutritional well being, glycaemic control and prevent or ameliorate diabetes-related complications (WHO, 1999). In diabetic patients, the control of complex carbohydrate and dietary fiber intake will lead to lower serum triglycerides and cholesterol levels (Asif, 2011).

17

The main goal of dietary treatment include; eating of balanced diet, having regular meals, achieve and maintain a desirable body weight, provide adequate nutrition for health and growth.

"World Health Organization, (2009)" recommendations for a balanced diet as shown in figure 2.1 includes a combination of carbohydrates, fats, proteins and fibres in the following quantities:

Carbohydrates 50 – 60 % of DCI (Daily Caloric Intake) mainly from complex Carbohydrates (starchy fibre-rich diet)

Fats 30% of DCI Saturated fat 10%, Poly-unsaturated 10%, Mono-unsaturated 10%, Cholesterol < 300 mg/day

Proteins 12 – 20% of DCI Plant and animal source

Salt < 6 gm/day < 3 gm/day for people with hypertension and diabetes
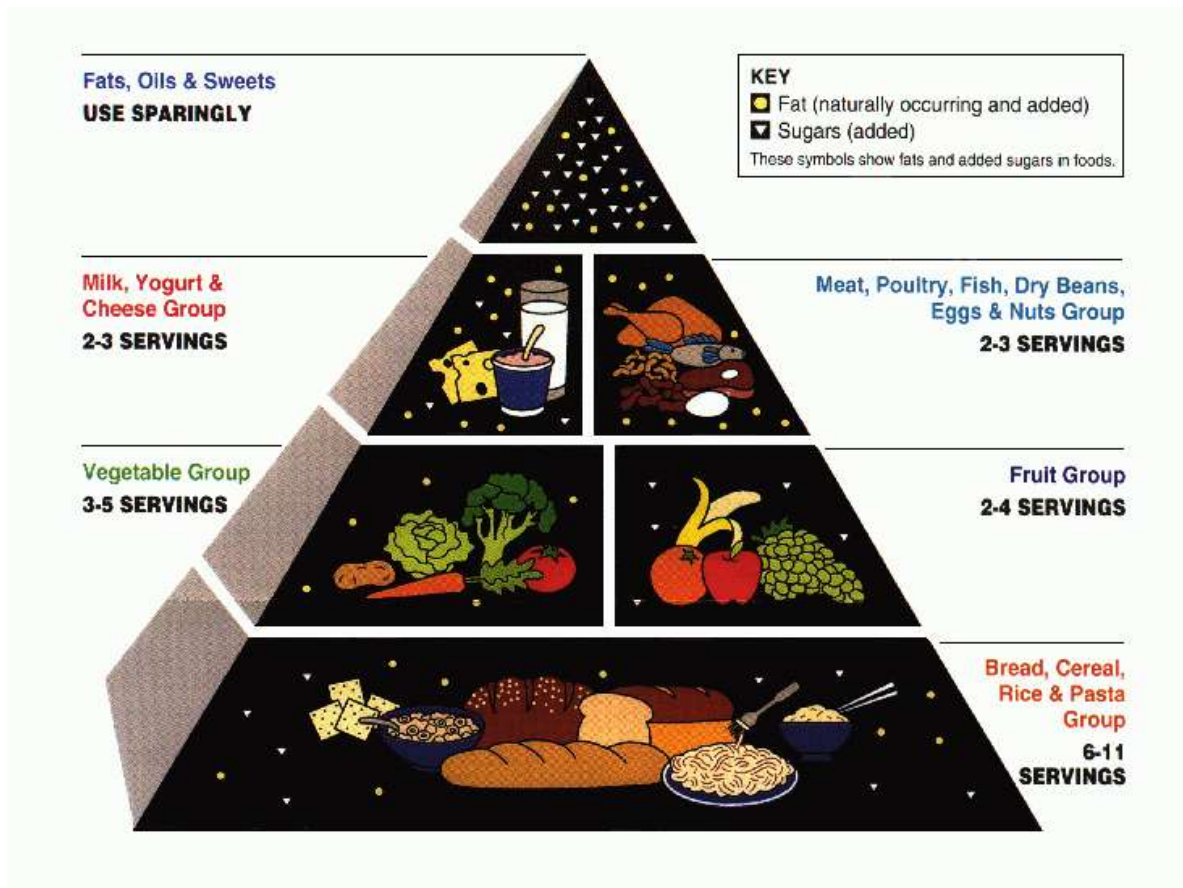
Fig 2.1: Diabetic Meal Plan Using the Food Guide Pyramid

Source: WHO, 2009

Note: The number of servings listed above is an average daily intake for diabetic patients with 1800kcal/day. Patient's requirements may vary depending on the daily caloric intake needed to maintain his blood sugar level.

2.8.2.1 The Role of Fruits in Diabetes

Fruits should form an important part of one's staple diet. Whether an individual has type-2 diabetes or not, fruits provide the body with fiber, vitamins and minerals, which are essential for a complete, balanced diet. If individuals are suffering from type-2 diabetes, they can still enjoy the benefits of fruits, except those that contain high levels of carbohydrates and sugars, which can affect an increase in the blood glucose level. They must include fruits with a low Glycaemic Index to control blood sugar level. The fruits with low Glycaemic Index include Cherries, Prunes, Grapefruit, Dried Apricots, Raisins, Peach, Apple, Pear, Strawberries, Plum, Guava, Orange, Grapes, Papaya, Banana, Kiwi, Pineapple, Figs and Mango. Although watermelon has a high Glycaemic Index, the glycaemic load per food serving (120g) is low; it will not have a big effect on blood glucose levels. However it should still be eaten in moderation (Barnard et al., 1982; Gillman, 1995; Hutch, 2010; Barnard et al., 2006).

2.8.2.2 Role of vegetables in diabetes

Vegetables supply vitamins, minerals and fiber. The best vegetables choices can be found to have low amounts of carbohydrates. The vegetables recommended in a Type-2 Diabetes diet include Broccoli, Lettuce, Spinach, Cabbage, Asparagus, Brussels sprouts, Cauliflower, Radish, Turnip, Mushrooms, Green Peas, Soybean sprouts, Carrots, Onions, Peppers, Green Beans, Eggplant, Celery, Cucumber, Zucchini, Tomatoes, Chilies and vegetables juice. Consume cooked or uncooked vegetables prepared with little or no fat and with little or no dressing (or sauces). Opt for fat-free or low-fat dressings on salads, as well as uncooked vegetables. Make use of low-fat broths or water to steam the vegetables. Another good idea is to sprinkle the vegetables with spices, peppers and many of the commonly available herbs (Hutch, 2010; Barnard, 2006; Puwastein et al., 1990).

2.8.2.3 Role of spices and diabetes mellitus

Spices exert several beneficial physiological effects including the anti-diabetic effect like short-term hypoglycemia and long-term improved glucose tolerance activities. Recent studies have on the basis of animal experimentation as well as clinical trials, studied the effects of spices and their extracts or active constituents in the treatment of diabetes. Fenugreek seeds, garlic, onion, turmeric, cumin seeds, ginger, mustard, curry leaves and coriander have been

20

reported to possess potential anti-diabetic agents. Hypoglycaemic effect on these spices includes; Cinnamon and its various spices display insulin-potentiating activity, in vitro in cinnamon spice and its phenolic extracts. Cinnamon supplementation may thus be important to in vivo glycaemic control and insulin sensitivity in humans, not only as an immediate effect, but also in sustaining it for 12 hours. It also significantly delays gastric emptying and profoundly lowers postprandial glycaemic response, without any significant effect on the repletion. Curry leaves and mustard: the results of the effect of curry or bay leaf supplementation on lipid glycated protein and amino acids in non-insulin-dependent diabetes mellitus patients indicates a transient reduction in fasting and postprandial blood sugar levels, with no appreciable change in other parameters (Asif, 2011).

The use of fenugreek seeds has shown a hypoglycaemic effect in non-insulin dependent diabetes mellitus subjects. Incorporation of fenugreek in the diet produces a significant fall in fasting blood glucose and improvement in glucose tolerance, by improving peripheral glucose utilization. Both garlic and onion have been found to possess hypoglycaemic activity (Yaheya et al., 2010; Qi et al., 2008; Schroeder, 2007).

2.8.2.4 The Role of fiber in diabetes mellitus

A dietary fiber is the part of the plant that cannot be digested in the human body, but it is partially digestible in the colon. In the general fiber of the plant there is some part that is carbohydrate, for example cellulose, hemicelluloses, peptic substance and some part that is not a carbohydrate for example lignin and gum (Puwastein et al., 1990). Water-soluble dietary fibers can delay sugar digestion and absorption (Jenkins et al., 1978). They reduce the insulin level and hormones in the digestive tract and bring about improvement of insulin sensitivity and glucose utilization (Mann, 1986; Monnier et al., 1982). Various bile acid chelation effects of these fibers have also been demonstrated (Dongowski et al., 2003). The role of fruits and vegetables in the prevention of type-2 diabetes tends to be associated with the fiber found in fruits and vegetables. Dietary fibers helps to slow the release of sugar into the bloodstream, thus helping to keep the blood sugar levels normal. Diets that are high in fiber may be able to help in the management of diabetes. Soluble fiber delays glucose absorption from the small intestine and thus may help prevent the spike in blood glucose

21

levels that follow a meal or snack. Similarly diets rich in fiber have a number of important health benefits including helping to promote healthy laxation and decreasing the risk of coronary heart disease. Health authorities recommend increased fiber intake through fruits and vegetables. An adult needs about 30 grams of fiber a day to meet the anticipated new recommendations. Fibers perform the following functions:

- Fibers slows down the absorption of food in the gut, resulting in better blood sugar control, which may help prevent diminished blood sugar control and type-2 diabetes later on.

- Fiber lowers blood triglyceride levels. High triglycerides can damage arteries and increase risk of heart disease.

- Fiber-rich fruits and vegetables are rich in potassium, which helps lower blood pressure, one of the biggest risk factors of heart disease.

- Fiber-rich fruits, vegetables and whole grains are rich in phytochemicals that may have heart-disease fighting properties.

  The general dietary advice specified by medical personnel includes the following:

- Nutritive sweeteners as fructose and sorbitol should be restricted and if used their calories must be accounted for in the meal plan.

- Nonnutritive sweeteners as saccharin and aspartame are approved by the Food and Drug Administration (FDA) to be safe and not contraindicated for individuals with diabetes.

- Excessive salt intake should be avoided. It should be particularly restricted in people with hypertension and those with nephropathy.

- Except in special conditions as pregnancy and lactation, routine vitamin and mineral supplementation is generally not needed in people with a well balanced diet.

2.8.3 Medication Treatment

In subjects with type-2 diabetes, both defects of insulin secretion and insulin resistance contribute to the development of hyperglycaemia. The major goal of treatment is to optimize blood glucose control but non-pharmacological measures i.e. lifestyle changes (health education, dietary measures, exercise) usually fail to achieve proper glycaemic control when used alone. Therefore most patients with type-2 diabetes require therapy by oral agents and sometimes insulin during the course of the disease.

 Oral antidiabetic agents used to treat type-2 diabetes are:

- Insulin secretagogues (stimulators of insulin secretion by β-cells): Sulphonylureas (glibenclamide, gliclazide, glipizide, glimepiride) and Non-sulphonylureas insulin secretagogues (repaglinide, nateglinide).

- Insulin sensitizers (increase insulin sensitivity): Biguanides (metformin) and Thiazolidinediones (rosiglitazone, pioglitazone).

- Inhibitors of carbohydrate absorption (α-glucosidase inhibitors, acarbose and miglitol).

  When starting treatment of type-2 diabetic patients, the aim is to achieve treatment goals for glycaemic control according to table 2.3

Table 2.3: Guidelines for diabetes treatment

Parameters	Acceptable Control	Poor Control
Target fasting or pre-prandial plasma glucose mg/dl	90-130	>150
2-hour post-prandial plasma glucose mg/dl	140-180	> 180
Total serum cholesterol mg/dl	200-220	> 220
HDL-Cholesterol	> 35	< 35
LDL-Cholesterol	100-130	>130
HbA1$_c$	6-8%	> 8%
Blood pressure mmHg	<140/90	> 140/90

Source: WHO, 2006

2.8.4 Exercise treatment

Exercise is considered an important part in the treatment of people with diabetes. With appropriate exercise guidelines, people with diabetes can exercise safely to achieve the following:

- Reduction of weight.
- Improvement of cardiovascular function.
- Increase in fitness and physical working capacity.
- Improvement of their sense of well being and quality of life.
- Increase insulin sensitivity.
- Improvement of their lipids profile.

The duration of exercise should be 20-60 minutes, 3-5 times per week.

Exercise Risks

- It is important to take extra care of the feet as they may get cuts and blisters. These should not be left unattended, as infections in foot lesions easily develop in people with diabetes.
- In otherwise healthy people with diabetes, the major risk associated with exercise is hypoglycaemia, either during or after activity. It is well recognized that hypoglycemia may occur up to 24 hours later. Thus people with diabetes should take extra carbohydrates orally.

2.9 Epidemiology and Burden of Diabetes

With advancement in medical technology and availability of antimicrobial agents, previously life- threatening infectious diseases has become amenable to cure. Since the 1960s, there was also an associated ageing of populations worldwide. Consequently, there has been a continuing epidemiological shift away from acute diseases to more chronic illnesses. (Hospital Authority Statistical Report 2003/04). Thus, cardiovascular diseases and diabetes mellitus have become major health challenges. Moreover, effective management of such chronic disorders is associated with lower avoidable morbidity, mortality and health care utilization across many chronic conditions. (Mar, 2001).

Diabetes is a chronic disease primarily defined by high levels of blood glucose, (hyperglycaemia) giving rise to risk of tiny blood vessel damage (retinopathy, nephropathy

and neuropathy) (WHO, 2008). All forms of diabetes negatively affect the body's ability to maintain a relatively constant level of sugar in the blood. The most important hormone involved in this process is known as insulin, which is secreted by the pancreas and facilitates the uptake of sugar from the blood into the cells of the body. Logically, if the pancreas is not able to produce insulin or if the insulin is not able to function properly then the body is not able to maintain a constant blood sugar level, which is harmful to the body (Mayo, 2010).

Diabetes is the sixth leading cause of death worldwide (Morbidity Mortality Weekly Report, 2002) while the number of diabetes cases worldwide has increased significantly in the last decade (Zeck and McIntyre, 2008). Thus it is now regarded as a global epidemic and more than 230 million people worldwide are living with diabetes (Silinik, 2007). This number is expected to rise to a staggering 350 million (6.3% of the world population) within 20 years (Silinik, 2007). The WHO estimated that there were 135 million people in the world with diabetes in 1995 and that this would rise to 154 million in 2000 (King et al., 1998).

The most recent "IDF Atlas (2006)" pointed to an even greater current and future problem by calculating that, at present, diabetes affects 246 million people worldwide, with a projected rise to 380 million by 2025. For instance in the United States, more than 13.8 million Americans have diabetes and Type-2 diabetes accounts for 90% to 95% of the diagnosed cases with 800,000 new cases reported each year (Silinik, 2007). In Australia, chronic diseases like diabetes now contribute to over 70% of the disease burden, and this is expected to increase to 80% by 2020 (Jordan and Osborne, 2006). China with its large population of 1.3 billion has 30 million diabetic adults, while India has 35.5 million (Jordan and Osborne, 2006). Currently, diabetes affects 246 million people worldwide (Levitt, 2008) and has become a major threat to global public health (WHO, 2008).

The increasing number of people with type-2 diabetes is a worldwide concern (Beran and Yudkin, 2006) and the number of adults with diabetes in the world will rise from 135 million in 1995-380 million in the year 2025. The major part of this numerical increase will occur in developing countries (WHO, 2008). There will be a 42% increase from 51-72 million in the developed countries and a 170% increase from 84-228 million in the developing countries.

Thus by the year 2025, >75% of people with diabetes will reside in developing countries, as compared with 62% in 1995 (King et al., 1998). It has been noted also that one in twenty adult deaths in developing countries is diabetes related (Gojka et al., 2005).

At the beginning of the last century, diabetes mellitus was considered a rare medical condition in Africa but there is now evidence to demonstrate an increasing incidence and prevalence of diabetes in these populations (Kengne et al., 2005) although the traditional rural communities still have low prevalence of 1-2% (except in specific high risk groups) while 1-13% or more adults in urban communities have diabetes (Sobngwi et al., 2007; Kolawole et al., 2005). Thus, the prevalence of diabetes has increased significantly and the ''International Diabetes Federation Atlas (2006)''; reports an overall prevalence of diabetes at 3.1%, affecting a total population of 10.4 million people; a huge number despite a lower prevalence than Europe, 8.4%, and North America, 9.2% (Levitt, 2008).

The IDF Atlas estimated that 10.8 million people have diabetes in Sub-Saharan Africa in 2006 and that this would rise to 18.7 million by 2025, an increase of 80%, as such exceeding the predicted worldwide increase of 55%. Indeed, while the HIV epidemic has captured the world's attention, recent data indicate that the global mortality due to diabetes and HIV are similar (Roglic et al., 2005). Furthermore, whereas the trends for a rise in diabetes prevalence are clear, globally and regionally, there is less certainty for HIV (UNAIDS, 2006).

The reported prevalence, using predominantly urine analysis, in localized settings in a number of countries including Ethiopia, Ghana, Lesotho, Uganda and Malawi between 1960 and mid-1985, was 1%. There were two exceptions, Ivory Coast (5.7%) and South Africa (2.2–2.7%) (McLarty et al.,1990; Motala et al., 2003). Surveys conducted in Sub- Saharan Africa demonstrated low prevalence was still evident in rural and urban Eastern and Western Africa when standardized WHO criteria for the diagnosis of diabetes were applied to cross sectional studies from 1985 to 1995 (McLarty et al., 1990; McLarty et al., 1989; Mbanya et al., 1997; Abubakari and Bhopal, 2008). In contrast, moderate prevalences were reported from South African studies undertaken in different cities and one peri-urban area (4–8%) (Levitt et al., 1993; Mollentze et al., 1995; Omar et al., 1993). These differences could be largely ascribed to considerably higher rates of obesity in the South African population

27

compared with other countries in the region. More recently, there has been a clear demonstration that the prevalence of diabetes is rising in the region. In Tanzania and Cameroon, the only two countries where repeated local surveys have been undertaken using similar methodology, the prevalence has increased six- to 10-fold within a 10-year period (Aspray et al., 2000).

While it is estimated that 92% of Nigerians live under $2 a day (Population Reference Bureau,2008), studies have shown that there has been a progressive increase in the prevalence of diabetes in Nigeria and the burden is expected to increase even further (Adeleye et al., 2006). The World Health Organization stated that, there are 1.71 million People living with diabetes in Nigeria and this figure is projected to reach 4.84 million by the year 2030 (WHO, 2009). Current prevalence rate estimates of diabetes in Nigeria have been tagged at 2.5% compared to its 2.2% rate in 2003 (WHO, 2009).

Complications of diabetes, including diabetic eye disease, nephropathy, neuropathy and peripheral vascular disease are common in patients with type-2 diabetes. Moreover, type-2 diabetes is a major risk factor for cardiovascular disease. Two landmark studies, the diabetes control and complications Trial (Blanca et al.,2001) and the United Kingdom prospective diabetes study (UKPDS) (Ciechanowski et al., 2001) have clearly established that tight blood glucose control in both Type-1 and Type-2 diabetes can decrease the   risk of developing secondary micro vascular complications.

Diabetes and its complications impose significant economic consequences on individuals, families, health systems and countries (WHO, 2009). It is associated with reduced life expectancy, significant morbidity and diminished quality of life. Again, overall risk of premature death is twice as high among individuals with diabetes as for those without diabetes (WHO, 2008). The threat is growing; the number of people, families and communities affected is increasing. This growing threat is an under-appreciated cause of poverty and hinders the economic development of many countries (WHO, 2009). Diabetes takes a staggering toll on the people in Nigeria and the economic burden is heavy (Popoola, 2005). According to the Nigerian Daily Sun, over 12 million Nigerians have diabetes and

most worrisome is the fact that 40% of this people did not know that they had the disease. The life expectancy of a child with Type-1 diabetes is as low as seven months in rural African country like Nigeria caused mainly by limited access to insulin and its cost. In parallel, an emerging epidemic of Type-2 diabetes is developing in this part of the world. Recent research on common causes of inpatient hospitalizations in Nigeria showed that of 1,327 patients admitted to the medical wards, diabetes mellitus related admissions comprised 15% of the entire medical admissions and the case fatality rate was 16% (Ogbera et al., 2007).

The most common reasons for the admissions were hyperglycaemic emergencies (40%) and hypertension (21%) (Ogbera et al., 2007). The most common causes of deaths were hyperglycemic emergencies 46% and Diabetic Foot Ulcers (DFU) 30%. Diabetic foot ulcers and Cerebral Vascular Accidents (CVA) commonly known as stroke had the highest case fatality rates of 28 and 25%, respectively (Ogbera et al, 2007). ''Okoro (2002)''; showed that diabetes care among patients in the Teaching Hospitals in Nigeria was less than optimal and recommended improvements in the areas of foot and eye examinations.

Diabetes is considered to be one of the most psychologically and behaviourally demanding of the chronic diseases (Ciechanowski et al., 2001). Studies have emphasized the importance of achieving optimal glucose control through strict adherence to medications in order to minimize serious long term complications (Blanca et al., 2001; Ciechanowski et al., 2001; Barnes et al., 2004). These complications affect the patients' quality of life, increase mortality, morbidity and economic cost to society (Blanca et al, 2001; Ciechanowski et al., 2001; Lo, 1999). It is imperative that patients adhere to their prescribed drug regimens to minimize the burden of the disease on the health systems (Blanca et al., 2001; Lo, 1999). The linkage between hyperglycaemia and complications of diabetes has firmly established the need for maintenance of blood glucose within a recommended range in individuals with diabetes. Helping patients adhere to often complex treatment regimens and achieve tight blood glucose control is a challenge that must be addressed during all phases of diabetes treatment. (Sackett et al.,1991).

2.10 Risk factors of diabetes mellitus in Sub-Saharan Africa

The major risk factors for diabetes in sub-Saharan Africa are similar to those in other regions of the world, whether this refers to the modifiable risk factors, such as urbanization, obesity, physical inactivity, or those that are not mutable, such as increasing age and ethnicity. The rising prevalence of diabetes in the region has largely been ascribed to changes in lifestyle and urbanization, resulting in greater levels of obesity and physical inactivity (Levitt, 2008).

2.10.1 Obesity

Inappropriate weight gain leading to obesity is one of the major risk factors for type-2 diabetes and risks of the disease increase steadily with increasing Body Mass Index – BMI (IDF Diabetes Atlas, 2006). However, in Western countries, around 90% of type-2 diabetes mellitus cases are attributable to overweight (IDF Diabetes Atlas, 2006). Obesity probably acts as a diabetogenic factor by increasing resistance of the action of insulin and individual is genetically predisposed to develop type-2 diabetes mellitus. The natural history for people at risk of developing type-2 diabetes is weight gain and deterioration in glucose tolerance (Swinburn et al., 2001). Obesity has traditionally been uncommon in many parts of the region, largely owing to scarcity of food and high levels of energy expenditure (Monteiro et al., 2004; Monteiro et al., 2004).

As recently as 1995 only 1–7.1% of women aged 15–45 years of age in 18 sub-Saharan Africa countries were obese (body mass index (BMI) 30 kg/m2); Namibia and Zimbabwe alone had a prevalence of more than 5% (Martorell et al., 2000). Yet at the same time, 31% of South African women were obese, even exceeding the 20.7% reported in US women (Monteiro et al., 2004; Martorell et al., 2000). Given the marked fourfold difference in obesity between rural and urban areas, the strong relationship between level of education as a marker of socioeconomic status and obesity within countries with low gross national product and the extent of urbanization projected by 2025, suggesting that 70% of Africans will reside in cities at that time, increasing rates of obesity can be expected in the region. This in turn will fuel the rise in diabetes prevalence as obesity, expressed by BMI or centrally by waist circumference or waist:hip ratio, has been consistently an independent risk factor for diabetes in the region (Levitt et al., 1993; Aspray et al., 2000).

2.10.2 Undernutrition

Undernutrition is a common problem in children of the region. Rates of stunting varying from 20% to 40% have been reported in children, 5 years of age (Labadarios and Steyn, 2005). To compound the problem, stunting confers a two- to sevenfold risk for being overweight, even in children. Indeed the deleterious effects of weight gain in children with low birth weight on insulin sensitivity were already demonstrable in 7-year-old South African children in the birth to age 10 cohort (Crowther et al., 1998). A healthy dietary habit does play a tremendous role in the prevention and management of type-2 diabetes.

2.10.3 Physical inactivity

In contrast to the ease with which obesity can be ascertained in field studies, it has been difficult to measure physical activity with any degree of reliability in such studies, owing to the lack of standardized and validated methods. Consequently, few reports have been able to identify physical inactivity as a risk factor for diabetes in sub-Saharan Africa. Despite this ''Sobngwi et al. (2002)''; were able to show an inverse relationship between fasting glucose concentrations and energy expenditure. Thus physical inactivity, a consequence of urbanization, due to changes in modes of work and transport from rural areas, is also expected to play a role in the increasing diabetes prevalence (Sobngwi et al., 2004).

2.11 Care and Management of Diabetes Mellitus
2.11.1 Global Management of Diabetes

Management of patients with diabetes aims to save lives, eliminate symptoms, and in the long term reduce complications and other risk factors which may shorten life (Watkins et al., 1996). Care management refers to a set of activities which assure that every person served by the health care system has a single approved care and/or service plan that is coordinated, not duplicative, and is designed to enhance cost effective and good outcomes. Effective care and management of diabetes starts with early diagnosis. Globally however, there are significant levels of undiagnosed or delayed diagnosis of type-2 diabetes mellitus (Watkins et al., 1996). ''Bilski et al. (2005)''; reported that the latent onset of type-2 diabetes and its slow progression may delay the diagnosis and lead to numerous complications. Similarly, ''Watkins et al. (1996)''; observed that many population-based studies have shown that, even

31

in western countries, as many as half of all diabetic cases remain undiagnosed, though these unidentified cases are all type-2 diabetes mellitus. In the UK, for example, close to 40 per cent of people with diabetes are unaware of their health status and delay diagnosis (Watkins et al., 1996). Similarly in the United States there are about a million people with the disease who are not aware of it, the majority of whom are diagnosed late (Hobson, 1997).

Furthermore, studies in the USA among minority populations have shown that diseases such as diabetes, whose symptoms are not readily identifiable by many people, may lead some not to seek health care unless their condition interferes with social or personal activities including their daily living such as work and household maintenance functions (Tripo-Reimer et al., 2001). Seeking care when functionally impaired may be viewed as a self-indulgent luxury. There is often a fear of seeking professional care unless necessary (Tripo-Reimer et al., 2001).

In addition ''Boult (1995)''; has noted a belief among immigrants in the USA that discussing a potential health problem before it occurs may increase its likelihood of occurrence. Such a belief may hinder early detection and health-seeking behaviour particularly at the household level. ''Peyrot, et al. (2005)''; identified several important gaps in diabetes management across developed and developing countries (Asian and European countries). First, diabetes self-management is less than optimal and is often compromised by diabetes-related distress which is often not treated. Second, health care providers often lack a good understanding of the social and psychological problems that people with diabetes face. Thirdly, team care for people with diabetes is uncommon. ''Van der Plight (1998)''; proposed that the first line of treatment and management in diabetes is lifestyle adjustment in order to prevent complications. The efficacy of treatment is highly dependent on the self-care behaviour of the individual. Patients are encouraged to modify their lifestyles, acknowledge their susceptibility to the various health risks involved, appreciate the severity of the disease and believe in the effectiveness of health protective behaviour.

The role of education in the management of diabetes is crucial not only with reference to information about the disease and its complications, but also for provision of practical

elements such as skills required for injecting insulin, the ability to self-monitor and most importantly, empowering patients with knowledge which will enable them to change their management and adjust their treatment safely (Watkins et al., 1996).

Therefore research into the delivery of diabetes care should seek to determine the extent to which the health care workers provide patients and their caregivers with adequate information on the management of diabetes and the related complications. Watkins and colleagues suggest that management plans should aim for active involvement of the patient in addressing their basic care needs at the household level supported by their family and/or social networks. Health care providers may help the patient open up and share any stressful events or situations like a change in job, sexual problems, or the death of a family member that could have an impact on their care management. The patient needs to tell their health care providers whether they are getting adequate social and family support, as these are likely to influence their care (Anderson et al., 1991).

Diabetes is a life-long challenge that needs behavioural change, most often through education and support offered by family members and health care practitioners (Anderson et al., 1991). Self-care management in diabetes is crucial to keep diabetes under control (Anderson et al., 1995). ''Anderson et al. (1995)''; proposed that as much as 95 per cent of diabetes self-care is usually provided by people with diabetes or their families. Self-care management involves self-monitoring of blood glucose, variation of nutrition to daily needs, as well as insulin dose adjustments to actual needs (De Weerdt et al., 1990). ''Rubin et al. (1989)''; claim that effective self-care can only be achieved when the person with diabetes is provided with skills such as injection techniques and other diabetes medication, and an awareness of how psychological factors affect their care. ''Rubin et al. (1989)''; emphasized that learning to master self-care in diabetes is highly important and this is achieved through a process where the patient attempts a variety of self-care strategies, according to their body's unique cues, until discovering what is effective for their lifestyle and contextual situation.

Self-care for people with diabetes is complex and influenced by various socioeconomic and cultural factors. Addressing these factors can enhance self-care practices of people with

diabetes (Anderson et al., 1991). These factors need to be known by the health care professionals to enable them to be more responsive to the needs of their patients. Although health care professionals may not be able to influence some patient's related factors such as age, gender, social class and the type of diabetes and its severity, they can influence diabetes-related knowledge, physical skills, emotional aspects, and self efficacy in relation to the four self-care areas: self-glycaemic control; adhering to a prescribed diet and drugs; self-monitoring of blood glucose; regular exercise, foot care, and abstinence from cigarette smoking and alcohol (Anderson et al., 1991).

''O'Reilly (2005)''; warned that a perceived loss of control related to homebound status and the need for home health services, as well as previous life experiences and familiarity with the more traditional model of medical care, may cause people with diabetes to feel ill-equipped to manage their diabetes. However, according to O'Reilly, most patients can develop the skills and confidence needed to participate fully in their diabetes management. Patients who are self-directed but physically unable to fully participate in their self-management may be willing to have a family member or other caregiver assist with the process. According to O'Reilly, it is important to allow patients to determine the involvement of others in their care. This emphasizes the importance of involving family, a caregiver and/or social networks in the self-management of diabetes.

2.11.2 Care and Management of Diabetes in sub-Saharan Africa

Health care systems in Africa including sub-Saharan Africa face challenges in the delivery of health care (Whiting et al., 2003). According to Whiting and colleagues, resources in sub-Saharan Africa are limited and systems are strained. Further, ''Whiting et al. (2003)''; argued that health systems in sub-Saharan Africa have evolved to treat acute infectious diseases rather than chronic diseases. This means that the training of health staff and health service organizations are not predisposed to effective and efficient treatment of people with diabetes. For example, people with chronic illnesses like diabetes need long-term follow-up and treatment requiring continuity of care over many years which has implications, among other things, for record keeping. The role of the person with diabetes is crucial in diet, weight loss, physical activity, taking medication, and the involvement of multiple organ systems means

that the care of patients often involves many services or specialties. These characteristics imply that diabetes care services must be more coordinated and integrated than that required for acute conditions.

According to ''International Diabetes Federation Africa Region Task Force (2006)''; most sub-Saharan Africa countries have no formal organized diabetes health care delivery system at the primary health care level. Insufficiently trained personnel and doctors at primary and secondary health facilities generally manage people with diabetes. Additionally, diagnostic equipment such as glucometers with appropriate strips and sphygmomanometers are frequently unavailable, and drugs are often not supplied in adequate quantities. ''International Diabetes Federation Africa Region, Task Force (2006)''; states that few health facilities can provide comprehensive tertiary care. The Federation's type-2 diabetes clinical practice guidelines for sub-Saharan Africa (2006) suggest that where diabetes clinics do not exist, clinics should be established and integrated into the health care system. Additionally, where the clinics do exist, an assessment of the quality of care provided should be done and changes instituted to rectify any deficiencies identified.

Furthermore, the clinical practice guidelines observed that in certain countries in sub-Saharan Africa, traditional healers are integrated into the primary health care system. However, it was suggested that should the patient choose to utilize a traditional healer services, it is imperative that the patient be counseled by the health care provider to continue monitoring of glycaemic control and other process measures of diabetes management (International Diabetes Federation Africa Region Task Force, 2006). Similarly, the clinical practice guidelines for sub-Saharan Africa proposed the minimum staffing and equipment requirements at each level of health care such as primary, secondary and tertiary for the appropriate management of diabetes mellitus. In addition, the clinical practice guidelines proposed what should be done and when at each health care level. However, delivering anything like ideal diabetes care in sub Saharan Africa in particular presents enormous problems influenced by socioeconomic, cultural and geographical factors (Mbanya and Gill, 2004). Similarly, ''Tshabalala (2001)''; states that a wide diversity of beliefs, cultures, religions, traditions, educational backgrounds and economic structures have made

35

management of diabetes in South Africa challenging. Mbanya and Gill remark that in Africa, socioeconomic considerations dictate that costs of diabetes treatment should be kept to a minimum. The aim should be to control plasma glucose with the least expensive but effective and not necessarily latest anti-diabetes drugs. Mbanya and Gill propose that the goal for diabetes management should be set for each individual based on the patient's clinical status, social, psychological, cultural and financial background and willingness to participate actively.

''Neuhann et al. (2002)''; state that diabetes care and management in developing countries and sub-Saharan Africa must address the specific background of the patient population, their needs, the medical problems and the social constraints. Moreover, they argue that active participation of the patients in diabetes management is required to help overcome some of these difficulties. Based on a survey finding in Tanzania, ''Simpson (2003)''; concluded that biomedical health systems in many developing countries and sub-Saharan African are undeveloped and would not be able to provide a service for monitoring and ensuring a constant supply of diabetes drugs (insulin) and other diabetes devices. Further, Simpson argues that diabetic care cannot just consist of dispensing more diabetes drugs and devices: "an increase in monitoring, education and general follow-up for patients is required to ensure that management is adequate" (Simpson, 2003).

2.12 Challenges in Care and Management of Diabetes in developing countries and sub-Saharan Africa

2.12.1 Limited Financial Resources

One of the major challenges for diabetes care services delivery in sub-Saharan Africa is inadequate financial resources for purchasing diabetes drugs and related services and self-monitoring of blood glucose. (Mbanya and Gill, 2004; Smide et al., 2002). Mbanya and Gill claim that although blood glucose testing is more accurate than urine testing, and normally preferred, urine testing is still a useful tool in diabetes management in Africa. For example, on testing the reliability of urine glucose tests for monitoring diabetes control in Ethiopia, ''Feleke and Abdulkadir (1998)''; concluded that urine glucose testing provides reliable

information for people with diabetes who cannot afford the cost of blood glucose monitoring. Feleke and Abdulkadir went further to argue that management of diabetes poses a serious challenge in Africa because of inadequate health care systems and the cost of medications, especially insulin.

A study in Ethiopia showed that the main problems pertaining to diabetes care management are the recurrent shortages and rising costs of drugs, and illiteracy (Abdulkadir, 1997). The high cost of diabetes management has also been reported in Cameroon (Mbanya and Sobngwi, 1997). Measuring HbA1c, according to ''Gill (1997)''; is difficult and expensive, and few clinics in Africa have this facility. Home glucose testing has been successfully introduced in some parts of Africa but is generally far too expensive.

''Rolfe et al. (1992)''; have shown that glycaemic control is commonly poor and diabetes drugs are expensive among patients in Gambia. This problem is compounded by poor adherence, especially amongst type-2 diabetes mellitus patients. The researchers note that hot, humid conditions mean that tablets and strips for urine testing rapidly deteriorate and the cost of purchasing them from local pharmacists is prohibitive. In light of this observation they proposed forward planning to ensure a better supply of drugs and other related supplies for people with diabetes, while stepping up intensive patient education to reduce patient morbidity and mortality.

2.12.2 Poor Accessibility and Affordability of Diabetes Drugs
Poor and erratic availability of drugs such as insulin in health facilities has been a problem in most sub-Saharan countries (Alberti, 1992; Gill, 1994). Insulin is often unavailable in half of the large city hospitals in sub-Saharan Africa, and only five countries reported regular insulin availability in rural areas (International Diabetes Federation Task Force, 1997). Supply of such drugs in most developing and sub-Saharan countries depends on where the patient lives and the affordability of insulin (Mbanya and Gill, 2004).

According to Mbanya and Gill the chronic lack of access to insulin is due to a number of factors. First, in some countries, insulin preparations are not included in the national

formulary and are therefore not available on a regular and uninterrupted basis. In most sub-Saharan countries insulin is not one of the drugs on the essential drug list (Mbanya and Gill, 2004; McLarty et al.,1994).

Secondly, in the absence of these drugs through the hospital pharmacies, patients have to buy them through the private outlets where they are far more expensive. In cases where there has been an introduction of cost-sharing, and in the absence of medical insurance, such costs are a burden on patients and their families. For instance, the cost of outpatient health care for diabetes in Tanzania was estimated at US$229 per person per year, of which some two-thirds (US$ 156) was the cost of insulin (Chale et al., 1992). This is equivalent to about six months of a family's income in most developing and sub-Saharan African countries and may explain the problem of poor adherence to treatment, and lack of follow-up among patients, often leading to diabetic complications (Mbanya and Gill, 2004).

2.12.3 Access to Diabetes Care Services

Health care coverage is another major factor influencing timely accessibility to care and treatment for diabetes in sub-Saharan Africa. ''Amoah (2002)''; observed that in Ghana some people with diabetes had to travel more than 300 kilometers to receive care. Amoah stated that it is not surprising, that many could not attend these centres and were therefore seen instead at facilities that had no trained diabetes healthcare personnel. He concludes that despite some advances in the management and treatment of diabetes, people in Ghana are still dying due to poor access to timely and appropriate medical treatment.

Similarly, in a survey in Northern Ethiopia, ''Alemu et al. (1998)''; report that treatment for diabetes in Ethiopia is only available in hospitals, hence many patients must travel great distances to obtain diabetes drugs and education. The study observed that half of the patients coming from rural areas travelled more than 120 kilometres to a health facility while a quarter came from more than 100 kilometres away and a few from more than 180 kilometres away. Based on the findings, it is likely that patients from distant areas might have been seeking health care from somewhere else, most likely from traditional healers. Some may have basically died from the disease before reaching a health facility.

Further, studies in Uganda have shown that diabetic biomedical care facilities are inadequate due to increasing numbers of new patients and the fact that people with diabetes are living longer (Otim and Nambuya, 1997). Likewise a study in Ivory Coast, show the absence of appropriate infrastructure, diabetes education, and drug supply to be among the major issues in improving diabetes care and management (Lokrou, 1997). ''Amoah et al. (1998)''; in Ghana and ''Levitt et al. (1996)''; in South Africa point out that although most patients are reported to be seeking care at primary health care clinics, in most areas these clinics are village dispensaries that are poorly equipped and staffed. The specialized diabetes clinics in some of the large cities are too expensive for the ordinary person. This poor coverage, inaccessible health care (Kagee et al., 2007) and lack of government commitment to NCDs "due to the unfinished agenda on communicable diseases and the AIDS pandemic" (Levitt, et al., 1996) makes delivery of diabetes care services in most sub-Saharan African countries far from adequate. Moreover, both studies state that people with diabetes travel long distances to seek appropriate care from specialists who work mostly in large teaching hospitals. ''Mbanya and Gill (2004)''; argue that type-2 diabetes mellitus can usually be well managed in primary health care settings with properly trained staff and expertise in diabetes, using appropriate treatment protocols if the government has a strong commitment to make it happen.

Most diabetes clinics and specialists are usually at central and/or referral teaching hospitals, making them less accessible for the majority of the rural population. People with diabetes nevertheless travel hundreds of miles to such centres (Gill et al., 1993), or even move to local townships, basically to obtain care not available or not perceived as available locally. By contrast, in Malawi about 80 per cent of the population is estimated to live within eight kilometres of a care facility and utilization is high (Harris et al., 1993). ''Bensouda (1997)''; reports that primary care services for diabetes are highly inadequate in Morocco. Bensouda point out that screening is only occasional, and diagnostic criteria are not standardized.

Further, the researcher notes that basic education is not given, particularly on prevention and control of diabetes. As in most developing and sub-Sahara African countries researcher also noted great disparities between rural and urban communities in access to quality care for

people with diabetes. Constraints around access to health care due to lack of financial resources have also been reported in Cameroon (Mbanya and Sobngwi, 1997). Similarly, ''Kiawi et al. (2006)''; in Cameroon observed that people often seek alternative or complementary treatment from folk healers and other sources, mainly because they cannot afford to pay for health services.

2.12.4 Inadequately Trained Care Providers for Diabetes

Another major obstacle in managing type-2 diabetes mellitus in developing and sub-Saharan Africa is inadequately trained health care professionals and public health educators, although such personnel are beginning to appear in some referral and regional hospitals. However, they are still lacking at the district and primary health care level facilities where the majority of the rural population is likely to seek health care (Gill, 1997). Other studies have shown that most health facilities in sub-Saharan Africa (Peyrot et al., 2006) lack health care providers with trainings in diabetes management, thus compromising the quality of care for patients.

Findings of low levels of professional competence in managing type-2 diabetes mellitus have been observed in Uganda by ''Otim and Nambuya (1997)''. They recommended that health care providers, particularly nurses, should be instructed in the proper method of routine blood pressure measurement for those people with diabetes and hypertension. Otim and Nambuya also recommended that education should be improved because many people with diabetes basically discontinue their antihypertensive treatment once they feel better or basically because they have not been given correct instructions about the need for seeking treatment for their hypertension.

The traditional African diet is rich in carbohydrates (i.e. rice, corn or flour, sorghum and millet, roots and tubers, yams, plantains, potatoes and cassava) accompanied by meat, fish or vegetables, which is ideal for patients with type-2 diabetes (Mbanya and Gill, 2004). However, the traditional diet is changing to a more western influenced diet high in fat and kilojoules. Such changes in diet contribute to the diversity and complexities of diets across sub-Saharan Africa countries, which when coupled with a lack of dieticians in most health

institutions, make it difficult to prescribe a standard for the management of people with diabetes. The nurses or doctors who are not adequately trained to provide complex dietary advice to people with diabetes are therefore responsible for supervising the diet of patients (Beran and Yudkin, 2006; Kaushik, 2004). Successful adherence depends greatly on the acceptability of the prescribed diet and on continuous counseling. ''Watkins et al. (1996)''; note that diets need to be tailored to suit individual patients and their habits in terms of physique, occupation, cultural habits and religious beliefs.

2.12.5 Inadequate Health Education

Inadequate provision of patient education, to help those with diabetes to look after themselves is also reported to pose a major challenge in most sub-Saharan African countries (Gill, 1997). Diabetes education is the cornerstone of successful diabetes treatment. It is particularly important in a continent where diabetes is believed to be caused by supernatural forces and evil spirits (Kofi and Anarfi, 1997).

''Parry et al. (2004)''; and his colleagues argue that lack of diabetes educators in most African countries, scarcity of diabetes specialists and multidisciplinary support teams, low patient education levels along with low literacy, poor treatment adherence, adverse cultural beliefs, and a lack of reliable and affordable supplies of medication and monitoring equipment, all combine to limit good diabetes management outcome.

''Tshabalala (2001)''; proposes that diabetes education in South Africa should be done in a holistic manner to empower people affected with diabetes–for example, patients, relatives, and the community–with relevant information, knowledge, skills, and motivation for self-care, as well as freedom of choice and responsibility. Education can be started informally either at outpatient clinics or on admission to hospital, as well as during urine or blood glucose testing, and when giving medication (Mbanya and Gill, 2004). Mbanya and Gill emphasize that patients should be encouraged to join existing diabetes association's or given help in creating one through which continuing diabetes education and counseling can be provided. Diabetes education in Africa should involve people with diabetes, families, health

care staff and communities, and should be considered as an integral and vitally important component of diabetes treatment and management.

According to ''Gill (1997)''; if diabetes care is to reach the "grassroots", then care needs to be focused at the primary health care level, along with efficient administration and education of primary health care staff. Likewise, ''Gill (1990)''; proposes that training, particularly on type-2 diabetes mellitus, should come down the diabetes care and management pathway, that is from teaching hospital experts to district hospitals and from there to primary health care. Studies in Cameroon report that the absence of trained diabetes health care providers and affordable health services has led to the forfeiture of the rights of people with diabetes to relevant education, leading to high diabetes related morbidity and mortality (Mbanya and Sobngwi, 1997).

2.13 Health Seeking Behaviour

The determinants of health-related behaviours and burden of diseases are important for health promotion (Berrigan, 2003). Health-seeking behaviour refers to any activity undertaken by individuals who perceive themselves to have a health problem or to be ill, for the purpose of finding an appropriate remedy (Kasl and Cobb, 1966).

Health seeking behaviour is not just a one off isolated event. It is part and parcel of a person's family or a community's identity, which is the result of an evolving mix of social, personal, cultural and experiential factors. The process of responding to 'illness' or seeking care involves multiple steps (Uzma et al., 1999), and can rarely be translated into a simple one off choice or act, or be explained by a single model of health seeking behaviour.

When an individual makes a decision in relation to their health, they weigh up the potential risks or benefits of a particular behaviour. But they do so in a way that is mediated by their immediate practical environment, their social rootedness and their whole outlook on life more generally (Lash, 2000). ''Ralpey and Fruin (1999)''; emphasize that conditions such as diabetes often require changes in lifestyle and approach to health behaviours, and the ease with which such changes occur depends on the person's self-efficacy and expectations about outcomes. ''Miglani et al. (2000)''; suggest that physicians usually neglect the social or

psychological issues associated with diabetes during consultations with diabetic patients. Similarly, ''Stenström and Anderson (2000)''; also raise the interesting point that patients with weaker beliefs in health care professionals may be more likely to engage in risky behaviours in relation to their diabetic status.

Previous studies comparing beliefs about health and illness in persons of different origin with diabetes mellitus have shown that Europeans cite various and more medically oriented causes of disease, for example heredity, obesity (Hjelm et al., 2003; Hjelm et al., 2005; Dechamp-le roux et al., 1990; Hjelm et al., 1999); whereas non-Europeans, e.g. North Africans, cited either stress or fate (Dechamp-le roux et al., 1990). Middle-Easterners showed a similar pattern of beliefs to North Africans, with a more fatalistic view of diabetes mellitus in terms of factors lying beyond one's own control, such as fate and supernatural influence through the will of God or Allah (external locus of control) (Hjelm et al., 2003; Hjelm et al., 2005). Although health was described similarly to freedom from disease, in Swedes, Ex-Yugoslavians and Arabs, three different self-care behaviours were demonstrated (Hjelm et al., 2003; Hjelm et al., 2005; Hjelm et al., 1999). Swedes were active and had a healthy and controlled lifestyle. Ex-Yugoslavians highlighted enjoyment of life and had a passive self-care attitude. Arabs focused on mental well-being, adaptation to diabetes mellitus, and actively searched for information and had a lower threshold for seeking care (Hjelm et al., 2003; Hjelm et al., 2005; Hjelm et al., 1999).

Similarly, study carried out among Uganda men and women (Hjelm and Nambozi, 2008) showed limited knowledge about diabetes mellitus. Majority did not know the cause of diabetes mellitus and attributed it to the influence of supernatural forces, which meant that limited self-care measures were used and health professionals were not consulted about health problems. Men focused on socio-economic factors, particularly the affordability of drugs, sexual function and lifestyle, while women valued well-being, support in daily life and household activities and had a higher risk awareness of diabetes mellitus.

The indication of limited knowledge was in accordance with findings shown in previous investigations focusing on knowledge of diabetes mellitus in people in Cameroon and South

Africa (Kiawi et al., 2006; Shilubane and Potgieter, 2007) and little understanding of the nature of diabetes mellitus, with reporting of a spectrum of different causes of diabetes mellitus in an investigation of the impact of the disease in Nigerians with diabetes mellitus (Famuyima et al., 1985) while in Ghanaians diagnosed with diabetes mellitus a blend of commonsense, scientized, and religious knowledge modalities that merged with biomedical goals, specifically drug and diet management (de-Graft Aikins, 2003). However when investigating health beliefs and stress with a quantitative approach (Bopape and Petzer, 2002) it was found that a number of patients suffered from considerable psychosocial stress mainly related to leisure time and physical complications resulting from diabetes mellitus and sometimes associated with poor diabetic control. They concluded that health care staff needed to consider the self-perception of compliance held by patients in order to consolidate progress. Risk- and health seeking behaviours are largely determined by an individual's knowledge, attitude, beliefs and health practice. Individuals often adjust their lifestyle within the framework of his cultural influences, economic status, knowledge and resources, regardless of clinical recommendations. (Cohen et al., 1993).

2.14 Factors affecting health seeking behaviours

A variety of factors have been identified as the leading causes of poor utilization of health care services and poor health seeking behaviours. Review of the global literature suggests that these factors can be classified as awareness and knowledge, cultural beliefs, socio-demographic status, disease understanding and perceptions, women's autonomy, economic conditions, physical and financial accessibility, and disease pattern and health service issues and use of alternative sources of care (Katung, 2001; Navaneetham and Dharmalingam, 2002; Fatimi and Avan, 2002; Uchudi, 2001; Stephenson and Hennink, 2004).

2.14.1 Awareness and Knowledge about Diabetes Mellitus

Among the many factors that influence health-seeking behaviour for diabetes care and management is the overall awareness and knowledge that the patient and their caregivers and/or social networks have about diabetes signs and symptoms. Low levels of awareness and knowledge about chronic health conditions have been blamed for delays in seeking care in biomedical care facilities. The level of awareness and knowledge about diabetes is noted to be low among many patients.

44

In marking World Diabetes Day in 2003 the president of the International Diabetes Federation noted with great concern that in a world of expanding waistlines, increasing urbanization, and rising health costs, awareness and knowledge of diabetes and its complications, particularly in developing countries, remained low among many populations. He went on to state that awareness was also low among health care providers, and people who live with the condition.

Furthermore, in a qualitative study of people without diabetes in Cameroon, ''Kiawi et al. (2006)''; noted that awareness and knowledge about diabetes, its causes, clinical course, and complications were limited. Additionally, perceptions of the threats associated with diabetes were reported to be low and lifestyle modifications required for diabetes management were also unknown (Kiawi et al., 2006).

In Tanzania, ''Ramaiya (2005)''; reported that more than two thirds of patients with diabetes at a regional hospital were unaware that their problems were related to high or low concentrations of glucose in their blood and did not know that they could or should monitor their sugar levels themselves. Similarly, a survey conducted by ''Simpson (2003)''; in Tanzania revealed that people with diabetes were at times unaware of the complications and seriousness of diabetes if left untreated. In the same vein, late diagnosis due to delayed health care seeking has also been attributed to poor patient knowledge about diabetes and associated misconceptions (McLarty et al., 1997). ''McLarty et al. (1997)''; for example, noted that most people with diabetes in tropical Africa including Tanzania present with classical symptoms of diabetes, but often seek help only when infection or other complications have developed. Sometimes the clinical combination of weight loss, frequent visits to the toilet and or presence of an abscess may lead to the erroneous conclusion that the patient has AIDS. This erroneous conclusion may delay patients and relatives seeking health care.

In South Africa, a qualitative study aimed at gaining in-depth information about patients' knowledge and attitudes about diabetes. ''Van Rooijen et al. (2001)''; reported low levels of awareness and knowledge about diabetes among people with low education levels. Van

Rooijen and colleagues suggested that health care providers need to be well informed about diabetes and pass on such information to their patients to enhance prevention, control and/or better management of diabetes after diagnosis. In their study patients reported substantial psychosocial problems in coping with diabetes, indicating the need for counseling by health care providers. The study recommended that patients should be educated about the basic physiology of diabetes, insulin action and causes of hypoglycaemia. Similarly, patients should be motivated to increase physical activity on a continuous basis. Finally, the study called for further culturally sensitive studies aimed at identifying health beliefs, motivation for the control of diabetes and environmental and personal barriers to exercise and physical activity.

2.14.2 Cultural and socio-demographic factors

Culture refers to the organized system of knowledge and beliefs through which people structure their experience and perceptions, formulate acts, and choose between action alternatives (Keesing and Strathern, 1998). Cultural beliefs and practices often lead to self-care, home remedies and consultation with traditional healers in rural communities (Nyamongo, 2002). Cultural practices and beliefs have been prevalent regardless of age, socio-economic status of the family and level of education (Geissler, 2000; Stuyft et al., 1996; Perez-Cuevas, 1996). They also affect awareness and recognition of severity of illness, gender, availability and acceptability of service (Aday and Anderson, 1974). ''Hollinger (2005)''; in Tanzania noted that beliefs regarding disease causality tend to be consistent with cultural and personal values, which consequently shape patients' decisions for action.

Disease causality may be linked to an action of a family member, something in the community or to a supernatural agent. Therefore, health-seeking behaviour clearly varies for the same individuals or communities when faced with different illnesses (MacKian, 2002).
It is believed that cultural factors influence health-seeking behaviours in chronic diseases. For example, in South Africa a qualitative study among the Xhosa women with breast lumps (Mdondolo et al., 2003) found that the cultural perceptions of the significance of the female breast, the meaning of a breast lump and the cause of illness influenced health-seeking behaviours.

46

Gender disparity has affected the health of women by putting an un-rewarded reproductive burden on them, resulting in early and excessive child-bearing. Throughout the life cycle, gender discrimination in child rearing, nutrition, health care seeking, education and general care make a woman highly vulnerable and disadvantaged (Hunte and Sultana, 1992; Karim, 1987; Hasan and Khatum, 2000). At times, religious misinterpretations have endorsed her inferior status. For her, limited access to the outer world has been culturally entrenched in the society, and for the unmarried, the situation has been even worse (Fatimi and Avan, 2002; Stephenson and Hennink, 2004).

2.14.3 Disease Understanding and Perceptions

People's perceptions of illness are complex and are influenced by traditional and cultural beliefs and attitudes. ''Simpson (2003)''; argues that it is not just the classification of illness that determines the course of action but also the people's perceptions of its cause.

''Muela et al. (2000)''; have shown that in African societies, disease aetiology is the main element according to which illness are broadly classified. People distinguish between 'normal illness or 'illness of God' as opposed to illness caused by witchcraft and spirits, which is referred to as 'out of order illness' or 'abnormal illness'. 'Normal illnesses or 'illnesses of God' are a natural creation by God and are part of normal human life and suffering. Such diseases include malaria, schistosomiasis, flu, diarrhoea diseases or worms. The most efficient treatment for such diseases is through hospitals with 'biomedical medicine' or 'white man's medicine'. 'Out of order' or 'abnormal illness' includes afflictions such as barrenness, impotence, mental disturbances and chronic disorders. The distinctive characteristic of 'out of order' or 'abnormal illness' is that they are not treatable at the hospital but are treated through traditional healers who have the appropriate skills to enter into contact with the invisible world. Diagnosis is normally done through divination, using the power of spirits to identify the cause of the illness (Muela et al., 2000).

''Tshabalala and Gill (1997)''; observed that often an individual perception of illness has a significant influence on a person's course of action. In most traditional African countries the action taken against any disease is based on the beliefs and perceptions that people have on

the actual disease causation. The power of beliefs and preconceptions related to disease, and particularly type-2 diabetes mellitus, seems to lead to strange courses of action. Fortune-tellers and 'sangomas' (witch-doctors or traditional healers) are extremely popular in most African countries. Type-2 diabetes mellitus may be perceived to emanate from a vengeful god or ancestors and successful treatment may, therefore, be perceived to be placation with sacrifice, prayers or even self- punishment. The authors recommended that health care workers should be aware of the guilt, confusion and self-blame which frequently haunt patients with newly developed diabetes. Based on perceived disease causation, health-seeking may involve among other things the execution of traditionally prescribed rituals believed to get rid of the health problem.

According to ''Tshabalala (2001)''; in one part of South Africa a diabetic patient may basically scoop out pineapple flesh, pour urine into the remaining shell and bury it in the garden. The health belief model here is that diabetes is also 'buried' through this ritual and therefore, the patient is cured! The same study noted that in parts of Natal in South Africa there is a widespread use of 'flowers', which is used to make some tea which is believed to cure diabetes. The use of traditional rituals in the treatment of diabetes cuts across all social classes irrespective of gender, economic status or educational levels. ''Tshabalala and Gill (1997)''; for example, reported having known a University graduate Black African in South Africa who used cinnamon to control his diabetes. ''Bopape and Peltze (2002)''; in South Africa also observed widespread use of combined traditional and biomedical therapies in managing diabetes and noted the need to consider using different strategies to motivate patients to comply with biomedical treatment regimens. Similarly, ''Simpson (2003)''; in Tanzania noted that about 40 percent of type-1 people with diabetes sought alternative care services from a traditional healer, consequently compromising insulin intake.

2.14.4 Women's autonomy

Men play a paramount role in determining the health needs of a woman. Since men are decision makers and in control of all the resources, they decide when and where woman should seek health care (Rani and Bonu, 2003). Women suffering from an illness, report less frequently for health care seeking as compared to men (Ahmed et al., 2000). The low status of women prevents them from recognizing and voicing their concerns about health needs.

48

Women are usually not allowed to visit a health facility or health care provider alone or to make the decision to spend money on health care. Thus women generally cannot access health care in emergency situations (Navaneetham and Dharmalingam, 2002; Fatimi and Avan, 2002; Uchudi, 2001). This certainly has severe repercussions on health in particular and self-respect in general of the women and their children. Despite the fact that women are often the primary care givers in the family, they have been deprived of the basic health information and holistic health services (Rani and Bonu, 2003). Women are socially dependent on men and lack of economic control reinforces her dependency (Hunte and Sultana, 1992). The community and the family as institutions have always undermined her prestige and recognition in the household care. The prevailing system of values preserves the segregation of sexes and confinement of the woman to her home (Stephenson and Hennink, 2004; Mumtaz et al., 2003). Education of women can bring respect, social liberty and decision making authority in household chores.

2.14.5 Economic factors

The economic polarization within the society and lack of social security system make the poor more vulnerable in terms of affordability and choice of health provider (Nyamongo, 2002; Asenso-Okyere, 1998). Poverty not only excludes people from the benefits of health care system but also restricts them from participating in decisions that affect their health, resulting in greater health inequalities. Possession of household items, cattle, agricultural land and type of residence signify not only the socio-economic status but also give a picture of livelihood of a family (Geissler, 2000). In most of the developing countries of south Asia region, it has been observed that magnitude of household out of pocket expenditure on health is at times as high as 80 per cent of the total amount spent on health care per annum (Ha et al., 2002). This factor also determines the ability of a person or a family as a whole to satisfy their need(s) for health care. Cost has undoubtedly been a major barrier in seeking appropriate health care in developing countries (Fatimi and Avan, 2002; Stephenson and Hennink, 2004). Not only the consultation fee or the expenditure incurred on medicines count but also the fare spent to reach the facility and hence the total amount spent for treatment turns out to be cumbersome. Consequently, household economics limit the choice and opportunity of health seeking (World bank, 1997; Hunte and Sultana, 1992).

2.14.6 Physical accessibility

Access to a health care facility is projected as a basic social right (United Nations, 2001). Dissatisfaction with primary care services leads many people to health care shop (Uzma et al., 1999) or to jump to higher level hospitals for primary care (Atkinson, 1999), leading to considerable inefficiency and loss of control over efficacy and quality of services (Daniels, 2000; Campbell and Sham, 1995). In developing countries including Pakistan, the effect of distance on service use becomes stronger when combined with the dearth of transportation and with poor roads, which contributes towards increase costs of visits (Islam and Tahir, 2002; Noorali et al., 1999; Bhuiya et al., 1995). Availability of the transport, physical distance of the facility and time taken to reach the facility undoubtedly influence the health seeking behaviour and health services utilization (Fatimi and Avan, 2002; Stephenson and Hennink, 2004; Karim, 1987; Moazam and Lakahani, 1990). The distance separating patients and clients from the nearest health facility has been remarked as an important barrier to use, particularly in rural areas. The long distance has even been a disincentive to seek care especially in case of women who would need somebody to accompany. As a result, the factor of distance gets strongly adhered to other factors such as availability of transport, total cost of one round trip and women's restricted mobility.

2.14.7 Health services and disease pattern

The under-utilization of the health services in public sector has been almost a universal phenomenon in developing countries. On the other hand, the private sector has flourished everywhere because it focuses mainly on 'public health goods' such as antenatal care, immunization, family planning services, treatment for tuberculosis, malaria and sexually transmitted infections (Berman and Rose, 1996; Zwi, 2001; Bannette, 1994). Still higher is the pattern of use of private sector allopathic health facilities. This high use is attributed mostly to issues of acceptability such as easy access, shorter waiting time, longer or flexible opening hours, better availability of staff and drugs, better attitude and more confidentiality in socially stigmatized diseases (Aljunid and Zwi, 1996; Bhattia and Cleland, 2001).

However, in private hospitals and outlets, the quality of services, the responsiveness and discipline of the provider has been questionable (Andaleeb, 2000; Meng et al., 2000). Client-perceived quality of services and confidence in the health provider affect the health service utilization (Duong et al., 2004). Also whether medicine is provided by the health care facility or has to be bought from the bazaar has an effect (Mondal, 1997).

For instance in Pakistan, the public health sector by and large has been underused due to insufficient focus on prevention and promotion of health, excessive centralization of management, political interference, lack of openness, weak human resource development, lack of integration, and lack of healthy public policy (World Bank, 1997; Khan, 1996). The communication factor also creates a barrier due to differences of language or cultural gaps and it can also affect the choice of a specific health provider or otherwise (Aga Khan University, 2003). The type of symptoms experienced for the illness and the number of days of illness are major determinants of health seeking behaviour and choice of care provider. In case of a mild single symptom such as fever, home remedies or folk prescriptions are used, whereas with multiple symptoms and longer period of illness, biomedical health provider is more likely to be consulted (Sadiq and Muynck, 2002; Islam and Aman, 2001). Traditional beliefs tend to be intertwined with peculiarities of the illness itself and a variety of circumstantial and social factors. This complexity is reflected in the health seeking behavior, including the use of home-prescriptions, delay in seeking bio-medical treatment and non-compliance with treatment and with referral advice. The attitude of the health provider and patient satisfaction with the treatment play a role in health seeking behaviour (Stephenson and Hennink, 2004; Newman, 1998; Sadiq and Muynck, 2002; Ndyomugyenyi et al., 1998).

2.14.8 Use of Alternative Sources of Care

In their TB study in the Philippines, ''Auer et al. (2000)''; noted that "multiple health seeking" may account for delayed case finding. Only 29 per cent of patients in their study presented first to a health centre, with 53 per cent consulting a private doctor initially. They found that 69 per cent of patients had been told by a member of the household to seek medical advice for their symptoms, and those who felt ostracized because of their TB delayed seeking medical help. ''Yamasaki-Nakagawa et al. (2001)''; found that women in Nepal were more likely than men to first seek help from traditional healer. In urban Zambia

and Nepal this has an implication for diagnosis, and women have been found to have significantly longer delays to diagnosis than men (Needhama et al., 2004; Yamasaki-Nakagawa, et al., 2001).

Non-Western practitioners remain a favourite source of care for many diseases including STIs. In Tanzania, ''Outwater et al. (2001)''; found that respondents pursue several different avenues of treatment for sexually transmitted infections (STIs) including self-treatment with herbs, traditional healers and/or herbalists, injections, pharmacies, government hospitals, and private clinics. Further, interviews with traditional healers about their knowledge and relationships with 'biomedical' medicine, as well as health-seeking behaviour among their clients revealed that some patients appeared to 'wander' from one service to another also known as 'healer shopping' (Outwater et al., 2001).

Despite the ongoing evidence that people do choose traditional and folk medicine providers in a variety of contexts which have potentially profound impacts on health, recommendations have been made on ways to build bridges to enable individual preferences to be incorporated into a more responsive health care system. For example, ''Ahmed et al. (2001)''; concluded that effort should be made to raise community awareness regarding the importance of seeking care from the trained, and the availability of services.

2.14.9 Religious Belief

Religion has been defined as belief in worship of a supernatural power or powers considered to be divine or to have control of human destiny. It is a system of beliefs that gives meaning to human existence through its explanation of people's origin and purpose in life, it is a source of security and comfort, it defines parameters for social control of its adherents and it can be both unifying and divisive (Aldridge, 2000).

On the other hand religious beliefs are a person's religious conviction, a firm opinion or an acceptance of a thing or fact. "Andrews and Boyle (1999)" define beliefs as something held to be actual or true on the basis of a specific rationale or explanatory model. Prescriptive beliefs govern behaviour; they state what should be done and restrictive beliefs state what

should not be done. Religious beliefs are truths that are grounded in the belief in God or the supernatural. They define what a believer should or should not do in specific situations.

When a client arrives at a clinic or hospital, there is an implied intent to use whatever services are available. At this point the client has to some extent disregard or overcome some barriers for example religious beliefs that could have prevented him/her from using the health care system. At community level barriers to utilization of health care services are present in one form or another. They may be cultural, religious, economic or environmental. (Haggart, 2000).

For instance, the Botswana health care system has a primary health care oriented philosophy, while the individual in the community may have a philosophy that is grounded in culture or religion. The divergence in philosophies may lead to the provision of inappropriate or inadequate professional health care services making the individual turn to traditional health care based on religion or traditional beliefs and practices for their health needs.

In assessing the African American patients and Diabetes, some patients may see diabetes as a result of natural causes, improper diet and eating habits, exposure to cold air or wind, and the will of God for improper behaviour. Any type of illness, physical or mental, may be seen as a lack of spiritual balance. Good health is a product of keeping spiritual harmony between mind, body and soul. Some delay in seeking health care can be attributed to allowing God a chance to heal. Some older patients may seek care in the form of lay advice, home remedies and prayer to treat illness as well as western medical treatments.

In addition, "Obidiya et al. (2011)" in their study on health seeking behaviour among adult residents of Yenogoa city in southern Nigeria found that respondents perceived causes of sickness/illness to be religious/cultural factors which include demons, witches, bad luck among others. Similarly, almost half of the respondents will pray and expect a miracle as first line of action when sick and ill. Also some of the respondents in this study will go to a church or mosque as their first choice of health care facilities when sick or ill.

2.15 Adherence to treatment

Evidence abound that the most important predictor of reduction of morbidity and mortality due to diabetes complications is the level of glycaemic control achieved (American Diabetes Association, 1999; Diabetes Control and Complications Trial Research Group, 1996; UKPDS, 1998). This has encouraged aggressive treatment of patients with the goal of achieving blood glucose level as close to normal as possible. However, achievement of optimal glycaemic control, which reduces the likelihood of diabetic complications and risk of death, is predicated on rational use of available anti-diabetic regimen, good adherence to prescribed treatments and successful self-management by patients (Defronzo, 1999).

Adherence has been defined as the "active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behaviour to produce a therapeutic result (Delameter, 2007). The word "adherence" is preferred by many health care providers, because "compliance" suggests that the patient is passively following the doctor's orders and that the treatment plan is not based on a therapeutic alliance or contract established between the patient and the physician (Osterberg and Blaschke, 2005). Implicit in the concept of adherence is choice and mutuality in goal setting, treatment planning, and implementation of the regimen. Patients internalize treatment recommendations and then either adhere to these internal guidelines or do not adhere (Okolie et al., 2010).

Issues about adherence became a topic of considerable research by multidisciplinary teams beginning in the 1970s when studies showed that as many as 50% of patients diagnosed with hypertension were not taking sufficient amounts of their antihypertensive medications and that non-adherence was common particularly with long term treatments for conditions such as diabetes, asthma, hypertension and HIV/AIDS (Morisky et al., 2009). Rates of adherence for individual patients are usually reported as the percentage of the prescribed doses of the medication and diet actually taken by the patient over a specified period.

Adherence rates are typically higher among patients with acute conditions, as compared with those with chronic conditions; persistence among patients with chronic conditions is disappointingly low, dropping most dramatically after the first six months of therapy (Jackevicius et al., 2002; Cramer et al., 2003; Haynes et al., 2002). For example, approximately half of patients receiving hydroxymethylglutaryl–coenzyme A reductase

inhibitor therapy will discontinue their medication within six months of starting the therapy (Benner et al., 2002). The average rates of adherence in clinical trials can be remarkably high, owing to the attention study patients receive and to selection of the patients, yet even clinical trials report average adherence rates of only 43 to 78 percent among patients receiving treatment for chronic conditions (Cramer et al., 2003; Waeber et al., 1999; Claxton et al., 2001).

Worldwide, adherence rate for medication for diabetes vary between 36 and 93%. Adherence to prescribed medication is crucial to reach metabolic control as non adherence with blood glucose lowering or lipid lowering drug is associated with higher HbAIc and cholesterol, levels respectively (Nasir et al., 2011). The study conducted in Netherland on refill adherence and poly pharmacy among patients with type-2 diabetes in general practice show that mean adherence with oral glucose lowering drugs is between 61 and 85%. According to this study it has become apparent an increase in the number of co-medications tends to decrease the adherence of patient with type-2 diabetes to their treatment regimens (King et al., 1998). Glycaemic control was assessed in stable type-2 diabetes mellitus black South African patients. At the beginning of this study the overall meal HbAIc was 9.1+ 0.1%. The target value of HbAIc is < 7 were achieved in only 20% of patient (Erasmus et al., 1999). A study on the adherence to anti diabetic drug therapy and self management practice among type-2 diabetics conducted in south western Nigeria showed that about two third of patients are not adherent (Yusuff et al., 2008).

Similarly, Short-term studies of diabetic management in patients with Type-2 diabetes have demonstrated that when adherence to medical regimen is satisfactory, improvements in metabolic control, decreases in health risks, and decreases in complications result (Geraci et al., 1999; Smith et al., 1997). However, adherence to medical recommendations in diabetic patients is not the norm. A pervasive problem with adherence to medical regimens has been demonstrated for dietary control, regular exercise, glucose monitoring, and medication adherence (Bond and Hussar, 1991; Glasgow, 1991; Mason et al., 1993; Paes et al., 1997; Skaer et al., 1993). Previous research has demonstrated an increased number of clinic visits, hospital admissions, and emergency room visits by patients with poorly controlled diabetes

compared to those with well-controlled diabetes (Bond and Hussar, 1991; Cowen et al., 1981).

Furthermore, poor metabolic control and adherence behaviours among diabetics are related to poorer levels of adjustment to their disease (Jacobson et al., 1990) and poorer quality of life (Weinger and Jacobson, 2001).

Non-adherence to lifestyle modification recommendations occurs when patient deviates partially or completely (i.e. below acceptable level of adherence) from the mutually agreed collaborative approach to behaviour/lifestyle changes that are known to improve health status. For example, non-adherence to prescribed physical activity is defined as engaging in less than 75% of prescribed physical activity goals across a four week period (Wadden et al., 2006) i.e. achieving less than 150 minutes of physical activity per week or less than 30 minutes of physical activity spread over 5 or less days for four consecutive weeks. Non-adherence to therapeutic lifestyle measures can worsen the quality of life and add to the cost of medical care including accelerating the development of new complications, and worsen existing ones (Serour et al., 2007).

Therefore, improving the adherence to the lifestyle intervention recommendations would increase its cost-effectiveness substantially and subsequently, improves glycaemic control and reduce diabetic complications (Tuomilehto, 2005). ''Harris et al. (1987)''; stated that adherence to a prescribed diet and exercise was associated with the benefit perceived in people diagnosed with type-2 diabetes. Similarly, adherence is associated with open frank discussion about diabetes i.e. acceptance of the disease, supporting behaviour-family and social supports, family's structures and functioning, and patient's knowledge on diabetes (Garay-Sevilla et al., 1995).

2.16 Measures of adherence

Adherence to medication regimen has been monitored since the time of Hippocrates, when the effects of various portions were recorded with notations of whether the patient had taken them or not. Even today, patients' self-reports can simply and effectively measure adherence (Walsh et al., 2002; Haynes et al., 1980). The methods available for measuring adherence can

be broken down into direct and indirect methods of measurement. Each method has advantages and disadvantages, and no method is considered the gold standard (Wagner et al., 2001; Alcoba et al., 2003). Directly observed therapy, measurement of concentrations of a drug or its metabolite in blood or urine, and detection or measurement in blood of a biologic marker added to the drug formulation are examples of direct methods of measures of adherence. Direct approaches are expensive, burdensome to the health care provider, and susceptible to distortion by the patient.

Indirect methods of measurement of adherence include asking the patient about how easy it is for him or her to take prescribed medication, assessing clinical response, performing pill counts, ascertaining rates of refilling prescriptions, collecting patient questionnaires, using electronic medication monitors, measuring physiologic markers, asking the patient to keep a medication diary, and assessing children's adherence by asking the help of a caregiver, school nurse, or teacher. Questioning the patient (or using a questionnaire), patient diaries, and assessment of clinical response are all methods that are relatively easy to use, but questioning the patient can be susceptible to misrepresentation and tends to result in the health care provider's overestimating the patient's adherence. The use of a patient's clinical response as a measure is confounded by many factors other than adherence to a medication regimen that can account for clinical outcome.

The most common method used to measure adherence, other than patient questioning, has been pill counts (i.e., counting the number of pills that remain in the patient's medication bottles or vials). Although the simplicity and empiric nature of this method are attractive to many investigators, the method is subject to many problems, because patients can switch medicines between bottles and may discard pills before visits in order to appear to be following the regimen. For these reasons, pill counts should not be assumed to be a good measure of adherence (Rudd et al., 1988; Pullar et al., 1989; Cramer et al., 1989). In addition, this method provides no information on other aspects of taking medications, such as dose timing and drug holidays (i.e., omission of medication on three or more sequential days), both of which may be important in determining clinical outcomes.

Rates of refilling prescriptions are an accurate measure of overall adherence in a closed pharmacy system (e.g., health maintenance organizations, the Department of Veterans Affairs Health Care System, or countries with universal drug coverage), provided that the refills are measured at several points in time (Steiner and Prochazka, 1997; Lau et al., 1997; Christensen et al., 1997). A medical system that uses electronic medical records and a closed pharmacy can provide the clinician or research scientist with readily available objective information on rates of refilling prescriptions that can be used to assess whether a patient is adhering to the regimen and to corroborate the patient's responses to direct questions or on questionnaires. Electronic monitors capable of recording and stamping the time of opening bottles, dispensing drops (as in the case of glaucoma), or activating a canister (as in the case of asthma) on multiple occasions have been used for approximately 30 years (Cramer et al., 1989; Spector et al., 1986; Norell, 1981; Kass et al., 1984). Rather than providing weekly or monthly averages, these devices provide precise and detailed insights into patients' behaviour in taking medication, but they are still indirect methods of measuring adherence; they do not document whether the patient actually ingested the correct drug or correct dose. Patients may open a container and not take the medication, take the wrong amount of medication, or invalidate the data by placing the medication into another container or taking multiple doses out of the container at the same time.

The cost of electronic monitoring is not covered by insurance, and thus these devices are not in routine use. However, this approach provides the most accurate and valuable data on adherence in difficult clinical situations and in the setting of clinical trials and adherence research (Spilker, 1991; Paterson et al., 2002) and has advanced our knowledge of medication-taking behaviour (Urquhart, 1997). Although certain methods of measuring adherence may be preferred in specific clinical or research settings, a combination of measures maximizes accuracy (Spilker, 1991; Liu et al., 2001; Turner and Hecht, 2001).

2.17 Epidemiology of medication taking behaviour

Electronic medication-monitoring devices have provided very detailed information about the patterns of medication-taking behaviour. Most deviations in medication taking occur as omissions of doses (rather than additions) or delays in the timing of doses (Burnier, 2000;

Paes et al., 1997). Patients commonly improve their medication-taking behaviour in the 5 days before and after an appointment with the health care provider, as compared with 30 days after, in a phenomenon known as "white-coat adherence" (Feinstein, 1990; Cramer, 2004). Studies using these monitors have shown six general patterns of taking medication among patients treated for chronic illnesses who continue to take their medications. Approximately one sixth come close to perfect adherence to a regimen; one sixth take nearly all doses, but with some timing irregularity; one sixth miss an occasional single day's dose and have some timing inconsistency; one sixth take drug holidays three to four times a year, with occasional omissions of doses; one sixth have a drug holiday monthly or more often, with frequent omissions of doses; and one sixth take few or no doses while giving the impression of good adherence (Urquhart, 1997; Urquhart, 2002). In a large systematic review of 76 trials in which electronic monitors were used, ''Claxton et al. (2001)''; found that adherence was inversely proportional to frequency of dose (Fig. 2.2), and patients taking medication on a schedule of four times daily achieved average adherence rates of about 50 percent (range, 31 to 71 percent).

0

_____
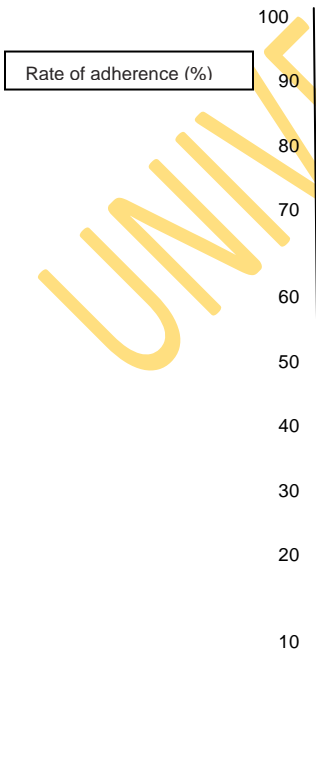
| Once | Twice | Three times | Four times |
| daily | a day | a day | a day |

Medication Schedule

Figure 2.2. Adherence to Medication According to Frequency of Doses.
 Source: Osterberg and Blaschke, 2005

Vertical lines represent 1 SD on either side of the mean rate of adherence (horizontal bars).

2.18 Identifying poor adherence

Indicators of poor adherence to a medication regimen are a useful resource for physicians to help identify patients who are most in need of interventions to improve adherence (Benner et al., 2002; Golin et al., 2002). Table 2.4 lists major predictors associated with poor adherence. Race, sex, and socioeconomic status have not been consistently associated with levels of adherence (Balkrishnan, 1998; Stone et al., 2001). When these predictors, listed in Table 2.4, are present, physicians should have a heightened awareness of the possibility of poor adherence, but even patients in whom these indicators are absent miss taking medications as prescribed. Thus, poor adherence should always be considered when a patient's condition is not responding to therapy.

The simplest and most practical suggestion for physicians is to ask patients non-judgmentally how often they miss doses. Patients generally want to please their physicians and will often say what they think their doctor wants to hear. It can be reassuring to the patient when the physician tells them, "I know it must be difficult to take all your medications regularly. How often do you miss taking them?" This approach makes most patients feel comfortable in telling the truth and facilitates the identification of poor adherence. A patient who admits to poor adherence is generally being candid (Haynes et al., 1980; Stephenson et al., 1993). Patients should also be asked whether they are having any side effects of their medications, whether they know why they are taking their medications, and what the benefits of taking them are, since these questions can often expose poor adherence to a regimen (Morisky et al., 1986).

Table 2.4 Major predictors of poor Adherence to Medication, According to studies of predictors

Predictor	Study
Presence of psychological problems, particularly depression	Van Servellen et al., 2002; Ammassari et al., 2002; Stilley et al., 2004
Presence of cognitive impairment	Stilley et al., 2004; Okuno et al., 2001
Treatment of asymptomatic disease	Sewitch et al., 2003
Inadequate follow-up or discharge planning	Sewitch et al., 2003; Lacro et al., 2002
Side effects of medication	Van Servellen et al., 2002

Patient's lack of belief in benefit of treatment	Okuno et al., 2001; Lacro et al., 2002
Patient's lack of insight into the illness	Lacro et al., 2002; Perkins, 2002
Poor provider–patient relationship	Okuno et al., 2001; Lacro et al., 2002
Presence of barriers to care or medications	Van Servellen et al., 2002; Perkins, 2002
Missed appointments	Van Servellen et al., 2002; Farley et al., 2003
Complexity of treatment	Ammassari et al., 2002
Cost of medication, copayment, or both	Balkrishnan, 1998; Ellis et al., 2004
Socio-demographic factors	Rubin and Peyrot, 1998; Mckay et al., 1998
Personality and psychosocial variables	Vileiktye, 1999; Golin et al., 1996
Patients' attitude and beliefs	Peterson et al., 1998; Diehl et al., 1985
Socioeconomic factors	Botelho and Dudrak, 1992; Anderson and Kirk, 1982

Source: Osterberg and Blaschke, 2005

2.19 Problems associated with poor adherence to diabetic treatment

Poor adherence in chronic diseases has been described as taking less than 80% of the prescribed treatment (Sackett et al., 1991). Poor adherence to treatment of chronic disease is worldwide problem of striking magnitude. Recently, the world health organization stated that only 50% of patient diagnosed with chronic illness were fully compliant with their treatment regimen (WHO, 2002). Rates of poor adherence to therapeutic lifestyle modification recommendations have been reported to range from 40 to 50% and some experts estimate that poor adherence to lifestyle measures is even higher (Cawood, 2006). Globally poor adherence to medication regimen is becoming a major problem, because it accounts for substantial worsening of disease, death, and increased health care costs in the United States with approximately 125,000 deaths annually or twice the number killed each year in

automobile accidents. Up to 11% of hospital admissions and 40% of nursing home admissions are due to lack of adherence with medication therapy (McDonnel and Jacobs, 2002; Schiff et al., 2003).

The direct and indirect costs of poor adherence total approximately $100 billion per year in the United States (Medication compliance aids, 2004; American Pharmacists Association, 2003). In the UK it has been estimated that £100 million per annum is wasted on medications unused and returned to pharmacists (National Audit Office, 2007). Similarly, given that the research and development of a single new drug has been estimated at approximately $1 billion (Adams and Brantner, 2010), the fact it may only be taken 50% of the time due to poor adherence suggests other wasted resources. However, poor adherence to medication is a pervasive medical problem that is common among patients with chronic disease generally and type-2 diabetes in particular. A systematic review of adherence to medication for diabetes showed that average adherence to oral anti diabetes medications ranged from 36% to 93% (Rubin and Peyrott, 2005; Delameter, 2007; Lo, 1999; Harris, 2001). Expectedly, patient poor adherence to prescribed hypoglycaemic medications could decrease treatment effectiveness (Helmrich et al., 1991; Mark et al., 2007; Rozenfeld et al., 2008). Poor adherence to medications among diabetic patients resulted in poor glycaemic control and hence increased risk of developing chronic complications as well as increased hospitalization and mortality (Kuo et al., 2003).

Studies have shown that socio-demographic factors, personality and psychosocial variables, patients' attitude and beliefs were among the several factors that can affect adherence to diabetes treatment regimen (Rubin and Peyrot, 1998; Mckay et al., 1998; Vileiktye, 1999; Golin et al., 1996; Peterson et al., 1998; Diehl et al., 1985). Also socioeconomic factors play a vital role in adherence, as patients who are poor or live on fixed income may be non-adherent because of their inability to afford the cost of prescribed medications (Botelho and Dudrak, 1992; Anderson and Kirk, 1982).

Both the patient and the health-care provider affect compliance, and a positive physician-patient relationship is the most important factor in improving compliance (WHO, 2003) although the high cost of prescription medication also plays a major role (Harris interactive,

2010). Major barriers to adherence to treatment are thought to include the complexity of modern medication regimens, poor "health literacy" and lack of comprehension of treatment benefits, the occurrence of undiscussed side effects, the cost of prescription medicine, and poor communication or lack of trust between the patient and his or her health-care provider (Ngoh, 2009; Elliott and Marriott, 2009).

2.20 Barriers to adherence

Research on adherence has typically focused on the barriers patients face in taking their medications. Common barriers to adherence are under the patient's control, so that attention to them is a necessary and important step in improving adherence. In responses to a questionnaire, typical reasons cited by patients for not taking their medications included forgetfulness (30 percent), other priorities (16 percent), decision to omit doses (11 percent), lack of information (9 percent), and emotional factors (7 percent); 27 percent of the respondents did not provide a reason for poor adherence to a regimen (Cramer, 2004). Physicians contribute to patients' poor adherence by prescribing complex regimens, failing to explain the benefits and side effects of a medication adequately, not giving consideration to the patient's lifestyle or the cost of the medications, and having poor therapeutic relationships with their patients (Golin et al., 2002; Elliot et al., 2000; Black, 1999; Ickovics and Meades, 2002). More broadly, health care systems create barriers to adherence by limiting access to health care, using a restricted formulary, switching to a different formulary, and having prohibitively high costs for drugs, copayments, or both (Ellis et al., 2004; Murphy et al., 2003; Stuart and Zacker, 1999).

To improve the patient's ability to follow a medication regimen, all potential barriers to adherence need to be considered. An expanded view that takes into account factors under the patient's control as well as interactions between the patient and the health care provider and between the patient and the health care system will have the greatest effect on improving medication adherence (Wilson et al., 2005; Zyczynski and Coyne, 2000).

2.21 Conceptual Framework

The study was guided by the PRECEDE model to understand the antecedents (factors) influencing the medication and dietary adherence behaviours among study participants.

Origin: This model was developed by Larry Green and Marshall Kreuter in the early 1970s.

Purpose of the Model

The **precede** model is a framework for the process of systematic development and evaluation of health education programs. An underlying premise of this model is that health education is dependent on voluntary cooperation and participation of the client in a process which allows personal determination of behavioural practices; and that the degree of change in knowledge and health practice is directly related to the degree of active participation of the client. Therefore, in this model, appropriate health education is considered to be the intervention (treatment) for a properly diagnosed problem in a target population. This model is multidimensional, founded in the social/behavioural sciences, epidemiology, administration and education. As such, it recognizes that health and health behaviours have multiple causations which must be evaluated in order to assure appropriate intervention. The comprehensive nature of precede allows for application in a variety of settings such as school health education, patient education, community health education, and direct patient care settings.

There are five phases in the precede model:

2.21.1 Phase 1 - Social Diagnosis: The focus of this phase is to identify and evaluate the social problems which impact the quality of life of a target population. This requires program planners to gain an understanding of the social problems which affects the quality of life of the patient, consumer, student, or community, as those populations see those problems. This followed by the establishment of a link between these problems and specific health problems which may become the focus of health education.

Social problems that impact the quality of life of diabetes mellitus patients are cultural practices, socio-demographic factors, economic factors, health services and disease pattern.

2.21.2 Phase 2 - Epidemiological Diagnosis: It helps determine health issues associated with the quality of life. It helps identify behavioural and environmental factors related to the quality of life issues. The focus of this phase is to identify specific health problem and non health factors which are associated with a poor quality of life. Describing these health problems can: 1) help establish relationships between health problems, other health conditions, and the quality of life; 2) lead to the setting of priorities which will guide the focus of program development and resources utilization; and 3) make possible the delineation of responsibilities between involved professionals and organizations and agencies. These priorities are defined as program objectives which define the target population (WHO), the desired outcome (WHAT), and HOW MUCH benefit the target population should benefit, and by WHEN that benefit should occur. Epidemiological diagnosis on diabetes mellitus includes; Incidence, prevalence, morbidity and mortality rates of the disease among the population.

2.21.3 Phase 3 - Behavioural and Environmental Diagnosis:

This phase focuses on the systematic identification of health practices and other factors which seem to be linked to health problems defined in Phase 2.

Behavioural Diagnosis is the analysis of behavioural links to the goals or problems that are identified in the epidemiological or social diagnosis. For example diabetic patients not adopting good health seeking behaviours such as taking their drugs regularly, Going for check-up at the hospital, Eating as recommended can increase the rate of morbidity and mortality among diabetic patients.

Environmental Diagnosis is a parallel analysis of factors in the social and physical environment other than specific actions that could be linked to behaviours. Diabetic patients residing in an environment that encourages good clinical practices such as within a hospital will encourage good health seeking behaviours.

2.21.4 Phase 4 - Educational Diagnosis: This phase assesses the causes of health behaviours which were identified in Phase 3. Three kinds of causes are identified - predisposing factors, enabling factors, and reinforcing factors.

Predisposing Factors: It involves any characteristics of a person or population that motivates behaviour prior to the occurrence of that behaviour. Increase in the awareness and

knowledge on diabetes management practices among diabetic patients will encourage good health seeking behaviour in diabetes management.

Enabling Factors: These are characteristics of the environment that facilitate action and any skill or resource required to attain specific behaviour. Availability of money for transport to clinic/hospital and purchase of drugs will promote good health seeking behaviour and encourage good diabetes management practices. Similarly availability and accessibility of drugs at the hospital and good health worker/patient relationship will encourage good diabetes management practices among diabetic patients.

Reinforcing Factors: These are the rewards or punishments following or anticipated as a consequence of a behaviour. They serve to strengthen the motivation for behaviour. Good organizational structure at the hospitals and support from spouses and family members will help in enforcing good health seeking behaviours and good diabetes management practices.

2.22 Summary of Literature Reviewed

Abundant literature supports the beneficial effects of adherence to medication and dietary recommendations for improving and maintaining glycaemic level of people with diagnosed type-2 diabetes mellitus.

Patient adherence to therapeutic lifestyle measures recommendations is notoriously difficult to achieve, but essential to the success of managing type-2 diabetes mellitus. Adherence to treatment recommendations is considered adequate when patients with type-2 diabetes strictly restrict fat and calories intake and achieves at least 150 minutes of exercise per week for four consecutive weeks. The problem of poor adherence to treatment recommendations amongst patients with type-2 diabetes is very complex and multi-faceted in nature.

The determinant of health related behavior is important for health promotion. However, health seeking behaviour is not just one off isolated event but involves multiple steps such as Awareness and Knowledge of diabetes mellitus, Attitude to treatment, Beliefs about health and illness, Belief in health care professionals and Self perception of compliance.

Adherence rates are typically higher among patients with acute conditions as compared with those with chronic conditions. Clinical trials report average adherence rates of only 43 to 78% among patients receiving treatment for chronic conditions. Worldwide, adherence rate for medication for diabetes vary between 36 to 93%. However a pervasive problem with

adherence to medical regimens has been demonstrated for dietary control, regular exercise, glucose monitoring and medication adherence. Factors influencing adherence to medication and dietary treatment includes; presence of psychological problems, presence of cognitive impairment, inadequate follow-up, side effects of medication, patients' lack of belief in benefit of treatment, patients' lack of insight into the illness, poor provider-patient relationship, missed appointments, complexity of treatment and cost of medication or copayment.

Finally, more than 50% of the people with type-2 diabetes believe that adherence to treatment recommendations would improve their diabetic condition, but greater proportion finds it difficult to initiate and sustain. However, patients' adherence can be enhanced by improving diabetic education, perception, motivation, and self-management.

Predisposing Factors

Increase in participants' awareness and knowledge on the importance of adhering to treatment

Behavioural Assessment

Adopting good health seeking behavior such as:

Taking their drug regularly

Going for check-up at the hospital

Monitoring their blood regularly

Eating according to medical instructions

Epidemiological Assessment

Decrease in incidence and prevalence of diabetes

Decrease in morbidity and mortality of Diabetes

Quality of life

Increase in life expectancy among diabetic patients

Enabling Factors

Availability of money for transport, purchase of drugs and recommended diets

Availability of drugs at the hospital and good health worker/patient relationship

Environment

Residing in an environment that encourages good clinical practices will encourage good health seeking behaviour

Reinforcing Factors

Good organizational structure at the hospitals

Support from spouses and family members

Figure 2.3: The precede framework illustrating the relationship between the various educational Constructs

Source: Modified from Green and Kreuter, 1999.

70

CHAPTER THREE

Materials and Methods

This chapter is about methods applied in the study on health seeking behaviour and pattern of adherence to treatment among patients with type-2 diabetes mellitus in Central Hospital Warri, Delta state.

3.1 Study Design

This was a descriptive cross sectional study design using interviewer-administered questionnaires and observational checklist.

3.2 Description of Study Area

The study is a hospital based survey which was conducted in Central hospital Warri in Warri South local Government Area of Delta State. It is the largest referral hospital within the Warri metropolis. It operates out-patient diabetic clinic twice every week and has in-patient facilities where medical care is provided throughout the week. Diabetic patients, self and non-self referred from Warri and nearby towns attend the clinic on appointments days.

Delta state was created on 27th August 1991 from the defunct Bendel state and it has 25 local government areas. It has 3 senatorial district and currently covers a land mass of 80% of land population of 2,590491 (1991 census). The state has boundaries with the following:

- North by Edo state.
- East by Anambra state.
- South East by Bayelsa state.

The major occupations among the inhabitants of the state are predominantly Farming, Fishing and Hunting.

Warri is a major crude oil producing city in Delta State, Nigeria, with a population of over a million people within the Warri metropolis. The people of Warri are mainly the Urhobos, Itsekiris, and Ijaws, but other ethnic groups also live within the city. Warri is predominantly Christian, as in most of Southern Nigeria. The city is known nationwide for its unique Pidgin English. Warri sits on the bank of the Niger Delta and has a modern seaport which serves as

the cargo transit point between the Niger River and the Atlantic Ocean for import and export. Warri has three local government areas namely: Warri South which is within Warri mainland, while the other two Warri North and Warri South-West are mainly riverine areas. Warri South Local Government Area which is the study area was founded in 1991 and it has 19 wards. It has a total population of 303,417; the total number of males in the local government area is 156,098 and the total number of females in the local government area is 147319 (2006 Census). However, the current population estimates according to the National Population Commission 3% national annual growth is 455,126.

3.3 Study Population
The study focused on all patients 35 years or older diagnosed with type-2 diabetes mellitus attending Central Hospital Warri from June to August 2011.

3.4 Inclusion Criteria
The main inclusion criteria were: having type-2 diabetes mellitus, aged at least 35 years, attending the diabetic clinic during the study period and giving informed consent to participate in the study.

3.5 Exclusion Criteria
The exclusion criteria were: people with type-1 diabetes mellitus, Age less than 35 years, non clinic attendants' type-2 diabetes mellitus patients and those not giving informed consent to participate in the study.

3.6 Instrument for Data Collection
A pre-tested interviewer-administered questionnaire was used to collect the data. Questions on the instrument covered socio-demographic characteristics, health seeking behaviours, adherence to treatment, factors influencing adherence to treatment, attitude towards medication and dietary treatment and participants' opinion on ways of improving adherence to medication and dietary treatment among diabetic patients. In addition an observation checklist containing observable indicators such as; sores and calluses, impaired vision, stroke, gum disease, ketone in breath and amputation of limb was used to access respondents' state of health.

3.7 Sample Size Determination

The minimum sample size was calculated based on the Yaro Yamane's formula for sample size determination for estimating proportion in a finite population (Okolie et al., 2010).

$$n = \frac{z^2 pq}{d^2}$$

n= the minimum sample size

z= 1.96 at 95% confidence interval obtained from statistical table of normal distribution.

P=28.9% i.e prevalence of non adherence (Kalyango et al., 2008).

q=1.0-p=1- 0.289=0.711

d= degree of accuracy desired (0.05)

$$n = \frac{1.96^2 \times 0.289 \times 0.711}{0.05^2}$$

n= 315

10% of non-response rate was added to the estimated minimum sample size, bringing the sample size to 350.

3.8 Sampling Procedures

The study recruited respondents who fulfilled the inclusion criteria of having type-2 diabetes, >35 years and who gave informed consent to participate in the study.

3.9 Method of Data Collection

Data were collected from June-August, 2011 using interviewer administered questionnaire. The questionnaire was written in English language. The questionnaire comprised close ended, open ended and multiple response questions. A total of 350 questionnaires were administered.

The questionnaires were administered on diabetic clinic days of Tuesdays and Wednesdays in the morning till the close of work for each of the clinic days. Respondents consented to be interviewed after being duly informed about the study. Furthermore, the checklist was used to note the various observable symptoms among respondents in each of the clinic days.

3.10 Validity and Reliability of Instrument

Validity refers to the capacity of a test, instrument or question to give a true result" (Bruce et al., 2008). Reliability is the extent to which test scores are accurate, consistent or stable (Struwig and Stead, 2004). The synonymous terms are reproducibility and repeatability" (Bruce et al., 2008). The Cronbachs Alpha test reliability was used to determine the reliability of the instrument. The Cronbachs Alpha Reliability Statistics gave 0.821.

The questionnaire was pretested to ensure that questions items were adequate for soliciting desired responses to the variables of interest and to remove ambiguity and misinterpretation.

3.10.1 Preliminary Study

3.10.1.1 Initial Survey: Research site was assessed before the method for data collection was designed. Relevant information on the number of diabetic clinic days, number of patients attending each clinic day and the age group attending the clinic.

3.10.1.2 Pretesting

The questionnaire designed for collecting data was first pretested among 20 diabetes mellitus patients at Michael Bella Memorial Hospital Akobo Ibadan. The pretesting was done to ensure the validity and reliability of the questionnaire. Also to ensure that all the questions were relevant to the study and would solicit the desired responses from the respondents. The pretesting was carried out in May 2011, after obtaining oral consent from respondents the questionnaire was administered. The pretested questionnaires were coded, entered and analyzed using SPSS version 15.0. Some problems detected during the pretest included 'question 5' (Educational status) HND/Bachelor and Postgraduate were separated as single item, but after pretesting both were merged to just Postgraduate as an option for that question. Similarly, 'question 6' (Occupation) option 4 Others which included; Retiree, Businessman/woman, Pastor, Farmer, Housewife. Each of these was splitted to options, entered and analyzed as separate options in the main study. In addition, Checklist was added to the main study as part of the instrument after pretesting to capture the current state of respondents' health.

3.11 Data Analysis

Data analysis refers to making sense of data collected so as to present findings and draw specific conclusions at the end of the study by answering the research questions (Miles and Huberman, 1994).

3.11.1 Scales of Measurement of Health Seeking Behaviour

Health seeking behaviour was measured by posing questions on how participants conduct themselves to diabetic treatment. A total of seven (7) questions were asked and two (2) points were allocated to every correct answer and one (1) point to every fairly correct answer; thus bringing the total points to fourteen (14). Afterwards the points were categorized between 0-8 as Code 1 and > 8-14 as Code 2. Participants that score between 0-8=Code 1 were adjudged as poor health seeking behaviour and > 8-14=Code 2 as good health seeking behaviour.

3.11.2 Scales of Measurement of adherence to medication treatment

The level of adherence to treatment was assessed by posing questions on how patients take their medications and follow instructions in relation to medical or health advice. A total of nine (9) questions were asked and two (2) points were allocated to every appropriately correct answers and one (1) point to every fairly correct answers; thus bringing the total points to eighteen (18). Subsequently, the points were categorized between 0-10 as Code1 and > 11-18 as Code 2.

Respondents that score between 0-10=Code 1 were adjudged as partially adhering to medication treatment, and > 11-18=Code 2 as strictly adhering to medication treatment.

3.11.3 Scales of Measurement of adherence to dietary treatment

The level of adherence to dietary treatment was assessed by posing questions on how patients follow dietary instructions in relation to medical or health advice. A total of three (6) questions were asked and two (2) points were allocated to every appropriately correct answers and one (1) point to every fairly correct answers; thus bringing the total points to six (6). Subsequently the points were categorized between 0-3 as Code1 and > 4-6 as Code 2. Respondents that score between 0-3=Code 1 were adjudged as partially adhering to dietary treatment, and > 4-6=Code 2 as strictly adhering to dietary treatment.

3.11.4 Scales of Measurement of Attitude towards medication treatment

Attitude towards medication treatment was measured by assessing participants' attitude to medication treatment. A total of seven (7) questions were asked and two (2) points were allocated to every appropriately correct answers and one (1) point to every fairly correct answers; thus bringing the total points to fourteen (14). Consequently the points were categorized between 0-8 as Code 1 and > 9-14 as Code 2. Respondents that score between 0-8=Code 1 were adjudged as encompassing poor attitude to medication treatment, and > 9-14=Code 2 as encompassing good attitude to medication treatment.

3.11.5 Scales of Measurement of Attitude towards dietary treatment

Attitude towards dietary treatment was measured by assessing participants' attitude to dietary treatment. A total of two (2) questions were asked and two (2) points were allocated to every appropriately correct answers and one (1) point to every fairly correct answers; thus bringing the total points to four (4). Consequently the points were categorized between 0-2 as Code 1 and > 3-4 as Code 2. Respondents that score between 0-2=Code 1 were adjudged as encompassing poor attitude to dietary treatment and > 3-4=Code 2 as encompassing good attitude to dietary treatment.

The collected data was initially sorted out, coded manually, entered into the computer and analysed with SPSS version 15.0. Frequency distribution, cross tabulations, Logistic regression and Chi-square test were performed to test for associations between the variables of interest. The results were used to draw inferences.

The checklist results were analysed manually to obtain the various frequencies.

3.12 Data Management

The following was put in place to ensure proper and effective management of data.

1) The questionnaires were serially numbered for control and recall purposes.

2) Data collected were checked for completeness and accuracy on a daily basis.

3) The data were sorted, cleaned, edited and coded manually.

4) Frequency counts were run to detect missing cases during cleaning.

5) The data analyses were carried out using the SPSS software 15.0 version.

3.13 Ethical Consideration

1) The study followed the ethical principles guiding the use of human participants in research, which include Respect for persons, Beneficence, Non–maleficence and Justice.

2) Ethical approval was sought from Delta State Ministry of Health.

3) With respect to confidentiality, no identifiers such as name of respondents was required or used during the course of the study.

4) All information provided was kept confidential during and after the research.

5) All information was used for the purpose of the research only.

3.14 Limitations of the Study and how they were controlled

The main limitation in this study is conducting the study in a hospital environment where patients would want to show that they are obedient to instructions from health care personnel, thus may not provide the actual sincere responses required. However the researcher minimized this effect both in asking of the questions and use of checklist, it is hoped that future research on adherence to treatment among type-2 diabetes mellitus patients should be carried out in the community at patient's homes were 90-95% of diabetes management and self care practices usually take place.

CHAPTER FOUR

Result of Analysis

This section focuses on results of the study that investigated health seeking behaviour and pattern of adherence to treatment among type-2 diabetes mellitus patients in Central Hospital Warri, Delta state.

4.1 Sample

A total of 350 questionnaires were administered and considered adequate for analysis.

4.2 Socio-demographic characteristics of the respondents

4.2.1 Age distribution

Table 4.1 showed that 32.3% (n=113) of the respondents were 55-64 years age group, this is followed by 29.7% (n=104) of respondents aged 45-54 years and the lowest proportion of 4.0% (n=14) was noted among respondents aged 75-84 years. The total mean age of respondents was 57.9 ± 9.8 years while mean age of male was 58.6 ± 9.7 years and female was 57.5 ± 9.9 years.

4.2.2 Sex

As shown in Table 4.2 of the 350 respondents 60.9% (n=213) were females and 39.1% (137) were males.

4.2.3 Marital Status

Most of the respondents were married 78.0% (n=273) at the time of data collection, 21.7% (n=76) were either widow or widower and 0.3% (n=1) reported to be single.

4.2.4 Educational Status

Of the 350 respondents 40.9% (n=143) had secondary education, 28.0% (n=98) tertiary education, 21.4% (n=75) primary education and 9.7% (n=34) had no formal education.

4.2.5 Occupation

According to Table 4.1, 38.0% (n=133) of respondents were Traders, 24.3% (n=85) were Civil servant, 17.4% (n=61) were either Businessmen or women and 16.3% (n=57) were Retiree.

4.3 Age when first diagnosed with type-2 diabetes mellitus

As shown in table 4.2, 42.9% (n=150) were diagnosed with type 2 diabetes mellitus at late adulthood (50-59), 24.3% (n=85) at mid adulthood (40-49), 21.7% (n=76) at early elderly

(60-69), 8.0% (n=28) at early adulthood (30-39), 2.9% (n=10) at mid-elderly (70-79) and 0.3% (n=1) at late elderly (>80). The total mean age of respondents at diagnosis with type-2 diabetes mellitus was 51.8 ± 9.2 years while mean age of male was 51.8 ± 9.0 years and female was 51.9 ± 9.3 years.

Table 4.1- Socio-demographic characteristics of the respondents

Variable		Frequency(n=350)	Percent (%)
Age (years)	35-44	29	8.3
	45-54	104	29.7
	55-64	113	32.3
	65-74	90	25.7
	75-84	14	4.0
Sex	Male	137	39.1
	Female	213	60.1
Marital Status	Single	1	0.3
	Married	273	78.0
	Widow/Widower	76	21.7
Educational Status	No formal education	34	9.7
	Primary education	75	21.4
	Secondary education	143	40.9
	Tertiary education	98	28.0
Occupation	Trader	133	38.0
	Civil Servant	85	24.3
	Oil worker	8	2.3
	Retiree	57	16.3
	Bus. Men/Woman	61	17.4
	Pastor	3	0.9
	Farmer	2	0.6
	Housewife	1	0.3

Table 4.2 Age when diagnosed with type-2 diabetes mellitus

Variable		Frequency(n=350)	Percent (%)
Age (years)	30-39	28	8.0
	40-49	85	24.3
	50-59	150	42.9
	60-69	76	21.7
	70-79	10	2.9
	>80	1	0.3

4.4 Health Seeking Behaviours

Figure 4.1 shows bar chart representing level of health seeking behaviour, 95.7% (n=335) had good health seeking behaviour and 4.3% (n=15) had poor health seeking behaviour.

4.5 Level of Adherence to Medication Treatment

Figure 4.2 shows bar chart representing level of adherence to medication treatment, 58.9% (n=206) is strictly adhering to medication treatment and 41.1% (n=144) is partially adhering to medication treatment.

4.6 Level of Adherence to Dietary Treatment

Figure 4.3 shows bar chart representing level of adherence to dietary treatment, 67.4% (n=236) is strictly adhering to dietary treatment and 32.6% (n=114) is partially adhering to dietary treatment.
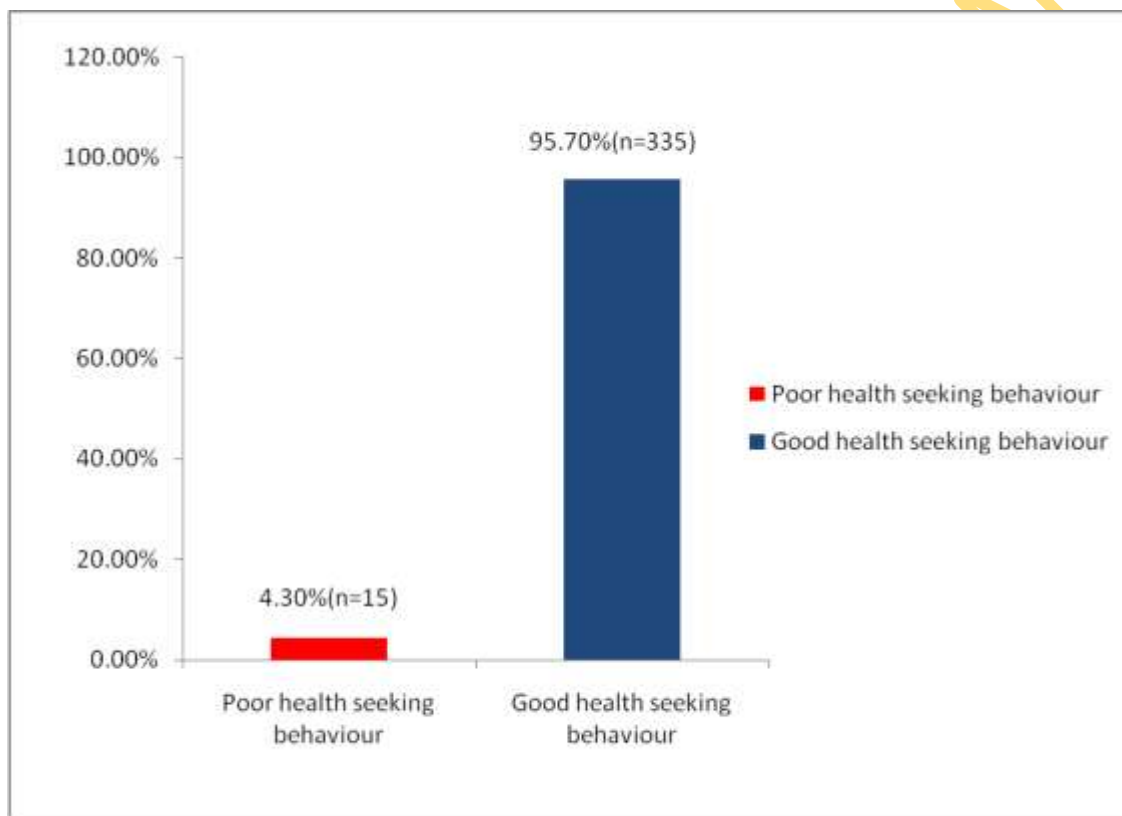
Figure 4.1: Level of health seeking behaviour
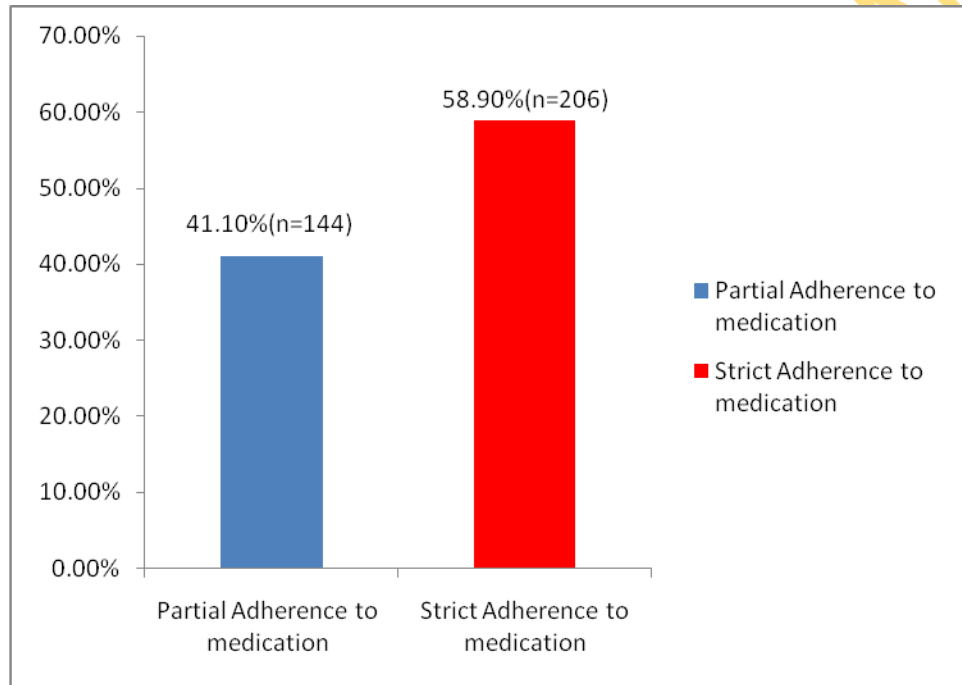
Figure 4.2: Level of Adherence to Medication Treatment
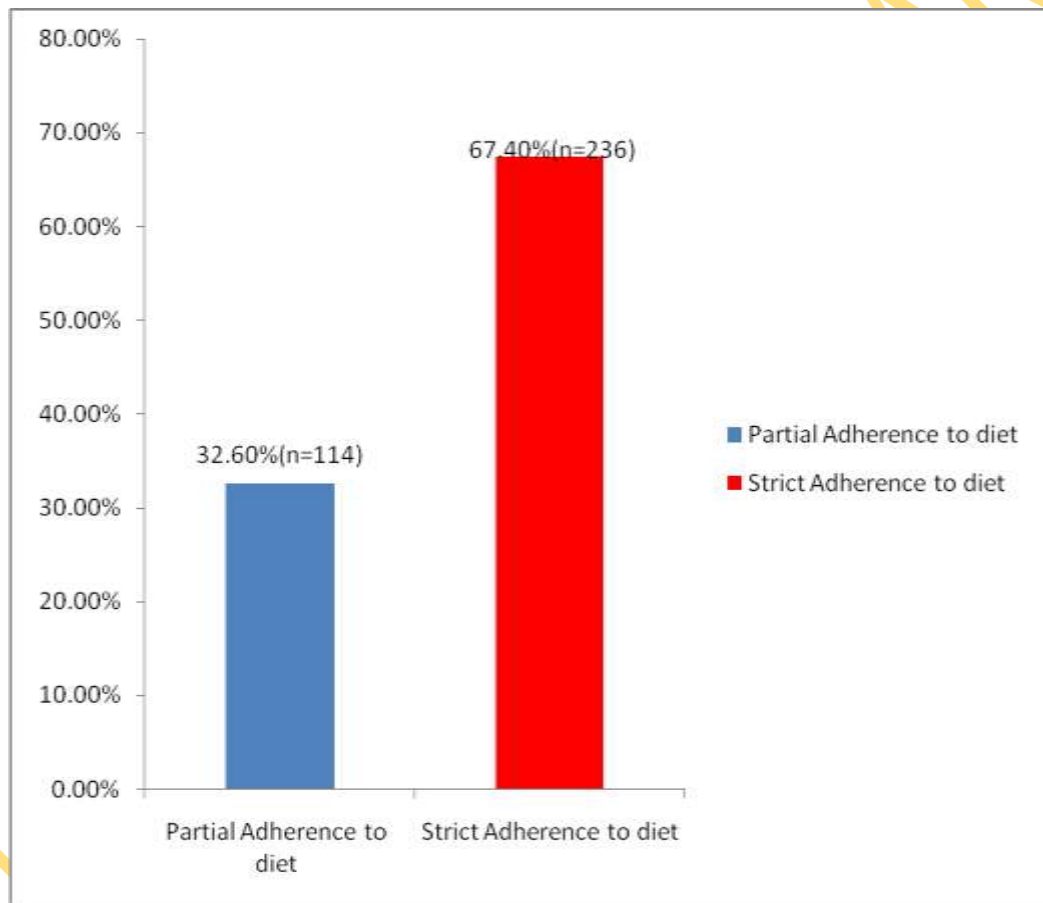
Figure 4.3: Level of Adherence to Dietary Treatment

As shown in Table 4.3 below, logistic regression on the determinants of non-adherence to treatment showed that taking alternative traditional medicines (herbs) for the treatment of disease was the major contributing variable at OR=0.425 95% CI=0.568-1.916, followed by taking medicine regularly according to doctor's prescription OR=4.129 95% CI=3.861-15.625,feeling worse and stop taking prescribed medicine OR=4.965 95% CI=3.346-7.367, feeling better and stop taking prescribed medicine OR=5.347 95% CI=3.453-8.280, forgetting to take prescribed medicine OR=5.487 95% CI=3.630-8.296, eating food in large quantity that should be taken in little quantity OR=6.289 95% CI=3.919-10.083, skipping doses of prescribed medicine OR=7.450 95% CI=4.680-11.858, faith healing preventing one from adhering to treatment OR=9.904 95% CI=6.244-15.710, preferring medicines from local pharmacy store to the ones prescribed by the doctor OR=9.991 95% CI=6.125-16.298, taking other medicines prescribed by friends and relations OR=10.934 95% CI=6.782-17.628, taking incomplete doses of prescribed medicine OR=11.201 95% CI=6.927-18.112 and the least contributing variable is eating foods that one should stop taking because of the disease at OR=12.010 95% CI=7.422-19.435.

Table 4.3 Determinants of non-adherence to treatment

Variables	df	P-Value	OR	95% CI
Taking of alternative traditional medicines to treat diabetes.	1	0.00	0.425	0.568-1.916
Taking medicine regularly according to doctor's prescription	1	0.00	4.129	3.861-15.625
Feeling worse and stop taking prescribed medicine	1	0.00	4.965	3.346-7.367
Feeling better and stop taking prescribed medicine	1	0.00	5.347	3.453-8.280
Forgetting to take prescribed medicine	1	0.00	5.487	3.630-8.296
Eating food in large quantity that should be taken in little quantity	1	0.00	6.286	3.919-10.083
Skipping doses of prescribed medicine	1	0.00	7.450	4.680-11.858
Faith healing preventing one from adhering to treatment	1	0.00	9.904	6.244-15.710
Preferring medicines from local pharmacy store to the ones prescribed by the doctor	1	0.00	9.991	6.125-16.289
Taking other medicines prescribed by friends and relations	1	0.00	10.934	6.782-17.628

Taking incomplete doses of prescribed medicine	1	0.00	11.201	6.927-18.112
Eating foods that one should stop taking because of the disease	1	0.00	12.010	7.422-19.435

According to Table 4.4 below, the logistic regression on the determinants of poor health seeking behaviour showed that participating in physical exercise was the major contributing variable to poor health seeking behaviour at OR=0.024 95% CI=0.003-0.181 followed by eating according to doctor's instructions OR=0.114 95% CI=0.026-0.491, seeking information in management of the disease OR=0.114 95% CI=0.044-0.294, always taking alcoholic drinks prohibited because of the disease OR=2.758 CI=0.959-7.938, always failing to attend hospital for follow-up care OR=4.984 95% CI=1.278-19.443 and the least contributing variable is always forgetting to take prescribed drugs OR=7.641 95% CI=3.036-19.234.

Table 4.4 Determinants of poor health seeking behaviour

Variables	df	P-Value	OR	95% CI
Participating in physical exercise	1	0.00	0.024	0.003-0.181
Eating according to doctor's instructions	1	0.00	0.114	0.026-0.491
Seeking information in management of the disease	1	0.00	0.114	0.044-0.294
Always taking alcoholic drinks that is prohibited because of the disease	1	0.06	2.758	0.959-7.938
Always failing to attend	1	0.02	4.984	1.278-19.443

hospital for follow-up care				
Always forgetting to take prescribed drugs	1	0.00	7.641	3.036-19.234
Checking of blood glucose	1	0.99	0.00	0.000

4.6 Factors influencing adherence to treatment

As shown in Table 4.5 below, Perceived factors influencing adherence to treatment are; difficulty in sticking only to recommended diet 69.1% (n=242), long queues and waiting times in the clinic 66.0% (n=231), side effects from recommended drugs 58.6% (n=205), burden of ingesting or injecting drugs 56.9% (n=199), stigma when in midst of friends 38.3% (n=134), use of alternative traditional medicines 36.3% (n=127), cost of drugs 26.0% (n=91), frequent change of medications 20.6% (n=72), forgetting to take prescribed drugs 15.1% (n=53), poor access to information that will promote continuous use of drugs 14.9% (n=52), lack of availability of prescribed drugs 13.4% (n=47), poor perception about the seriousness of the disease 11.4% (n=40), lack of money for transport and purchase of drugs 11.1% (n=39), negative attitude of health personnel 8.3% (n=29), nature of job which prevents accessibility and use of drugs 4.3% (n=15), recommended diet are too expensive 2.0% (n=7), believe in prayer to cure the disease 1.4% (n=5) and doctors too busy to listen to complaints 0.3% (n=1).

Table 4.5 Factors influencing adherence to treatment

Variables Factors influencing adherence to treatment	Frequency(n=350)		Percent (%)
Negative attitude of health staff	Yes	29	8.3
	No	321	91.7
Doctors too busy to listen to complaints	Yes	1	0.3
	No	349	99.7
Lack of availability of prescribed drugs	Yes	47	13.4
	No	303	86.6
Side effects from recommended drugs	Yes	205	58.6
	No	145	41.4
Forgetting to take prescribed drugs	Yes	53	15.1
	No	297	84.9
Use of alternative traditional medicines	Yes	127	36.3
	No	223	63.7
Lack of money for transport and purchase of drugs	Yes	39	11.1
	No	311	88.9
Long queues and waiting times in the clinic	Yes	231	66.0
	No	119	34.0

Believe in prayer to cure the disease	Yes	5	1.4
	No	345	98.6
Poor perception about the seriousness of the disease	Yes	40	11.4
	No	310	88.6
Frequent change of medications	Yes	72	20.6
	No	278	79.4
High cost of drugs	Yes	91	26.0
	No	259	74.0
Burden of ingesting or injecting drugs	Yes	199	56.9
	No	151	43.1
Difficulty in sticking only to recommended diet	Yes	242	69.1
	No	108	30.9
Recommended diet are too expensive	Yes	7	2.0
	No	343	98.0
Stigma especially when in the midst of friends	Yes	134	38.3
	No	216	61.7
Nature of job which prevents accessibility and use of drugs	Yes	15	4.3
	No	335	95.7
Poor access to information that will promote continuous use of drugs	Yes	52	14.9
	No	298	85.1

4.7 Attitude towards medication and dietary treatment

Figure 4.4 shows bar chart representing attitude towards medication treatment, 65.1% (n=228) had good attitude towards medication treatment, 34.9% (n=122) had poor attitude towards medication treatment.

Similarly, 64.0% (n=224) had good attitude towards dietary treatment, 36.0% (n=126) had poor attitude towards dietary treatment.

90
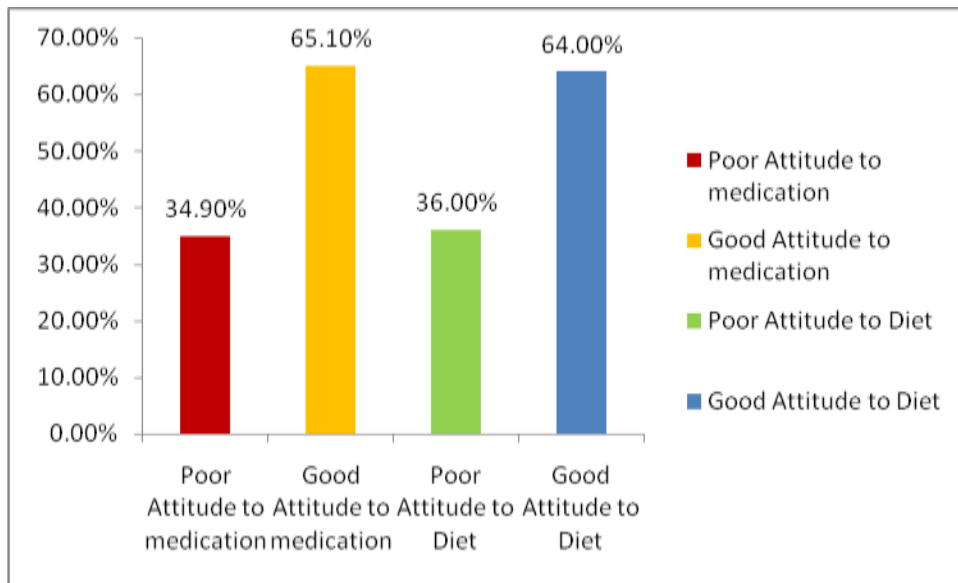
Figure 4.4 Attitude towards medication and dietary treatment

4.8 Suggested ways of improving adherence to treatment

4.8.1 Possibility of diabetic patients to actually adhere to medication and dietary treatment

Most of the respondents 343 (98.0%) believed it is possible for diabetic patients to adhere to medication and dietary treatment while 7 (2.0%) believed it is not possible for diabetic patients to adhere to medication and dietary treatment (Table 4.8).

Table 4.8 Respondent's view on possibility of diabetic patients to adhere to treatment

Variable	Frequency(n=350)	Percent (%)
Yes	343	98.0
No	7	2.0

4.8.2 Ways of improving adherence to medication and dietary treatment

As shown in Table 4.9 46.7% (n=164) of respondents suggested patients exhibiting self discipline, 40.0% (n=140) Patients should seek more information about the disease, 39.7% (n=139) Health care should be easily accessible, 19.1% (n=67) Regular workshop on diabetic education should be organized, 15.7% (n=54) Government should help in subsidizing drugs, 14.0% (n34=4) Patients should attend hospital regularly, 13.4% (n=47) Free treatment of diabetic patients, 13.1 (n=46) Availability of drugs, 9.7% (n=34) Taking drugs regularly, 8.9% (n=31) Finding cure for the disease, 6.3% (n=22) Creation of awareness about the disease, 5.1% (n=18) Regular counseling and 2.3% (n=8) Government should equip hospitals as a way of improving adherence to medication and dietary treatment.

Table 4.9 Respondent's view on ways of improving medication and dietary treatment

Variable	Frequency (n=700)	Percent (%)
Patients should seek more information about the disease	140	40.0

Health care should be easily accessible	139	39.7
Stick to doctors instructions	139	39.7
Patients should exhibit self discipline	164	46.7
Patients should attend hospital regularly	49	14.0
Regular workshop on diabetic education should be organized	67	19.1
Government should help in subsidizing the drugs	54	15.4
Pray to God for help	55	15.7
Find the cure for the disease	31	8.9
Free treatment	47	13.4
Availability of drugs	46	13.1
Taking drugs regularly	34	9.7
Creation of awareness	22	6.3
Regular counseling	18	5.1
Government should equip hospitals	8	2.3

4.8.3 Ways health care personnel can improve Adherence to medication and dietary treatment among diabetic patients

According to Table 4.10, 44.0% (n=154) of respondents suggested constant encouragement from doctors, 40.3% (n=141) doctors should provide proper information to patients on management of the disease, 38.3% (n=134) doctors should emphasize the importance of adherence to treatment, 33.7% (n=118) doctors should be patient and listen to complaints of patients when treating them, 32.0% (n=112) creation of awareness about the disease by health care personnel, 26.9% (n=94) more research should be conducted to find cure for the

disease and develop friendly user drugs, 20.3% (n=71) doctors should advice patients regularly, 20.0 (n=70) doctors should keep to appointment and 16.9% (n=59) phone calls and text messages to patients regularly from health care personnel as a way of health care personnel improving adherence to medication and dietary treatment among diabetic patients.

Table 4.10 Respondent's view on ways health care personnel can improve adherence to treatment

Variable	Frequency (n=700)	Percent (%)
Doctors should provide proper information to patients on management of the disease	141	40.3
Creation of awareness about the disease by health care personnel	112	32.0
Doctors should emphasize the importance of adherence to treatment to patients	134	38.3
Phone calls and text messages to patients regularly from health care personnel	59	16.9
Doctors to be more patient and listen to complaints of patients when treating them	118	33.7
Constant encouragement from doctors	154	44.0
More research should be conducted to find cure for the disease and develop friendly user drugs	94	26.9
Keep to appointment	70	20.0
Advice patients regularly	71	20.3

4.8.4 Majors challenges confronting diabetic patients

Table 4.11 shows that 42.6% (n=149) said lack of awareness about the disease, 37.7% (n=132) Ignorance on the importance of adhering to treatment, 36.0% (n=126) Age of patients and what they feel and go through, 34.6% (n=121) Individual differences/belief, 33.7% (n=118) Restriction in drinking and eating,26.3% (n=92) Non challancy and carelessness on the part of patients, 25.4% (n=89) Burden of ingesting and injecting drugs, 21.7% (n=76) Financial constraints, 20.9% (n=73) Stigma in mixing with friends and

95

relations, 2.0% (n=7) Counterfeit drugs in the system often discourage diabetic patients and 1.1% (n=4) Food stuff is expensive as the major challenges confronting diabetic patients.

Table 4.11 Major challenges confronting diabetic patients

Variable	Frequency (n=700)	Percent (%)
Lack of awareness about the disease	149	42.6
Age of patients and what they feel and go through	126	36.0
Stigma in mixing with friends and relations	73	20.9
Restriction in drinking and eating	118	33.7
Financial constraint	76	21.7
Non challancy and carelessness on the part of patients	92	26.3
Individual differences/belief	121	34.6
Ignorance on the importance of adhering to treatment	132	37.7
Burden of ingesting and injecting drugs	89	25.4
Counterfeit drugs in the system often discourage diabetic patients	7	2.0
Food stuff is expensive	4	1.1

4.8.5 Ways of overcoming the challenges

According to Table 4.12 65.4% (n=229) suggested following recommended guidelines, 39.1% (n=137) Creation of more awareness about the disease, 27.7% (n=97) Conditions of diabetic patients should be improved, 26.0% (n=91) Empower diabetic patients with knowledge on management of the disease, 22.6% (n=79) Counseling on the need to adhere to treatment, 22.0% (n=77) Patients should be realistic and show strong will to adhere, 19.7% (n=69) Praying to God for help, 16.3% (n=57) Financial support from the government and

relations, 14.0% (n=14.0) Attending clinic regularly, 11.4% (n=40) Diabetic patients should prepare adequately before leaving home to avoid temptation, 9.1% (n=32) Doctors should prescribe drugs regularly and 5.4% (n=19) Proper management of finance when it is available as a way of overcoming the challenges confronting diabetic patients.

Table 4.12 Respondent's view of overcoming challenges confronting diabetic patients

Variable	Frequency (n=700)	Percent (%)
Creation of more awareness about the disease	137	39.1
Conditions of diabetic patients should be improved	97	27.7
Patients should be realistic and show strong will to adhere	77	22.0
Praying to God for help	69	19.7
Financial support from the government and relations	57	16.3
Diabetic patients should prepare adequately before leaving home to avoid temptation	40	11.4
Following recommended guidelines	229	65.4
Empower diabetic patients with knowledge on management of the disease	91	26.0
Attending clinic regularly	49	14.0
Counseling on the need to adhere to treatment	79	22.6
Proper management of finance when it is available	19	5.4
Doctors should prescribe drugs adequately	32	9.1

4.9 HYPOTHESES

4.9.1 HYPOTHESIS ONE: The relationship between Age and Adherence to medication treatment.

Table 4.13 Relationship between age and adherence to medication treatment

Variable	Level of Adherence	Frequency(n=350)

	Partial adherence	Strict adherence	(%)
35-44	17(4.9%)	11(3.1%)	28 (8.0)
45-54	39(11.1%)	61(18.9%)	105 (30.0)
55-64	42(12.0%)	71(20.30%)	113 (32.3)
65-74	41(11.7%)	49(14.0%)	90 (25.7)
>75	5(1.4%)	9(2.6%)	14 (4.0)

Chi-Square statistical analysis

X^2	df	P-Value	
10.68	4	0.03	P<0.05

According to Table 4.13, of the respondents that strictly adhered to treatment 3.1% (n=11) were (35-44), 18.9% (n=61) were (45-54), 20.3% (n=71) were (55-64), 14.0% (n=49) were (65-74) and 2.6% (n=9) were (>75).

Statistically, there was an association between the various age groups and adherence to medication treatment. Thus, those between the ages of (55-64) exhibited more strict adherence to medication (20.30%) while those in their late elderly (>75) exhibited the least adherence (2.6%).

4.9.2 HYPOTHESIS TWO: The relationship between Age and Adherence to dietary treatment.

Table 4.14 Relationship between age and adherence to dietary treatment

Variable	Level of Adherence		Frequency(n=350)
	Partial adherence	**Strict adherence**	**(%)**
35-44	13(3.7%)	15(4.3%)	28 (8.0)

45-54	26(7.4%)	79(22.6%)	105 (30.0)
55-64	36(10.3%)	77(22.0%)	113 (32.3)
65-74	36(10.3%)	54(15.4%)	90 (25.7)
>75	3(0.9%)	11(3.1%)	14 (4.0)

Chi-Square statistical analysis

X^2	df	P-Value	
8.45	4	0.04	P<0.05

According to Table 4.14, of the respondents that strictly adhered to treatment 4.3% (n=15) were (35-44), 22.6% (n=79) were (45-54), 22.0% (n=77) were (55-64), 15.4% (n=54) were (65-74) and 3.1% (n=11) were (>75).

Statistically, there was an association between the various age groups and adherence to medication treatment. Thus, those between the ages of (45-54) exhibited more strict adherence to medication (22.6%) while those in their late elderly (>75) exhibited the least adherence (3.1%).

4.9.3 HYPOTHESIS THREE: The relationship between sex and Adherence to medication treatment.

Table 4.15 Relationship between sex and adherence to medication treatment

Variable	**Level of Adherence**		
	Partial adherence	**Strict adherence**	**Frequency(n=350) (%)**

Male	58(16.6%)	79(22.6%)	137 (39.1)
Female	86(24.6%)	126(36.3%)	213 (60.9)

Chi-Square statistical analysis

X^2	**Df**	**P-Value**	
0.298	1	0.585	P>0.05

As shown in Table 4.15, 22.6% (n=79) of Males exhibited strict adherence to medication treatment and 16.6% (n=58) Partial adherence to medication treatment.

Statistically there was no relationship between the sex of respondents and adherence to medication treatment.

4.9.4 HYPOTHESIS FOUR: The relationship between sex and adherence to dietary treatment.

Table 4.16 Relationship between sex and adherence to dietary treatment

Variable	**Level of Adherence**		**Frequency(n=350)**
	Partial adherence	**Strict adherence**	**(%)**
Male	44(12.6%)	93(26.6%)	137 (39.1)
Female	86(20.0%)	143(40.9%)	213 (60.9)

Chi-Square statistical analysis

X^2	**Df**	**P-Value**	
0.021	1	0.884	P>0.05

As shown in Table 4.16, 26.6% (n=93) of Males exhibited strict adherence to dietary treatment and 12.6% (n=44) Partial adherence to medication treatment.

Statistically there was no relationship between the sex of respondents and adherence to dietary treatment.

4.9.6 HYPOTHESIS FIVE: The relationship between educational status and adherence to medication treatment.

Table 4.17 Relationship between educational status and adherence to medication treatment

Variable	Level of Adherence		Frequency(n=350)
	Partial Adherence	Strict Adherence	(%)
No formal Education	12(3.4%)	22(6.3%)	34 (9.7)
Primary Education	30(8.6%)	45(12.9%)	75 (21.5)
Secondary Education	57(16.3%)	86(24.6%)	143 (40.9)
Tertiary Education	45(12.9%)	53(15.1%)	98 (28)

Chi square statistical analysis

X^2	df	P-Value	
33.3	6	0.02	P<0.05

Cross tabulation of educational status and adherence to medication treatment (Table 4.17) showed that of those that strictly adhered to treatment 6.3% (n=22) had no formal education, 12.9% (n=45) had primary education, 24.6% (n=86) had secondary education and 15.1% (n=53) had tertiary education.

There was statistical significant association between educational status and adherence to medication treatment. Those who had attained secondary education exhibited greater strict adherence to medication treatment (24.6%) and those with no formal education exhibiting the least adherence to medication treatment (6.3%).

4.9.7 HYPOTHESIS SIX: The relationship between educational status and adherence to dietary treatment.

Table 4.18 Relationship between educational status and adherence to dietary treatment

Variable	Level of Adherence		Frequency(n=350)
	Partial Adherence	Strict Adherence	(%)

No formal Education	9(2.6%)	25(7.1%)	34 (9.7)
Primary Education	29(8.3%)	46(13.1%)	75 (21.4)
Secondary Education	42(12.0%)	101(28.9%)	143 (40.9)
Tertiary Education	34(9.7%)	64(18.3%)	98 (28.0)

Chi square statistical analysis

X^2	df	P-Value	
3.65	4	0.01	P<0.05

Cross tabulation of educational status and adherence to medication treatment (Table 4.18) showed that of those that strictly adhered to treatment 7.1% (n=25) had no formal education, 13.1% (n=46) had primary education, 28.9% (n=101) had secondary education and 18.3% (n=64) had tertiary education.

There was statistical significant association between educational status and adherence to dietary treatment. Those who had attained secondary education exhibited greater strict adherence to medication treatment (28.9%) and those with no formal education exhibiting the least adherence to medication treatment (7.1%).

4.9.8 HYPOTHESIS SEVEN: The relationship between age of diagnosis with diabetes mellitus and adherence to medication treatment.

Table 4.19 Relationship between Age of diagnosis with diabetes mellitus and adherence to medication treatment

Variable	Level of Adherence		Frequency (n=350)
	Partial Adherence	Strict Adherence	(%)

30-39	16(4.6%)	12(3.4%)	28(8.0)
40-49	33(9.4%)	51(14.6%)	84(24.0)
50-59	60(17.1%)	91(26.0%)	151(43.1)
60-69	30(8.6%)	46(13.1%)	76(21.7)
>70	5(1.4%)	6(1.7%)	11(3.1)

Chi-Square statistical analysis

X^2	df	P-Value	
3.375	4	0.497	P>0.05

Table 4.19 shows that 3.4% (n=12) of respondents diagnosed with Type-2 diabetes mellitus are at (30-39), 14.6% (n=51) of respondents diagnosed at (40-49), 26.0% (n=91) of respondents diagnosed at (50-59), 13.1% (n=46) of respondents diagnosed at (60-69), and 1.7% (n=6) of respondents diagnosed at (>70) exhibited strict adherence to treatment.

There was no statistical significant association between age when diagnosed with Type-2 diabetes mellitus and adherence to treatment.

4.9.9 HYPOTHESIS EIGHT: The relationship between age of diagnosis with diabetes mellitus and adherence to dietary treatment.

Table 4.20 Relationship between Age of diagnosis with diabetes mellitus and adherence to dietary treatment

Variable	Level of Adherence		Frequency (n=350)
	Partial Adherence	Strict Adherence	(%)
30-39	14(4.0%)	14(4.0%)	28(8.0)

40-49	23(6.6%)	61(17.4%)	84(24.0)
50-59	44(12.6%)	107(30.6%)	151(43.1)
60-69	29(8.3%)	47(13.4%)	76(21.7)
>70	4(1.1%)	7(2.0%)	11(3.1)

Chi-Square statistical analysis

X^2	df	P-Value	
6.865	4	0.143	P>0.05

Table 4.20 shows that 4.0% (n=14) of respondents diagnosed with Type-2 diabetes mellitus are at (30-39), 17.4% (n=61) of respondents diagnosed at (40-49), 30.6% (n=107) of respondents diagnosed at (50-59), 13.4% (n=47) of respondents diagnosed at (60-69), and 2.0% (n=7) of respondents diagnosed at (>70) exhibited strict adherence to treatment.

There was no statistical significant association between age when diagnosed with Type-2 diabetes mellitus and adherence to treatment.

4.9.10 HYPOTHESIS NINE: The relationship between period of accessing treatment at the hospital and adherence to medication treatment.

Table 4.21 Relationship between period of accessing treatment at the hospital and adherence to medication treatment

Variable	Level of Adherence		Frequency (n=350)
	Partial Adherence	**Strict Adherence**	**(%)**
1-6 months	24(6.9%)	39(11.1%)	63 (18.0)

104

7-12 months	30(8.6%)	37(10.6%)	67 (19.1)
2-5 years	71(20.3%)	97(27.7%)	168 (48.0)
6-10 years	11(3.1%)	20(5.7%)	31 (8.9)
11-15 years	4(1.1%)	9(2.6%)	13 (3.7)
16-20 years	0(0.0%)	1(0.3%)	1 (0.3)
>20 years	1(0.3%)	0(0.0%)	1 (0.3)
1st time	3(0.9%)	3(0.9%)	6 (1.7)

Chi-Square statistical analysis

X^2	df	P-Value	
4.005	7	0.779	P>0.05

Table 4.21 shows that 27.7% (n=97) were accessing hospital for treatment of Type-2 diabetes mellitus between 2-5 years, 10.6% (n=37) between 7-12 months, 11.1% (n=39) between 1-6 months, 5.7% (n=20) between 6-10 years, 2.6% (n=9) between 11-15 years and 0.9% (n=3) for the 1st time.

Statistically there was no significant relationship between period of accessing hospital for treatment of Type-2 diabetes mellitus and adherence to medication treatment.

4.9.11 HYPOTHESIS TEN: The relationship between period of accessing treatment at the hospital and adherence to dietary treatment.

Table 4.22 Relationship between period of accessing treatment at the hospital and adherence to dietary treatment

Variable	Level of Adherence		Frequency (n=350)
	Partial Adherence	**Strict Adherence**	**(%)**
1-6 months	21(6.0%)	42(12.0%)	63 (18.0)
7-12 months	19(5.4%)	48(13.7%)	67 (19.1)

105

2-5 years	59(16.9%)	109(31.1%)	168 (48.0)
6-10 years	9(2.6%)	22(6.3%)	31 (8.9)
11-15 years	3(0.9%)	10(2.9%)	13 (3.7)
16-20 years	0(0.0%)	1(0.3%)	1 (0.3)
>20 years	1(0.3%)	0(0.0%)	1 (0.3)
1ˢᵗ time	2(0.6%)	4(1.1%)	6 (1.7)

Chi-Square statistical analysis

X^2	df	P-Value	
4.320	7	0.742	P>0.05

Table 4.22 shows that 31.1% (n=109) were accessing hospital for treatment of Type-2 diabetes mellitus between 2-5 years, 13.7% (n=48) between 7-12 months, 12.0% (n=42) between 1-6 months, 6.3% (n=22) between 6-10 years, 2.9% (n=10) between 11-15 years and 1.1% (n=4) for the 1ˢᵗ time.

Statistically there was no significant relationship between period of accessing hospital for treatment of Type-2 diabetes mellitus and adherence to dietary treatment.

Table 4.23 Checklist on respondent's health status relating to effect of management of diabetes mellitus

Variables	Frequency%	Level of Adherence		P-Value	OR	95%CI	
		Partial	**Strict**				
Sores and Calluses	Yes 20(5.7)	4(1.1%)	16(4.6%)	0.04	2.947	0.964	9.008
	No 330(94.3)	140(40.0)	190(54.3%)				
Impaired Vision	Yes 200(57.1)	75(21.4)	125(35.7)	0.110	1.420	0.923	2.183

	No 150(42.9)	69(19.7)	81(23.1)				
Stroke	Yes 10(2.9)	2(0.6)	8(2.3)	0.187	2.869	0.600	13.712
	No (97.1)	142(40.6)	198(56.6)				
Ketone in Breath	Yes 50(14.3)	19(5.4)	31(8.9)	0.626	1.165	0.630	2.157
	No 300(85.7)	125(35.7)	175(50.0)				
Gum disease	Yes 15(4.3)	5(1.4)	10(2.9)	0.532	1.418	0.474	4.241
	No 335(95.7)	139(39.7)	196(56.0)				
Amputation	Yes 6(1.7)	2(0.6)	4(1.1)	0.696	1.406	0.254	7.780
	No 344(98.3)	142(40.6)	202(57.7)				

Checklist on respondents (Table 4.18) revealed that 57.1% (n=200) had impaired vision, 14.3% (n=50) had ketone in their breath, 5.7% (n=20) had sores and calluses, 4.2% (n=15) had gum disease, 2.9% (n=10) had stroke, and 1.7% (n=6) had undergone amputation of the limb.

Statistically, respondents with sores and calluses had significant relationship with adherence to medication treatment. Furthermore, respondents with sores and calluses that adhered strictly are more likely to adhere to medication treatment than those that adhered partially.

CHAPTER FIVE

DISCUSSION OF RESULTS AND CONCLUSIONS

5.1 Introduction

This study sought to answer the following questions: What is the level of adherence and factors influencing adherence to medication and dietary treatment among Type-2 diabetes mellitus patients? This study was prompted due to the challenge of adherence to medication

and dietary treatment among Type-2 diabetes mellitus patients because the disease requires long term therapies and daily self-management to prevent/delay the onset of complications. The study employed the Precede model in exploring the factors influencing adherence to medication and dietary treatment among Type-2 diabetes mellitus patients in central hospital Warri, Delta state. The model highlights 3 major factors perceived to influence the adherence behaviour of respondents. These include predisposing, enabling and reinforcing factors.

Using quantitative research method, data were collected from patients attending central hospital Warri, Delta state. Thus, this chapter describes the findings of the study that investigated health seeking behaviour and pattern of adherence to treatment among Type-2 diabetes mellitus patients in central hospital, Warri Delta state. These findings would be compared with previous research based on literature review in order to demonstrate relevant and important aspects of the results including similarities, differences and deviations. It provides an estimate of health seeking behaviours, levels of adherence to treatment, factors influencing adherence to medication and dietary treatment and attitude towards medication and dietary treatment among Type-2 diabetes mellitus patients. This chapter is divided into discussion of the key findings, recommendations and conclusions.

This section is discussed under the following headings:

1. Demographic characteristics of respondents
2. Respondents' health seeking behaviour
3. Level of adherence to treatment
4. Attitude towards medication and dietary treatment
5. Factors influencing adherence to treatment
6. Implications for policy and practice

5.2 Demographic characteristics of respondents

Results showed that most of the respondents were between the ages of 55 and 64 years of age. This shows that most of the respondents were in their early elderly to late adulthood which is similar with previous studies (Nguma, 2010; Kazeem et al., 2008). This age range might be because the study focuses on type-2 diabetes mellitus which is usually adult onset.

Most of the respondents were females which show that women value well-being, support in daily life and household activities and had a higher risk awareness of diabetes mellitus (Hjelm and Nambozi, 2008). Also majority of respondents were married which is due to all

of the respondents being adults or elderly. In addition, about one quarter of the respondents were traders which was consistent with most of the respondents being females who were majorly traders in the study location.

5.3 Respondents' health seeking behaviours

A complex set of personal health care behaviours is critical to diabetes control (Anderson et al., 1995). Among the behaviours of particular importance are self-monitoring of blood glucose concentrations, adjustment of insulin and oral antidiabetic agents in response to blood glucose readings and intercurrent illnesses, management of comorbid medical conditions (e.g. hypertension and hyperlipidemia), dietary adherence, exercise and smoking. Among the many factors that influence health seeking behaviours for diabetes care and management is the overall awareness and knowledge that the patient and caregivers and/or social networks have about diabetes signs and symptoms (Nguma, 2010). Low levels of awareness and knowledge about chronic health conditions have been blamed for delays in seeking care in biomedical care facilities.

Previous studies show that the level of awareness and knowledge about diabetes, its causes, clinical course and complications is low among patients (Kiawi et al., 2006; Ramaiya, 2005; Simpson, 2003; Van Rooijen et al., 2001). However the current study shows that majority of respondents had good health seeking behaviour. Although the current study did not focus on measuring respondents' level of awareness and knowledge of diabetes, the high health seeking behaviour among respondents might be attributed to increasing awareness and knowledge about diabetes care and management practices such as not always taking alcoholic drinks prohibited because of the disease, not always failing to attend hospital for follow-up care, not always forgetting to take prescribed drugs and always checking their blood glucose.

In Tanzania, Ramaiya (2005) reported that more than two thirds of patients with diabetes at a regional hospital were unaware that their problems were related to high or low concentrations of glucose in their blood and did not know that they could or should monitor their sugar levels themselves. However, checking of blood glucose rarely contributed as a determinant variable for poor health seeking behaviour in the current study. This shows that majority of

the respondents do not miss their appointed clinic days, as this is usually the point of checking their blood glucose. Exercise has several important functions in the treatment of diabetes: it enables weight loss by burning fat, creates a sense of wellbeing, lowers blood sugar for hours, reduces the risk of cardiovascular disease by reducing cholesterol and triglyceride levels, and lowers blood pressure (American College of Osteopathic Family Physicians, 2005). However regular exercise remain a problem among type-2 diabetes patients as was shown by previous studies (Garay-Sevilla et al., 1995; Cawood, 2006; Wanko et al., 2004; Thomas et al., 2004; Serour et al., 2007). The study showed poor participating in physical exercise was a major determinant of poor health seeking behaviour.

Furthermore, majority of the respondents had not been affected by stigma of the disease from friends and relations. In addition most of the respondents being traders have also enhanced their health care seeking behaviour as they can spare out time which is usually in the morning to attend clinic on appointed days before going back to the market to continue their daily trading activities. This good health care seeking behaviour was also buttressed as checking of blood glucose rarely contributed as a determinant to poor health seeking behaviour showing that most of the respondents do not miss their appointed clinic days as this usually the point of checking their blood glucose.

Similarly, the centralization of the Central hospital in the Warri metropolis makes access to health care at the hospital easy for diabetic patients in the Warri metropolis, nearby towns and riverine areas. This easy accessibility makes it easy for patients to attend hospital on appointed clinic days, thus enhancing their health seeking behaviour.

The health care system and the way in which health services are provided have been noted to influence health care seeking for such services. In Tanzania Simpson (2003) has shown that the setting of the health facility, and the interactions between the health care providers and the patient also influence the patient's health seeking behaviour. Simpson found that physicians at the clinics are extremely busy, and very little time is devoted by the doctor to listen to patients' problems. The type of relationship between the patient and health care providers has been reported to be a factor in the patient's health care seeking behaviour. Hospital personnel have been accused of being rude and giving very little information to

110

patients, hence losing the rare opportunity to educate their clients about the health problems at hand (Astrom et al., 1999; Feierman, 1981).

However, the study showed majority of the respondents believing doctors always listen to their complaints and the other health personnel exhibits positive attitudes towards them whenever they attend clinic for treatment.

5.4 Level of adherence to medication treatment

Previous studies have found adherence to diabetes medication treatment to be sub-optimal ranging from 23 to 77% (Rubin and Peyrot, 2005; Delameter, 2007; Lo, 1999; Harris, 2001). The level of adherence from the study showed above average for strict and partial adherence to medication treatment which is consistent with previous studies (King et al., 1998; Nasir et al., 2011). The above average level of adherence to medication exhibited by respondents might be attributed to respondents exhibiting good health seeking behaviour which is a determinant of adherence related behaviour among diabetes patients (Green and Keuter, 1999).

As shown in the results taking alternative traditional medicines (herbs) for the treatment of the disease was the major determinant variable contributing to non-adherence to medication treatment. Public awareness and knowledge about diabetes in sub-Saharan is limited, and as a result, there are many urban/rural areas who may have diabetes without being aware of it. Like any other disease, managing diabetes becomes more difficult when diagnosis is delayed. When this is coupled with limited patient education at the heath care facilities particularly on proper drug use, many patients end up facing great problems in adhering to their medical regimens and consequently consider the use of alternative care services (Nguma, 2010).

The findings from this study is similar to previous study where the main external factors for non-adherence to medication were lack of finance, perceived side effect of drugs and perceived inefficacy of prescribed anti diabetic drugs leading to concomitant self medication with traditional medicine (Nasir et al., 2011).

Linda (2004); reported that socio-demographic variables such as age, gender and race appears to influence the degree of adherence to medication treatment. However, Race, sex, and socioeconomic status have not been consistently associated with levels of adherence to

medication treatment (Balkrishnan, 1998; Stone et al., 2001). Similarly, there was no association between sex of respondents and adherence to medication in the current study.

An individual's low level of education has been associated with poorer physical or emotional health (Robinson et al., 1993), all-cause mortality or higher rates of fatal and nonfatal cardiovascular disease (Matsushima et al., 1996; Chaturvedi et al., 1998; Cabrera et al., 2001), poorer glycaemic control (Connolly and Kesson, 1996; Weng et al., 2000), and increased risk of microvascular disease (Chaturvedi et al., 1996; Unwin et al., 1996). Among persons with diabetes, factor such as less education have been associated with higher rates of smoking (Connolly and Kesson, 1996) lower rates of blood glucose monitoring (Muhlhauser et al., 1998; Harris et al., 1993) and lower rates of vigorous exercise (Caddick et al., 1994; Cubbin et al., 2001). Having less education has been associated with lower rates of haemoglobin A1c and lipid measurement, fewer ophthalmologic visits, and lower rates of preventive services (Chin et al., 1998). Less educated persons also have less understanding of haemoglobin A1c testing and receive fewer foot examinations and dilated eye examinations (Chin et al., 1998).

In this study, the educational status of respondents had a relationship with adherence to medication treatment. Respondents with secondary and tertiary education exhibited stricter adherence to treatment than those with no formal and primary education. This higher level of adherence might be attributed to this group of respondents having access to more information on diabetes care and management by basis of their social and academic exposure.

Hollinger (2005) in Tanzania noted that beliefs regarding disease causality tend to be consistent with cultural and personal values, which consequently shape patients' decisions for action. Type-2 diabetes is asymptomatic or has relatively non-specific symptoms. Thus, who is consulted once symptoms are recognised will depend on pre-existing beliefs about the likely meaning of the symptoms, disease causation, and the efficacy of different approaches such as traditional healers, spiritual methods, or biomedical medicine for the condition and the availability and accessibility of the various potential sources of help. Studies in Swaziland, Nigeria and Mozambique suggest that where symptoms are thought to signify natural imbalances, infidelity or some form of spiritual intervention, traditional healers may

be viewed as the most appropriate initial point of contact for help (Green, 2000; Piot and Tezzo, 1990). This is in line with this study, where taking of alternative traditional medicine was the main determinant of non-adherence to medication treatment; were most of the herbs are usually obtained from traditional healers and local herb dealers.

5.5 Level of adherence to dietary treatment

Previous studies have found adherence to dietary treatment to be sub-optimal ranging from 23 to 77% (Rubin and Peyrot, 2005; Delameter, 2007).

The level of adherence from the study showed above average for strict and below average for partial adherence to dietary treatment which is consistent with previous studies (King et al., 1998; Nasir et al., 2011). The above average level of adherence to dietary treatment exhibited by respondents might be attributed to respondents exhibiting good health seeking behaviour which is a determinant of adherence related behaviour among diabetes patients (Green and Keuter, 1999).

As shown in the results eating food in large quantity that should be taken in little quantity was the major determinant variable contributing to non-adherence to dietary treatment while eating foods that one should stop taking because of the disease was the least contributing variable. This finding might be due to respondents from the study location having difficulty in adjusting to little or moderate carbohydrate intake which is the main staple food of the people. This finding is similar to previous findings were respondents had difficulty in adjusting to dietary treatment (Nguma, 2010; Rubin and Peyrot, 2005).

Linda (2004); reported that socio-demographic variables such as age, gender and race appears to influence the degree of adherence to treatment. However, Race, sex, and socioeconomic status have not been consistently associated with levels of adherence to dietary treatment (Balkrishnan, 1998; Stone et al., 2001). Similarly, there was no association between sex of respondents and adherence to dietary treatment in the current study.

5.6 Attitude towards medication and dietary treatment

113

Badruddin et al., (2002); proposes that it is important to identify interventions that reinforce peoples' attitudes despite their levels of knowledge of a particular subject. Adherence rates are typically higher among patients with acute conditions, as compared with those with chronic conditions; persistence among patients with chronic conditions is disappointingly low, dropping most dramatically after the first six months of therapy (Jackevicius et al., 2002; Cramer et al., 2003; Haynes et al., 2002). Similarly, Thompson et al., (1988); in its study of attitudes, knowledge and glycaemic control found that 9.3% of respondents had poor attitude towards dietary treatment. Alternatively, patients who report high levels of adherence to diabetes care and control have more positive attitudes toward disease management (Anderson et al., 1993). This was similar to the findings of this study.

Demographic factors such as ethnic minority, low socio-economic status, and low levels of education have been associated with lower regimen adherence and greater diabetes-related morbidity (Delamater, 2007). However, the study shows respondents having good attitude to treatment despite majority being in the middle and lower socio-economic class as a result of them being traders, artisans and retirees.

Similarly, psychological factors are also linked with regimen adherence. Appropriate health beliefs, such as perceived seriousness of diabetes, vulnerability to complications, and the efficacy of treatment, can predict better adherence (Delamater, 2007). However respondents showed high perceived seriousness of the disease, this in turn influenced their attitude to treatment.

Social factors such as family relationships play an important role in diabetes management. Studies have shown that low levels of conflict, high levels of cohesion and organization, and good communication patterns are associated with better regimen adherence (Delamater et al., 2001). Greater levels of social support, particularly diabetes-related support from spouses and other family members are associated with better regimen adherence (Glasgow and Toobert 1988). Social support also serves to buffer the adverse effect of stress on diabetes management (Griffith et al., 1990). This is line with this study were age showed a significant relationship with adherence to medication and dietary treatment.

In addition social support provided by nurse case managers has been shown to promote positive attitude to adherence among diabetic patients to diet and medication (Sherbourne et al., 1992). It was also observed in the Diabetes Control and Complications Trial that one of the key elements to success in achieving good attitude to glycaemic control was the availability of support provided to patients by the health care team (The DCCT Research Group, 1995). In addition, ability to obtain support from health care team members, the quality of the patient-doctor relationship is a very important determinant of good attitude to regimen adherence. Research has demonstrated that patients who are satisfied with their relationship with their health care providers have better attitude to adherence to diabetes regimens (Von Korff et al., 1997). This is also in line with this study were majority of respondents were satisfied with the kind of support and services they receive from health personnel at the hospital. This might also have contributed to the good attitude to medication and dietary treatment exhibited by respondents.

5.7 Factors influencing adherence to medication and dietary treatment

One of the major predictor of poor adherence to treatment is poor-provider-patient relationship (Okuno et al., 2001; Lacro et al., 2002). This often results in poor-provider patient communication, patient poor understanding of the disease, patients encompassing poor understanding of the benefits and risks of treatment and patients encompassing poor understanding of the proper use of the medication. However, the findings shows only a small proportion of respondents believe the negative attitude of health personnel had influenced their adherence to medication and dietary treatment while some believed doctors too busy to listen to respondent's complaints had influenced their adherence to treatment. This perceived good patient-provider relationship in the study might be attributed to how respondents reverence and respect the physician and other health personnel providing medical services in the hospital. This might results to a perception that health care personnel does nothing wrong as far as providing medical services is concerned.

Ability of the respondents to adhere to treatment has been influenced by side effects from recommended drugs which is similar to previous studies (Van servellen et al., 2002). ''Van servellen et al., (2002)''; reported side effects of medication as a major predictor of poor

adherence to medication. Similarly, Kazeem et al., (2008); reported side effects from medication as one of the factors underpinning non-adherence.

Some of the respondents believe their poor perception regarding the seriousness of the disease had an influence in their ability to adhere to treatment recommendations which is in line with previous studies (Lacro et al., 2002; Perkins, 2002). This poor perception of the seriousness of the disease might be attributed to the slow onset of complications which can often be taken for granted by patients but can prove fatal if not given the desired attention.

Balkrishnan, (1998); and Ellis et al., (2004); reported that cost of medication is a major factor influencing adherence to treatment. Similarly, Kazeem et al., 2008; reported that lack of finance for transportation to clinic and purchase of drugs was one of the factors underpinning non-adherence to anti-diabetic drug therapy. However only less than one quarter of respondents had lack of finance for transport to clinic and purchase of drugs influenced their ability to adhere to treatment. The average monthly cost of anti-diabetic drugs to patients is $22.9 (Range: $4.8–$38.4) (2867 Nigeria's Naira; Range: 600–4800).

Furthermore, the economic access to anti-diabetic medications appeared restricted by the average monthly cost of $22.9; as an average patients with type-2 diabetes will based on the National minimum daily wage of $2 require 11.5 days to pay for only anti-diabetic medications (Kazeem et al., 2008). In addition, the payment policy of fee for-service which makes out-of-pocket payment mandatory for the purchase of all medications may be compounding the financial difficulty being experienced by patients in purchasing their medicines.

Kazeem et al., (2008) reported that perceived inefficiency of prescribed anti-diabetic drugs usually leads to concomitant self medication with local herbs. This is in line with the findings where almost half of the respondents said use of alternative medicines has influenced their ability to adhere to treatment. The identification of concomitant use of local herbs due to perceived inefficacy of prescribed orthodox anti-diabetic medicines in patients with type-2 diabetes suggests a gap in the diabetic care process; and this could have serious negative public health consequence. The use of local herbs for the treatment of diseases is long

116

standing and pervasive in Nigeria. This often leads to reduction in adherence to recommended medications which is linked with increase morbidity and admission to hospital (Kennedy and Erb, 2002; Tamblyn et al., 2001).

Although diet is the cornerstone of treatment of diabetes mellitus, patients find this area of self-management difficult. Most of the dietary habits of respondents were violating good dietary advice as shown where more than half of the respondents said they find it difficult to adhere to recommended diet, thus influencing their adherence to treatment.

This difficulty in adhering to recommended diet might be attributed to lack of proper dietary guidelines and where available some of the patients are illiterates requiring guidelines to be memorized or the constant support of literate relatives. Similarly, many patients are not seen by dieticians, a situation generally obtaining in resource limited setting such as Nigeria (Abioye-Kuteyi et al., 2005). This means lack of patient's dietary history which is helpful in assessing caloric intake, dietary content and carbohydrate consistency. This often leads to prescription of diets with marked changes from what the patients likes to eat, thus making it less likely for the patient to comply with dietary prescription (Nuttal, 1993).

More than half of the respondents believe dissatisfaction with having to ingest or inject medications on a daily basis has influenced their ability to adhere to treatment which is similar to previous findings (Adisa et al., 2009). Some of the respondents think forgetting to use drugs, stigma, especially when in the midst of friends and nature of job which prevents accessibility and use of drugs has influenced their ability to adhere with treatment. These findings are in line with the studies that reported forgetfulness and spontaneous activities (Ary et al., 1986). Poor access to information on diabetic care and management by patients appears to be one of the reported reasons for non adherence to treatment recommendations. This tends to agree with findings by (Rowley, 1999; Wens et al., 2005). However, only a small proportion of respondents agreed that poor access to information had influenced their ability to adhere to treatment.

Observable symptoms among respondents were impaired vision, ketone in breath, sores and calluses and stroke. This is consistent with findings of previous study (Kazeem et al., 2008). Diabetic foot syndrome (including ulcers) is a common morbidity/indication for admission

and cause of death. Diabetic foot ulcer is a leading cause of non-traumatic amputation and contributes significantly to morbidity and mortality in Nigerians with diabetes (Chuhwak et al., 1999; Harris et al., 2009). However, the magnitude and impact of this potentially preventable Diabetes mellitus complication can be reduced by adequate education of the diabetic patients about foot care, re-emphasizing the same at subsequent visits at the clinics or in diabetes meetings. The diabetes care team should include a comprehensive examination of the feet at least once a year for all persons with diabetes.

Ketone in breath among some of the respondents indicates poor metabolic control in these patients and reinforces the need for adequate health education, monitoring and follow-up care, to reduce the morbidity associated with diabetes.

5.8 Implications for policy and practice

The researcher suggests diabetes education which must be tailored to the individual needs and perceived factors influencing adherence to treatment in a culturally acceptable manner. This study has important implications for current levels of clinical practice in the country, and public health burden of the disease may be reduced significantly with implementation of effective and sustainable medication and dietary programs. This is because strict adherence to treatment recommendations, an integral part of comprehensive diabetes care has been proven to enhance clinically meaningful glycaemic control.

Finally, informing policy makers about the study findings would increase their commitments to the recruitment of dieticians, diabetic nurses and educators in our health institutions, especially in primary care centre. Potential focus for future interventions must include public health policy to support promotion of adherence to medication, diet, regular exercise and increase public awareness on the fatal consequences of not adhering to treatment recommendations.

5.9 Summary and Conclusion

This study has demonstrated high rates of health seeking behaviours and strict-adherence to treatment recommendations amongst people diagnosed with type-2 diabetes mellitus in Central Hospital Warri, Delta State.

The study also revealed that lack of physical exercise was the major determinant contributing to poor health seeking behaviours while taking alternative traditional medicines (herbs) for the treatment of the disease was the major determinant contributing to poor adherence to

118

treatment. Factors that influenced respondents adherence to treatment includes side effects from recommended drugs, lack of money for transport to clinic and purchasing of drugs, high cost of drugs, difficulty in sticking to recommended diets, burden of ingesting and injecting drugs among others. Therefore, intensive and repeated diabetic education should be incorporated as part of routine diabetes care in health institutions nationwide.

Attitude towards medication and dietary treatment was favourable, but need to be sustained. Respondent's suggestions on ways of improving adherence to treatment included self discipline (46.9%) and encouragement from healthcare personnel (44.0%). Similarly, respondents' believed lack of awareness about the disease (42.6%) was the major challenge confronting Diabetic patients while one of the ways of overcoming the challenges of type-2 diabetes mellitus was creation of awareness about the disease as suggested by 39.1% of respondents.

In the light of these findings, recommendations were suggested which could be adopted and utilized by the appropriate agencies. It is hoped that if these recommendations are implemented there will be marked and sustained improvement in medication, dietary and exercise behaviour among type-2 diabetes mellitus patients in Nigeria.

5.10 Recommendations

In the light of the findings of this study, the following recommendations are suggested:

1. Comprehensive and robust strategies for medication, diet and exercise recommendations should be incorporated as part of total health care for people with type-2 diabetes. These strategies must be based on multi-disciplinary team and collaborative approach, and should include individual and group interventions, inter-disciplinary focus including referral to non-primary care physician (such as pharmacist, dieticians, diabetes nurses and

educators, and exercise experts) for ongoing patient's support and maintenance, and community resources.

2. People with diagnosed type-2 diabetes must be encouraged to express their concerns on treatment recommendations, especially, understanding and self-perceptions of lifestyle measures and perceived reasons for not adhering to treatment.

3. The health educator and care physician must interpret (preferably in patient's language), for each diabetic patient, the short and long-term benefits of adhering to medication and dietary recommendations. Interpretations must be focusing on good glycaemic control, preventing and/or delaying diabetic complications and good quality of life.

4. Due to financial difficulty in purchase of drugs, the adoption of viable cost reduction strategies such as the pooled procurement, prescription and use of lowly-priced but good quality generic anti-diabetic medications; and possible provision of subsidy by governments and its collaborating donor agencies, as adopted for the provision of anti-retroviral medicines, may increase patients' access to the needed anti-diabetic medications in Nigeria and other resource-limited settings.

5. The Nigeria diabetes federation should regularly organize diabetes education programmes such as seminars and symposia on all levels of health institutions (Primary health care centre to specialist hospitals) nationwide to create awareness and provide information on diabetes mellitus, possible complications associated with poor adherence to treatment recommendations and possible ways of improving adherence to treatment recommendations among type-2 diabetes mellitus patients.

6. Diabetic health care personnel and professionals should regularly make frequent contact with patients via telephone and text messages, as this promotes regimen adherence and improvements in glycaemic control, as well as in lipid and blood pressure levels (Aubert et al., 1998).

7. Suggestions for future study should address use of alternative medicine (herbs) which remains a major challenge among patients with type-2 diabetes mellitus.

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151

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APPENDIX ONE

QUESTIONNAIRE

DEPARTMENT OF HEALTH PROMOTION AND EDUCATION
FACULTY OF PUBLIC HEALTH
COLLEGE OF MEDICINE

UNIVERSITY OF IBADAN, IBADAN

QUESTIONNAIRE ON HEALTH SEEKING BEHAVIOUR AND PATTERN OF ADHERENCE TO TREATMENT AMONG PATIENTS WITH TYPE-2 DIABETES MELLITUS IN CENTRAL HOSPITAL WARRI, DELTA STATE

Dear Respondents,

My name is AGOFURE OTOVWE a post graduate student of the Department of Health Promotion and Education, Faculty of Public Health, University of Ibadan. This questionnaire is designed to gather vital information that could be used for designing programmes for promoting adherence to treatment and better health seeking practices among people living with diabetes.

This study will not expose you to any danger. Data collected from this study will be treated with strict confidentiality. For the avoidance of doubt your name will not be written on this questionnaire and taking part in this study is voluntary.

Please feel free to answer the questions as honestly as possible. Do you have any question? Please feel free to ask questions as the interview progresses. Thank You.

I agree to be part of this study (Please tick) [ ]

Thank you for your cooperation

AGOFURE OTOVWE

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

Instruction: For most of the questions in this section, please tick (√) the appropriate alternative response(s). In some cases, however simply supply the needed information in the blank spaces provided.

1. Age in years as at last birthday: ☐☐

2. Sex: 1. Male ☐   2. Female ☐

3. Religion

1. Christianity ☐ . Islam ☐ Traditional 4. ☐ ne ☐

    5. Others (please specify).....................

4. Marital Status

1. Single ☐ 2. Married ☐ 3. Divorced ☐ 4. Widow ☐ 5. Separated ☐

      6. Cohabiting ☐

5. Educational status

1. No formal Education ☐ 2. Primary Education ☐ 3. Secondary Education ☐

  4. HND/Bachelor ☐ 5. Postgraduate ☐

6. Occupation

1. Trader ☐ 2. Civil servant ☐ 3. Oil worker ☐ 4. Others specify.....................

7. Type of hospital

  1. Public ☐ 2. Private ☐

8. How old are you when you were diagnosed as diabetic? _____

9. How long have you been accessing medical services for the treatment of diabetes Mellitus in this Hospital? _____

SECTION B: ADHERENCE TO TREATMENT

Instruction: Please for each of the questions below tick (√) the appropriate answers in the spaces provided.

Measurement of Adherence to treatment

	Adherence to treatment	Always	Occasionally	Rarely	Remark
10	How often do you forget to take your prescribed				

	medicine?				
11	How frequently do you take incomplete doses of your prescribed medicine?				
12	When you feel better, how regularly sometimes do you stop taking your prescribed medicine?				
13	Sometimes if you feel worse when taking your medicine, how frequently do you stop taking it?				
14	How recurrently do you take your medicine according to doctor's prescription?				
15	How repeatedly do you take alternative traditional medicines (herbs) to treat your diabetes condition?				
16	How often do you skip doses of your prescribed medicine?				
17	How regularly do you take other medicines or drugs prescribed by friends and relations?				
18	How frequently do you prefer medicines or drugs from local pharmacy store to the ones prescribed by your doctor?				
19	How often do you eat too much of the diet (food) the doctor says you should be taking in little quantity?				
20	How frequently do you eat foods the doctors says you should stop taking because of your condition?				
21	How often do your believe in prayer and faith healing prevent you from taking your prescribed drugs and sticking to recommended diet?				

22.   POINTS SCORED=   **23. Category code:** ——————————

SECTION C: HEALTH SEEKING BEHAVIOURS AMONG RESPONDENTS

Instruction: For each of the questions below to capture health seeking behaviour; tick (√) the appropriate answers in the blank spaces provided.

Measurement of Health Seeking Behaviour

	Health Seeking Behaviours	Always	Occasionally	Rarely	Remark

155

24	I fail to go to the hospital for follow-up care				
25	I forget to take my recommended drugs as recommended by the doctor				
26	I eat according to doctors instructions				
27	I participate in physical exercise				
28	I usually check my blood glucose				
29	I seek information in management of this condition from a qualified doctor				
30	I usually take alcoholic drinks/foods that are not allowed because of my condition				

31.   POINTS SCORED=   **32. Category code:** _____

SECTION D: Factors that influence adherence to treatment

Instruction: The table below contains a list of factors that influences your medication and dietary adherence behaviour Tick **(√) Yes if it has affected you and No if it has not affected you.**

Factors that influence adherence to treatment

	Factors that hindered adherence to treatment	**Tick (√)**		**REMARK**
		Yes	**No**	
33	Negative attitude of health staff			
34	Doctors too busy to listen to my complaints			
35	Lack of availability of prescribed diabetic drugs			
36	Side effects from recommended drugs			
37	Forgetting to use drugs as prescribed by the doctor			
38	Use of alternative native medicines apart from the ones prescribed by the doctor			
39	Lack of money for transport to clinic and purchasing of drugs			

156

|		SA	A	U	D	SD
40	Long queues and waiting times in the clinic					
41	Believe in prayer to cure the disease					
42	Poor perception about the seriousness of the disease					
43	Frequent change of medications					
44	High cost of drugs					
45	Burden of ingesting or injecting drugs					
46	Difficulty in sticking only to recommended diet					
47	The diet recommended by doctors are too expensive					
48	Stigma, especially when in the midst of friends					
49	Nature of job, which prevents accessibility and use of drugs					
50	Poor access to information that will promote continuous use of the drugs					

SECTION E: Attitude towards medication and dietary treatment

Instruction: The table below contains a set of attitudinal statement; for each tick **(√)** whether you Strongly agree (SA), Agree (A), Undecided (U), Disagree (D) or Strongly disagree (SD).

Attitude towards medication and dietary treatment

	Attitudinal statements	SA	A	U	D	SD
51	It is not advisable for me to take only the drugs recommended because it is not easy to do so					
52	I like to take many drugs to get better quickly					
53	Apart from the drugs prescribed at the hospital, it is good for me to use traditional/alternative medicines to treat diabetes					
54	Routine blood test is not necessary if I take recommended drugs regularly					

55	It is not compulsory for me to take diabetic drugs everyday					
56	Going to the hospital regularly for follow-up care is not necessary because I can always buy drugs from pharmacy or chemist shops when it gets finished					
57	Urine test is not necessary if I take my recommended drugs regularly					
58	I am disposed to eating any kind of food to get better					
59	It is advisable for me to eat only the food recommended by the doctor					

60.   POINTS SCORED=   **61. Category code:** _____

SECTION F: Suggested ways of improving adherence to treatment

Instruction: The questions in this section are meant to assess your opinion on ways of improving adherence to treatment, please provide answers as appropriate.

62. Is it possible for diabetic patients to actually adhere to medication and dietary treatment?

Yes ☐   No ☐

63. What is your view on ways adherence to medication and dietary treatment among diabetic patients can be improved?

_____   _____

_____   _____

64. What are your suggestions to health care personnel (if any) on ways you think they can help to improve adherence to treatment among diabetic patients?

65. What are the major challenges confronting diabetic patients that hinder them from adhering to medication and dietary treatment?

_____   _____

_____   _____

66. How can these challenges be overcome? _____

APPENDIX TWO

OBSERVATIONAL CHECKLIST

HEALTH SEEKING BEHAVIOURS AND PATTERNS OF ADHERENCE TO TREATMENT   AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN CENTRAL HOSPITAL, WARRI DELTA STATE

Date of Assessment --

Time --

Instructions

The following contain indicators to be observed in patients. Tick Yes if applicable and NO if not applicable.

Indicators to be observed	Yes	No
Sores and calluses on feet		
Impaired vision		
Stroke		
Gum disease		
Ketone in breath		
Amputation		

APPENDIX THREE

DELTA STATE

MINISTRY OF HEALTH

P. M. B. 5012
ASABA
DELTA STATE OF NIGERIA

Your Ref:

Our Ref: No. HD.92/A/7.

20ᵗʰ Jan., 2012.

Mr. Otovwe Agofure
Department of Health Promotion and Education,
College of Medicine,
University of Ibadan,
Ibadan.
Oyo State.

<u>RE: APPLICATION FOR ETHICAL</u>

APPROVAL TO CONDUCT A RESEARCH ON HEALTH SEEKING BEHAVIOUR AND PATTERN OF ADHERENCE TO TREATMENT AMONG PATIENTS WITH TYPE-2 DIABETES MELLITUS IN CENTRAL HOSPITAL WARRI DELTA STATE

I wish to refer to the above subject dated 13ᵗʰ June, 2011 and acknowledge receipt of your application and proposal.

2. I further wish to convey approval to you to conduct this research in Delta State hospitals in Warri South Local Government Area.

3. With kind regards.

Dr. (Mrs) Gloria Patrick-Ferife
for: Hon. Commissioner.