THE EFFECTIVENESS OF DIABETES SELF-MANAGEMENT EDUCATION TRAINING AMONG INDIVIDUALS WITH TYPE 2 DIABETES MELLITUS IN RURAL NIGERIA

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ABSTRACT

Type 2 Diabetes Mellitus (T2DM) constitutes the highest percentage of diabetes cases. It has become a serious global problem due to rapid cultural and social changes, ageing, increasing urbanisation, dietary changes, reduced physical activity and unhealthy behavioural lifestyles. Furthermore, unidentified diabetes has been found to be common in many parts of Africa, including rural Nigeria, due to factors such as poor accessibility to health facilities, cultural barriers and high rates of health illiteracy. The overall aim of this study is to determine the effectiveness of the Diabetes Self Management Education (DSME) programme among individuals with T2DM in Jigawa State, Nigeria. A mixed methods research design was used for this study, utilising both quantitative and qualitative methods for data collection and analysis. The first phase used a quantitative approach, with a cross-sectional design (survey) to collect data from clients with Type 2 Diabetes Mellitus regarding the prevalence and awareness of T2DM. Thereafter, a qualitative approach was used in Phase 2 to explore current practice and challenges regarding the management of T2DM in Jigawa State, Nigeria. The third phase used quantitative approach with pre-test-post-test design to determine the effectiveness of the DSME training programme among individuals with T2DM in rural Nigeria. The population of the first phase was recruited using cluster sampling by randomly selecting three (3) census enumeration units (out of fifteen) from Dutse Local Government Area of Jigawa State, Nigeria. A total of 1500 individuals were approached, using even numbered houses. In the end, 936 clients consented. The sample population of this phase was recruited from the available healthcare personnel, and the clients that attended the community health centres (CHSs) in their respective rural areas. The medical personnel were recruited from the four (4) randomly selected CHCs and four (4) clients from each CHC, making up a total of sixteen (16) clients. The population of Phase 3 was recruited using power analysis to calculate a minimum sample size of 200 clients.

The 936 clients that participated in Phase 1 had a mean age of 37.90 years (SD = 15.56) just more than half (51.8%) were female, and about 34.5% of these had no formal education. The prevelance of Diabetes Mellitus was found to be 26.1% (n=244). Phase 2 explored the challenges disclosed by medical personnel, which included poor renumeration and working conditions. Meanwhile, the clients' major challenge was lack of financial resources. For Phase 3, more than half (54.5%) of the 200 T2DM patients were female. The difference in the diabetes care knowledge for DSME intervention indicated a significance improvement between the baseline to the post-intervention period (X^2=303.5, P<0.0001) across the first period. The result of the diabetes care profile of the participants also demonstrated improved knowledge at post-intervention in eight domains (P<0.05), with the exception of the support domain, which indicated no significance post-intervention difference from baseline (P>0.05). It was concluded that T2DM is highly prevalent in rural Nigeria. The study also concluded that the major problems encountered by both medical personnel and clients with T2DM included low literacy levels, lack of adherence to medication, lack of access to healthcare resources and use of tradomedical services. Nevetheless, the DSME intervention proved to be a generally effective treatment approach in optimising the healthcare behaviours, quality of life, as well as medication use among individuals with T2DM.

DECLARATION

I hereby declare that **"The Effectiveness of Diabetes Self-Management Education Training among Individuals with Type 2 Diabetes Mellitus in Rural Nigeria"** is my own work that has not been submitted, or part of it, for any degree of examination at any other university, and that I acknowledged all the sources I used and quoted in this study.

Yusuf Said **Date** 11 December 2020

Signature:_____

Witness:

_____ Tania Steyl

Prof. J.S. Phillips Dr. T. Steyl

DEDICATION

This work is dedicated to my late parents Alhaji Said and Hajiya Maryam (may their souls rest in perfect peace, Ameen!), my beloved wife, Jamila, and my daughters, Asia and Munifa.

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CHAPTER ONE

1.1 INTRODUCTION

This chapter provides a brief summary of the public health problems related to Type 2 Diabetes Mellitus (T2DM). The factors contributing to the prevalence of Diabetes Mellitus (DM) in the rural areas are also outlined. The aim and objectives of the study are stated. The significance of the study elaborates the urgent need to curb the impact of diabetes by designing interventions that are specific to rural Nigeria. Definition of terms, abbreviations and the summary of the chapters form the latter part of this chapter.

1.2 RATIONALE FOR THE STUDY

Diabetes Mellitus (DM) is one of the most common non-communicable diseases (NCDs) globally (Sicree, 2014). T2DM constitutes about 85% to 95% of all diabetes cases in high income countries and many accounts for an even higher prevalence in low- and middle-income countries (Sicree, 2014). It is a serious global health problem which, for most countries, has evolved from socialisation with rapid cultural and social changes, ageing population, increasing urbanisation, dietary changes, reduced physical activity and other unhealthy lifestyle and behavioural patterns (Mash, 2012).

A recent report by World Health Organisation (WHO) indicates that the number of adults living with diabetes has increased by nearly fourfold since 1980, reaching the current estimate of >422 million globally (WHO, 2016). Approximately 80% of these adults live in low-income and middle-income countries. The number of cases of diabetes worldwide among adults ≥20 years of age in 2000, was estimated to be approximately 171 million. This figure is 11% higher than the previous estimate of 154 million (Herman, 2012). Estimates of total population size and proportion of people >64 years of age in 2000 used in the previous report were higher

than those used in the latter report, and therefore demographic changes cannot account for the discrepancy. The higher prevalence is more likely to be explained by a combination of the inclusion of surveys reporting higher prevalence of diabetes than was assumed previously, and different data sources for some countries. The International Diabetes Federation (IDF) 2019 Diabetes report and projection for 2030 and 2045, using a total 255 high-quality evidence based data from 138 countries reported a global diabetes prevalence of 9.3% (463 million people) (Saeedi et al, 2019). The prevalence is projected to rise to 10.2% (578 million) by 2030 and by 10.9% (700 million) by 2045. The report suggested that the prevalence is greater in urban settings (10.8%) compared to rural settings (7.2%). In addition, the prevalence is aslo more pronounced in high income countris (10.4%) compared to low income countries (4.0%). The report emphasiszed that most diabetes cases are undiagnosed, as one in two persons (50.1%) living with diabetes are often unaware that they have the disease.The report concluded that below 50% of a billion people are living with diabetes globally and the number is projeccted to rise by 25% in 2030 and by 51% in 2045 (Saeedi et al., 2019).

The number of studies describing the epidemiology of diabetes over the last 20 years has been extraordinary (Steinsbekk, 2012). The incidence of diabetes, especially Type 2, is rapidly growing globally. In 1985, an estimated 30 million people suffered from this chronic disease, which by the end of 2006 had increased to 230 million people, representing 6% of the world population. Of this number, 80% was found in the developing world (Bradshaw, Norman, & Schneider, 2007). It is estimated that during the next 35 years, the worldwide diabetes prevalence will reach 25%, with India being the most affected. It is recognised that low- and middle-income countries (LMICs) face the greatest impact of diabetes (Mash, 2012). However, many government and public health planners still remain largely unaware of the current magnitude, or more significantly, the future burden of the increasing prevalence of diabetes and its complications in their own countries. It has been consistent in several findings

of population-based diabetes studies that a substantial part of the population has diabetes (Marsh, 2008). The discovery of new cases when mass blood testing is undertaken is primarily because of symptoms associated with the early years of T2DM, meaning that those with diabetes are unaware of their condition and therefore may not seek medical attention (Mash, 2012).

Complications of diabetes, such as coronary artery and peripheral vascular diseases, stroke, peripheral neuropathy, amputation, renal failure and blindness result in increasing disability, reduce life expectancy and tremendous health cost for virtually all society (WHO, 2000). Diabetes is undoubtedly one of the most challenging health problems in the 21st century (Sicree, 2014). Prevention of diabetes is important because it is costly both in human and monetary terms (Ambigapathy, 2003). Awareness of risk factors is a pre-requisite for the prevention of diabetes among the general population and also high-risk groups, such as persons with impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). If people are aware of the risk factors that lead to diabetes, the rate of its occurrence can be minimised. Evidence eventually reported that people who perceive themselves to be at risk of a disease are considerably more likely to engage in, and comply with, efforts to reduce their risk of developing the problem (Mumu, 2014). Thus, efforts are needed to inform people about T2DM to judge their risk, including the severity and probability of ill effects, the risk factors that modify their suscptibility, as well as the ease or difficulty of avoiding harm (Rosal, 2011). Acquiring knowledge on the level of awareness among population about diabetes is the first step in formulating a prevention programme for diabetes. Such data is extremely important to plan public health polices with specific reference to implementation of national diabetes control programmes (Garfield, 2003). In addition, there are great variations in the level of awareness amongst different populations, and this needs to be explored in different ethnic and social groups for designing appropriate preventive strategies.

Mohan (2005) observed that even among self-reported diabetic subjects in Chennai, knowledge about diabetes, including awareness of complications of diabetes, was poor (Mohan, 2005). This observation could indicate that the majority of the patients have not been taught about diabetes by their physicians. Studies in India and Pakistan show that the problem of obesity and overweight are less in rural reas compared to urban areas (Lau, 2009).

Similarly, Nisar and Khan et al., (2008) showed only 30% of non-diabetic and 22% of the patients with diabetes in a rural town in Karachi, India were overweight. This may be due to consuming whole grain food rather than refined food and being more physically active than urban people. A study regarding public awareness in Singapore observed low scores in general knowledge and risk factors for Diabetes Mellitus, but a good understanding of symptoms and the complications of diabetes (Wee, 2011). It has been reported that community health workers did not have the essential knowledge, attitude, and beliefs to make a positive impact on the prevention and management of diabetes (Hughes, 2006).

For a long time, Africa was considered safe from the so-called "disease of affluence" which plagued the Western world. Diabetes seemed to be very uncommon in Africa, a situation which remained virtually static until the 1990's, and more recently (Mollentze, 2006). Indeed, from 1959 to the mid-1980s, medical statistics showed that the prevalence of diabetes in Africa was equal to or less than 1.4%, with the exception of South Africa, where the rate was estimatd to be as high as 3.6 % in 2001 (Parker, 1995). By 1994, the continent-wide prevalence of Diabetes Mellitus was 3 million, and it was predicted to double or triple by 2010 (Rollnick, Miller & Butler, 2008). It is of great concern that approximately 7.1 million Africans were said to be suffering from diabetes at the end of 2000, a figure that was expected to rise to 18.6 million by 2030.

Diabetes Mellitus is present in every country of the world and epidemiological evidence suggests that without effective prevention and control programmes, diabetes may likely increase globally. Knowledge regarding T2DM is very poor in rural areas. This emphasises the need for spreading the correct message regarding diabetes right down to the masses and also extending diabetes education activities to rural areas as well, where the prevalence rates of diabetes are on the rise (Goff, Moore, Harding, & Rivas, 2020). As diabetes requires extensive self-management related to diet, exercise and medication in order to prevent complications, self-management education and support are regarded as a critical element of treatment for all people with diabetes (Van den Broucke, 2014). As such, diabetes self-management education (DSME) is widely recommended and carried out where resources permit. However, despite the great variety of DSME programmes that are currently available internationally, there is a paucity of information regarding educational interventions for the prevention of diabetes complications in developing countries (Dube & Housiaux; Van den Broucke et al, 2015).

This emphasises the need for increasing diabetes awareness activities in the form of mass campaigns in both urban and rural areas. One of the important components of diabetes management is diabetes self-management education (DSME), which has been recognised to be effective in improving the clinical outcomes and quality of life of patients (Dube & Van den Broucke, 2015; Housiaux et al., 2015). With the exception of South Africa, the cadre of diabetic education in Sub-Saharan Africa was almost non-existent until 1998, when the first Pan African Diabetes Education Group (PADEG) leadership course for nurses was held in Tanzania. The role of DSME has being well documented in many studies. However, Sub-Saharan African countries are yet to benefit from DSME training programmes. Therefore, a training programme for diabetes self-management, including both preventive and curative

aspects, could greatly benefit patients with Diabetes Mellitus in their daily endeavor of managing the disease (Cunningham, Crittendon, White, Mills, Diaz, & LaNoue, 2018).

This study is aimed at implementing the DSME training programme in a rural setting of Nigeria and evaluating its effectiveness within the setting.

1.3 PROBLEM STATEMENT

Diabetes Mellitus is recognised as a group of heterogeneous disorders with the common element of hyperglycemia and glucose intolerance, due to insulin deficiency, impaired effectiveness of insulin action, or both. According to the 2019 International Diabetes Federation report T2DM estimates for Africa was 19.4 million in 2019, and projected to be 28.6 and 47.1 million by 2030 and 2045 respectively (Saeedi et al., 2019). T2DM is a common and serious global problem, which advanced due to rapid cultural and social changes, ageing populations, increasing urbanisation, dietary changes, reduced physical activity and other unhealthy behavioural patterns (Saeedi et al., 2019).

Diabetes self-management (DSME) remains the cornerstone of prevention of the development of diabetic complications. In addition, literature has alerted to the fact that rural areas in developing countries have the added burden of under-development and people having varied beliefs and misconceptions regarding diabetes (Cunningham et al., 2018). DSME may thus be used to increase community understanding of the special needs of people with the Diabetes Mellitus. DSME may also be used by health care professionals in promoting strategies for primary prevention of T2DM in the rural areas. Many of these strategies may bring about positive change in an individual's behaviour and therefore increase the understanding of the community and dispel the myths surrounding diabetes. While it is well established that DSME training is generally effective at enhancing health care behaviours, the specific effect of it on

several outcomes have not been evaluated for cultural population in rural areas of Jigawa State, Nigeria.

1.4 RESEARCH QUESTION

What is the effectiveness of the Diabetes Self-Management Education (DSME) training programme among individuals with T2DM in Jigawa State, Nigeria?

1.5 AIM OF THE STUDY

The overall aim of the study is to determine the effectiveness of the Diabetes Self-Management Education (DSME) training programme among individuals with T2DM in Jigawa State, Nigeria.

1.6 OBJECTIVES OF THE STUDY

PHASE 1: To determine the prevalence and awareness of individuals regarding Type 2 Diabetes Mellitus in Jigawa State, Nigeria.

- To determine the prevalence and awareness of Type 2 Diabetes Mellitus in Jigawa State, Nigeria.
- To determine the socio-demographic and behavioural risk factors associated with Type 2 Diabetes Mellitus in Jigawa State, Nigeria.
- To determine the health-related risk factors associated with Type 2 Diabetes Mellitus in Jigawa State, Nigeria.

PHASE 2: To explore the current practices regarding the management of Diabetes Mellitus in Jigawa State, Nigeria.

- To explore the current practices of health care professionals regarding the management of Type 2 Diabetes Mellitus in Jigawa State, Nigeria.

- To determine the views of individuals with Type 2 Diabetes Mellitus regarding the management of their disease.
- To explore challenges experienced by health care professional and clients with Type 2 Diabetes Mellitus regarding the management of the disease in Jigawa State, Nigeria.

PHASE 3: To implement and test the effectiveness of the DSME training programme at a selected community health centre in Jigawa State, Nigeria.

1.7 SIGNIFICANCE OF THE STUDY

Several possible causes for the Type 2 Diabetes Mellitus pandemic have been identified, namely westernisation, epidemiological transition, obesity and lack of physical activity. In addition, undiagnosed cases, underdevelopment and misconceptions regarding Diabetes Mellitus are added problems for rural areas and developing countries. Self-management strategies remain fundamental in the effort to prevent and combat diabetic complications. This underscores the need to empower people to make lifestyle changes. DSME will provide a training strategy for the health care providers in the prevention of Type 2 Diabetes Mellitus in the rural areas of Nigeria. The results of the study could shed some light on the prevalence of Diabetes Mellitus in rural Nigeria and generate information regarding the efficacy of a health education programme for Type 2 Diabetes Mellitus. This in turn may inform policy frameworks to guide health education initiatives in diabetes care and management in rural Nigeria.

1.8 DEFINITION OF TERMS

Awareness: A condition of being cognisant of surrounding and external phenomena as well as one's personal state (Medical Dictionary).

Behavioural Risk Factors: Any attitude characteristics, or exposure of any individual that increase the likelihood of developing a disease or injury (WHO, 2018).

Diabetes Self-Management Education (DSME): The ongoing process of facilitating the knowledge, skill and ability necessary for diabetes self-care. This process incorporates the needs, goals and life experience of the person with diabetes and is guided by evidence-based standards (Funnell & Siminerio et al., 2010).

Healthcare Professional: A person who by education, training, certification, or licensure is qualified to and is engaged in providing health care (Medical Dictionary).

Hyperglycaemia: A condition in which an excessive amount of glucose circulates in the blood plasma (WHO, 2018).

Moderate Physical Activity: Activities that take moderate physical effort and make you breathe somewhat harder than normal (International Physical Activity Questionnaire (IPAQ), 2001).

Non-Communicable Diseases (NCDs): Chronic diseases that are not passed from person to person. They are of long duration and generally slow progression (WHO, 2013).

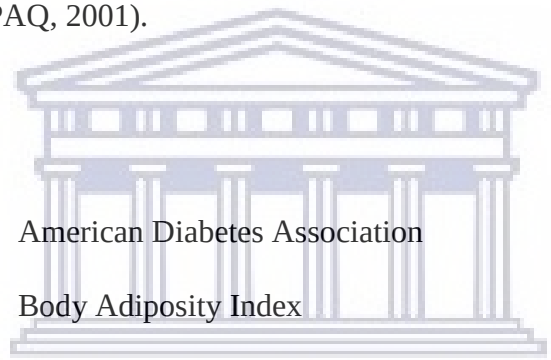
Overweight: Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Overweight is defined as a BMI greater than or equal to 25kg/m^2, while obesity is defined as a BMI greater than or equal to 30kg/m^2 (WHO, 2013).

Physical Activity: Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level that enhances life (Centre for Disease Control and Preventions, 2008).

Sedentary: Work or activities in which an individual spends a lot of time sitting down or not moving (Yang et al, 2019).

Type 2 Diabetes Mellitus: A common form of Diabetes Mellitus that develops especially in adults, and most often in obese individuals that is characterised by hyperglycemia, resulting from impaired insulin utilisation coupled with the body's inability to compensate with increased insulin production; also called non-insulin-dependent Diabetes Mellitus (Medical Dictionary).

Vigorous Physical Activity: Activities that take hard physical effort and make you breathe much harder than normal (IPAQ, 2001).



1.9 ABBREVIATIONS

ADA	American Diabetes Association
BAI	Body Adiposity Index
BF%	Body Fat Percentage
BLS	Bureau Labour of Statistics
BMI	Body Mass Index
BNF	British National Formulary
CDS	Centre for Disease Control and Prevention
CHC	Community Health Centres
CSM	Common Sense Model
DCR	Diabetes Care Report
DSME	Diabetes Self-Management Education
EMA	European Medicines Agency
HICs	High-Income Countries

HbA1c	Glycated Haemoglobin
HTN	Hypertension
IFG	Impaired Fasting Glucose
IDF	International Diabetes Federation
IGT	Impaired Glucose Tolerance
INO	International Nutrition Organisation
LMICs	Low and Middle-Income Countries
MET	Metabolic Equivalent
NCDs	Non-Communicable Diseases
NIDC	National Information Diabetes Clearinghouse
NIDDK	National Institute of Diabetes, Digestive & Kidney Diseases
NIHCE	National Institute for Health and Clinical Excellence
NPC	National Population Commission
PA	Physical Activity
PADEG	Pan African Diabetes Education Group
SES	Socio-Economic Status
SSA	Sub-Saharan Africa
T1DM	Type One Diabetes Mellitus
T2DM	Type Two Diabetes Mellitus
UKPDS	United Kingdom Prospective Diabetes Study
UNAIDS	United Nation Acquired Immune Deficiency Syndrome
WHO	World Health Organisation
WHR	Waist to Hip Ratio

1.10 SUMMARY OF THE CHAPTERS

Chapter One provides a brief summary on the public health problems related to Type 2 Diabetes Mellitus (T2DM). The factors contributing to Diabetes Mellitus (DM) in the rural areas are also discussed. The aims and specific objectives of the study are outlined. The significance of the study elaborates the urgent need to curb the threat of diabetes by designing interventions that are specific to rural Nigeria. Definition of terms, abbreviations and the summary of the thesis form the latter part of this chapter.

Chapter Two presents an extensive review that appraises reports of current literature related to the effectiveness of diabetes self-management education (DSME) training among individuals with Type 2 Diabetes Mellitus (T2DM) and other relevant themes. Specifically, the literature is organised as follows: Epidemiology of DM, including current trends in the prevalence of the disease, associated risk factors and complications of DM in Sub-Saharan Africa and globally; management of DM (physical activity, diet, behavioural, drug and surgery - merits and demerits of each of these) and detailed accounts of the use of Diabetes Self-Management Education (DSME) and the training thereof. The last part of the chapter presents the theoretical framework that forms the basis of the study.

Chapter Three specifies all methodological measures toward achieving the goal of this study. This chapter provides a detailed description of the methodology engaged in conducting this study. A broad description of the research setting, population and study sample, study approach and design, data collection procedures as well as data analysis are all explained. Ethics considerations pertaining to the study are also described.

Chapter Four contains the result from the quantitative data answering the objectives of the first phase of the study, namely to determine the prevalence and awareness of T2DM in Jigawa

State, Nigeria. The chapter also highlights the associations between demographic variables, risk factors, hyperglycemia and the prevalence of DM.

Chapter Five contains the qualitative results of the thematic analysis of the focus group discussions (FGDs) in order to answer the objectives set out in the second phase of the study, i.e. to explore the current practices regarding the management of T2DM in rural Nigeria. The results highlight the current practice and challenges encountered by both the patients and the health care professionals, and their views in the management of DM in the rural Nigeria.

Chapter Six outlines the results of the third phase of the study, i.e. the implementation of the DSME training programme at a selected community health center and the effectiveness thereof.

Chapter Seven provides an overall discussion of the findings of the study and compares the the findings with the salient literature. The chapter further provides a summary of the study and draws conclusions based on the findings. Limitations to the study are also described. Recommendations based on the main findings of the study are made.

CHAPTER TWO
REVIEW OF THE LITERATURE

2. INTRODUCTION

This chapter reviewed and appraised the reports of current literature related to Type 2 Diabetes Mellitus (T2DM) in general. The literature is presented as follows: epidemiology of Diabetes Mellitus (DM), including current trends in the prevalence of the disease, associated risk factors and complications of DM in Sub-Saharan Africa and globally; management of DM (physical activity, diet, behavioural changes, drugs and surgery - merits and demerits of each of these) and the use of Diabetes Self-Management Education (DSME) for T2DM. The chapter concludes with the theoretical framework that forms the basis of the study.

2.1 DESCRIPTION OF DIABETES MELLITUS

Diabetes Mellitus (DM) is a chronic endocrine disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood glucose), or when the body does not effectively use the insulin it produces (Donath, 2011) resulting in an array of clinical manifestations related to the utilisation of macromolecules in the body. Insulin is a hormone that regulates blood glucose (Donath, 2011) and hyperglycemia, or raised blood sugar, is a common effect of uncontrolled diabetes, which overtime, leads to serious damage to many of the systems of the body, especially the nerves and blood vessels. The disease has been described as a cluster of disorders of metabolism which results in a chronic hyperglycemic state (raised blood glucose) due to abnormality in insulin release or insulin action (hepatic and peripheral glucose uptake), with both of these defects occurring in some cases. It is a highly prevalent disease occurring globally, and without effective management and preventive strategies, the problem will continue to increase worldwide (Saeedi et al., 2019).

The disease is of two major types – Type 1 and Type 2 DM. Type 1 Diabetes Mellitus (T1DM) is primarily due to autoimmune-mediated destruction of the β cells of the islets of Langerhans of the pancrease, resulting in absolute defect in insulin production. Individuals with T1DM will require the administration of exogenous insulin to prevent complications such as ketoacidosis. Its prevalence is much lower than that of T2DM, which constitutes almost 100% of patients with diabetes worldwide (Wang, 2013). The etiology of T2DM is embedded in a very complex group of genetic and epigenetic systems interacting within an equally complex societal framework that determines behaviour and environmental influences (Zimmet, 2011). This type of DM is characterised by insulin resistance (IR) and/or a compromise in insulin secretion, either of which may be the predominant abnormality.

In contrast to individuals with T1DM, persons with T2DM do not depend on exogenous insulin, but this may be required for glycemic control in the presence of poor blood glucose control with dietary intervention alone or with oral hypoglycemic agents (Zimmet, 2011). Figure 2.1 below depicts the pancreas and its functions.

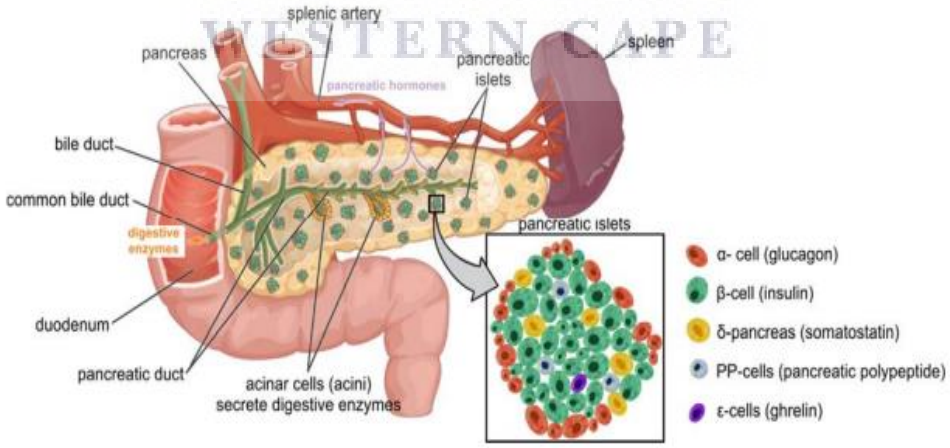


Figure 2.1 The Pancreatic Exocrine and Endocrine Function (OpenStax College. Anatomy & Physiology, 2016).

2.1.1 Global Estimates and Cost of Diabetes

The high global prevalence in DM is mainly related to T2DM and occurs in all nations, regardless of the level of development (Zimmet, 2011). Strangely, the problem is partly explained by advances that have occurred in public health beginning from the last century, with longevity increasing due to the eradication of numerous contagious diseases (Zimmet, 2011). In 2015 it was estimated that there were 415 million (uncertainty interval: 340 - 536 million) people with diabetes aged 20–79 years, 5.0 million deaths attributable to diabetes, and the total global health expenditure due to diabetes was estimated at 673 billion US Dollars. Three quarters (75%) of those with diabetes were living in low- and middle-income countries (LMICs). The number of people with diabetes aged 20–79 years old was predicted to rise to 642 million (uncertainty interval: 521–829 million) by 2040 (Ogurtsova, 2017). The tendency for the increased number of individuals with T2DM in lower socio-economic groups in industrialised nations and higher socio-economic groups in poor countries (Ginsberg, 2009) may be related to the fact that better education in affluent societies has resulted in individuals embracing behaviours that are more wholesome. In developing countries, the wealthy tend to consume energy-dense foods with little or no engagement in physical activity (Anderson, 2001). Undoubtedly, the number of people with DM worldwide is increasing at an alarming rate and it is attributed to advancing age, urbanisation and related behavioural changes (Zimmet, 2011).

Globally, the prevalence of DM has seen a more than two-fold surge in the last thirty years (Danaei, 2011). The International Diabetes Federation (IDF, 2015) reported that North America and the Caribbean region had the highest prevalence of diabetes among adults, followed by Europe and the Middle East. Africa and the West Pacific region have the lowest prevalence.

There were predictions that these trends would continue through 2030, which will pose enormous challenges for stakeholders in the management of diabetes globally (IDF, 2015). The global burden of DM has undergone several estimations (Sanghani, 2013). The International Diabetes Federation (IDF, 2015) estimates that over 100 million people worldwide had diabetes. An estimate of 124 million people was given in 1997, with a prediction of 221 million by the year 2010 (Zimmet, 2011). It was reported that the global burden due to DM would rise from 135 million in 1995 to 300 million in 2025, suggestive of an increase of 64%, 35% and 122% in the adult population, prevalence of DM in adults, and number of individuals with DM respectively (Sanghani, 2013). Globally, the number of people with DM has quadrupled in the past three decades, and recently diabetes mellitus is the ninth major cause of death. About 1 in 11 adults worldwide have Diabetes Mellitus, 90% of whom have T2DM (Zhang et al., 2013).

As of 2010, an estimated 285 million people had DM globally, with Type 2 accounting for approximately 90% of the cases (WHO, 2011). In 2013, an estimated 381 million people had diabetes (IDF, 2015). In industrialised nations, an 11% rise in the adult population, a 27% rise in the prevalence of adult diabetes, and a 42% rise in the number patients with DM were expected. On the other hand, developing nations were expected to witness a growth of 82% (adult population), 48% (prevalence of adult diabetes) and 170% (number of diabetics) (Sanghani, 2013). Over the past three decades, the number of people with T2DM worldwide has more than doubled, making it a key public health problem concerning all nations. In recent decades, DM has spread extensively, not only in high-income countries (HICs) but also in many low- and middle-income countries (LMICs). The world's most populous countries, India and China, attained prevalence rates of between 9% and 10%, corresponding to 65 and 100 million in absolute numbers, respectively. The high prevalence rates observed in Mexico (12.6%) and Egypt (16.8%) exceeds the rates in most HICs, including the USA (9.2%) and

Germany (8.2%). Taken together, in 2013, about two-thirds of all individuals with diabetes lived in LMICs. There is global trend for rates of diabetes to increase in populations as they move from a rural to an urban area is probably ascribed to decreasing physical activity as well as dietary changes. For example, rural Chinese have a prevalence of T2DM of 50%, less than half the rate of Singapore Chinese (10.5%). Thus, the rising prevalence of diabetes in LMICs appears to be fueled by rapid urbanisation, nutrition transition and increasingly sedentary lifestyles (Hu, 2011). The most prevalent form of diabetes by far is Type 2 diabetes, affecting about 90% of people with diabetes, while the remaining 10% mainly have Type 1 diabetes or gestational diabetes (IDF, 2015).

It has been estimated that 8.3% of adults, i.e. some 382 million people worldwide had diabetes, with a projected figure of 592 million or one in ten adults by the year 2035. This is equivalent to about three new cases every ten seconds or nearly ten million per year. The highest increases are expected to occur in developing nations (IDF, 2012). In 2012, diabetes was the direct cause of 1.5 million deaths and high blood glucose was the cause of over 2.2 million. In 2014, 8.4% of adults aged 18 years and older had diabetes. Since the 1990s, the incidence of T2DM has increased in children and adolescents, and is linked to the rise in childhood obesity. T2DM and its co-morbidities are risk factors for vascular diseases later in life (Britta & Lori, 2017). Figure 2.2 below presents the IDF Regions and global projections of the number of individuals with diabetes for the years 2015 and 2040.

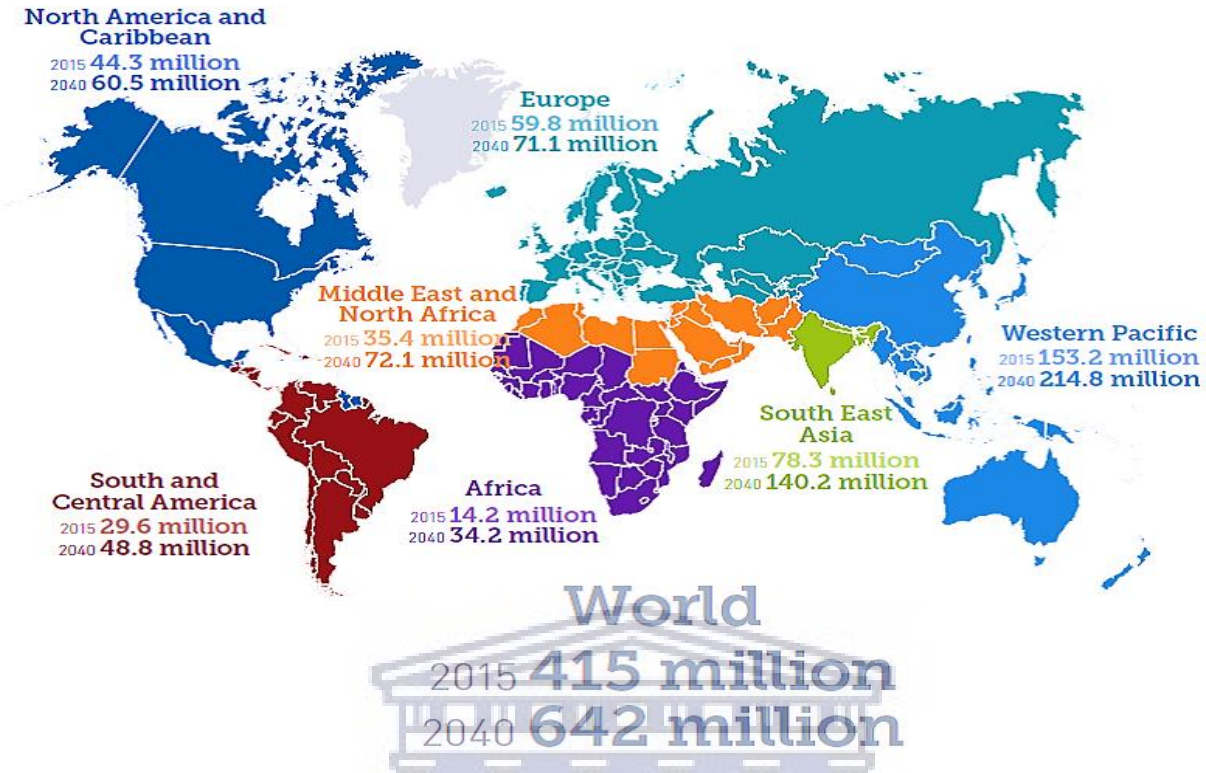


Figure 2.2 IDF Regions and Global Projections of the Number of People with Diabetes (20-79 years), 2015 and 2040 (IDF, 2015).

The global burden of DM measured in Disability Adjusted Life Years or DALYs, has risen by 43.1% over the last two decades. There has been a significant worldwide surge in the number of diabetes-associated mortality. The 2010 Global Burden of Disease Study reported 1.3 million deaths due to diabetes globally in 2010, which was twice as many as in 1990 (Lozano et al, 2012). For these reasons, DM was labelled as one of the most common, severe, and costly diseases (Lavigne, 2003). In the year 2015, there were five million deaths due to DM. This is alarming when compared to a total of 3.6 million deaths from Tuberculosis, HIV/AIDS and Malaria combined for the previous two years (see Figure 2.3).

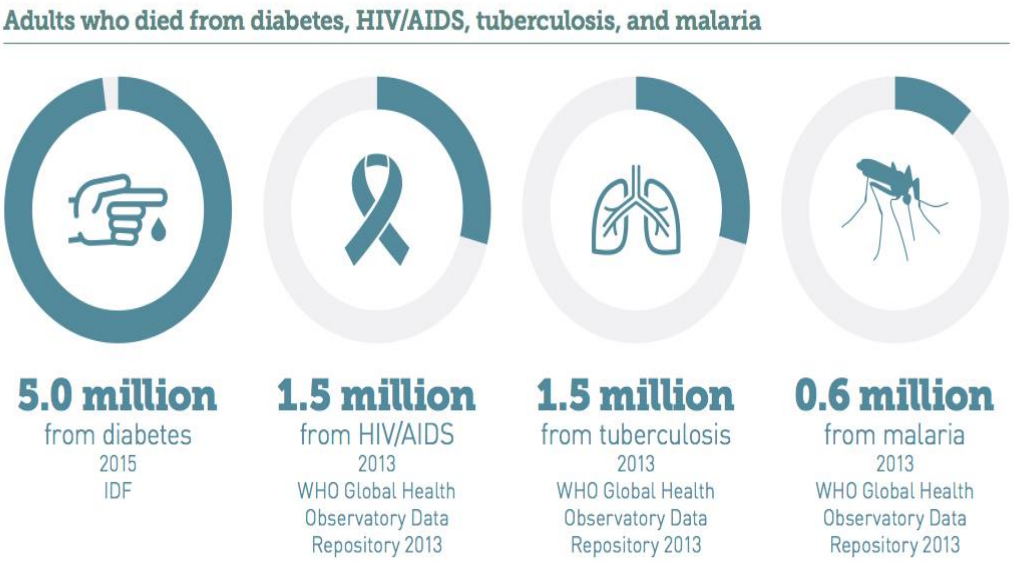


Figure 2.3 Comparative Deaths: Adults who died from Diabetes, HIV/AIDS, Tuberculosis, and Malaria (IDF, 2015).

The proportion of deaths due to diabetes in people under the age of 60 years by the International Diabetes Federation (IDF, 2013) are shown in Figure 2.4 below.

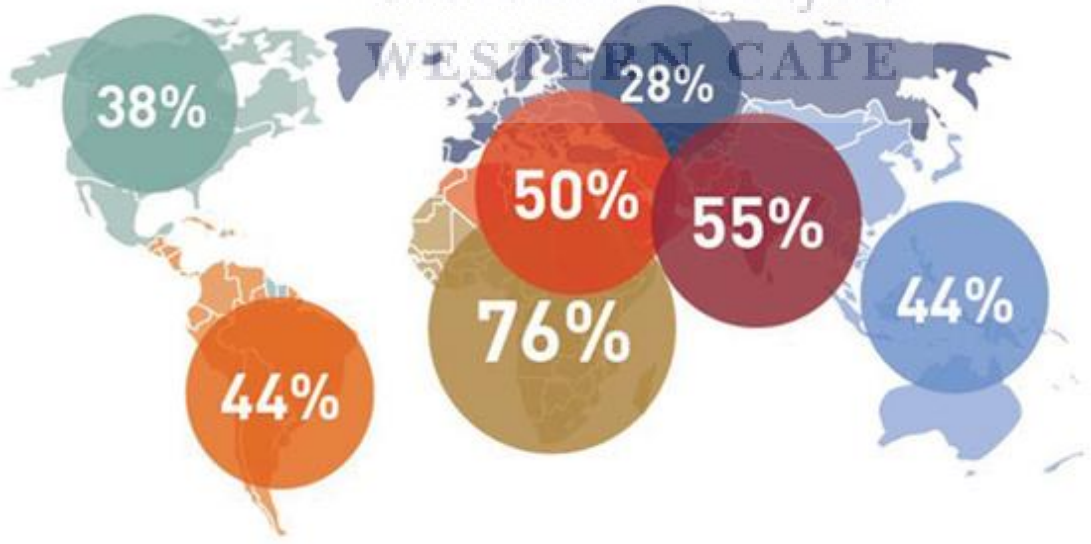


Figure 2.4 Proportion of Deaths due to Diabetes in Persons under 60 years of age (IDF, 2013).

Diabetes imposes a huge economic burden on the healthcare system, and therefore the affliction is at both individual and societal levels (ADA, 2008). There are health system expenditures incurred by society in the disease management, indirect expenditures due to losses in productivity and intangible costs (Kirigia, 2009). Some studies have also considered the cost of complications. For example, the two-year cost of treating a diabetic foot ulcer was 27,987 USD in 1995 which had risen to 46,841 USD fourteen years later (BLS, 2010). These huge amounts were associated with frequent out-patient visits, in-patient days, laboratory investigations, cost of medications, hospital stays, and secondary complications of osteomyelitis and amputation (Habib, 2010). Direct cost for amputation of the lower extremity was between $22,700 and $51,300 (Gordois, 2003).

In 2011, healthcare expenditure due to DM accounted for 11% of the overall healthcare expenditures globally (IDF, 2012). The global healthcare expenditures to treat DM and prevent complications were estimated at a total of $465 billion dollars in the same year. By 2030, this figure is anticipated to exceed $595 billion. The worldwide healthcare expenditure due to diabetes in 2015 and the projected figures for 2040 are shown in Figure 2.5 below.

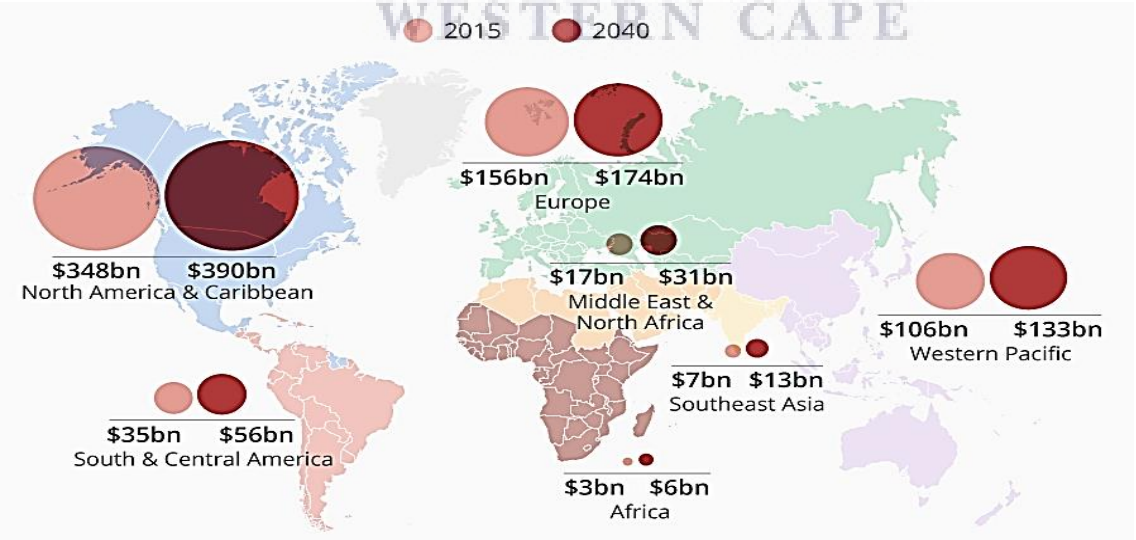


Figure 2.5 The Global Cost of Diabetes. Worldwide Healthcare Expenditure due to Diabetes in 2015 and 2040, by Region. Figures for 2040 are Forecasts (IDF, 2015).

2.1.2 Gender and Urban / Rural Distribution of Diabetes

There exists some disparity, albeit little, with respect to gender in the number of persons with diabetes worldwide for both 2015 and 2040. In 2014, there were around 15.7 million more men than women with DM (215.2 million men vs 199.5 million women). However, a surge is anticipated in this gap by one million (328.4 million men vs 313.3 million women) by the year 2040 (IDF, 2013).

In developing nations, the number of individuals with diabetes living in urban areas was about 269.7 million, while those residing in rural communities accounted for 145.1 million. There are predictions that by the year 2040, this difference will increase, with 477.9 million people residing in urban areas and 163.9 million in rural communities (IDF, 2015). This has been outlined in Figure 2.6 below.

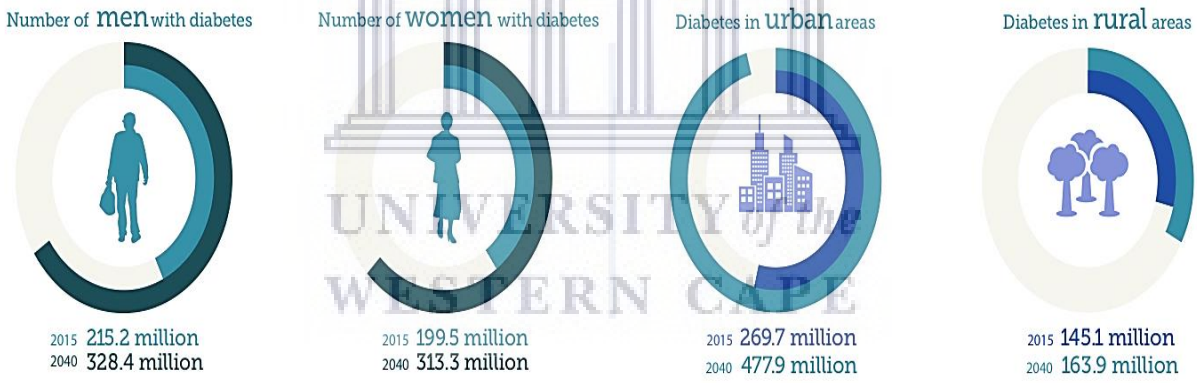


Figure 2.6 Diabetes by Gender and Urban/Rural Distribution (IDF, 2015).

2.1.3 Summary and Appraisal of the Epidemiological Review

To summarise, Diabetes Mellitus remains an increasingly prevalent disease globally, in both developing and developed countries. Despite the high prevalence and interest, complete and effective management and preventive strategies remains elusive. Currently, the global prevalence of Diabetes Mellitus is estimated to affect between 100 and 400 million individuals.

Diabetes Mellitus also accounts for significant economic costs, which is estimated at about $673 billion, about 11% of all healthcare costs, making it a significant health problem. Type 2 Diabetes Mellitus (T2DM) accounts for a significant proportion of Diabetes Mellitus. T2DM is increasingly prevalent in many parts of the world, with the majority of cases occurring in low-middle income countries due to urbanisation, environmental and lifestyle changes. Currently, little or no study has reported on the epidemiology of the disease in most parts of Sub-Saharan Africa, especially in the rural areas. Based on findings from the reviewed literature, it could be suggested that the prevalence of T2DM is higher in urban areas compared to rural areas, even in the Sub-Saharan African region. The existing studies have continually failed to capture the exact national and global burden of the disease, especially in the developing nations, due to a lack of accurate data for monitoring and surveillance. As a result, existing population-based study designs still fall far short of the standard requirements. Moreover, Zimmet (2016) orated that even the current estimates are imprecise, thereby only providing a rough picture, and probably under-estimating the disease burden of T2DM. Therefore, it could be suggested that higher quality population-based studies should be conducted on this topic.

2.2 THE DIABETES SCENARIO IN AFRICA

According to the International Diabetes Federation (IDF, 2015), of the estimated 415 million people stricken with DM globally, an estimated 14.2 million people aged 20–79 have the disease in Sub-Saharan Africa (SSA), representing a regional prevalence of 2.1–6.7 %. In addition, SSA has the highest proportion of undiagnosed cases of DM, with over two-thirds (66.7%) of those with the disease are not aware of their status. Generally, more than half of individuals with DM (58.8%) live in cities, in spite of the fact that the population in the region is largely rural (61.3%).

With increasing urbanisation and the ageing population, DM will pose an even greater threat. It is expected that by 2040 there will more than double the number of persons with DM than in 2015 in the SSA region (IDF, 2015).

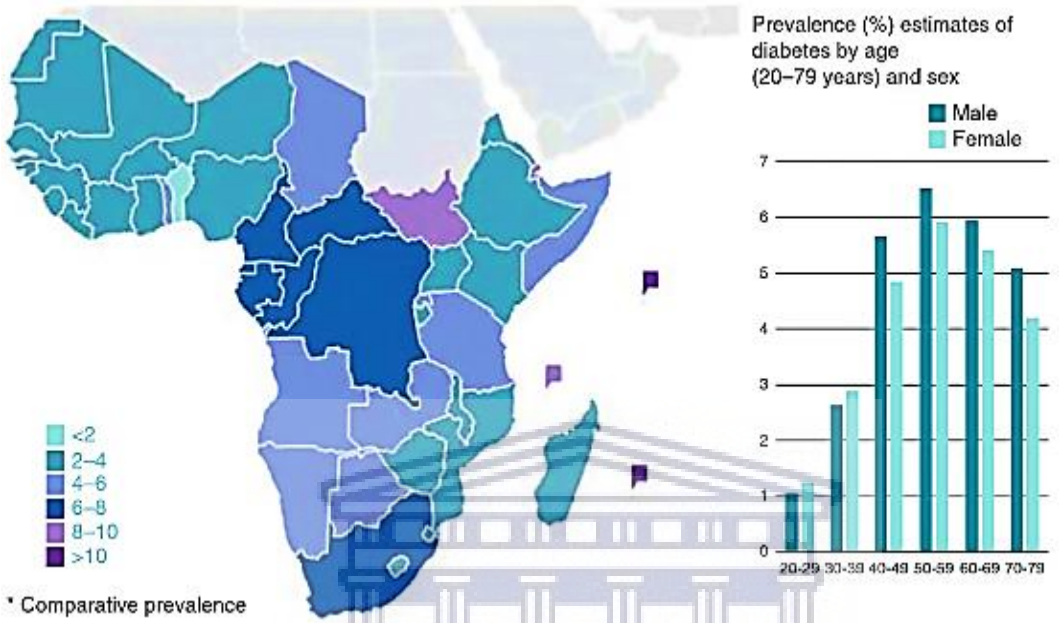


Figure 2.7 The Estimated Number of Adults with Diabetes in Sub-Saharan Africa by Age Group and Sex (IDF, 2015).

In Sub-Saharan Africa (SSA), as is in the rest of the world, there is a rising prevalence in diabetes, together with other non-communicable diseases (WHO, 2004). In 2010, it was estimated that 12.1 million people had DM in Africa, which has been predicted to surge to 23.9 million by the year 2030 (Sicree, Shaw, & Zimmet, 2009). From the IDF's more recent data, 14.2 million individuals had DM (in Africa) in the year 2015, with 34.2 million being predicted to have the disease by the year 2040 (IDF, 2015). Unfortunately, these large numbers are occurring in SSA, a region with the highest world-wide prevalence of HIV (UNAIDS, 2010), tuberculosis (WHO Tuberculosis, 2010) and malaria (WHO Malaria, 2010) epidemics. As it is elsewhere, T2DM accounts for over 90% of Diabetes Mellitus cases in the SSA (Levitt, 2008), while the other types or variants constitute the remainder percentage.

Studies conducted on the prevalence of T2DM within Africa in the general population noted a range from 0.6% in rural settlements such as villages in South Western Uganda (Maher, 2011) to 12% in urban Kenya (Christensen, 2009). While a prevalence rate of about 0-7% was observed in Cameroon, Ghana, Guinea, Kenya, Nigeria, South Africa and Uganda, Zimbabwe had a very high prevalence of >10% (Hall, 2011). Diabetes is incriminated as a causative factor in several other important diseases such as cardiovascular disease (Saydah, 2002), renal disease, as well as other non-communicable and communicable diseases which can considerably impact morbidity and mortality (Mayanja, 2010) Thus, SSA is grappling with the double burden of disease and limited resources, thereby over-stretching the already limited resources available. Nigeria has the highest burden of diabetes in Africa, followed by South Africa, Ethiopia and then Tanzania (see Table 2.1 below).

Table 2.1 Top Five Countries for Number of People with Diabetes (20-79 years old)

Countries/Territories	Number (millions)
1. Nigeria	3.9
2. South Africa	2.6
3. Ethiopia	1.8
4. Tanzania	1.7
5. Congo DRC	1.6

Note: Adapted from "IDF Diabetes Atlas" (IDF, 2013)

Diabetes Mellitus is not only a highly prevalent disease, but also a costly one, with research studies indicating the enormous associated economic burden. A study conducted in a South Western State in Nigeria revealed the annual cost of DM to be almost $21,000 for the 52 patients studied, while the average annual cost of per patient was $400, with the cost being

higher in those within the 60-69 years age bracket (Ipingbemi & Erhun, 2015). The very expensive nature of treatment for DM in the WHO's African region has been emphasised. It was estimated that the direct cost of diabetes management in the year 2000 was between 2,302 USD and 3,207 USD per person (Kirigia, 2009). In the year 2010, the national funding for the healthcare of persons with DM in Africa was estimated at $111 per person (Zhang, 2009), which amounted to 7% of national healthcare expenditure, indicative of a substantial difference between the cost and available expenditure (Zhang, 2009). With lean national budget and earnings that may unfortunately not be sustainable, individual patients and their families may have to use a large portion of these earnings on diabetes management.

In a study conducted in Sudan, it was observed that families spent an average of 283 USD per year providing care for their child with diabetes, amounting to 65% of the family's yearly spending on health (Bennet et al., 2011). In this scenario, other healthcare needs are possibly ignored with >50% of yearly expenditure on health being devoted to diabetes management for one member of the family with the disease (Hall, 2011). It was observed in a Nigerian study, that the average direct cost of illness per patient with T2DM was only $284.57, while that of T1DM was $625.21 USD. Patients with hypertension (HTN), in addition to T2DM, had $372.55 as the mean annual cost of illness, while the mean cost for those with T1DM who also had HTN was $713.18. The annual national direct cost of illness for T2DM patients was in the range of $1, 639 to $122 840, with 112 to $537 001.25 being the estimate for T1DM (Suleiman et al, 2015).

Though T2DM occurs throughout the world and is more common in developed countries, the greatest rise in prevalence is, however, expected to occur in Asia and Africa (Decode, 2010).

2.2.1. Type 2 Diabetes Mellitus in Sub-Saharan Africa

The prevalence of T2DM in SSA is estimated at 2.1–6.7 %. However, these figures do not include a very high proportion of undiagnosed cases of DM in the region, which is currently estimated at over 60%. DM alone accounts for significant healthcare costs and as a cause of morbidity and mortality in SSA (Dall et al., 2010). Also, The SSA region is faced with other disease burdens, as well as a very high poverty rate. Being the world's poorest region, very little research has been commissioned across the region. Nonetheless, the few available studies tend to suggest that Nigeria has one of the highest prevalence rates for diabetes in Africa. This is not surprising, since Nigeria remains the most populated nation in Africa. Unfortunately, these results are mainly based upon small samples, local or regional studies that may not be generalisable across the whole country (IDF, 2013). The IDF accounted for the major source of reliable data on DM from this region. Furthermore, the available results of the data from the rural areas of the SSA tend to suggest that the prevalence rate is quite low (0.6%) compared to the average prevalence or urban areas (above 10%) (see Table 2.2 below).

Table 2.2 Top Five Countries for Prevalence (%) of Diabetes (20-79 years old)

Countries/territories	Percentage
1. Reunion	15.38
2. Seychelles	12.14
3. Gabon	10.71
4. Zimbabwe	9.73
5. South Africa	9.27

Note: Adapted from "IDF Diabetes Atlas" (IDF, 2013)

2.3 PREVALENCE OF DIABETES MELLITUS IN NIGERIA

Nigeria is the most populated country in Africa with about 170 million people, of which an estimated 4 million people have DM, accounting for a fifth of all diabetes cases in Sub-Saharan Africa (IDF, 2015). Diabetes has a wide range of prevalence across Nigeria. It is suggested that one-third of all the cases of diabetes are in the rural communities, while the rest are in the urban centres (Oputa & Chinenye, 2015). A study conducted in 2012 reported a prevalence range of less than 1% in rural Mangu village to 11% in urban Lagos. In the rural areas of Nigeria, diabetes is prevalent in 0-2% of the population, whereas in the urban regions the figures are much higher at 5-10% (Nyenwe, Odia, Ihekwaba, Ojule & Babatunde, 2003). In selected urban cities, up to 23.4% individuals of higher socio-economic status in urban Port Harcourt have DM (Nwafor, 2001), which was higher than those of lower socio-economic status (16%) (Nwafor, 2001). The difference in prevalence has often been attributed to westernisation and demographic transition due to increasing rural-to-urban migration.

A national survey has shown a rise in prevalence from 2.2% in 1997 to 5.0% by 2013 (Akinkugbe, 1997). The WHO projected a rise in prevalence of DM in Nigeria from 1.7 million in 2000 to 4.8 million by the year 2030. The disease burden is very high as persons with DM are 2-4 times at risk of death as a result of heart disease and stroke compared to their counterparts without the disease. In addition, more often than not, DM co-exists with obesity, hypertension and dyslipidemia (Tam, 2010). Of greater concern than the absolute number of people with DM in Nigeria, is the number who remain undiagnosed or untreated (70%-80% of the 4 million) (IDF, 2013). This relatively large number mounts great pressure on the scant budget allocated to healthcare in Nigeria. Predictably, many patients will present to healthcare facilities with advanced disease and attendant high morbidity and mortality. Diabetes-related deaths in Nigeria in the year 2013 were estimated at 105,091 cases (IDF, 2013).

The prevalence of DM among children in Nigeria is not high, but available local anecdotal and clinic reports have suggested that the number of children and adolescents with the disease is gradually increasing (Oluwayemi, 2015). Ofoegbu and Chinenye (2013) observed the complications of DM to be common at the time of presentation in Nigeria as follows: 56%, 36%, 9% and 7% for neuropathy, erectile dysfunction, nephropathy and retinopathy respectively. This is partially due to the progressive nature of the disease which is initially asymptomatic with on-going tissue damage and deterioration in pancreatic β cell mass and function. Figure 2.8 depicts some of the major complications of T2DM.

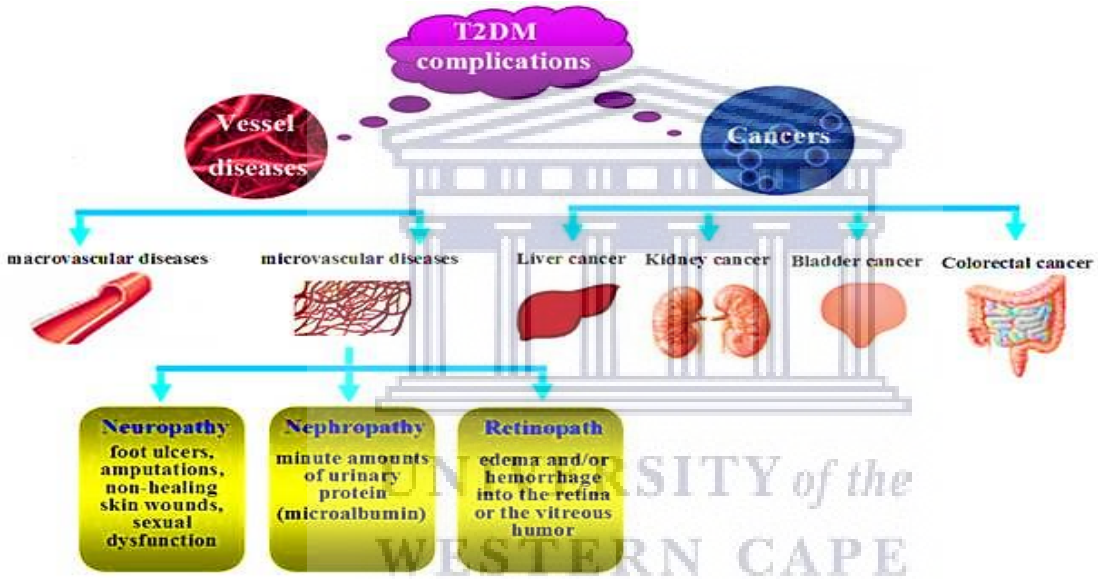


Figure 2.8 Complications of T2DM (Wu, 2014).

2.4 RISK FACTORS ASSOCIATED WITH DEVELOPMENT OF TYPE 2 DIABETES MELLITUS

Type 2 Diabetes Mellitus is one of the greatest public health threats of the 21st century. Changes in human behaviour and lifestyle associated with globalisation have resulted in dramatic increase in its prevalence and incidence worldwide (Zimmet, 2011).

Therefore, T2DM should be investigated in adults of any age who are overweight and have one or more risk factors for the development of the disease. For those without these risk factors, testing should begin at the age of 45 years. If the results are normal, testing should be repeated at least every three years (Whiting, & Shaw, 2011). Many risk factors the development of T2DM exist and may be related to advancing age, gender and elevated blood glucose on previous testing (Vinholes & Bittencourt, 2013). The various risk factors for T2DM include: unhealthy diet (fast food, excess refined sugar, excess salt, low fibre); overweight/obesity, lack of regular physical exercise, excessive use of alcohol, advancing age, hypertension, family history, history of previous Impaired Glucose Tolerance (IGT) or Impaired Fasting Glucose (IFG), dyslipidemia, history of GDM or large babies, and ethnicity.

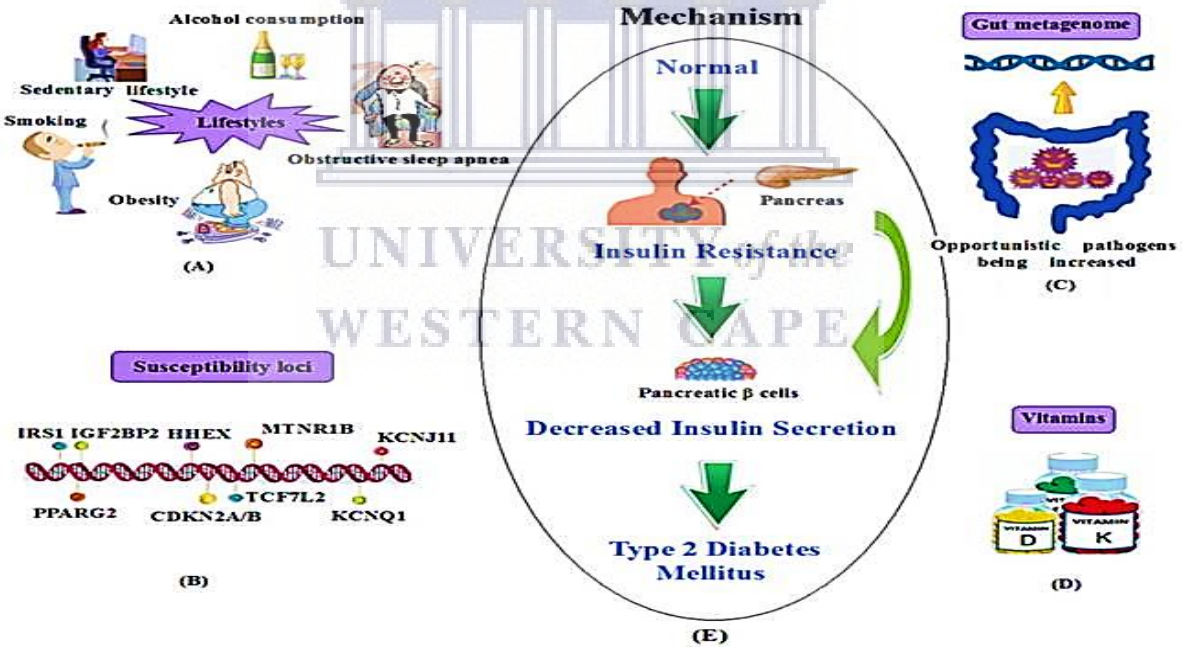
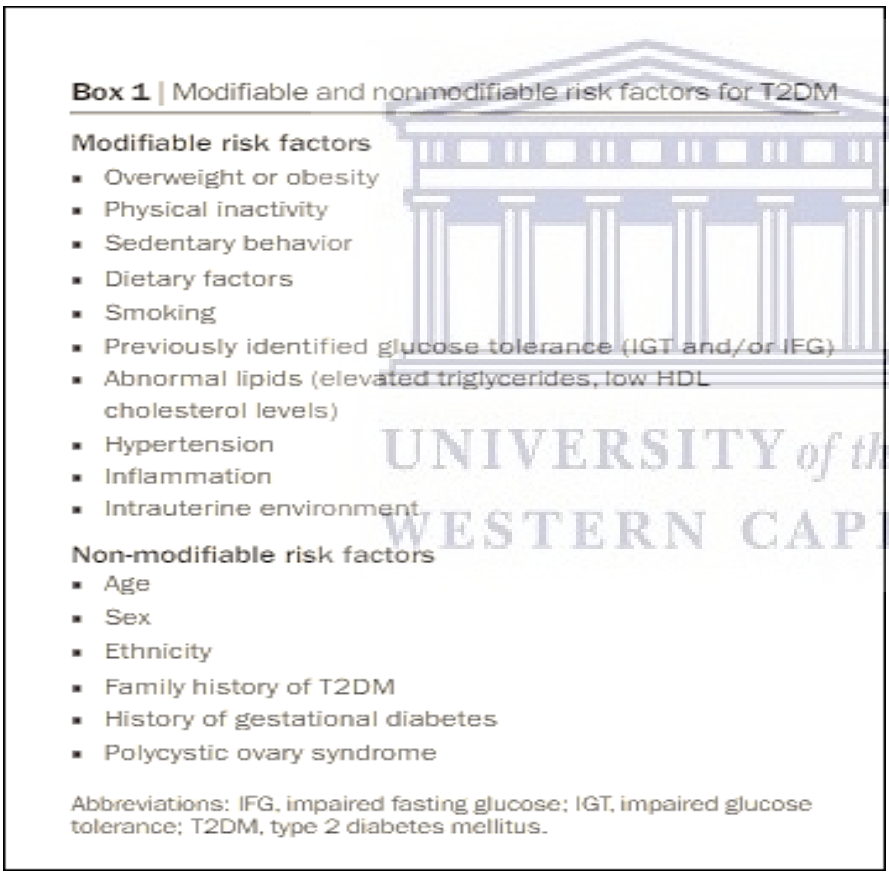


Figure 2.9 Influencing Factors and Mechanism of T2DM (Wu, 2014).

Some of these risk factors are modifiable, while others are not (see Figure 2.10 below). Modifiable risk factors include excess body fat (Shrivastava, Shrivastava & Ramasamy, 2013),

central obesity or fat distribution around the abdomen (Barrero et al., 2012) and physical inactivity (Hu, 2011).

Unmodifiable risk factors include increasing age, a family history of T2DM, and ethnicity, with those from African, Caribbean, South Asian and Polynesian descent, and Native Americans and indigenous people of Australasia having higher risk of developing the condition (Rutebemberwa, 2013). In addition, psychological factors such as depression and schizophrenia can also predispose the individual to the development of the disease (Amin, Al-Sultan & Ali, 2008).



Box 1 | Modifiable and nonmodifiable risk factors for T2DM

Modifiable risk factors

- Overweight or obesity
- Physical inactivity
- Sedentary behavior
- Dietary factors
- Smoking
- Previously identified glucose tolerance (IGT and/or IFG)
- Abnormal lipids (elevated triglycerides, low HDL cholesterol levels)
- Hypertension
- Inflammation
- Intrauterine environment

Non-modifiable risk factors

- Age
- Sex
- Ethnicity
- Family history of T2DM
- History of gestational diabetes
- Polycystic ovary syndrome

Abbreviations: IFG, impaired fasting glucose; IGT, impaired glucose tolerance; T2DM, type 2 diabetes mellitus.

Figure 2.10 The Worldwide Epidemiology of Type 2 Diabetes Mellitus - Present and Future Perspectives (Chen, 2012).

The significance of socio-economic status in diabetes risk has been well documented, with a diagnosis of diabetes more likely in people of lower socio-economic status (Maiti et al., 2004).

The risk of contracting T2DM was associated with low socio-economic position in high, middle- and low-income countries. The strength of the association was consistent in high income countries, whereas there is a strong need for further investigation in middle- and low-income countries (Zimmet, 2011).

The mechanism through which low socio-economic position could relate to T2DM is not clear. In most of the included studies, unhealthy characteristics could not fully explain socio-economic differences in T2DM incidence, indicating that other factors may be involved, for example, a few of the included studies adjusted for psycho-social stress factors (Kyrou et al 2020; Pan et al, 2019). A lower socio-economic status is related to higher stress level (Meyer, 2008) and long-term stress affects the entire neuro-endocrine system involving endocrine perturbations, which in turn may lead to T2DM (Di Dalmazi, 2012). Socio-economic inequalities in T2DM incidence were more pronounced in women than men. This is in line with a previous cross-sectional finding by (Espelt, 2008). A possible explanation could be that women in lower socio-economic position groups are obese, physically inactive and experience psycho-social stress to a higher extent than men in these group (Tang, 2003).

2.5 TYPE 2 DIABETES MELLITUS CO-MORBIDITIES

Individuals with T2DM are at increased risk for associated co-morbidities, including hypertension (with associated changes in cardiac structure), dyslipidemia, and non-alcoholic fatty liver diseases. The morbidity from T2DM predominantly relates to its microvascular and macrovascular complications. Patients with T2DM are at higher risk of stroke and cardiovascular disease as well as renal impairment, retinopathy and peripheral nerve damage.

Data from the 2012–2013 National Diabetes Audit showed that in patients with diabetes, the risk of stroke increased by 62.6%, angina by 138.8%, heart attack by 94.2% and end-stage

renal failure requiring renal replacement therapy by 272.3% (Audit & National Diabetes, 2013.).

Patients with T2DM, especially those with sub-optimal glycemic control, hypertension, and dyslipidemia also are at risk of vascular complications. This has been best established in adults, but accumulating data suggest that it is also the case for children and adolescents with T2DM (Pinhas-Hamiel & Zeitler, 2007). One study reported mean glycated hemoglobin concentration of 12% percent, even among patients involved in active follow-up (Pinhas-Hamiel & Zeitler, 2005). Youth with T2DM have higher risk for vascular disease and retinopathy, compared to those with T1DM, after adjustment for age, disease, glycaemia and obesity (Grossman, 2017). Diabetic ketoacidosis and hyperosmolar hyperglycemia are acute complications that sometimes develop in adolescent patients with T2DM (Rewers, 2014).

2.6 MANAGEMENT OF TYPE 2 DIABETES MELLITUS

The goals in caring for patients with T2DM are to eliminate symptoms and prevent, or at least slow down, the development of complications. Micro-vascular (i.e. eye and kidney diseases) risk reduction is accomplished through glycemic and blood pressure control; macro-vascular (i.e. coronary, cerebrovascular, peripheral vascular) risk reduction are through control of lipids and hypertension, smoking cessation and aspirin therapy. Metabolic and neurologic risk reduction is also achieved by attaining optimal blood glucose (Khardoni & Romesh, 2017).

2.6.1 Pharmacological Management

Recently, a stepwise, progressive approach to pharmacotherapy has been proposed, with emphasis on the significance of individualising therapy. Thus, an HbA1c goal of >6.5%, even 7% to 8%, may be appropriate for some patients, for example, those with reduced life expectancy, a history of severe hypoglycemia, or serious co-morbidity (Garber, 2017). The

recommended initial T2DM management approach includes lifestyle changes and mono-therapy (usually with metformin) (Garber, 2017). Failure to attain the HbA1c target within about three months of starting initial therapy should warrant the use of an additional agent. After a further reassessment of glycemic control in three months, triple therapy should be considered if the HbA1c goal has not been met. If the HbA1c goal has still not been attained, combination injectable therapy, including basal insulin may be considered to obtain glycemic control.

While the control of blood glucose, blood pressure and cardiovascular risk can improve outcomes (Sanghani, 2013), current treatment options are not without problems, frequently leading to weight gain and increased risk of hypoglycemia. The current T2DM management options and potential future therapies are described in the sections below.

- **Current Management**

UK strategies for the management of T2DM are currently based on evidence from The UK Perspective Diabetes Study (UKPDS), a large prospective study in patients newly diagnosed with Type 2 diabetes that spanned over three decades. The results of the study by Sanghani (2013) established that improving glycemic control significantly reduced the rate of diabetes complications, including retinopathy, neuropathy, nephropathy and diabetes-related deaths.

Data from the study showed that for every 1% reduction in Glycated Haemoglobin (HbA1c), there was a 35% reduction in microvascular complications and a 25% reduction in diabetes-related deaths (ADA, 2000). Importantly, the reduction in diabetes-related risk shows a 'legacy effect', namely the improved outcomes for those with better controlled blood sugars persisted for many years after the study had finished, even though the difference in glycaemia control ceased after the trial ended (Campbell, 2009). Early diagnosis and more aggressive treatment for blood glucose levels are therefore associated with improved clinical outcomes.

Metformin is unequivocally the first-line treatment in patients with Type 2 diabetes. It belongs to the biguanide class of drugs and acts by increasing hepatic insulin sensitivity. It also increases the uptake of glucose into peripheral cells, reduces hepatic glucose production and aids weight loss (UKPDS, 1998). Metformin can induce gastrointestinal side effects such as abdominal bloating, cramps, nausea, vomiting and diarrhea, which can be mitigated by starting metformin at a low dose. The British National Formulary recommends starting at 500mg of metformin once daily for at least a week prior to the titrate the dose up to a maximum to 2g daily in divided doses (BNF, 2015). Caution is advised when used in patients with impaired renal function or other conditions that may increase the risk of lactic acidosis, such as acute heart failure or shock. However, a Cochrane review of trials that included patients on metformin suggests that the potential risk of developing lactic acidosis is often overstated (Salpeter, Greyber & Pasternak, 2010).

Sulfonylureas (for example, gliclazide, glimepiride, and meglitinides) are commonly used as second-line agents in patients with Type 2 diabetes. It can also be used as an alternative first-line treatment instead of metformin, if the patient is not overweight, or is unable to tolerate metformin. Sulfonylureas can also be added to metformin if glycemic control is inadequate.

Sulfonylureas act by binding to a specific receptor on pancreatic beta cells, leading to increased secretion of endogenous insulin. The main side effects of sulfonylureas are weight gain and hypoglycemia (Tran, 2015), and risk is increased in people with mild to moderate renal impairment and severe hepatic impairment.

Thiazolidinedione (for example, pioglitazone) is an alternative second-line or a third-line therapy, although it has increasingly lost favour because of its adverse effects. The National Institute for Health and Care Excellence (NIHCE, 2009) recommends that it should be considered as second-line therapy in addition to metformin. NICE suggests that in these cases

the risks and benefits should be discussed with each patient (NIHCE, 2009). Thiazolidinediones act via the peroxisome proliferator-activated receptor-γ (PPAR-γ), a nuclear transcription factor to decrease insulin resistance and have been shown to lead to a significant reduction in HbA1C, both as a monotherapy and when used in combination with other oral agents such as metformin and/or sulphonylureas. Thiazolidinediones are associated with an increased fracture risk (Lyssenko, 2013) and in some patients may have led to heart failure. In 2010, the European Medicines Agency (EMA) suspended marketing authorisation for rosiglitazone, as new evidence suggested that its cardiovascular risks outweighed its benefits. There is also a possible increased risk of bladder cancer with use of pioglitazone.

Insulin replacement therapy will eventually be required in the majority of patients with Type 2 diabetes. Ideally, this would mimic the normal pattern of insulin secretion, where a background level of insulin is supplemented by higher release of insulin to match the glucose load following a meal. Oral agents are usually continued in patients who are starting insulin, but this may need to be reviewed if hypoglycemia is a problem. Broadly, there are three strategies of insulin replacement; a basal insulin alone, twice daily biphasic insulin containing a mix of rapid-acting and long-acting insulins and a basal bolus regimen with a long-acting insulin, with additional doses of a short acting insulin given at meal times. Patients with T2DM who are already taking oral agents may initially only need long-acting basal insulin to improve their glycemic control. Alternatively, premixed insulin can be used twice daily to provide both long-acting and short-acting insulin. This is potentially more convenient, but is less flexible than other regimens and may be better for patients with regimented mealtimes. A basal bolus regimen is more flexible, but has the disadvantage of requiring four injections each day.

All insulin regimens are associated with an increased risk of hypoglycemia and can cause weight gain. In addition, fear of injections, perceived complexity of the treatment regimens, and concern about failure to self-manage the disease can form barriers to starting insulin treatment (Haggar, 2014).

- **Recent Therapies Targeting the Incretin Axis**

In recent years, a greater understanding of the normal physiology of insulin release and technological advances in drugs and therapeutics has led to new targets to improve glycemic control. One such target is the incretin axis. In non-diabetic individuals, the insulin response is increased following ingestion of food as a result of the release of incretin hormones including glucagon-like peptide-1 (GLP-1). This response is reduced in patients with diabetes. The incretin hormones lead to glucose dependent insulin release and reduced glucagon release. *In vivo* the incretin hormones are quickly broken down by the hormone dipeptidyl peptidase-4 (DDP4) (Prasad-Reddy & Isaacs, 2015). *In vivo*, endogenous GLP-1 has a half-life of a few minutes as it is rapidly degraded by DDP4. GLP-1 receptor agonists (for example, exenatide, liraglutide, lixisenatide, dulaglutide) target the incretin axis by increasing the action of GLP-1. Exenatide is derived from the saliva of a reptile, the gila monster, and is structurally similar to GLP-1, leading to longer lasting glucose dependent insulin release (Prasad-Reddy & Isaacs, 2015).

Liraglutide is another synthetic GLP-1 which resists degradation by DDP4 by fatty acid substitution (Prasad-Reddy & Isaacs, 2015). Collectively, GLP-1 receptor agonists increase insulin release; decrease glucagon release and slow gastric emptying (see 'Actions of newer diabetes therapies targeting the incretin axes'). In contrast to many diabetes treatments, GLP-1 receptor agonists aid weight loss, and liraglutide was recently licensed for non-diabetic individuals as a weight loss treatment (Pi-Sunyer, 2015). A common side effect of GLP-1

receptor agonists is nausea, which is usually temporary and disappears around two weeks after treatment initiation. In addition, GLP-1 receptors also increase satiety and augment weight loss. At present, GLP-1 receptor agonists are only available in an injectable form.

DDP4 Inhibitors (for example, sitagliptin, linagliptin, saxagliptin, vildagliptin) are recommended by NIHCE as an alternative second-line or third-line therapy. Because of their mechanism of action, DDP4 inhibitors have a low risk of hypo-glycaemia and do not lead to weight gain (Nauck, 2014).

2.6.2 Non-Pharmacological Management of Diabetes Mellitus

- **Diet Therapy**

The role of diet in the etiology of T2DM was proposed by Indians who observed that the disease was almost confined to rich people who consumed oil, flour, and sugar in excessive amounts (Sharma, Kumar, Mishra & Gupta, 2010). During the First and Second World Wars, declines in the diabetes mortality rates were documented due to food shortage in the involved countries, such as Germany and other European countries. In Berlin, the diabetes mortality rate declined from 23.1 per 100,000 in 1914 to 10.9 per 100,000 in 1919.

In contrast, there was no change in diabetes mortality rate in other countries with no shortage of food at the same time period, such as Japan and North American countries.

Research found a strong association of T2DM with high intakes of carbohydrates and fats (Ekamper et al., 2014). In addition, a positive association was found between high intake of sugars and the development of T2DM (Khatib, 2004). Ludwig, Peterson and Gortmaker (2001) investigated more than 500 ethnically diverse schoolchildren for nineteen months. It was found that for each additional serving of carbonated drinks consumed, frequency of

obesity increased, after adjusting for different parameters such as dietary, demographic, anthropometric, and lifestyle.

A study was conducted which included the diabetic patients with differing degrees of glycemic control. There were no differences in the mean daily plasma glucose levels or diurnal glucose profiles. As with carbohydrates, the association between dietary fats and T2DM was also inconsistent (Peterson et al., 1986). Many of prospective studies have found relations between fat intake and subsequent risk of developing T2DM. In a diabetes study conducted at San Louis Valley, more than a thousand subjects without a prior diagnosis of diabetes were prospectively investigated for four years. The researchers found an association between fat intake, T2DM and impaired glucose tolerance (Misra, Singhal & Khurana, 2010). Another study observed the relationship of the various diet components among two groups of women, including fat, fibre plus sucrose, and the risk of T2DM. After adjustment, no associations were found between intakes of fat, sucrose, carbohydrate or fibre and risk of diabetes in both groups (Giovannucci, 2003).

Food intake has been strongly linked with obesity, not only related to the volume of food, but also in terms of the composition and quality of diet (Amin, Al-Sultan & Ali, 2008). Evidence suggested a link between the intake of soft drinks, obesity and diabetes as a result of large amounts of high fructose corn syrup used in the manufacturing of soft drink. This leads to raised BMI and blood glucose levels (Nseir, 2010).

Assy (2008) also found that diet soft drinks contain glycated chemicals that markedly augment insulin resistance. Furthermore, a high intake of red meat, sweets and fried foods contribute to the increased risk of insulin resistance and T2DM (Panagiotakos & Stefanadis et al., 2005). In contrast, an inverse correlation was observed between intake of vegetables and T2DM.

Consumption of fruits and vegetables may protect the development of T2DM, as vegetables are rich in nutrients, fibre and anti-oxidants, which are considered a protective barrier against disease (Villegas et al., 2008). Elevated intake of white rice in Japanese women was associated with an increased risk of T2DM (Nanri et al., 2010). This demands an urgent need for changing lifestyle among general population and further increase the awareness of healthy diet patterns in all groups.

The American Diabetes Association has defined self-dietary management as the key step in providing people suffering from diabetics the knowledge and skill in relation with treatment, nutritional aspects, medications and complications. A study showed that the dietary knowledge of the targeted group who were at high risk of developing T2DM was poor. Red meat and fried food were consumed more by males as compared to females (Mohieldein, Alzohairy & Hasan, 2011).

In recent times in Saudi Arabia, food choices, size of portions and sedentary lifestyle have increased dramatically, resulting in high risk of obesity. Unfortunately, many Saudi Arabians are becoming more obese because of the convenience of fast foods, adding to the alarming diabetes statistics (Badran & Laher, 2011). On the other hand, Saudi Arabians consume a large number of high-sugar drinks. In addition, (Backman, 2002) reported dietary knowledge to be a significant factor that influences dietary behaviours. Another study conducted stated that patients' food selection and dietary behaviours may be influenced by the strong knowledge about diabetic diet recommendations (Savoca & Miller, 2001). A significant positive relationship was observed between knowledge regarding a diabetic diet and the amount of calorie needs ($r = 0.27$, $P < 0.05$) (Primanda et al., 2011). The study concluded that knowledge regarding a diabetic diet is essential, and is needed to achieve better dietary behaviours. Results

of a study conducted in Saudi Arabia reported that more than half of the diabetic patients denied modifying their dietary pattern, reduction in weight and perform exercise (Bani, 2015) .

The National Centre for Health Statistics reported that socio-economic status plays an important role in the development of T2DM. It is was known as a disease of the rich (Sami et al., 2016). On the contrary, the same reference reported that T2DM was more prevalent in lower-income level groups and in those with lower education. The differences may be due to the type of food consumed. Nutritionists advised that nutrition is very important in managing diabetes - not only the type of food, but also the quantity of food which influences blood sugar. Meals should be consumed at regular times with low fat and high fibre content, including a limited amount of carbohydrates. It was observed that daily consumption of protein, fat and energy intake by Saudi Arabian residents were higher than what is recommended by the International Nutritional Organisation (Shai & Tangi-Rozental et al., 2008).

DM can be controlled through the improvement in a patient's dietary knowledge, attitudes, and practices. These factors are considered as an integral part of comprehensive diabetes care (Islam, 2015). Although the prevalence of DM is high in Gulf countries, patients are still deficient in understanding the importance of diet in diabetes management (Abdel-Wahab & El-Khawaga, 2015). Studies have shown that assessing patients' dietary attitudes may have a considerable benefit toward treatment compliance as well as decreasing the occurrence rate of complications as well. A study conducted in Egypt reported that the attitude of the patients towards food, compliance to treatment, food control with and without drug use and foot care was inadequate (Carr-Hill et al, 2005).

Research found that one-third of patients with diabetes was aware about the importance of diet planning, and limiting carbohydrate intake to prevent CVD (Alomar, Al-Ansari, & Hassan, 2019). Various studies have documented an increased prevalence in eating disorders and eating

disorder symptoms in T2DM patients. Most of these studies have discussed a binge eating disorder, due to its strong correlation with obesity, as a condition that leads to T2DM. Furthermore, weight gain among patients with diabetes was associated with the eating disorder due to psychological distress (Al-Hamdan et al., 2005). Berkman (2006) examined eating disorder-related symptoms in patients with T2DM. The researcher suggested that the dieting-bingeing sequence can be applied to diabetics, especially obese diabetic patients. Unhealthy eating habits and physical inactivity are the leading causes of diabetes.

Failure to follow a strict diet plan and workout, along with prescribed medication are the leading causes of complications among patients of T2DM (Gæde, 2008). Midhet (2010) reported that most patients with diabetes in Saudi Arabia do not regard the advice given by their physicians regarding diet planning, diet modification and exercise. Patients with diabetic dietary practices are mainly influenced by cultural backgrounds. Concerning each of the dimensions of dietary practices, there was a significant positive relationship between knowledge regarding diabetic diet and dietary practices. Knowledge was a salient factor related to dietary behaviour control (Sainsbury & Mullan, 2011). Moreover, patients' knowledge on a recommended diet indicates their understanding of dietary guidelines which influenced their food selection and eating patterns (Savoca & Miller, 2001). However, another study revealed no relationship between dietary knowledge and compliance of dietary practices. On the other hand, (Sainsbury & Mullan, 2011) found that a high dietary knowledge score was associated with following dietary recommendations and knowledgeable patients performed self-management activities in a better way.

Dietary knowledge significantly influences dietary practices. In Indonesia, a study was conducted to measure dietary practices among diabetic patients, which postulated that the Indonesian people preferred to consume high-fat foods, which leads to an increased risk of

CVD (Persell et al., 2004). The trend of skipping breakfast has dramatically increased over the past ten years in children, adolescents and adults (Hogan et al., 2003). There is increasing evidence that skipping breakfast is related with risk of T2DM (Akinkugbe, 1997). In addition, frequent eating or snacking may also increase the body weight and the risk of metabolic diseases (McCrory & Campbell, 2011). The prudent dietary pattern was characterised by the increased consumption of fish, poultry, various vegetables and fruits, whereas the Western dietary pattern was characterised by an increased consumption of processed and red meat, chips, dairy products, refined grains, and sweets and desserts. These patterns were previously associated with T2DM risk.

The glycemic index is an indicator of the post-prandial blood glucose response to food per gram of carbohydrate compared with a reference food such as white bread or glucose. Hence, the glycemic load represents both the quality and quantity of the carbohydrates consumed (LaCombe & Ganji, 2010). Another study conducted in Lebanon demonstrated a direct correlation between refined grains, desserts and fast-food patterns with T2DM. However, in the same Lebanese study an inverse correlation was observed between the traditional food pattern and T2DM (Joosten et al., 2011).

- **Physical Activity**

Physical exercise programmes have long been recognised as being effective in the management of DM. Research using both observational and interventional designs have indicated the therapeutic benefits of exercise, when consistently applied, on both insulin resistance and glucose intolerance (Bokyo, Ahroni, Cohen, Nelson & Heagerty, 2006). Research found that an active lifestyle with optimal physical fitness serves to prevent initial anomaly in blood glucose homeostasis and significantly delays the state of compromised glycemic control from advancing to full-blown diabetes. The benefits of PA in the prevention of DM does not seem

to depend on other risk indicators such as Impaired Fasting Glucose (IFG), family history of diabetes, obesity and other pre-disposing factors (Lipsky et al., 2005).

A large number of cross-sectional as well as prospective and retrospective studies have found a significant association between physical inactivity and T2DM (Kumar et al., 2019). A prospective study conducted among more than one thousand non-diabetic individuals from the high-risk population of Pima Indians, found that the diabetes incidence rate remained higher in less active men and women from all BMI groups (Davies, Roderick & Raftery, 2003). The existing evidence suggests a number of possible biological pathways for the protective effect of physical activity on the development of T2DM. Firstly, it has been suggested that physical activity increases sensitivity to insulin. In a comprehensive report published by Health and Human Services, USA, it was stated that physical activity enormously improved abnormal glucose tolerance when caused by insulin resistance primarily than when it was caused by deficient amounts of circulating insulin (Chawla et al., 2013). Secondly, physical activity is likely to be most beneficial in preventing the progression of T2DM during the initial stages, before insulin therapy is required. The protective mechanism of physical activity appears to have a synergistic effect with insulin. During a single prolonged session of physical activity, contracting skeletal muscle enhances glucose uptake into the cells.

This effect increases blood flow in the muscle and enhances glucose transport into the muscle cell (Tucker & Palmer, 2011). Thirdly, physical activity also reduces intra-abdominal fat, which is a known risk factor for insulin resistance. In certain other studies, physical activity has been inversely associated with intra-abdominal fat distribution and can reduce body fat. Lifestyle and environmental factors are reported to be the main causes of extreme increase in the incidence of T2DM (Danaei, 2011).

- **Behavioural Modifications**

In 2012, 29.1 million Americans had diabetes with costs of $245 billion, representing 11% of the total U.S. healthcare expenditure (Dall et al., 2010). Although tight glycemic control may reduce the risk for microvascular complications in T2DM, behavioural and pharmacologic management of body weight, blood pressure, and cholesterol levels are often needed to reduce the risk of mortality and macrovascular complications (Hemmingsen et al., 2013). In addition, other patient-centred outcomes that are related to diabetes, such as depression and emotional distress, are important to address (Funnell, 2013).

Healthcare experts recommend that anyone with diabetes should adopt and adhere to multiple self-care behaviours, including healthy eating, being active, monitoring, taking medication, problem-solving, healthy coping, and reducing risks. Approaches to support behaviour change includes diabetes self-management education (DSME) with or without an added support (clinical, behavioural, psycho-social, or educational) phase, and lifestyle programmes. Because knowledge acquisition insufficiently promotes behavioural changes (Maina, Ndegwa, Njenga & Muchemi, 2010), recommendations for DSME have shifted from traditional didactic educational services to more patient-centred methodologies that incorporate interaction, problem-solving, and other behavioural approaches. Although evidence shows that diabetes-specific behavioural interventions can be effective, the most effective combination of programme components and delivery mechanisms is still unclear (Cunningham et al., 2018).

- **Traditional Treatment**

Diabetes Mellitus is a chronic condition that has a major impact on the life of people with diabetes and their families, and may complicate family functioning. People with diabetes are faced with challenges to self-regulate their diabetes, live a full and normal life, while facing

the other responsibilities and stresses of life, which are psychologically complex and burdensome (Saeedi et al., 2019). Self-management is the cornerstone of diabetes management. Persons with diabetes will achieve optimal outcomes only if they are willing to, and capable of managing their condition adequately on a daily basis (Saeedi et al., 2019). DSME training is the on-going process of facilitating knowledge, skills, and ability necessary for diabetes self-care. It incorporates the needs, goals and life experiences of the person with diabetes and is guided by evidence-based standards.

The overall objectives of DSME training are to support informed decision-making, self-care behaviour, problem-solving, and active collaboration with the healthcare team to improve clinical outcomes, health status and quality of life (Norris, Engelgaw & Narayan, 2001). It is well established that the DSME training programme, a complex health intervention, is generally effective at enhancing self-care behaviour (Norris, Engelgaw & Narayan, 2001) and improving blood sugar control and improving quality of life (Cunningham et al., 2018). However, the specific impact of the programme on several outcomes have not been thoroughly evaluated, particularly for specific cultural and gender populations (Gutierrez, Fortmann, Savin, Clark, & Gallo, 2019). For instance, research shows that women are more successful with intervention that incorporates family, peers, and promoters (for example, Community Health Workers). This finding suggests that men and women with diabetes may have different DSME needs and that different cultures may respond better to various DSME intervention features than others.

A better understanding of which intervention features are associated with improved outcomes by gender and culture can be used to target interventions for specific populations to enhance learning, skills building, and diabetes management more efficiently than the standardised DSME training programmes.

Managing patients with T2DM present a number of challenges to clinicians. Poor glycemic control, the presence of co-morbidities and complications, the potential of polypharmacy, and non-adherence to medication all contribute to the difficulties in optimisation of outcomes (Patel et al., 2008; Rosen, Hunt, Plauchinat & Wong, 2008). Unfortunately, the challenges healthcare providers and patients must overcome to ensure treatment successes continue to persist. The foundations of managing Type 2 Diabetes Mellitus are diet, medication and physical activity. Simple measures that clinicians can undertake include: building rapport with a client, working with diabetes educators (DSME), monitoring repeat prescriptions, explaining the progressive nature of Type 2 Diabetes Mellitus and arranging a home medicine review (Norris, Engelgaw & Narayan, 2001).

People with diabetes have the responsibility to manage their condition on a day-to-day basis, communicate with their healthcare provider periodically throughout the year and seek advice when necessary. To efficiently self-manage Type 2 Diabetes Mellitus, those with diabetes must identify symptoms of emergency health crises, adhere to a complex medication schedule and modify long-standing lifestyle behaviours such as an unhealthy diet and physical inactivity (Brookhart et al., 2007). Limited health literacy among Type 2 diabetes patients could explain several of the barriers to self-management. The primary barriers to diabetes self-management result from lack of knowledge of target blood glucose, diet control and medication (Onwudiwe et al., 2011).

As urbanisation increases and populations grow older, Type 2 diabetes will continue to pose an ever-greater threat. The African region has a high population of undiagnosed diabetes (63%). An estimated 522,600 people in this region have died from diabetes-related causes in 2013 (Akinsola, Oluyo, & Morakinyo, 2019). Change in lifestyle is associated with the increase in Type 2 Diabetes Mellitus. Urban residents have a 1.2 to 4.0 times higher prevalence

of diabetes than their rural counterparts (Akinsola et al., 2019). Although the number people with Diabetes Mellitus in the rural areas are on the increase, there are more people with diabetes living in urban (246 million) than in rural areas (136 million). In low- and middle-income countries, the number of people with diabetes in urban areas was 181 million, while 122 million lived in rural areas. By 2035, the predicted prevalence for urban and rural areas was 247 million and 145 million people respectively (Cunningham et al., 2018).

2.7 THEORITICAL FRAMEWORK

2.7.1 Introduction and Overview

In recent years, there have been reports of the rise in the number of new cases of DM and early onset of complications in developing countries (Chuang, Tsai, Huang & Tai, 2002). In Nigeria for instance, there are about 4 million people with DM (IDF, 2013). In a study in the southern city of the country, Port Harcourt, the prevalence of diabetes was associated with high socio-economic class and being of Hausa-Fulani and Ibibio ethnicity (Nyenwe, Odia, Ihekwaba, Ojule & Babatunde, 2003). However, the population of the site of that study has just a small number of Hausa-Fulani people.

Secondly, it is possible that the Hausa-Fulani investigated in the study are of the upper class. In contrast, Jigawa state, Nigeria, the site of the present study has more than 90% Hausa-Fulani inhabitants, which composes of people of lower, middle and upper socio-economic classes. Thus, it is difficult to associate prevalence of DM with the high socio-economic class in the population.

One of the major goals for diabetes care is prevention of complications (Bennet et al., 2011). To prevent complications, continual suitable care is needed. Providing constant care for patients may defy even the well-established healthcare system in developed countries.

Similarly, the situation could be worse in developing countries such as Nigeria, where health system resources are unequally distributed between urban and rural communities, to the disadvantage of the latter (Ramachandran, Ma & Snehalatha, 2010). Consequently, accessing readily available health services or care constantly by people living with long term conditions may seem either very difficult or even impossible. In additiona, although effective treatment for diabetes in Nigeria is clearly defined, the resources are under-utilised as a mere one-third of people with DM achieve optimum treatment goals (Chinenye & Young, 2011). Elsewhere, there is the National Standard for Diabetes Self-Management Education (McCrory & Campbell, 2011) in which people with DM, irrespective of where they live, access treatment for diabetes. The present study had drawn upon both the theories and models in both qualitative and quantitative interventions for adults with Type 2 Diabetes Mellitus.

2.7.2. The Health Belief Model

The Health Belief Model (HBM) is a psycho-social model that accounts for health behaviours by identifying factors associated with individuals' beliefs which influence their behaviours (Green, Murphy, & Gryboski, 2020).

According to this model, individuals who perceive themselves as susceptible to a certain disease (perceived susceptibility), who perceive that the disease has potentially serious consequences (perceived severity), who believe that preventive actions will cause positive outcomes (perceived benefits), who perceive that barriers to taking preventive actions are outweighed by the benefits, and who believe that they are able to engage in a certain preventive health behaviour (self-efficacy), are more likely to engage in that health behaviour (Yarbrough & Braden, 2001). The HBM is used as one of the frameworks for motivating people to take positive decisions regarding their health to avoid negative health effects. Despite substantial applications of the HBM in research, it has its critics.

The theoretical models of behaviour change usually expect a longer time for modifying a problematic behaviour or acquiring a positive and healthy behaviour. For instance, the trans-theoretical model argues that health behaviour change involves different long-term processes, and thus one should not expect to see a behaviour change within a short period of time. The model also posits that not only is a behaviour change by itself an important step towards adopting a healthy behaviour, but also the maintenance of such behaviours is crucial (Prochaska & Vellicer, 1997). The health belief model is appropriate for use in this study.

2.7.3 Self-Determination Theory (SDT)

This is a theory of motivation and personality that addresses three universal innates and psychological needs: competence, autonomy and psychological relatedness. If these universal needs are met, this theory argues that people will function and grow optimally. To actualise their inherent potential, the social environmental needs to nurture these needs. Competence seeks to control the outcome and experience mystery. Relatedness is the universal want to interact, be connected to, and experience caring for others.

Autonomy is the universal urge to be causal agents of one's own life and act in harmony with one's integrated self; however, (Davies, Roderick & Raftery, 2003) noted that this does not mean to be independent of others (Vinholes, 2013).

Motivations have often been grouped into extrinsic and intrinsic. With extrinsic motivation a person tends to do the task or activity mainly because doing so will yield some kind of reward or benefits upon completion. Intrinsic motivation, in contrast, is characterised by doing something purely because of enjoyment or fun. The theory of outonomy model is adopted in the implementation of this work (Vansteenkiste, Lens & Deci, 2006). Consequently, the self-determination theory is also appropriate for use in this study.

2.7.4 Self Regulatory or the Leventhal's Common Sense Model

The Self Regulatory Model is a useful theoretical tool for understanding adults' health self-management behaviour, particularly in the context of chronic disease (Leventhal, 2012). The Self-Regulatory Model argues that individuals are active problem-solvers in managing their health; individuals' self monitor health-related experiences and symptoms, and they evaluate available alternatives for responding to perceived deviations in health status. Individuals are posited to create a "Common Sense Model" (CSM) of their health by integrating knowledge and beliefs across several discreet domains or illness representations (Leventhal, 2012).

In the context of chronic diseases, such as diabetes or asthma, an individuals' CSM of the disease is comprised of the identity assigned to the disease, its presumed cause, beliefs about controllability, anticipated consequences of the disease, and awareness of alternatives for medical management (Leventhal, 2010).

Individuals are believed to integrate their knowledge and beliefs across these illness representations into a more or less coherent model of the disease, and variation in individuals' CSMs contributes to differences in observed behaviours for disease management.

Self-Regulatory Model has proven to be useful in several studies there are areas where additional development is needed (Wilson et al., 2021). In particular, the theory provides little direction about how discreet domains of beliefs or illness representations are combined to create a CSM of a specific disease (for example, diabetes) or health experience (for example, dizziness). Researchers frequently use established instruments like the Illness Perception Questionnaire (IPQ) to measure illness representations, but there is substantial ambiguity in how to use obtained data (Grzywacz, 2011). For example, researchers interested in understanding CSMs of diabetes frequently use scores obtained from the diabetes-specific IPQ (Skinner, 2003) for specific belief domains (i.e., control, cause, consequences, etc) as

independent outcomes (George et al., 2008). Research such as this informs understanding of specific belief domains, but it cannot advance understanding of CSMs of diabetes because investigators are considering components of the CSM rather than the whole. Similarly, when considering the consequences of variation in CSMs of diabetes, researchers frequently use scores obtained from sub-scales of the Illness Perception Questionnaire as independent predictors of diabetes self-management outcomes (for example, frequency of physical activity) (Broadbent, 2006).

This analytic approach misses the essential conceptual point that the CSM of the disease, not the individual components of the CSM, is the most proximal determinant of the outcome. Of course, the tendency to reduce complex ideas to a few discernable ideas is not limited to the Self Regulatory Model. Dominant theories of health behaviour focus on a discreet number of concepts representing distinct knowledge and belief domains.

The Health Belief Model, one of the most commonly used theories in health behaviour highlights the salience of perceived susceptibility and severity of illness or disease, as well as perceptions of treatment efficacy (Glanz, Rimer & Viswanath, 2008). The Theories of Reasoned Action and Planned Behaviour emphasise subjective norms and beliefs about control and efficacy (Policy, 2014). Like the Self Regulatory Model, these and other theories lack the ability to characterise holistic belief systems, including sometimes inconsistent knowledge and beliefs that shape how individuals interpret and react to their health (Arcury, Skelly, Gesler & Dougherty, 2004). Although they have long recognised the fact that health belief systems are complex, health behaviour practitioners' ability to design consistently effective interventions for health promotion or chronic disease management has likely been hampered by the inability to summarise knowledge and beliefs into a complete and meaningful whole. The self-regulatory model is also appropriate for actuallzing the ojectives of this study.

The goal of this study is to determine the effectiveness of DSME intervention programme on T2DM in the rural Nigeria holistically. This overall goal will be achieved by focusing on beliefs about diabetes management at the sample of rural community adults with diabetes. Leventhels Commonsence Model provides a good model for viewing belief systems holistically because diabetes is a common chronic condition with defined behaviour strategies advocated for self-management.

2.8 DIABETES MELLITUS SELF-MANAGEMENT PROGRAM/EDUCATION

2.8.1 Introduction

Diabetes self-management education is a critical element of care for all people with diabetes and is necessary in order to improve patient outcomes (Funnell et al., 2010). The National Standards for these programmes are designed to define quality diabetes self-management education and to assist diabetes educators in a variety of settings to provide evidence-based education (Haas et al., 2012). Diabetes self-management education is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. Diabetes Self-Management Education is the cornerstone of care for all individuals with diabetes who want to achieve successful health-relatedoutcomes. The overall objectives of DSME are to support informed decision-making, self-care behaviours, problem-solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life.

The teaching process in the Diabetes self-management education makes the programme effective. Classes are designed to be highly participatory, and mutual support and success builds participants' confidence in their ability to manage their health and maintain active and fulfilling lives (ADA, 2002). One important area in diabetes self-management education is

self-efficacy, which is a skill, information or knowledge that can be gained from a particular activity or task performance. The construct has many ways for its sources that include mastery experience, verbal persuasion, physiological feedback and vicarious experience (Bandura, 2000).

The Mastery Experience relates to experience of success in accomplishing a task that will help one achieve self-efficacy. The verbal persuasion relates to verbal validation or approval someone a patient considers to be very important to him or her such as the wife or husband or the therapist. The vicarious experience refers to the encouragement one gets when he observes another person performing a task. The Physiological Feedback refers to a feedback as a result of anticipation of success.

2.8.2 Format

According to the American Diabetic Association (ADA, 2020), diabetes self-management education is conducted in a small group workshop fashion. Each session can last for a duration of about 2½ hours per session, 1 session per week for 6 weeks. It is the process in which the program is taught that makes it effective. Classes are highly participative, where mutual support and success build the participants' confidence in their ability to manage their health and maintain active and fulfilling lives. Diabetes self-management education can also be successfully delivered even at the community level (Britta & Lori, 2017), face-to-face or by phone (Flaws, 2002).

2.8.3 Settings

Diabetes self-management education is administered in community settings such as community centres, churches, libraries, community primary healthcare settings and hospitals

(Powers et al., 2021). Special attention is given to making the location accessible to all. A room large enough for all participants to gather comfortably, as well as space for two (2) leaders and their materials (Joosten et al., 2011).

2.8.4 Participants

Diabetes self-management education is designed for people with Type 2 diabetes. Typically a group of 12-16 participants are needed per workshop (ADA, 2020). Some level of literacy may be required for successful participation. However, the programme can be delivered in both low- and high-income populations (Wallace et al., 2009).

2.8.5 Leaders

Diabetes self-management education is delivered mainly via two (2) trained leaders, one or both of whom are non-health professionals with diabetes themselves. These leaders must be trained by certified Master Trainers, or must be Master Trainers themselves (American Diabetic Association, 2020).

2.8.6 Subjects Taught

Diabetes self-management education subjects include subjects such as techniques to deal with the symptoms of diabetes, fatigue, pain, hyper/hypoglycemia, stress, and emotional problems such as depression, anger, fear and frustration, as well as appropriate exercises for maintaining and improving strength and endurance, healthy eating, appropriate use of medication and working more effectively with health care providers. Examples of questions included during the interactive sessions may include, “Who do you tell about your diabetes and what do you say?” (Funnel et al., 2005). The participants are expected to make weekly action plans, share

experiences, and help each other solve problems they encounter in creating and carrying out their self-management programme (ADA, 2020).

2.9 CONCLUSION

This chapter reviewed the relevant literature pertaining to the epidemiology of Diabetes Mellitus and its risk factors among adults. This epidemiology was first taken in a global perspective. Thereafter, the African, Sub-Saharan Africa and the Nigerian context were all appraised. The chapter also analysed the factors that contribute to the Diabetes Mellitus pandemic. Moreover, several diabetes self-management programmes and approaches to delay or reduce the development of diabetic complications were also reviewed. Policy analysis of international and national policies or guidelines regarding diabetes was summarised. Lastly, as a point of exit, relevant theoretical frameworks underpinning several DSME interventions in clients with diabetes were also reviewed. The summary is highlighted below:

- The prevalence of DM has seen more than two-fold a surge globally in the last thirty years (Danaei, 2011). This increasing prevalence is linked to urbanisation and associated risk factors such as tobacco smoking, obesity and physical inactivity.
- In developing nations, the number of individuals with diabetes living in urban areas was about 181 million, while those residing in rural communities accounted for 122 million. There are predictions that by the year 2035, this difference will increase, with 347 million people residing in urban areas and 145 million in rural communities (IDF, 2013).
- Type 2 Diabetes Mellitus accounts for more than 90% of all diabetes cases globally. In South Africa, 4.5% of the general population has diabetes. The estimated prevalence for urban South African is between 8% and 13%.
- Sub-Sahara Africa has the highest proportion of undiagnosed cases of DM, as more than two-thirds (66.7%) of those with the disease are not aware of their status. Generally,

individuals with DM (58.8%) live in cities, in spite of the fact that the population in the region is largely rural (61.3%).

- Nigeria has the highest burden of diabetes in Africa, followed by South Africa, Ethiopia and then Tanzania.
- Lifestyle behaviour change through health promotion interventions, including physical activity (aerobic and resistance exercise) and dietary advice may prove to be effective in the management of Diabetes Mellitus.
- Diabetes self-management (DSME) remains the cornerstone of prevention of the development of diabetic complications.
- The role of DSME has being well authenticated in many studies. However, Sub-Saharan African countries are yet to benefit from DSME training programmes.
- Adhering to pharmacological and non-pharmacological management is influenced by social factors, attitudes and beliefs as well as knowledge of the disease which increase people's disposition to diabetic complications.

From this chapter, it is evident that clients with Type 2 Diabetes Mellitus in primary healthcare facilities of rural areas have more DSME and self-management empowerment needs than those living in urban settings because of their higher disposition to unhealthy lifestyles and lack of education. DSME is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards.

The current study is designed to address these highlighted gaps. The next chapter will therefore describe the methods used to reach the study objectives as outlined in Chapter One.

CHAPTER THREE
METHODOLOGY

3. INTRODUCTION

This chapter provides an overview and description of the methods used to answer the objectives stated in the first chapter of this thesis. The research question that guided the study is stated and is then followed by a broad description of the research setting. A description of the participants and sampling methods, the methods of data collection and data analysis used for each of the four phases of the study are described. The ethics principles that guided the study are outlined as well.

3.1 RESEARCH QUESTION

What is the effectiveness of the DSME training programme among individuals with type T2DM in Jigawa State, Nigeria?

It was hypothesised that adult clients with Type 2 Diabetes Mellitus that participate in the DSME training programme would have:

- an increased knowledge regarding self management of their disease,
- an increased knowledge regarding the role physical activity can play in the management of their disease,
- an increased knowledge regarding risk factors for developing Diabetes Mellitus complications, and
- an increased self-efficacy to manage their disease.

3.2 RESEARCH SETTING

This study was conducted in Jigawa State of Nigeria. It is one of the thirty-six (36) states that constitute the Federal Republic of Nigeria. It is situated in the North-Western region of the country, and has a total land area of 22,410 square kilometres, with a population of 3.6 million people (NPC, 2006). It is topographically characterised by undulating land, with sand dunes of various sizes spanning several kilometres of the state. The socio-cultural situation in Jigawa State could be described as homogenous. Eighty percent (80%) of the population are found in the rural areas and are most populated by Hausa/Fulani tribes (NPC, 2006). Although population of the State is predominantly rural (90%), the distribution in terms of gender is almost equal between male (50.8%) and female (49.2%). Although the pattern of human settlement is nucleated with defined population centres, the population distribution is the same across various constituencies in the State and between urban and rural areas (NPC, 2007). It is estimated that 2.9 million adults are considered to working.

Jigawa State has twenty-seven (27) local governments with Dutse Local Government being the local government with the highest number of rural settlements and the most densely populated of all the local governments in the state, and was therefore purposively selected for the study.

3.3 STUDY DESIGN

An embedded strategy of mixed methods research, specifically the parallel mix methods design was used for this study, utilising both quantitative and qualitative methods for data collection and analysis. With this type of design, the qualitative and quantitative strands are planned and implemented to answer related aspects of the same over-arching research question (Teddlie & Tashakkori, 2009), in this case: "What is the effectiveness of the DSME training programme among individuals with T2DM in rural Nigeria?"

The combination of quantitative and qualitative research approach is becoming the preferred method to evaluate public health interventions (Teddlie & Tashakkori, 2009). This is because it increases the overall strength and comprehensiveness of the study findings compared to a single method (Barbour & Gerritsen, 2001).

In this study, the first phase used a quantitative approach, with a cross-sectional study design. Surveys were employed to collect data from clients with Type 2 Diabetes Mellitus and healthcare professionals regarding the prevalence and awareness of Diabetes Melitus and the current practices of health care professionals regarding the management of Type 2 Diabetes Mellitus. In the second phase of the study, a qualitative approach with an explorative design was used to further shed light on the challenges that clients with Type 2 Diabetes Mellitus experienced, as well as those challenges experienced by health care professionals. The last and third phase of the study used a quantitative approach with a pre-test-post-test design to determine the effectiveness of the DSME training programme among individuals with T2DM in rural Nigeria. The mixed method approach enabled us to have findings from a large cohort of participants (cross-sectional phase) and an indepth information (qualitative phase) for an otherwise understudied population.

3.4 DATA COLLECTION METHODS AND PROCEDURES

The data collection methods and procedure followed for each of the three phases of the study will be outlined separately below:

3.4.1 PHASE 1: To Determine the Prevalence and Awareness of T2DM in Jigawa State, Nigeria.

- **Study Population and Sample**

Cluster sampling was used to recruit participants from the Dutse Local Government (DLG) area of Jigawa State. The Local Government has a population of 246,143 (NPC, 2006).

The primary cluster are the eleven (11) political wards in the DLG area. Using the World Health Organisation (WHO, 1994) guidelines for conducting community surveys, five (5) out of the eleven (11) political wards were randomly selected (secondary cluster). Each political ward has at least five (5) census enumeration centers. Three census enumeration units were randomly selected in each of the five (5) political wards of the DLG area altogether (tertiary and final cluster), giving a total of fifteen (15) enumeration areas. Each enumeration area includes approximately 100 adults aged 18 years old and older. Even numbered houses were approached in each of the census enumeration areas. Therefore, approximately 1500 adults were approached for participation in this study.

A summary of the sampling procedure is provided in Figure 3.1 below.

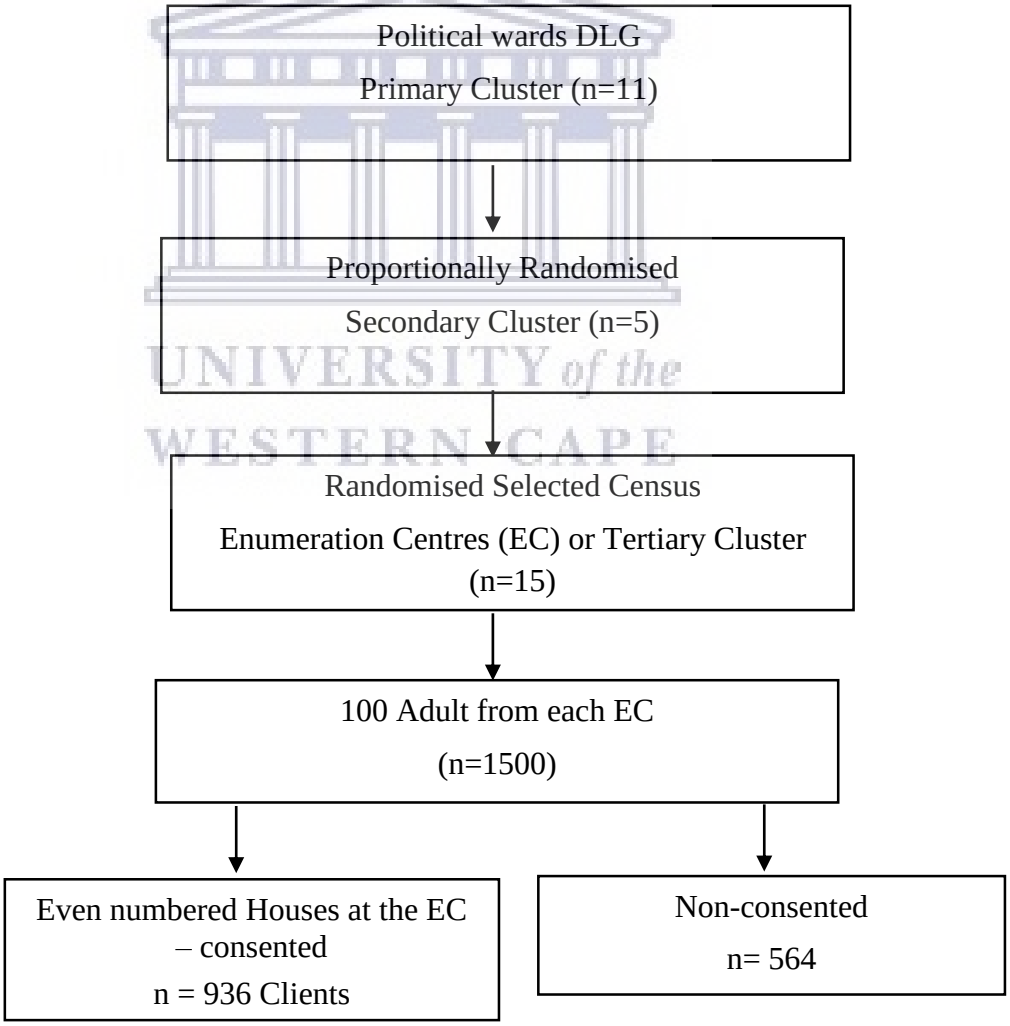


Fig. 3.1 Summary of the Study Participant of Phase I (Quantitative Component)

- **Data Collection Methods**

To determine the prevalence, awareness and behavioural risk factors associated with DM, the WHO STEPS-instrument Core and Expanded (Appendices 5 and 6) was used. The WHO STEPS-instrument is a standardised method of collecting, analysing and disseminating data for non-communicable diseases. The WHO instrument consists of three steps; in the first part of Step 1 the demographic information such as gender, age, socio-economic status and highest level of education is requested. The second part of Step 1 request for information regarding behavioural measurements such as tobacco use, alcohol consumption and physical activity participation. Both core and expanded items are included in this section. In addition, awareness and history of Diabetes Mellitus and blood pressure are also requested. Step 2 of the instrument captures the physical measurements including body weight, height waist circumference and blood pressure. The final step contains the biochemical measurements of blood glucose.

The WHO STEPS-instrument Core and Expanded, a valid and reliable tool, has been used successfully in numerous continents, including Africa. Reliability is the ability of an assessment tool to give the same result if repeated under the same conditions (Bless & Higson-Smith, 2012), while validity is the capacity of the assessment tool to measure what it is intended to measure (Silverman, 2013). Validity is one of the most important criteria by which a quantitative instruments' adequacy is evaluated (Polit, Beck & Hungler, 2014). The internal consistency and reliability of the scales measured with Cronbach alpha and levels above 0.7 were deemed acceptable. Specific measures were put in place to ensure **reliability** and **validity** of the physical and bio-chemical measures.

Prior to the commencement of the study, the WHO STEPS instrument was translated into Hausa by a Hausa linguist (Appendix 6). To further ensure the reliability of the data, a total of sixteen (16) instruments, six (6) and ten (10) in English and Hausa versions were administered

to clients resfectively with Type 2 Diabetes Mellitus, depending on which language they preferred. The time taken to complete the instrument ranged from 20 to 30 minutes. A 30-minutes focus group discussion followed the completion of the instrument to test content validity of the instrument, and to see whether it was necessary to re-phrase or change any of the questions. The consensus from the participants of the focus group discussion indicated that the translation was adequate. However, a few grammatical changes were made. For example, "*wadanda*" to correctly spell as "*waɗanda*". "*Zavi*" to correctly spell as "*zaɓi*".

Physical and Bio-chemical Measurements:

A digital scale was used to measure **Weight** in light clothes to the nearest 0.1 kg. To ensure reliability, two weight measurements were obtained, and a third was taken if the first two differ by more than 0.2 kg. A tape measure was used to measure **Height**, without shoes, to the nearest 0.1 centimetre (cm). The participants were requested to stand on paper without shoes in an upright position against the wall and the line at the level of the head was selected for measurements. To ensure reliability, two height measurements were taken and a third was taken if the first two were more than 0.5 cm apart. The **BMI** of the partcipants was calculated as follows: body weight (in kg) divide by the square of height (in metres). The subjects were then categorised into overweight and obese based on the WHO (2000) standards as follows: BMI <18.5 kg/m^2 as underweight; between 18.5 kg/m^2 – 24.9 kg/m^2 as normal; between 25 kg/m^2 – 29.9 kg/m^2 as overweight and >30 kg/m^2 as obese.

Waist Circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch resistant tape that provides a constant 100g tension, while **Hip Circumference** was measured around the widest portion of the buttocks, with the tape parallel to the floor. For the measurement of waist circumference and hip circumference, the subject stand with feet close together, arms at the side and body weight

evenly distributed, wearing little clothing. The subjects were asked to relax, and the measurement was taken at the end of a normal expiration. Each measurement was repeated twice; if the measurements are within 1 cm of one another, then average was calculated. Each of the measurements was repeated if the difference between the two measurements exceeds 1 cm (Polit, 2010). **Blood Pressure** readings and **Blood Glucose** levels were taken by the research assistant (trained professional nurse). Blood pressure readings were taken after participants had been seated for at least 15 minutes. A registered nurse practitioner used a sphygmomanometer and stethoscope to measure blood pressure of the participants. Two measurements of blood pressure were taken with the average of these two measurements recorded. To ensure reliability of blood glucose measurement the quality of test strips was ensured, hands was washed adequately, the testing site was completely dry, the test was performed at room temperature, storage and handling of the glucometer was done with utmost care. The fingertip was used at all times and enough blood was applied to test strip. The metre calibration was performed using the quality control solutions according to manufacturer's instructions at regular intervals to ensure accuracy.

- **Data Analysis**

Data was captured and analysed using SPSS version 25.0 Demographic data of the subjects were expressed using descriptive statistics of mean, standard deviation and frequency. The proportion of individuals classified as hyperglycemic was calculated and stratified by gender, household income, marital status and educational level.

Inferential statistics was used to test for significant associations between demographic variables, risk factors and blood glucose level (impaired: 110 to <126mg per dL (6.1 to 7.0 mmol per L), **diabetic** >110 mg per dL (>6.1 mmol per L), or normal 72 to <109mg per dL (4

to 6 mmol per L). Chi-square test was also used to test for significance for categorical variables and student t-tests for continuous variables. Level of significant was set at 0.05.

3.4.2 PHASE 2: To Explore the Current Practices Regarding the Management of T2DM in Jigawa State, Nigeria

- **Study Population and Sampling**

As previously stated, five (5) political wards were randomly selected in the Dutse Local Government area. Each of the political wards has at least two (2) health centres where clients with T2DM are managed by health care professionals. One (1) health centre was randomly selected from each of the political wards, thus a total of five (5) health centres were selected for this part of the study. According to Jigawa State Ministry of Health, all the clients from Dutse District are managed at those health centres. Therefore, the population of this phase consisted of all the clients that attend the health centres for treatments, and all health care professionals (HCPs) working at the health centres. The selection of the study sample for clients with Type 2 Diabetes Mellitus and HCPs are outlined separately below.

Clients with Type 2 Diabetes Mellitus

Purposive sampling was employed in recruiting some participants to participate in the qualitative phase of the study (focus group discussion). Theoretical saturation was used to stop data collection. To enhance spread, the participants for the FGD were selected from the four different participating CHCs. Therefore, a total of sixteen (16) clients, eight per FGD, were included.

Health Care Professionals

Each health centre has different health care professionals responsible for their Diabetes Clinics. Purposive sampling technique was used to contact fifteen (15) healthcare professionals to

participate in the qualitative research (indepth interviews). They comprised of four (4) doctors, four (4) nurses and four (4) community health officers from across four participating clinics. However, after interviewing five (5) HCPs, theoretical saturation was reached and the data collection was stopped.

- **Data Collection Methods**

Focus group discussion were employed for clients with T2DM and individual interviews for HCPs to collect data in this phase of the study. These two methods are described sperately below.

Focus Group Discussions (FGDs) with Clients with T2DM

FGDs were used to explore the challenges experienced by clients with Type 2 diabetes in the management of their disease. Focus groups, a commonly employed qualitative data collection method, allow the participants, in interaction with each other, to speak for themselves in the context of their own experience (Bergin, Tally & Hamer, 2003). It has also been identified as a valuable tool in health promotion needs assessment (Allen, Van Der Does & Gunst, 2016). A separate conference room was made available for the discussion and the interviews by the management of each of the clinics. Each FGD was facilitated by two facilitators, namely the researcher acting as discussion leader/observer and a research assistant acting as a scribe/recorder. The participants were informed about the aim of the discussions and that everyone should feel free to participate as there is no right or wrong answer. The procedure was explained to the participants and each consented participant completed a focus group discussion binding form (Appendix 4).

The facilitator guided the discussions to permit and encourage participation from everyone in the language used by the majority of the participants. The decision about language medium was made by the group. Hausa language was the medium for the patients with T2DM. The

sessions were concluded when each participant said they could not think of anything else to add. Each session lasted between 45 minutes to an hour. The responses were audio-taped and notes were recorded on paper.

Interviews with Health Care Professionals (HCPs)

As stated earlier, a separate conference room was made available for the discussion and the interviews by the management of each of the clinics. Semi-structured interviews were used to explore the challenges health professionals experience in managing the clients with Type 2 diabetes within the current primary health care system. Each discussion was facilitated by two facilitators, namely the researcher acting as the guide/observer and the research assistant acting as a scribe/recorder. The discussions were conducted in English language after permission was obtained to record the interviews and this took approximately 30 minutes to complete. Semi-structured indepth interviews offer the opportunity to discuss in detailed with the interviewees.

- **Data Analysis**

Data analysis started with the transcription of the recorded interviews and focus group discussions. Data from the audio-tape recordings were transcribed verbatim by an independent person with knowledge and experience in transcriptions to produce a manuscript. A comparison was made between notes taken during the focus group discussions and interviews, to verify accuracy. Content analysis was done by extracting meaningful thought of the participants' ideas (coding into themes).

Thereafter, the transcripts were read through several times by the researcher to look for emerging themes. Grouping of the themes into broader categories was done in order to fit small

categories together. After the derivation of themes, and independent researcher read through the transcripts and the generated themes to further confirm its reliability.

- **Trustworthiness of the Qualitative Data**

Trustworthiness in qualitative data is measured by its credibility which is determined by the match between assembled realisms of the participants and the data drawn from the participants presented by the researcher (Padgett, 2016). In this study, trustworthiness was enhanced through the strategies detailed below:

1. Credibility (Internal Validity): During the sessions field notes were compared and discussed (member checking) for their accuracy. Each participant was given a summary of the discussions after the session. Participants were also given time to comment on whether or not they felt the data was interpreted in a manner congruent with their own experiences. Furthermore, the transcribed verbatim draft was given to a colleague, who was not involved in the study for her view. Any matters raised by her were incorporated into the written notes.

2. Transferability (External Validity): A detailed description of the target population and setting in which the health promotion programme is intended to be adapted were described. Furthermore, several of the data analysis documents are available and give other researchers the ability to transfer the conclusions of this study to another projects/research.

3. Dependability (reliability): This was achieved by ensuring that the audit trail consisting of the methodology, original transcripts, and data analysis documents, field notes and comments from the member checking were transparent so that any researcher that wants to adapt the process in his/her own setting, could do so.

4. Confirmability: A measure of how well the findings are supported by the data collected (Padgett, 2016). A colleague who was not involved in the study was provided with the verbatim transcripts, analysis and process notes and summaries of the results for her opinion.

3.4.3 PHASE 3: To Implement and Test the Effectiveness of the DSME Training Programme at a Selected CHC In Jigawa State, Nigeria

- **Population and Study Sample**

One health centre was purposely selected for the implementation of DSME training programme. The health centre with the highest number of clients with Type 2 Diabetes Mellitus was selected for this phase. Being in the rural area, it is the only health centre that is easily accessible to the patients and has the capability to run the programme. At a workshop for the healthcare professionals of the health centre where the implementation took place, several suggestions were made for the best way of recruiting the clients with Type 2 Diabetes Mellitus. Due to lack of data on the number of patients with Type 2 Diabetes Mellitus attending the health centre, an estimated population was calculated based on personal communication with the medical doctors. Each of the doctors sees an average of forty (40) patients with Type 2 Diabetes Mellitus per week at the health centre. Patients are seen only on appointment, twice weekly. Therefore, an estimated 320 patients are seen per month at the specific health centre. The doctors offered to inform and invite every patient they see on a weekly basis and keep records of the contact details of those patients that gave permission to do so. A period of four (4) weeks was set aside for recruitment of patients to participate in the intervention. Power analysis calculated a minimum sample size of 200 clients. With 200 clients, a difference with a standard deviation slightly larger than the magnitude of the difference can be detected as statistically significant with an overall alpha level of 5% and power of 90%.

Consecutive sampling was utilised over an eight (8) week period until 200 clients have undergone training. The DSME training was implemented by the researcher, who is a trained Diabetes Educator.

- **DSME Training Programme**

The United Kingdom MRC Framework (Colagiuri, Dickinson, Girgis & Colagiuri, 2012), was adapted to incoporate some of the key tasks in this phase which includes the identification of feasible and valid outcome measures, recruitment and retention rates, and sample size calculation. Therefore, the DSME was implemented in a pre-test, post-test design.

DSME training is a collaborative process through which individuals with Diabetes Mellitus will gain the knowledge and the skills needed to modify their behaviour and successfully manage their disease. Seven (7) self-care behaviours, essential for effective diabetes management, have been identified by the National Standards for Diabetes Self-Management Education (Fletcher, 2002). With this approach, DSME training is moving beyond a behavioural focus and also includes patient empowerment. These seven (7) self-care behaviours include (1) healthy eating, (2) being active, (3) monitoring, (4) taking medication, (5) problem solving, (6) healthy coping and (7) reducing risks. The programme was conducted over a period of eight (8) weeks, with the first week entailing an introduction and staking of baseline outcome measures and the following seven (7) weeks addressed each of the self-care behaviours outlined above. Each of the DSME/T group sessions conducted had duration of approximately two (2) hours. Sessions was conducted in groups with a maximum of twenty (20) participants per group.

Outcome Measures

The following measures were taken for each study participant:

Resting Blood Pressure (mmHg): was recorded using a calibrated automatic sphygnamometer after the client was sitting quietly for at least 5 minutes. The procedure followed is described on pg. 65.

Height (m): measurement was taken with a tape measure fixed against the wall, 10 cm above the ground. The procedure followed is described on pg. 64.

Weight (kg): was measured using an electronic digital scale. The procedure followed is described on pg. 64.

BMI (kg/m^2): was calculated using the formula weight/m^2. The procedure followed is described on pg. 64.

Random Blood Glucose (mmol/l): was recorded after a nurse did the finger prick test while the client was sitting in a relaxed position. The procedure followed is described on page 65.

Waist-Hip Ration (m): Waist to hip ratio can be calculated using the circumferential measurement of waist in centimetres by circumferential measurement of hip in centimetres. The procedure followed is described on pg. 65.

Table 3.1 World Health Organisation Cut-off Points for Waist to Ratio

Indicator	Cut-off points
Waist circumference	≥94 cm (M); ≥80 cm (F)
Hip circumference	≥102 cm (M); ≥88 cm (F)
Waist–hip ratio	≥0.90 cm (M); ≥0.85 cm (F)

M: Men; F: Female (WHO Expert Consultation on Obesity, 2000)

Diabetes Self-Care Knowledge Scale

Diabetes self-care knowledge was assessed with the Diabetes Self-Care Knowledge Scale (DSCK-30) (Chinyere, Nancy, & Nwankwo, 2010). The items include overall diabetes care, coping with stress, diet for blood sugar control, the role of exercise in diabetes care, medications taken, how to use the results of blood sugar monitoring, how diet, exercise and

medication affect blood sugar levels, prevention and treatment of high/low blood sugar, preventions of long-term complications of diabetes, foot care, benefits of improving blood sugar control, as well as pregnancy and diabetes. Participants had to rate each item using a 5-point Likert scale ranging from *poor* to *excellent* across 13 items (1 = poor; 2 = fair; 3 = good; 4 = very good; 5 = excellent). The scale has internal consistency (Chronbach alpha) of .942. Higher scores indicate a better understanding of Type 2 Diabetes Mellitus (Wu, Huang, Liang, Lee & Tung, 2011).

Diabetes Care Profile

Diabetes self-efficacy was measured with the validated and reliable Diabetes Care Profile (Polit, 2010), a 30-item tool that measures the social and psychological factors related to diabetes and its treatment. It is a structured measure with response choices of "yes" and "no". A point is awarded for each correct response and zero for a wrong one. The total score is presented as a percentage. In addition to the outcome measures described above, data included age, gender, diagnosis and number of years elapsed since diagnosis, co-morbidities, medications and dosages were also captured. Measurements was done at baseline (Week 1) and two weeks after completion of the DSME Programme (Week 10).

- **Data Analysis**

Data for clients with Type 2 Diabetes Mellitus were captured on a 2010 Word Excel spreadsheet and imported into the Statistical Package for the Social Sciences (SPSS) version 25.0 and analysed. Descriptive statistics were employed to summarise the baseline demographic data of the clients with Type 2 Diabetes Mellitus. Continuous variables such as age, height and weight were expressed as means (SD). Categorical variables such as gender and level of education were expressed as frequencies and percentages. Inferential statistics (cross tabulations) were used to determine the distributions of cases in the various groups.

Significant differences were tested for using the Chi-square test (for example, socio-demographic data and diabetes risk factors), Wilcoxon signed-rank test was used to determine differences between baseline and posttreatment scores of diabetes self-care knowledge among participants and Independent-Samples t-test (mean scores). Statistical significance was set at an alpha level of 5%. Subsequently, a one-way repeated measure ANOVA analyses was conducted to compare the effectiveness of DSME training on blood glucose, blood pressure, BMI, diabetes self-care and self-efficacy at three different time periods (baseline, post-test 1 and post-test 2).

3.5 ETHICAL CONSIDERATIONS

Ethics clearance and permission to conduct the study were obtained from the Senate Research Committee of the University of the Western Cape (UWC) (Appendix 1). Further ethics clearance was sought from the ethics committee of Jigawa State Ministry of Health (JSMH), Jigawa State, Nigeria (Appendix 2). The study was conducted according to ethical practices pertaining to the study of human subjects, as specified by the Faculty of Community and Health Sciences Research Ethics Committee of the UWC. The following guidelines were followed: The purpose of the study was clearly explained by the researcher to the participants, namely, clients with Type 2 Diabetes Mellitus (Appendix 3) and health care professionals (Appendix 3). Signed, written informed consent was sought from all clients with Type 2 Diabetes Mellitus (Appendix 5a, 5b) and healthcare professionals (Appendix 5).

Participation in the study was voluntary. The participants were informed of their rights to withdraw from the study at any time without any consequences. Participants were treated with respect and dignity. The consent forms, information sheets and questionnaires were available in English and Hausa. Identification codes using numbers was used on data forms to ensure anonymity. Information obtained from participants was for the study only and was handled

with confidentiality. Pseudonyms were used to protect participants' identities when results are published. The researcher collected the questionnaires personally and was responsible for ensuring their storage in a locked and secure place. Information obtained from the focus group discussions and interviews were handled with confidentiality. All tapes were destroyed once they have been transcribed and documented according to themes. All information will be kept for a minimum of five years whereafter it will be destroyed. Participants in the focus group signed a form where they undertake not to disclose any information from the focus group discussions (Appendix 4a, 4b). Minimal perceived risks were expected in the study. However, if participants were affected by the study and they experience questions to be traumatic, the participants were referred to a counsellor for management. The findings of the study will be made available to CHC's facility managers and the relevant stakeholders.

3.6 SUMMARY OF THE CHAPTER

A community health centre was purposely selected for the implementation of the DSME training programme in Dutse metropole. The health centre with the highest number of clients with Type 2 Diabetes Mellitus was selected for this phase. Both quantitative and qualitative methods were employed for data collection from health care professionals and clients with Type 2 Diabetes Mellitus and are described in detail in this chapter. Quantitative data was analysed by means of descriptive and inferential statistics to determine clients with Type 2 Diabetes Mellitus knowledge, self-efficacy, care profile, physical activity levels as well as satisfaction with the quality of care received at the health centres and health care professionals' attitude towards existing concepts in diabetes care. Focus group discussions and semi-structured interviews were used to gain insight into challenges that clients with Type 2 Diabetes Mellitus and health care professionals experienced in the management of the disease. The results of the quantitative and qualitative analysis are presented in Chapters Four and Five. The results partaining the implementation of DSME are outlined in Chapter Six.

CHAPTER FOUR

QUANTITATIVE RESULTS

4.1 INTRODUCTION

This chapter contains the results of the statistical analysis that attempted to answer the objectives of the first phase of the study, to determine the prevalence and awareness of individuals regarding Type 2 Diabetes Mellitus. The following was outlined in the chapter: an overview of the socio-demographic profile of the clients of the initial cohort; the physical, physiological measurements and health-related variables of these clients; their awareness of the disease; and their engagement in physical activities. In addition, the general diabetes-related attitudes as well as the quality of physical activity. The results are summarised in tables where appropriate.

4.2 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SAMPLE (n=936)

A total of 1500 individuals from fifteen (15) enumeration areas of the Dutse Local Government area were approached to participate in the study, 936 consented and completed the baseline questionnaire. A response rate of 62.4% (n = 936/1500) was thus achieved. The mean age of the participants was 37.90 years (SD = 15.56) and approximately half (51.8%) of the participants were female, and approximately a third of the study sample (34.5%) has no formal education. The majority (63.9%) of the participants were married and more than half (56.6%) had six to ten people living in the household.

Table 4.1: Socio-Demographic Characteristics of the Study Sample (n=936)

Characteristics	M±SD	Male n (%)	Female n (%)	Total n (%)	p-value
Age	37.90±15.56				.0001
<= 20		57 (12.6)	136 (27.8)	188 (20.1)	
21 – 29		58 (12.9)	86 (17.7)	144 (15.4)	
30 – 39		87 (19.3)	64 (13.2)	151 (16.1)	
40 – 49		73 (16.2)	81 (16.7)	154 (16.5)	
50 – 59		65 (14.4)	79 (16.3)	144 (15.4)	
60 +		111 (11.9)	44 (9.1)	155 (16.5)	
Highest level of Education					.942
Primary School Incomplete		150 (33.3)	173 (35.7)	323 (34.5)	
Primary School Completed		119 (26.4)	109 (22.5)	228 (24.4)	
Secondary School Complete		71(15.7)	79(16.3)	150 (16.0)	
Tetiary Education		105 (23.3)	120 (24.7)	125(24.0)	
Missing		6 (1.3)	4 (0.8)	10 (1.1)	
Marital status					.771
Married		286 (63.4)	312 (54.3)	598 (63.9)	
Single		165 (36.6)	173 (35.7)	338 (36.1)	
People in household					.884
<= 5		202 (44.8)	204 (42.1)	406 (43.4)	
6 – 9		127 (28.2)	138 (28.5)	265 (28.3)	
10=>		122 (27.1)	143 (29.5)	265 (28.3)	
TOTAL		**451 (48.2)**	**484 (51.8)**	**936 (100)**	

4.3 PHYSICAL AND PHYSIOLOGICAL MEASUREMENTS OF THE STUDY SAMPLE (n=936)

The physical and physiological measurements of the participants by gender are presented in Table 4.2. The mean weight of the participants was 55.87 kg (SD = 15.02), ranging between 46 kg and 115 kg. The mean body mass index (BMI) of the study sample was 22.63 (SD = 6.23).

The CDC (2011) standard weight status categories associated with BMI ranges for adults' guidelines were used to classify the participants into underweight, normal, overweight or obese. The results indicated that 37 (4%) of the participants were underweight, while 37.5% were of normal weight. The results also showed that 35.9% and 22.6% were overweight and obese, respectively.

Among the 936 participants, the gender distribution showed that the male and female had a BMI of 22.93 (SD=6.29) kg/m^2 and 22.35 (SD=6.18) kg/m^2, respectively, (see Table 4.2 below) and no significant difference was found between males and females. The mean systolic and diastolic blood pressure for the study sample was 125.21 (SD = 16.25) and 81.71 (SD = 7.56), respectively. According to the National Institute for Health and Clinical Excellence (NICE, 2011) clinical guideline for hypertension is definded as a a clinical SBP of >140 mmHg and DBP of > 90 mmHg.

Random Blood Glucose (RBG) test was done for all the participants. It is a non-fasting test, therefore the higher reference value compared to the fasting bloog glucose. According to the American Diabetes Association (ADA) guidelines (2013), the average RBG result for an adult should be between 3.9 – 7.8 mmol/ℓ. In this study, the male, female and total RBG was 4.92 (1.14) mmol/ℓ, 4.76 (1.03) mmol/ℓ and 4.84(1.54) mmol/ℓ, respectively, all of which are within the normal ranges.

Independent-samples t-tests were performed to test whether there was a statistically significant difference in the mean scores of the physical and physiological measurements for male and female participants. As shown in Table 4.2, a significant difference was found in **height** for males (mean = 1.58, SD = 0.12) and females (mean = 1.51, SD = 0.17, t = 6.00, p = 0.000), as well as for **weight** for males (mean = 54.54, SD=0.12) and females (mean=57.09, SD=0.13, t =-3.15, p<0.002).

Similarly, there was a statistically significant difference in waist circumference for male (88.96, SD=13.6) and female (85.85, SD=15.86, t =3.20, p= 0.002), as well as hip circumference for male (99.89, SD=12.71) and female (97.14, SD=12.35, t =-2.75, p=0.006). There was no stastical significant difference between males and females in terms of waist-hip ratio. No significant differences were also found for the systolic and diastolic blood pressure.

Table 4.2: Physical and Physiological Measurements of the Study Sample (n=936) (Mean, SD)

Variable	N	Male (n=451)	N	Female (n=496)	Total (n=936)	Df	T-value	P-value	95% CI for diff.
BP									
Systolic (mmHg)	451	125.64 (16.30)	485	124.80 (16.21)	125.21 (16.25)	934	0.790	.430	-1.247 - 2.925
Distolic (mmHg)	451	81.51 (7.31)	485	81.90 (7.72)	81.71 (7.56)	928	0.788	.432	-1.360 - .582
Waist Cir.	451	88.96 (13.60)	485	85.85 (15.86)	87.33 (14.89)	934	3.20	.002	-1.270 - 2.485
Hip Cir.	451	99.89 (12.71)	485	97.14 (12.35)	96.05 (12.57)	927	-2.75	.006	-3.859 - -639
BMI (kgm^2)	451	22.93 (6.29)	485	22.35 (6.18)	22.63 (6.23)	934	1.44	.152	-21485- 1.38495
Weight (kg)	451	54.54 (11.72)	485	57.09 (12.97)	55.87 (12.44)	934	-3.15	.002	-4.1388 - -9599
Height (m)	451	157.53 (12.36)	485	151 (16.66)	154.55 (15.02)	934	6.00	.000	1.544 - 5.152
WHR	451	.93 (.14)	485	.933 (.152)	.931 (.14655)	933	0.60	.563	-02437 - 01329
RBG (mnol/ℓ)	451	4.92 (1.14)	485	4.76 (1.028)	4.84 (1.54)	934	2.22	.027	-017 - .297

4.3 PREVALENCE AND AWARENESS OF DM (n=936)

4.3.1 Awareness of Diabetes Mellitus (n=936)

Awareness of Diabetes Mellitus was measured by self report. Clients were asked if they had ever been told by a doctor or any other health worker whether they have a raised blood sugar or diabetes. Based on that 10% of the total sample indicated self reported DM. There was no statistically significant difference in response between male and female participants as shown in Table 4.3.

Table 4.3: Awareness of Diabetes Mellitus (n=936).

Self-Reported DM	Male n (%)	Female n (%)	Total n (%)	P – Value
Yes	47 (5.0)	47 (5.0)	94 (10.0)	.287
No	404 (43.2)	438 (46.8)	842 (90)	

4.3.1 Prevalence of Hyperglycemia (n=936)

The prevalence of hyperglycema was determined by the measured blood glucose level of the study sample. Biochemical measurements related to blood glucose level was obtained from the study sample. Fasting plasma glucose was selected as the primary diagnostic test because it predicts adverse outcomes (for example, retinopathy) much more reproducible than the oral glucose tolerance test and easier to perform in a clinical setting (WHO, 2005). A registered nursing practitioner took the blood samples and it was analysed by a registered laboratory scientist. Based on their fasting blood glucose level, the participants were categorised into either impaired fasting glucose: FPG from 110 to <126 (6.1 to 7.0 mmol per L) ***hyperglycemic*** or FPG <110 mg per dL (6.1 mmol per L) and ***normal***, according to the WHO classification (WHO, 2005).

Therefore, 73.9% (n=692) of the study sample were classified to be normal and 26.1% (n=244) as hyperglycemic, as summarised in Table 4.4 below. Independent-samples t-test was performed to test whether there was a statistically significant difference in the biochemical measurements for male and female participants.

The result of the study showed a statistically significant association between blood glucose level and gender (p=0.027).

Table 4.4: Prevalence of hyperglycemia (n=936)

Characteristics	Male n (%)	Female n (%)	Total n (%)	P Value
Hyperglycemic	116 (12.4)	128 (13.7)	244 (26.1)	.027
Normal	335 (35.8)	357 (38.1)	692 (73.9)	
Total	**451 (48.2)**	**485 (51.8)**	**936 (100)**	

4.4 SOCIO-DEMOGRAPHIC AND BEHAVIOURAL CHARACTERISTIC OF CLIENTS WITH TYPE 2 DIABETES MELLITUS (N=244)

4.4.1 Socio-Demographic Characteristic

Of the 936 clients who consented to participate in the first phase of the study, 26.1 % (244) were found to be hyperglycaemic. The characteristics of these participants are shown in Table 4.4. The table indicated that a total of 244 clients was classified as hyperglycemic with a mean age of 37.90 years (SD=15.56), which included 119 males (48.8%) and 125 females (51.2%). The majority of the participants (20%) were between 30 to 39 years and older. Sixty-eight percent of the participants were married, while almost half of the participants (50.8%) highest level of education is tertiary.

Participants were asked about *the number of people living in the family*, and (48.8%) reported living in a family of less than five. More than two-thirds (83.2%) of the participants were unemployed, whilst 14.8% were employed.

Table 4.5: Socio-Demographic Characteristic of Clients with Hyperglycemia (n=244)

Characteristics	M±SD	Male n (%)	Female n (%)	Total n (%)	p-value
Age	37.90±15.56				.0001
<= 20		17 (7.0)	24 (9.8)	41 (16.8)	
21 – 29		20 (8.2)	15 (6.1)	35 (14.3)	
30 – 39		23 (9.4)	26 (10.7)	49 (20.1)	
40 – 49		22 (9.0)	23 (9.4)	45 (18.4)	
50 – 59		20 (8.2)	14 (5.7)	34 (13.9)	
60 +		17 (7.0)	23 (9.4)	40 (16.4)	
Total		119 (48.8)	125 (51.2)	244 (100)	
Highest level of Education					.942
Primary School Incomplete		23 (9.4)	25 (10.2)	48 (19.7)	
Primary School Completed		17 (7.0)	25 (10.2)	42 (17.2)	
Secondary School Complete		14 (5.7)	14 (5.7)	28 (11.5)	
Tetiary Education		64 (26.2)	60 (24.6)	124 (50.8)	
Missing		1 (0.4)	1 (0.4)	2 (0.8)	
Total		**119 (48.8)**	**126 (51.2)**	**244 (100)**	
Marital status					.771
Married		80 (32.8)	86 (35.2)	166 (68.0)	
Single		39 (16.0)	39 (16.0)	78 (32.0)	
Total		**119 (48.8)**	**125 (51.2)**	**244 (100)**	
People in household					.881
<= 5		57(23.4)	62 (25.4)	119 (48.8)	
6 – 9		30 (47.6)	33 (13.5)	63 (25.8)	
10=>		32 (13.1)	30 (12.3)	62 (25.4)	
Total		**119 (48.8)**	**125 (51.2)**	**244 (100)**	
Employment status					.488
Employed		16 (6.6)	60 (20)	36 (14.8)	
Unemployed		100 (41.0)	103 (42.2)	203 (83.2)	
Pensioner		3 (1.2)	2 (0.8)	5 (2.0)	
Total		**119 (48.8)**	**125 (51.2)**	**244 (100)**	

4.4.2 Behavioural Factors of Study Sample

The behavioural factors that were investigated include smoking, alcohol consumption and physical activity (PA). Due to the fact that the subjects were predominantly of the Islamic faith, the prevalence of smoking and alcohol use was zero, therefore the only factor that could be investigated was physical activity.

PA levels of the study sample were classified as vigorous, moderate and sedentary according to the WHO STEPS Instrument Question-by-Question Guide (Core and Expanded) classification (WHO, 2013). Vigorous physical activities are activities that require hard physical effort and cause a significant increase in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause a small increase in breathing or heart rate. The Guidelines for Data Processing and Analysis of the WHO STEPS Instrument were used to compute MET-minutes/week for all three domains, as well as for the total physical activity score per client. Thereafter, the clients were classified as either sedentary, moderate or vigorous physical activity levels.

Among the 244 participants, 9 % (22) was classified as vigorous levels of physical activity levels, while majority of them (71.7%) were classified as having moderate physical activity levels. The remaining 19.7% (n=47) was classified as sedentary physical activity levels.

Gender differences related to physical activity categories as presented in Table 4.6 below. The association between gender and physical activity categories was not significant. Both males and females were mostly classified as being moderately active.

Table 4.6: Gender Differences in Physical Activity Categories (n=244)

Variable	Total (n=244) n (%)	Male (n=244) n (%)	Female (n=244) n (%)	P-Value
VPA	22 (9.0)	7 (2.9)	15 (12.0)	0.352
MPA	175 (71.7)	89 (74.8)	86 (68.8)	0.351
SPA	47 (19.3)	23 (9.4)	24 (9.8)	0.351

Note: VPA – Vigorous Physical Activity

MPA – Moderate Physical Activity

SPA - Sedentary Physical Activity

4.4.3 Health Related Factors of the Participants (n=244)

The majority (88.5%) of the study sample reported not ever being diagnosed with Diabetes Mellitus (self-reported). However, on analysis using fasting blood sugar, all the 244 clients (100%) were diagnosed to be hyperglycemic. Another 40.6% of the study sample reported being diagnosed with hypertension; but only 15.6% of the sample are categorised as hypertensive, according to the WHO definition of hypertension (systolic/diastolic ≥140/90mmHg) using objective measurement of blood pressure size (WHO, 2011), as shown in Table 4.7 below.

Table 4.7: Health Related Characteristic of the Study Sample (n=244)

Characteristics	Male n (%)	Female n (%)	Total n (%)
Alcohol Use			
Yes	0 (0.0)	0 (0.0)	0 (0.0)
No	119 (48.8)	125 (51.2)	244 (100)
Tobacco Use			
Yes	0 (0.0)	0(0.0)	0 (0.0)
No	119 (48.8)	125 (51.2)	244 (100)
Self-reported DM			
Yes	9 (3.7)	19 (7.8)	28 (11.5)
No	110 (45.1)	106 (43.4)	216 (88.5)
Self-reported Hypertension			
Yes	48 (19.7)	51 (20.9)	99 (40.6)
No	71 (29.1)	74 (30.3)	145 (59.4)
Measured Blood Pressure			
Normal	99 (40.6)	107 (43.9)	206 (84.4)
Hypertensive	20 (8.2)	18 (7.4)	38 (15.6)
Measured Blood Glucose			
Hyperglycaemic	119 (48.9)	125 (51.2)	244 (100)
Non-Hyperglycemic	0 (0.0)	0 (0.0)	0 (0.0)

4.8 SUMMARY OF THE CHAPTER

The quantitative results of this chapter were analysed based on the objectives of the study. The prevalence and the awareness were based on a larger sample (n=936), while socio-demographic characteristics and the health-related factors were based on a sub-population of Type 2 Diabetes Mellitus patients (n=244).

A total of 1500 individuals from fifteen (15) enumeration areas of Dutse Local Government area were approached to participate in the study, 936 consented and complete the baseline questionnaire. A response rate of 62.4% (n = 936/1500) was thus achieved. The prevalence of hyperglycemia was determined by the measured blood glucose level of the study sample, of which 73.9% (n=692) of the study sample were classified to be normal and 26.1% (n=244) as hyperglycemic, as summarised in Table 4.3. Also, the awareness of DM was was measured by the self reported DM. Based on that 10% of the total sample indicated self reported DM. There was no statistically significant difference in response between male and female participants as shown in Table 4.2.

The socio-demographic characteristic of the Type 2 diabetic (n=244) indicated that the sample has a mean age of 37.90 years old (SD=15.56), 119 males (48.8. %) and 125 females (51.2%). The majority of the participants (20%) were 30 to 39 years and older. Sixty eight percent of the participants were married, while almost half of the participants (50.8%) highest level of education is tertiary.

The health reported factors indicated that the are predominantly of the Islamic faith, and that the prevalence of smoking and alcohol use was zero. In addition, the majority (88.5%) of the study sample reported not ever being diagnosed with Diabetes Mellitus (self-reported). However, analysis of measured fasting blood glucose levels showed that all the clients (100%) in the subset with high fasting blood glucose levels were hyperglycemic and 40.6% of the study sample also reported of being diagnosed with hypertension. However, measured blood pressure showed that 15.6% of the sample size are categorised as hypertensive.

These results obtained from the analysis and outlined in this chapter were used to assist in the development of the DSME programme. The next chapter will outline the challenges experienced by both the clients with Type 2 Diabetes Mellitus and the healthcare professionals in the management of the disease.

CHAPTER FIVE
RESULT OF THE CURRENT PRACTICE OF DIABETES MELLITUS IN RURAL NIGERIA

5.1 INTRODUCTION

This chapter contains the results of the content analysis of the focus group discussion and semi-structured interviews which attempted to answer the objective of the second phase of the study, namely to explore the current practices regarding the management of Diabetes Mellitus in rural Nigeria. Focus group discussions with clients with Type 2 Diabetes Mellitus, as well as semi-structured interviews with health care professionals (detailed description of methodology in Chapter Three) were employed to explore the participants' and health care professionals' challenges experienced in the management of the disease.

5.2 FOCUS GROUP DISCUSSIONS WITH CLIENTS WITH T2DM

All the clients were invited to participate in the FGD in all the Community Health Centres CHCs, and therefore four (4) were conveniently selected per participating CHC (four randomly selected CHCs in total) and completed the baseline questionnaire for participation in the FGD. Therefore, a total of sixteen (16) clients were invited, and they all consented, from four (4) CHCs resulting in a response rate of 100%. Therefore, a total of four (4) FGD was conducted.

A total of four (4) focus groups discussions were facilitated by the researcher and trained research assistant. Sixteen (16) clients, 11 males and 5 females with a mean age of 47.95 years (SD = 13.20), agreed to participate. The focus groups took place in a relaxed and convenient setting for all the group members. Each participant was encouraged to effusively participate in the discussions.

Table 5.1: Themes of FGDs with Clients

Pre-Determined Themes		Emerging Themes
Current Practice	**Views of Clients**	a) Views on treatment b) Recommendations
Challenges	**Views from Clients**	a) Financial constraints b) Lack of cooperation from HCPs c) Lack of time to exercise d) Lack of family support e) Traditional healers

5.2.1 Current Practice

a) Views on treatment

Most of the participants were of the view that they are satisfied with the kind of diabetes treatment they have received; they are feeling better now than before the treatment.

"I am feeling better now; most of the symptoms have now reduced to the minimum, no weakness and other things. So the treatment is quite on course." **(Female Patient, 45 years old)**

"I am enjoying my body now, I am taking my drugs regularly, I am also abiding by the doctor's advice on diet, I am also trying to exercise, I am feeling fine now." **(Male Patient, 56 years old)**

"Thank God that I stopped patronising traditional healers, my condition was worse when I was taking traditional medicine, but now I am better and abiding by the doctor's advice." **(Male Patient, 58 years old)**

"I can say that the majority of my complications come from taking traditional medicine, but am now better." **(Female Patient, 45 years old)**

b) Recommendations

In the course of our discussion, the clients gave some recommendations on how they want to be assisted both by government and non-governmental organisations.

"Government should try as much as possible to subsidise our drugs so that we can buy them at affordable prices, this can help in the treatment of diabetes." **(Male Patient, 55 years old)**

"In addition to subsidising our drugs, stakeholders should also give a waiver to diabetes lab tests and make it free for all diabetic patients, this will reduce our problem" **(Male Patient, 65 years old)**

"To me, communities should alleviate our suffering by funding our association so that we can channel all our problems through it." **(Male Patient, 58 years old)**

"I think NGO's should also come to our aid and help us, this can be done in so many ways" **(Male Patient, 45 years old)**

"The media also have a role to play in public awareness through their media in the prevention and control of diabetes; this can seriously help in combating diabetes." **(Female Patient, 45 years old)**

5.2.2 Challenges

a) Financial Constraints

Patients' financial constraints greatly hinder the treatment of diabetes. Some participants, during the focus group discussion, are of the view that lack of money to pay for laboratory tests and to buy drugs and other medical bills is a great challenge in their treatment of diabetes, especially in rural communities where the majority of them are low-income earners.

Some participants have this to say:

"I have no money to buy drugs, the drugs are too expensive……. I cannot buy because I don't have money, the one I am taking is finished, and I can't buy." **(Male Patient, 55 years old)**

"For me, lack of money is a great challenge to me, now I can't even pay for lab test, they ask me to pay #2,900 for one test but I don't have the money and my Doctor said the test is very important." **(Male Patient, 48 years old)**

"I have the same problem; I want to buy drugs but I don't have money to buy drugs." **(Female Patient, 65 years old)**

"We are facing the same problem, the drugs are expensive and we don't have the money to buy, even periodic tests I find them difficult to do because of lack of money." **(Male Patient, 67 years old)**

"Yes, one of the major challenges we are facing as diabetic patients is lack of money, to buy drugs and go for test." **(Male Patient, 50 years old)**

b) Lack of Cooperation from the Healthcare Personnel

Some of the participants raised the issue of not getting proper attention from the healthcare professionals. Sometimes they are left unattended, waiting for a long time to see their doctors, this sometimes is frustrating.

"I could remember I went to the hospital to see my doctor, and I waited for hours, but after a long wait I was told he will not be coming; I should come back the following week. This really frustrated me because I was sick and I need to see him." **(Male Patient, 64 years old)**

"Myself, I had similar experience, I had an appointment to see my doctor, I was asked to wait, that the doctor has a visitor. I waited for hours still I was not called; I was later told that he was with a friend." **(Female Patient, 60 years old)**

c) Lack of Time to do Exercise

Some participants during the focus group discussion said they were advised by their doctors to have routine exercises during the week. But, one of their challenges is that they do not have time to do the exercises and some other time they forgot to do it. Below are excerpts from the FGD.

"My problem is that I have tight schedule, so I find it difficult to do the exercise… so I can't find time to exercise which my doctor told me it will help in treating my diabetes. This is a great challenge to me." **(Male Patient, 50 years old)**

"I am a trader, I move from village market to another, I always leave early in the morning and come back late, so it is a great challenge to me in the treatment of my diabetes." **(Male Patient, 47 years old)**

d) Lack of Support from my Family

Diabetic patients need support, especially from members of their immediate family, both morally, financially and otherwise. In the course of our discussion, the participants raised the issue of lack of support from members of their immediate family. They continue to narrate their experiences as a challenge to the treatment of their diabetes. They all agreed that they had not experienced support from members of their immediate family. Excerpt from the discussions.

"*One of my greatest challenge in the treatment of my diabetes is lack of motivation from members of my family, they don't show much concern about my problem, they are not there to support and motivate me so that I get more courage to face my ailment."* **(Male Patient, 53 years old)**

"My own family too do not care much about my problem, nobody cares to support me financially, they know I have low income as such I need financial support, but they don't give me, that's why sometimes I could not even buy drugs, sometimes I missed my dosage." **(Male Patient, 46 years old)**

"Members of my family don't care much about my ailments, no motivation, not to talk about financial support. Only my wife cares about my health problem, this is one of my greatest challenges as far as my diabetes is concerned." **(Male Patient, 48 years old)**

"My greatest challenge as far as family members are concerned is my wife, my Doctor advised me on the type of foods I should eat, but she doesn't help here, some time she will only cook normal food, and I have to eat it since there is no alternative, this seriously affect my treatment." **(Male Patient, 53 years old)**

e) Consulting Traditional Healers

In the focus group discussion, one of the issues raised and agreed upon by the majority of the participants as a challenge to the treatment of diabetes, is traditional healers. It was mentioned that pairing traditional healers' treatment with that of orthodox medicine is seriously affecting the treatment of diabetes. They said that sometimes taking traditional medicine severely raises their glucose level, leading to emergency medical help. Below are excerpts from the patients:

"I started going to the hospital as well as traditional healers; I discovered that any time I take traditional medicine my condition become worse and had to be rushed to hospital for an emergency, so I had to stop using the traditional medicine." **(Male Patient, 48 years old)**

"*My friend advised me to visit a traditional healer for my diabetes, I was instructed to stop taking my drugs, and was given some traditional medicine to drink twice a day, I fell unconscious immediately after taking it, and rushed to the hospital for an emergency. This seriously affected my treatment."* **(Male Patient, 65 years old)**

5.3 FOCUS GROUP DISCUSSIONS WITH HEALTH PROFESSIONALS

Health professionals from the four randomly selected CHCs. Seven (7) doctors, 5 males, 2 females and a nurse, agreed to participate. The focus groups took place in a relaxed and convenient setting for all the group members.

During the discussion, the majority of the participants in all the hospitals where the FGD was conducted, who were medical practitioners, highlighted that their current practice in the treatment of Type 2 Diabetes is carried out in three stages. It begins with investigation through laboratory tests to ascertain and confirm that the client is actually a confirmed Type 2 diabetic patient, then the treatment stage and the diet advisory stage.

Table 5.2: Themes of FGDs With Doctors

Pre-Determined Themes		Emerging Themes
Current Practice	**Views of Doctors**	a) Investigation and confirm diagnosis b) Treatment c) Advise on diet
Challenges	**Views from Doctors**	a) Patient related b) Government related

5.3.1 Current Practice

a) Investigation and Confirmation of Diagnosis

This is done through laboratory tests to ascertain and confirm that the client actually has Type 2 Diabetes Mellitus. According to a male health personnel participant (doctor):

"*The first thing we do… is to conduct investigation to confirm that the patient has Type 2 Diabetes. We do all the necessary tests."* **(Male Doctor, 45 years old)**

Another male doctor stated the types of tests that is normally done to normally confirm the diabetic diagnosis.

"*We start with random blood sugar assessment… we do both random blood sugar and urinalysis."* **(Male Doctor, 40 years old)**

However, one of the participants, a female doctor in a rural hospital stated that if the initial random blood test is positive, further laboratory tests are recommended. The excerpt below states:

"*In the urinalysis is positive, then further tests such as fasting blood sugar or even OGTT test (oral Glucose Tolerance Test) are done to confirm…"* **(Female Doctor, 37 years old)**

b) Treatment

Participants at the FGD were of the view that, after investigation, and is confirmed that the client is a type 2 diabetic patient, then they go for treatment. According to a male doctor; they have two management strategies in their hospital, namely primary and secondary treatment. At first the primary treatment is employed, namely of medicator. This is what he has to say regarding treatment:

"*After investigation…., then we go for treatment……. there are primary and secondary treatment, where we prescribe* ***glucose…*** *only, or we combine it with* ***globe*** *if the case is severe. This is our correct practice, where we put the patient on our primary drugs (Type 1 treatment before we go to Type 2 treatments)."*

"The secondary option is to prescribe drugs based on the seriousness of their condition…" **(Male Doctor 45 years old).**

The researcher also asked the participants whether their clients use personal Glucometer to measure their glucose level, and also whether they rely on such measurement for follow up visits. The general consensus among the participants is that, they don't rely on such measurement by their clients; rather they rely on results obtained from the hospitals laboratory. The following quotations illustrate their sentiments.

"*Yes, some of the patient have their personal glucometer, it depends on the patient's level of education, some are educated and can use it, but some cannot even measure it and if measured they cannot be able to interpret the results."* **(Female Doctor, 35 years old)**

"Actually, even if a patient can use glucometer, we still send him to the laboratory to measure his glucose level, because at our level we rely on the results from our lab than that of the patient." **(Male Doctor, 33 years old)**

The researcher further asked what the participants normally do when faced with complications from Type 2 diabetes. The participants described the procedure or current practice in the treatment of complications as a result of Type 2 diabetes. See the excerpt below:

"Well, once we have confirmed chronic diabetic patient, we always do some tests on the patient such as kidney function test, liver function tests etc. So once we noticed signs of complication……we try to address it depending on the severity of the case." **(Male Doctor, 40 years old)**

c) Dietary Advice

Diet also plays an important role an important role in the management of Diabetes Mellitus. It is therefore important to include education with regard to diet in the management of patients with T2DM.

"*You know diabetes is a metabolic disorder, sometimes it is attributed to our lifestyle, i.e., lack of exercise, our diet etcetera, so what we normally do in this rural hospital is to educate the patient on what diabetes is all about, and advice the patient to reduce intake of foods rich in carbohydrates, and also prescribe some exercises."* **(Male Doctor, 45 years old)**

"Most patients can't adhere to an advice; they always eat whatever comes their way." **(Nurse, 35 years old)**

"My advice for them is to cut down junk foods, sugary substances and excercice regularly." **(Nurse, 35 years old)**

"Yes, really diet plays an important role in the management of diabetes when incorporated with excercises **(Female Doctor, 35 years old)**

All other participants in the FGD discussion agreed that in addition to prescribing drugs to the patient, they equally advise the patient on lifestyle modification that has to do with diet and exercises as a current practice in the treatment of diabetes.

5.3.2 Challenges

a) Patient-Related Challenges

"*Really we face a lot of problems from patients; they don't adhere to the prescribed drugs"* **(Male Doctor, 47 years old)**

"Once a patient begins to feel better, he stops taking the drugs or skip some doses until he reaches critical condition." **(Female Doctor, 32 years old)**

"Also, some patients don't follow the diet advises, they continue to eat regular diet, this is a great challenge we are facing from the patients in the treatment of diabetes." **(Male Doctor, 47 years old)**

b) Government-Related Challenges

With regard to this challenge, a doctor has this to say:

"Cost of lab tests is very expensive in government hospitals…… not every patient can afford such lab fees especially in the rural community. So, patients hardly afford this test despite its importance in the treatment of Diabetes Type 2." **(Female Doctor, 40 years old)**

However, the participants were quick to suggest some recommendations on how Government can help overcome such challenges. A female doctor has this to say:

"Yes, drugs in diabetic treatment are very expensive, so government should try and subsidise the drugs so that patients can afford them, since most of our patients are living in the rural areas." **(Female Doctor, 45 years old)**

Another male doctor has this to say:

"Yes, authorities can help in supply of drugs and subsidise the cost of the lab tests… If these are done then, the problems of diabetes management especially in rural communities will be alleviated." **(Male Doctor, 48 years old)**

Another recommendation to the government is on staff welfare. A male doctor has this to say:

"Good working environment such as …… motivation and welfare, as well as training." **(Male Doctor, 50 years old)**

"Good remuneration and allowance to ease the stress of over work needs to be addressed." **(Male Doctor, 50 years old)**

5.4 SUMMARY OF THE CHAPTER

This chapter outlined the results of the qualitative investigation regarding the the current practices regarding the management of Diabetes Mellitus in rural Nigeria. It is evident from the results outlined in this chapter that both healthcare professionals and patients with Type 2 Diabetes Mellitus experience challenges related to the management of this condition. In addition, recommendations are also offered and outlined in this chapter. The next chapter outlines the intervention effects of the DSME intervention.

CHAPTER SIX

IMPLEMENTATION OF THE DSME TRAINING PROGRAMME

6.1 INTRODUCTION

This chapter contains the results of the quantitative analysis of the intervention implemented to answer the sixth and final phase of the study, to implement and test the effectiveness of the DSME programme at a selected community health centre. The chapter will therefore report on the changes in outcome measures, including physiological measures, self-efficacy, knowledge and change for physical activity and diet respectively after the implementation of the DSME programme.

6.2 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SAMPLE

One health centre was purposely selected for the implementation of the DSME training programme. The health centre with the highest number of clients with Type 2 Diabetes Mellitus was selected for this phase. The population of this phase consists of both males and females residing at the rural area of Jigawa State, Nigeria. Clients with Type 2 Diabetes were screened until the required number was reached. Individuals aged 18 years and older were recruited and participated in the study.

Power analysis suggested a minimum sample size of 200 clients. With 200 clients, a difference with a standard deviation slightly larger than the magnitude of the difference was detected as statistically significant with an overall alpha level of 5% and power of 90%. Consecutive sampling was utilised over a three-week period, until 200 clients were recruited. The DSME training was implemented by the researcher who is a trained Diabetes Educator.

All the patients that attended the Diabetes Clinic at the rural community health centre (CHC) were approached and 200 patients identified with Type 2 Diabetes Mellitis consented and completed the baseline questionnaire. The study sample consisted of both male (91) (45.5%) and female (109) (54.5%) with a mean age of the participants was 47.95 years old and just more than half (5.45%) of the participants were female. Twenty-four percent (24.5%) of the participants had completed Secondary School, and 24.5% completed tertiary education. The majority of the participants (89.0%) were married and 27.5% were employed. A total of 45.5% (n=91) had six to nine people living in the household, as seen in Table 6.1 below.

Table 6.1 Socio-Demographic Characteristics of the Clients with Type 2 Diabetes Mellitus Baseline (n=200)

Characteristics	M±SD	Male n (%)	Female n (%)	Total n (%)
Mean Age	**(47.95) SD (13.20)**			
<=20		0 (0)	1 (0.5)	1 (0.5)
20 – 29		6 (6.6)	8 (9.3)	14 (7.0)
30 – 39		11 (12.1)	18 (16.5)	29 (15.5)
40 – 49		29 (31)	36 (33.0)	65 (32.5)
50 – 59		23 (25.3)	28 (25.7)	51 (25.5.5)
60 =>		22 (24.2)	18 (16.5)	40 (20.0)
Highest Education Level				
Primary School Incomplete		14 (15.4)	35 (32.1)	49 (24.5)
Primary School Completed		30 (33.3)	24 (22.0)	54 (27.0)
Secondary School Completed		25 (27.)5	24 (22.0)	49 (24.5)
Tertiary Education		16 (17.6)	21 (19.3)	37(18.5)
Missing Data		6 (6.6)	5 (4.6)	11(5.5)
Marital status				
Married		78 (85.7)	13 (14.3)	178 (89.0)
Single		9 (8.3)	37 (91.7)	22 (11.0)
Employment Status				
Employed		32 (29.4)	23 (25.3)	55 (27.5)
Unemployed		51 (46.8)	53 (58.2)	104 (52.0)
Pensioner		26 (23.9)	15 (16.5)	41 (20.5)
No. of people living in the household				
<=5		34 (37.4)	24(22.0)	58(29.0)
6 to 9		32 (35.2)	59 (54.1)	91(45.5)
10 =>		25 (27.5)	26 (23.9)	51 (25.5)
Total		**91(45.5%)**	**109 (54.5%)**	**200 (100)**

6.3 INTERVENTION EFFECTS

The outcome measures used included physiological variables such as weight, BMI, HGT and blood pressure, self-care knowledge and diabetic care profile.

6.3.1 Effect on Physiological Outcome Measures

A paired samples t-test was conducted to evaluate the impact of the intervention on physiological variables such as weight, body mass index (BMI), random blood glucose test (HGT), systolic blood pressure (SBP) and diastolic blood pressure (DBP). There was a statistically significant decrease in **weight** from time 1 (M=68.78 kg; SD=14.44) to time 2 (M=67.38 kg; SD=13.99), t=4.359, p<0.05 (two-tailed). The mean decrease in weight was 14.00 (95% CI: 0.764 – 2.026). The eta statistic (0.36) indicated a large effect size. Similarly, a statistically significant decrease was obtained for **BMI** from time 1 (M=26.38 kg/m2; SD=5.68) to time 2 (M=25.82 kg/m2; SD=5.15), t = 4.736, p<0.05 (two-tailed). The mean decrease in BMI was 0.56 (95% CI: 0.12844 - .81538). The eta statistic (0.83) indicated a large effect size. There was a statistically significant decrease in **HGT** from time 1 (M=13.12 mmol/ℓ; SD=4.59) to time 2 (M=11.11 mmol/ℓ; SD=3.00), t =8.705, p<0.05 (two-tailed). The mean decrease in HGT was 2.01 (95% CI: 1.555 – 2.466). The eta statistic (0.49) indicated a large effect size. A statistically significant decrease was obtained for **Systolic Blood Pressure (SBP)** from time 1 (M=129.11mmHg; SD=18.94) to time 2 (M=126.39 mmHg; SD=17.53), t=6.862, p<0.05 (two-tailed). The mean decrease in SBP was 2.72 (95% CI: 1.251 – 4.194. The eta statistic (0.03) indicated a small effect size. There was a statistically significant decrease in **Diastolic Blood Pressure (DBP)** from time 1 (83.65mmHg; SD=9.36) to time 2 (M=81.78 mmHg; SD=9.23), t=3.651, p<0.05 (two-tailed). The mean decrease in DBP was 1.87 (95% CI: 1.336 – 2.414). The eta statistic (0.03) indicated a small effect size.

Table 6.2 Intervention Effects on Physiological Measurements (N=200)

Variable	Pre-test	Post-test	t-value	Df	P –value	eta squared
SBP (mmhg)	129.11(18.94)	126.39(17.53)	6.862	190	.000	.034
DBP (mmhg)	83.65(9.36)	81.78(9.23)	3.651	199	.000	.026
FBG (mmol/l)	13.12(4.59)	11.11(3.00)	8.705	199	.000	.485
BMI (kg/m)	26.38(5.68)	25.82(5.15)	4.376	199	.000	.826
Height (kg)	1.57.(1.35)	1.57(1.35)	-	-	-	-
Weight (kg)	68.78(14.41)	67.38(13.99)	4.359	199	.000	.363

Paired sample t-test Intervention effects on physiological measurements (n=200) Paired sample t-test.

6.4 DIABETES SELF-CARE KNOWLEDGE

Diabetes self-care knowledge was assessed with the Diabetes Self-Care Knowledge Scale (DSCK-30) (Chinyere, Nancy, & Nwankwo, 2010). The items include overall diabetes care, coping with stress, diet for blood sugar control, the role of exercise in diabetes care, medications taken, how to use the results of blood sugar monitoring, how diet, exercise and medication affect blood sugar levels, prevention and treatment of high/low blood sugar, preventions of long-term complications of diabetes, foot care, benefits of improving blood sugar control as well as pregnancy and diabetes. However, these items are classified under three domains including: Modifiable Lifestyles, Adherence to Self-care Practices, and Consequences of uncontrolled blood sugar level. Participants rated each item using a categorical Yes/No answers across 13 items. Scores were subsequently coded as No = 0 and Yes = 1, cumulative scores were collated for each domain and thereafter for the total score of the DSCK-30.

Higher scores generally indicate better diabetes self-care knowledge for domains and overall score. Table 6.3 below presents participants' knowledge across domains and the overall score.

Table 6.3 Changes in Diabetes Self-Care Knowledge Following DSCE

Variables Mean	Baseline Assessment	Post intervention	*W*	Prob.
Modifiable Lifestyle	4.53	9.73	11.78	0.0001
Adherence to Self-Care Practices	2.29	3.76	11.45	0.0001
Consequences of Uncontrolled Blood Sugar Level	1.34	2.25	7.81	0.0001
Total	8.17	15.77	12.06	0.0001

The outcome of this study indicated significant improvement in participants' knowledge from baseline to post-intervention in all the three domains of diabetic care knowledge ($P<0.05$) as well as an overall diabetes self-care knowledge post-intervention ($w=12.06$, $P<0.0001$).

6.5 DIABETES CARE PROFILE

This outcome measure consists of nine domains (understanding, support, control problem, social and personal factors, attitude towards diabetes, diet adherence, long term care benefits, exercise barrier and monitoring barrier), of 30 items (scored categorically as Yes or No). Total score was determined, higher score represents better knowledge of profile, scores of 21 and above (70% of total score) are categorised as high and scores below are low.

The present outcome indicated that of the nine domains of the Diabetic Care Profile participants demonstrated improved knowledge post-intervention in eight domains ($p < 0.05$),

however, only the support domain indicated no difference post-intervention ($p > 0.05$) (Table 6.3).

TABLE 6.4: Diabetes Care Profile Self-Efficacies

Variables	Baseline	Post	χ^2	Prob.
Understanding	115.50	358.39	435.22	0.0001
Support	300.50	300.50	0.00	1.000
Control problem	419.50	241.00	296.39	0.0001
Social and personal factors	499.00	203.50	585.82	0.0001
Attitude towards diabetes	177.13	336.65	198.94	0.0001
Diet adherence	119.59	385.38	423.05	0.0001
Long term care benefits	424.50	238.50	312.08	0.0001
Exercise barrier	414.50	243.50	281.01	0.0001
Monitoring barrier	298.50	298.50	8.04	0.018

6.6 SUMMARY OF THE CHAPTER

This chapter provided the results of the analysis assessing the effects of the DSME intervention programme. The programme for clients with Type 2 Diabetes Mellitus was implemented in the rural community health centre (CHC) in Dutse Jigawa State, and was successfully delivered by the researcher for six (6) weeks. The key findings were the statistically significant change in a number of outcome measures such as BMI, random blood glucose (HGT), systolic blood pressure, and diastolic blood pressure and, change in diabetes care knowledge and care profile.

The next chapter will provide an overall discussion of the study. In addition, the conclusion, limitations and recommendations of the present study will be outlined.

CHAPTER SEVEN

DISCUSSION, SUMMARY, CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

7. INTRODUCTION

The overall aim of this study was to determine the effectiveness of the Diabetes Self-Management Education (DSME) training among individuals with Type 2 Diabetes Mellitus in rural Nigeria. Type 2 diabetes constitutes about 85 to 95% of all diabetes in high-income countries. Type 2 diabetes is now a common and serious global health problem, which, for most countries has evolved in association with rapid cultural and social changes, reduced physical activities and other unhealthy heath lifestyle and behavioural patterns (1). This study therefore examined the demographic, behavioural measurements, physical measurements, biochemical measurements, diabetes care profile and diabetes self-care knowledge in determining the effectiveness of DSME. For the proffer discussion of the above, several questions were answered:

What is the prevalence and awareness of T2DM?

What are the current practices with regards to the management of T2DM?

What is the effectiveness of DSME?

7.1 WHAT IS THE PREVALENCE AND AWARENESS OF T2DM?

The prevalence of Type 2 diabetes is on the increase globally, with Sub-Saharan Africa being estimated to have 20 million individuals living with the condition, and the number is expected to reach 42 million by the year 2040 (an increase of (109.1%). In Sub-Saharan Africa, Nigeria has the highest number of people with diabetes, with an estimated 3.9 million people (an extrapolated prevalence of 5.0%) of the adult population aged 20 to 79 years (WHO, 2000).

There is an increasing prevalence of diabetes and pre-diabetes worldwide (Force, 2006). More than five million people suffer from the disease in Africa, and the number is expected to skyrocket to 15 million by 2025 (Force, 2006). As already pointed out, the sixth edition of the IDF Diabetes Atlas shows that Nigeria is the leading country in Africa in terms of the number of people with diabetes, and that 3.9 million people had diabetes, with 105,091 diabetes-related deaths in 2013. This figure is estimated to increase annually by 125,000 between 2010 and 2030 even though the prevalence of 4.99% is far less than that of Reunion (15.4%), Seychelles (12.1%), Gabon (10.7%), Zimbabwe (9.7%), and South Africa (9.3%). In addition, there are still about 1.8 million Nigerians with undiagnosed diabetes in 2013 (IDF, 2006).

In Nigeria, the prevalence varies from 0.65% in rural Mangu village to 11.0% in urban Lagos (Western Nigeria) (Gbolade, 2009). With the incidence of diabetes in Africa, diabetic complications are also expected to rise proportionately (Wild, 2004). In South Eastern Nigeria, the overall prevalence of diabetes was 10.5% (Chris, Akpan, John & Daniel, 2012), whereas in South Western Nigeria the prevalence of diabetes ranges from 4.8% in Ile-Ife, Osun State to 11.0% in Lagos (Gbolade, 2009); (Force, 2006). Also, 0.8% of Type 2 Diabetes Mellitus and 2.2% of Impaired Glucose Intolerance in Ibadan (Nwatu, 2016). Another study also reported a comparable prevalence of 2.8% in Ibadan (Owoaje, Rotimi, Kaufman, Tracy & Cooper, 1997), 1.7% in Ilorin (Rasaki et al., 2017), and 6.8% in Port Harcourt, Nigeria (Nyenwe, Odia, Ihekwaba & Babatunde, 2003). In 2004, a survey in Jos reported a prevalence of 10.3%, while Nyenwe, Odia, Ihekwaba and Babatunde (2003) reported a prevalence of 2.2% in Port Harcourt in 2003. Lucia and Prisca (2012) reported a prevalence of 4.7% which was higher than the national prevalence of 2.2% reported in the (IDF, 2007).

Findings from the current study revealed a prevalence of Type 2 diabetes of almost 26% in Northern Nigeria (a rural Nigerian community). This is unusually higher than the prevalence

observed in Nigeria, and elsewhere in rural communities within and outside Africa. Thus, it is at variance with a number of previous findings (Rasaki, 2017; Staniferet & Philippin, 2016).

The reasons for the high prevalence of Type 2 Diabetes Mellitus among rural Nigerians are multi-factorial. Lower educational attainment has been considered as a predictor affecting poor health outcomes and management of chronic disease (Choi & Shlipak, 2011; Stamatakis, Wardle & Cole, 2010). For instance, a study on SES and the incidence of diabetes suggested that higher educational attainment was associated with a lower risk of diabetes (Lee, Glynn & Peña, 2011). The present study's finding is in line with previous findings that might support an inter-related pathway between education and health. Education level is a marker of the ability to turn information into practical behaviours, with the ultimate goal to prevent or manage chronic diseases (Geyer, Hemström, Peter & Vågerö, 2006). In this sense, it is plausible that a higher education level supports the improvement of health by increasing health knowledge and motivating healthy behaviours (Braveman, Egerter, & Williams, 2011; Lee & Albert, 2011). In addition, higher educational attainment is closely linked to a better physical and social environment. For example, lower educational attainment is in part associated with lower levels of social support and more adverse physical and environmental exposures (Silles, 2009). Furthermore, a better education usually implies more opportunities in the labour force market and raises more income, which closely influences healthy behaviours for chronic disease management (Alomar, Al-Ansari, & Hassan, 2019). Overall, the present study's finding that Type 2 diabetes is more prevalent among individuals with lower educational attainment could be due to the fact that lower educational attainment possibly limits information and resources linking to healthy behaviours and environment exposure (Suhrcke & de Paz Nieves, 2011).

Financial constraint is a key factor as most patients have to pay out of pocket for their drugs and for blood glucose tests, and at a price which has been found to be much higher than the cost of these drugs in other parts of the world (Saadine et al, 2006). In Nigeria, a substantial portion of healthcare costs (74.5%) is borne by the patient, as the government provided only 25.5% of the healthcare expenditure in 2003 (WHO, 2008). The WHO report estimates that 90.2% of Nigerians live below the poverty level of $2 per day. Thus, accessing healthcare is a challenge for people living with diabetes in Nigeria (Ofoegbu, 2005). This difficulty is evident by reports showing the high prevalence of complications due to diabetes (Grant, Pirraglia, Meigs & Singer, 2004; ADA, 2002). Patients' non-adherence to therapy is an important factor. Culturally, Nigerians are averse to accepting traditional medication and accepting that a disease is incurable and requires life-long management. Patient education is the key for counteracting the menace, unfortunately only 54.4% of the study sample completed education from primary to postgraduate level. Healthcare providers are likely to benefit from continues education on DSME permanently in the management of Type 2 DM in rural areas.

7.2 WHAT ARE THE CURRENT PRACTICES WITH REGARDS TO THE MANAGEMENT OF T2DM?

Records exist that various socio-demographic factors are associated with the increase in Type 2 Diabetes Mellitus in both low- and high-income countries. Amongst these factors are: age, gender, level of education, marital status and level of employment. Findings from the present study shows that level of employment proved to play a significant role in the development of DM. Forty-five percent (45.0%) are homemakers, and government employees account for only 10.7% of DM cases. This shows that unemployment is a major contributing factor to the development of Type 2 Diabetes Mellitus in rural Nigeria. Previous literature suggests a bi-directional association between unemployment and health. Individuals with poor health tend

to drift towards unemployment and unemployment tends to lead to deteriorating health (Lundin, 2010). The underlying potential pathways include prolonged stress resulting from economic hardship, loss of self-esteem and loss of the health promoting aspects available at the workplace (Jahoda, 2009; Bartley, 2004).

It is also important to get an understanding of the current practices of Diabetes Mellitus from the viewpoint of both the client and health professionals in an attempt to inform health promotion strategies. In this study, the participants highlighted several challenges related to the current management practices. Issues related to care, especially from the health facilties were reported, for example, long waiting times to be attended to by medical doctors. The issues raised in this study is similar to what was reported by Steyl and Phillips (2014) in South Africa, Al-Malki (2014) in Saudi Arabia and De-Graft Aikins (2002) in Ghana. Long waiting times and clients' dissatisfaction with it could impact their adherence to treatment or their attendance of follow-up appointments, as stated by Steyl and Phillips (2014). Neither clients nor health professionals in the present study disclosed the possible reasons for the long waiting times, but possible large workloads of patients per healthcare professionals could potentially be an issue, as stated by Romakin and Mohammadnezhad (2019). These types of challenges however are beyond the control of both the clients and healthcare providers and should be taken up by government agencies.

The healthcare professionals in this study correctly pointed out that lifestyle changes are an important issue to be considered in the management of diabetes mellitus. Their concern with regard to the clients' adherence to dietary advice is an important issue to take note of. Although clients did not offer any opinion with regard to diet specifically, their opinion regarding lack of finances could potentially be a challenge they face when it comes to adherence to diet

prescribed by the healthcare professionals. Steyl and Phillips (2014) also highlighted that clients might not necessarily have the knowledge to replace unhealthy food with healthier options that could be of similar prices, as clients are mostly of the opinion that healthy food are expensive. Issues such as this, highlights the need for better collaboration between the healthcare team and the client. Vedasto, Morris and Furia (2020) explained that shared decision-making is an aspect that is important and plays a significant role in assisting clients with Diabetes Mellitus with self-management of their disease.

Both clients and healthcare professionals pointed out other lifestyle choices such as physical activity participation. Once again, a more collaborative approach could be useful to assist in the clients' understanding of what exercise entails and the benefits thereof. This approach should, however, include the family of the client too, as it was expressed in this study that a lack of family support was experienced as a challenge. Steyl and Phillips (2014) pointed out that low motivation could be a major challenge for individuals with Diabetes Mellitus when it comes to becoming more physically active. This could be futher aggrevated if family members do not offer support, as is the case in this study.

The management of Diabetes Mellitus has been challenging in resource-limited areas such as Sub-Saharan Africa and researchers have pointed out the existence of traditional healers in parallel with the bio-medical health system a decade ago (Renzaho, 2015; Mbeh et al., 2010). Mbeh et al. (2010) highlighted the opposing viewpoints with regards to traditional healers. Some viewed the incorporation of them as dangerous while others viewed the inclusion of them in the management of diabetes as a potential asset. However, in this study, visiting or consulting traditional healers were reporteted as a challenge by some of the participants. Participants felt that combining traditional medicine with orthodox medicine affected their disease management negatively with increased glucose levels caused by the traditional

medicine at times. A need for improved collaboration between the bio-medical health system and traditional healers could be beneficial, however. Renzaho (2015) is of the opinion that the acknowledgement of traditional healers as a deliberate role player in managing diabetes has several advantages. These include their accessibility in rural areas, their extraordinary levels of community knowledge among others. Therefore, a concerted effort should be made in this study's setting, as traditional healers could play a huge role in community health education. Proper training and workshops for traditional healers regarding the management of diabetes would be very useful in this setting, as Mbeh et al. (2010) pointed out, that they are good at communicating with their respective communities.

7.3 WHAT IS THE EFFECTIVENES OF DSME?

Over the past twenty years, there has been an explosive increase in the number of cases of diabetes (Khan et al & Quan, 2011). The International Diabetes Federation (IDF, 2012) has recently estimated that in 2030, 9.9% of the adult population worldwide will have diabetes (552 million). Type 2 diabetes accounts for at least 90% of diabetes cases in developed countries (Baik & Kim et al, 2012). Iran has a 7.7% (approximately 2 million adults) population rate of prevalence of diabetes within the age range, from 25 to 64 years old (Alaeddin & Esteghamati et al., 2009). This rather high prevalence is seemingly rising (Rathmann, 2004). This increase is likely to have a significant public health impact given the high rates of acute myocardial infarction, heart failure, stroke, and death that follow diabetes (Khan & Quan, 2011), and implies a substantial burden on both the individual and the healthcare system (Goday, 2002). Diabetes is also associated with significant healthcare costs (CDC, 2007). The aggregate annual direct costs of diabetes in Iran, is estimated to be 590.7 ± 66.0 million US dollars (Alaeddin & Esteghamati et al., 2009). While it is well established that diabetes self-management education (DSME), a complex health intervention, is generally

effective at enhancing self-care behaviour (Cunningham et al, 2018), improving glycemic control (Pimouguet, Thiebaut, Dartigues, & Helmer, 2011), lowering healthcare costs (Li, Zhang, Barker, Chowdhury & Zhang, 2010), and improving quality of life (Cunningham et al, 2018).

Basically, the remedy for diabetes, to a large extent, depends on the patients' self-care. Patients are expected to control 95% of diabetes themselves, and make a significant change in their lifestyle. They should change simultaneously their diet, physical exercise, and individual control of their blood sugar (Clarke, 2002). However, recent studies, using national representative samples, have shown that few patients follow multiple self-care behaviours at recommended levels (Nwasuruba, Khan & Egede, 2007).

The findings from this study shows that diabetes self-care knowledge for DSME intervention in the rural Nigeria indicated significance, χ =303.5, $p<0.0001$ across the test period (Baseline to 2nd Post) intervention assessment. Post hoc indicated that both first and second post interventions evaluation were significantly better than the baseline ($p<0.05$) and second intervention assessment was better than the first post intervention assessment. This study is in line with (Cunningham et al, 2018). From the above findings we've concluded that: Health Education or Universal Basic Education (UBE), healthy lifestyle, poverty obliteration and a balanced diet are necessary requirements to alter the diabetes epidemic. Diabetes education programmes are essential to both the caregiver and the care receiver and is important to addressing traditional perceptions and cultural opinions which fuel health misunderstandings and impede application of appropriate preventive and control steps for DM and its risk factors. DSME thaws significantly traditional misconceptions about lifestyle risk factors for DM, especially "perception of obesity as evidence of good living" and buttresses the positive roles of critical non-drug intervention measures – exercise, nutrition, balanced diet, abstention from

tobacco – to diabetes care. It also makes implementation of socio-culturally proper health promotion campaigns much more efficient.

Diabetes health education for the future must go beyond focusing on the caregiver and care receiver to include education programmes in schools, hospitals, churches, markets, town union meetings, women organisation gatherings and other fora in which there is a meeting of large numbers of people, with talks on diabetes from well-read physicians, advance cadre Diabetes Educators, nutritionists and other relevant healthcare professionals. The great need for a much more expanded diabetes education programmes should emphasise Diabetes Self-Management (DSME) and also incorporate behavioural and psychological strategies to facilitate improved outcomes. Psychological counselling helps the diabetic patient cope better with extreme stress which diabetes confers on its victims while culture and age-appropriate group education programmes are most effective.

7.4 SUMMARY

Diabetes Mellitus (DM) is one of the most common non-communicable diseases globally (Sicree, 2014). It is the fourth or fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many economically developing and newly industrialised nations (Mash, 2008). Complications of diabetes, such as coronary artery and peripheral vascular diseases, stroke, peripheral neuropathy, amputation, renal failure and blindness are resulting in increasing disability, reduce life expectancy and tremendous health cost for virtually all societies (WHO, 1994). With the exception of South Africa, diabetic education in Sub-Saharan Africa was almost non-existent until 1998 when the first Pan African Diabetes Education Group (PADEG) leadership course for diabetes nurses was held in Tanzania. The role of DSME has being well authenticated in many studies. However, Sub-Saharan African countries are yet to benefit from DSME training programmes. Therefore, a

training programme for diabetes self-management, including both preventive and curative aspects, could greatly benefit patients with Diabetes Mellitus in their daily endeavours to manage the disease.

This study is aimed at implementing the DSME training programme in a rural setting of Nigeria and evaluating its effectiveness within the setting. While it is well established that DSME training is generally effective at enhancing healthcare behaviours, the specific effect of it on several outcomes have not been evaluated for a cultural population in rural areas. Literature related to the effectiveness of diabetes self-management education training among individuals with Type 2 Diabetes Mellitus (T2DM) and other relevant themes was reviewed. Specifically, the literature was organised, among other sections, into the following: Epidemiology of Diabetes Mellitus (DM), including current trend in the prevalence of the disease, associated risk factors and complications of DM in Sub-Saharan Africa and globally, management of DM (physical activity, diet, behavioural, drug and surgery - merits and demerits of each of these) and detailed accounts of the use of Diabetes Self-Management Education (DSME) and the training thereof. The last part of the chapter deals with the theoretical framework that forms the basis of the study.

A broad description of the research setting, population, study design, data collection procedures as well as data analyses were all explained. Ethical considerations pertaining to the study are also described. Chapter Four contains the result from the quantitative data answering the first objective of the study which is to determine the prevalence of Type 2 Diabetes Mellitus (DM) in Jigawa State, Nigeria. The chapter also highlights the associations between demographic variables, risk factors, hyperglycemia and the prevalence of DM.

The qualitative results of the thematic analysis of the focus group discussions, which was one of the steps taken towards the management of Type 2 DM in Nigeria was discussed. The focus

group discussions explored the current practice regarding the management of DM, the challenges encountered by both the patients and the health care professionals, and their views in the management of DM in the rural Nigeria.

Chapter Seven focuses on combining together the results of various stages of this study to accomplish the primary goals of the study by discussing issues that come up from each phase of the study. Finally, conclusions, limitations and recommendations based on the findings of the study were presented.

7.5 CONCLUSIONS

The prevalence of complications of diabetes, such as coronary artery and peripheral vascular diseases, stroke, peripheral neuropathy, amputation, renal failure and blindness are resulting in increasing disability, reduce life expectancy and tremendous health cost for virtually all societies. This prevalence is increasing at an alarming rate in many developing countries especially in Sub-Saharan Africa with attending increase in associated health problems like osteo-arthritis, sleep apnea, psychological problems and those associated with metabolic effects of increased adiposity such as coronary heart disease, hypertension, and certain types of cancer. This study was carried out to design culturally appropriate intervention for Type 2 diabetes management.

All anthropometric measures related to body fat employed in this study showed that the prevalence of Type 2 diabetes is on the increase among Nigerians, with a larger percentage among rural community. Patient, government, socio-economic factors such as financial level of the patients, marital status, educational level and employment were found to be associated with the increased prevalence of Type 2 diabetes. Other health risk factors associated with Type 2 diabetes were lack of exercise, lack of cooperation on the part of health workers, lack

of family support and patronising traditional healers. The need for an intervention to prevent or manage the health problems of Type 2 diabetes was clearly highlighted by these findings.

7.6 RECOMMENDATIONS

The following recommendations were made based on the outcome of this study for the prevention and management of Type 2 diabetes among Nigerian adults:

Nigerian Government

- There is an urgent need for health promotion programmes for clients with Type 2 diabetes from rural areas in Nigeria to prevent the development of diabetes-related complications.
- In addition, these health promotion programmes should also aim at preventing Type 2 diabetes among Nigerians.
- Safety, security and accessibility of facilities should be addressed as it could contribute to the citizens limited physically active.
- Culturally-sensitive interventions such as the health promotion programme employed in the current study should be given increasing attention to curb the diabetes epidemic.

Primary Healthcare Facilities

- Facility- and community-based health promotion programmes should be implemented in the communities to enhance self-management skills of clients with Type 2 Diabetes Mellitus.
- Clients should be empowered to take control of their health and prevent the development of Type 2 diabetes as well as the development of diabetes-related complications.
- Specific allocated venues to accommodate health promotion activities (sessions for small group) should be available at primary healthcare facilities.

- Interventions must engage family members of clients with Type 2 Diabetes Mellitus as well as the community to strengthen participation and adherence to management; hence decreasing the development of diabetic complications.

Researchers

- Researchers must collaborate with relevant stakeholders (for example, government, community, NGOs, health care facilities) during the planning and design stage to facilitate effective implementation of the programme.
- The designed intervention should be implemented in a much bigger sample to determine its efficacy among Nigerians in rural areas.
- The outcome of the intervention employed in the study should be assessed at six (6), twelve (12) and eighteen (18) months post-intervention to assess adherence and determine its short- and long-term efficacy.

7.7 LIMITATIONS OF THE STUDY

The findings of the present study should be interpreted in the perspecive of the following limitations:

- Data was based on self-reporting, thus is open to desirability bias where participants either under-value or over-value their true physical activity behaviour for instance.
- Although the baseline data of the study were collected from randomly selected CHCs in the Dutse capital, the implementation phase of the intervention took place at one randomly selected CHC. The sample of the intervention study was relatively homogenous and may not be representative of the general population of individuals with Type 2 Diabetes Mellitus. Therefore, generalisation of the findings to other areas is limited.

- There was no control group with the implementation phase of the study due to confounding variables.

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Appendix 1

UNIVERSITY of the
WESTERN CAPE

OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT

08 June 2015

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape approved the methodology and ethics of the following research project by:
Mr Y Saidu (Physiotherapy)

Research Project:	The effectiveness of diabetes self-management education training among individuals with type 2 diabetes mellitus in rural Nigeria.
Registration no:	15/4/52

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

Private Bag X17, Bellville 7535, South Africa
T: +27 21 959 2988/2948 . F: +27 21 959 3170
E: pjosias@uwc.ac.za
www.uwc.ac.za

Appendix 2

MINISTRY OF HEALTH

OLD SECRETARIAT BLOCK 1, 2, 3, 4
KIYAWA ROAD, DUTSE, P. M. B. 1003 JIGAWA STATE
☎: 064-261242, 261230, 261236, E-mail: smoh_jigawa@yahoo.co.uk

Our Ref: MOH/SEC/3/S/536/1/4 Your Ref: _____ Date: 13th August 2015 / 28 Shawwal 1436 A.H

Yusuf Sa'idu
Department of Physiotherapy
Dutse General Hospital
Jigawa State

RE: APPLICATION TO CARRY OUT RESEARCH IN JIGAWA STATE

With reference to letter dated 7th July 2015 seeking for approval to conduct research titled **"Effectiveness of Diabetes Self-Management Education"** in Dutse Local Government Area of Jigawa State;

In view of the foregoing; I have been directed to convey ministry's provisional approval for the conduct of the study on the condition that you should be liaising with the Operation Research Advisory Committee of the Ministry in every stage of the research activity.

Best regards

18/8/2015

Dr. Muhammad Abdullahi Kalgo
Chairman, Operation Research Advisory Committee
For: Honorable Commissioner

MINISTRY OF HEALTH
JIGAWA STATE

Appendix 3

UNIVERSITY OF THE WESTERN CAPE
Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2542Fax: 27 21-9591217
Email: 3508009@myuwc.ac.za

Revised: September 2014

INFORMATION SHEET

Project Title: The effectiveness of Diabetes Self-Management Education training among individuals with Type 2 Diabetes Mellitus in rural Nigeria

What is this study about?

This is a research project being conducted by Yusuf Said at the University of the Western Cape. We are inviting you to participate in this research project because you are a Type 2 diabetic patient or as a Healthcare provider working at the Health Centre. The purpose of this research project is to determine the effectiveness of the Diabetes Self-Management Education (DSME) training among individuals with type 2 diabetes mellitus in rural Nigeria.

What will I be asked to do if I agree to participate?

You were asked to participate in a group discussion to find out if you are experiencing any challenges related to your disease if you are a patient with type 2 diabetes mellitus. If you are a healthcare provider, we want to find out what your current practices are regarding the management of individuals with type 2 diabetes mellitus. The group discussions and interviews will last for approximately an hour.

Would my participation in this study be kept confidential?

The researchers undertake to protect your identity and the nature of your contribution.

To ensure your confidentiality, all participants will sign a confidentiality form and those participating in a focus group discussion; they will undertake not to disclose any information the focus group discussion by signing the focus group binding form. Data was kept in locked filing cabinets; use of identification codes only on all forms and computer files containing data was protected with a password.If we write a report or article about this research project, your identity was protected.

In accordance with legal requirements and/or professional standards, we will disclose to the appropriate individuals and/or authorities information that comes to our attention concerning abuse of a minor or vulnerable adult or neglect or if there are serious concerns about significant harm to you or others or loss of life to self or another person *In this event, we will inform you that we have to break confidentiality to fulfil our legal responsibility to report to the designated authorities.*

This study will use focus groups and the extent to which your identity will remain confidential is dependent on participants' in the Focus Group maintaining confidentiality. All participants in the focus group will sign a confidentiality form where they will undertake not to disclose any information from the focus group discussion.

What are the risks of this research?

There may be some risks from participating in this research study.

All human interactions and talking about self or others carry some amount of risks. We will nevertheless minimize such risks and act promptly to assist you if you experience any discomfort, psychological or otherwise during the process of your participation in this study. Where necessary, an appropriate referral was made to a suitable professional for further assistance or intervention.

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the investigator learn more the challenges experienced by individuals with diabetes mellitus regarding the management of their disease OR the challenges experienced by healthcare providers with regards to their management.

Describe the anticipated benefits to science or society expected from the research, if any.

New body of knowledge was generated and the Program can be implemented in rural areas in the rest of Nigeria.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by ***Yusuf Said, Physiotherapy department*** at the University of the Western Cape. If you have any questions about the research study itself, please contact ***Yusuf Said*** at: +2721-9592542, 3508009@nmyuwc.ac.za

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Head of Department: Dr N. Mlenzana

Dean of the Faculty of Community and Health Sciences:

Prof José Frantz

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee.

Appendix 3

UNIVERSITY OF WESTERN CAPE

Private Bag X 17, Bellville, South Africa

Tel.: +27 21-959 2542, Fax: 27 21-9591217

Email: 3110615@myuwc.ac.za

INFORMATION SHEET

BAYANI A GAME DA BINCIKE

Batun Bincike: Ingancin amfaani da hanyar koyar da masu ciwon sukari yadda za su kula da kansu wajen magance ciwon Sukari.

me Binciken ya kunsa?

Wannan Bincike ne da Yusif Sa'idu, dalibi a jami'ar Western Cape da ke Afirka ta kudu yake gudanarwa. Muna gayyatar ka da ka shigo cikin wannan bincike a matsayinka na mai ciwon sukari, ko kuma a matsayinka na jami'in kula da lafiya da yake aiki a cibiyar lafiya (asibiti). Makasudin gudanar da wannan bincike shi ne, gano/tabbatar da Ingaancin amfani da hanyar koyar da masu ciwon sukari yadda za su kula da kansu wajen magance ciwon sukarin ga masu ciwon sukari a karkara, a Nijeriya.

Me zan yi idan na amince na shiga cikin wannan bincike?

Za a bukace ka da ka shiga cikin wata tattaunawa wadda daga nan za a fahimci ko kana fuskantar wani kalubale a game da ciwon sukari idan ka kasance mai ciwon sukarin ne. idan kuma ka kasance jami'in laffya ne, za mu yi kokarin jin yadda kuke yi da mai lalurar ciwon sukari idan ya zo wajenku neman magani. Wannan tattaunawa,atakaice ba za ta wuce ta sa'a daya ba.

Shin shigata cikin wannan bincike za a dauke ta a matsayin sirri?

Mai gudanar da wannan bincike ya yi alkawarin ba zai bayyana wannan shiga taka cikin bincike ga wani ba, wato ba zai bayyana sunanka da kuma dukkan bayanan da ka bayar ga wani ba. Domin tabbatar da sirri a wannan bincike, dukkan masu shiga wannan bincike za a bukace su da su sanya hannu a takardar yarjejjeniyar boye sirri a tsakaninsu da mai gudanar da bincike cewar ba za su bayyana dukkan wani bayani da aka tattauna ga wani mutum daban ba. dukkan bayanan da aka tattauna za a adana shi a wuri mai tsaro, sannan kuma wanda za a adana a na'ura mai kwakwalwa za a ba shi kariya da lambar sirri da za ta hana bude shi. Idan mun buga wani rahoto a game da wannan bincike kuwa, za mu tabbatar mun boye sunanka da kaminnunka.

Amma kamar yadda dokar kasa, da ta aiki ta tanadar, za a iya fallasa duk wani bayani ga hukumar da ta dace wanda ya shafi cin zarafin kananan yara ko kuma manya masu rauni a yayin da ake nazarin bayanan wannan bincike. Idan har muka fahimci akwai wata matsala a game da bayanan da ka bayar wanda kuma ta shafi cutarwa ko asarar rai a gare ka ko ga wani, ya zama wajibi a kanmu mu sanar da hukuma. Amma a wannan hali za mu sanar da kai cewar za mu karya alkawarin boye sirri da muka yi da kai domin cika wani wajibci na dokar kasa.

Wannan bincike zai yi amfani da salon tattaunawa a kungiyance ne, saboda haka tsananin sirrin zai dogara ne da yadda sauran abokan tattaunawarku suka yi kokarin boye sirrin tattaunawar. Dukkan wadanda suka shiga tattaunawar za su sanya hannu cikin takardar yarjejjeniyar boye sirri da alkawarin ba za su bayyana dukkan abin da aka fada a yayin tattaunawar ga wani daban ba.

Mene ne hadarin shiga wannan binciken?

E! za a iya fuskantar hadari a wannan bincike, domin kuwa duk wata hulda ta dan Adam da ta shafi tattaunawa a game da kanka ko wani mutum daban ba za a rasa hadari na bacin rai ko na

wani abu ko yaya yake ba. Za mu yi iya kokarinmu da mu kare faruwar hakan ko kuma mu rage hakan, kuma za mu yi gaggawar taimakawa idan mutum ya ji wani rashin jin dadi ko kuma wata damuwa sakamakon wani abu da aka fada yayin tattaunawar. Idan abin ya zama wajibi za mu yi kokarin tura wanda abin ya shafa ga wani kwararre a fannin domin taimakawa.

Wacce irin karuwa zan samu idan na shiga wannan binciken?

Wannan bincike ba an tsara shi ba ne domin ka samu wata karuwa ta wani abu ba, amma kuma sakamakon da za a samu zai taimaka wa mai gudanar da bincike fahintar irin kalubalen da masu ciwon sukari suke fuskanta wajen magance ciwon sukari, ko kuma irin kalubalen da jami'an lafiya suke fuskanta a kokarin magance ciwon sukari.

Bayyana irin taimakon da sakamakon binciken zai iya bayarwa ga bangaren kimiyya da kuma alumma idan akwai.

Wani sabon ilimi zai iya fitowa sakamakon wannan bincike wanda zai iya taimakawa wajen magance cutar sukari a karkara, a Nijeriya.

Tilas ne sai na shiga wannan binciken, kuma zan iya fita daga ciki duk lokacin da na ga dama?

Shigarka cikin wannan bincike na ganin-dama ne ba dole ba ne. Kana iya kin shiga cikin wannan bincike. Idan ka amince shiga cikin wanna bincike kana da dama ka fita duk lokacin da ka yi niyyar fita. Haka kuma, idan ka ki shiga wannan bincike, ko kuma ka fice daga cikinsa hakan ba zai sa ka fukanci wani hukunci ba ko kuma ka rasa wata dama ta wani abu da ka cancanta ba.

Idan ina da wata tambaya fa?

Wannan bincike Yusif Sa'idu ne na sashen Gashi da motsa gabobi, Jami'ar western Cape, Afirka ta kudu yake gudanar da shi, dukkan wata tambaya a game da wannan bincike sai a tuntubi Yusif Sa'idu a lambar waya: +2721-9592542.3508009@nmyuwc.ac.za

Idan akwai wata tambaya a game da wannan bincike, ko kuma a game da hakkinka a matsayinka na wanda ya shiga wannan bincike, ko kuma kana da wani korafi a game da wanna bincike da kake son mikawa sai a tuntubi wannan:

Shugaban sashe: Dr. M MLENZANA

Shugaban Tsangayar Likitanci: Farfesa José Frantz

Jami'ar Western Cape

Jakar gidan waya X17 Bellville 7535

chs-deansoffice@uwc.ac.za

wannan bincike ya samu amincewar kwamitin da'ar bincike na hukumar Jami'ar Western Cape.

Appendix 4

UNIVERSITY OF THE WESTERN CAPE
Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2542Fax: 27 21-9591217
E-mail: 3508009@myuwc.ac.za

FOCUS GROUP CONFIDENTIALITY BINDING FORM:

HEALTH CARE PROVIDERS

Title of the Project: The effectiveness of Diabetes Self-Management Education training among individuals with Type 2 Diabetes Mellitus in rural Nigeria.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way. I agree to be audio-taped during my participation in the study. I also agree to disclose any information that was discussed during the discussion.

Participant's Name:_____

Participant's Signature:_____

Witness Name:_____

Witness Signature:_____

Date:_____

Appendix 4

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2542Fax: 27 21-9591217

E-mail: 3508009@myuwc.ac.za

FOCUS GROUP CONFIDENTIALITY BINDING FORM:

TRADITIONAL HEALERS

Title of the Project: The effectiveness of Diabetes Self-Management Education training among individuals with Type 2 Diabetes Mellitus in rural Nigeria.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way. I agree to be audio-taped during my participation in the study. I also agree to disclose any information that was discussed during the discussion.

Participant's Name: _____

Participant's Signature: _____

Witness Name: _____

Witness Signature: _____

Date: _____

Appendix 5

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2542Fax: 27 21-9591217

E-mail: 3508009@myuwc.ac.za

CONSENT FORM: TRADITIONAL HEALERSS

Title of the Project: The effectiveness of Diabetes Self-Management Education training among individuals with Type 2 Diabetes Mellitus in rural Nigeria.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's Name: _____

Participant's Signature: _____

Witness Name: _____

Witness Signature: _____

Date: _____

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: **YUSUF SAID**

University of Western Cape

Private Bag X17, Belville 7535

Telephone: (021) 959-2542

Cell: +27788172675

Fax: (021)959-1217

Email: 3508009@uwc.ac,za

Appendix 5

UNIVERSITY OF THE WESTERN CAPE
Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2542Fax: 27 21-9591217
E-mail: 3508009@myuwc.ac.za

CONSENT FORM: COMMUNITY MEMBERS

Title of the Project: The effectiveness of Diabetes Self-Management Education training among individuals with Type 2 Diabetes Mellitus in rural Nigeria.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's Name: _____

Participant's Signature: _____

Witness Name: _____

Witness Signature: _____

Date: _____

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: **YUSUF SAID**
University of Western Cape
Private Bag X17, Belville 7535
Telephone: (021) 959-2542
Cell: +27788172675
Fax: (021)959-1217
Email: 3508009@uwc.ac,za

Appendix 6

WHO STEPS Instrument
(Core and Expanded)

UNIVERSITY of the
WESTERN CAPE

The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS)

World Health Organization
20 Avenue Appia, 1211 Geneva 27, Switzerland

For further information: www.who.int/chp/steps

World Health Organization

STEPS Instrument

Overview

Introduction

This is the generic STEPS Instrument which sites/countries will use to develop their tailored instrument. It contains the:

- CORE items (unshaded boxes)
- EXPANDED items (shaded boxes).

Core Items

The Core items for each section ask questions required to calculate basic variables. For example:

- current daily smokers
- mean BMI.

Note: All the core questions should be asked, removing core questions will impact the analysis.

Expanded items

The Expanded items for each section ask more detailed information. Examples include:

- use of smokeless tobacco
- sedentary behaviour.

Guide to the columns

The table below is a brief guide to each of the columns in the Instrument.

Column	Description	Site Tailoring
Number	This question reference number is designed to help interviewers find their place if interrupted.	Renumber the instrument sequentially once the content has been finalized.
Question	Each question is to be read to the participants	• Select sections to use. • Add expanded and optional questions as desired.
Response	This column lists the available response options which the interviewer will be circling or filling in the text boxes. The skip instructions are shown on the right hand side of the responses and should be carefully followed during interviews.	• Add site specific responses for demographic responses (e.g. C6). • Change skip question identifiers from code to question number.
Code	The column is designed to match data from the instrument into the data entry tool, data analysis syntax, data book, and fact sheet.	This should never be changed or removed. The code is used as a general identifier for the data entry and analysis.

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

WHO STEPS Instrument
for Chronic Disease Risk Factor Surveillance

<insert country/site name>

Survey Information

Location and Date		Response	Code
1	Cluster/Centre/Village ID	⌊_⌊_⌊_⌋	I1
2	Cluster/Centre/Village name		I2
3	Interviewer ID	⌊_⌊_⌊_⌋	I3
4	Date of completion of the instrument	⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌊_⌊_⌋ dd mm year	I4

Participant Id Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

Consent, Interview Language and Name		Response	Code
5	Consent has been read and obtained	Yes 1 No 2 IF NO, END	I5
6	Interview Language *[Insert Language]*	English 1 *[Add others]* 2 *[Add others]* 3 *[Add others]* 4	I6
7	Time of interview (24 hour clock)	⌊_⌊_⌋ : ⌊_⌊_⌋ hrs mins	I7
8	Family Surname		I8
9	First Name		I9
Additional Information that may be helpful			
10	Contact phone number where possible		I10

Record and file identification information (I5 to I10) separately from the completed questionnaire.

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

Step 1 Demographic Information

CORE: Demographic Information

Question		Response	Code
11	Sex *(Record Male / Female as observed)*	Male 1 Female 2	C1
12	What is your date of birth? *Don't Know 77 77 7777*	⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌊_⌊_⌋ *If known, Go to C4* dd mm year	C2
13	How old are you?	Years ⌊_⌊_⌋	C3
14	In total, how many years have you spent at school or in full-time study (excluding pre-school)?	Years ⌊_⌊_⌋	C4

EXPANDED: Demographic Information

15	What is the highest level of education you have completed? *[INSERT COUNTRY-SPECIFIC CATEGORIES]*	No formal schooling 1 Less than primary school 2 Primary school completed 3 Secondary school completed 4 High school completed 5 College/University completed 6 Post graduate degree 7 Refused 88	C5
16	What is your *[insert relevant ethnic group / racial group / cultural subgroup / others]* background?	[Locally defined] 1 [Locally defined] 2 [Locally defined] 3 Refused 88	C6
17	What is your marital status?	Never married 1 Currently married 2 Separated 3 Divorced 4 Widowed 5 Cohabitating 6 Refused 88	C7
18	Which of the following best describes your main work status over the past 12 months? *[INSERT COUNTRY-SPECIFIC CATEGORIES]* *(USE SHOWCARD)*	Government employee 1 Non-government employee 2 Self-employed 3 Non-paid 4 Student 5 Homemaker 6 Retired 7 Unemployed (able to work) 8 Unemployed (unable to work) 9 Refused 88	C8
19	How many people older than 18 years, including yourself, live in your household?	Number of people ⌊_⌊_⌋	C9

Participant Identification Number ⌊_⌋⌊_⌋⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋

EXPANDED: Demographic Information, Continued				
Question		Response		Code
20	Taking the past year, can you tell me what the average earnings of the household have been? *(RECORD ONLY ONE, NOT ALL 3)*	Per week ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ *Go to T1*		C10a
		OR per month ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ *Go to T1*		C10b
		OR per year ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ *Go to T1*		C10c
		Refused	88	C10d
21	If you don't know the amount, can you give an estimate of the annual household income if I read some options to you? Is it *(INSERT QUINTILE VALUES IN LOCAL CURRENCY)* *(READ OPTIONS)*	≤ Quintile (Q) 1	1	C11
		More than Q 1, ≤ Q 2	2	
		More than Q 2, ≤ Q 3	3	
		More than Q 3, ≤ Q 4	4	
		More than Q 4	5	
		Don't Know	77	
		Refused	88	

Step 1 Behavioural Measurements

CORE: Tobacco Use				
Now I am going to ask you some questions about various health behaviours. This includes things like smoking, drinking alcohol, eating fruits and vegetables and physical activity. Let's start with tobacco.				
Question		Response		Code
22	Do you currently smoke any tobacco products, such as cigarettes, cigars or pipes? *(USE SHOWCARD)*	Yes	1	T1
		No	2 *If No, go to T6*	
23	Do you currently smoke tobacco products daily?	Yes	1	T2
		No	2 *If No, go to T6*	
24	How old were you when you first started smoking daily?	Age (years)		T3
		Don't know	77 ⌊_⌋⌊_⌋ *If Known, go to T5a*	
25	Do you remember how long ago it was? *(RECORD ONLY 1, NOT ALL 3)* *Don't know 77*	In Years ⌊_⌋⌊_⌋ *If Known, go to T5a*		T4a
		OR in Months ⌊_⌋⌊_⌋ *If Known, go to T5a*		T4b
		OR in Weeks ⌊_⌋⌊_⌋		T4c
26	On average, how many of the following do you smoke each day? *(RECORD FOR EACH TYPE, USE SHOWCARD)* *Don't Know 77*	Manufactured cigarettes ⌊_⌋⌊_⌋		T5a
		Hand-rolled cigarettes ⌊_⌋⌊_⌋		T5b
		Pipes full of tobacco ⌊_⌋⌊_⌋		T5c
		Cigars, cheroots, cigarillos ⌊_⌋⌊_⌋		T5d
		Other ⌊_⌋⌊_⌋ *If Other, go to T5other, else go to T9*		T5e
		Other (please specify): ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ *Go to T9*		T5other

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

CORE: Alcohol Consumption

The next questions ask about the consumption of alcohol.

Question		Response	Code
36	Have you ever consumed an alcoholic drink such as beer, wine, spirits, fermented cider or *[add other local examples]*? *(USE SHOWCARD OR SHOW EXAMPLES)*	Yes 1 No 2 *If No, go to D1*	A1a
37	Have you consumed an alcoholic drink within the **past 12 months**?	Yes 1 No 2 *If No, go to D1*	A1b
38	During the past 12 months, **how frequently** have you had at least one alcoholic drink? *(READ RESPONSES, USE SHOWCARD)*	Daily 1 5-6 days per week 2 1-4 days per week 3 1-3 days per month 4 Less than once a month 5	A2
39	Have you consumed an alcoholic drink within the **past 30 days**?	Yes 1 No 2 *If No, go to D1*	A3
40	During the past 30 days, on how many **occasions** did you have at least one alcoholic drink?	Number ⌊_⌊_⌋ Don't know 77	A4
41	During the past 30 days, when you drank alcohol, **on average**, how many **standard alcoholic drinks** did you have during one drinking occasion? *(USE SHOWCARD)*	Number ⌊_⌊_⌋ Don't know 77	A5
42	During the past 30 days, what was the **largest number** of standard alcoholic drinks you had on a single occasion, counting **all** types of alcoholic drinks together?	Largest number ⌊_⌊_⌋ Don't Know 77	A6
43	During the past 30 days, how many times did you have **for men: five or more** **for women: four or more** standard alcoholic drinks in a single drinking occasion?	Number of times ⌊_⌊_⌋ Don't Know 77	A7

EXPANDED: Alcohol Consumption

44	During the past 30 days, when you consumed an alcoholic drink, how often was it with meals? Please do not count snacks.	Usually with meals 1 Sometimes with meals 2 Rarely with meals 3 Never with meals 4	A8
45	During each of the past 7 days, how many standard alcoholic drinks did you have each day? *(USE SHOWCARD)* *Don't Know 77*	Monday ⌊_⌊_⌋	A9a
		Tuesday ⌊_⌊_⌋	A9b
		Wednesday ⌊_⌊_⌋	A9c
		Thursday ⌊_⌊_⌋	A9d
		Friday ⌊_⌊_⌋	A9e
		Saturday ⌊_⌊_⌋	A9f
		Sunday ⌊_⌊_⌋	A9g

CORE: Diet

The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions please think of a typical week in the last year.

Question		Response	Code
46	In a typical week, on how many days do you **eat fruit**? *(USE SHOWCARD)*	Number of days ⌊_⌋⌊_⌋ Don't Know 77 *If Zero days, go to D3*	D1
47	How many **servings** of fruit do you eat on one of those days? *(USE SHOWCARD)*	Number of servings ⌊_⌋⌊_⌋ Don't Know 77	D2
48	In a typical week, on how many days do you **eat vegetables**? *(USE SHOWCARD)*	Number of days ⌊_⌋⌊_⌋ Don't Know 77 *If Zero days, go to D5*	D3
49	How many **servings** of vegetables do you eat on one of those days? *(USE SHOWCARD)*	Number of servings ⌊_⌋⌊_⌋ Don't know 77	D4

EXPANDED: Diet

50	What type of **oil or fat** is most often used for meal preparation in your household? *(USE SHOWCARD)* *(SELECT ONLY ONE)*	Vegetable oil 1 Lard or suet 2 Butter or ghee 3 Margarine 4 Other 5 *If Other, go to D5 other* None in particular 6 None used 7 Don't know 77	D5
		Other ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	D5other
51	On average, how many meals per week do you eat that were not prepared at a home? By meal, I mean breakfast, lunch and dinner.	Number Don't know 77 ⌊_⌋⌊_⌋	D6

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

CORE: Physical Activity

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.
Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. *[Insert other examples if needed]*. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

	Question	Response	Code
Work			
52	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like *[carrying or lifting heavy loads, digging or construction work]* for at least 10 minutes continuously? *[INSERT EXAMPLES] (USE SHOWCARD)*	Yes 1 No 2 *If No, go to P 4*	P1
53	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Number of days ⌊_⌋	P2
54	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours : minutes ⌊_⌊_⌋ : ⌊_⌊_⌋ hrs mins	P3 (a-b)
55	Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate such as brisk walking *[or carrying light loads]* for at least 10 minutes continuously? *[INSERT EXAMPLES] (USE SHOWCARD)*	Yes 1 No 2 *If No, go to P 7*	P4
56	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Number of days ⌊_⌋	P5
57	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours : minutes ⌊_⌊_⌋ : ⌊_⌊_⌋ hrs mins	P6 (a-b)
Travel to and from places			
The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. *[Insert other examples if needed]*			
58	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	Yes 1 No 2 *If No, go to P 10*	P7
59	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days ⌊_⌋	P8
60	How much time do you spend walking or bicycling for travel on a typical day?	Hours : minutes ⌊_⌊_⌋ : ⌊_⌊_⌋ hrs mins	P9 (a-b)

Participant Identification Number └─┴─┴─┘ └─┴─┴─┘ └─┴─┴─┘

CORE: Physical Activity, Continued			
Question		**Response**	**Code**
Recreational activities			
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure), *[insert relevant terms]*.			
61	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like *[running or football]* for at least 10 minutes continuously? *[INSERT EXAMPLES] (USE SHOWCARD)*	Yes 1 No 2 *If No, go to P 13*	P10
62	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Number of days └─┘	P11
63	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘ hrs mins	P12 (a-b)
64	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, *[cycling, swimming, volleyball]* for at least 10 minutes continuously? *[INSERT EXAMPLES] (USE SHOWCARD)*	Yes 1 No 2 *If No, go to P16*	P13
65	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	Number of days └─┘	P14
66	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘ hrs mins	P15 (a-b)

EXPANDED: Physical Activity			
Sedentary behaviour			
The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping. *[INSERT EXAMPLES] (USE SHOWCARD)*			
67	How much time do you usually spend sitting or reclining on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘ hrs mins	P16 (a-b)

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

CORE: History of Raised Blood Pressure			
Question		Response	Code
68	Have you ever had your blood pressure measured by a doctor or other health worker?	Yes 1 No 2 *If No, go to H6*	H1
69	Have you ever been told by a doctor or other health worker that you have raised blood pressure or hypertension?	Yes 1 No 2 *If No, go to H6*	H2a
70	Have you been told in the past 12 months?	Yes 1 No 2	H2b

EXPANDED: History of Raised Blood Pressure			
	Are you currently receiving any of the following treatments/advice for high blood pressure prescribed by a doctor or other health worker?		
71	Drugs (medication) that you have taken in the past two weeks	Yes 1 No 2	H3a
	Advice to reduce salt intake	Yes 1 No 2	H3b
	Advice or treatment to lose weight	Yes 1 No 2	H3c
	Advice or treatment to stop smoking	Yes 1 No 2	H3d
	Advice to start or do more exercise	Yes 1 No 2	H3e
72	Have you ever seen a traditional healer for raised blood pressure or hypertension?	Yes 1 No 2	H4
73	Are you currently taking any herbal or traditional remedy for your raised blood pressure?	Yes 1 No 2	H5

Participant Identification Number ⌊_⌋⌊_⌋⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋

Step 2 Physical Measurements

CORE: Height and Weight				
Question		Response		Code
80	Interviewer ID		⌊_⌋⌊_⌋⌊_⌋	M1
81	Device IDs for height and weight	Height	⌊_⌋⌊_⌋	M2a
		Weight	⌊_⌋⌊_⌋	M2b
82	Height	in Centimetres (cm)	⌊_⌋⌊_⌋⌊_⌋ . ⌊_⌋	M3
83	Weight *If too large for scale 666.6*	in Kilograms (kg)	⌊_⌋⌊_⌋⌊_⌋ . ⌊_⌋	M4
84	For women: Are you pregnant?	Yes	1 *If Yes, go to M 8*	M5
		No	2	
CORE: Waist				
85	Device ID for waist		⌊_⌋⌊_⌋	M6
86	Waist circumference	in Centimetres (cm)	⌊_⌋⌊_⌋⌊_⌋ . ⌊_⌋	M7
CORE: Blood Pressure				
87	Interviewer ID		⌊_⌋⌊_⌋⌊_⌋	M8
88	Device ID for blood pressure		⌊_⌋⌊_⌋	M9
89	Cuff size used	Small	1	M10
		Medium	2	
		Large	3	
90	Reading 1	Systolic (mmHg)	⌊_⌋⌊_⌋⌊_⌋	M11a
		Diastolic (mmHg)	⌊_⌋⌊_⌋⌊_⌋	M11b
91	Reading 2	Systolic (mmHg)	⌊_⌋⌊_⌋⌊_⌋	M12a
		Diastolic (mmHg)	⌊_⌋⌊_⌋⌊_⌋	M12b
92	Reading 3	Systolic (mmHg)	⌊_⌋⌊_⌋⌊_⌋	M13a
		Diastolic (mmHg)	⌊_⌋⌊_⌋⌊_⌋	M13b
93	During the past two weeks, have you been treated for raised blood pressure with drugs (medication) prescribed by a doctor or other health worker?	Yes	1	M14
		No	2	

EXPANDED: Hip Circumference and Heart Rate				
94	Hip circumference	in Centimeters (cm)	⌊_⌋⌊_⌋⌊_⌋ . ⌊_⌋	M15
	Heart Rate			
95	Reading 1	Beats per minute	⌊_⌋⌊_⌋⌊_⌋	M16a
	Reading 2	Beats per minute	⌊_⌋⌊_⌋⌊_⌋	M16b
	Reading 3	Beats per minute	⌊_⌋⌊_⌋⌊_⌋	M16c

Participant Identification Number ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋

Step 3 Biochemical Measurements

CORE: Blood Glucose			
Question		**Response**	**Code**
96	During the past 12 hours have you had anything to eat or drink, other than water?	Yes 1 No 2	B1
97	Technician ID	⌊_⌊_⌊_⌋	B2
98	Device ID	⌊_⌊_⌋	B3
99	Time of day blood specimen taken (24 hour clock)	Hours : minutes ⌊_⌊_⌋ : ⌊_⌊_⌋ hrs mins	B4
100	Fasting blood glucose *Choose accordingly: mmol/l or mg/dl*	mmol/l ⌊_⌊_⌋ ⌊_⌊_⌋ mg/dl ⌊_⌊_⌊_⌋ . ⌊_⌋	B5
101	Today, have you taken insulin or other drugs (medication) that have been prescribed by a doctor or other health worker for raised blood glucose?	Yes 1 No 2	B6
CORE: Blood Lipids			
102	Device ID	⌊_⌊_⌋	B7
103	Total cholesterol *Choose accordingly: mmol/l or mg/dl*	mmol/l ⌊_⌊_⌋ . ⌊_⌊_⌋ mg/dl ⌊_⌊_⌊_⌋ . ⌊_⌋	B8
104	During the past two weeks, have you been treated for raised cholesterol with drugs (medication) prescribed by a doctor or other health worker?	Yes 1 No 2	B9
EXPANDED: Triglycerides and HDL Cholesterol			
105	Triglycerides *Choose accordingly: mmol/l or mg/dl*	mmol/l ⌊_⌊_⌋ . ⌊_⌊_⌋ mg/dl ⌊_⌊_⌊_⌋ . ⌊_⌋	B10
106	HDL Cholesterol *Choose accordingly: mmol/l or mg/dl*	mmol/l ⌊_⌊_⌋ . ⌊_⌊_⌋ mg/dl ⌊_⌊_⌊_⌋ . ⌊_⌋	B11

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Appendix 6

Takardar Neman Bayanai Tsarawar Hukumar Lafiya ta Duniya (WHO)

Salon Mataki- Maki (STEPS)

Muhimman Bayanai (CORE) da kuma Qarin Bayanai (EXPANDED)

Takaradar Neman Bayanai salon Mataki-mataki

Taqaitaccen Bayani

Gabatarwa: Wannan takardar neman Bayanai an tsarata ne domin sauran qasashe su daidaita ta ta dace da yanayinsu sannan su yi amfani da ita. Wannan salo ya qunshi:

- Muhaimman Bayanai waxanda suke cikin akwatunan da ba a yi musu duhu ba.
- Qarin Bayanai waxanda suke cikin akwatunan da aka yi musu duhu.

Muhimman Bayanai (CORE)

Wannan ya qunshi tambayoyi da ake buqata domin yin qididdiga domin fito da sakamakon bincike..

Qarin Bayanai (EXPANDED)

Wannan ya qunshi tambayoyin da za su yi qarin bayani.

Jagorar gudanar da Tambayoyi

Sashe	**Bayani**	**Gyara/ Tsari**
Lamba	Wannan yana nufin lambar Matalafin Bincike domin ta taimaka masa wajen gano a ina ya tsaya da bayanai yayin da ya dawo ci-gaba da tattaunawa	A gyara tsarin lamabar da zarar an kammala batu.
Tambaya	Lallai a karanta wa Matallafin Bincike dukkan tambayoyin.	Zavi sashen da za a tattauna akai. A qara bayani idan akwai buqatara haka.
Amsa	Wannan sashen yana bayar da zavi ne ga Matallfin Bincike inda kuma mai tambayar zai zagaye amsar da aka zava.	A tantance lambar kowacce tamabaya
Lambar sirri	Wannan zai taimaka wajen haxe bayanai	Ko da wasa kada a canja wani abu daga wanna sashe.

Takardar Neman Bayanai Tsarawar Hukumar Lafiya ta Duniya (WHO)

<NIGERIA/ JIGAWA/ DUTSE>

Bayanin yadda aka gudanar da Binciken (Safiyo)

Wuri da kwanan wata		**Amsa**	**Lamba**
1	Lambar Unguwa/Cibiya/ qauye	----------	11
2	Sunan unguwa/Cibiya/Qauye		12
3	Lambar mai gabatar da tambayoyi	----------	13
4	Ranar da aka gudanar da ganawar	----- ---------- ----------	14

……

…… **Lambar matallafin Bincike ---------- ---------- -------**

Neman amincewa, harshen da aka yi ganawar da shi, da kuma sunan Matallafin binciken.	**Amsa**	**Lamba**

5	An samu izini/yardar matallafin bincike	Eh A'a (idan a'a, shike nan ba za a ci gaba da binciken ba)	15
6	Harshen da aka yi amfani da shi	Turanci 1 Hausa 2 Fillanci 3 Kanuri 4	16
7	Lokacin da aka yi ganawar. (a yi amfani da lissafin agogo na awa ashirin da huxu)	---------- -------	17
8	Sunan Mahaifinka		18
9	Sunanka		19
Qarin bayanin da zai taimaka			
10	Lambar waya idan da akwai		I 10

Lambar matallafin Bincike ------- -------- ------ ---

MATAKI NA 1 Bayani a kan Matallafin Bincike

	Tambaya	Amsa	Lamba
11	Jinsi (mace ko namiji)	Namiji 1 Mace 2	C1
12	Ranar haihuwa Idan ba a sani ba sai a rubuta 77 77 7777	------- ---------- --------- ----	C2
13	Shekarunka nawa?	----------	C3
14	A gaba xaya rayuwarka, shekaru nawa ne ka yi su makaranta?	----------	C4

Qarin bayani a kan matallafin bincike				
15	Wane mataki ne mafi zurfi na ilimi da ka kammala?	Ban yi makaranta ba Qasa da firamare Matakin firamare	1 2 3	C5

		Sakandire 4 Gaba da sakandire 5 Kwaleji/ Jami'a 6 Babban digiri 7	
16	Wacce qabila ce?	Hausa 1 Fulani 2 Kanuri 3	C6
17	Matsayin iyali.	Ban tava aure ba 1 Ina da aure 2 Ba ma tare 3 Mun rabu 4 Mijina ya rasu 5	C7
18	A jerin waxannan bayanai, wanne ne ya dace da aikin da kake yi a tsawon shekara guda da ta wuce?	Ma'aikacin gwamnati 1 Hukumomin da ba na gwamnati ba. 2 Sana'a 3 Aikin sa kai 4 Xalibi 5	C8

		Aikin kula da gida 6 Mai Ritaya 7 Babu aikin (amma zan iya aiki) 8 Babu aikin yi (ba zan iya yin aiki ba) 9	
19	Mutane nawa ne waxanda suka haura shekaru 18 har da kai kanka suke zaune a gidanku?	----------	C9

EXPANDED: Bayanaai, Cigaba

	Tambaya	Amsa		
20	Idan aka xauki shekarar da ta wuce, za ka iya bayyana ko Naira nawa kuka samu a matsayin kuxin shiga a gidanku?	A sati/mako #----------a tafi T1 Ko a wata # ----------a tafi T1 Ko a shekara #----------a tafi T1 88		C10a C10b C10c C10d
21	Idan ba za ka iya tantance adadin kuxin ba, za ka iya yin qiyasi daga zavin da zan karanto maka?	Ya gaza #100,000 a shekara Ya fi #100,000 a shekara Ya fi #200,000 a shekara Ya fi #300,000 a shekara Ya fi #400,000 a shekara	1 2 3 4 5	C11

MATAKI NA 1 Awon Halayya ko Xabi'ar matallafin banicke

Muhimmin Bayani : Shan Taba ko Sigari

Yanzu zan yi maka waxansu ‘yan tambayoyi a game da wasu halaye/xabi’u da suke da alaqa da lafiya. Waxannan batutuwa sun haxa da shan sigari, shan barasa/giya, cin kayan marmari da ganyayyaki, da kuma motsa jiki.			
Tambaya		**Amsa**	**Lamba**
22	A halin yanzu, kana shan taba? kamar sigari ko tunkura ko buqi ko kuma lofe?	Eeh 1 A’ah 2. idan amsar a’a ce sai a tafi T6	T1
23	A halin yanzu kana shan taba a kullun?	Eeh 1 A’ah 2 idan amsar a’a ce sai a tafi T6	T2
24	Kana xan shekara nawa a duniya ka fara shan taba?	Xan shekara ---------- Ban sani ba 77 ----------	T3
25	Za ka iya tuna shekara nawa kenan yanzu? A bayar da amsa xaya kawai, shekara ko wata ko sati.	Shekara ----------	T4a
		Ko watanni ----------	T4b
		Ko sati ----------	T4c
26	A taqaice, kara nawa kake sha a kullun?	Sigarin kamfani----------	T5a
		Naxin hannu ----------	T5b
		Lofe ----------	T5c

		Tabar bature (Siga)	T5d
		Sauran	T5e

Qarin bayani a kan shan taba/sigari			
Tambaya		**Amsa**	**Lamba**
27	A da can, kana shan taba a kullun?	Eeh 1 A'ah 2 idan amsar a'a ce sai a tafi T6	T6
28	Kana xan shekara nawa ka daina shan taba a kullun?	Xan shekara ---------- Ban sani ba 77 ----------	T7
29	Ka kai shekara nawa da daina shan taba a kullun?	Shekara ---------- da suka wuce	T8a
		Ko wata ---------- da sukawuce	T8b
		Ko sati nawa ----- da suka wuce	T8c
30	A yanzu kana amfani da Taba maras hayaqi? Kamar Taba qulle, anwuru ko fure?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi T12	T9
31	A yanzu kana amfani da taba maras hayaqi a kullun?	Eeh 1	T10

		A'ah 2 idan amsar a'a ce sai a tafi T12	
32	A qiyasi, a kullun sau nawa kake amfani da……	Anwuru ta baki. Sau ---------- --	T11a
		Anwuru ta hanci sau. ---------- --	T11b
		Taba qulle sau ---------- --	T11c
33	A da can, ka tava kasancewa cikin amfani da taba maras hayaqi a kullun?	Eeh 1 A'ah 2	T12
34	A kwanaki 7 da suka shige, sau nawa wani daga cikin mutanen gidanku ya sha sigari lokacin da kuke tare da shi?	Sau …… Ban sani ba. 77 ……..	T13
35	A kwanaki 7 da suka shige, sau wani ya sha sigari a lokacin da kuke tare a	Sau ……. Ban sani ba, ko kuma ba na aiki a rufaffan wuri. 77 ……	T14

	rufaffan wuri a wajen aikinku?		

: Shan Barasa/ Giya			
Tambaya ta gaba da zan yi maka ta shafi shan Barasa/ Giya ne.			
Tambaya		**Amsa**	**Lamba**
36	Ka tava shan Barasa/Giya kamar Giyaar kwalba, burkutu, Kokino da sauransu?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi D1	A1a
37	Ka sha Barasa/Giya a tsawon watanni 12 da suka shige?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi D1	A1b
38	A watanni 12 da suka shige, karo nawa ka sha a qalla kwalba xaya ta Barasa	Kullun 1 Kwanaki 5-6 a sati 2 Kwana 1-4 a sati 3 Kwana 1-3 a sati 4	A2

		Qasa da sau 1 a wata 5	
39	Ka sha barasa/giya a kwanaki 30 da suka wuce	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi D1	A3
Tambaya		**Amsa**	**Lamba**
40	A kwanaki 30 da suka wuce, sau nawa ka sha a qalla barasa kwalba guda xaya a wani taro ko buki da ka halarta.	Sau …….. Ban sani ba 77 …….	A4
41	A kwanaki 30 da suka shige kana shan barasa, a qiyasi, kwalabe nawa kake sha a zama guda.	Guda…….. Ban sani ba 77. ……	A5
42	A kwanaki 30 da suka shige kana shan barasa, adadin kwalabe nawa ka sha a zama xayan da kake	Guda…… Ban sani ba 77. ……..	A6

	ganin ba ka tava yin shan da ya kai haka yawa ba.		
43	A kwanaki 30 da suka wuce, sau nawa ka sha kwalabe 5 ko sama da haka a zama xaya **ga maza**. Ko kuma kwalba 4 zuwa sama da haka **ga mata.**	Sau …… Ban sani ba 77 ……	A7

Qarin bayani a kan shan Barasa/Giya			
Tambaya		Amsa	Lamba
44	A kwanki 30 da suka shige kana shan Barasa, sau nawa ka sha a lokacin da kake cin abinci. Amma fa kar a qidaya har da cin 'yan qananan abubuwa.	Koyaushe tare da abinci 1 Wani lokaci tare da abinci 2 Ba sosai ba. 3 Ko sau xaya 4	A8
45	A kwanaki 7 da suka shige, kwalabe nawa ka sha a kowacce rana?	Litinin ……	A9a
		Talata ……	A9b
		Laraba …….	A9c

		Alhamis ……..	A9d
		Juma'a ……..	A9e
		Asabar …….	A9f
		Lahadi ……	A9g

: Abinci			
Yanzu kuma tambayoyin da za a yi ma sun shafi kayayyakin marmari da kuma ganyayyaki da kake ci ne. Ina da wasu Katina da za su nuna maka misalan kayayyakin marmari da ganyayyaki da muke da su a wannnan yanki namu. A yayin da kake qoqarin amsa waxannan tambayoyi ka ayyana wani sati a cikin shekarar da ta wuce.			
	Tambaya	**Amsa**	**Lamba**
46	A cikin sati guda, kwanaki nawa kake shan kayayyakin marmari?	Sau …… Ban sani ba 77……. Idan babu a tafi D3	D1
47	Sau nawa kake shan kayan marmarin a rana?	Sau …… Ban sani ba 77……. Idan babu a tafi D3	D2
48	A cikin sati guda, kwanaki nawa kake cin ganyayyaki?	Sau …… Ban sani ba 77……. Idan babu a tafi D5	D3
49	Sau nawa kake cin ganyayyaki a rana?	Sau …… Ban sani ba 77…….	D4

Qarin bayani a kan Abinci			
Tambaya		Amsa	Lamba
50	Wane irin man girki kuke amfani a girkinku.	Man gyaxa 1 Kitse 2 Man shanu 3 Kakide 4 Sauransu 5 Babu takamaimai 6 Babu ko xaya 7 Ban sani ba 77	D5
		Sauransu …….	D5 other
51	A qiyasi, sau nawa a sati guda kake cin abincin da ba a gidanku aka girka ba? wato dai abincin safe ko na rana ko kuma na dare.	Sau …….. Ban sani ba 77. …….	D6

: Motsa jiki			
Yanzu kuma tambayoyin sun shafi irin lokacin da kake amfani da shi wajen ayyukan motsa jiki a sati. Don Allah ka amsa taambayoyin ko da kuwa kai ba mai sha'awar motsa jiki ba ne. ka fara tunanin lokacin da kake vatawa wajen aikinka. Yi tunanin aikace-aikacenka a matsayin wani abu da ya wajaba ka yi, kamar aikin neman kuxi, karatu/koyon wani abu, aikin gida, aikin gona, yin su, ko farauta, kora dabbobi kiwo da sauransu. A yayin amsa waxannan tambayoyin, *ayyuka masu buqatar tsananin kuzari* suna nufin duk wani aikin da yake buqatar motsa jikin da zai sa a yi haki ko qaruwar bugawar zuciya da sauri. Yayin da ayyuka *masu buqatar matsakaicin kuzari* su ne masu buqatar matsakaicin motsa jikin da ba zai sa bugawar zuciya ta qaru da sauri ba.			
Tambaya		**Amsa**	**Lamba**
Aiki			
52	Shin aikinka ya shafi ayyuka masu buqatar tsananin kuzari wanda yakan haifar maka da qaruwar bugun zuciya da	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi P4	P1

	haki? Kamar xaukar kaya masu nauyin gaske, yin haqa ko leburancin gini?		
53	A kowanne sati, sau nawa kake yin ayyuka masu buqatar tsananin kuzari a wurin aikinka	Sau …….	P2
54	Tsawon wane lokaci kake aiwatar da ayyuka masu buqatar tsananin kuzari a kullun a wurin aikinka?.	Awa…… minti……..	P3

55	Shin aikinka ya shafi ayyuka masu buqatar matsakaicin kuzari? wanda yakan haifar maka da qaruwar bugun zuciya da haki kaxan? Kamar ‘yar tafiyar qafa kaxan, ko xaukar kaya maras nauyi,	Eeh 1 A’ah 2. idan amsar a’a ce sai a tafi P7	P4

	da bai wuce na minti goma ba?		
56	A cikin sati guda sau nawa kake yin ayyukkka masu buqatar matsakaicin kuzari a wurin aikinka?	Sau ……..	P5
57	Tsawon lokaci nawa kake xauka wajen yin ayyuka masu buqatar matsakaicin kuzari a wajen aikinka?	Awa ……. Minti …….	P6
Tafiye-tafiye zuwa wurare			
Tambayoyi na gaba ba su shafi ayyukan qarfi da aka bayyana a baya ba. yanzu zan yi ma tambayoyi a game da hanyoyin da aka saba tafiye tafiye zuwa wurare. Misali zuwa aiki, ko zuwa kasuwa, masallaci da sauransu.			
58	Kana tafiya a qafa ko a kan keken da ake tuqawa da qafa na a qalla minti goma don zuwa ko dawowa daga wani wuri?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi P10	P7

59	A sati guda, kwana nawa kake tafiya a qafa na aqalla minti 10 domin zuwa wajen aiki?	Sau …….	P8
60	Tsawon lokaci nawa kake vatawa wajen tafiya a qafa ko a keke domin zuwa wurare	Awa ……. Minti …….	P9(a-ba)

Abubuwan shaqatawa			
Tambayoyi na gaba ba su shafi tafiye-tafiye ba waxanda muka yi a baya ba. Zan yi tambaya ne a kan wasanni da sauran abubuwan shaqatawa.			
61	Kana yin wasanni masu buqatar tsananin kuzari? Kamar gudu ko qwallan qafa na a qalla minti 10?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi P13	P10
62	A cikin sati guda, kwanaki nawa kake wasanni masu buqatar tsananin kuzari?	Kwanaki ……..	P11
63	Tsawon lokaci nawa kake xauka kana yin wasanni masu buqatar tsananin kuzari a rana?	Awa …… minti …….	P12
64	Kana yin wasanni masu buqatar matsakaicin kuzari kamar linqaya, qwallon raga na aqalla minti 10?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi P16	P13

65	A cikin sati guda, kwanaki nawa kake wasanni masu buqatar matsakaicin kuzari? Kamar wasanni, motsa jiki da sauransu?	Kwanaki ……..	P14
66	Tsawon lokaci nawa kake xauka kana yin wasanni masu buqatar matsakaicin kuzari a rana guda?	Awa …….. minti ……..	P15

Qarin bayani a kan Motsa jiki			
Wannan tambayar ta shafi zama a wajen aiki, ko tare da abokai, ko a cikin mota ko jirgi da sauransu. Amma ban da lokacin bacci..			
Tambaya		**Amsa**	**Lamba**
67	Tsawon lokaci nawa kake xauka a zaune ko a tsaye a rana guda?	Awa …….. minti …….	P16

: Tarihin Hauhawan jinni			
Tambaya		**Amsa**	**Lamba**
68	An tava auna bugun jininka kuwa.	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi H6	H1
69	Wani likita ko ma'aikacin lafiya kuwa ya tava faxa maka cewa jininka ya hau, wato kana da hawan jini?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi H6	H2a
70	An tava faxa maka haka a watanni 12 da suka wuce?	Eeh 1 A'ah 2.	H2b

Qarin bayani a kan Hauhawar jinni			
71	A halin yanzu kana karvar wani daga cikin waxannan magungunan /shawarwari na hawan jini?		
	Kana karvar magungunan hawan jini?	Eeh 1 A'ah 2	H3a

	Shawarar ka rage cin gishiri?	Eeh 1 A'aah 2	H3b
	Shawarar ka rage qiba?	Eeh 1 A'ah 2	H3c
	Shawarar/maganin ka daina shan taba?	Eeh 1 A'ah 2.	H3d
	Shawarar ka fara motsa jiki?	Eeh 1 A'ah 2.	H3e
72	Kana zuwa wajen mai maganin gargajiya domin matsalar hawan jini?	Eeh 1 A'ah 2	H3f
73	A halin yanzu kana shan magugunan gargajiya domin magance matsalar hawan jini?	E'eh 1 A'ah 2	H3g

: Tarihin Ciwon suga			
Tambaya		**Amsa**	**Lamba**
74	An tava auna yawan sugan da ke cikin jininka kuwa?	Eeh 1 A'ah 2. idan amsar a'a ce sai a tafi M1	H6
75	Likita ko wani maaikacin lafiya ya tava faxa maka cewar suganka da ke cikin jini ya hau sama kuwa?	Eeh 1 A'ah 2	H7a
76	An faxa maka haka a cikin watanni 12 da suka wuce?	Eeh 1 A'ah 2	H7b

Qarin bayani a kan Ciwon suga			
77	A halin yanzu kana karvar wani daga cikin waxannan magungunan /shawarwari na ciwon suga?		
	Kana karvar allurar sunadarin insole	Eeh 1 A'ah 2	H8a

	Kana karvar magungunan ciwon suga?	Eeh 1 A'aah 2	H8b
	Shawarar canjin abinci na musamman?	Eeh 1 A'ah 2	H8c
	Shawarar rage qiba?	Eeh 1 A'ah 2.	H8d
	Shawarar daina shan sigari/Taba?	Eeh 1 A'ah 2.	H8e
	Shawarar ka fara motsa jiki?	Eeh 1 A'ah 2	H8f
78	Kana zuwa wajen mai maganin gargajiya domin matsalar ciwon suga?	Eeh 1 A'ah 2	H9
79	A halin yanzu kana shan magugunan gargajiya domin magance matsalar ciwon suga?	E'eh 1 A'ah 2	H10

MATAKI NA 2 Aune-Aunen Jiki

: Tsayi da Nauyi			
Tambaya		**Amsa**	**Lamba**
80	Lambar mai yin tambayoyi,	----------	M1
81	Lambar na'urar awan tsayi da nauyi.	Ta auna tsayi---------- ------ Ta gwajin nauyi ---------- --------	M2a M2b
82	Tsayi	----------santimita	M3
83	Nauyi **(idan ya fi qarfin sikeli sai a rubuta 666.6)**	----------kilogiram	M4
84	**Ga Mata.** Kina da juna biyu?	Eeh 1 idan ee ce amsar saia tafi M8 A'ah 2.	M5
: Faxin Qugu/ Tsantsa			
85	Lambar na'ura/ magwajin awon tsantsa/qugu	----------	M6

86	Awan faxin qugun/Tsantsar	---------- ------ santimita	M7
: Awon gudanawar jini.			
87	Lambar mai yin Tambayoyin	----------	M8
88	Lambar na'urar awon gudanawar jini.	----------	M9
89	Faxin dantse	Qarami 1 Matsakaici 2 Babba 3	M10
90	Sakamako awon na 1	Awo na sama---------- (mmhg)	M11a
		Awo na qasa---------- (mmhg)	M11b
91	Sakamakon awo na 2	Awon sama ---------- (mmhg)	M12a
		Awon qasa ---------- (mmhg)	M21b
92	Sakamakon awo na 3	Awon sama ----------(mmhg)	M13a

		Awon qasa ---------- (mmhg)	M13b)
93	A cikin sati biyu da suka wuce an ba ka maganin hawan jini?	Ee'h 1 A'ah 2	M14

Qarin bayani a kan Faxin qugu da bugawar zuciya			
94	Faxin qugu	---------- ---------- santimita	M15
95	Bugawar zuciya		
	Awo na 1	---------- bugawa a minti 1	M16a
	Awo na 2	---------- bugawa a minti 1	M16b
	Awo na 3	---------- bugawa a minti 1	M16c

MATAKI NA 3 Gwaje-gwajen Sunadarai

: yawan suga cikin jinni			
Tambaya		**Amsa**	**Lamba**
96	Ka ci wani abu kuwa Cikin sa'o'i 12 da suka wuce?	Eeh 1 A'ah 2	B1
97	Lambar ma'aikacin gwaje-gwaje	----------	B2
98	Lambar na'urar gwajin	----------	B3
99	Lokacin da aka xauki jini? A yi amfani da lokacin agogo na awa24	----------	B4
100	Sakamakon yawan suga cikin jin,	---------- ---------	B5
101	Yau ka yi allurar insoli?	Eeh 1 A'aa 2	B6

: Awon Kitse a cikin hanyar jini.

102	Lambar na'urar awo	----------	B7
103	Yawan kitse cikin jini.	----------	B8
104	A cikin sati 2 da suka wuce an ba ka maganin rage kitse cikin jini?	Eeh 1 A'ah 2	B9

Qarin awon Kitse cikin jijiyoyin jini.			
105	**Sakamakon awo**	----------mmol/l	B10
		----------mg/di	B10
106	**Sakamakon awo**	----------mmoi/l	B11
		----------mg/dl	B11

Appendix 7

DIABETES CARE PROFILE

Understanding

Q1. How do you rate your understanding	**Poor**		**Good**		**Excellent**
f) how to use the results of blood	1	2	3	4	5
affect blood sugar levels					
h) prevention and treatment of high	1	2	3	4	5
blood sugar					
j) prevention of long-term	1	2	3	4	5
l) benefits of improving blood sugar	1	2	3	4	5

Section V–Support

Q1. I **want** a lot of help and support from myfamilyor friends in: (circle one answer for each line)

	oes Strongly	**Somewhat**		**Somewhat Strongly**	**Not Disagree**	**D**
plan.						
d)getting enough	1	2	3	4	5	N/A
f) handling myfeelings	1	2	3	4	5	N/A

Q2. Myfamilyor friends help and support me a

lot to: (circle one answer for each line)

	oes Strongly	**Somewhat**		**Somewhat Strongly**
d)get enough physical	1	2	3	4	5

about diabetes.

Q3. Myfamilyor friends: (circle one answer for each line)

b)	feel uncomfortable about me	1	2	3	4	5
	about mydiabetes.					
d)	discourage or upset me about	1	2	3	4	5
	talk about mydiabetes.					

f) nag me about diabetes. 1 2 3 4 5

Q4. Who helps you the **most** in caring for your diabetes? (Checkonlyone box)

☐ 1Spouse

☐ 2Other familymembers

☐ 3Friends

☐ 4Paid helper

☐ 5Doctor

☐ 6Nurse

☐ 7Case manager

☐ 8Other health care professional

☐ 9No one

Control Problems

For the following questions, please check the appropriate response.

Q1. How many **times** in the last **month** have you had a **low blood sugar** (glucose) reaction with symptoms such as sweating, weakness, anxiety, trembling, hunger or headache?

☐ 1 0 times

☐ 2 1-3 times

☐ 3 4-6 times

☐ 4 7-12 times

☐ 5 More than 12 times

☐ 6 Don't know

Q2. How many **times** in the last **year** have you had **severe low blood sugar** reactions such as passing out or needing help to treat the reaction?

☐ 1 0 times

☐ 2 1-3 times

☐ 3 4-6 times

☐ 47-12 times

☐ 5More than 12 times

☐ 6Don’t know

Q3. Howmany**days** in the last**month** have you had **high blood sugar** with symptoms such as thirst,drymouth and skin,increased sugar in the urine,less appetite,nausea,or fatigue?

☐ 10 days

☐ 21-3 days

☐ 34-6 days

☐ 47-12 days

☐ 5More than 12 days

☐ 6Don't know

Q4. Howmany**days** in the last**month** have you had **ketones**in your urine?

☐ 10 days

☐ 21-3 days

☐ 34-6 days

☐ 47-12 days

☐ 5More than 12 days

☐ 6Don't test

Q5. During the past year**,**howoften did your						
medicine?						
e) you ate too much food?	1	2	3	4	5	
f) you had less physical activitythan	1	2	3	4	5	DK

Q6. During the past year**,**howoften did (circle one answer for each line)	**Never**	**Sometime**	**Often**
medicine?			

f) you had more physical	1	2	3	4	5	DK
g) you waited too long to eat or skipped a meal?	1	2	3	4	5	DK
h) you were feeling stressed?	1	2	3	4	5	DK

Social and Personal Factors

For the following questions,please circlethe appropriate response.

Q1. How often has your diabetes kept you From doing your normal daily activities during the past **year** (e.g. couldn't: go to work, work around the house,go to school,visit friends)?	**Never**		**Sometimes**		**Often**	**Don't Know**
	1	2	3	4	5	DK

Q2. Mydiabetes and its treatment keep me from:(circle one answer for	Strongly	Disagree	Neutral	Agree	Strongly
a) having enough money.	1	2	3	4	5
b)meeting school, work, household,and other	1	2	3	4	5
c) going out or traveling as much asI want.	1	2	3	4	5
d)being as active as I want.	1	2	3	4	5
e) eating foods that I like.	1	2	3	4	5
f) eating as much as I want.	1	2	3	4	5
g)having good relationships with people.	1	2	3	4	5
h)keeping a schedule I like (e.g.,	1	2	3	4	5
i) spending time with myfriends.	1	2	3	4	5
j) having enough time alone.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Q3. Paying for my diabetes treatment and supplies is a problem.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
difficult.					

ATTITUDES TOWARD DIABETES (POSITIVE ATTITUDE, NEGATIVE ATTITUDE, CARE ABILITY, IMPORTANCE OF CARE, AND SELF-CARE ADHERENCE) FOR THE FOLLOWING QUESTIONS, PLEASE CIRCLE THE PPROPRIATE RESPONSE. (CIRCLE ONE ANSWER FOR EACH LINE)

		Strongly Disagree				**Strongly**
Q1.	I am afraid of my diabetes.	1	2	3	4	5
Q2.	I find it hard to believe that I really have diabetes.	1	2	3	4	5
Q3.	I feel unhappy and diabetes. depressed	1	2	3	4	5
Q4.	I feel satisfied with my life.	1	2	3	4	5
Q5.	I feel I'm not as good as others because of my diabetes.	1	2	3	4	5
Q6.	I can do just about anything I set out to do.	1	2	3	4	5
Q7.	I find it hard to do all the things I have to do for my diabetes.	1	2	3	4	5
Q8.	Diabetes doesn't affect my life at all.	1	2	3	4	5
Q9.	I am pretty well off, all things considered.	1	2	3	4	5
Q10.	Things are going very well for me right now.	1	2	3	4	5

Q11. I am**able** to: (circle one answer for each line)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
a) keep myblood sugar in good control.	1	2	3	4	5
b)keep myweight under	1	2	3	4	5
c) do the things I need to do medicine, exercise, etc.).	1	2	3	4	5
d) handle myfeelings (fear, worry,anger) about my	1	2	3	4	5

Q12. I think it is**important** for me **Strongly** to: (circle one answer for each	**Disagree**	**Disagree**	**Neutral**		
a) keep myblood sugar in good control.	1	2	3	4	5
b)keep myweight under	1	2	3	4	5
c) do the things I need to do medicine, exercise, etc.).	1	2	3	4	
d)handle myfeelings (fear, 5 worry,anger) about my	1	2	3	4	

	Never	Sometimes	Always		Don't Know
Q13. I keep my blood sugar in good control.	1	2	3	4	5 DK

	Never		Sometimes		Always
Q14. I keep myweight under control.	1	2	3	4	5
Q15. I do the things I need to do for my diabetes (diet, medicine, exercise,	1	2	3	4	5
Q16. I feel dissatisfied with life because of mydiabetes.	1	2	3	4	5
Q17. I handle the feelings (fear, worry, about mydiabetes fairlywell.	1	2	3	4	5 anger)

Diet Adherence

Q1. Has any health care provider or nurse ☐ 1No ☐ 2Yes ☐ 3Not sure told you to follow a meal plan or diet?

	Never		Sometimes		Always
Q2. How often do you follow a meal plan or diet?	1	2	3 ☐	4	5 ☐

Q3. Have you been told to follow a schedule for your meals and snacks? 1No ☐ 2Yes ☐

Q4. Have you been told to weigh or measure 1No ☐ 2Yes ☐

Q5. Have you been told to use exchange lists or food group lists to plan your meals? 1No 2Yes

		Never		Sometimes		Always
Q6.	Howoften do you followthe schedule for your meals and snacks?	1	2	3	4	5
Q7.	Howoften do you weigh or measure	1	2	3	4	5
Q8.	Howoften do you (or the person who lists or food group lists to plan your meals?	1	2	3	4	5

Long-TermCare Benefits

For the following questions,please circlethe appropriate response. (circle one answer for each line)

Q1.	Taking the best possible care of diabetes will delayor prevent:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	a) eye problems	1	2	3	4	5
	b)kidneyproblems	1	2	3	4	5
	c) foot problems	1	2	3	4	5
	d)hardening of the arteries	1	2	3	4	5
	e) heart disease	1	2	3	4	5

Exercise Barriers

For the following questions,please circlethe appropriate response. (circle one answer for each line)

Q1. Howoften do you have trouble getting enough exercise because:	**Rarely**		**Sometimes**		**Often**
a) it takes too much effort?	1	2	3	4	5
b)you don't believe it is useful?	1	2	3	4	5
c) you don't like to do it?	1	2	3	4	5
d)you have a health problem?	1	2	3	4	5
e) it makes your diabetes more difficult to control?	1	2	3	4	5

Monitoring Barriers and Understanding Management Practice

Q1. Howmanydaysa week have you been told to test:

a) urine sugar? (days per week) ☐9 Not told ☐

to test b)blood sugar? (days per week) 9

Not told to test

If you **do not** test for sugar,skip Question No.2.

For the following questions,please circlethe appropriate response. (circle one answer for each line)

Q2. When you **don't** test for sugar

as often as you have been

a) you forgot?	1	2	3	4	5
b)you don't believe it is useful?	1	2	3	4	5
c) the time or place wasn't right?	1	2	3	4	5
d)you don't like to do it?	1	2	3	4	5
e) you ran out of test materials?	1	2	3	4	5
f) it costs toomuch?	1	2	3	4	5
g)it's too much trouble?	1	2	3	4	5
h)it's hard to read the test results?	1	2	3	4	5
i) you can't do it by yourself?	1	2	3	4	5
j) your levels don't change very	1	2	3	4	5
k)it hurts to prick your finger?	1	2	3	4	5

Q3. Have you ever received diabetes education? 1No 2Yes

If No,skipQuestionNo.4

For the following questions,please circlethe appropriate response. (circle one answer for each line)

Q4. Howdo you rate your understanding of:					
a) diet and blood sugar control	1	2	3	4	5
b)weight management	1	2	3	4	5
c) exercise	1	2	3	4	5
d)use of insulin/pills	1	2	3	4	5
e) sugar testing	1	2	3	4	5
f) foot care	1	2	3	4	5
g)complications of diabetes	1	2	3	4	5
h)eye care	1	2	3	4	5
i) combining diabetes medication with other medications	1	2	3	4	5

j) alcohol use and diabetes	1	2	3	4	5

Appendix 7

BAYANAN KULA DA CIWON SUKARI

Fahimtar yadda za a kula da ciwon sukari

1. **Yaya za ka auna fahimtarka ga wadannan**

   Bayanai ? **(*Zagaye amsar da ka zaba*)**

a) Harkar kula da ciwon sukari gaba **Sosai**	**Kadan**			**Da yawa**	
dayanta	1	2	3	4	5
b) Yadda za a magance damuwa	1	2	3	4	5
c) Abincin masu ciwon sukari	1	2	3	4	5
d) Muhimmancin motsa jiki ga mai ciwon sukari	1	2	3	4	5
e) Magungunan da kake sha	1	2	3	4	5
f) Yadda za a yi da sakamakon gwajin jini	1	2	3	4	5
g) Tasirin motsa jiki da kula da abinci Wajen magance ciwon sukari	1	2	3	4	5
h) Yadda za a kare da magance hawan jini	1	2	3	4	5
i) Yadda za a kare da magance karancin					

sukari a jiki	1	2	3	4	5
j) Kare kai daga matsalolin da ciwon sukari kan Iya haifarwa	1	2	3	4	5
k) Kulawa da sawu/kafa	1	2	3	4	5
l) Muhimmancin dai-daita yawan sukari a jiki	1	2	3	4	5
m) Samun ciki da ciwon sukari	1	2	3	4	5

BUKATAR TAIMAKO (Section V. Support)

1. **Ina bukatar taimako da kwarin guiwa daga 'Yan uwa da Abokan arziki ta fuskar: (zagaye amsar da ka zaba)**

		Sam ban yard a ba.	**Ban yard a ba.**	**Ba tabb as.**	**Na yard a.**	**Haqi qa na yard a.**	**Babu zabi**
		1	**2**	**3**	**4**	**5**	
a.	Daidaita min abincina	**1**	**2**	**3**	**4**	**5**	
b	Shan magani	**1**	**2**	**3**	**4**	**5**	
c	Kula da kafata/sauna	**1**	**2**	**3**	**4**	**5**	
d	Samun wadataccen motsa jiki	**1**	**2**	**3**	**4**	**5**	
e	Awon sukari	**1**	**2**	**3**	**4**	**5**	
f	Kwantar min da hankali sabod damuwa sakamakon ciwon sukari	**1**	**2**	**3**	**4**	**5**	

2. ‘Yan uwana da abokan arziki suna taimaka min sosai ta fuskar:

(zagaye amsar da ka zaba)

		Sam ban yard a ba.	**Ban yard a ba.**	**Ba tabb as.**	**Na yard a.**	**Haqi qa na yard a.**	**Babu zabi**
		1	**2**	**3**	**4**	**5**	
a.	Daidaita min abincina	**1**	**2**	**3**	**4**	**5**	
b	Shan magani	**1**	**2**	**3**	**4**	**5**	
c	Kula da kafata/sauna	**1**	**2**	**3**	**4**	**5**	
d	Samun wadataccen motsa jiki	**1**	**2**	**3**	**4**	**5**	
e	Awon sukari	**1**	**2**	**3**	**4**	**5**	
f	Kulawa da damuwata a game da ciwon sukari	**1**	**2**	**3**	**4**	**5**	

3. ‘Yan uwana ko abokaina sun:

(zagaye amsar da ka zaba)

		sam ban yarda ba.	**Ban yarda ba.**	**Ba tabbas.**	**Na dan yarda.**	**Haqiqa na yarda.**
		1	**2**	**3**	**3**	**5**
a	Sun karbe ni da larurata ta ciwon sukari	**1**	**2**	**3**	**3**	**5**
b	Sun ki sakin jiki da ni saboda ina da ciwon sukari	**1**	**2**	**3**	**3**	**5**
c	Suna ba ni kwarin guiwa a game da larurata ta ciwon sukari	**1**	**2**	**3**	**3**	**5**
d	Suna kashe min guiwa kuma su bata min rai saboda ina da ciwon sukari	**1**	**2**	**3**	**3**	**5**
e	Suna sauraro na yayin da nake bayani a game da ciwona na sukari	**1**	**2**	**3**	**3**	**5**
f	Suna yi min mita a kan ciwon sukari	**1**	**2**	**3**	**3**	**5**

A cikin wadannan mutane, wane ne ya fi taimaka maka wajen kula da ciwon sukarinka?

[ ] 1. Matarka/mijinki

[ ] 2 Sauran ‘yan uwa

[ ] 3 Abokai

[ ] 4 Mai aiki

[ ] 5 Likita

[ ] 6 Ma’aikaci/ma’aikaciyar jinya (Nas)

[ ] 7 Wanda yake duba ni

[ ] 8 Sauran ma’aikatan lafiya

[ ] 9 sauran mutane

MATSALOLIN KULA DA CIWON SUKARI (control problems)

A wadannan tambayoyin, ana so ka bayyana amsarka ta zabar akwatin da ya dace.

1. **A cikin watan da ya wuce, sau nawa ka samu matsalar suganka ya yi kasa wanda har ya haifar maka da alamomi irin su gumi da kasala da rawar jiki da jin matsananciyar yunwa da ciwon kai?**

[ ] 1 Babu

[ ] 2 Sau 1 zuwa 3

[ ] 3 Sau 4 zuwa 6

[ ] 4 Sau 7 zuwa 12

[ ] 5 Fiye da 12

[ ] 6 Ban sani ba

2. **A shekarar da ta gabata, sau nawa ka samu matsalar da suganka ya yi kasa, wanda har hakan ya haifar maka da jin kamar za ka suma ko bukatar agaji?**

[ ] 1 Babu

[ ] 2 Sau 1 zuwa 3

[ ] 3 Sau 4 zuwa 6

[ ] 4 Sau 7 zuwa 12

[ ] 5 Fiye da 12

[ ] 6 Ban sani ba

3. **A watan da ya wuce, kwana nawa ka yi sukarinka yana sama wanda ya haifar da wasu alamomi kamar bushewar baki da bushewar fata, da yawan suga a cikin fitasri, da jiri da kasala?**

[ ] 1 Babu

[ ] 2 Kwana 1 zuwa 3

[ ] 3 Kwana 4 zuwa 6

[ ] 4 Kwana 7 zuwa 12

[ ] 5 Fiye da kwana 12

[ ] 6 Ban sani ba

4. **A watan da ya wuce, kwana nawa ka yi ana samun sunadarin Ketan a cikin fitsarinka?**

[ ] 1 Babu

[ ] 2 Kwana 1 zuwa 3

*

[ ] 3 Kwana 4 zuwa 6

[ ] 4 Kwana 7 zuwa 12

[ ] 5 Fiye da kwana 12

[ ] 6 Ban sani ba

5. A shekarar da wuce, sau nawa aka ce sukarinka ya yi sama saboda wadannan dalilai?

(Zagaye amsar da ka zaba)	**sam-sam lokaci-**		**wani lokaci**		**sam-sam lokaci**
a) Saboda wata rashin lafiya da ta same ka	1	2	3	4	5
b) Saboda ka yi fushi/harzuka	1	2	3	4	5
c) Saboda ka shi magani fiye da adadin da ya kamata	1	2	3	4	5
d) Saboda ka ci abincin da bai dace da kai ba	1	2	3	4	5
e) Saboda ka ci abinci fiye da kima	1	2	3	4	5
f) Saboda kana jin gajiya	1	2	3	4	5

6. A shekarar da wuce, sau nawa aka ce sukarinka ya yi kasa saboda wadannan dalilai?

(Zagaye amsar da ka zaba)	**sam-sam lokaci-**		**wani lokaci**		**sam-sam lokaci**
a) Saboda wata rashin lafiya da ta same ka	1	2	3	4	5
b) Saboda ka yi fushi/harzuka	1	2	3	4	5
c) Saboda ka sha magani fiye da adadin da					

ya kamata	1	2	3	4	5
d) Saboda ka ci abincin da bai dace da kai ba	1	2	3	4	5
e) Saboda ka ci abinci fiye da kima	1	2	3	4	5
f) Saboda ka motsa jiki fiye da kima	1	2	3	4	5
g) Saboda ka da ka ketare lokacin cin abinci	1	2	3	4	5
h) Saboda kana jin gajiya	1	2	3	4	5

MATSALOLIN ZAMANTAKEWA/ RAYUWA GA MAI CIWON SUKARI

(Social and personal factors)

Zagaye amsar da ka zaba

1. **Sau nawa ciwon sukarinka ya hana ka gudanar da ayyukanka na yau da kullum a shekarar da ta wuce?**

   (misali, kasa zuwa wajen aiki, kasa sam-sam wani lokaci- lokaci lokaci

   1 2 3 4 5

2. **Ciwon sukarina ya hana ni:**

		Sam ban yard a ba.	**Ban yard a ba.**	**Ba tabb as.**	**Na yard a.**	**Haqi qa na yard a.**	**Babu zabi**
		1	**2**	**3**	**4**	**5**	
a.	Tara kudi	**1**	**2**	**3**	**4**	**5**	

b	Zuwa makaranta da sauran ayyukan cikin gida	**1**	**2**	**3**	**4**	**5**	
c	Fita waje da saura tafiye-tafiye	**1**	**2**	**3**	**4**	**5**	
d	Na kasance mai kuzari kamar yadda nake so	**1**	**2**	**3**	**4**	**5**	
e	Cin abincin da nake so	**1**	**2**	**3**	**4**	**5**	
f	Cin abinci na koshi irin yadda nakae so	**1**	**2**	**3**	**4**	**5**	
g	Yin mua'amula da sauran jama'a	**1**	**2**	**3**	**4**	**5**	
h	Tsara abubuwana kamar yadda na saba, kamar cin abinci, bacci da sauran su	**1**	**2**	**3**	**4**	**5**	
i	Zama cikin abokai/kawaye	**1**	**2**	**3**	**4**	**5**	
j	Samun isasshen lokaci na zauna ni kadai	**1**	**2**	**3**	**4**	**5**	

3. **Daukan nauyin magugunan ciwon Sukarina babbar matsala ce a gare ni**. (***Zagaye amsar da ka zaba)***

		Sam ban yard a ba.	**Ban yard a ba.**	**Ba tabb as.**	**Na yard a.**	**Haqi qa na yard a.**	**Babu zabi**
		1	**2**	**3**	**4**	**5**	

4. **Kamuwa da ciwon sukari ya saka ni cikin mawuyacin hali .**

(***Zagaye amsar da ka zaba)***

		Sam ban yard a ba.	**Ban yard a ba.**	**Ba tabb as.**	**Na yard a.**	**Haqi qa na yard a.**	**Babu zabi**
		1	**2**	**3**	**4**	**5**	

TUNANI/HALAYYA GA CIWON SUKARI (Attitude towards diabetes)

Zagaye amsar da ka zaba

		Sam ban yard a ba.	**Ban yar da ba.**	**Ba tabb as.**	**Na yard a.**	**Haqiq a na yarda.**
		1	**2**	**3**	**4**	**5**
1	Ina jin tsoron ciwon sakari	**1**	**2**	**3**	**4**	**5**
2	Na kasa yarda cewar wai ina da ciwon sukari	**1**	**2**	**3**	**4**	**5**
3	Kullun ina cikin damuwa da rashin jin dadi saboda ina da ciwon sukari	**1**	**2**	**3**	**4**	**5**
4	Na gamsu da halin da nake ciki	**1**	**2**	**3**	**4**	**5**
5	Ina jin ina kasa da kowa saboda ina da ciwon sukari	**1**	**2**	**3**	**4**	**5**

6	Zan iya aiwatar duk abinda na sa kaina	**1**	**2**	**3**	**4**	**5**
7	Ina samun wahalar aiwatar da duk abinda da na yi niyyar aiwatarwa.	**1**	**2**	**3**	**4**	**5**
8	Ba na iya aiwatar da duk abinda na yi niyyar yi a game da ciwon sukarina.	**1**	**2**	**3**	**4**	**5**
9	Duk da halin da nake ciki, komai yana tafiya daidai	**1**	**2**	**3**	**4**	**5**
10	Komai nawa yana tafiya daidai	**1**	**2**	**3**	**4**	**5**

11. Yanzu ina iya:

		Sam ban yard a ba.	**Ban yar da ba.**	**Ba tabb as.**	**Na yard a.**	**Haqiq a na yarda.**

A	Daidaita yawan sukarin da ke jikina	**1**	**2**	**3**	**4**	**5**
B	Daidaita kibata					
C	Yin duk abinda ya kamata ga ciwon sukarina.	**1**	**2**	**3**	**4**	**5**
D	Daidaita halayyata a game da ciwon sukarina, irin su tsoro, damuwa, da fushi da sauran su.	**1**	**2**	**3**	**4**	**5**

12. Ina ga yana da muhimmanci a gare ni na:

		Sam ban yard a ba.	**Ban yar da ba.**	**Ba tabb as.**	**Na yard a.**	**Haqiq a na yarda.**
A	Daidaita yawan sukarin da ke jikina.	**1**	**2**	**3**	**4**	**5**
B	Daidaita kibata					

C	Na yi duk abinda ya kamata ga ciwon sukarina.	**1**	**2**	**3**	**4**	**5**
D	Daidaita halayyata a game da ciwon sukarina, irin su tsoro, damuwa, da fushi da sauran su	**1**	**2**	**3**	**4**	**5**

	sam-sam	wani-	lokaci	lokaci-lokaci	
13. Ina daidaita sukarin da ke jikina	1	2	3	4	5
14. Ina daidaita kibata.	1	2	3	4	5
15. Ina yin abubuwan da ake bukata a game da ciwon sukarina kamar motsa jiki, abinci da sauransu	1	2	3	4	5
16. Ban gamsu da rayuwata ba saboda ina da ciwon sukari	1	2	3	4	5
17. Ina magance damuwata a game da ciwon sukari kamar tsoro, bacin-rai	1	2	3	4	5

KULA DA ABINCI (Diet adherence)

1. Shin ko wani daga cikin ma'aikatan lafiya ya taba yi maka bayani a game da tsarin abincin mai ciwon sukari? [ ] ee [ ] a'a [ ] Ba tabbas

	sam-sam	wani	lokaci	lokaci-lokaci	
2. Kana yawan bin wannan tsarin?	1	2	3	4	5

3. Shin ko an taba yi ma bayanin tsarin lokacin cin abinci ga mai ciwon sukari ? [ ] ee [ ] a'a
4. An taba yi ma bayanin kake auna nauyin abincinka ? [ ] ee [ ] a'a
5. An taba yi ma bayanin yadda za ka ke caccanja abincinka? [ ] ee [ ] a'a

	sam-sam	wani	lokaci	lokaci-lokaci	
6. Kana yawan bin tsarin lokacin cin abinci?	1	2	3	4	5
7. Kana yawan auna nauyin abincinka?	1	2	3	4	5
8. Kana yawan caccanja abincinka?	1	2	3	4	5

MUHIMMANCIN KULA DA CIWON SUKARI (Care benefits)

1. **Daukar matakin kulawa da ciwon sukari yana taimakawa wajen dakile/hana aukuwar:**

		Samban yarda ba.	**Banyarda ba.**	**Batabbas.**	**Nayarda.**	**Haqiqa nayarda.**
A	Matsalar gani/ido	**1**	**2**	**3**	**4**	**5**
B	Matsalar ciwon koda	**1**	**2**	**3**	**4**	**5**
C	Matsalar ciwon sawu.	**1**	**2**	**3**	**4**	**5**
D	Motsewar jijiyoyin gudanar jini.	**1**	**2**	**3**	**4**	**5**
E	Ciwon zuciya	**1**	**2**	**3**	**4**	**5**

DALILAN DA KE HANA KA MOTSA JIKI (Exercise barriers)

1. **Kana samun matsalar zuwa motsa ne jiki saboda:**

	sam-sam lokaci		**wani lokaci**		**lokaci-**
a) Yana da wahala sosai	1	2	3	4	5
b) Ban yadda yana da muhimmanci a gare ni ba.	1	2	3	4	5
c) Ba na son yi	1	2	3	4	5
d) Saboda ina da matsalar rashin lafiya	1	2	3	4	5
e) Yana ba ni wahala wajen sauko da sukarina	1	2	3	4	5

MATSALOLIN RASHIN AUNA SUKARI (Monitoring barriers)

1. Sau nawa a sati aka ce kake gwada:

   a) Yawan sukari a fitsarinka? Sau-------- a sati [ ] ba a fada mini ba

   b) Yawan sukari a jininka sau----------a sati [ ] ba a fada mini ba

Idan ba ka yin gwaji, to ka tsallake bayanan da ke tambaya ta 2.

2. **Baka yawan yin gwajin ne duk an fada maka saboda:**

	sam-sam	**wani**	**lokaci-**	**lokaci**	**lokaci**
a) Mantuwa	1	2	3	4	5
b) Ba ka yadda da muhimancinsa ba	1	2	3	4	5
c) Lokaci da wurin yin bai dace da kai ba	1	2	3	4	5
d) Ba ka son yi.	1	2	3	4	5
e) Kayan yin gwajin sun kare maka	1	2	3	4	5
f) Ya yi tsada da yawa	1	2	3	4	5
g) Matsalolinsa suna da yawa	1	2	3	4	5
h) Akwai wahalar gane sakamakon	1	2	3	4	5
i) Ba zan iya yi da kaina ba	1	2	3	4	5
j) Sakamakon ba ya canjawa	1	2	3	4	5
k) Akwai ciwo idan na huda jikina	1	2	3	4	5

3. **Ka taba samun ilmin kula da ciwon sukari?** [ ] ee[ ] a'a

Idan amsarka A'a ne, to a tsallake bayanan tambaya ta 4

4. **Yaya za ka auna fahimtarka a game da**:

(zagaye amsar da ka zaba)	**Kadan**				**Da yawa**
Sosai					
a) Dangantakar abinci da daidaitawar sukari a jiki?	1	2	3	4	5
b) Daidaita kiba	1	2	3	4	5
c) Mosta jiki	1	2	3	4	5
d) Amfani da insolin/kwayoyi	1	2	3	4	5
e) Gwajin sukari	1	2	3	4	5
f) Kula da sawun kafa	1	2	3	4	5
g) Matsalolin da ciwon sukari kan haifar	1	2	3	4	5
h) Kula da idanu	1	2	3	4	5
i) Haduwar magungunan ciwon Sukari da sauran magunguna.	1	2	3	4	5
j) Shan barasa/giya ga mai ciwon sukari	1	2	3	4	5

Appendix 8

Diabetes Self-care Knowledge (DSCK-30) item

	Item (Question)	**Response options**
Component 1: Modifiable Lifestyles		
1.	Fasting blood sugar (FBS) test can be used to monitor 2 to 3 months blood sugar control.	Yes; **No**
3.	Only the doctors should make plans on how a person with diabetes can achieve his/her target goals.	Yes; **No**
4.	Blood glucose level should be measured before and after every planned physical activity.	**Yes**; No
5.	Having physical activity for 20-30 minutes per session at least 3 days per week is essential. (Example of physical activities: Brisk walking, house activities, climbing staircase).	**Yes**; No
6.	Regular exercise does not reduce the need for insulin or other diabetic drugs.	Yes; **No**

7.	Maintaining a healthy weight is not important in management of diabetes.	Yes; **No**
8.	A person with diabetes should only ask for help when he/she feels sick from his/her healthcare team.	Yes; **No**
9.	Cigarette smoking can worsen diabetes disease	**Yes**; No
17.	At the initiation of insulin therapy for a person with diabetes who may require it, appropriate advice on Self Blood Glucose Monitoring (SBGM) and diets should be given to the person.	**Yes**; No*
18.	There should be mutual agreement between a person with diabetes and the doctor if he/she cannot change a particular lifestyle and afford his/her drugs.	**Yes**; No
19.	A person with diabetes should take extra care of his/her feet especially when cutting his/her toenails	**Yes**; No
20.	Tight elastic hose or socks are not bad for a person with diabetes.	Yes; **No**
21.	A person with diabetes should take care of his/her teeth and brush and floss his/her teeth every day.	**Yes**; No

23.	No person should check blood sugar and blood pressure of a diabetic patient except qualified medical doctor and other health personnel in the hospital.	Yes; **No**
24.	A person with diabetes should report any change in his eyesight to his doctor.	**Yes**; No
25.	Self-blood glucose monitoring (SBGM) allows doctor and other healthcare team to gather data for treatment planning.	**Yes**; No
26.	Self-blood glucose monitoring (SBGM) enables a person with diabetes to monitor and react to changes in his/her blood sugar levels.	**Yes**; No
29.	Monitoring blood pressure is not as important as monitoring blood glucose in a person with diabetes.	Yes; **No**

Component 2: Adherence to Self-care Practices

2.	Dietary instructions should be written out, even if the person with diabetes is illiterate: someone at home should be available to interpret it for him/her.	*Yes; No
10.	A person with diabetes taking diabetic medicines even when he/she feels good is waste of money.	Yes; **No**
11.	Being drunk while on diabetic drugs is not a serious problem	Yes; **No**
12.	Diet and exercise are not as important as medication in control of diabetes.	Yes; **No**
13.	Instructions about drugs and other self-care practices must not be strictly followed.	Yes; **No**
14.	Regular medical checkups are not essential when a person with diabetes is feeling well.	Yes; **No**
15.	Taking low dose Aspirin (Vasoprin®, Emprin®) tablet every day decreases risk of having heart attack and stroke.	**Yes**; No
16.	Diabetes Drugs are not taken throughout the life time of a person with diabetes.	Yes; **No**

22.	If blood sugar is close to normal, a person with diabetes is likely to have more energy, feel less thirsty and urinate less often.	**Yes**; No
27.	Shaking, confusion, behavioural changes and sweating are signs of high blood sugar.	Yes; **No**
28.	Prolonged high blood sugar level can cause eye problem or even blindness.	**Yes**; No
30.	Prolonged uncontrolled blood sugar level can cause heart attack, stroke and kidney problems.	**Yes**; No

Component 3: Consequences of uncontrolled blood sugar level

22.	If blood sugar is close to normal, a person with diabetes is likely to have more energy, feel less thirsty and urinate less often.	**Yes**; No
27.	Shaking, confusion, behavioural changes and sweating are signs of high blood sugar.	Yes; **No**
28.	Prolonged high blood sugar level can cause eye problem or even blindness.	**Yes**; No
30.	Prolonged uncontrolled blood sugar level can cause heart attack, stroke and kidney problems.	**Yes**; No

Appendix 8

SANIN YADDA ZA A KULA DA KAI (Self Care Knowledge)

KASHI NA DAYA

1. Gwajin sukari na yin azumi za a iya amfani da shi

   Wajen gwada daidaita sukari na wata biyu zuwa uku[ ] ee [ ] a'a

2. Likita ne kawai zai iya bayyana wa mai ciwon sukari

   Yadda zai cimma burinsa da kula da kansa [ ] ee [ ] a'a

3. Lallai ne a auna yawan bulkodin da ke jiki kafi da kuma

   Bayan dukkan wani tsarin motsa jiki. [ ] ee [ ] a'a

4. Yin motsa jiki na akalla minti 20 zuwa 30 a rana har kwana

   3 a sati yana da muhimmanci soasai [ ] ee [ ] a'a

5. Yin motsa jiki koyaushe ba ya rage bukatar amfani da

   Insoli ko magungunan ciwon sukari [ ] ee [ ] a'a

6. Daidaita kiba ba shi da wani muhimmanci wajen maganin

   ciwon sukari [ ] ee [ ] a'a

7. Mai fama da ciwon sukari zai bukaci taimako daga ma'aicin

   lafiya ne kawai idan ya ji ba shi da lafiya. [ ] ee [ ] a'a

8. Shan sigari/taba zai iya tsananta ciwon sukari [ ] ee [ ] a'a

9. Ga farkon wanda zai fara amfani da sunadarin insolin a

   matsayin maganin ciwon sukari, ana bukatar a ba shi

   Shawarwar da yake yin gwaji da kansa lokaci-lokaci,

da kuma kula da abincinsa. [ ] ee [ ] a'a

10.Lallai ne samu fahintar juna tsakanin mai ciwon sukari da kuma likitansa idan har ya kasance ba zai iya canja tsarin rayuwarsa ba, kuma ba zai iya sayen magungunansa ba [ ] ee [ ] a'a

11.Lallai ne mai ciwon sukari ya kula sosai a yayin da yake gyara kafafunsa, musamman wajen yanke farce yatsunsa. [ ] ee [ ] a'a

12.Safar kafa matsattsiya ba ta da wata matsala ga mai ciwon Sukari [ ] ee [ ] a'a

13.Mai ciwon sukari zai kula da tsaftar hakoransa, ya goge hakoransa da burushi a kullun [ ] ee [ ] a'a

14.Kada wani ya auna hawan jinin mai ciwon sukari ko kuma ya gwada yawan sukarinsa idan ba kwararran likita/ma'aikacin Lafiya ba ne. [ ] ee [ ] a'a

15.Lallai ne mai ciwon sukari ya kai rahoton matsalar gani da ya fuskanta ga likitansa. [ ] ee [ ] a'a

16.Gwajin sukari da mai ciwon sukari yake da kansayi zai bai wa likita damar samun bayanai a game da ciwon nasa domin tsara masa magani [ ] ee [ ] a'a

17.Gwajin hawan jini bai kai muhimmancin awon sukari ga mai ciwon sukari ba [ ] ee [ ] a'a

KASHI NA BIYU.

1. Lallai ne bayanin yadda za a tsara abinci ga mai ciwon suga a bayar a rubuce ko da kuwa bai iya rubutu da karatu ba har sai wani ya karanta masa. [ ] ee [ ] a'a
2. Ci gaba da shan magani ga mai ciwon sukari bayan ya fara jin dadin jikinsa asarar kudi ne. [ ] ee [ ] a'a
3. Kasancewa cikin buge/maye bayan kuma an sha magani, ba illa ba ne ga mai ciwon sukari [ ] ee [ ] a'a
4. Tsarin abinci da motsa jiki ba su kai muhimmancin shan magani ba ga mai ciwon sukari [ ] ee [ ] a'a
5. Umarni a kan yadda za a yi amfani da magunguna da sauran bayanai ba lallai ne a bi su sawu da kafa ba.[ ] ee [ ] a'a
6. Zuwa duba lafiya a kai-a kai ba shi da wani muhimmanci yayin da mai ciwon sukarin da yake jin dadin jikinsa [ ] ee [ ] a'a
7. Shan kwayar magani na asfirin a kullun yana rage hadarin kamuwa da ciwon zuciya/shanyewar barin jiki. [ ] ee [ ] a'a
8. Magungunan ciwon sukari ba za a yi ta shan su ba har tsawon rayuwa ga mai ciwon sukari. [ ] ee [ ] a'a

KASHI NA UKU

1. Idan awon sukari a jikin mai ciwon sukari ya kusa zama daidai, zai ji ya samu karin kuzari, kuma jin kishirwa zai ragu, haka kuma yawan zuwa fitsari zai ragu. [ ] ee [ ] a'a
2. Rawar jiki, rudewa, gumi da canjin halayya alamomi ne na ciwon sukari. [ ] ee [ ] a'a
3. Matsalar ciwon sukari na tsawon lokaci kan haifar da matsalar gani har ma da makanta. [ ] ee [ ] a'a
4. Matsalar ciwon sukari na tsawon lokaci kan iya haifar da ciwon zuciya, shanyewar barin jiki, da ciwon koda [ ] ee [ ] a'a