TYPE-2 DIABETES PATIENTS' GLYCAEMIC CONTROL AND QUALITY OF LIFE AS OUTCOMES OF FAMILY- INTEGRATED DIABETES EDUCATION IN TWO TERTIARY HOSPITALS IN SOUTHWESTERN NIGERIA

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ABSTRACT

Diabetes Mellitus (DM) and its complications are associated with high mortality and morbidity rates in Nigeria. Diabetes Self-Management Education (DSME) is germane to achieving optimum glycaemic control but is thwarted by a non-supportive family ambience. Evidence suggests that Family Integrated Diabetes Education (FIDE) is associated with better glycaemic control and Quality of Life (QoL). However, there is dearth of evidence regarding FIDE's effectiveness in Nigeria. This study was designed to determine the effects of FIDE on the two important health-related outcomes among type-2 diabetes patients attending two tertiary hospitals in Southwestern, Nigeria.

A quasi-experimental study was carried out. University College Hospital (UCH) and Olabisi Onabanjo University Teaching Hospital (OOUTH) were selected based on similarity in diabetes management programme and randomly assigned to Control group (CG) and Intervention group (IG), respectively. A total of 170 patients; 88 in CG and 82 in IG, with an equal number of family members (170), were recruited at baseline, (P1). At baseline (P1), patients completed questionnaire on Diabetes Knowledge Test (DKT), with scores ranging from 0 – 14; and QoL, having scores between 0 and 66; also capillary blood was taken for measurement of Point of Care (POC) glycosylated haemoglobin (HbA1c). Family members completed the questionnaire on DKT. A one-day FIDE was given to IG, in addition to routine diabetes education. Patients and family members were immediately assessed for post-intervention knowledge (P2), same day after FIDE. Follow-up SMS messages were sent to family members weekly for three weeks after FIDE. Glycaemic control (HbA1c) and QoL were measured for patients, at three and six-month post-intervention (P3 & P4). Analyses were conducted using independent t-test, paired t-test and ANOVA, at $\alpha_{0.05}$.

The IG and CG patients were not significantly different in age (59.8±11.6 and 61.7±11.1 years, respectively). Similarly, family members of IG (40.0±15 years) and CG (41.8±16.7 years) were comparable in age. At P1, DKT of patients in IG (5.8± 2.4) was similar to that of CG (6.1±2.3); QoL was also similar among the two groups of patients at P1 (IG: 49.7±7.6; CG: 50.5±7.1). The HbA1c for IG: 8.6±2.2% and CG: 7.5±2.1%, at P1 were significantly different, indicating worse glycaemic control in IG. Family members' DKT was similar between IG (5.6±2.4) and CG (5.9 ±2.3) at P1. At P2, DKT improved significantly among patients and family members in IG (IG: 9.7±2.6; CG: 6.1 ±2.3, and IG: 8.6 ±3.0; CG: 5.8±2.2, respectively) but not in CG. At P3, the QoL of IG (51.7 ± 8.8) and CG (51.3±9.9) were not significantly different. Mean HbA1c reduced significantly in IG at P3 (7.7±1.5%) compared to P1 (8.6±2.2%) but it increased significantly in CG (P3=8.0±2.1; P1=7.5±2.1%). This shows improvement in IG's glycaemic control. At P4, there were neither differences in the QoL of IG (56.2 ±11.9) and CG (55.0 ±9.5) nor their HbA1c (IG: 7.5± 1.8; CG: 7.8 ±2.1%).

Family-integrated diabetes-education effectively contributed to better glycaemic control but not quality of life of type 2 diabetes patients. Family members should be formally included in structured and regular diabetes-education.

Keywords: Family-integrated diabetes education, Glycaemic-control, Quality of life in diabetes mellitus

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CERTIFICATION

I certify that this work was carried out by Lucia Yetunde OJEWALE in the Department of Nursing, Faculty of Clinical Sciences, College of Medicine, University of Ibadan

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DEDICATION

I dedicate this PhD thesis on ‘Family-Integrated Diabetes Education’ (FIDE; which in Latin means ‘Faith’) to the Almighty God who never fails anyone who trusts in him.

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List of abbreviations

CG – Control group

DAN – Diabetes Association of Nigeria

DM – Diabetes mellitus

DSM –Diabetes self-management

DSME – Diabetes self-management education

HbA1c –glycosylated haemoglobin

IG – Intervention group

OOUTH – Olabisi Onabanjoo University Teaching Hospital

P1 – Phase 1

P2 - Phase 2

P3 –Phase 3

P4 –Phase 4

PFS- Perception of family support

QoL – Quality of life

SCT – Social Cognitive theory

UCH – University College Hospital

CHAPTER ONE
INTRODUCTION

1.1. Background

The International Diabetes Federation (IDF) stated in 2017 that there were 425 million (8.8%) adults living with Diabetes Mellitus (DM) and that diabetes caused about 4.0 million deaths in people aged 20-79 years. The federation further stated that Nigeria topped the list in terms of the overall number of people with diabetes in the West African region, having 1.7 million cases, (IDF, 2017).

Diabetes mellitus is a chronic condition that places a heavy burden on the clients and their carers/family. People with diabetes have to make several day-to-day decisions about the management of their illness involving behavioural change, frequently with very little contribution from a healthcare professional, in the areas of consumption of suitable food, appropriate exercise or physical activity and drug adherence, (Jarvis, et al, 2010). Studies have shown that carrying - out self - care activities by adults with type 2 DM is associated with improvement in glycaemic control, in addition to preventing complications, hospitalization and death, (Jackson et al, 2014, Skyler, et al, 2009 In Mayberry and Osborn, 2012)

Diabetes Self - Management Education (DSME) is vital to diabetes patients' self -care activities and achievement of successful health-related outcomes, (Brunisholz et al, 2014, Mensing et al, 2007 In Odili and Eke, 2010). A DSME is most effective when given by a nurse, (Fan and Sidani, 2017; Siminerio, et al, 2007); when family members are involved, (Pamungkas et al, 2017; Glasgow et al, 2008) and when behavioural strategies and psychosocial issues are addressed, (Powers et al, 2015, Anderson et al, 2010, Peyrot and Rubin, 2007).

In managing diabetes, the totality of the person as a bio-psychosocial being with diabetes having a psychosocial effect on the individual must be considered (Young et al, 2012, Santrock, 2007,). Quality of Life (QoL), which is an important outcome in evaluating the

effectiveness of diabetes management and the burden of care (Lindsat et al, 2011 In PrasannaKumar, et al, 2018),encompasses information about patient's psychosocial well-being, (Snoek, 2000). Diabetes and its complications can have an untoward effect on the quality of life of diabetes patients (Rani et al, 2015; Issa and Baiyewu, 2006). Literature, however, shows that effective DSME, particularly when incorporated with social support leads to an improvement in the QoL of diabetes patients, (Pamunkgas et al, 2017).

Moreover, glycaemic control and QoL are affected by several factors, including diabetes education, as part of the care provided by health care workers. One major factor affecting outcome in diabetes patients is the family setting. People with DM, just like other persons, live with their family members. Some authors have documented the positive correlation between family perception, as well as support, and optimum glycaemic control, evidenced by a reduction in HbA1c level, (Pamunkgas et al, 2017; Huidobro et al, 2011; Tang et al, 2008; Fisher, 2005; Kayh and Reintges, 2003). Huidobro et al (2011), found a significant improvement in the knowledge of patients whose family members were involved in education and were counselled.

An association was also found between family togetherness and diabetes QoL by Hu et al, (2014) and Chesla et al, (2004). In Nigeria, studies have shown that patients who perceived their family members as being supportive had better fasting blood glucose, (Adejoh, 2012; Adetunji et al, 2007). The major limitation of these studies was their cross-sectional nature, thus making it difficult to establish a cause-effect relationship.

Mayberry and Osborn, (2012) reported that diabetes patients reported feeling sabotaged by family members, who, despite having good knowledge about diabetes refused to support the patients in making changes. Sometimes, the help offered by family members reduced the self-efficacy of diabetes patients – 'uninformed" help (Harris, 2006). Besides, Fisher et al (2000), affirmed that the members of the family can either have a constructive or a destructive effect (albeit inadvertently) on the health status of individuals having diabetes; hinder or aid self - management activities and exacerbate or reduce the effects of stress on blood glucose control. On the other hand, family members also experienced diabetes burden, distress, and negative emotion as a result of diabetes and these are reduced when

they are exposed to diabetes education, (Burns et al, 2013), thus making them more effective in providing support.

Educational interventions involving family members have sometimes been effective in reducing the glycosylated haemoglobin level through better medication and diet adherence, improvement in the knowledge of diabetes patients, behavioural changes as well as improvement in the QoL of the patient, (Hu et al, 2014; Huidoro et al 2011). Other studies, on the other hand, reported a non-significant result between intervention and control groups after family education and counselling, (Wichit et al, 2017; Gilligand et al, 2002). However, the interventions differed in their length because whereas Hu et al 2014 gave the intervention weekly for eight weeks, Wichit et al (2017) gave three sessions of intervention every four weeks. The weekly consistent information may be responsible for the more significant result.

In Nigeria, some cross-sectional studies have examined the association between family support and metabolic control (using fasting blood glucose) among diabetes patients, (Adejoh, 2012; Adetunji et al, 2007). However, there is a dearth of information on educational interventions targeted at diabetes patients and their family members to improve management outcomes such as QoL and glycaemic levels. The availability of such would be most useful for planned actions by nurses who have obligations and opportunities to provide education for clients with diabetes and their family members. This is the impetus for this study.

1.2. Statement of problem

The rising incidence of tuberculosis and the prevalence of lower extremity amputation (LEA), in Nigeria, have been linked to diabetes mellitus, among patients, (Ogbera et al, 2014 and Odatuwa-Omagbemi and Vadiki, 2012). Uncontrolled diabetes mellitus represents half of all diabetes-related admissions, (Ngwogu et al, 2012), while the disease accounts for 3.5% - 15% of medical admissions in Nigeria, (Aguocha et al, 2013).

Diabetes mellitus management requires diet restriction; often life-long oral medication or insulin, frequent glucose monitoring, and exercise. People who have diabetes could find diet restrictions cumbersome and inhibitory especially when with others. They may find it

difficult to adhere to a diet for instance if family members and friends are not understanding. Having to take medications and check the blood glucose level daily can also be tiresome in the absence of understanding and supportive relatives. Equally, if family members lack understanding and knowledge of diabetes as well as its management and their role in providing support, they may fail to carry out this function.

Non - adherence to management regimen leads to poor glycaemic control and subsequent complications such as peripheral neuropathy, serious eye disorders including cataracts and retinopathy. This was reported by Chinenye et al, (2012), in a diabetes study involving seven tertiary hospitals in Nigeria. These complications have financial implications and are linked to increased mortality among diabetes patients, (Chijoke et al, 2010). Complications of diabetes result in increased hospitalization of clients which tends to put more pressure on an already strained personal and family economy. A yearly average sum of N62, 402 ($416) was spent on hospitalization by each hospitalized Nigerian client with diabetes due to various complications, (Odilli and Okwuanasor, 2012). If the problem of non-adherence is not addressed, diabetes-related morbidity and mortality may continue to increase.

The benefits of Diabetes Self - Management Education (DSME) have been documented but there is a scarcity of data on Family - Integrated Diabetes Education (FIDE) in Nigeria. Anecdotal evidence shows, that family members are not integrated into diabetes education in most hospitals in Nigeria. Integrating family members into a diabetes-education programme whereby family members attend sessions on diabetes education, with their relatives who have diabetes, could empower family members to provide support in Nigeria. This might improve adherence and ultimately lead to improved glycaemic control and good quality of life among the patients.

Hence, this study was carried out to determine the effects of Family-Integrated Diabetes Education on quality of life and glycaemic control among diabetes patients in selected hospitals in southwestern Nigeria. It is hoped that results from this study will generate evidence that, if implemented, will contribute to reducing diabetes-associated mortality, morbidity and debility.

1.3 Objectives of the study

The broad aim of the study was to examine type 2 diabetes patients' glycaemic control and quality of life as outcomes of family-integrated diabetes education in two tertiary hospitals in southwest Nigeria.

Specific objectives:

1. To determine the DM knowledge of diabetes patients in the intervention and control groups, pre and post-intervention.
2. To determine the DM self - care knowledge of diabetes patients in the intervention and control groups, pre and post-intervention.
3. To assess the diabetes knowledge of family members of DM patients in the intervention and control groups, pre and post-intervention.
4. To evaluate the diabetes self - management of DM patients, in the intervention and control groups, pre and post-intervention.
5. To determine DM patients' perceived social support from family, in the intervention and control groups, pre and post-intervention.
6. To evaluate the quality of life of diabetes patients, in the intervention and control groups, pre and post-intervention.
7. To measure the glycosylated haemoglobin level of diabetes patients, in the intervention and control groups pre and post-intervention.

1.4.Research questions

1. What is diabetes patients' knowledge of DM pre and post-intervention, in the intervention and control groups?
2. What is the diabetes patients' knowledge of self - care practices, in the intervention and control groups, pre-intervention and post-intervention?
3. What is the diabetes knowledge of family members of diabetes patients in the intervention and control groups pre and post-intervention?
4. What is the diabetes self - management of DM patients, in the intervention and control groups, pre-intervention and post-intervention?
5. What is the DM patients' perceived social support from family, in the intervention and control groups, pre and post-intervention?

6. What is the quality of life of DM patients, in the intervention and control groups, pre and post-intervention?
7. What is the glycosylated haemoglobin level of DM patients, in the intervention and control groups, pre and post-intervention?

1.5. Significance of the study

Despite documented evidence that shows that family members can influence their relatives with diabetes either positively or negatively as regards adherence to management regimen, there is a scarcity of data in Nigeria on the effects of family-integrated diabetes education. This study provides information about the impact of diabetes education on glycaemic control and quality of life of diabetes patients after integrating family members into diabetes education. Findings broaden the knowledge base on diabetes management.

With the module made into a booklet and given to diabetes patients and family members, it has become a valid resource and reference for access to correct diabetes information, hence increasing health literacy on the health matter for clients and their family members. Those who can read can get the information by themselves while those who cannot read can get somebody to remind them of the contents of the module.

Moreover, since the best and enduring policies are those founded on evidence-based practice, recommendations from this study will guide policymakers at primary, secondary and tertiary health institutions in making decisions concerning the health and wellbeing of people with diabetes and other chronic conditions. Though the Diabetes Association of Nigeria and the Federal Health Ministry recommended that family members be present during diabetes education, this practice has not fully taken effect. It is anticipated that results from this study will serve as a motivating factor for ensuring that family – members are well educated.

Finally, it is hoped that diabetes patients and family members who participated in the study benefited directly from the family-integrated diabetes education by learning how to work collaboratively to achieve optimal glycaemic control and quality of life.

1.6 Delimitation

The scope of geographical coverage and hence the population of type 2 DM patients and their families who could be reached was delimited to those drawn from selected tertiary health institutions in Southwestern Nigeria.

1.7. Operational definition.

Family- integrated diabetes education: A comprehensive diabetes education involving diabetes patients and one significant family member, with contents as reflected in Appendix 6.

Family: Any individual above 18 years whom the diabetes patient participating in the study regards as part of his/her family and who has an input into the diabetes management.

Knowledge: This refers to what diabetes patients and family members know about diabetes and diabetes self-care before and immediately after family-integrated education, using a validated knowledge questionnaire

Quality of life: This is the subjective report of a state of general well-being by diabetes patients using the WHO Diabetes specific quality of life scale.

Diabetes patients: Individuals who were diagnosed with type 2 diabetes and are 18 years and above in the selected tertiary health institutions.

Diabetes self - management practices: This refers to activities that are carried out by diabetes patients to ensure normal blood glucose levels. This includes adherence to a diabetes diet, taking medication, exercising regularly and self - monitoring of blood glucose level.

CHAPTER TWO
LITERATURE REVIEW

This chapter presentsa review of information on Diabetes Mellitus with particular focus on diabetes management in general and diabetes education in particular with emphasis on family involvement in diabetes education and management. Studies on the knowledge of diabetes patients, diabetes knowledge of family members, diabetes self -management of diabetes patients as well as their quality of life (QoL) are presented. An assessment of glycosylated haemoglobin measure in the context of effective glucose control is included in the chapter. The chapter ends by discussing the theoretical foundation on which the study is built as well as hypotheses emanating from the review of the literature.

2.1 Definition of diabetes mellitus

Various definitions of diabetes mellitus have been given over the years. However, the disease is not difficult to define as the hyperglycaemia of diabetes is common to all the definitions. The American Diabetes Association (ADA) defined Diabetes Mellitus as a setof diseases in which hyperglycaemia is the main feature, following defect in the secretion or action of insulin or both (ADA, 2012). WHO / IDF consultation in 2006 also defined DM as ‘a condition primarily defined by hyperglycaemia giving rise to a risk of microvascular damage (retinopathy, nephropathy and neuropathy). Diabetes Mellitus is a disease that is not curable but which can be controlled thus the use of the term ‘chronic’ when describing diabetes. For this reason, DM requires ongoing medical care and patient self-management education to avoid complications (SIDCAIN 2009).

Diabetes mellitus cannot be transmitted from one person to another through contact in contrast to diseases like Human Immune – Deficiency Virus (HIV) infection, hence the use of the term ‘non – communicable’. As a non – communicable disease, it is recognized as one of the most common globally (IDF, 2012).

Normally, DM is insidious in onset and people have been known to have diabetes for years without suspecting this until serious damage has been done to major organs in the body. Sometimes it is the onset of complications that alert patients to the presence of the disease. The IDF stated in 2012 that the African region has the highest percentage of people with undiagnosed diabetes (81%).

The hyperglycaemia of DM has other sequelae and these are typically characteristic of DM. Typical among these are polydypsia, polyuria and polyphagia, weight loss and blurred vision. Sometimes, susceptibility to infections and impaired growth result from the hyperglycaemia. Acute consequences of uncontrolled hyperglycaemia which can lead to death include hyperglycaemia with ketoacidosis or non-ketotic hyperosmolar syndrome, (ADA, 2010)

2.2 Epidemiology of diabetes mellitus

The IDF Atlas published in 2017 showed that 425 million people have diabetes as at 2016 compared to the 366 million recorded by IDF in 2012. The IDF (2017) further predicted that the number will rise to 629 million among people aged 20 -79 years by 2045, with the largest incidence occurring in developing economies who are transitioning from low to middle income. IDF also stated that there is an increasing number of type 2 diabetes in every country. Diabetes is noted to have caused 4.6 million deaths in 2011 while at least 465 billion dollars was spent on diabetes alone accounting for 11% of total health expenditure in adults, globally, (IDF, 2012). By 2017, IDF had put the total health expenditure on DM at 727 billion USD.

Besides, Diabetes is a disease which affects countries of all income levels and a wide variety of epidemiological profiles. However, the burden of diabetes falls heaviest on low and middle-income countries, with 80% of people with diabetes living in low and middle-income countries. Characteristically, such countries are experiencing a ‘double burden’ of disease, with the increasing prevalence of non-communicable diseases occurring alongside a persistently high prevalence of the communicable disease, (Commonwealth secretariat, 2008).Studies in the US have shown that minority populations are more affected by Diabetes than whites. These populations are made up of Blacks, Hispanics, and American Indians and

Alaska Natives. They are also more likely to develop diabetes complications (www.cdc.gov/omdh).

Authors have linked the increase in the prevalence of DM in Africa to changing lifestyle characterized by urbanization and westernization, reduction in physical activities, increasing prevalence of obesity and ageing, (Azevedo and Alla, 2008; Sobwign, Marvis – Jarvis, 2001).

2.2.1 Epidemiology of Diabetes Mellitus in Africa

Epidemiological studies by the International Diabetes Federation,(IDF), published in 2012 showed that 4.3% of adults in the African region have diabetes mellitus. The IDF further stated that in 2012 alone, over four hundred thousand (401, 276) Africans died as a result of the condition; the estimated expenditure on diabetes treatment in the year was about USD 2.5 billion. To compound the issue, the study revealed that the African region has the highest percentage of undiagnosed DM. By 2017 Nigeria was rated among the top five (5) countries with the highest prevalence of DM in the African region, according to IDF, showing an increase in prevalence in Nigeria in comparison with other African countries. Moreover, diabetes can cause grave and expensive-to-treat complications.The prevalence among countries in the African region with the highest prevalence is shown in figure 2.1.

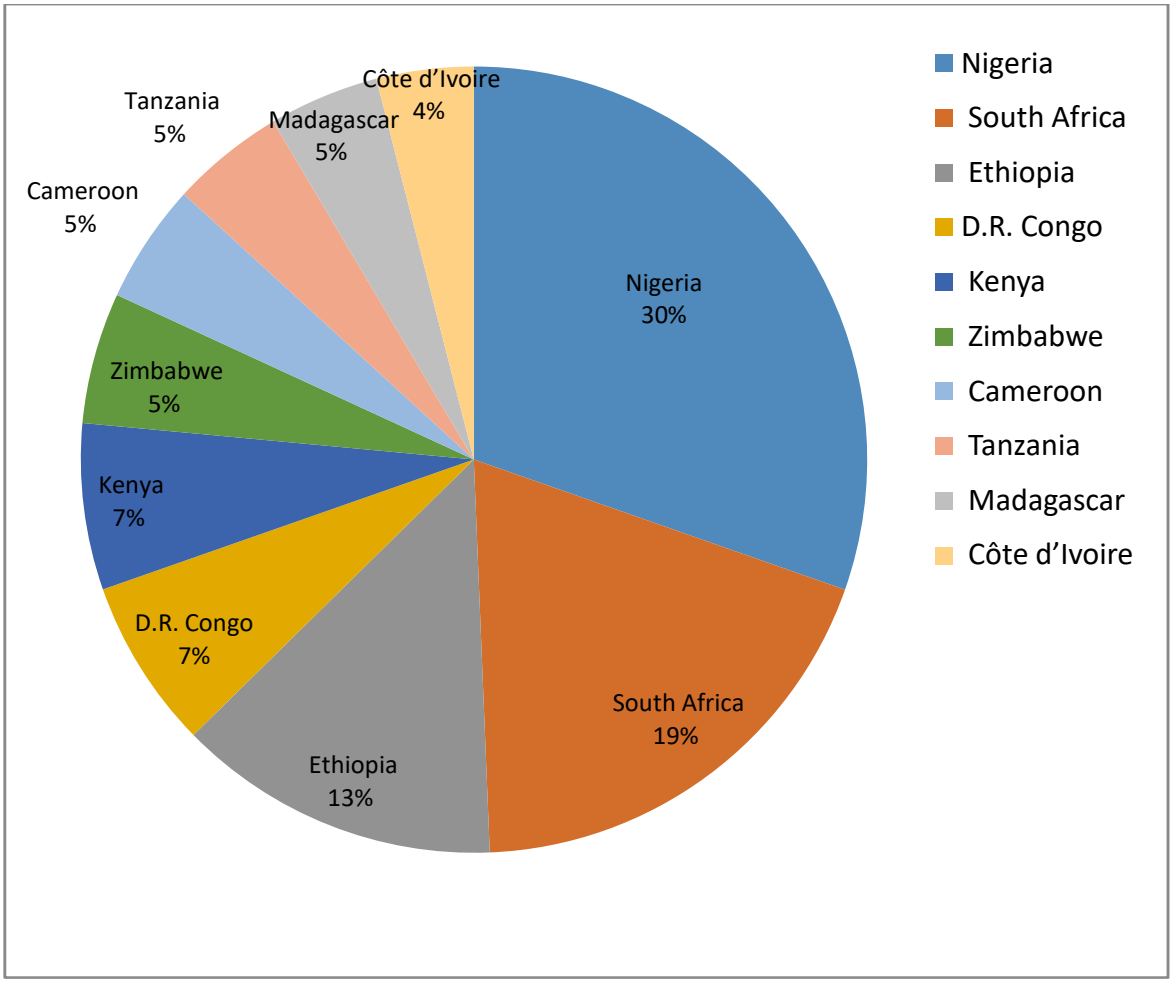

Figure 2.1. Top ten countries with Diabetes in the African region

2.3 Classification of Diabetes Mellitus

The American Diabetes Association (ADA) in 2012 classified DM into four major classes as follows:

- Type 1 diabetes. This is caused byβ-cell destruction, thereby resulting ina total deficiency of insulin. Hence, the need to manage patients with insulin injection.
- Type 2 diabetes: In this type of DM, there is a progressive insulin secretory defect coupled with a resistance of the cells to insulin.
- Secondary diabetes mellitus: This results from specific causes not directly related to insulin metabolism. Examples of this type include flaws in β-cell function, genetically associated defects in the action of insulin, exocrine diseases (such as

cystic fibrosis), those induced by chemical or drugs (as seen among those on HIV/AIDS therapy or following organ transplantation)

- Gestational diabetes mellitus (GDM). It occurs and is diagnosed during pregnancy, (ADA, 2012)

2.4 Diagnosis of Diabetes Mellitus

Diagnostic criteria have been established for DM and the intermediate hyperglycaemias i.e. impaired glucose tolerance and impaired fasting blood glucose, even though there is a slight variability in these. The WHO Diabetes consultation group in 2006 affirmed that a diagnosis of DM is to be made using the following criteria:

- Fasting plasma glucose level ≥ 126mg/dl (7.0mmol/l) OR
- 2-hour plasma glucose of ≥ 200mg/dl (11.1mmol/l) OR
- Glycosylated haemoglobin (HbA1c) ≥ 6.5% / 48mmol/mol OR
- Random plasma glucose ≥ 200mg/dl (11.1mmol/l) in the presence of classical diabetes symptoms.

In the case of asymptomatic individuals with a one-time abnormal test, WHO (2006) recommends a repeat of the test to be certain of the diagnosis. In situations where the tests are around borderline values such as random plasma glucose of5.6 mmol/l (100 mg/dl) and < 11.1 mmol/l (< 200 mg/dl), an FPG should be checked or an OGTT measured out or an HbA1c carried out.

2.4.1. IDF Guideline on the diagnosis of people with diabetes and the detection of those with undiagnosed diabetes.

In the year 2012, IDF issued a guideline regarding various aspects of diabetes management. The guideline took cognizance of the variability of settings and resources available. The following recommendations were made on how to diagnose and detect diabetes mellitus.

2.4.1.2. Recommended care settings

In nations where recommended care is provided, screening for diabetes is carried out in the following ways:

- Every each health care facility must decide if it is expedient to have a programme that will facilitate the early detection of people with undiagnosed diabetes. In making this decision, those concerned must first consider the prevalence of diabetes in such a region and the number of resources available for diagnosis and management. Generally, a mass programme for diabetes detection is not advisable.

  The IDF 2012 guideline further posited that there are two processes involved in identifying individuals at high risk. The first process involves using a diabetes risk assessment questionnaire while the second process involves assessing such an individual blood glucose level. Thus, resources are conserved particularly in low-resource settings. To arrive at a diagnosis of diabetes, the WHO (2006) criteria is followed.

Additionally, in situations where HbA1cis the diagnostic tool, strict quality assurance must be maintained and standardized criteria ensured for the assay, according to internationally acceptable standards. The organization also recommends that individuals detected as having diabetes during routine screening should be given treatment.

2.4.1.3 Limited care

The reality of varying socio-economic status in different parts of the world led to the International Diabetes Federation (1DF), [2012], providing a guideline on diabetes detection and diagnosis in low-resource settings. These include limiting detection programmes to persons at high risk; following the screening guideline for recommended level of care; using plasma fasting blood glucose as a diagnostic criterion, preferably, which when not available, capillary blood glucose can be used instead. However, when this is not available urine testing showing glycosuria can be used especially where there are typical symptoms of diabetes, (IDF, 2012).

2.4.1.4 Comprehensive care

The IDF (2012) further recommends that in places where there is the presence of advanced technologies for diabetes care or technology-driven society, adequate resources should be made available for the detection of diabetes. Moreover, the A1C test should be carried out routinely for the diagnosis of the condition. Other advanced tests to determine the type of diabetes, islet - cell-related antibodies, C-peptide, genotyping are to be accessible to the persons suspected of having diabetes.

2.4.2. Reason for early detection and screening of high - risk individuals.

Though it may be expensive to carry out routine screening, it is advisable to carry it out. This is because complications which decrease the quality of life and sometimes cause premature mortality easily develop, (IDF, 2012). Moreover, diabetes has been known to have a long asymptomatic pre-clinical period which frequently goes undetected. A study carried out in the Netherlands showed that at the time of diagnosis, a considerable number of patients had already developed microvascular and macrovascular complications such as retinopathy (7.6%), impaired foot sensitivity (48.1%), microalbuminuria (17.2%), myocardial infarction (13.3%), ischaemic heart disease (39.5%) and peripheral arterial disease (10.6%),(Spijkerman et al, 2003; Spijkerman et al, 2004). It has also been found that diabetes can exist for up to 12 years before its clinical diagnosis, (Harris et al, 1992) and that " for every person with diagnosed diabetes there is another who has undiagnosed diabetes, although the proportion varies between countries and ranges from 28% to 80% (Whiting et al, 2011).

2. 5. DIABETES CARE.

Diabetes care is very broad and complex requiring a multi-disciplinary approach. The American Diabetes Association (2012) classified it into eight broad areas, as follows:

- Initial evaluation
- Management plan
- Glycaemic control
- Pharmacologic, pancreatic transplantation and overall approach to treatment

- Medical Nutrition Therapy (MNT)
- Physical activity
- Psychosocial assessment and care
- Diabetes self - management education (DSME)

- **Initial evaluation**
- Depending on the setting, the nurse at the outpatient department will assess the patient's vital signs before the patient sees the diabetologist and if, at the emergency unit, this would include history taking. This first meeting provides an opportunity for creating trust in the patient which will facilitate the integration of the patient into the diabetes management team.

This occurs when the diabetes client first presents at the clinic or hospital. The medical officer or diabetologist takes a health history and carries out a physical examination. This initial assessment will further provide an opportunity for classifying diabetes, help recognize the occurrence of complications, obtain a history of prior treatment and blood glucose control among patients with previously diagnosed diabetes mellitus. It will moreover aid decision on treatment/management regimen and serve as a guide to follow-up care.

- **Management plan**

The members of the health care team come together to formulate the management plan for clients with diabetes in a collaborative and integrated fashion. The management team comprises nurses, nurse practitioners, physicians, physician's assistants, dieticians,pharmacist, and psychologist/mental-health professional who has specialized in diabetes. However, the diabetes client needs to assume an active role in his/her care. The family members also play an active part in formulating the management plan.

The plan would give pride of place to diabetes self -management education (DSME) and continuous support. A good plan takes into cognizance the age of the patient, amount of physical activities engaged in, the schedule of work or school as the case may be, the pattern of nutritional intake as well as the patients' social and cultural milieu.

- **Glycaemic control**

This involves self - monitoring of blood glucose (SMBG) and at least twice biannual glycosylated haemoglobin (HbA1c) check. Glycaemic control is peculiar to each client. The HbA1c is an endocrine test that reveals the average glucose control for a period of six to ten weeks or an average of three months, (Radin, 2014). The average value considered normal is 7% and below (ADA, 2013).

- **Pharmacologic approach to treatment**

This depends mainly on the type of diabetes. Type 1 diabetes always requires insulin therapy and this is commenced soon after the presentation in the hospital. For type 2 DM, patients are usually commenced on metformin treatment in addition to lifestyle intervention. Lifestyle modifications include weight loss for all obese patients who have or at least have the risk of developing DM. Oral hypoglycaemic agents are broadly classified into nine namely: Biaguanides, thiazolidinediones, sulfonylureas, GLP-1 receptor agonists, meglitinides, Dopamine-2 agonists, bile acid sequestrants, alpha-glucosidase inhibitorand DPP-4 inhibitors.

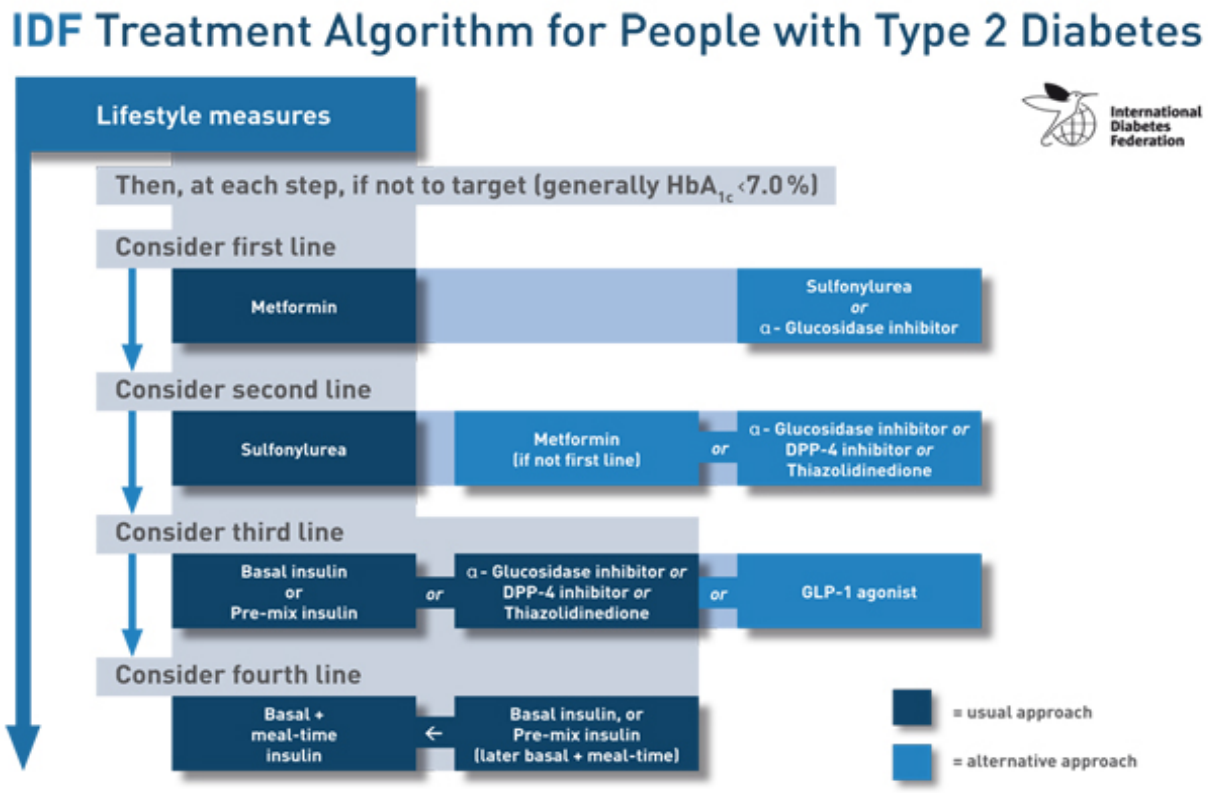

Figure 2: Reproduced with kind permission from IDF.

- **Medical nutrition therapy (MNT)**

Every newly diagnosed DM client receives individualized nutrition education and diet plan which are then reinforced and evaluated during follow-up appointments. This is best provided by a registered dietician. Obese patients are placed on a low carbohydrate, low-fat calorie-restricted diet. This is complemented by physical activity and behaviour modification. For all DM patients, however, the recommended diet is a high protein, low fat, low carbohydrate (RDA = 130g/day for adequate glucose to fuel the nervous system).

- **Physical activity**

The ADA (2012) recommended that individuals with DM be advised to carry-out 150min/week of moderate-intensity aerobic physical activity stretched over at least three days/week with not greater than two consecutive days without exercise. Exercise helps improve A1C (Boulé et al, 2003, ADA, 2018). Exercise was also shown to be

associated with weight loss, improved cardiovascular status and a general feeling of well - being (ADA 2012).

- **Psychosocial evaluation and care**

It has been demonstrated that psychological and social problems can weaken the individual (ADA, 2008; Delahantyet al., 2007) or family's ability to perform tasks associated with diabetes care, thus negatively affecting health status (ADA, 2012). This underlines the need to include evaluation of social and psychological states of the patient as acontinuing aspect of both nursing and medical management of DM. Aspects of these evaluations include, for example, patient's attitudes towards the illness, hopesregarding treatment and outcomes of this, emotional state as judged by patient's mood as well as the quality of life – both general and specific, among others, (ADA, 2012.)

- **Diabetes Self -Management Education (DSME)**

Among individuals diagnosed as having DM, effective management necessarily involves making multiple daily decisions about the management of their condition. These include appropriate dietary intake, physical activity, and adherence to drugs, often with minimal input from a healthcare professional (Jarvis, Skinner, Carey, Davies, 2010). Therefore individuals with diabetes have to receive Diabetes Self- Management Education (DSME) following their diagnosis. DSME leads to successful self-management and quality of life and these variables ought to be assessed and followed-up as integral aspects of DM management. DSME ought also to tackle patient's psychosocial state given that affective/emotional health is linked with excellent diabetes outcome; hence the need to include Diabetes Self - Management Support (DSMS) in DSME (ADA, 2012).

2.5.1.IDF recommendations for government support in the management and control of type 2 diabetes mellitus.

In 2012, IDF also issued a guideline on the management and control of DM. The guideline was particularly important because it took into consideration the health care facilities available in developing countries who are constantly confronted with inadequate

resources. The guideline offer suggestions that are pragmatic, cost-effective yet evidence-based. This guideline presented at three levels are:

Recommended care: The care provided is evidence-based, i.e. based on the ideal management protocol, as shown in Figure 2. . Ideally, this type of health care should be available to all people with diabetes. The aim of every health care system should be to get to this level. Where this is not available, other levels of care are provided. Recommended care takes place in countries where health care funding is provided for from the nation's fund and consumes a considerable amount of the fund. It is the form of health care that prevails in most developed economies/ nations such as the United State of America and the United Kingdom.

Limited care: This is the least level of care that should be made available to anyone with diabetes mellitus. It is the recommended level of care in resource-poor settings where standard medical resources and highly trained personnel are inadequate. Despite the limited resources, this level of care aims to achieve the level of care provided by recommended care. Most sub – Saharan African countries are only able to provide this form of care to diabetes patients.

Comprehensive care: This level of care has embedded in it, a variety of up to date, current or cutting edge technologies. This can also be offered to people with diabetes. However, the evidence supporting the use of these technologies is relatively weak. This is also common in developed nations.

2.5.2.IDF GUIDELINE FOR THE DELIVERY OF DIABETES CARE

Again, the IDF made recommendations on how care is to be delivered to diabetes patients based on the level of care available in each country i.e. recommended or limited or comprehensive.

Recommended care

- Care is to be offered to all individuals with diabetes bearing in mind cultural wishes and desires.

- A collaborative relationship between health care providers and people with diabetes is to be encouraged. The patient's concerns and other life issues should be attended to and patients should be encouraged to ask questions.
- Every year, all patients with type 2 diabetes should have a check-up involving all aspects of diabetes control and complications.
- Each person with diabetes is to have a care plan which is agreed upon by such a person. It should be reviewed annually and modified if necessary depending on the wishes of the patient, change in circumstances, and medical findings.
- Protocol-driven diabetes care is to be employed during planned usual visits between the annual reviews.
- Prompt access to diabetes care in the case of a sudden illness.
- Diabetes care should be arranged around the person with diabetes
- A multidisciplinary care team with particular expertise in diabetes should be used. Team members should update themselves through continuing professional education.
- Every individual with diabetes should be recorded in a register to make recall for complication surveillance easier.
- Telephone contacts between clinic visits should be provided.
- Integrate individuals with diabetes who can provide expert knowledge to their peers into the health care team of their local setting. This should be done along with the local/ regional/ national association.
- Information gathered during periodic visits by patients should be used as an aid to quality assurance measure and other development activities.

Limited care

In limited care settings such as Nigeria, where health care expenditure is largely out - of - pocket, the following lines of management are recommended:

- Surveillance should be offered annually
- Care plans should be agreed upon by the patient and the care team

- Care should be protocol-driven
- Every person with diabetes must be recorded on a local list of people with diabetes as is done under recommended care.
- Diabetes patient is the centre of care thus care should be organized around him/ her
- Well trained health care personnel should be responsible for the provision of care.

Comprehensive care

In comprehensive care which is characterized by the use of the latest technology to augment care, the principles followed are the same as for recommended care, i.e. evidence-based care, but in addition to these;

- Individuals with diabetes will be able to access their electronic medical records through secure technology from remote areas. They will be responsible for granting access to health professionals
- The health care professional and the patient will need decision support systems

2.6. DIABETES SELF - MANAGEMENT EDUCATION.

Diabetes Self-ManagementEducation (DSME) and Diabetes Self-Management Support (DSMS) have been defined as the continuing processes of aiding the acquisition of knowledge, ability and skill required for diabetes self –management, (Powers et al, 2017). In offering this aid, patients' desires, goals, needs, experiences garnered through life are all incorporated, (Norris, Engelgau and Narayan 2001). Also, according to Seligman, 2007 and Bodenheimer, 2007, effective DSME, must go beyond knowledge and focus on helping patient change behaviour; stress benefits and motivation for behaviour change; incorporate goal-setting (best if goals are small, short term, easily achievable *baby steps*); assesses patient confidence and offer support and follow-up.

2.6.1. Benefits of DSME

According to Mulcahy, Maryniuk, Peeples, Peyrot, Tomky, Weaver and Yarborough (2003), DSME has several advantages which include assisting newly diagnosed individuals with diabetes to commenceimpactful self –care and deal effectively with diabetes; giving people with diabetes the ability to adjust to changing circumstances while maintaining successful glycaemic control, due to the on-going nature of DSME and DSMS; facilitating optimization of metabolic control as well as helping to prevent or manage complications and positively impacting the quality of life of individuals with diabetes cost-effectively.

2.6.2. Effects of DSME on some clinical and psychosocial variables.

Research has demonstrated the great benefits of diabetes education on the glycaemic level as measured by A1C. Researchers noticed a reduction in the A1C level of patients with diabetes after undergoing Diabetes Self -Management Education / Structured Diabetes education, (Scainet al, 2009; Wattana et al, 2007). The DSME was also associated with improved quality of life, (Wattanaet al, 2007), reduction in depression, benefits in illness belief, weight loss and smoking status (Davies et al 2012; Niccoluci, et al (1996) In Suhl and Bonsignore 2006). Some authors moreover found a reduction in cardiovascular risk and other complications among patients exposed to DSME (Wattana et al, 2007; Niccoluci et al, 1996 In Suhl and Bonsignore, 2006). Besides, DSME is associated with improved diabetes knowledge as well as self -care behaviour (Norris et al, 2001) and healthy coping (Fisher et al, 2007).

2.6.3. Approach to DSME.

At present, the recommended approach to DSME is patient and family - centred as opposed to the hitherto common didactic approach in which the focus was on providing information. The best practice is a ‘skills-based’ method which centres on assisting individuals having diabetes mellitus in making well-informed management decisions. This patient-centred approach in collaboration with the health care team is supported by Glasgow, Peeples and Skovlund (2008). These authors asserted that “patient- centred

care" has many benefits including respecting and responding to individual patient's values, needs and preferences, further ensuring that decisions are based on these.

Moreover, studies have highlighted features that characterize DSME interventions that lead to optimum glycaemic control. These include the greater length and follow - up support (DSMS) (Tang, Funnell, Brown and Kurlander, 2010); cultural appropriateness, (Hawthorne et al, 2008), age-appropriateness (Sarkisian et al, 2003), targeted at individual needs and preferences, as well as deal with psychosocial issues and integrate behavioural strategies (Peyrot and Rubin, 2007; Anderson et al, 2010.).

Other features of DSME that lead to optimum glycaemic control of are to have it developed with patients and providers (to help ensure, usefulness, clarity and comprehension; focused on "need to know & do" instead of "nice to know", emphasizes benefits; given to patients in a teachable moment; accompaniedwith brief counselling, support and follow-up. Various authors have compared individual and group DSME to determine which of the two is more effective. The consensus is that both methods are effective (Trento et al. 2004; Deakin et al, 2005; Duke et al, 2009).

2.6.4. Who is responsible for diabetes education?

Health care professionals who provide DSME are usually referred to as diabetes educators. In countries where formal training is available, they undergo the required training and are licensed as educators. Diabetes education has traditionally been provided by nurses and dieticians. Nurses have often played the role of instructors in the delivery of formal DSME (Gary et al 2003 In Funnel et al, 2010). A study by Siminerio et al (2007) shows that nurses provide better education, spend more time with patients, were better listeners, and knew their patients better than physicians and are thus more fitted for the role of educators.

Diabetes educators are a vital part of the diabetes management team. The diabetes educator's role is to make it possible for individuals with diabetes to manage their diabetes-related health to the best of their abilities, to allow them to make choices and take actions based on informed judgment, and to enhance the quality of life of the person with

diabetes (IDF-ARTFDE, 2006). Consequently, the diabetes educator is not just a 'lecture – giver' but is rather a person who is skilled in supporting and motivating.

More specifically, nurses manage diabetes mellitus together with other health-care teammembers. The unique contribution of nurses is made through Diabetes Self -Management Education (DSME) and Diabetes Self -Management Support (DSMS). Though, the nurse also carries out an initial evaluation and works collaboratively with other health professionals in developing a plan of care. The nurses' role of educating individuals with diabetes is better achieved in collaboration with family members.

2.6.5.International Diabetes Federation (IDF) recommendation for diabetes education

Due to the importance of diabetes education in the achievement of optimum blood glucose control, all hands must be on deck to facilitate diabetes education at the individual, health care settings and family levels. In this regard, IDF (www.idf.org) recommended various strategies for delivering DSME as follows:

At the Individual Level

- Everyone with a diagnosis of diabetes and people at risk of the condition irrespective of whether they live in rural or urban settings, at home or in institutionalized settings, have the right to learn about the cause, prevention and management of diabetes mellitus including knowledge of where and how to get access to treatment.
- Education should be of a high standard and should include assessment, planning, implementation, and continuous evaluation of the outcomes of Diabetes self-management education, (DSME).
- The DSME is expected to incorporate not only the clinical aspect of care but also the behavioural and psychosocial aspects; which must be sustained.
- Education of the entire public on how to prevent and detect diabetes early is an integral part of diabetes education at the individual level.

At Health Care Settings and Professional Levels

- Every health care practitioner, not only the nurse, has the responsibility of providing education when caring for persons with diabetes. This role includes facilitating easy access to DSME continuous support.
- Multidisciplinary team method is the best one when providing diabetes education and these should include individual having diabetes, a nurse, a dietician and physician with specialization/ high level of skill in diabetes prevention and management, including strategies for educating, facilitating behavioural change and promoting psychosocial adjustments. Other people who may form part of the team are family members, behavioural scientists and pharmacists.
- Effective methods of developing educational, behavioural and psychosocial schemesshould be part of the programs for health professional education including at continuing education level and postgraduate education curriculum.

At the National Level

- A successful education programme for prevention and treatment of diabetes must necessarily involve governments at local, national and international levels. This collaboration can be in the form of educational enterprises. It can also consist of financial support andpromoting public awareness DSME.
- Ministries of Health mustincorporate a DSME plan into the National Diabetes Programmes, taking into cognizance the level of risk of the particular population and the public health consequences of a possible epidemic of diabetes to their countries.
- Ministries of Health have to ensure that Diabetes Self-Management Education is delivered according to the IDF International Standards for Diabetes Education.
- The Government in collaboration with professional bodies must have a thorough system of accreditation for diabetes training and education
- Primary care has to be strengthened to curb diabetes epidemic by ensuring the availability of quality diabetes education for prevention and treatment.

2.7. Factors affecting diabetes overall care

The management of Diabetes mellitus is complex and various factors contribute to the adherence of patients to the management plan. These factors have been generally grouped into five, namely demographic, psychological, social, health care providers and medical system, disease and treatment-related.

2.7.1. Demographic factors.

Studies have demonstrated the influence of certain demographic factors on adherence of patients to treatment. For example, minority ethnic groups, poor/low economic capability/status and low educational level have been associated with poor adherence among patients with diabetes mellitus ((Delamater, 2006). Okolie et al (2010) furtherreported that males adhered better to treatment that females, married couple better than the unmarried individuals, diabetes patients with employment compared to those unemployed and those in the age group 18-50 years as different from those over 50 years. The authors also found a high level of adherence among participants with secondary or tertiary education as opposed to those with only primary or no formal education.

2.7.2. Psychological factors

Correct health beliefs, for example, perceived seriousness of diabetes, susceptibility to complications, as well as the efficacy of treatment, can predict better adherence. It has been suggested that generally, patients adhere better to treatment "when the treatment regimen makes sense to them, when it seems effective when they believe the benefits exceed the costs when they feel they have the ability to succeed at the regimen, and when their environment supports regimen-related behaviours" (Delamater, 2006). Personality trait has not been demonstrated as being a predictor of adherence. Depression and diabetes-related distress often lead to poor glycaemic control and increased risk for cardiovascular complications, (Hackett and Steptoe, 2017).

A study has further shown that a good number of diabetes patients have psychological well-being, (Peyrot et al, 2005 In Delamater, 2006).

2.7.3. Social factors

Central to diabetes management is family relationships. Research has shown that high level of family unity, low level of tension/conflict as well as organization, and excellent communication pattern are linked with better regimen adherence,(Brunner et al, 2009) An intense social support, especially from spouses and other family members, are connected with better regimen adherence, (Molloy et al, 2008). Moreover, social support has the added value of counteracting the negative effect of stress on diabetes management, (Delameter, 2006)

2.7.4. Health care providers and medical system factors

A key component of any adherence-improving plan is effective patient education.

Studies have shown that patients comply better when provided with effective diabetes education, (Balamurugan et al, 2006). Evidence has shown that patients recall as little as 50% of what is discussed during the interaction with their physician, thus effective patient education must be multifactorial, individualized, and delivered in a variety of methods and settings outside of the examining room, (Schillinger et al, 2003). Evidence has also demonstrated the fact that social support provided by nurse case managers had a positive impact on adherence of diabetic patients to diet, medications, Self Monitoring of Blood Glucose and weight loss (Ciechanowski et al, 2001)

Frequent and regular telephone contacts with patients promoted regimen adherence and achieved improvements in glycaemic control, and lipid and blood pressure levels. This fact was further proved by the Diabetes Control and Complications Trial where it was found out that one of the major factors of success in achieving good glycemic control was the availability of support provided to patients by the health care team.

The quality of the doctor-patient relationship is also an important determinant of adherence as patients who are satisfied with their relationship with their health care providers have better adherence to treatment compared to patients who do not trust their health care providers so much. This is supported by Birkhäuer et al (2017), who reported in a metaanalysis that “patients reported more beneficial health behaviours, fewer symptoms and higher quality of life and were more satisfied with treatment when they had higher trust in their health care professional”. In addition, an organization where patients

are sent reminder postcards, called up before appointment or receive reminder letters have a higher level of adherence and a better outcome, (Nuti et al 2015).

2.7.5. Disease- and treatment-related factors

Studies have also shown that in general, adherence is poor when an illness is chronic, when the course of therapy is composite, when symptoms are not obvious and when the course of management involves lifestyle modifications, (Fernandez-Lazaro et al, 2019).

2.8 Level of diabetes patients' knowledge about diabetes

In the management of DM, the patient with the disease has a central role to play. Since DM is a disease which requires lifestyle changes and daily self -management activities, the diabetes patient must be empowered, (Nwankwo et al, 2010; Funnel, 2004) hence adequate knowledge about the disease and its management cannot be overemphasized. This is the most effective way of ensuring good blood glucose control and of preventing serious complications associated with the illness, (Pereraet al, 2013).

However, studies both in and outside Nigeria, for instance in Zimbabwe, have shown that the knowledge of diabetes patients about the disease is poor (Mufunda et al, 2012; Odili et al, 2011) or inadequate (Nwankwo et al, 2010). Specifically, diabetes patients demonstrated poor knowledge of causes of diabetes, with over seventy percent of patients in Umuahia, Nigeria affirming that it is due to poison, (Okolie et al, 2009). One of the most important tests for monitoring effective management of DM is glycosylated haemoglobin level and this test is recognized worldwide. However, authors in Nigeria have affirmed that most DM patients did not have a good knowledge of this test (Odili et al, 2011; Nwankwo et al, 2010; Wang et al, 2008).

Moreover, DM is a disease which requires a modification in diet comprising the consumption of food high in complex carbohydrate, a substantial amount of protein and lots of fruits and vegetables. Nevertheless, studies have demonstrated that patients' knowledge of diabetes diet is still deficient. Mufunda et al, 2012; Odili *et al* 2011 demonstrated that only 24% and 2% DM patient respectively in Zimbabwe and Nigeria correctly answered the question on 'free food' for DM patients. However, the term 'free food' is not commonly used in the two settings as it was developed by researchers in the

US. The authors did not specify whether the questionnaire was adapted and translated for local use. Moderate level of DM knowledge was also reported by Jackson, et al (2014) among diabetes patients in Uyo, Nigeria.

2.8.1. Family integrated diabetes education and effects on the knowledge of people with diabetes

On the effect of a family-integrated educational intervention for DM patients, Ing et al (2016) reported an increase in the knowledge of self -care among DM patients following an educational intervention that included social support, although the social support was provided by community partners. This finding concurs with that of Williams et al, (2014) who found a significant improvement in the self - care knowledge of a group of African Americans DM patients and family members, recruited into one group culturally tailored and family-oriented intervention study.

2.9. Family support and diabetes Care

The need to involve the family in diabetes education is premised on the fact that family support and other forms of social support can either negatively or positively affect outcomes in diabetes patients.

2.9.1. The context of family relationship and effects on diabetes management

There is a consensus among some authors in the western world about the benefits of family and social support in diabetes management and education. For instance, Beverly and Wray, (2010), describedthe assistance provided by family members in helping diabetes patients carry out physical activity/exercise. Likewise, some family members assisted the patients in adhering to their diet, (Stephens et al, 2010; Watanabe et al, 2010; Choi, 2009. Garcia-Huidoro, (2011) and Choi (2009) found a decrease in the A1C of diabetes patients following family support. Garcia – Huidoro et al, (2011) however stated that the A1C reduction was during the second six month.

The positive family attributes that contribute to diabetes management include family coherence and structural togetherness. These were reported to have a positive effect on the quality of life of persons with diabetes mellitus, (Cheslaet al, 2004). Further, Vaccaro et al

(2014) reported that an increase infamily/ friend social support led to better diabetes self -management, although this did not affect the patients' A1C. Perceived level of social support from family has also been shown to improve after educational intervention involving family members. For instance, Keogh et al (2011) reported a significant improvement in the perception of family support among diabetes patients involved in a psychological family intervention in Ireland.

2.9.2. Negative behaviour of family members and effects on diabetes management

Mayberry and Osborn, (2012) stated that when diabetes patients perceived family members as non-supportive, medication adherence became worse and glycosylated haemoglobin levels also increased. Lack of family support experienced by diabetes patients was manifested in the form of nagging, and arguing (Beverly et al, 2008); censures (Sabone, 2008), and overprotection (Hagedoorn et al, 2006). Some individuals diagnosed with diabetes mellitus affirmed that members of their family created obstacles to self-management of the condition (Rosland et al, 2008); stress (Lohri-Posey, 2006) and lack of motivation towards self -care activities due to a feeling of grief by the spouse (Beverly et al, 2007).Chesla, et al, (2004) reported a lower QoL among diabetes persons with poor emotional management as a result of family conflict. In contrast to the findings of most authors, Kanget al, (2010) found no significant relationship between support from family and self -care behaviour.

2.9.3 The need to enhance the knowledge of family members.

Different beliefs about diabetes by individuals having diabetes and members of their family have been documented, (Sabone, 2008; Searleet al, 2007). For instance, many family members understand diabetes as being very severe than persons with diabetes (Stodberget al, 2007; Whiteet al 2009). Inadequate or lack of knowledge about diabetes by persons with diabetes and their family members may be responsible for this. The necessity for more knowledge and understanding of diabetes particularly as regardsappropriate diet and healthier communication between couples has been expressed by individuals having diabetes mellitus and member of their family (Beverly et al, 2008). Adejoh (2012) made a similar finding among a group of Nigerians where persons with diabetes attributed family

members' non – supportive behaviour to inadequate knowledge about diabetes. When persons with diabetes perceived that their family members were more knowledgeable, they also perceived them as giving diabetes-specific supportive behaviour and were more adherent to treatment (Mayberry and Osborn, 2012) However, the same author reported that the reverse was the case when diabetes patients perceive family members as being unsupportive.

Poorer knowledge of diabetes among members of the family of individuals compared to such individuals has been reported, even though both groups had poor knowledge (Arora et al, 2011). Family members have also been reported to have misconceptions and poor knowledge about insulin thereby discouraging family member with diabetes. Wrong assertions made include statements such as 'insulin kills', 'insulin causes damages' 'insulin is the last resort', (Hu et al, 2012).

There are very few studies that measure intervention outcomes among family members involved in diabetes – integrated education. This assertion is supported by Baig, (2015) in a review of 26 family-based interventions for adults with type 2 DM. This makes literature on the effect of educational intervention on the family members of people with diabetes scanty. Nevertheless, one of the few published data suggests a significant improvement in the knowledge of family members following a family-based intervention, (Hu et al, 2014). This view is further reiterated by other authors, (Hu et al 2016). A similar study took place among Chinese patients and their family members and family members were reported to have an increase in diabetes knowledge after the educational intervention (Cai and Hu, 2016).

2.10 Psychosocial aspect of diabetes management

Diabetes is a complex multifaceted condition which has to be managed throughout the entire life of an individual. It is complex and multifaceted because it requires a combination of various behavioural modifications. These modifications include a change in diet, having to include an exercise programme in weekly/daily schedule, having to learn and practice new skills such as self-administering insulin injection, drawing blood through a finger prick to use a glucometer, among others. These changes place a lot of

psychological stress on the person living with diabetes, hence the need for psychosocial care. This was put more succinctly by Young-Hyman et al, (2016) who stated that there are complex environmental, emotional, social and behavioural factors, constituting psychosocial factors, which affect glycaemic control and psychological wellbeing of the person with diabetes.

The word 'psychosocial' is a combination of two words, 'psyche' and 'social'. Etymologically, the word '*psyche*' has both Latin and Greek roots. In Latin, 'psyche' means animating spirit; while in Greek, the word '*psykhe*' refers to 'the soul, mind, spirit, breath, life, the invisible animating spirit or entity which occupies and directs the physical body, (www.etymonline.com).

The word 'social' originates from the Latin word *'socialis'* which means companionship; allies; living with others. Hence, psychosocial refers to that aspect of the individual related to the operation of the mind – often seen in external behaviours - and relationship with other individuals, (www.yourdictionary.com). It can modify the physical/biological aspect of a person. Psychosocial has also been described as that "on the psychological development of the individual concerning his or her social environment", (Berkman, 2012)

Shumaker and Brownell (1984) defined psychosocial care as "an exchange of resources between two individuals perceived by the provider or recipient to be intended to enhance the well - being of the recipient". Chen et al (2017) also defined psychosocial care as the use of therapeutic communication to provide culturally sensitive psychological, social and spiritual care. It encompasses both psychological and social support. According to Kirk *et al*, (2013), social systems of support whereby family and friends play a major rolepositively impacts the adherence of individuals to complex management regimens.

Giving psychosocial care does not necessarily involve undergoing specialized training. It is however important that the provider of psychosocial care can recognize the need to offer this care and when to offer it. This care/support can be in the form of emotional, appraisal, informational and tangible support, (van Dam *et al*, 2012). It has been suggested that social support can be a mediator or moderator of health outcomes, (Berkman in Kadirvelu, *et al*, 2012). This can occur either directly leading to some beneficial effects

irrespective of the stress level or indirectly by providing the wherewithal to alter the negative consequences of high – level stress conditions, (Cohen and Syme, 1985 In Kadirvelu, *et al* 2012).

Furthermore, according to Dam Van *et al,* (2003; In Kadirvelu, Sadasivan, Hui Ng, 2012) in the context of diabetes management, psychosocial care can, and is often provided by the family and friends of the person living with DM (PWD). It can also be provided by peers, neighbours, colleagues, fellow patients, pen friends and even social networking on the internet.

2.10.1The concept of man as a biopsychosocial being

Diabetes affects the totality of a person and as such has biological, psychological and social dimensions. Health care workers must be aware of these dimensions and should also take steps to promote ways by which needs arising from these dimensions can be met. An understanding of the biopsychosocial model can be an effective tool in achieving this.

The biopsychosocial model as compared to the biomedical model views disease on a larger scope in which biological, (genetic, biochemical, etc.), psychological (mood, personality, behaviour), and social (familial, cultural, socio-economic, medical) factors interact, (Borrell-Carrió *et al,* 2004). Further, in biopsychosocial model, human health is taken to be a consequence of the reciprocal interaction between biological, interpersonal, psychological, and macrosystem dynamics, which gradually manifest over historical and personal time, (Lehma et al, 2017).

The model was developed by George Engel in 1977, who believed that physicians who want to fully understand and care for patients who are suffering must take into cognizance and attend to the biological, psychological, and social facets of illness at the same time. His approach was holistic and was an alternative to the then more popular biomedical approach which had dominated the medical world in developed societies since the mid-20th century.

Engel's biopsychosocial model which came about three decades after the World Health Organization (WHO)'s definition of health brought about a link between the model and

the definition. In 1948, WHO had defined health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"

2.10.2 Psychosocial effects of Diabetes mellitus

DM has many effects on the psychosocial state of an individual. The manifestations of these effects can take varied forms. Some of the effects of diabetes are:

Hypoglycaemia related fear and anxiety: Mandrik*et al*, (2013) reported that the prospect of having hypoglycaemia episodes can cause fear, anxiety and depression with a subsequent negative impact on patient's feeling of well - being. According to the authors, some of the specific instances which cause these negative effects are: being afraid of having hypoglycaemia in public, having hypoglycaemia when alone with no one around to make available the needed help, fear of collapsing, among others. Generally, the hypoglycaemia related fear and anxiety often leads to the curtailment of physical activities, moving the time of insulin administration, having an extra meal and reducing long-distance journeys.

Furthermore, hypoglycaemia leads to a reduction in the health-related quality of life of diabetic patients, (Stargard *et al,* 2009). Other indicators of anxiety are finding it challenging to maintain control when required to bear responsibility for other people or finding it difficult to perform important tasks due to low sugar level, (Mandrik et al, 2013).

Reduced work productivity and employment discrimination: DM patients sometimes suffer from discrimination at work because of employers' erroneous belief about DM. Some employers believe that people with DM will not perform maximally at work or absent themselves from work due to frequent hospitalizations and complications of the illness, (Young and Unachukwu, 2012)

In the United States (US) for instance, people with diabetes are not allowed into military service on the claim that 'serving in the US military requires a certain level of physical fitness and freedom from any disability "that may require excessive time lost from duty for necessary treatment.". While this is a necessary prohibition for the security of the nation, it has a

psychological and social impact on people with diabetes who may wish to enlist in the mil itary, (www.diabetesselfmanagement.com). In some societies, military personnel who develop diabetes are discharged, although, in some other places, they are simply required to bring testimony from health professionals that DM will not interfere with their work, (www.diabetes-info.co.uk). Nebika-Pedrotti *et al,* 2009 reported a 5 – 11% workplace discrimination against individuals with diabetes in Switzerland. Though,data are scarce on whether people with diabetes are discriminated against at work in Nigeria, results from a study on the attitude of employers towards people living with disability in Nigeria can be extrapolated to diabetes. It was reported that the majority of the employers had a negative attitude towards people living with disabilities, (Bukoye and Ogidan, 2011).

Reduction in quality of life: People with diabetes mellitus tend to have a poor quality of life when compared with those who do not have DM, Odili, *et al* (2008). Various factors are responsible for this. The fact that DM makes a lifestyle demand and causes debilitating and life-threatening complications affect the patients' feeling of wellbeing and social life. The economic burden of managing DM is another reason that leads to poor quality of life. This is particularly poignant in developing countries with poor health care and lack of financial support from the government to DM patients, (Young et al, 2012). Besides, lifestyle changes including weight reduction in those who are obese, alcohol cessation, modification of food intake are challenging and often affect the patients' sense of wellbeing. These, added to the lack of understanding and support from family, colleagues and peers further cause psychological and social complexes, (Young et al, 2012).

2.11Quality of life (QoL) and diabetes mellitus.

Quality of life has been identified as an important health outcome in diabetes management and the terms *quality of life*, *well-being*, *health status*, and *satisfaction* are often used interchangeably (Snoek, 2000). The term QoL was first used by American economists Samuel Ordway (1953) and Fairfield Osborn (1954). They used the term to put across their concerns over the ecological dangers of unlimited economic growth. Physical health appeared not to be a strong predictor of people's subjective well-being.

Researchers carry out studies on QoL for two reasons, viz: first, to determine the psychosocial functioning (somatic) of patient groups and to recognize particular challenges faced by patients at different stages of the disease process. The second and most common reason why research on QoL is carried out is to compare the effect of different treatment regimens on the patients' well-being and treatment satisfaction, (Snoek, 2000). Again, according to Hörnquist (1982), quality of life was defined as a broad spectrum of dimensions of human experience, ranging from those associated with the necessities of life, such as food and shelter, to those associated with achieving a sense of fulfilment and personal happiness.

In diabetes care, QoL measure is of great importance in evaluative research. It is moreover the most valuable outcome of all health care policies, (Farquhar, 1995). QoL has also been defined by other authors. Donald, (2010), stated that Quality of life is a 'descriptive term that refers to people's emotional, social and physical wellbeing and their ability to function the ordinary tasks of living'. Toronto University QoL research group (www.gdrc. org/uem/documents) further defined it as 'the degree to which a person enjoys the important possibilities of his/her life'. In addition to these definitions, Von Steinbuchel et al, (2006) defined quality of life as the ' the individual's perception of their position in life in the context of the culture and value system in which they live and concerning their goals, expectations, standards and concerns'.

It has been asserted that a person's happiness and satisfaction with life are the two keystone issues in defining quality of life (Kwak, 2010). However, Health-related QoL encompasses domains of life that get better when a treatment modality has been successful (Odili et al, 2008). Although,some generic quality of life scaleshave been developed, over the years, disease-specific quality of life scales have also come to the fore.

In the case of diabetes mellitus, the specific scales developed include Appraisal of Diabetes by Carey et al, 1991; Diabetes Quality of life (DQoL) by DCCT group (1998); diabetes treatment satisfaction andwellbeing scale by Bradley, (1990), Diabetes Quality of life Inventory (Burrough, 2004); among others. These scales were developed to better evaluate changes among diabetes patients. Though authors in Nigeria have used various instruments, the wellbeing questionnaire is the only one that has been validated among

patients living with diabetes in Nigeria by Kolawole et al, (2004). The wellbeing questionnaire consists of four domains including depression, anxiety, energy and positive wellbeing, with a total of 22 items. The entire questionnaire can be scored holistically, or based on the various domains if the focus of the study is specifically on the quality of life.

2.11.1. Quality of life of individuals with diabetes in Nigeria

A study by Odili et al, (2008) shows that persons with diabetes have a lower health-related quality of life than their counterparts without diabetes mellitus. However, in an earlier study by Kolawoleet al, (2004), high quality of life was reported among diabetes patients in Ile- Ife. The authors attributed this to a coping mechanism which includes extended family system, spirituality, among others; although these factors were not empirically proven. Another reason for the difference in the two studies may be due to the fact that whereas Odili et al (2008) compared the QoL of diabetes patients with that of individuals without diabetes, Kolawole et al (2004) did not make any comparison.

Moreover, the two authors also used different instrument in determining the QoL. Whereas Kolawole et al (2004) used the Disease (Diabetes) specific QoL questionnaire – the Wellbeing questionnaire and Diabetes Treatment Satisfaction questionnaire, Odili et al (2008) utilized the generic form of the QoL questionnaire. Another study (Igwe et al 2012) comparing the QoL of patients with DM and those with essential hypertension found a significantly lower QoL score among diabetes patients. However, the duration of illness differed significantly between the two groups of patients.

2.11.2. Factors associated with QoL

Various factors have been linked to variations in the QoL of DM patients in Nigeria.Isaa et al, (2006) and Igwe, et al (2012) reported an association between high educational level and QoL. Isaa (2006) further reported an association between the presence of DM complications, lower-income, and QoL. However, Odili et al (2008) did not find an association between QoL and the existence of diabetes complications.

Other factors linked to high QoL of diabetes patients in Nigeria include male gender [Kolawole et al, (2004); Igwe et al (2012)] and being married [Igwe et al (2012)]. Additionally, the presence of major depression had a significantly negative impact on the

QoL of 30% of DM patients who participated in a study in Edo state which was conducted by James et al, (2010).

2.11.3 Family integrated diabetes education and Quality of Life of patients.

Quality of life measure encompasses social and psychological domains and can therefore be easily affected by the social milieu of the patient. Family-integrated DM education was linked to a significant improvement in the QoL of Hispanic DM patients in North Carolina, USA, who were involved in a one-group family-based intervention programme after three months, (Hu et al, 2014). This finding is further confirmed by John, Ananda and James, (2014) who reported an improvement in the quality of life of patients with DM following a family-integrated educational programme. Some other studies have shown different results about the effect of a family – integrated DM education on patients' QoL. Pamungkas et al, (2017) in a systematic review on Randomized Controlled Trials (RCTs) reported that there was an improvement in psychological well – being and QoL among DM patients following programmes in which family support was integrated with Diabetes Self - Management Education (DSME). Conversely, Wichit et al (2017) in an RCT on the family-oriented programme found no significant difference in the QoL of patients in the intervention and control groups

2.11.4 Family integrated diabetes education and DMself-management

Diabetes self -management (DSM) is crucial in diabetes management since it is linked to overall glycaemic control, (ADA, 2013). Studies on the effect of family-integrated or family-oriented education have shown that diabetes management improved significantly three months after the intervention, whereas there was no improvement in the DSM of patients in the control group (Wichit et al (2017, Hu et al 2014). More specifically, Hu *at al* (2014) reported a significant improvement in diet and foot care among Hispanic diabetes patients who were involved in a family-based intervention programme. Other authors have reported significant improvement in DM patients' adherence to medication (Hamidreza et al, 2014); healthy diet (Toobert, et al, 2011); exercise and self -glucose monitoring (Aikens et al, 2015), following family-integrated education programme. In contrast, Wild et al (2016); Garcia – Huidoro et al, (2011) reported that family support did not significantly improve medication adherence.

2.12. Glycaemic control: Glycosylated haemoglobin (HBA1c) versus fasting blood glucose (FBG)

Glycosylated haemoglobin (HbA1c/A1c) is an important outcome parameter in diabetes management as it is linked to the development of diabetes complications includingneuropathy, nephropathy and retinopathy and cardiovascular complications such as stroke, (UKPDS group,1998, In Baxter et al, 2016). It is a manifestation of the average plasma glucose over the past eight to twelve weeks (8-12 weeks). It was introduced about 25 years ago and since then it has become the most frequently used measure of chronic glycaemia in epidemiological studies, clinical trials and management of diabetes (Nathan et al, 2007). The test does not entail exceptional preparation such as an overnight fast and can therefore be performed at any time of the day. However, it is subject to several genetic, physiological, haematological and illness-related factors. Moreover, costs and availability of HBA1c in many countries are what limits its use, (Prajapatiet al, 2014).

A study carried out in India to compare HbA1c and FBS showed a significant positive correlation between HbA1c and FBS (r = 0.74, 0.62). Both diabetic and non-diabetic individuals took part in the study (Prajapati, et al 2014).

Besides, some researchers in Nigeria (Sakpa and Idemudia, 2014) also compared fasting blood glucose and glycosylated haemoglobin to see if there is a relationship between them. Their study involved 118 diabetic patients and 36 healthy controls. Their results were similar to previous authors'. There was a significant positive correlation between the HBA1c and FBG in both diabetic patients and controls (r = 0.418 and 0.782 respectively, $p< 0.001$).

2.12.1 Family integrated diabetes education and its effect on HbA1c.

Since, as mentioned earlier, HbA1c is an important outcome in diabetes management, researchers often consider it an important outcome for evaluating the effectiveness of interventions. Hu et al (2014) in a one – group pre-test post-test intervention study, reported a significant improvement in HbA1c, after three months, following a family-based educational programme for DM patients. A similar result was published by García et al, (2015) in a home-based, culturally tailored intervention for Mexican Americans, in which family members were incorporated as primary motivators for the DM patients.

Moreover, family-integrated DM education has also led to a sustained reduction in HbA1c six months after the intervention. This assertion is supported by Pamungkas et al (2017); Garcia – Huidoro et al, (2011) and Keogh et al, (2011). However, Williams et al, (2014) and Wichit *et al* (2017), reported a lack of significant difference among a group of diabetes patients following a family-oriented intervention.

Also, authors generally like to report percentage decrease in HbA1c because as little as 1% decrease in HbA1c value is relatedto a decrease in the possibility of developing complications of DM, (Tang et al, 2015; Sinclairet al, 2013). More specifically, authors have stated that a 1% reduction in HbA1c level is linked with a 21% reduction in diabetes-related mortality, 37% reduction in the risk of developing microvascular complications particularly diabetic retinopathy and 14% reduction in the risk of developing myocardial infarction (Stratton et al, 2000, In Federation of European Nurses in Diabetes, [accessed 2018]; UKPDS group [1998] In Baxter et al [2016]). Williams et al, (2014) also stated that the achievement of HbA1c level of 7% and below is linked to a reduction in microvascular complications.

2.13. Health Problems Related to Diabetes

Harding *et al*, (2019) posited that the global increase in the prevalence of diabetes mellitus is likely to cause an increase in the number of associated acute and chronic illnesses, affecting the quality of life, causing a greater burden on health services and increase in hospital spending. These complications are generally divided into microvascular, affecting the small blood vessels and causing retinopathy, neuropathy and nephropathy; and macrovascular, leading to cardiovascular diseases such as heart attack, cardiovascular accident and poor circulation to the legs (www.who.int./diabetes/action_online). Acute complications of diabetes also occur quite often, although they are preventable, (Rewers, 2017).

Unfortunately in Nigeria, many individuals who are diagnosed for the first time with DM already had serious complications of the disease; with 56% having neuropathy, 36% having erectile dysfunction, 9% with nephropathy and 7% having retinopathy, (Ofoegu and Chinenye, 2013). This further underlines the need for effective control through patient and family education to ensure adherence to diet, medication and exercise.

2.14. Summary of literature review

Reviewed literature shows diabetes mellitus is on the increase globally and mortality from the disease is on the rise, as well. For instance, the global prevalence was 366 million in 2012 and by 2017, it had increased to 425 million. The condition affects all nations, but low and middle-income countries experience the heaviest burden. This is due to the persistent prevalence of communicable diseases. Nigeria has the highest prevalence of diabetes mellitus among all west-African countries. Complications are prevalent and are associated with poor glycaemic control. Literature also shows that the most prevalent form of diabetes is the types-2, which accounts for about 95% of the condition.

The International Diabetes Federation (IDF) recommends the early detection of diabetes as a way of curbing the rising prevalence of the condition. This early detection must start with the use of diabetes risk questionnaire in a population-based survey and must be followed by the assessment of the blood glucose level of individuals at high risk. The IDF further recommended that if resources are not available for population-based surveys, only individuals suspected to be at high risk should be screened. Urine testing for glucose along with the existence of the typical symptoms of diabetes can also replace blood glucose testing.

Management of diabetes mellitus is carried out within a team, of which the patient is at the centre. The nurse is the first to meet the person with diabetes during a presentation to the hospital and is therefore in a position to create a trusting environment that will facilitate collaboration between the health care team, the patient as well as the familymembers. The management of diabetes includes an initial evaluation, formulation of a management plan, glycaemic control, diabetes self-management education (DSME),pharmacologic and surgical treatment (pancreatic transplantation), medical nutrition therapy, physical activity (exercise) and psychological assessment. The patient is at the centre of care which ought to incorporate family members as well.

Diabetes self-management education (DSME) is very essential to a successful management outcome. An effective DSME must take into consideration the patient's age, cultural background, level of literacy, family background/presence and collaboration of family members or significant others. It must also emphasize benefits to the patients and

integrate psychosocial issues into it. This education is usually given by a nurse and literature supports the higher effectiveness of DSME provided by nurses.

Much published work within Nigeria also shows that the knowledge of patients with diabetes is inadequate, particularly regarding the importance of glycosylated haemoglobin and proper diet. The presence of family members is reported to enhance the education of people with diabetes. Diabetes education is usually given by a nurse, although it is sometimes given by another health care professional such as a nutritionist. It is most effective when psychosocial issues including the quality of life of the person with diabetes, are incorporated. Studies also reveal that some factors affect diabetes care and these are broadly classified into patient, health care, disease and health professional-related factors. It is important for the nurse and other health professionals involved in the care of the patient to keep these factors in mind to achieve management effectiveness.

There were also published data that supported the fact that family members influence diabetes management, either positive or negative. Some authors, such as Adejoh (2012), further stated that the family's lack of support is attributable to poor knowledge of diabetes. However, very few literatures measure the effect of family-integrated diabetes educational on the knowledge of family members themselves. Most studies focused on patient-related outcomes such as quality of life and glycosylated haemoglobin (HbA1c) level.

Several studies reported improvement in the quality of life (QoL) of DM patients after family-integrated diabetes education while some others, though fewer, reported that there was no significant difference in QoL. The same trend is found among literature reporting post-intervention effect on HbA1c. All the cited literature on interventions to improve diabetes management through improvement in family support reported studies that were carried out outside Nigeria, albeit the close-knit nature of the African families.

2.15 Conceptual framework

The conceptual framework used for this study was derived from the Family Systems Theory (FST) and the Social Cognitive Theory (SCT).

2.15.1 The Family Systems Theory

The family systems theory was developed from the General systems theory, Whitchurch and Constantine, (2009). The system is a bounded set of interrelated elements exhibiting coherent behaviour (Constantine, 1986). Pollock, Kazman and Deuster (2014) further stated that 'family systems theory, views the family as an identifiable system and not just a collection of individuals: It is an interacting system and an entity itself' Families are seen as systems due to their having interrelated objects/elements, exhibiting coherent behaviours, having regular interactions and interdependence on one another.

The key concepts of Family Systems Theory are interrelated elements and structure, patterns of interaction, boundaries, composition law, messages and rules, and subsystems.

Family systems have **interrelated elements and structure**. Family members constitute the elements of a system. Individual elements have particular features and there are relationships among the elements. These relationships occur in an interdependent manner.

Structure: This is created by the interrelationships among the elements of a system.

Family systems interact in patterns. The interaction of the elements in a family system is predictable. This predictability leads to stability within the family and acts as pointers to family elements about how to act.

Family systems have **boundaries** which can either be 'open' or 'closed'. Open boundary means that the family systems permit influence from outside the family to act upon it. Closed boundary means elements are separated or segregated from external influence. In reality, a family functions to incorporate both types of boundary.

The family system functions by the **Composition Law**: There are distinctive characteristics of the family as a whole system which is not a feature of individual elements.

A family system utilizes **messages and rules** to form members. Even though they are not usually written down, they direct and check the behaviour of family members along the family life span.

Family systems have **subsystems**. All family systems comprise of some small groups of 2 -3 family elements. The relationships among these people are called alliances, coalitions or subsystems, each having rules, boundaries and particular features.

The diabetes patient is an element within a family and interacts with other elements/ members of the family. This relationship can be either supportive or not. The Social Cognitive Theory can help understand how family relationships can be inhibitory or supportive.

Application of concepts of family systems theory to family-integrated diabetes education.

Interrelated elements and structure within the family systems: The diabetes patient is an element within a family system and relates with other elements (individuals) within the family. The relationship of the diabetes patient with other members is interdependent. Hence, a good understanding of diabetes by family members or a significant family member will make it possible to meet the need for support with managing diabetes that is unique to the patient. This understanding can be enhanced through family-integrated diabetes education.

Structure: The existence of a predictable and expected pattern of behaviour in the family of a person with diabetes can make it difficult for a patient with diabetes to adhere to a diet, exercise, medication and self-monitoring of blood glucose. For instance, if the patient is a woman and her husband and children like cakes, ice cream, and fried food, then she is also likely to join in and will fail to adhere to a diabetes diet.

2.15.2The Social Cognitive Theory (SCT)

The SCT was developed by Bandura (1986) by introducing concepts from cognitive psychology into social learning theory, which was developed earlier in the '60s, LaMorte, (2016). The concepts from psychology helped in understanding factors that influence learning from symbolic communication, experience and observation, (Bandura, 1986).

In 1997, Bandura introduced concepts from sociology and political science. This was done to better appreciate the ability of groups and society to function and adapt. Overtime, concepts from humanistic psychology have shaped the theory. Theseconcepts (from humanistic theory), have helped in determining the issues behind determination, altruism and moral behaviour.

According to SCT, human behaviour is a consequence of the "dynamic interplay of personal, behavioural and environmental influences" (Glanz et al, 2008).

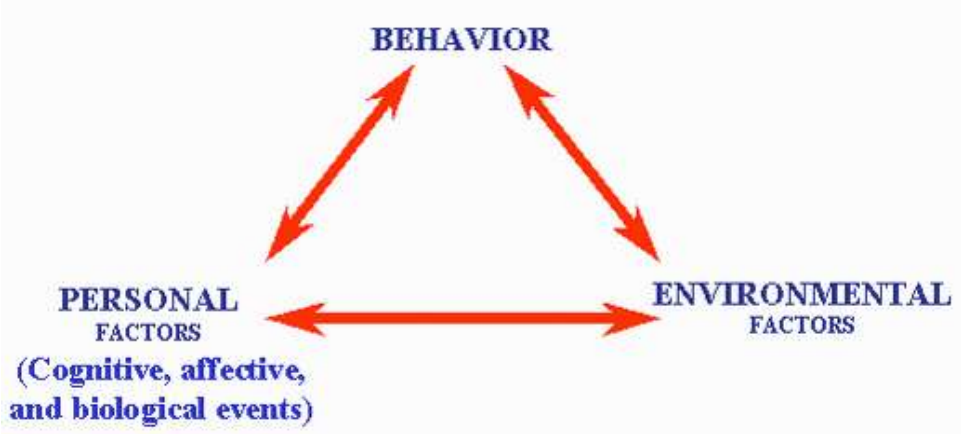

Figure 2.3: Interrelations between the major concepts of SCT.

The main concepts of SCT are **reciprocal determinism**, **outcome expectations**, **self - efficacy,** collective efficacy, **observational learning**, incentive motivation, **facilitation,** self -regulation, moral disengagement. Some of the concepts of SCT which apply to the present study and their respective applications are summarized in the table below:

Table 2.1: Other concepts of Social Cognitive Theory applicable to the present study

Concept	Definition	Application/ illustration
Reciprocal Determinism	Environmental factors affect individuals and groups. No amount of learning will cause behaviour change unless there is environmental support for the behaviour [even though individuals and groups can also control their behaviour].	Diabetes patients' knowledge of diabetes and self-care activities can be enhanced by giving diabetes education to family members as well. This can lead to better adherence to the diet, exercise, medication and self-glucose monitoring can be affected by family members' support.
Observational Learning	Learning to perform new behaviour by exposure to interpersonal displays of them	During family-integrated diabetes education, diabetes patients and family member learn new skills from researcher to manage diabetes better. The skill include blood glucose monitoring and goal setting
Facilitation	Providing resources or tools that make new behaviours easier to perform	Providing diabetes patients and family members with booklets, as a reminder of effective diabetes management.
Self – regulation	Controlling oneself through self-monitoring, goal setting and enlistment of social support	Control signifies adherence to SMBG, exercise, medication and diet. This is enhanced by social support leading to improved QoL, FBG and HBA1c.

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Conceptual framework CC

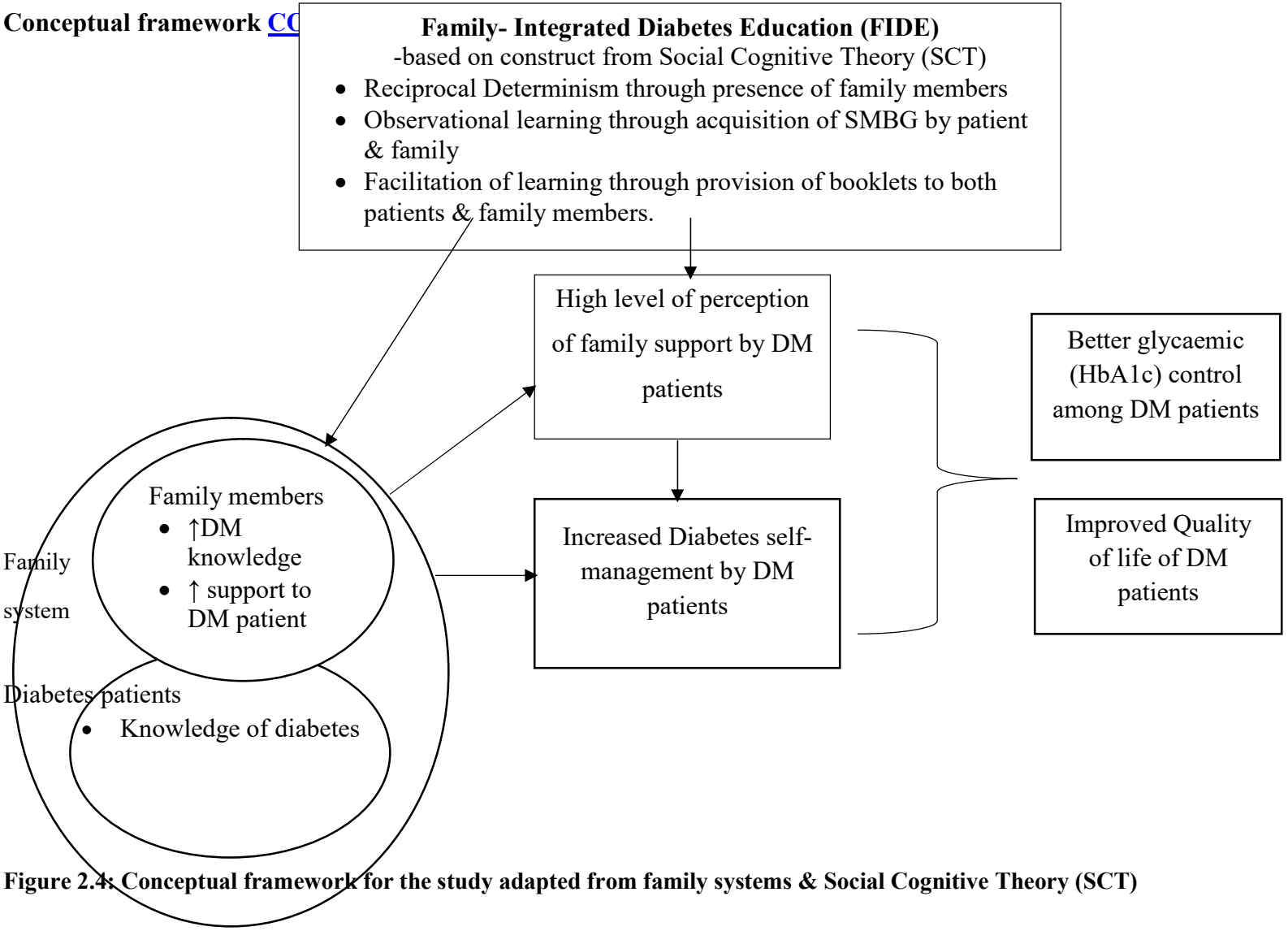


Figure 2.4: Conceptual framework for the study adapted from family systems & Social Cognitive Theory (SCT)

2.16. Research hypotheses

1. There is no significant difference in the diabetes self - management between diabetes patients in the intervention and control groups, pre and post-intervention
2. There is no significant difference in perceived social support from a family between diabetic patients in intervention and control groups, pre and post-intervention.
3. There is no significant difference in diabetic patients' quality of life between intervention and control groups, pre and post-intervention.
4. There is no significant difference between the proportion of type 2 diabetes patients with normal glycosylated haemoglobin level (< 7%) in the intervention and control groups pre and post-intervention.
5. There is no significant difference in the QoL and HbA1c at baseline, three and six - month post-intervention in the experimental and control groups.

CHAPTER THREE

METHODS

This chapter describes the methods and materials that were used in conducting the study. Research design, setting, population, sample size calculation and sampling technique, instruments, the procedure for data collection, ethical consideration and procedure for data analysis are also described.

3.1 Study Design

The study was a pre-test - post-test quasi-experimental research involving two groups of patients with Type 2 DM. One group was the control and the other was the intervention group. The intervention group received family-integrated diabetes education while the control group received the usual diabetes education, i.e. given by the nurses while patients wait to see their Physician and without their family members being necessarily present. The two primary outcomes were glycosylated haemoglobin (HbA1c) and quality of life. The secondary outcomes were: diabetes self - management and perception of family support.

3.2 Study area.

The study took place in Ibadan and Sagamu, both in southwestern Nigeria. Ibadan is the capital of Oyo state and is the second-largest city in Nigeria. The city came into existence when some people settled there after the collapse of the **Yoruba** Oyo empire around the 18th century. It has a population of 2,550,593 according to the 2006 census results (the Federal Republic of Nigeria, 2007). This figure was put at 3,552,000 by the year 2020 (https://populationstat.com/nigeria/ibadan). The city has several primary health care centres and general hospitals located strategically around it. It has only two teaching hospitals, viz The University College Hospital, (UCH) and Adeoyo Maternity Teaching Hospital. Sagamu or Ishagamu as it is also called is a city located in Southwest Nigeria near River Ibu. It came into existence in the mid – 19th century as an amalgamation of

several small towns. This (amalgamation) was brought about by the fall of the old Oyo Empire that made it necessary for these small towns to unite for self-defence. Moreover, the city has a rich deposit of limestone hence its big cement – producing industries. The city is also a major producer and exporter of kolanut and cocoa. Kolanut gathering has also led to the development of secondary inductees such as those making ropes and baskets to store the Kolanut.

The city has many primary health care centres, general hospitals and private clinics. The only tertiary hospital in Sagamu in the Olabisi Onabanjo University Teaching Hospital which is in one of the campuses of the university.

3.3. Study setting

The research was carried out in purposively selected university teaching hospitals that were located in Southwest Nigeria. These were University College Hospital (UCH), Ibadan, Oyo State and Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu, Ogun State.

Southwest Nigeria, majorly populated by the Yoruba ethnic group, comprises six states viz: Oyo, Osun, Ogun, Ondo, Lagos and Ekiti states. In these six states, there are a total number of eight (9) government-owned teaching hospitals. These are made up of two in Lagos state, two in Oyo State and one in each of Ogun, Osun, Ondo and Ekiti states. The ninth hospital is jointly owned by Oyo and Osun states. The hospitals are as follows:

Oyo State: University College Hospital (UCH) and Adeoyo Maternity Teaching Hospital.
Osun State: Obafemi Awolowo University Teaching Hospital Complex (OAUTHC).
Oyo and Osun state: Ladoke Akintola University of Technology Teaching Hospital (LAUTECH - TH), located in Ogbomoso and Osogbo.
Lagos State: Lagos University Teaching Hospital (LUTH) and Lagos State University Teaching Hospital (LASUTH).
Ogun state: Olabisi Onabanjo University Teaching Hospital (OOUTH).
Ekiti State: Ekiti State University Teaching Hospital

Ondo State: University of Medical Sciences (UNIMED) Teaching Hospital, Ondo

In terms of socio-economic development which can affect the socio-demographic characteristics of the patients, Lagos state had to be excluded because it is a commercial cosmopolitan city. Thus, LUTH and LASUTH were excluded. In terms of health programmes for diabetes patients and city structure, UCH, OOUTH and OAUTHC were found compatible to a large extent. The health programmes for individuals with diabetes in LAUTECH – TH – the last of the teaching hospitals to be founded – is not comparable to the other hospitals and was therefore excluded too. Ekiti State University Teaching Hospital - located in Ekiti town - and UNIMED Teaching Hospital, Ondo, have an environmental structure that differs greatly from the other locations in terms of infrastructural development. It was therefore excluded.

Three hospitals – UCH, OAUTHC and OOUTH were found to have similar environmental structures and infrastructural development, in addition to having comparable health programmes for diabetic patients, (Researcher's observation). However, OAUTHC had to be eliminated because of logistical issues that did not make it feasible to carry out the study in the hospital, (issues of OAUTHC ethical review committee policy that was against the University of Ibadan Postgraduate School policy). Hence, UCH and OOUTH were found appropriate and selected for the study. The two hospitals are located about 84km apart.

3.3.1. University College Hospital, Ibadan, Oyo State

The University College Hospital (UCH) is the single tertiary health institution located in Ibadan which belongs to the Federal Republic of Nigeria. UCH majorly serves as a referral centre to other health care facilities across the country. The institution first started at Adeoyo Hospital, Yemetu, as an appendage to the University of London between 1948 and 1952. The physical development of UCH commenced in 1953 and it was commissioned on 20th November 1957. Thus, UCH became the first teaching hospital in Nigeria.

The hospital which has an 850-bed capacity provides different kinds of services which include clinical services (both in-patient & out-patient services), training of health manpower, and research. Being a tertiary health institution, it receives patronage from all parts of the country.

Statistics of the medical records of the medical outpatient clinic (informally obtained) showed that the endocrine/ diabetes clinic holds on Mondays and Fridays. On average, approximately 40 diabetes patients receive care at the Diabetes / Endocrinology clinic of the hospital every week, while about 170 patients are seen every month. The hospital has five consultant endocrinologists and six diabetes nurse educators.

3.3.2.Olabisi Onabanjo University Teaching Hospital, (OOUTH), Sagamu, Ogun State.

Olabisi Onabanjo University Teaching Hospital (OOUTH), formerly, Ogun State University Teaching Hospital, (OSUTH) was founded on 1st January 1986. It is the only tertiary health care facility in Ogun State. The primary aim of establishing the hospital was to ensure the provision of a clinical facility for medical students' education, training of health manpower, and research. The hospital was also established to ensure the delivery of tertiary health care services to the inhabitants of Ogun State and other parts of the country. It provides both in-patient & out-patient services. It is, therefore, a centre of referral for health care facilities in the state and surrounding towns within Ogun State. At its inception, it was linked with the Obafemi Awolowo College of Health Sciences (OACHS).

The hospital has a total bed capacity of two hundred and fifty-eight (258). The Endocrinology/Diabetes clinic of OOUTH holds at the Madam Adebutu centre. Located within the hospital premises, the centre was founded in 2012 and has since served as the clinic for diabetes patients. An average of twenty - five (25) patients receive care at the clinic every week, precisely on Tuesdays. The clinic is run by two consultant endocrinologists, two diabetes nurse educators and a dietician. (www.oouth.com).

3.4. Population

3.4.1Target population

The target populations are Type 2 Diabetes mellitus patients and family caregivers in South-Western Nigeria. The results from the study will apply to diabetes patients and family members living in southwestern Nigeria because of the similarities in culture and language.

3.4.2 Study population

Type 2 Diabetes Mellitus patients aged 18years and above, with a family member who met the following additional inclusion and exclusion criteria, were recruited into the study:

Inclusion criteria for diabetes patients

- attending the endocrinology clinic of selected hospitals
- willing to participate in the study accompanied by one significant family member aged ≥18 years living in the same household with the patient and who was also willing and able to participate in the study and was endorsed by the patient as being able to provide support in diabetes management and attend the training session
- Absence of cognitive impairment

Exclusion criteria

- Pregnancy
- Severe disability.

Inclusion criteria for the family member

- ≥ 18 years of age
- Willing to accompany the patient to the endocrinology clinic, participate in the study and attend all the training sessions
- Living in the same household as the patient and ready to provide support for the patient
- Willing to provide informed consent
- Could be spouse, child, sibling or Carer

Exclusion criteria for family members

- Cognitive impairment
- Diagnosis of type 1 or type 2 diabetes

Even though family members attended the training session, the anticipated improvement in their knowledge of Diabetes and presumed improvement in their ability to provide support for the diabetes patients were expected to lead to better management adherence and consequently better glycaemic control and quality of life in the diabetes patients.

3.5. Sample size calculation

The sample size calculation was computed using the sample-size formula for comparison of outcomes in two independent proportions, (Dhulkhed, Dhorigol, Mane, Gogate, Dhulkhed, 2008). The statistical power for the study was 85% and the goal was to have an expected effect of a 25% reduction in the prevalence of suboptimal glycosylated haemoglobin (HbA1c) level. According to Adebisi, *et al* (2009), 64% of type 2 DM patients in Ilorin, (a southwestern city in Nigeria) had HBA1c value > 7.2% - the expected normal taken for the study.

Hence, the sample size per group was determined as follows:

$$n = \frac{2(Z_{\infty}+Z_{\beta})^2 pq}{(p_1-p_2)^2}$$

Where:

n = required sample size

$\boldsymbol{Z_{\infty}}$ = standard normal deviate corresponding to a level of significance of 95% = 1.96 ((Dhulkhed et al 2008)

$\boldsymbol{Z_{\beta}}$ = standard normal deviate corresponding to a power of 85% = 1.03 (Dhulkhed et al 2008)

$$\mathbf{p} = \frac{\mathbf{p_1}+\mathbf{p_2}}{\mathbf{2}}$$

$\mathbf{p_1}$= prevalence of HbA1c greater than 7.2.(= 64% in the control group; the present prevalence of suboptimal HbA1c)

It was hypothesized that the intervention would reduce the proportion by **25%,**

Thus, $\mathbf{p_2}$= reduction in the proportion of HbA1c greater than 7.2 = 64% – 25% = **39%** (i.e. prevalence/proportion expected in the experimental group)

Thus, $p = \frac{64+39}{2}$

$= 51.5\%$

$q = 100 - p = 48.5\%$

$$n = \frac{2\,(1.96 + 1.03)^2\ 51.5*48.5}{(25)^2}$$

$$= \frac{44{,}660.27}{625}$$

= 71.5, i.e. 72 per group.

Since the study was longitudinal, attrition was likely to occur in each group. Hence, an allowance of 13% of the calculated sample size was made to accommodate 'drop-out', which is a little higher than the 10% that researchers tend to use

13% of 72 = 9

Final sample size = 72 + 9= 81

Hence, at least 81 participants for control and intervention groups each, were recruited to participate in the study.

3.6. Sampling procedure

A two-stage sampling technique was used in carrying out this study. First, UCH and OOUTH were allocated into intervention and control groups using a coin-tossing method. OOUTH emerged as the intervention hospital while UCH was the control hospital.

The second stage consisted of patient selection. This was done on clinic days by inviting all diabetes patients who met the inclusion criteria to participate in the study. A total sampling of all eligible patients was used. The baseline recruitment lasted for about three months in both hospitals.

3.7 Instruments for data collection and educational intervention

Three types of instrument were used for the study. These were:

1. Questionnaire for patients
2. Questionnaire for family members
3. HbA1c Analyser.
4. Diabetes educational intervention package

Questionnaire for patients: This questionnaire was made up of six sections as follows:

Section A: Socio-demographic data, history of diabetes and exposure to diabetes education

Section B: Diabetes Knowledge Test

Section C: Diabetes Self - care knowledge Questionnaire

Section D: The Diabetes Self -Management Questionnaire

Section E: Perception of Family support

Section F: Quality of life (Wellbeing) questionnaire

Section A: Socio-demographic data, history of diabetes and exposure to diabetes education

Items under this section were based on items included in similar studies that have been published and which are relevant to the study. The items were also evaluated by the research supervisor to determine appropriateness. The section consisted of 12 items - comprising both open and closed-ended questions.

Section B: Diabetes knowledge Test

This section was made up of items from the modified Diabetes Knowledge Test (DKT). The DKT was developed by the Michigan Diabetes Research Training Centre (MDRTC) in 1998. It consists of a total of 23 general questions on diabetes. The first 14 questions apply to DM patients in general while the entire 23 items apply to patients on insulin.

Section C: Diabetes Self - Care Knowledge Questionnaire (DSCKQ-30)

Diabetes Self - care knowledge questionnaire (DSCKQ -30) was developed by Adibe et al, (2011) and validated among diabetes patients in Benin City, Nigeria. The 30 – item questionnaire consists of questions on the knowledge of self - care practices of diabetes patients. It was developed based on the National Standard Treatment Guideline (STG). It covers aspects of self -care such as self -glucose monitoring, physical activities, adverse effects of diabetes medications, foot problems among others.

Half of the 30 questions are ‘true’ questions while the rest are ‘false’ questions. The ‘true’ and ‘false’ items are equally spread throughout the questionnaire. Participants were instructed to tick ‘Yes’ if they find any item/question true and ‘No’ if they find any question false.

Section D: The Diabetes Self - Management Questionnaire.

A Diabetes Self-Management Questionnaire consisting of 16 items and developed by Schmitt et al (2013), was utilized for this section. It was developed to determine the level of self - care activities corresponding to good glycaemic control. It was found adequate in predicting glycaemic control among diabetes patients. The questionnaire assesses adherence to various aspects of diabetes management. The subscales of the questionnaire include Glucose Management/ Self- Glucose monitoring (five questions); Dietary Control/ diet adherence (four questions); Physical Activity (three questions) and Health-Care Use (three questions) and a Sum Scale (one questions) as a total estimate of self-management. It had the advantage of determining behaviour for the last eight weeks, compared to the Summary of Diabetes Care scale which assesses self - care in seven (7) days.

Out of the sixteen items, seven are phrased positively i.e. as regards effective self – care. The remaining nine are phrased negatively and will have to be reversed when scoring. Possible answers are on a four-point Likert scale viz: "Applies to me very much"; Applies to me to a considerable degree"; Applies to me to some degree" and "Does not apply to me" with scores of "4" "3" "2" and "1" respectively.

Section E: Perceived social support family-scale

The Perceived Social Support family-scale (PSSFS) was used in determining diabetes patients' perception of support received from their family members. According to Afolabi et al, (2007), Perceived family support is the extent to which an individual recognizes that his or her requirements for support are met by the members of the family. Although its initial development and validation were carried out by Procidiano and Keller (1983), it has been used by Adetunji et al (2007 among diabetes patients in Ibadan, Nigeria, to evaluate the patients' perception of family support.

It is a 20-item questionnaire and requires the patient to answer 'Yes', 'No', or 'don't know' to questions regarding experiences and feelings with their family. However, in this study, the options were modified to a five-point Likert scale and scored as follows: "Strongly agree", scored as 4, "Agree" scored 3, "Disagree" scored 2 while "strongly disagree" was scored 1. Negatively worded items were reversed when marking.

Section F: Quality of life

Participants' Quality of life (QoL) was measured using the Diabetes - specific QoL scale which was first developed by Bradley (1994) and used among diabetes patients in south-western (Ile -Ife) Nigerians by Kolawole et al, (2004). It measures depression and anxiety associated with diabetes, energy as well as a feeling of positive well - being. It consists of 22 items on well - being on a 4 – point Likert scale. "All the time" was scored as 3; 'Sometimes' scored as 2; "Rarely" scored as 1 while "Not at all" was scored as 0. Negatively worded items were also reversed when marking.

Questionnaire for family members: It consisted of three sections. The first section was on socio-demographic characteristics, previous exposure to diabetic education and the nature of the relationship to the patient. The second section consisted of a modified diabetes knowledge test (DKT) which was developed by the Michigan Diabetes Research Training Centre (MDRTC). The same one that was used for the patients was reworded and used in eliciting information from family members. Modified. The third section consisted of a modified Diabetes Self - care knowledge questionnaire (DSCKQ -30) which was used for the patient and adapted for use with family members.

HbA1c analyser (A1c Now+): The second instrument for the study was the HbA1c analyser. HbA1c reagents were obtained and used in checking diabetic patients' HbA1c. It is a 'point of care' test in that the test result is generated within five minutes and it can be done in the diabetic clinic. The reagent which was manufactured by Polymer technology (USA) was obtained through a subsidiary in Lagos State. The same reagent was used for the patients in both intervention and control hospitals. The test was carried out by the Researcher in both hospitals throughout data collection. In DM patients, the target for the HbA1c level is $\leq 7\%$ (IDF, 2006).

Teaching module

The third instrument for the study was the diabetes educational intervention package (Appendix 6). The teaching module was adapted for diabetes patients and their family members based on the IDF diabetes education curriculum for sub-Saharan Africa published in 2006. The module, in addition to highlighting key areas of diabetes education

such as management, prevention of complications, also emphasizes the psychosocial impact of diabetes including the role of family members.

3.7.1 Validity of Instrument

The **Diabetes Knowledge Test** (DKT) is a standardized instrument designed for determining diabetes knowledge. The contents of **DKT** were further evaluated by the researcher's supervisor, a nutritionist with a bias in diabetes and a diabetes nurse educator to assess their applicability to the study. Some of the contents were modified and adapted for local use since some of the food were not typically consumed in Nigeria. For instance, 'baked potatoes' was changed to 'boiled yam', 'peanut butter' was changed to 'groundnut' and '3 hard candies' was changed to '3 cubes of sugar'.

Contents of **DSCKQ-30** were found suitable for use with the need for modification. This is probably because the instrument was developed in Nigeria. **The Diabetes Self - Management Questionnaire (DSMQ**) is a standard scale for determining actual self-management among diabetes patients. It was found suitable in terms of content and construct.

The other instrument viz **"Perception of family support" and "quality of life questionnaire**" are also standardized scales whose contents were found suitable for the study. Further validation of all sections of the questionnaire was carried out during the pilot study which was preceded by a translation of the entire questionnaire into the Yoruba language for non - English speakers using back-to-back translation.

3.7.2 Reliability of the instrument

The modified **DKT** and the **DSCKQ -30** were translated to Yoruba from the original English language. They were then given to another bi-lingual translator independent of the first translator to back-translate into English. The back-translated copy was found to be congruent with the original one. To test the reliability of **DKT and DSCKQ-30**, the Yoruba and English versions were administered to twenty - two (22) diabetes patients in O.L.A. Catholic Hospital, Oluyoro, Ibadan - a hospital that was not included in the study setting, for the pre-test. The Cronbach's alpha for the DKT was 0.83; 0.98 for the DSCKQ-30 and 0.95 when the two questionnaires were combined.

The reliability test was performed for the other sections of the questionnaire, i.e. diabetes self-management questionnaire, perception of family support scale and quality of life, (QoL), during the pilot study involvingtwenty-nine (29) diabetes patients. This took place at Ladoke Akintola University Teaching Hospital, (LAUTECH), Ogbomoso. Cronbach's alphas were as follows: Diabetes Self - Management Questionnaire (DSMQ) – 0.95; Perception of family support scale: 0. 95 and QoL scale: 0.94. The DKT and DSCK-30 had their reliabilities tested before the other sections because some items had to be modified on the DKT, thus it was expedient to establish its suitability for data collection earlier.

For the family members, the Reliability of the **DKT** and the **DSCKQ -30** - was determined by also translating the two sections to Yoruba and back translating to the English language. The two were found congruent. It was then administered to 29 family members who accompanied their relations with diabetes during the pilot study. The Cronbach's alpha for the DKT and DSCKQ – 30 were 0.91 and 0.93 respectively.

3.8. Procedure for data collection and study phases

The data collection was in four phases (P1, P2, P3 and P4) comprising the pre-intervention/recruitment phase (P1), immediate post-intervention Phase (P2), three – month post-intervention Phase (P3) and six – month post-intervention Phase (P4).

The Pre-intervention phase

An initial visit was made to both UCH and OOUTH, which were the control and intervention hospitals respectively after the ethical approval had been obtained. At UCH, this visit was on the day of the Diabetes Association of Nigeria (local branch) meeting and also a clinic day; while at OOUTH, the initial visit was on a normal clinic day – a Tuesday. During these visits, the nature of the study, its requirements as well as the benefits were explained to the patients, the nurses and the Physicians. The patients were given information flyers and those interested were asked to come with a family member by the Monday of the next week for those in UCH and by the Tuesday of the next week, for the group in Sagamu, to complete the questionnaire on baseline data.

Informed consent was obtained from patients and family members who turned up for the data collection. Questionnaires were then administered to the patients with four research assistants to assist participants who were not lettered or had difficulty reading due to not having their reading glasses with them. Following the completion of the questionnaire, the HbA1c test was carried out for the patients. The test was recorded in the last section of the questionnaire and also on a slip of paper which was given to the patients so that they could show their Physicians. The patients were also helped to understand the meaning of the result i.e. whether normal or high. The recruitment lasted for approximately three months.

All participants i.e. patients and family members were given transportation fare after data collection and were informed that they would be contacted for the next phase, using the phone (s) number they supplied. Thereafter, the sections of the questionnaire on diabetes knowledge and diabetes self – care knowledge were analysed to identify areas of weaknesses that would require emphasis during the intervention phase.

Intervention.

At the OOUTH clinic, where the intervention took place, a diabetes education module was prepared in two forms; PowerPoint presentation and as a booklet with an overall theme of 'Patient – Family Collaboration in Diabetes Care'. There were six sections in the module namely: Introduction and overview of diabetes; dietary management; blood glucose control including self - glucose monitoring and signs and symptoms of hypoglycaemia/ hyperglycaemia; physical activities/ exercise; use of tablets or insulin and family collaboration in management. The one-day educational programme took the form of lecture/ discussion and goal setting among family member units. There were four groups in all, made up of an average of twenty family units in each group. The groups had an educational intervention on different days.

Moreover, the education/discussions were accompanied by picture illustrations and were given by the Researcher who speaks both Yoruba and English languages fluently. Research assistants were available to help with classroom management and setting up audio-visual aids. The education was given using PowerPoint presentation, as guides to discussions in interactive sessions. Participants asked questions, made contributions in-between sessions and also shared personal experiences with managing diabetes or helping

their family members manage it. Both patient and family members received a booklet each. Family units were then asked to set an achievable goal in the area of diabetes management in which the patient was deficient. Thus, in this quasi-experimental study, the participants were both patients with diabetes and their family members who all participated in a joint session of educational intervention.

The educational intervention was followed by three SMS messages to family members reminding them of concrete ways in which they could assist the patient in managing diabetes. These were sent before the next three-month post-intervention follow-up, as a way of complementing the educational intervention they had received. The messages were sent weekly for three weeks. Areas suggested in the SMS messages were 'helping to get low-calorie fruits such as cucumber; exercising with the patient; helping to check and record blood glucose level; 'tailoring the family menu to align with patients' diet so the entire family keeps healthy'. These were areas emphasized during the FIDE. Besides, on the seminar day itself, there was a post-intervention assessment of diabetes knowledge and knowledge of self - care among all the participants.

All participants who attended diabetes education classes (intervention) were provided with lunch. They were also given transportation fare to their various destinations since the educational intervention was conducted on days outside their normal clinic days.

Post Intervention Phase

Immediately after the intervention, the sections of the questionnaire on knowledge – diabetes knowledge test (DKT) and diabetes self-care knowledge (DSCKQ -30) – were administered to the patients and family members, separately, (Post-intervention 1). The same procedure was followed for the participants in the control group except that they did not have the intervention. The three (3) SMS messages were then sent to the family members, encouraging them to continue to support the diabetes patient. This was sent weekly for three weeks, after the intervention, i.e. before the three- month follow up and before the six-month follow-up as well.

During the three and six-month post-intervention follow-up, the patients' HbA1c was checked at both times, i.e. at three and six-month post-intervention, for both intervention

and control groups. Then, the sections of the questionnaire on diabetes self-management, perception of family support and the quality of life sections were completed, for both groups of patients. Patients were contacted for follow-up through bulk SMS messages and telephone calls if they did not show up so that the follow-up could be scheduled for them the following week.

The six - month follow – up is important to evaluate the long- term effect of the intervention. This is supported by the American Society for Preventive research (2006) who commented that outcomes with the possibility of fading as time passes must have a minimum of one long term follow up at an appropriate period post-intervention for instance, a minimum of 6 months after the intervention.

Furthermore, for ethical reasons, the same educational intervention that was given to participants in the intervention group was repeated for those in the control group at the end of the study. Patients and family members attended this seminar and also received the booklet printed for the study and were provided with refreshments. The data collection schedule is summarized in the table below.

Table 3.1: **Table summarizing the procedure for data collection**

Phase/activity	Timeline	Intervention Group	Control Group
Baseline data (P1) (patient and family)	1 -10th week	X	X
Intervention	9^{th} – 11^{th} week	X	O
Immediate Post Intervention data [P2] (patient & family)	9^{th} – 11^{th} week	X	O X
SMS messages	12^{th} – 14^{th} week	X	O
Post-test at 3 months (P3) (Patient only)	20th – 22^{nd} week	X	X
SMS messages	21^{st} – 23^{rd} week	X	O
Post-test at 6 months (P4) (Patient only)	42^{nd} - 44^{th} week	X	X

Key: X = Yes O = No

Four trained research assistants assisted with the data collection particularly assisting the participants in completing; checking while the questionnaires were being completed and clarifying where and when necessary. The training of research assistants lasted for two days. The training was carried out by the Researcher with input from the supervisor. The researcher was involved in all aspects of data collection, cleaning, entry and analysis. She, along with the research assistants, made all telephone calls for post-intervention data collection. The Researcher was also the one who provided the education to participants in the intervention group.

3.9 Ethical consideration

The proposal was submitted to the Olabisi Onabanjo University Teaching, Sagamu, Ogun State and University of Ibadan/ University College Hospital Ibadan (U.I. /UCH) ethical review committeefor ethical approval, and same were granted by the U.I. /UCH ethical review committee, (UI/EC/15/0012) and OOUTH ethical review committee (OOUTH/HR EC/031/2015). The permission of the head of the department of endocrinology unit and the collaboration of nurse educators were sought and obtained. Informed consent was sought and obtained from each prospective study participant and recruitment and participation were by ethical principles guiding research, viz:

Confidentiality of Data: Participants were identified using serial numbers instead of their names to maintain confidentiality. Participants were assured that responses would be treated as confidential and questionnaires would be kept safely under lock and key. Data entered into the computer was protected by a password and made accessible only to the researcher, data entry clerk and a biostatistician

Translation of protocol to the native language for easy communication: The questionnaire was translated to Yoruba, the native language of the people where the study took place and back-translated to the English language to ensure that the original meaning was preserved. All research assistants were fluent in Yoruba and English languages and the researcher is fluent in both languages.

Beneficence to Participants: This study determined the effects of family-integrated diabetes education on glycaemic control and quality of life of type 2 diabetes patients and would serve as a basis for planning appropriate intervention. The patients with family members in the intervention group benefited directly from the education and free HbA1c check for glycaemic monitoring while those in the control group were given the educational intervention at the end of data collection. The HbA1c test was done for free for the patients in the control group as well.

Non-maleficence to participants: The patients and family members who participatedwere compensated for the time spent attending the teaching and completing the questionnaire by providing refreshments and transportation fare during the period.

Voluntariness/Right to decline/ withdraw from the study without loss of benefits: The participants were assured of their right to decline participation or discontinue participation at any time during the data collection without any adverse consequences.

3.10. Method of data analysis

Questionnaires were checked daily to ascertain whether they were properly completed and for errors. Data were then entered into a computer software - IBM – SPSS version 22 for analysis.

Participants' socio-demographic distribution across study groups was analysed using frequencies percentages and mean. Chi-square and independent t-tests were used in comparing baseline characteristics of the two study groups. The research objectives and hypotheses were then analysed as presented:

Objective One: To determine the diabetes knowledge of patients in the intervention and control groups pre and post-intervention

Diabetes Knowledge Test (DKT) which was used in determining this had options A-E with only scores ranged from 0 (minimum) to 14 (maximum) for patients who were not on insulin and 0 (minimum) to 23 (maximum) for patients taking insulin. To determine the knowledge score of each participant, all the correctly answered questions were added up for intervention and control groups separately. Items 1- 14 were common to all participants, therefore this was used in determining the mean score. This procedure was used in analysing both pre and post-intervention DKT data. Results are presented using charts.

Objective Two: To determine the diabetes self - care knowledge of patients in the intervention and control groups, pre and post-intervention.

The Diabetes Self – Care knowledge Questionnaire (DSCKQ) which was used in eliciting this information consisted of 30 items with two options: 'Yes' and 'No'. The correct answer was scored '1' while an incorrect answer was scored '0' so that the maximum score was 30 while the minimum score obtainable was 0. The mean was determined separately for participants in the intervention and control group and result presented using a table.

Objective Three: To determine the diabetes knowledge of family members of diabetes patients in the intervention and control groups pre and post-intervention.

Data were analysed in a similar method to Objective One.

Objective Four: To determine the diabetes self - care knowledge of family members of diabetes patients in the intervention and control groups, pre and post-intervention.

Data were analysed in a similar method to Objective Two.

Objective Five: To determine the diabetes self – management of diabetes patients in the intervention and control groups pre and post-intervention.

There were sixteen (16) items on the DSMQ with responses on a four-point Likert scale viz: as 'Applies to me very much', ' Applies to me to a considerable degree', 'Applies to me to some degree' and 'Does not apply to me', scored as '4', '3', '2', '1' respectively. Negatively worded items were reversed. The maximum score obtainable was 64 while the minimum score was 16. The mean score was determined for DM patients in the intervention and control groups at baseline, post-intervention 1 and post-intervention 2. Results of the study phases were presented using tables

Objective Six: To determine the Perception of Family Support (PFS) by diabetes patients in the intervention and control groups pre and post-intervention.

The PFS questionnaire consisted of 20 items with responses on a Likert scale viz: 'Strongly agree', 'Agree', 'Strongly Disagree' and 'Disagree', scored as '4', '3', '2', '1' respectively. Negatively worded items were reversed. The maximum score obtainable was 80 while the minimum score obtainable was 20. The mean score for patients in the intervention and control groups was determined separately at baseline, post-intervention one and post-intervention two. Results are presented using figures and tables.

Objective Seven: To determine the quality of life of diabetes patients in the intervention and control groups, pre and post-intervention.

The questionnaire consisted of 22 items on a four-point Likert scale with responses as follows: 'Always': 3; 'Sometimes': 2; 'Rarely': 1 and 'Never' '0'. In this section too, negatively-worded items were reversed. The maximum score obtainable was 66 while the minimum score obtainable was 0. Mean scores were determined for participants in the

intervention and control groups at the three phases of the study (baseline, three months' post-intervention, i.e. phase 3 and six - month post-intervention, i.e. phase 4). Results were presented using figures and tables as well. Moreover, the mean scores of the subscales of depression, anxiety, energy and positive well-being were determined. The composite and subscale scores were further classified into 'good' and 'poor', based on the values above and below the mean scores, respectively.

Objective Eight: To evaluate the glycosylated haemoglobin (HbA1c) of DM patients in the intervention and control groups, pre and post-intervention.

Raw scores of DM patients' HbA1c were obtained from the HbA1c analyser and recorded. The mean scores were then determined for patients in the intervention and control groups at baseline, three - month post-intervention and at six - months post-intervention. The mean scores of the two groups are presented using graphs. Also, the post-intervention scores were categorized into ≤ 7% and > 7%, representing good and poor glycaemic controls respectively. This was presented in a table.

Research hypotheses were analysed as follows:

Hypothesis One: There is no significant difference in the diabetes self - management between diabetes patients in the intervention and control groups, pre and post-intervention.

The mean value obtained for patients in the intervention and control groups were compared using independent t-test

Hypothesis Two: There is no significant difference in perceived social support from a family between diabetic patients in intervention and control groups, pre and post-intervention.

The mean value obtained for patients in the intervention and control groups was also compared using an independent t-test.

Hypothesis Three: There is no significant difference in diabetic patients' quality of life between intervention and control groups, pre and post-intervention.

Mean scores for patients in the two study groups were compared using independent t-tests

Hypothesis Four: There is no significant difference between the proportion of type 2 diabetes patients with normal HbA1c level (≤ 7%) between the intervention and control

groups pre and post-intervention. Patients in the two HbA1c categories: ≤ 7% (normal) and > 7% (high) were compared for the two study groups using a chi-square test.

Besides, the mean scores of HbA1c for the two groups of patients were also determined and an independent t-test was used in comparing the mean values at the different study phases.

Hypothesis Five: There is no significant difference in the diabetes self – management, Perception of family support, QoL and HbA1c in the intervention and control groups, at baseline, three months post-intervention (Phase 3) and at six months post-intervention, (Phase 4). This was analysed using Repeated Measures ANOVA. The statistical significance level was set at $P < 0.05$.

CHAPTER FOUR

RESULTS

The overall aim of this study was to determine the effects of family-integrated diabetes education on glycaemic control and quality of life among patients with type 2 diabetes in two hospitals in Southwest, Nigeria. The findings from the study are presented in this chapter using texts, tables and charts.

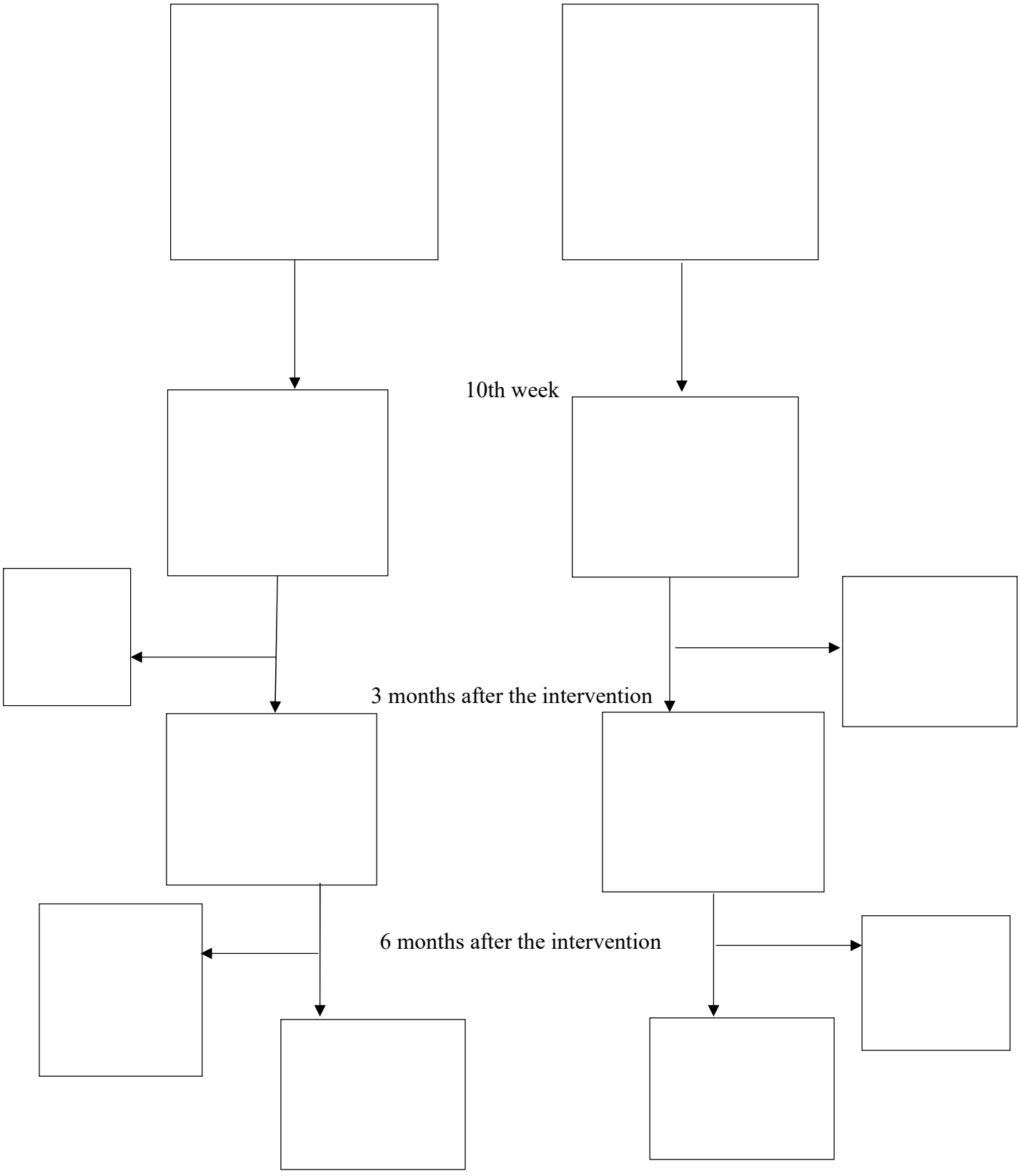
4.1. Recruitment of participants in the study

A total of One hundred and seventy (170) type 2 diabetes patients were recruited into the study of which 88 were recruited as a control group from UCH and 82 as intervention group from OOUTH. The recruitment lasted for about 10 weeks and the patients recruited were each able to invite a family member to come along with them to the clinic at the baseline (P1), thus the corresponding number of family members were recruited into the study. The 170 pairs of participants participated in Phase 2 of the study.

Out of the 170 patients who completed the P2; six (6) dropped out by the time of the 3-month post-intervention follow-up (P3) - three (3) from each of the two hospitals. In OOUTH, this was due to a tight work schedule of one (1) and the fact that two (2) patients travelled out of Sagamu for a considerable period and could not attend the follow-up. In UCH, drop out was due to patients declining to continue with the study. Thus, a total of 164 patients completed the P3.

The six-month follow up (P4) involved a total of 152 patients with 78 from UCH and 74 from OOUTH, twelve patients had dropped out. Seven (7) of the UCH patients dropped out due to: having relocated (2), unavailable for a long period (1) and declined to continue to participate (4). In OOUTH, out of the five (5) who dropped out, one (1) died, one (1) travelled out of the country, two (2) had relocated and one (1) could not come because of a new work schedule in another town which was overly hectic.

An unforeseen confounding variable affected results from this study and made follow-up results similar in the intervention and control groups. This was a series of educational programmes organized for patients in the control group as part of the diabetes association week.


10th week
3 months after the intervention
6 months after the intervention

4.2 **Sociodemographic and clinical data of patients recruited into the study & group comparison.**

The Sociodemographic and clinical variables of the 170 type 2 patients who took part in the study are presented in table 4.1, along with the baseline comparison of the two groups. On the whole, most of the study participants were female (70.0%), a majority (67%) had secondary school education only. The largest proportion (55.9%) were 60 years and above. Furthermore, 35% of the participants were on insulin therapy, while 75.4% had been exposed to diabetes education and many (80.6%) owned a glucometer. Whereas only 12.4% of them had been diagnosed and receiving treatment for twenty years and above, diabetes duration in 87.8% of the study population was less than twenty years. These results are presented in Table 4.1 along with other relevant baseline characteristics.

Chi-square test was used to determine the significance comparison of the two groups. There was no significant difference in the gender distribution ($p = 0.321$), marital status, ($p = 0.909$), age ($p = 0.116$); ownership of a glucometer ($p = 0.054$) and previous diabetes education ($p = 0.131$); of patients in the intervention and control groups. Monthly income, however, was significantly higher among patients in the intervention group, ($p = 0.042$); although not all the patients provided information about their income. Income information was provided by 70 patients in the control group and 53 patients in the intervention group.

Table 4.1: Baseline characteristics of type 2 DM patients across the study groups

Variable	Control group (n=88) *Frequency (%)*	Intervention group(n=82) *Frequency (%)*	Total (%)	p- value
Sex: Male	23 (26.1)	28 (34.1)	51 (30.0)	0.315
Female	65 (73.9)	54 (65.9)	119 (70.0)	
Marital status				
Married	63 (71.6)	62 (75.6)	125 (73.5)	0.604
Not married i.e.	25 (28.4)	20 (24.4)	45 (26.5)	
Single/ widowed/divorced	4 (4.0)	6 (6.1)	10 (5.9)	
Age: ≤40 years				
41-59 ears	28 (31.8)	27 (45.1)	65 (38.2)	0.106
≥60 years	56 (63.6)	39 (47.6)	95 (55.9)	
Minimum	31	27	59 (35)	
Maximum	83	80	118 (65)	
Use of insulin injection:				
Yes	30 (34.1)	29 (35.4)	56 (33)	0.873
No	58 (65.9)	53 (64.6)	114 (67)	
Educational level:				
Tertiary	29 (33.0)	27(32.9)		
Secondary and below	59 (67.0)	55 (67.1)	84 (42.6)	1.000
Income/month[+] (Naira)			39 (19.8)	
< 50,000	53 (75.7)	31 (58.5)		
≥ 50,000	17 (24.3)	22 (41.5)	137 (80.6)	0.042*
Mean	39,428.8	50,150	33 (19.4)	
Minimum	1000	2000		
Maximum	300,000	300,000	139 (75.4)	
Ownership of a			31 (18.2)	
glucometer: Yes	76 (86.4)	61 (74.4)		
No	12 (13.6)	21 (25.6)	148 (87.6)	0.054
Previous DM education:			21 (12.4)	
Yes	75(85.2)	64 (78.0)		
No	13 (14.8)	18 (22.0)	50(29.4)	0.240
Diabetes duration:			95 (55.9)	
< 20 years	76 (86.4)	72 (88.9)	25 (14.7)	
≥ 20 years	12 (13.6)	9 (11.1)		0.649
Family member: Spouse	22 (25.0)	28 (34.1)		
Child	51 (58.0)	44 (53.7)		0.363
Others	15 (17.0)	10 (12.2)		

[+] 123 (62.4%) declined information about income

***Statistically significant variable**

4.3. **Baseline characteristics of the family members of diabetes patients and comparison across study groups.**

Family members' characteristics and comparisons of these are presented in Table 4.2. Results show that most of those who accompanied the patients were females (63.6%) and a little over half (53.4%) were aged 40 years and below. The majority (71.7%) earned monthly income less than 50,000 Naira and 45.5% had been exposed to diabetes education in the past. Other characteristics are presented in table 4.2. Besides, results of chi-square test to compare the characteristics of family members across study groups showed that sex, age, monthly income and experience of previous education in diabetes were not statistically significant ($p > 0.05$).

4.4 Diabetes Knowledge of Patients

The aggregate diabetes knowledge scores of patients are presented in Tables 4.3a – 4.3c. The table shows that a greater proportion of patients in the intervention group than those in the control group had improvement in the areas covered by the test. In particular, there was a great improvement in the knowledge about 'free food' (Question No 4) in which both groups had very low scores at baseline, as only about 10% in both groups got the correct answer. However, at post-intervention, the number of those who got this right in the intervention group more than quadrupled (46.3%).

Similarly, the question on when glycosylated haemoglobin (HbA1c) test should be done (Question No 5), was poorly answered by both groups of patients, because only 19.2% in the intervention group and 14.6% in the control group got the answer correctly at baseline. At post-intervention, 27.3% of patients in the control group and 67.1% of patients in the intervention group answered the question correctly.

Regarding the question on 'what not to use to treat DM'. At baseline, none (0%) of the patients in the control group got this correctly while 1.2% of those in the intervention group got it correctly. At post-intervention, 1.1% of control chose the correct answer while 3.7% of those in the intervention group chose the correct answer.

Table 4.2: **Baseline characteristics and comparison of family members across study groups.**

Variable	Control group f (%) (n = 88)	Intervention group f (%) (n=82)	Total (%)	p - value
Sex: Male	32 (36.4	31 (37.8)	63 (37.1)	0.875
Female	56 (63.6)	51 (62.2)	107 (62.9)	
Age (in years)				
≤ 40 years	47 (53.4)	41 (50.0)	88 (51.8)	0.759
> 40 years	41 (46.6)	41 (50.0)	82 (48.2)	
Mean (S.D)	41.7 (16.7	40.0 (15.1)		
Minimum	18	18		
Maximum	80	81		
Educational level:				
Tertiary:	52 (59.1)	37 (45.1)	89 (52.4)	0.091
Secondary & Below	36 (40.9)	45 (54.9)	81 (47.6)	
Monthly income+				
< 50,000	38 (71.7)	28 (73.7)	66 (72.5)	1.000
≥ 50,000	15 (28.3)	10 (26.3)	25 (27.5)	
Previous DM education				
Yes:	40 (45.5)	41 (50)	81 (47.6)	0.645
No:	48 (54.5)	41 (50)	89 (52.4)	
Rating of DM knowledge:				
Good:	18 (20.5)	21 (25.6)	39 (22.9)	0.603
Average:	42 (47.7)	40 (48.8)	82 (48.2)	
Poor:	18 (20.5)	16 (19.5)	34 (20.0)	
Non – existent:	10 (11.4)	5 (6.1)	15 (8.8)	

+ N = 108: Not all family members provided income information.
***statistically significant**

Table 4.3. Aggregate Scores of DM Patients On Diabetes Knowledge Test (DKT) – Dietary management

			Baseline (P1)				Post-intervention (P2)			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			f	%	f	%	F	%	f	%
1	Definition of a diabetes diet	the way most Nigerian people eat	8	9.1	4	4.9	14	15.9	2	2.4
		a healthy diet for most people*	35	39.5	23	28	26	29.5	44	53.7
		too high in carbohydrate for most	11	12.5	10	12.2	11	12.5	16	19.5
		too high in protein for most people	26	29.5	35	42.7	25	28.4	15	18.3
		don't know	8	9.1	10	12.2	12	13.6	5	6.1
2	Food highest in carbohydrate	Roast chicken	12	13.6	10	12.2	19	21.6	7	8.5
		Cheese	12	13.6	2	2.4	9	10.2	4	4.9
		Boiled yam*	48	54.5	50	61.03	40	45.5	68	82.9
		Ground-nut	2	2.3	7	8.5	5	5.7	2	2.4
		don't know	14	15.9	13	15.9	15	17	1	1.2
3	Food highest in fat	low fat milk*	48	50.0	39	47.6	33	37.5	64	78
		orange juice	10	11.4	8	9.8	4	4.5	3	3.7
		Corn	9	10.2	8	9.8	16	18.2	3	3.7
		Honey	4	4.5	9	11.0	12	13.6	7	8.5
		don't know	21	23.9	18	22.0	23	26.1	5	6.1
4	Food type that contributes a very small amount of carbohydrate or energy free food	Any unsweetened food	37	42.0	25	30.5	34	38.6	22	26.8
		Any dietetic food	15	18.2	9	11.0	18	20.5	6	7.3
		Any food that says "sugar free" on the	16	17.0	24	29.3	15	17.0	11	13.4
		Any food that has less than 20	9	10.2	10	12.2	7	8.0	38	46.3
		don't know	11	12.5	14	17.1	14	15.9	5	6.1

*Correct option

Table 4.4. Aggregate Scores of DM Patients On Diabetes Knowledge Test (DKT) – Blood glucose

			Baseline (P1)				Post-intervention (P2)			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			f	%	F	%	f	%	f	%
1	Average duration of blood glucose level which Glycosylated haemoglobin (HbA1c) measures	one day	12	13.6	16	19.5	14	15.9	5	6.1
		One week	29	33.0	17	20.7	16	18.2	5	6.1
		6-10 weeks*	17	19.3	12	14.6	24	27.3	55	67.1
		6 months	11	12.5	5	6.1	12	13.6	7	8.5
		don't know	19	21.6	32	39.0	22	25.0	10	12.2
2	Best method for testing blood glucose level	Urine testing	5	5.7	2	2.4	5	5.7	1	1.2
		Blood testing*	57	64.8	60	73.2	63	71.6	70	85.4
		Both are equally good	20	22.7	17	20.7	19	21.6	9	11
		don't know	6	6.8	3	3.7	1	1.1	2	2.4
3	Effect of unsweetened fruit juice on blood glucose	Lowers it	44	50.0	45	54.9	52	59.1	25	30.5
		Raises it*	10	11.4	3	3.7	6	6.8	42	51.2
		has no effect	13	14.8	12	14.6	13	14.8	8	9.8
		makes it fluctuate	12	13.6	13	15.9	8	9.1	2	2.4
		don't know	9	10.2	9	11.0	9	10.2	5	6.1
4	Ineffective treatment for low blood glucose	3 cubes of sugar	46	52.3	37	45.1	46	52.3	40	48.8
		orange juice	18	20.5	8	9.8	5	5.7	10	12.2
		diet soft drink*	0	0	1	1.2	1	1.1	3	3.7
		skim milk like three-crowns milk	12	13.6	15	18.34	17	19.3	27	32.9
		don't know	12	13.6	19	23.2	19	21.6	4	4.9
5	Effect of exercise on normal blood glucose	Lowers it*	66	75.0	70	85.4	74	84.1	70	85.4
		Raises it	8	9.1	1	1.2	3	3.4	6	7.3
		has no effect	4	4.5	3	3.7	5	5.7	4	4.9
		don't know	10	11.4	8	9.8	6	6.8	2	2.4

*Correct option

Table 4.5. Aggregate Scores of DM Patients On Diabetes Knowledge Test (DKT) – Diabetes complications

			Baseline (P1)				Post-intervention (P2)			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			f	%	F	%	f	%	f	%
1	Effect of infection on blood glucose	an increase in blood glucose*	55	62.5	45	54.9	55	62.5	68	82.9
		a decrease in blood glucose	6	6.8	6	7.3	7	8.0	10	12.2
		no change in blood glucose	8	9.1	7	8.5	3	3.4	1	1.2
		don't know	19	21.6	24	29.3	23	26.1	3	3.7
2	The best way to take care of the feet	look at and wash them each day*	67	76.1	60	73.2	76	86.4	76	92.7
		massage them with alcohol each day	1	1.1	0	0	4	4.5	1	1.2
		soak them for one hour each day	7	8.0	2	2.4	2	2.3	4	4.9
		buy shoes a size larger than usual	3	3.4	9	11.0	6	6.8	1	1.2
		don't know	10	11.4	11	13.4	0	0.0	0	0.0
3	Disease risk lowered by decrease in fat consumption	Nerve disease	13	14.8	4	4.9	11	12.5	12	14.6
		Kidney disease	23	26.1	17	20.7	24	27.3	15	18.3
		heart disease*	32	36.4	29	35.4	34	38.6	47	57.3
		eye disease	1	1.1	2	2.4	3	3.4	4	4.9
		don't know	19	21.6	30	36.6	16	18.2	4	4.9
4	Disease causing symptoms of numbness and tingling	Kidney disease	22	25.0	18	22.0	16	18.2	10	12.2
		nerve disease*	33	37.5	23	28.0	35	39.8	59	72
		eye disease	10	11.4	4	4.9	7	8	2	2.4
		liver disease	7	8.0	4	4.9	5	5.7	3	3.7
		don't know	16	18.2	33	40.2	25	28.4	8	9.8
5	Which of the following is usually not associated with diabetes	vision problem	11	12.5	5	6.1	3	3.4	3	3.7
		kidney problem	3	3.4	4	4.9	5	5.7	1	1.2
		nerve problem	8	9.1	10	12.2	15	17	10	12.2
		lung problem*	31	35.2	30	36.6	32	36.4	60	73.2
		don't know	35	39.8	33	40.2	33	37.5	8	9.8

Table 4.6 shows that the mean score of patients in the control group at P1 (baseline) was 6.1 while that of patients in the intervention group was 5.8. At post-intervention, the control group had a mean score of 6.1, while the intervention group had a mean score of 9.7.

The comparison of the mean values between and within the two groups presented on the same table shows that at baseline, there was no significant difference in the DKT of DM patients in the intervention and control groups whereas, at post-intervention, patients in the intervention group displayed a significantly higher level of the score on DKT with p-value < 0.01.

The within-group comparison using t-test shows that patients in the intervention group had a significantly higher level of knowledge after the intervention.

The aggregate diabetes self-care knowledge score of the patients are presented in Table 4.7-4.9. The table shows that more patients in the intervention group improved in their knowledge about checking blood sugar before exercise, (P1:84.1%, P2:89.0%); the need for 20 -30 minutes of exercise 3 times weekly (P1:93.9%, P2: 96.3%) and the need to see their physician not only when sick (P1:41.8%, P2:46.3%). Other results are presented in Table 4.5.

The mean diabetes self-care knowledge of patients (Table 4.10) shows that the score of patients in the control group at baseline, was 22.2 while that of those in the intervention group was 21.3, (maximum obtainable score being 30). Post-intervention scores were 22.4 for patients in the control group and 22.3 for those in the intervention group. Independent t-test comparing the mean scores of the patients at pre and post-intervention showed no significant difference between the two groups. The paired t-test of DM patients in both intervention and control groups are also presented in table 4.6. Results indicate that the diabetes self - care knowledge of DM patients in the intervention group improved significantly after the intervention, ($p < 0.05$), while there was no significant difference in the mean score of patients in the control group.

Table 4.6. Comparison of diabetes knowledge (DKT) of DM patients within and between groups at pre and post-intervention.

	Control		Intervention				
	n	$\overline{x}$ (±)	n	$\overline{x}$ (±)	mean diff.	t-value	p-value
P1	88	6.1 (2.3)	82	5.8 (2.4)	0.334	0.932	0.352
P2	88	6.1 (2.3)	82	9.7 (2.6)	-3.559	-9.505	<0.01**
mean diff		-0.023		-3.915			
t-value		-0.062		-10.979			
p-value		0.950		< 0.01**			

**** Significant at < 0.01**

Table 4.7 Diabetes self -care knowledge score of patients: Blood glucose control & lifestyle management

No.	Questions		Baseline (P1)				Post-intervention (P2)			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			f	%	f	%	f	%	f	%
1	Using fasting blood glucose to monitor blood glucose control over an extended period given that the glycosylated haemoglobin (HbA1C) test is expensive is a good option	Yes	71	80.7	68	82.9	72	81.8	62.0	75.6
		No*	17	19.3	14	17.1	16	18.2	20.0	24.4
2	Writing out dietary instructions for patients even if illiterate since someone at home could interpret this for the patient is helpful	Yes*	86	97.7	75	91.5	86	97.7	81.0	98.8
		No	2	2.2	5	6.1	2	2.3	1.0	1.2
3	Doctors are solely responsible for making plans on how an individual having diabetes could attain target goals.	Yes	71	80.7	68	82.9	48	54.5	46.0	56.1
		No*	17	19.3	14	17.1	40	45.5	36.0	43.9
4	Measurement of blood glucose ought to precede and come after all planned physical activity.	Yes*	78	88	69	84.1	77	87.5	73.0	89
		No	10	12	13	15.8	11	12.5	9	11
5	A person with diabetes ought to have physical activity for 20-30 minutes for 3 days per week at the minimum	Yes*	86	97.7	77	93.9	84	95.5	79	96.3
		No	2	2.2	5	6.1	4	4.5	3	3.7
6	Exercising regularly does not decrease dosage of insulin or other medications	Yes	61	69.3	53	64.6	57	64.8	57.0	69.5
		No*	27	30.6	29	35.4	31	35.2	25.0	30.5
7	Having a healthy weight is not an essential component of diabetes management.	Yes	25	28.4	24	29.3	23	26.1	26.0	31.7
		No*	63	71.6	58	70.7	65	73.9	56.0	68.3
8	An individual with diabetes should only seek assistance from health care personnel when feeling sick	Yes	59	67.0	47	57.3	43	48.9	44.0	53.7
		No*	29	32.9	35	42.6	45	51.1	38.0	46.3
9	Cigarette smoking and alcohol ingestion in excess can make diabetes take a turn for the worse.	Yes*	75	85.2	72	87.8	82	93.2	74.0	90.2
		No	13	14.8	10	12.2	6	6.8	8.0	9.8
10	It is a waste of money for people with diabetes to take medications while feeling good	Yes	16	18.2	17	20.7	16	18.2	18.0	22.0
		No*	72	81.8	65	79.2	72	81.8	64.0	78.0
11	Alcohol ingestion along with diabetes medication does not constitute a grave problem.	Yes	7	9.0	14	17.0	19	21.6	12.	14.6
		No*	81	92.0	68	82.9	69	78.4	70.	85.4

*Correct option

Table 4.8: Diabetes self-care knowledge score of patients: Use of medications & foot care

No.	Questions		Baseline (P1)				Post-intervention (P2)			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			F	%	f	%	f	%	f	%
1	Diet and exercise are not as important as medication in the control of diabetes.	Yes	45	51.1	41	50.0	46	52.3	46	56.1
		No*	43	48.8	41	50.0	42	47.7	36	43.9
2	Sometimes, persons with diabetes may not strictly follow instructions about medications and other self-care practices	Yes	14	15.9	15	18.3	19	21.6	24	29.3
		No*	74	84.1	67	81.7	69	78.4	58	70.7
3	When an individual with diabetes is feeling well, routine check-ups are not crucial to the management	Yes	8	9.1	13	15.9	17	19.3	10	12.2
		No*	80	90.9	69	84.1	71	80.7	72	87.8
4	Ingestion of low dose of an anticoagulant such as Aspirin can reduce the danger of developing heart attack and stroke.	Yes*	51	58.0	55	67.1	58	65.9	60.	73.2
		No	35	42.0	27	33.0	30	34.1	22.	26.8
5	Diabetes drugs are only taken for a period and not throughout the entire life.	Yes	24	27.3	25	30.4	25	28.4	24.	29.3
		No*	64	72.7	57	69.5	63	71.6	58.	70.7
6	On commencing insulin treatment for patients who need it, suitable advice on Self-Blood Glucose Monitoring (SBGM), as well as dietary intake, should be provided	Yes*	81	92.0	74	90.2	83	94.3	73.	89
		No	7	7.9	8	9.8	5	5.7	9.0	11
7	Individuals with diabetes and their doctors should have a mutual understanding if such a person is unable to change a specific lifestyle or afford medications.	Yes*	74	84.1	68	82.9	70	79.5	68.	82.9
		No	14	15.9	14	17.1	18	20.5	14.	17.1
8	Personal care of the feet particularly when trimming the nails is an integral aspect of diabetes care	Yes*	88	100.0	77	93.9	86	97.7	81.	98.8
		No	0	0.0	5	6.0	2	2.3	1.0	1.2
9	Tight and elastic socks can be worn by persons with diabetes without any problem	Yes	24	27.3	30	36.6	24	27.3	26.	31.7
		No*	64	72.8	52	63.4	64	72.7	56.	68.3

*Correct option

Table 4.9 Diabetes self-care knowledge score of patients: Prevention of complications

No.	Questions		Baseline (P1)				Post-intervention (P2)			
			Control 88		Interv. 82		Control 88		Interv. 82	
			f	%	f	%	f	%	f	%
1	People with diabetes ought to care for their teeth by daily brushing and flossing	Yes*	85	96.6	78	95.1	88	100	77	93.9
		No	3	3.4	4	4.9	11	0	5	6.1
2	When the blood glucose level is near being normal, an individual with diabetes usually has more energy, is not very thirsty and does not urinate too frequently.	Yes*	77	87.5	62	75.6	75	85.2	62	75.6
		No	11	12.5	20	24.4	13	14.8	20	24.4
3	It is only qualified health personnel in the hospital who should monitor the blood glucose level and blood pressure of people with diabetes	Yes	68	77.3	61	74.4	62	70.5	55	67.1
		No*	20	22.7	21	25.6	26	29.5	27	32.9
4	Changes in the eyesight ought to be made known to the doctor no matter how little	Yes*	87	98.9	81	98.8	87	98.9	80.	97.6
		No	1	1.1	1	1.2	1	1.1	2.0	2.4
5	Performing self-blood glucose monitoring makes it possible for health care professionals to obtain information to aid decision-making.	Yes*	86	97.7	80	97.6	85	96.6	76.	92.7
		No	2	2.2	2	2.4	3	3.4	6.0	7.3
6	Self-blood glucose monitoring makes it possible for individuals with diabetes to detect and correct changes	Yes*	86	97.7	75	91.5	87	98.9	73.	89
		No	2	2.3	7	8.5	1	1.1	9.0	11
7	High blood glucose level is manifested by confusion, sweating, shaking, and behavioural changes	Yes	75	85.2	73	89.0	68	77.3	42.	51.2
		No*	13	14.7	9	11.0	20	22.7	40.	48.8
8	Eye problem or damage can be caused by long-term uncontrolled blood glucose	Yes*	83	94.3	75	91.5	87	98.9	78.	95.1
		No	5	5.6	7	8.5	1	1.1	4.0	4.9
9	Blood glucose monitoring is more crucial than blood pressure monitoring in diabetes care	Yes	38	43.1	25	30.5	34	38.6	28.	34.1
		No*	50	56.8	57	69.6	54	61.4	54.	65.9
10	Kidney failure, stroke and heart attack can be caused by poor blood glucose control	Yes*	82	93.2	77	93.9	87	98.9	75.	91.5
		No	6	6.7	5	6.1	1	1.1	7.0	8.5

*Correct option

Table 4.10. Comparison of the diabetes self - care knowledge of DM patients within and between groups

	Control		Intervention				
	n	$\overline{x}$ (±)	n	$\overline{x}$ (±)	mean diff.	t-value	p-value
P1	88	22.2 (5.3)	82	21.3 (3.3)	0.922	1.355	0.177
Minimum		15.0		11.0			
Maximum		29.0		27.0			
P2	88	22.4 (3.3)	82	22.3 (3.5)	0.188	0.357	0.722
Minimum		12.0		9.0			
Maximum		28.0		28.0			
Mean diff	-0.517		-0.976				
t-value	-0.345		-2.087				
p-value		0.731		0.040*			

*** Significant at < 0.05**

4.5. DIABETES KNOWLEDGE OF FAMILY MEMBERS

The aggregate score on diabetes knowledge test of family members is presented on tables 4.11 - 4.13. This shows that at baseline, 31.8% of those in the control group got the definition of a diabetes diet correctly against the 19.5% who got it correctly in the intervention group. However, at post-intervention (P2), 27.5% in the control and 51.2% in the intervention groups answered this question correctly. Also, 12.5% of those in the control and 12.2% of those in the intervention group got the question on the frequency of glycosylated haemoglobin test correctly, at baseline. At post-intervention, 15.9% of those in the control group and 64.9% of those in the intervention group chose the correct option.

The mean score on the Diabetes Knowledge Test (DKT) of family members is presented in figure 4.2. It shows that, at baseline, family members in the intervention group had a mean score of 5.6 out of the maximum obtainable score of 14 while the control group had a score of 5.9. At immediate post-intervention (P2), the mean score of those in the intervention group increased to 8.6, while that of those in the control group was 5.8.

Table 4.14 shows that at baseline, there was no significant difference in the knowledge of family members in the intervention and control groups while a significant difference ($p < 0.01$) was observed after the intervention due to a higher mean knowledge score among family members in the intervention group. The result of the paired t-test on DKT among family members shows a significant difference ($p < 0.01$) between the pre and post-intervention score of those in the intervention group while there was no significant change in the DKT of those in the control group.

The result of the general regression analysis on the effect of family members' knowledge on HbA1c independently and when patients' knowledge was adjusted for were significant.

Table 4.11. Aggregate Scores of family members of DM Patients On Diabetes Knowledge Test (DKT): Dietary control

			Baseline (P1)				Post-intervention (P2)			
			Control 88		Interv. (82)		Control (88)		Interv. (82)	
			f	%	f	%	f	%	f	%
1	Definition of a diabetes diet:	the way most Nigerian people eat	6	6.8	8	9.8	3	3.4	2	2.4
		a healthy diet for most people*	28	31.8	16	19.5	24	27.3	42	51.2
		too high in carbohydrate for most	35		28	34.1	29	33	13	15.9
		too high in protein for most people	19	21.6	29	35.4	17	19.3	15	18.3
		don't know	0	0	1	1.2	15	17	10	12.2
2	Food highest in carbohydrate	Roast chicken	15	17.0	7	8.5	9	10.2	13	15.9
		Cheese	14	15.9	11	13.4	8	9.1	1	1.2
		Boiled yam*	56	63.6	58	70.7	57	64.8	66	80.5
		Ground-nut	3	3.4	5	6.1	4	4.5	2	2.4
		don't know	0	0	1	1.2	10	11.4	0	0
3	Food highest in fat	low fat milk*	53	60.2	41	50.0	49	55.7	58	70.7
		orange juice	13	14.8	11	13.4	10	11.4	3	3.7
		Corn	10	11.4	17	20.7	5	5.7	9	11
		Honey	11	12.5	11	13.4	4	4.5	8	9.8
		don't know	1	1.1	1	1.2	20	22.7	4	4.9
4	Food type that contributes a very small amount of carbohydrate or energy: free food	Any unsweetened food	30	34.1	24	29.3	20	22.7	18	22
		Any dietetic food	28	31.8	15	18.3	29	33	7	8.5
		Any food that says "sugar free" on	16	18.2	17	20.7	14	15.9	10	12.2
		Any food that has less than 20 calories per serving*	13	14.8	16	19.5	11	12.5	30	36.6
		don't know	1	1.1	10	12.2	14	15.9	17	20.7

Table 4.12. Aggregate Scores of family members of DM Patients on Diabetes Knowledge: Blood glucose

			Baseline (P1)				Post-intervention (P2)			
			Control (88		Interv. (82)		Control (88)		Interv. (82)	
			f	%	f	%	f	%	f	%
1	Average duration of blood glucose level which Glycosylated haemoglobin (HbA1c) measures	one day	19	21.6	19	23.2	10	11.4	9	11
		One week	35	39.8	16	19.5	12	13.6	5	6.1
		6-10 weeks*	11	12.5	10	12.2	14	15.9	53	64.9
		6 months	8	9.1	10	12.2	10	11.4	3	3.7
		don't know	12	13.6	27	32.9	42	47.7	12	14.6
2	Best method for testing blood glucose level	Urine testing	8	9.1	8	9.8	6	6.8	3	3.7
		Blood testing*	49	55.7	52	63.4	55	62.5	63	76.8
		Both are equally good	29	33.0	22	26.8	25	28.4	13	15.9
		don't know	2	2.3	0	0	2	2.3	3	3.7
						;				
3	Effect of unsweetened fruit juice on blood glucose	Lowers it	52	59.1	43	52.4	44	50	25	30.5
		Raises it*	13	14.8	9	11.0	13	14.8	37	45.1
		has no effect	4	4.5	14	17.1	16	18.2	11	13.4
		makes it fluctuate	5	5.7	15	18.3	6	6.8	3	3.7
		don't know	14	15.9	8	9.7	9	10.2	6	7.3
4	Ineffective treatment for low blood glucose	3 cubes of sugar	48	54.5	31	37.8	27	30.7	49	59.8
		orange juice	20	22.7	11	13.4	28	31.8	6	7.3
		diet soft drink*	1	1.1	8	9.8	1	1.1	1	1.2
		skim milk like three-crowns milk	15	17.0	31	37.8	14	15.9	20	24.4
		don't know	4	4.5	1	1.2	18	20.5	6	7.3
5	Effect of exercise on normal blood glucose	Lowers it*	59	67.0	57	69.5	73	83	62	75.6
		Raises it	10	11.4	8	9.8	5	5.7	12	14.6
		has no effect	14	15.9	10	12.2	7	8	5	6.1
		don't know	5	5.7	7	8.5	3	3.4	3	3.7

*Correct option

Table 4.13. Aggregate Scores of family members of DM Patients on Diabetes Knowledge: Diabetes complications

			Baseline (P1)				Post-intervention (P2)			
			Control (88		Interv. (82)		Control (88)		Interv. (82)	
			f	%	f	%	f	%	f	%
1	Effect of infection on blood glucose	an increase in blood glucose*	61	69.3	46	56.1	46	52.3	61	74.4
		a decrease in blood glucose	9	10.2	7	8.5	11	12.5	9	11
		no change in blood glucose	11	12.5	16	19.5	8	9.1	4	4.9
		don't know	6	6.8	10	12.2	23	26.1	8	9.8
2	The best way to take care of the feet	look at and wash them each day*	56	63.6	47	57.3	60	68.2	63	76.8
		massage them with alcohol each	7	8.0	7	8.5	5	5.7	2	2.4
		soak them for one hour each day	5	5.7	7	8.5	3	3.4	4	4.9
		buy shoes a size larger than usual	14	15.9	10	12.2	6	6.8	7	8.5
		don't know	6	6.8	11	13.4	14	15.9	6	7.3
3	Disease risk lowered by decrease in fat consumption	Nerve disease	12	13.6	10	12.2	8	9.1	10	12.2
		Kidney disease	32	36.4	19	23.2	24	27.3	14	17.1
		heart disease*	27	30.7	32	39.0	31	35.2	47	57.3
		eye disease	7	8.0	10	12.2	5	5.7	5	6.1
		don't know	10	11.3	11	13.4	20	22.7	6	7.3
4	Disease-causing symptoms of numbness and tingling	Kidney disease	23	26.1	13	15.9	15	17	14	17.1
		nerve disease*	37	42.0	28	34.1	27	30.7	43	52.4
		eye disease	9	10.2	14	17.1	7	8	3	3.7
		liver disease	6	6.8	5	6.1	3	3.4	7	8.5
		don't know	13	14.8	22	26.8	36	40.9	15	18.3
5	Which of the following is usually not associated with diabetes	vision problem	15	17.0	16	19.5	11	12.5	7	8.5
		kidney problem	10	11.4	12	14.6	3	3.4	9	11
		nerve problem	18	20.5	16	19.5	17	19.3	9	11
		lung problem*	34	38.6	26	31.7	30	34.1	50	61
		don't know	11	12.5	12	14.7	27	30.7	7	8.5

*Correct option

Figure 4.3: Diabetes Knowledge of family members

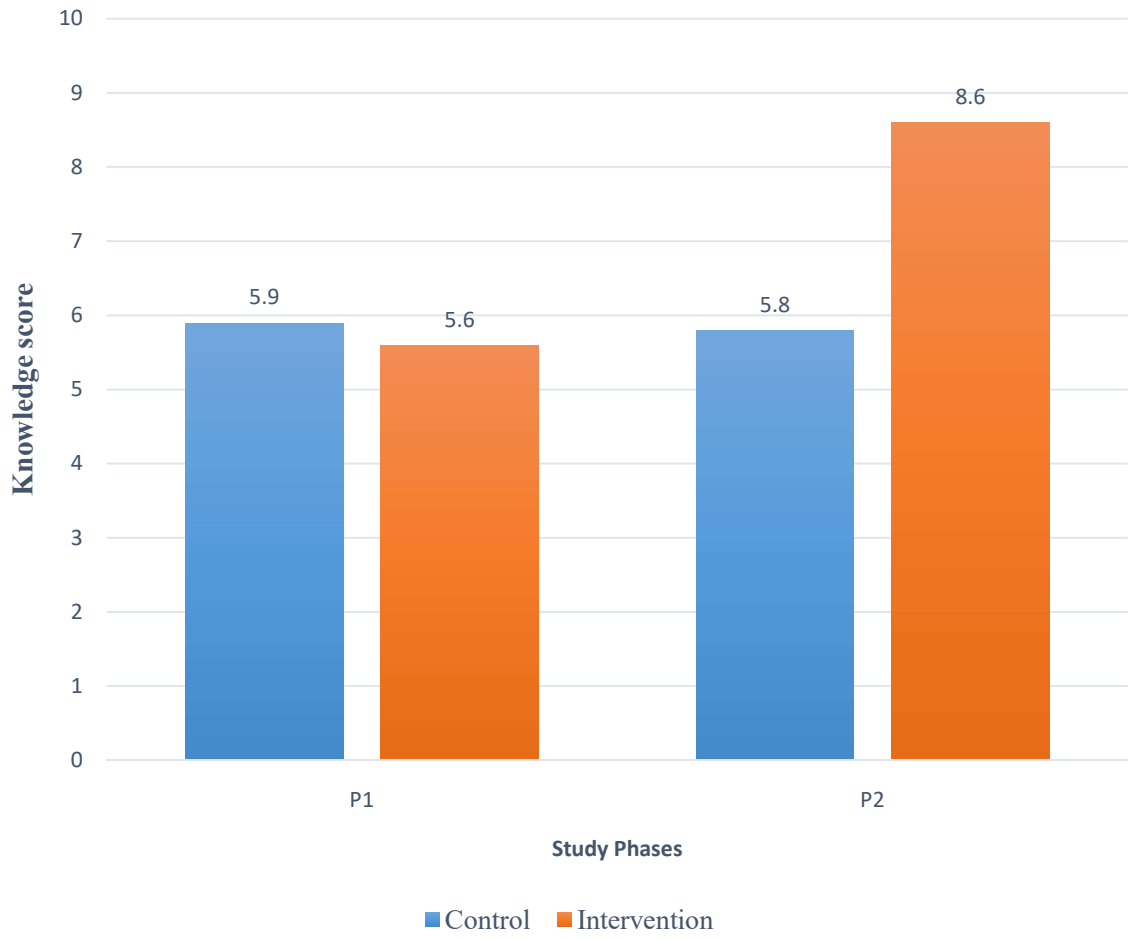


Table 4.14. Comparison of the diabetes Knowledge of family members of DM patients, within and between groups

	Control		Intervention				
	n	$\overline{x}$(±)	n	χ(±)	mean diff.	t-value	p-value
P1	88	5.9 (2.3)	82	5.6 (2.4)	- 0.448	1.343	0.181
Minimum		1.0		1.0			
Maximum		11.0		11.0			
P2	88	5.8 (2.2)	82	8.6 (3.0)	2.840	-7.100	<0.01*
Minimum		1.0		1.0			
Maximum		13.0		14.0			
Mean diff	0.125		-3.012				
t-value	0.393		-6.679				
p-value	0.769		<0.01*				

*** Significant at < 0.01**

Table 4.15. Regression analysis to show the independent effect of family members' knowledge on HbA1c, while holding the patients' knowledge constant

	β	P-value	Lower C.I	Upper C.I
Independent Knowledge of family members	-0.089	0.033	-.0.172	-.007
Knowledge of family members adjusting for Patients' knowledge	-0.096	0.024*	-0.179	-0.013
Knowledge of family members adjusting for Hba1c	-0.107	0.086	-0.230	0.015

* Significant at < 0.05; C.I: Confidence interval at 95%.

The aggregate scores of family members on diabetes self-care knowledge are presented in tables 4.16 - 4.18. Regarding the question on whether 'since HbA1c test is expensive, fasting blood sugar should be used to substitute it', at baseline, 13.1% of those in the control group answered this question correctly, while 11.2% of those in the intervention group also answered correctly. At post-intervention however, 13.6% of those in the control group and a greater percentage (29.6%) of those in the intervention group answered correctly.

The mean values of diabetes self - care knowledge of family members in the intervention and control groups are presented inFigure 4.4 and it shows that whereas at baseline, (P1) family members in the control group had a higher knowledge than those in the intervention group, being 21.4 and 19.2 respectively; at post-intervention, (P2) those in the intervention group had increased mean value (21.2) while those in the control group remained relatively static, (21.6).

Table 4.19 shows the comparison of the mean values of both intervention and control groups. Results reveal that at baseline, family members in the control group had a significantly higher level of diabetes self - care knowledge compared to those in the intervention group, ($p = 0.001$). However, at post-intervention, there was no significant difference in the self -care knowledge between the two groups, indicating an improvement in the intervention group. The Paired t-test indicates that at post-intervention, family members in the intervention group had a significantly higher ($p< 0.05$) mean self-care knowledge score compared to their baseline knowledge score whereas this was not so for family members in the control group.

Table 4.16 Diabetes self-care knowledge scores of family members: Blood glucose control and lifestyle

No.	Questions		BASELINE				POST- INTERVENTION			
		Response	Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			freq.	%	Freq.	%	freq.	%	freq.	%
1	Using fasting blood glucose to monitor blood glucose control over an extended period given that the glycosylated haemoglobin (HbA1C) test is expensive is a good option	Yes	69	78.4	65	79.3	71	80.7	46.0	56.1
		No*	19	12.5	8	9.8	12	13.6	24.0	29.3
		Don't know	8	9.1	9	11.0	5	5.7	12.0	14.6
2	Writing out dietary instructions for patients even if illiterate since someone at home could interpret this for the patient is helpful	Yes*	84	95.5	75	91.5	85	96.6	69.0	84.1
		No	4	4.5	7	8.6	3	3.4	13.0	15.9
3	Doctors are solely responsible for making plans on how an individual having diabetes could attain target goals.	Yes	61	69.3	51	62.2	44	50	35.0	42.7
		No*	25	28.4	27	32.9	43	48.9	41.0	50.0
		Don't know	2	2.3	4	4.9	1	1.1	6.0	7.3
4	Measurement of blood glucose ought to precede and come after all planned physical activity.	Yes*	72	81.8	70	85.4	82	93.2	71.0	86.6
		No	16	18.2	12	14.6	6	6.8	11	13.14
5	A person with diabetes ought to have physical activity for 20-30 minutes for 3 days per week at the minimum	Yes*	82	93.2	67	81.7	77	87.5	73	89
		No	5	5.7	12	14.6	10	11.4	4	4.9
		Don't know	1	1.1	3	3.7	1	1.1	5	6.1
6	Exercising regularly does not decrease the dosage of insulin or other medications.	Yes	49	55.7	51	62.2	58	65.9	56.0	68.3
		No*	38	43.2	29	35.4	30	34.1	26.0	31.7
7	Having a healthy weight is not an essential component of diabetes management.	Yes	24	27.3	35	42.7	26	29.5	31.0	37.8
		No*	63	71.6	47	57.3	62	70.5	51.0	62.2
8	An individual with diabetes should only seek assistance from health care personnel when feeling sick.	Yes	45	51.1	43	52.4	44	50	34.0	41.5
		No*	42	47.7	38	46.3	44	50	48.0	58.5
9	Cigarette smoking and alcohol ingestion in excess can make diabetes take a turn for the worse	Yes*	78	88.6	80	81.6	84	95.5	72.0	87.8
		No	8	9.1	18	18.4	9	10.6	10.0	12.2
10	It is a waste of money for people with diabetes to take medications while feeling good.	Yes	15	17.0	24	29.3	12	13.6	25.0	30.5
		No*	73	83.0	55	67.1	76	86.4	57.0	69.5
11	Alcohol ingestion along with diabetes medication does not constitute a grave problem.	Yes	9	10.2	22	26.9	12	13.6	24.0	29.3
		No*	79	89.8	60	73.2	76	86.4	58.0	70.7

Table 4.17 Diabetes self-care knowledge scores of family members: Use of medication

	Questions	Response	BASELINE				POST- INTERVENTION			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			freq.	%	freq.	%	freq.	%	freq.	%
1	Diet and exercise are not as important as medication in the control of diabetes.	Yes	45	51.1	45	54.9	34	38.6	44	53.7
		No*	43	48.9	37	45.1	54	61.4	38	46.3
2	Sometimes, persons with diabetes may not strictly follow instructions about medications and other self-care practices.	Yes	21	23.9	27	32.9	20	22.7	14	17.1
		No*	66	75.0	53	64.6	65	73.9	60	73.2
		Don't know	1	1.1	2	2.4	3	3.4	8	9.8
3	When an individual with diabetes is feeling well, routine check-ups are not crucial to the management	Yes	22	25.0	18	22.0	16	18.2	22	26.8
		No*	65	73.9	62	75.6	72	81.8	60	73.2
4	Ingestion of low dose of an anticoagulant such as Aspirin can reduce the danger of developing heart attack and stroke.	Yes*	54	61.4	47	57.3	52	59.1	47.0	57.3
		No	25	28.4	26	31.7	30	34.1	24.0	29.3
		Don't know	9	10.2	9	11.0	6	6.8	11.0	13.4
5	Diabetes drugs are only taken for a period and not throughout the entire life.	Yes	34	38.6	39	47.6	25	28.4	31.0	37.8
		No*	50	56.8	39	47.6	60	68.2	43.0	52.4
		Don't know	4	4.5	4	4.9	3	3.4	8.0	9.8
6	On commencing insulin treatment for patients who need it, suitable advice on Self-Blood Glucose Monitoring (SBGM), as well as dietary intake, should be provided.	Yes*	75	85.2	69	84.1	76	86.4	67.0	81.7
		No	8	9.1	7	8.5	7	8	3.0	3.7
		Don't know	5	5.7	5	6.1	5	5.7	12.0	14.6
7	Individuals with diabetes and their doctors should have a mutual understanding if such a person is unable to change a specific lifestyle or afford medications	Yes*	67	76.1	60	73.2	65	73.9	59.0	72.0
		No	17	19.3	19	23.2	20	22.7	12.0	14.6
		Don't know	4	4.5	3	3.7	3	3.4	11.0	13.4
8	Personal care of the feet particularly when trimming the nails is an integral aspect of diabetes care	Yes*	84	95.5	78	95.1	87	98.9	75.0	91.5
		No	3	3.4	1	1.2	1	1.1	7.0	8.5
9	Tight and elastic socks can be worn by persons with diabetes without any problem	Yes	48	54.5	45	52.4	36	40.9	32.0	39
		No*	39	44.3	39	47.6	52	59.1	50.0	61

Table 4.18 Diabetes self-care knowledge scores of family members Prevention of complications

		Response	BASELINE				POST- INTERVENTION			
			Control (88)		Interv. (82)		Control (88)		Interv. (82)	
			freq.	%	freq.	%	freq.	%	freq.	%
1	People with diabetes ought to care of their teeth by daily brushing and flossing.	Yes*	82	93.2	75	89.0	86	97.7	74	90.2
		No	6	6.8	9	11.0	2	2.2	8	9.7
2	When the blood glucose level is near being normal, an individual with diabetes usually has more energy, is not very thirsty and does not urinate too frequently.	Yes*	74	84.1	68	82.9	70	79.5	66	80.5
		No	10	11.4	8	9.8	13	14.8	9	11
		Don't know	4	4.5	6	7.3	5	5.7	7	8.5
3	It is only qualified health personnel in the hospital who should monitor the blood glucose level and blood pressure of people with diabetes.	Yes	61	69.3	46	56.1	52	59.1	47	57.4
		No*	25	28.4	34	41.5	36	40.9	35	42.7
4	Changes in the eyesight ought to be made known to the doctor no matter how little.	Yes*	84	95.5	74	90.2	83	94.3	74.0	90.2
		No	3	3.4	3	3.7	5	5.6	8.0	9.8
5	Performing self-blood glucose monitoring makes it possible for health care professionals to obtain information to aid decision-making.	Yes*	83	94.3	64	78.0	81	92	70.0	85.4
		No	3	3.4	18	21.9	7	7.9	12.0	14.6
6	Self-blood glucose monitoring makes it possible for individuals with diabetes to detect and correct changes	Yes*	80	90.9	65	79.3	79	89.8	60.0	73.2
		No	5	5.7	14	17.1	9	10.2	22.0	26.8
7	High blood glucose level is manifested by confusion, sweating, shaking, and behavioural changes.	Yes	75	85.2	64	78.0	68	77.3	34.0	41.5
		No*	11	12.5	12	14.6	15	17	43.0	52.4
		Don't know	2	2.3	6	7.3	5	5.7	5.0	6.1
8	Eye problem or damage can be caused by long-term uncontrolled blood glucose.	Yes*	84	95.5	68	82.9	82	93.2	67.0	81.7
		No	3	3.4	14	17.2	6	6.8	15.0	18.3
9	Blood glucose monitoring is more crucial that blood pressure monitoring in diabetes care.	Yes	37	42.0	39	47.6	23	26.2	35.0	42.7
		No*	51	58.0	43	52.4	65	73.9	47.0	57.3
10	Kidney failure, stroke and heart attack can be caused by poor blood glucose control.	Yes*	80	90.9	72	87.8	80	90.9	73.0	89.0
		No	8	9.1	10	12.2	8	9.1	9.0	11.0

* Correct option

Fig. 4.3 **Diabetes self-care knowledge of family members**

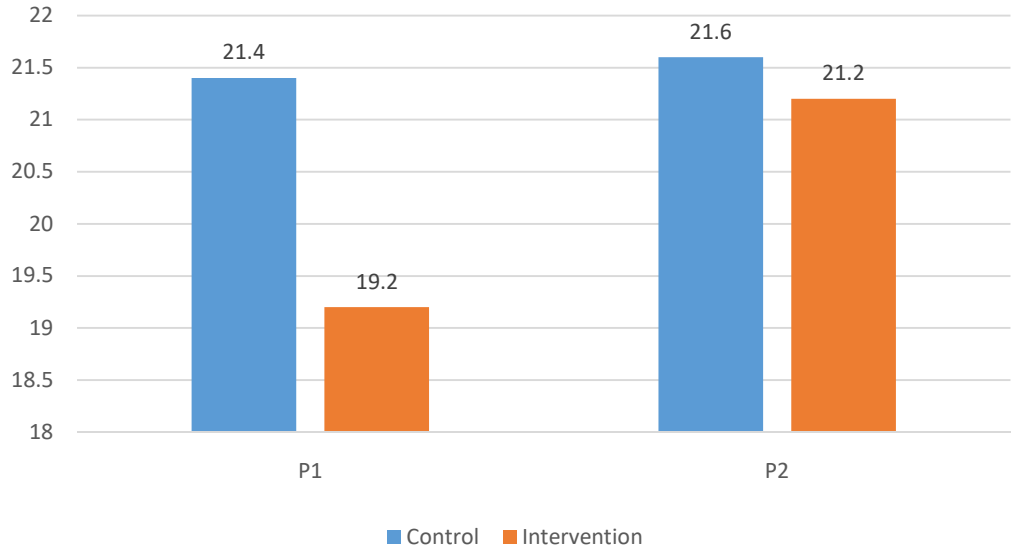


Table 4.19. Comparison of the diabetes self-care knowledge of family members of DM patients, within and between groups

	Control		Intervention			
	n	χ (±)	n	χ (±)	mean diff.	t-value	p-value
P1	88	21.4 (3.4)	82	19.2 (5.4)	2.227	3.240	0.001**
Minimum		13.0		9.0			
Maximum		28.0		27.0			
P2	88	21.6(3.2)	82	21.2 (6.0)	0.470	0.639	0.524
Minimum		13.0		11.0			
Maximum		27.0		28.0			
Mean diff	-0.299		-2.050				
t-value	-0.478		-2.194				
p-value	0.634		0.031*				

**** Significant at < 0.01**

***** Significant at < 0.05**

4.6. DIABETES SELF – MANAGEMENT

The aggregate score on diabetes self-management on tables 4.20 – 4.22 shows that at three-month post-intervention, only a small percentage of patients in the intervention group (5.1%) stated that 'checking their blood sugar levels with care and attention' did not apply to them, unlike the control group where 56.5% made this assertion. Likewise, at three-month post-intervention, 57% of patients in the intervention group and 15.3% of those in the control group stated that the statement 'The food I select to eat easily enables me to attain optimal blood glucose levels' applied to them very much. At six-month post-intervention however, 79.5% of patients in the control group and 71.6% of those in the intervention group made this same assertion.

Figure 4.5shows the trend in the diabetes self-management (DSM) of patients in the intervention and control groups. The graph shows some level of difference at the baseline between the two groups with those in the intervention group having lower DSM, (control group 51.1; intervention 49.4) Following the intervention, the participants in the intervention group had a steady improvement in the DSM – 53.4 at P3 and 57.5 at P4 - as shown by the graph points at P3 & P4, i.e. three and six–month post-intervention respectively. On the other hand, DM patients in the control group had a slight increase in their DSM at P3 – 52.3 - then a high level of increase at P4 – 57.3.

Table 4.23 is used to illustrate the difference in diabetes self-management (DSM) of patients in the intervention and control groups during the three stages of the study. There was no significant difference in the Diabetes Self - Management at baseline (P1), and three and six-month post-intervention, (P3 & P4), ($p > 0.05$).

Table 4.24 showsresults of **c**omparisons of differences between the baseline and post-intervention, (at three and six months) diabetes self - management (DSM) of the intervention group in which there is a significant difference ($p<0.01$). In the control group, however, the difference in DSM was not seen at three-month post-intervention but between three and six-month post-intervention and between the baseline and six-month post-intervention.

Table 4.20 Aggregate diabetes self-management scores of patients: Self glucose monitoring & dietary adherence.

			Baseline (P1)				Post-intervention (P3)				Post-intervention (P4)			
			Control 88		Interv.82		Control 85		Interv. 79		Control 78		Interv. 74	
			f	%	f	f %	f	%	f	%	f	%	f	%
1	I assess my blood glucose levels with care and attention.	Applies to me very much*	47	53.4	34	41.5	18	21.2	46	58.8	61	78.2	57	77
		Applies to a considerable degree	10	11.4	20	24.4	6	7.1	16	20.3	10	12.8	10	12.8
		Applies to me to some degree	10	11.4	7	8.5	13	15.3	13	16.5	7	9	4	5.4
		Does not apply to me	19	21.6	20	24.4	48	56.5	4	5.1	0	0	3	4.1
2	My food selection makes achieving optimal blood sugar levels easy	Applies to me very much*	45	51.1	36	43.9	13	15.3	45	57	62	79.5	53	71.6
		Applies to a considerable degree	17	19.3	20	24.4	6	7.1	25	31.6	8	10.3	12	16.2
		Apply to me to some degree	9	10.2	12	14.6	18	21.2	8	10.1	7	9	5	6.8
		Does not apply to me	16	18.2	12	14.6	48	56.5	1	1.3	1	1.3	4	5.4
3	I document my blood glucose levels habitually	Applies to me very much*	59	67.0	59	45	54.9	18.8	36	45.6	55	70.5	53	71.6
		Applies to a considerable degree	12	13.6	12	14	17.1	16.5	25	31.6	9	11.5	9	12.2
		Applies to me to some degree	5	5.7	5	8	9.8	12.9	5	6.3	7	9.0	6	8.1
		Does not apply to me	11	12.5	11	14	17.1	51.8	13	16.5	7	9.0	6	8.1
4	I faithfully keep to the dietary suggestions set by my doctor	Applies to me very much*	49	55.7	49	42	51.2	16.5	48	60.8	61	78.2	55	74.3
		Applies to a considerable degree	9	10.2	9	19	23.2	14.1	22	27.8	11	14.1	11	14.9
		Applies to me to some degree	4	4.5	4	6	7.3	18.8	7	8.9	5	6.4	4	5.4
		Does not apply to me	23	26.1	23	13	15.9	50.6	2	2.5	1	1.3	4	5.4
5	Sometimes I take a lot of sweets or other foods high in carbohydrates.	Applies to me very much	14	15.9	11	13.4	7	8.2	4	5.1	1	1.3	1	1.4
		Applies to a considerable degree	10	11.4	10	12.2	9	10.6	11	13.9	6	7.7	5	6.8
		Apply to me to some degree	15	17.0	14	17.1	28	32.9	21	26.6	23	29.5	13	17.6
		Does not apply to me*	47	53.4	44	53.7	41	48.2	43	54.4	48	61.5	55	74.3
6	I fail to assess my blood glucose levels often as required for good glucose control.	Applies to me very much	36	40.9	30	36.6	17	20	7	8.9	12	15.4	8	10.8
		Applies to a considerable degree	16	18.2	22	26.8	10	11.8	11	13.9	3	3.8	3	4.1
		Apply to me to some degree	8	9.1	8	9.8	16	18.8	10	12.7	6	7.7	4	5.4
		Does not apply to me*	27	30.7	20	24.4	42	49.4	51	64.6	57	73.1	59	79.7
7	Sometimes I have real ‘food indulgence’	Applies to me very much	15	17.0	14	17.1	8	9.4	6	7.6	4	5.1	9	12.2
		Applies to a considerable degree	2	2.3	6	7.3	13	15.3	7	8.9	6	7.7	3	4.1
		Applies to me to some degree	2	2.3	3	3.7	15	17.6	16	20.3	16	20.5	13	17.6
		Does not apply to me*	68	77.3	55	67.1	49	57.6	50	63.3	52	66.7	49	66.2

Table 4.21 Aggregate diabetes self-management scores of patients: Follow-up appointments and medication adherence

			Baseline (P1)				Post-intervention (P3)				Post-intervention (P4)			
			Control 88		Interv.82		Control 85		Control 79		Interv.78		Control 74	
			f	%	f	%	f	%	f	%	f	%	f	%
1	I follow all doctors' schedules needed for my diabetes care	Applies to me very much*	49	55.7	29	35.4	18	21.2	59	74.7	68	87.	57	77
		Applies to a considerable	16	18.2	28	34.1	3	3.5	14	17.7	5	6.4	6	8.1
		Applies to me to some degree	10	11.4	13	15.9	11	12.9	6	7.6	2	2.6	8	10.8
		Does not apply to me	11	12.5	10	12.2	53	62.4	0	0	3	3.8	3	4.1
2	I take my diabetes medicine (e. g. tablets, insulin,) as recommended	Applies to me very much*	57	64.8	34	41.5	15	17.6	54	68.4	68	87.	65	87.8
		Applies to a considerable	14	15.9	21	25.6	8	9.4	16	20.3	5	6.4	5	6.8
		Applies to me to some degree	4	4.5	11	13.4	6	7.1	6	7.6	2	2.6	4	5.4
		Does not apply to me	12	13.6	14	17.1	56	65.9	3	3.8	3	3.8	0	0
3	I sometimes miss doctors' appointments	Applies to me very much	21	23.9	19	23.2	13	15.3	5	6.3	12	15.	2	2.7
		Applies to a considerable	6	6.8	12	14.6	4	4.7	4	5.1	1	1.3	5	6.8
		Applies to me to some degree	10	11.4	3	3.7	5	5.9	3	3.8	3	3.8	4	5.4
		Does not apply to me*	49	55.7	46	56.1	63	74.1	67	84.8	62	79.	63	85.1
4	I often forget to take my diabetes medicine	Applies to me very much	15	17.0	14	17.1	13	15.3	5	6.3	2	2.6	4	5.4
		Applies to a considerable	3	3.4	7	8.5	9	10.6	2	2.5	2	2.6	3	4.1
		Applies to me to some degree	6	6.8	10	12.2	8	9.4	7	8.9	6	7.7	4	5.4
		Does not apply to me*	63	71.6	49	59.8	55	64.7	65	82.3	68	87.	63	85.1
5	I ought to see my medical practitioner(s) more often as regards my diabetes care.	Applies to me very much	17	19.3	15	18.3	33	38.8	26	32.9	20	25.	20	27
		Applies to a considerable	4	4.5	4	294	12	14.1	10	12.7	7	9	7	9.5
		Applies to me to some degree	8	9.1	14	17.1	12	14.1	12	15.2	6	7.7	5	6.8
		Does not apply to me*	57	64.8	48	58.5	28	32.9	31	39.2	45	57.	42	56.8

Table 4.22 Aggregate diabetes self-management scores of patients: Adherence to physical activities & overall self-rating

			Baseline (P1) Control 88		Interv.82		Post-intervention (P3) Control 85		Interv. 79		Post-intervention (P4) Control 78		Interv. 74	
			f	%	f	%	f	%	f	%	f	%	f	%
1	I engage in regular exercise to achieve effective blood glucose level	Applies to me very much*	14	17.0	18	12.2	16	18.8	38	48.1	60	76.9	47	63.5
		Applies to a considerable degree	13	14.8	18	22.0	9	10.6	14	17.7	7	9.0	10	13.5
		Applies to me to some degree	11	12.5	14	17.1	21	24.7	19	24.1	8	10.3	10	13.5
		Does not apply to me	49	55.7	32	39.0	39	45.9	8	10.1	3	3.8	7	9.5
2	I skip exercise though it would improve my diabetes.	Applies to me very much	45	51.1	36	43.9	10	11.8	4	5.1	6	7.7	7	9.5
		Applies to a considerable degree	6	6.8	14	17.1	8	9.4	7	8.9	2	2.6	6	8.1
		Applies to me to some degree	7	8.0	10	12.2	7	8.2	15	19	9	11.5	9	12.2
		Does not apply to me*	30	34.1	22	26.8	60	70.6	53	67.1	61	78.2	52	70.3
3	I often fail to keep to planned physical activity.	Applies to me very much	12	13.6	15	18.3	15	17.6	6	7.6	4	5.1	5	6.8
		Applies to me to a considerable	9	10.3	14	16.1	11	12.9	10	12.7	15	19.2	5	6.8
		Applies to me to some degree	16	18.2	12	14.6	14	16.5	18	22.8	59	75.6	8	10.8
		Does not apply to me*	51	58.0	41	50.0	45	52.9	45	57	0	0	56	75.7
4	My diabetes self-care is poor.	Applies to me very much	20	22.7	19	23.2	17	20	8	10.1	9	11.5	10	13.5
		Applies to me to a considerable	3	4.5	16	19.5	9	10.6	10	12.7	3	3.8	2	2.7
		Applies to me to some degree	9	10.2	12	14.6	8	9.4	8	10.1	4	51	4	5.4
		Does not apply to me*	55	62.5	35	42.7	51	60	53	67.1	62	79.5	58	78.4

* Negatively worded items were reversed, thus these were the highest scores

Figure 4.4: Mean DSM of patients during the study phases

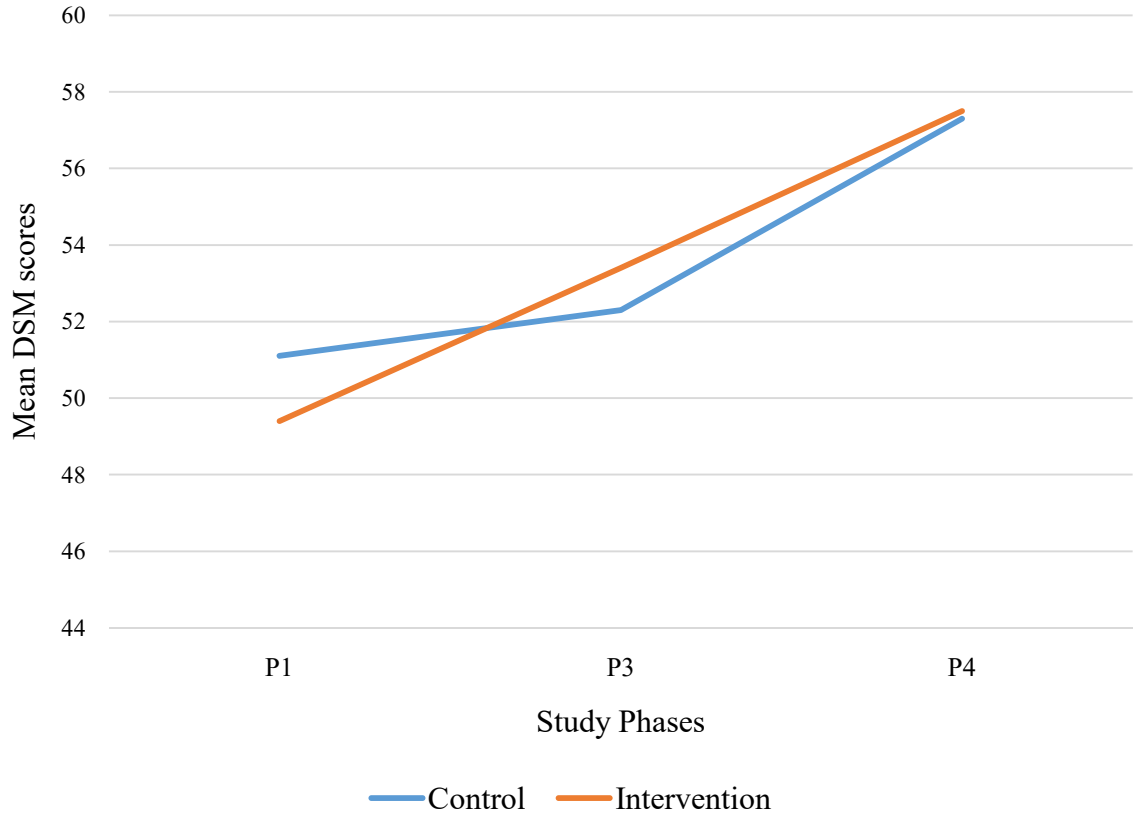


Table 4.23. Diabetes self - management of participants during the three phases of the study

Study phase	Study group	Mean (S.D.)	mean diff.	t – value	p value
P1	Control Intervention	51.1 (9.0) 49.4 (10.1)	1.759	1.201	0.231
P3	Control Intervention	52.3 (7.6) 53.4 (7.3)	- 1.33	-.973	0.332
P4	Control Intervention	57.3 (6.6) 57.5 (7.0)	-.1396	-.127	0.899

Table 4.24. Repeated Measures ANOVA showing within-group differences in the Diabetes self - management at different study phases

Study group		Mean	mean diff.	Std error	p - value
Intervention	P1 P3	49.0 53.2	-4.203	1.398	0.004**
	P1 P4	49.0 57.5	-8.446	1.365	<0.01**
	P3 P4	53.2 57.5	-4.243	1.098	<0.01**
Control	P1 P3	50.9 52.3	-1.449	1.352	0.287
	P1 P4	50.9 57.9	-6.97	1.270	<0.01**
	P3 P4	52.3 57.9	-5.526	1.230	<0.01**

**significant at < 0.01

4.7. PERCEPTION OF FAMILY SUPPORT

At six- month post-intervention, 75.7% of patients in the intervention group 'strongly agreed' that 'they relied on their family for emotional support regarding coping with diabetes' while 69.2% of those in the control group made this assertion. Also, at six-month post-intervention, 74.3% of patients in the intervention group 'strongly agreed' that there is a member of their family they could go to if they were just feeling down about diabetes without feeling funny about it later, while a 59% of those in the control group made this assertion. Similarly, at six-month post-intervention, 78.4% of patients in the intervention group as opposed to 64.1% of those in the control group 'strongly agreed' that members of their family are good at helping them solve problems to do with diabetes. These results are presented in table 4.25 – 4.28

Mean values of patients' scores on the perception of family support is presented infigure 4.5 which shows an increase in family support among patients in the intervention group at P3 (three months post-intervention) and P4, (six months post-intervention): P1 value 63.0, P3 value = 64.5 and P4 value = 71.2. On the other hand, patients in the control group did not experience any increase at P3, although there was an appreciable increase in the group at P4; P1 value 63.8, P3 value 63.5 and P4 value 69.0.

Independent t-test on the differences in the perception of family support (Table 4.29) among diabetes patients during the three phases of the study shows no significant difference between the intervention and control groups, ($p > 0.05$).

Table 4.30 shows that diabetes patients in the intervention group had a significantly higher score on the perception of family support at six-month post-intervention, ($p < 0.01$), although the increase was not significant at three -month post- intervention. The difference between the three and six - month post-intervention scores was also significant. Likewise, patients in the control group had a significant increase in the perception of family support, ($p<0.05$) Also, the difference between the three and six-month post-intervention PFS was significant ($p<0.01$).

Table 4.25 Aggregate Perception of family support scores of patients: Assistance with diabetes management

No	Item	Response	P1 (Baseline)				P3 (Post interv.)				P4 (Post interv.)			
			Control (88)		Interv. (82)		Control (85)		Interv. (79)		Control (78		Interv. (74)	
			f	%	f	%	f	%	f	%	f	%	f	%
1	My family and I have open discussion about my diabetes care	Strongly disagree	11	12.5	7	8.5	3	3.5	6	7.6	1	1.3	4	5.4
		Disagree	5	5.7	3	3.7	2	2.4	2	2.5	2	2.6	1	1.4
		Agree	19	21.6	27	32.9	24	28.2	19	24.1	9	11.5	9	12.2
		Strongly agree	52	59.1	45	54.9	55	64.7	52	65.8	63	80.8	59	79.7
		Undecided	1	1.1	0	0	1	1.2	0	0	3	3.8	1	1.4
2	Concerning my diabetes care, I get good useful ideas from my family members	Strongly disagree	7	8.0	5	6.1	8	9.4	7	8.9	5	6.4	9	12.2
		Disagree	14	15.9	6	7.3	6	7.1	6	7.6	3	3.8	2	2.7
		Agree	20	22.7	36	43.9	29	34.1	23	29.1	12	15.4	13	17.6
		Strongly agree	46	52.3	35	42.7	42	49.4	42	53.2	53	67.9	49	66.2
		Undecided	1	1.1	0	0	0	0	1	1.3	5	6.4	1	1.4
3	I get the impression that my family members feel uncomfortable when I confide in them regarding my diabetes	Strongly disagree	40	45.5	36	43.9	14	16.5	36	45.6	50	64.1	51	68.9
		Disagree	16	18.2	15	18.3	10	11.8	10	12.7	11	14.1	8	10.8
		Agree	12	13.6	9	11.0	18	21.2	10	12.7	6	7.7	5	6.8
		Strongly agree	15	17.0	16	19.5	41	48.2	20	25.3	9	11.5	9	12.2
		Undecided	5	5.6	6	7.3	2	2.4	3	3.8	2	2.6	1	1.4
4	I share several interests with my family members and they are also interested in my diabetes	Strongly disagree	43	48.9	41	50.0	6	7.1	4	5.1	2	2.6	1	1.4
		Disagree	21	23.9	12	14.6	2	2.4	4	5.1	3	3.8	2	2.7
		Agree	7	8.0	14	17.1	37	43.5	30	38	17	21.8	13	17.6
		Strongly agree	15	17.0	10	12.2	38	44.7	41	51.9	56	71.8	58	78.4
		Undecided	2	2.3	5	6.1	2	2.4	0	0	0	0	0	0
5	I rely on my family for emotional support regarding coping with diabetes	Strongly disagree	8	9.1	3	3.7	7	8.2	2	2.5	1	1.3	3	4.1
		Disagree	9	10.2	6	7.3	6	7.1	10	12.7	5	6.4	4	5.4
		Agree	21	23.9	38	46.3	26	30.6	27	34.2	16	20.5	10	13.5
		Strongly agree	49	55.7	34	41.5	41	48.2	38	48.1	54	69.2	56	75.7
		Undecided	1	1.1	1	1.2	5	5.9	2	2.5	2	2.6	1	1.4

Table 4.26 Aggregate Perception of family support scores of patients: Positive family relationship

No	Item	Response	P1 (Baseline)				P3 (Post interv.)				P4 (Post interv.)			
			Control (88)		Interv. (82)		Control (85)		Interv. (79)		Control (78		Interv. (74)	
			f	%	f	%	f	%	f	%	f	%	f	%
1	Members of my family are delighted when I share my thoughts.	Strongly disagree	7	8.0	7	8.5	3	3.5	4	5.1	1	1.3	4	5.4
		Disagree	8	9.1	8	9.8	0	0	6	7.6	3	3.8	3	4.1
		Agree	23	26.1	25	30.5	36	42.4	27	34.2	18	23.1	9	12.2
		Strongly agree	49	55.7	41	50.0	44	51.8	40	50.6	52	66.7	56	75.7
		Undecided	1	1.1	1	1.2	2	2.4	2	2.5	4	5.1	2	2.7
2	I am not as close to my family as most others	Strongly disagree	10	11.4	5	6.1	21	24.7	33	41.8	51	65.4	61	82.4
		Disagree	8	9.1	7	8.5	7	8.2	21	26.6	11	14.1	7	9.5
		Agree	23	26.1	34	41.5	13	15.3	11	13.9	4	5.1	2	2.7
		Strongly agree	46	52.3	35	42.7	36	42.4	12	15.2	7	9	4	5.4
		Undecided	1	1.1	1	1.2	8	9.4	2	2.5	5	6.4	0	0
3	Some members of my family approach me for help or advice.	Strongly disagree	7	8.0	7	8.5	4	4.7	3	3.8	6	7.7	1	1.4
		Disagree	13	14.8	10	12.2	3	3.5	5	6.3	1	1.3	2	2.7
		Agree	23	26.1	31	37.8	43	50.6	27	34.2	15	19.2	13	17.6
		Strongly agree	44	50.0	33	40.2	34	40	40	50.6	55	70.5	58	78.4
		Undecided	1	1.1	1	1.2	1	1.2	4	5.1	1	1.3	0	0
4	I depend on members of my family for psychological support in coping with diabetes	Strongly disagree	12	13.6	13	15.9	7	8.2	2	2.5	1	1.3	3	4.1
		Disagree	14	15.9	7	8.5	6	7.1	10	12.7	5	6.4	4	5.4
		Agree	17	19.3	23	28.0	26	30.6	27	34.2	16	20.5	10	13.5
		Strongly agree	44	50.0	36	43.9	41	48.2	38	48.1	54	69.2	56	75.7
		Undecided	1	1.1	3	3.6	5	5.9	2	2.5	2	2.6	1	1.4
5	My personal needs are easily noticed and given attention by my family	Strongly disagree	9	10.2	4	4.9	4	4.7	4	5.1	1	1.3	3	4.1
		Disagree	4	4.5	5	6.1	2	2.4	5	6.3	2	2.6	3	4.1
		Agree	24	27.3	30	36.6	31	36.5	32	40.5	18	23.1	11	14.9
		Strongly agree	49	55.7	41	50.0	48	56.5	38	48.1	54	69.2	57	77
		Undecided	2	2.2	2	2.4	0	0	0	0	3	3.8	0	0

Table 4.27 Aggregate Perception of family support scores of patients: Emotional support & problem solving

No	Item	Response	P1 (Baseline)				P3 (Post interv.)				P4 (Post interv.)			
			Control (88)		Interv. (82)		Control (85)		Interv. (79)		Control (78		Interv. (74)	
			f	%	f	%	f	%	f	%	f	%	f	%
1	I have a family member I could talk to freely about diabetes without regrets.	Strongly disagree	8	9.1	3	3.7	5	5.9	10	12.7	3	3.8	3	4.1
		Disagree	3	3.4	2	2.4	4	4.7	5	6.3	5	6.4	3	4.1
		Agree	29	33.0	33	40.2	24	28.2	29	36.7	23	29.5	13	17.6
		Strongly agree	46	52.3	43	52.4	50	58.8	35	44.3	46	59	55	74.3
		Undecided	2	2.3	1	1.2	2	2.4	0	0	1	1.3	0	0
2	My family members seek me out for psychological help as well.	Strongly disagree	8	9.1	2	2.4	4	4.7	4	5.1	2	2.6	3	4.1
		Disagree	5	5.7	3	3.7	6	7.1	6	7.6	3	3.8	2	2.7
		Agree	25	28.4	38	46.3	37	43.5	32	40.5	22	28.2	17	23
		Strongly agree	49	55.7	39	47.6	38	44.7	35	44.3	49	62.8	51	68.9
		Undecided	1	1.1	0	0	0	0	2	2.5	2	2.6	1	1.4
3	My family members are contribute to helping me find solutions to diabetes-related challenges	Strongly disagree	13	14.8	4	4.9	5	5.9	3	3.8	2	2.6	3	4.1
		Disagree	3	3.4	5	6.1	1	1.2	6	7.7	2	2.6	1	1.4
		Agree	23	26.1	31	37.8	30	35.3	26	33.3	22	28.2	2	16.2
		Strongly agree	47	53.4	42	51.2	47	55.3	43	55.1	50	64.1	58	78.4
		Undecided	2	2.3	0	0	2	2.4	0	0	2	2.6	0	0
4	I share a deeply caring relationship with many of my family members.	Strongly disagree	5	5.7	5	6.1	4	4.7	3	3.8	3	3.8	3	4.1
		Disagree	5	5.7	2	2.4	0	0	6	7.6	2	2.6	2	2.7
		Agree	24	27.3	41	50.0	32	37.6	30	38	22	28.2	13	17.6
		Strongly agree	49	55.7	34	41.5	49	57.6	38	48.1	49	62.8	56	75.7
		Undecided	5	5.7	0	0	0	0	0	0	2	2.6	0	0
5	I have open discussions with my family members regarding managing my diabetes	Strongly disagree	6	6.8	3	3.7	4	4.7	4	4.7	2	2.6	3	4.1
		Disagree	9	10.2	5	6.1	3	3.5	4	5.1	2	2.6	3	4.1
		Agree	27	30.7	33	40.2	28	32.9	31	39.2	18	23.1	11	14.9
		Strongly agree	42	47.7	41	50.0	50	58.8	40	50.6	52	66.7	57	77
		Undecided	4	4.6	0	0	0	0	0	0	4	5.1	0	0

Table 4.28. Aggregate Perception of family support scores of patients: a positive mutual relationship

No	Item	Response	P1 (Baseline)				P3 (Post interv.)				P4 (Post interv.)			
			Control (88)		Interv. (82)		Control (85)		Interv. (79)		Control (78		Interv. (74)	
			f	%	f	%	f	%	f	%	f	%	f	%
1	My family members get ideas of how to do things from me	Strongly disagree	50	56.8	55	67.1	5	5.9	2	2.5	0	0	2	2.7
		Disagree	12	13.6	12	14.6	5	5.9	6	7.6	1	1.3	2	2.7
		Agree	5	5.7	4	4.9	35	41.2	36	45.6	26	33.3	17	23
		Strongly agree	18	20.5	10	12.2	39	45.9	33	41.8	47	60.3	52	70.3
		Undecided	3	3.4	1	1.2	1	1.2	2	2.5	4	5.1	1	1.4
2	I feel ill at ease when I exchange confidences with family members	Strongly disagree	12	13.6	8	9.8	16	18.8	37	46.8	52	66.7	59	79.7
		Disagree	9	10.2	5	6.1	8	9.4	12	15.2	11	14.1	7	9.5
		Agree	24	27.3	36	43.9	20	23.5	8	10.1	6	7.7	2	2.7
		Strongly agree	39	44.3	30	36.6	41	48.2	20	25.3	5	6.4	5	6.8
		Undecided	4	4.5	3	3.6	0	0	2	2.5	4	5.1	1	1.4
3	Some of my family seek me out for company.	Strongly disagree	10	11.4	7	8.5	5	5.9	9	11.4	11	14.1	10	13.5
		Disagree	7	8.0	6	7.3	10	11.8	4	5.1	3	3.8	3	4.1
		Agree	27	30.7	39	47.6	27	31.8	32	40.5	22	28.2	15	20.3
		Strongly agree	38	43.2	28	34.1	41	48.2	31	39.2	39	50	45	60.8
		Undecided	6	6.8	2	2.4	2	2.4	3	3.8	3	3.8	1	1.4
4	I am convinced that my family members feel that I am good at helping them solve problems	Strongly disagree	48	54.5	53	64.6	5	5.9	7	8.9	5	6.4	5	6.8
		Disagree	6	6.8	10	12.2	4	4.7	5	6.3	4	5.1	2	2.7
		Agree	7	8.0	7	8.5	41	48.2	32	40.5	21	26.9	19	25.7
		Strongly agree	19	21.6	9	11.0	31	36.5	33	41.8	47	60.3	45	60.8
		Undecided	2	2.3	3	3.6	4	4.7	2	2.5	1	1.3	3	4.1
5	Other people have a closer relationship to their family members than I do	Strongly disagree	35	39.8	38	46.3	13	15.3	33	41.8	54	69.2	58	78.4
		Disagree	15	17.0	12	14.6	10	11.8	16	20.3	15	19.2	7	9.5
		Agree	13	14.8	17	20.7	24	28.2	13	16.5	5	6.4	4	5.4
		Strongly agree	21	23.9	9	11.0	30	35.3	16	20.3	2	2.6	2	2.7
		Undecided	4	4.5	10	12.2	8	9.4	1	1.3	2	2.6	3	4.1
6	I wish I belong to another family	Strongly disagree	6	6.8	5	6.1	23	27.1	24	30.8	46	59	52	70.3
		Disagree	9	10.2	2	2.4	15	17.6	19	24.4	8	10.3	6	8.1
		Agree	27	30.7	41	50.0	21	24.7	17	21.8	13	16.7	11	14.9
		Strongly agree	42	47.7	34	41.5	20	23.5	18	23.1	7	9	3	4.1
		Undecided	4	4.6	0	0	6	7.1	0	0	4	5.1	2	2.7

*Negatively worded items were reversed.

Figure 4.6: Perception of family support

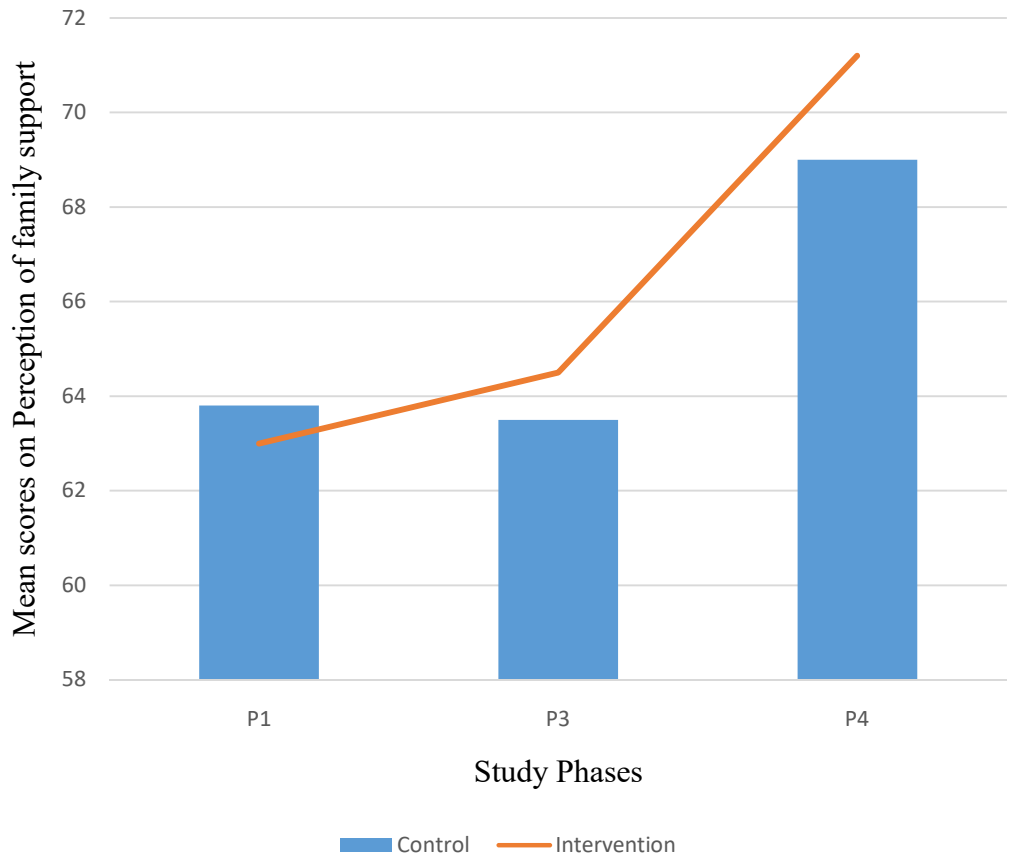


Table 4.29. Perception of family support of Participants during the Three Phases of Study

Study phase	Study group	Mean (S.D.)	mean diff.	t – value	p value
P1	Control	64.4 (12.4)	0.749	.423	0.673
	Intervention	63.7 (10.5)			
P3	Control	63.5 (11.1)	- .938	-.504	0.615
	Intervention	64.5 (12.7)			
P4	Control	69.0 (11.8)	-2.200	-1.041	0.300
	Intervention	71.2 (14.2)			

Table 4.30. Repeated Measures ANOVA showing within – group differences in the Perception of family support at different study phases

Study group		Mean	mean diff.	Std error	p - value
Intervention	P1	64.2	-. 473	1.373	0.731
	P3	64.6			
	P1	64.2	-6.986	1.813	<0.01**
	P4	71.2			
	P3	64.6	-6.514	1.789	0.001**
	P4	71.2			
Control	P1	64.4	0.615***	1.844	0.739
	P3	63.8			
	P1	64.4	-4.564	1.878	0.017*
	P4	69.0			
	P3	63.8	-5.179	1.792	0.005**
	P4	69.0			

*** Decrease from baseline in the control group
Significant at < 0.01
*significant at < 0.05

4.8. QUALITY OF LIFE (QoL) OF THE DIABETES PATIENTS

Table 4.31-4.34 presents the aggregate scores of diabetes patients' QoL. Regarding responses to the item on "I feel that I am useful and needed", at three months post-intervention, 58.2% of patients in the intervention group chose 'all the time' while just 20% of patients in the control group made this assertion. Also, three months after the intervention, 50.6% of patients in the intervention group reported that 'they enjoyed the things they do', against only 17.7% in the intervention group. At six-month post-intervention however, there was only a slight difference between the patients in the two groups regarding this item. Similarly, the percentage of patients in the intervention group who chose the response 'Not at all' to the question on 'I feel afraid for no reason at all' was 36.7% at three-month post-intervention, only 11.8% of patients in the control group chose this response.

DM patients' mean scores on QoL are presented in figure 4.6 using bar charts for the three periods of data collection and it shows marked increase in the QoL of patients in the intervention group over the study period, being 48.8 at baseline (P1), 51.7 at three-month post-intervention (P3) and 56.2 at six-month post-intervention (P4). However, patients in the control group did not show appreciable increase until the six-month post-intervention period, scoring 50.5 at P1, 51.3 at P3 and 55.0 at P4.

Independent t-test results at P1, P3 and P4 are presented in table 4.35. There was no significant difference in the quality of life of patients with diabetes at the commencement of the study and during the three and six – month follow – up periods, $p > 0.05$.

QoL categorization into 'good' and 'poor' (table 4.36) shows that at baseline there was a statistically significant proportion of patients in the control group with good quality of life, (control group 62.45; intervention group 50.6%). However, at six-month post-intervention, a great proportion of patients in the intervention group, 83.8%, against 71.8% of the control group, had a good quality of life.

Table 4.31 Aggregate scores on Quality of life (QoL) of DM patients: Depression domain

			Baseline (P1)				Post intervention (P3)				Post-intervention (P4)			
			Control (88)		Interv. (82)		Control (85)		Interv. (79)		Control (78		Interv(74)	
			f	%	f	%	f	%	f	%	f	%	f	%
1	Feeling needed and useful	All the time	2	2.3	4	4.9	17	20.0	46	58.2	72	92.3	65	87.8
		sometimes	4	4.5	8	9.8	9	10.6	3	3.8	5	6.4	6	8.1
		Rarely	4	4.5	70	85.4	58	68.2	30	38.0	1	1.3	1	1.4
		Not at all	78	88.6	0	0	1	1.2	0	0	0	0	2	2.7
		Total	88	100.0	82	100.0	85	100	79	100	78	100	74	100
2	Having crying spells at some periods	All the time	8	9.1	6	7.3	26	30.6	11	13.9	2	2.6	4	5.4
		sometimes	24	27.3	27	32.9	16	18.8	20	25.3	25	32.1	17	23.0
		Rarely	23	26.1	15	18.3	38	44.7	28	35.4	13	16.7	11	14.9
		Not at all	33	37.5	34	41.5	5	5.9	20	25.3	38	48.7	42	56.8
		Total	88	100.0	82	100.0	85	100	79	100	78	100	74	100
3	Ability to think clearly	All the time	52	59.1	45	54.9	19	22.4	36	45.6	57	73.1	53	71.6
		sometimes	9	10.2	9	11.0	18	21.2	19	24.1	10	12.8	11	14.6
		Rarely	18	20.5	19	23.2	46	54.1	16	20.3	2	2.6	2	2.7
		Not at all	9	10.2	9	11.0	2	2.4	8	10.1	9	11.5	8	10.8
		Total	88	100.0	82	100.0	85	100	79	100	78	100	74	100
4	Feeling that life is quite full	All the time	0	0	3	3.7	16	18.8	29	36.7	62	79.5	55	74.3
		sometimes	10	11.4	54	65.9	20	23.5	15	19.0	10	12.8	12	16.2
		Rarely	65	73.9	21	25.6	41	48.2	24	30.4	4	5.1	3	4.1
		Not at all	12	13.6	4	4.9	8	9.4	11	13.9	2	2.6	4	5.4
		Total	88	100.0	82	100.0	85	100	79	100	78	100	74	100
5	Feeling blue and downhearted	All the time	7	8.0	8	9.8	36	42.4	21	26.6	7	9.0	3	4.1
		sometimes	31	35.2	37	45.1	21	24.7	21	26.6	27	34.6	19	25.7
		Rarely	19	21.6	14	17.1	23	27.1	20	25.3	11	14.1	16	21.6
		Not at all	31	35.2	23	28.1	5	5.9	17	21.5	33	42.3	36	48.6
		Total	88	100.0	82	100.0	85	100	79	100	78	100	74	100
6	Enjoyment of activities	All the time	69	78.4	53	64.6	15	17.6	40	50.6	64	82.1	62	83.8
		sometimes	8	9.1	7	8.5	15	17.6	10	12.7	13	16.7	8	10.8
		Rarely	7	8.0	20	24.4	54	63.5	27	34.2	1	1.3	3	4.1
		Not at all	4	4.5	2	2.4	1	1.2	2	2.5	0	0	1	1.4
		Total	88	100.0	82	100.0	85	100	79	100	78	100	74	100

Table 4.32 Aggregate scores on Quality of life (QoL) of DM patients: Anxiety domain

			Baseline (P1)				Post intervention (P3)				Post-intervention (P4)			
			Control 88		**Interv. 82**		**Control 85**		**Interv. 79**		**Control 78**		**Interv.74**	
			f	%	f	%	f	%	f	%	f	f	%	f
1	Feeling of anxiety and nervousness *	All the time	8	9.1	13	15.9	33	38.8	20	25.3	4	5.1	5	6.8
		sometimes	31	35.2	33	40.2	21	24.7	14	17.7	27	34.6	14	18.9
		Rarely	23	26.1	14	17.1	25	29.4	24	30.4	11	14.1	10	13.5
		Not at all	25	28.4	21	25.6	6	7.1	21	26.6	36	46.2	45	60.8
2	Having fear without any reason *	All the time	5	5.7	8	9.8	29	34.1	10	12.7	3	3.8	4	5.4
		sometimes	18	20.5	15	18.3	9	10.6	14	17.7	12	15.4	7	9.5
		Rarely	21	23.9	23	28.0	37	43.5	26	32.9	12	15.4	8	10.8
		Not at all	42	47.7	35	42.7	10	11.8	29	36.7	51	65.4	55	74.3
3	Feeling panicky and becoming easily upset*	All the time	6	6.8	15	18.3	29	34.1	16	20.3	6	7.7	3	4.1
		sometimes	24	27.3	23	28.0	22	25.9	18	22.8	22	28.2	17	23.0
		Rarely	22	25.0	19	23.2	25	29.4	22	27.8	11	14.1	13	17.6
		Not at all	36	40.9	25	30.5	9	10.6	23	29.1	39	50.0	41	55.4
4	Feeling of going into pieces or falling apart*	All the time	5	5.7	3	3.7	17	20.0	7	8.9	4	5.1	5	6.8
		sometimes	13	14.8	19	23.2	18	21.2	9	11.4	10	12.8	5	6.8
		Rarely	14	15.9	15	18.3	39	45.9	35	44.3	11	14.1	5	6.8
		Not at all	54	61.4	44	53.7	11	12.9	28	35.4	53	67.9	59	79.7
5	Being able to sit still and feel calm	All the time	62	70.5	3	3.6	20	23.5	38	48.1	53	67.9	58	78.4
		sometimes	11	12.5	6	7.3	17	20.0	10	12.7	12	15.4	9	12.2
		Rarely	10	11.4	16	19.5	44	51.8	28	35.4	6	7.7	2	2.7
		Not at all	5	5.7	57	69.5	4	4.7	3	3.8	7	9.0	5	6.8
6	Ease of falling asleep and getting enough rest	All the time	49	55.7	46	56.1	20	23.5	31	39.2	57	73.1	51	68.9
		sometimes	13	14.8	9	11.0	24	28.2	27	34.2	13	16.7	18	24.3
		Rarely	24	27.3	25	30.5	39	45.9	18	22.8	5	6.4	2	2.7
		Not at all	2	2.3	2	2.4	2	2.4	3	3.8	3	3.8	3	4.1

***** Negatively worded items were reversed.

Table 4.33: Aggregate scores on Quality of life (QoL) of DM patients: Energy domain

			Baseline (P1)				Post intervention (P3)				Post-intervention (P4)			
			Control 88		**Interv. 82**		**Control 85**		**Interv 79**		**Control 78**		**Interv.74**	
			f	%	f	%	f	%	f	%	f	%	f	%
1	Feeling active, energetic and vigorous	All the time	55	62.5	8	9.8	17	20.0	34	43.0	61	78.2	53	71.6
		sometimes	7	8.0	37	45.1	31	36.5	21	26.6	10	12.8	15	20.3
		Rarely	23	26.1	37	45.1	35	41.2	19	24.1	3	3.8	1	1.4
		Not at all	3	3.4	0	0	2	2.4	5	6.3	4	5.1	5	6.8
2	Having dull feeling and being sluggish *	All the time	9	10.2	3	3.7	27	31.8	13	16.5	4	5.1	3	4.1
		sometimes	26	29.5	25	30.5	18	21.2	20	25.3	18	23.1	11	14.9
		Rarely	15	17.0	22	26.8	32	37.6	27	34.2	21	26.9	8	10.8
		Not at all	37	42.0	32	39.0	8	9.4	19	24.1	35	44.9	52	70.3
3	Feeling used up, tired, exhausted or worn out *	All the time	6	6.8	4	4.9	35	41.2	15	19.0	2	2.6	6	8.1
		sometimes	28	31.8	32	39.0	22	25.9	22	27.8	22	28.2	14	18.6
		Rarely	19	21.6	16	19.5	20	23.5	28	35.4	17	21.8	11	14.9
		Not at all	34	38.6	30	36.6	8	9.4	14	17.7	37	47.4	43	58.1
4	Feeling rested and fresh after waking up.	All the time	62	70.5	44	53.7	15	17.6	38	48.1	55	70.5	55	74.3
		sometimes	8	9.1	7	8.5	17	20.0	23	29.1	16	20.5	16	21.6
		Rarely	16	18.2	29	35.4	48	56.5	17	21.5	2	2.6	1	1.4
		Not at all	2	2.3	1	1.2	5	5.9	1	1.3	5	6.4	2	2.7

*Negatively worded items were reversed.

			Control 88		Interv. 82		Control 85		Interv. 79		Control 78		Interv.74	
			f	%	f	%	f	%	f	%	f	%	f	%
1	Feeling of happiness, satisfaction and pleasure with private life	All the time	68	77.3	44	53.7	18	21.2	41	51.9	67	85.9	57	77.0
		sometimes	7	8.0	4	4.9	13	15.3	12	15.2	7	9.0	12	16.2
		Rarely	10	11.4	31	37.8	51	60.0	25	31.6	3	3.8	3	4.1
		Not at all	2	2.3	3	3.7	3	3.5	1	1.3	1	1.3	2	2.7
2	Feeling of having adjusted properly to situation of personal life	All the time	61	69.3	47	57.3	13	15.3	41	51.9	63	80.8	60	81.1
		sometimes	4	4.5	6	7.3	16	18.8	10	12.7	11	14.1	10	13.5
		Rarely	18	20.5	24	29.3	54	63.5	27	34.2	2	2.6	2	2.7
		Not at all	4	4.5	5	6.1	2	2.4	1	1.3	2	2.6	2	2.7
3	Conviction of having lived the kind of life desired.	All the time	58	65.9	41	50.0	13	15.3	36	45.6	58	74.4	55	74.3
		sometimes	8	9.1	7	8.5	19	22.4	15	19.0	15	19.2	10	13.5
		Rarely	17	19.3	27	32.9	49	57.6	19	24.1	1	1.3	4	5.1
		Not at all	5	5.7	7	8.5	4	4.7	9	11.4	4	5.1	5	6.8
4	Having experienced eagerness at engaging in everyday activities or in making fresh decisions	All the time	55	62.5	36	43.9	16	18.8	33	41.8	58	74.4	61	82.4
		sometimes	7	8.0	7	8.5	19	22.4	20	25.3	15	19.2	8	10.8
		Rarely	19	21.6	31	37.8	47	55.3	21	26.6	3	3.8	2	2.7
		Not at all	7	8.0	8	9.8	3	3.5	5	6.3	2	2.6	3	4.1
5	Having felt confident of handling or coping any key change in personal life	All the time	57	64.8	44	53.7	17	20.0	38	48.1	61	78.2	60	81.1
		sometimes	5	5.7	10	12.2	22	25.9	16	20.3	13	16.7	4	5.4
		Rarely	21	23.9	24	29.3	43	50.6	21	26.6	3	3.8	5	6.8
		Not at all	5	5.7	4	4.9	3	3.5	4	5.1	1	1.3	5	6.8
6	The conviction that daily each day of life has been filled with personally interesting things	All the time	63	71.6	46	56.1	17	20.0	31	39.2	64	82.1	56	75.7
		sometimes	6	6.8	4	4.9	18	21.2	19	24.1	8	10.3	12	16.2
		Rarely	15	17.0	27	32.9	48	56.5	24	30.4	3	3.8	2	2.7
		Not at all	3	3.4	5	6.1	2	2.4	5	6.3	3	3.8	4	5.4

*Negatively worded items were reversed.

Figure 4.6: QoL during study phases

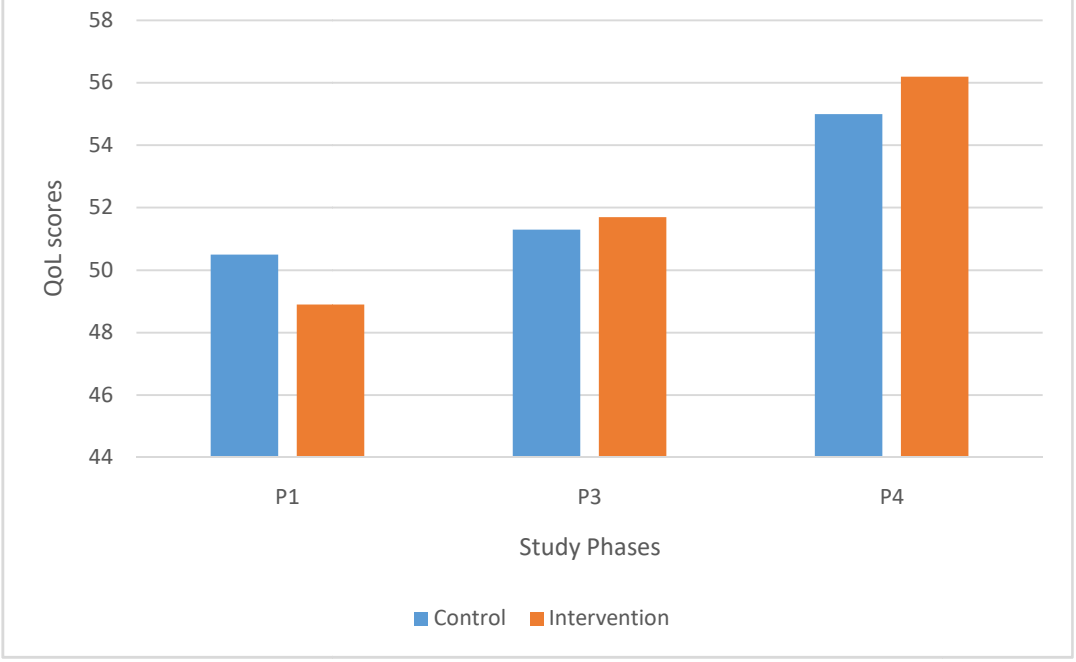


Table 4.35. Independent t- test showing the Quality of Life of Participants during the Three Phases of Study

Study phase	Study group	Mean (S.D.)	mean diff.	t – value	p value
P1	Control	50.5 (7.1	1.527	1.306	0.194
	Intervention	48.9 (8.2)			
P3	Control	51.3 (9.9)	- .437	-.299	0.765
	Intervention	51.7 (8.8)			
P4	Control	55.0 (9.5)	-1.17	-.668	0.505
	Intervention	56.2 (11.9)			

Table 4.36. Chi-square test showing the Quality of Life of Participants during study phases

		Control		Intervention		p- value
		Freq.	%	Freq.	%	
P1:	Good	55	62.4	43	50.6	
	Poor	33	37.6	39	49.4	0.043
P2:	Good	57	67.1	55	69.6	
	Poor	28	32.9	24	30.4	0.554
P3:	Good	56	71.8	62	83.8	0.665
	Poor	22	28.2	12	16.2	

The within-group differences in the mean score of quality of life of diabetes patients in the intervention and control groups are presented in table 4.37. The greatest improvement in the quality of life was seen among those in the intervention group during the interval between study commencement and six-month post-intervention, with a p-value < 0.01. This is followed by a significant difference between the third and sixth-month post-intervention ($p=0.001$) among patients in the intervention group. Patients in the control group showed significant improvement; $p < 0.05$ between the third and sixth-month post-intervention, and $p < 0.01$ between baseline and six-month post-intervention.

Furthermore, the domain scores on quality of life comprising depression, anxiety, energy and positive wellbeing are presented in table 4.38. At baseline, the control group had a significantly higher score on positive wellbeing, ($p < 0.05$), but this was not so at post-intervention. On the other hand, at three-month post-intervention, the intervention group had a significantly higher score in the energy domain, ($p < 0.01$).

Table 4.37. Repeated measures ANOVA showing within – group differences in the quality of life at different study phases

Study group		Mean (S.D.)	mean diff.	p - value
Intervention	P1	49.7 (7.6)	-1.649	0.199
	P3	51.4 (8.8)		
	P1	49.7 (7.6)	-6.419	<0.01**
	P4	56.2 (11.9)		
	P3	51.4 (8.8)	-4.770	0.001**
	P4	56.2 (11.9)		
Control	P1	51.4 (7.2)	-0.12	0.930
	P3	51.5 (9.8)		
	P1	51.4 (7.2)		
	P4	55.0 (9.5)	-3.55	0.003**
	P3	51.5 (9.8)	-3.436	0.025*
	P4	55.0 (9.5)		

**significant at < 0.01
*significant at < 0.05

Table 4.38: Quality of life domain scores of patients in intervention and control groups

	Control $\overline{x} \pm$	Intervention $\overline{x} \pm$	$\overline{x}$diff.	t-value	p-value
***Depression (P1)	12.5 (2.6)	12.0 (2.5)	0.43016	1.09	0.277
***Depression (P3)	13.5 (2.9)	13.1 (3.3)	0.39643	0.819	0.414
***Depression (P4)	14.9(2.6	15.0(3.4)	-0.09182	-0.188	0.851
***Anxiety (P1)	13.0(3.0)	12.4(3.6)	0.62361	1.223	0.223
***Anxiety (P3)	13.3(3.6)	13.5 (3.4)	-0.13894	-0.256	0.798
***Anxiety (P4)	14.1(3.5)	9.5(2.3)	-0.84061	-1.502	0.135
Energy (P1)	8.9(2.6)	8.6(2.3)	0.20593	0.554	0.580
Energy (P3)	9.0(2.5)	10.2(2.4)	-1.19255	-3.061	0.003**
Energy (P4)	9.5(2.3)	10.0(2.5	-0.43382	-1.114	0.267
+ Wellbeing (P1)	15.0(3.6)	13.9(3.3)	1.13165	2.127	0.035*
+ Wellbeing (P3)	15.0 (3.0)	15.8 (3.1)	-0.78838	-1.635	0.104
+ Wellbeing (P4)	16.3(2.9)	15.9(3.8)	0.32328	0.599	0.550

+ Positive
**significant at <0.01
*significant at <0.05

***: High scores indicate a lack of depression or anxiety since negatively worded items were reversed.

4.9. GLYCOSYLATED HAEMOGLOBIN

Figure 4.7 shows the group trend for DM patients as regards the mean HbA1c values. The graph shows a sharp decrease in the HbA1c value of patients in the intervention group, baseline (P1) was 8.9%, P3 (three-month post-intervention) was 8.0% and P4 (six-month post-intervention) was 7.5% whereas those in the control group had an increase in the HbA1c value at P3 as P1 value was 7.4% and P3 value was 7.8%. The P4 (six-month post-intervention) values show some level of decrease in the two groups, 7.5% for the intervention group and 7.5% for the control group.

Independent t-tests examining the differences in mean HbA1c values for patients in the intervention and control groups at P1, P3 and P4 are presented in Table 4.39. Results show that there was a significant difference in this parameter at baseline with the intervention group having a significantly higher level of HbA1c ($p < 0.05$). At three and six - month post-intervention period, however, there was no significant difference in the HbA1c level; although patients in the intervention group had reduced levels of HbA1c during these two follow – up periods.

The repeated measures ANOVA as shown in table 4.40 for within-group differences shows that patients in the intervention group had a significant reduction in the HbA1c level at three and six- month post-intervention compared to the baseline value. The difference between the three and six- month post-intervention HbA1c was not significant. However, the control group displayed a significant increase ($p<0.01$) in the HbA1c level at three and six -month post-intervention compared with the baseline result. Similar to the intervention group, the difference between the three and six- month post-intervention HbA1c was not significant.

Table 4.41 shows that at post-intervention 1, the proportion of DM patients in the intervention group with normal HbA1c had increased by 12.4% whereas in the control group, the proportion reduced by 10.7%. There was a further increase in the proportion of patients with normal HbA1c in the intervention group at post-intervention 2, although it is very little. There was no notable change in proportion for patients in the control group at post-intervention 2.

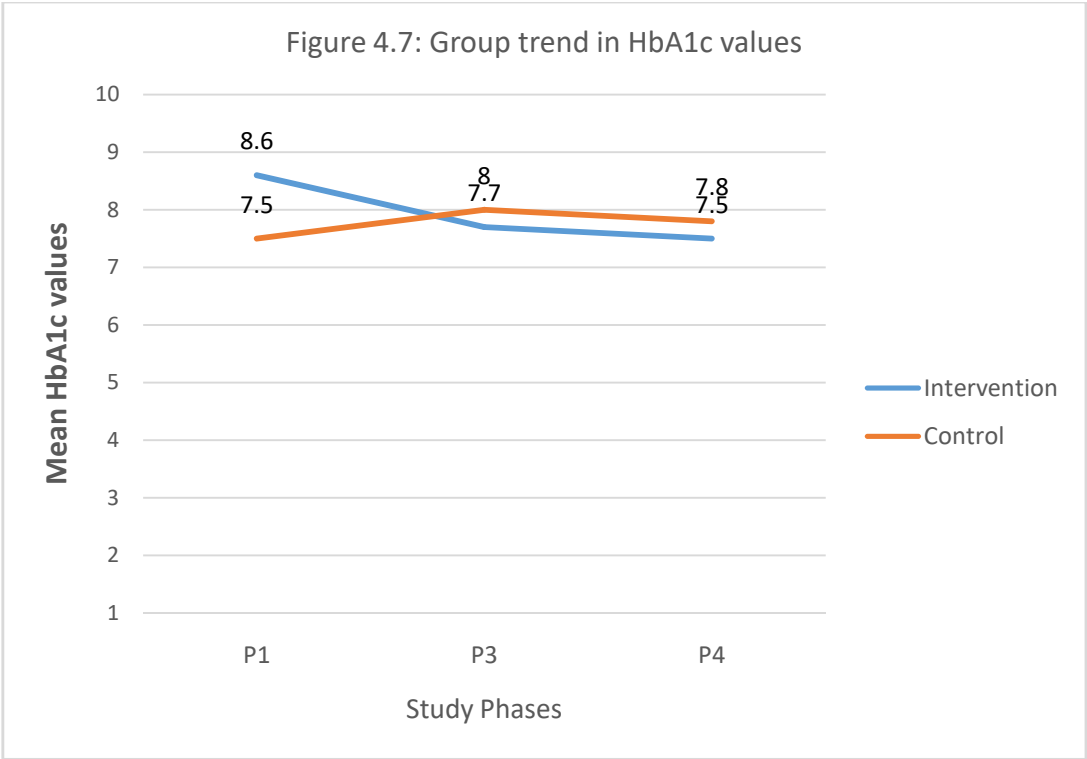


Figure 4.7: Group trend in HbA1c values
10
9
8
7
6
5
4
3
2
1
Mean HbA1c values
8.6
7.5
8
7.7
7.8
7.5
P1
P3
P4
Study Phases
Intervention
Control

Table 4.39. Independent t –test on comparison of Glycosylated haemoglobin (HbA1c) of Participants during the three phases of Study

Study phases	Study group	Mean (S.D.)	mean diff.	t – value	p value
P1	Control	7.5 (2.1)	-1.200	-3.854	0.013*
	Intervention	8.6 (2.2)			
P3	Control	8.0 (2.1)	0.314	1.094	0.276
	Intervention	7.7 (1.5)			
P4	Control	7.8 (2.1)	0.302	0.938	0.350
	Intervention	7.5 (1.8)			

* Significant at 0.05

Table 4.40. Repeated Measures ANOVA showing within – group differences in the Glycosylated haemoglobin (HbA1c) at different study phases

Study group		Mean	mean diff.	Std Error	p – value
Intervention	P1 P3	8.9 7.8	-1.123	0.207	<0. 01**
	P1 P4	8.9 7.5	-1.341	0.246	<0.01**
	P3 P4	7.8 7.5	-0.218	0.178	0.225
Control	P1 P3	7.4 8.0	0.694	0.183	<0.01**+
	P1 P4	7.4 7.8	0.487	0.182	0.009*
	P3 P4	8.0 7.8	-0.206	0.167	0.220

**significant at < 0.01
+ Change is negative

Table 4.41. Proportional changes in HbA1c level among intervention and control groups during the three phases of the study

Study	**Control**			**Intervention**			
Phase	freq. (%) normal	freq. (%) high	freq. (%) Total	freq. (%) normal	freq. (%) high	freq. (%) Total	p-value
P1	43 (48.9)	45 (51.1)	88 (100)	27 (32.9)	55 (67.1)	82(100)	0.012*
P3	33 (38.8)	52 (61.2)	85 (100)	35 (44.3)	44 (55.7)	79 (100)	0.290
P4	30 (38.5)	48 (61.5)	78 (100)	34 (45.9)	40 (54.1)	74 (100)	0.221

CHAPTER FIVE

DISCUSSION

This chapter presents a discussion on the results of a quasi-experimental study in which glycaemic control and quality of life were examined as outcomes of a family-integrated diabetes education among two groups of diabetes patients in two teaching hospitals in southwest Nigeria. The findings are discussed with the findings of previous authors and are divided into subsections based on the objectives and hypotheses of the study. Five hypotheses and eight research objectives were put forward at the beginning of the study. The implications of the study and recommendations are presented at the end of the chapter.

5.0. Sociodemographic characteristics of type 2 diabetes patients in the two groups

The retention rate of 78.2% in this study is higher than that deemed fit for experimental studies. It has been stated that 70% of the retention rate in each study arm of an experimental study is acceptable for considering interventions with positive outcomes, (Lyles et al [2007] and Centre for Disease Control, [2008], In Amico, 2009). Moreover, the attrition rate in this study is relatively similar to that reported by Trief et al (2016) in a telephonic couple-based intervention to improve glycaemic control among type 2 diabetes patients. The authors reported attrition of 17.9% at 4 months and 19.8% at 8 months.

On the whole, a greater proportion of the DM patients were female; had educational attainment of secondary school and below, and were married. These findings are similar to that of Jackson et al, (2014). On the contrary, the age distribution of DM patients in this study is different from that reported by the same author (Jackson et al, 2014) in a study that took place in two States located in South-South Nigeria. Whereas a little over half of the participants in this study were within the age range of ≥ 60 years, only 29.4% of DM patients in South-South were within this age range as reported by Jackson; while the majority of respondents in that study (62%) were aged between 40 and 59 years. This may be an indication of an earlier onset of DM among those in South-South Nigeria. DM patients aged less than 40 years were similar to some extent in both groups, being less than 10%.

The distribution of sex, age, educational attainment, use of insulin, exposure to previous diabetes education and relationship with accompanying family members were not statistically significant in the two groups. However, income and ownership of a glucometer were statistically significant. Though more DM patients in the intervention group reported income greater than #50,000 a month compared to those in the intervention group, fewer of them owned a glucometer. This means that having sufficient income alone is not enough motivation for the patient to take measures to improve health outcomes.

Besides, about 70% of individuals with diabetes in each of the groups were women. Several factors may be responsible for this. First, a higher prevalence of DM, among women, was reported in a meta-analysis involving Eastern, Middle and Southern parts of sub-Saharan Africa (Hilawe et al, 2013). Also, Bu et al, (2015) reported a higher prevalence of diabetes among women than men after the age of 50 years. Secondly, there was an observable difference in the proportion of women and men attending the clinic. Thongsa (2015) in a study among diabetic clinic attendees in Thailand reported that 68.3% of participants were females. Jackson et al (2014), in a study among DM patients in South-South Nigeria, reported that there were more women than men in the study. Although, the International Diabetes Federation (IDF) in 2017 reported a slightly higher prevalence of DM among men than women, the higher percentage of women with DM seen in the present study might also be linked to lower life expectancy for men compared to women in Nigeria (WHO, 2015). It is also possible that it is due to differences in the health-seeking behaviour of men and women. Women have been reported to seek health care more often than men do (Thompson et al, 2016). In the Nigerian society, in particular, the general belief that men ought to be strong and that it is a sign of weakness for the head of the family to be sick leads many men not to seek health care promptly when ill, even among academics. This is affirmed by Olanrewaju et al (2019) in a study among academics in a Nigerian university.

5.1 Sociodemographic characteristics of family members

Family members who accompanied DM patients were more of female than male, constituting 62.9%. This is similar to the reports from the multinational DAWN study by Kovacs et al (2013), where women constituted 65% of family members of people with diabetes who

showed interest and consented to participate in a study aimed at helping family members identify areas of unmet needs regarding diabetes management. Generally, women are more involved in caregiving than men and this is especially so in the African society, as reported by Adejoh (2012) in a study that took place among the Igalas in Kogi State, Nigeria.

With regards to educational attainment, about half of all family members had tertiary education, a proportion which is greater than that of DM patients with tertiary education. This level of education can lead to an easy understanding of educational intervention to improve the knowledge of family members. Kovacs et al (2013) reported the attainment of College education among a similar proportion of family members. Besides, Family members who accompanied the DM patients were mostly children of the patients, representing a little over 50% of accompanying relations. This is contrary to the findings of Kovacs et al (2013) where most relatives were spouses or partners of DM patients. This is not surprising since the study took place majorly in 17 developed countries, (Algeria, Canada, China, Denmark, France, Germany, India, Italy, Japan, Mexico, the Netherlands, Poland, Russian Federation, Spain, Turkey, the UK and the USA), where the birth rate is low – 1.6 and 1.9 in Europe and Northern America, respectively (United Nations, 2015). It is also possible that the value system in Nigeria where children often act as caregivers to their aged parents was responsible for this as found by Okoye and Asa, (2011)

5.2 . Diabetes patients' knowledge of diabetes

Diabetes patients in the intervention and control groups showed poor knowledge of DM at baseline, with both groups having mean scores less than half of the maximum score. This is in agreement with the findings of Adejoh, (2014), who reported that close to half of DM patients in a state in north-central Nigeria exhibited low diabetes knowledge. In particular, the patients demonstrated a very poor knowledge of glycosylated haemoglobin (HbA1c) test. This is in agreement with the findings of other authors in Nigeria, (Nwankwo et al, 2010; Odili et al, 2011). This may suggest that the recommendation of the International Diabetes Federation (2006) and the American Diabetes Association, (2016) on testing HbA1c at point of care (POC) or in the laboratory before a consultation, has not been implemented in many hospitals in Nigeria. The lack of implementation may be connected with the cost of the test. This is supported by Chinenye et al (2012) who stated that 'HbA1c was not regularly assessed among diabetes patients'. As such, the knowledge of this test among diabetes patients remains poor.

However, there was an improvement in the knowledge of this test among participants in the intervention group, following the intervention.

The difference in the post-intervention total knowledge was significantly higher among patients in the intervention group compared to the control group. This is in line with the findings of Ahmed et al, (2015) who reported a significant increase in the post-intervention knowledge of diabetes patients in Egypt after an educational intervention. Similar findings were reported by Wichit et al, (2017) and Hu et al (2014) after a family-oriented intervention programme among diabetes patients and their family members. Baig et al, (2015) further reported significant improvement in the knowledge of elderly DM patients following spousal involvement in DSME. In general, the important thing is for the patient to have a family member involved in care irrespective of the relationship with the family. In the present study, family members included any of spouses, children, and extended family members.

Although it may be argued that improvement in knowledge ought to be expected among diabetes patients after an educational intervention, nevertheless, it must be pointed out that diabetes education, which ought to be the mainstay of diabetes management, is still grossly deficient among diabetes patients as shown in this study where the average score at baseline for participants both in the intervention and control groups was less than half of the maximum score (maximum score is 14). This underscores the need to further evaluate the context, content, mode of delivery and frequency of the diabetes education provided to DM patients.

5.3 **Self-care knowledge of diabetes patients**

The self-care knowledge of the patients was examined using the diabetes self-care knowledge questionnaire. The mean score of participants in both groups at baseline is similar to that reported by Jackson et al, (2014), among diabetes patients in Uyo, Nigeria, where the score was above average but not excellent. There was a significant improvement in the post-intervention score of patients in the intervention group compared to baseline. This was not so in the control group. This is in line with the findings of Ing et al (2016) who reported an increase in the knowledge of self -care among DM patients following an educational intervention that included social support, although social support was provided by community partners. The findings also concur with that of Williams et al, (2014) who found a significant improvement in the self - care knowledge of a group of African Americans recruited into a one-group culturally-tailored and family-oriented intervention study.

However, the comparison of self-care knowledge between the two groups at post-intervention showed no significant difference. This may be associated with some differences in the baseline score of the patients in the intervention and control group. Also, based on anecdotes and observation, patients spend too much time waiting at the clinic; besides the time is not structured. This pattern could discourage them from attending follow-up appointments.

5.4 Family members' knowledge of diabetes.

Baig (2015), in a review of 26 family-based interventions for adults with type 2 DM, stated that very few studies measure the family outcome. Thus, the literature on the effect of educational intervention on the family members of people with diabetes is scanty. Nevertheless, in this study, family members' knowledge was assessed at baseline and post-intervention. Baseline assessment of family members' knowledge revealed no significant difference between the intervention and control groups showing that the groups were compatible. At post-intervention however, the family members in the intervention group showed a significant improvement in knowledge compared to the control group. The within-group difference between the baseline and post-intervention knowledge was also significant among those in the intervention group but was not so among those in the control group. This agrees with the findings of Hu et al, (2014) who reported a significant improvement in the knowledge of family members following a family-based intervention. This view is further reiterated by Hu et al, (2016) in a similar study. A similar study took place among Chinese patients and their family members and family members were reported to have an increase in diabetes knowledge after the educational intervention, (Cai and Hu, 2016). This can have the overarching effect of preventing diabetes in family members.

In addition, generally, very few family members of type 2 diabetes patients have ever participated in diabetes education, yet family members wish to provide support to those with diabetes in their family. This assertion is supported by Kovacs et al (2013) who carried out a multi-national study involving seventeen countries in four continents (including Africa represented by Algeria), on Diabetes Attitude, Wish and Needs (DAWN) of family members of people with diabetes. More specifically, the study revealed that only 23% of family

members had ever participated in diabetes education and 72.1% of these stated that education helped them understand diabetes and in offering emotional support to their sick relatives.

5.5 Diabetes self - management of the patients.

Diabetes self -management was an important secondary outcome measure in this study given its link to overall glycaemic control (ADA, 2013). The mean diabetes self-management of patients in both intervention and control groups was above the average of the maximum score obtainable, even at baseline. This means that a great proportion of the patients had a good self-management capacity. Contrary to this, Laxy et al, (2014) reported that only a small proportion (16%) of diabetes patients in Germany had a high level of self-management behaviour. It must be noted however that the instrument for determining diabetes self-management was different from the one employed in the present study. Whereas in this study, the Diabetes Self - Management Questionnaire (DSMQ) which owed its development and validation to Schmitt et al (2013), was utilized; Laxy et al, (2014) made use of the self - management behaviour index based on the work of Arnold-Wörner et al, in 2008. In another study authored by Gaoet al, (2013), an average level of self - management was reported among diabetes patients of Chinese origin, making use of the Summary of Diabetes Self- Care Activities (SDSCA) questionnaire. Nevertheless, the SDSCA questionnaire had been criticized previously because of the difficulty of relating any of its scales with HbA1c, (Primožič et al, 2012), whereas DSMQ was found adequate in predicting glycaemic control among people with diabetes.

It is noteworthy that, at three-month post-intervention, a much greater proportion of diabetes patients in the intervention compared to the control group, checked their blood sugar levels with care and attention; chose to eat food that made it easy to achieve optimal blood sugar levels, kept doctors' appointment as recommended, took their medications as prescribed and carried out physical activities to achieve optimal blood glucose control. Thus, the within-group comparison of mean diabetes self-management scores of DM patients in the intervention group showed a significant improvement in diabetes self – management at three-month follow up whereas the control group did not have a significant change three months after the intervention. This is similar to the study by Wichit et al (2017). Similarly, Hu *et al* (2014) reported a significant improvement in diet and foot care among Hispanic diabetes

patients who were involved in a family-based intervention programme. Other authors have reported significant improvement in DM patients' adherence to medication (Hamidreza et al, 2014); a healthy diet (Toobert et al, 2011); exercise and self -glucose monitoring (Aikens et al, 2015), following family-integrated education programme. In contrast, Wild et al (2016); Garcia – Huidobro et al, (2011) reported that family support did not significantly improve medication adherence.

There was further improvement at six-month post-intervention although the within-group improvement was also seen in the control group. The improvement in the control group could be linked to various health improvement programmes that were organized in the control group hospital as follow up of the Diabetes Association week during which various Pharmaceutical companies promised to further support and did support the patients in the control group hospital through various health education and demonstration programmes and sale of glycaemic lowering food items at reduced rates. This was absent at the hospital where the intervention took place.

5.6 Perception of family support by patients.

Participants in both study groups reported a high mean score regarding the perception of social support from family, at baseline. This may be associated with the close-knit nature of most families in Nigeria, (Eboiyehi, 2015). Moreover, Afolabi et al (2013), reported a high level of perceived social support from the family using the same scale, among a group of HIV positive patients on intensive antiretroviral therapy, in a city in South-west Nigeria.

Also, diabetes patients in the intervention group had a significant increase in the perception of family support, six-month post-intervention, although the patients in the control group also showed a significant increase in this parameter. However, the intervention group had higher mean scores at both three and six-month post-intervention, despite having a lower mean score at baseline. Keogh et al (2011) reported a significant improvement in the perception of family support among persons with diabetes involved in a psychological family intervention in Ireland. To date, there is a dearth of literature on interventions integrating family members into diabetes care in Nigeria. Thus, there is a scarcity of local literature to compare the findings of this intervention study with. This study thus provides evidence to build on, for future studies in this area.

Nonetheless, there was a strong and unforeseen cofounder which was likely to have influenced the perception of family support at the control group hospital. This was a series of programmes on improving glycaemic control and a sense of well- being among the patients organized by the local Diabetes Association as part of the diabetes week.

5.7 Quality of life of DM patients

The quality of life of DM patients who participated in this study was moderate. Previous authors had reported a low quality of life among diabetes patients in Nigeria (Issa et al, 2006, Ababio et al, 2017). These previous studies made use of the generic QoL instrument – WHO QOL Bref, whereas the diabetes-specific QoL (well-being) scale was used in this study. Another author reported a 'fairly good' quality of life, (Oguntubeju et al, 2012), among a hundred diabetes patients selected from Lagos State University Hospital, and Oyo State Specialist Hospital, Ring –road, Ibadan.

DM patients in the intervention group showed a significant improvement in Quality of life (QoL) six months after intervention as compared to the baseline result; although there was no significant improvement three months after the intervention, except in the energy domain. This finding is partly in keeping with that of Hu et al (2014) who found a significant improvement in the QoL of DM patients involved in a one – group family-based intervention programme after three months. The finding is also similar to that of John, Ananda and James, (2014) who reported an improvement in the Quality of life of patients with DM following a family-integrated teaching programme.

Generally, there was a more marked improvement in the post-intervention scores of patients in the intervention group compared to the control group, although some improvement was seen in the control group, particularly during the six-month post-intervention period. This, as mentioned earlier, may be linked to the attention the patients received from health professionals, religious leaders and pharmaceutical companies who were directly or indirectly involved in the Diabetes Association week that took place in the control group hospital. Similar activities did not take place in the intervention group hospital.

Other studies have varying reports on the effect of family-integrated DM education on patients' QoL. Pamungkas et al, (2017) in a systematic review on Randomized Controlled Trials (RCTs) reported an increase in psychological well-being and QoL among DM patients following programmes in which family support was integrated with Diabetes Self-Management Education (DSME). On the contrary, Wichit et al (2017) in an RCT on the family-oriented programme found no significant difference in the QoL of patients in the intervention and control groups.

5.8 Glycaemic control of DM patients.

Glycaemic control was measured using HbA1c reagents. The mean HbA1c value of patients in the intervention and control groups at baseline, 8.5% and 7.7% respectively are relatively similar to those reported by Adebisi et al (2009), among DM patients in a hospital in North-central, Nigeria. The mean HbA1c value reported by the author was 8.0%, which indicates poor control. However, there was a higher proportion of DM patients with poor glycaemic control in the study by Adebisi et al (2009), compared to the present study. In a later study that cut across seven tertiary hospitals in the six geopolitical zones of Nigeria, authors reported a mean value of 8.3%, (Chinenye et al, 2012). These values show that more interventions need to be carried out regarding glycaemic control of DM patients since the normal/recommended HbA1c value is 7%, (ADA, 2018). Importantly, participants in the intervention group of this study achieved some level of improvement in glycaemic control, a decrease of 0.9% at three-month post-intervention and a decrease of 1.1% by six-month post-intervention.

Furthermore, while Adebisi et al (2009) reported that only 36.6% of DM patients had a normal HbA1c level, based on a cut-off point of 7.2%, Chinenye et al (2012), in their multi-centre study reported that 32.4% of DM patients had a normal HbA1c level, using 7% as the cut-off point. This proportion is very close to that found among patients in the intervention group of this study, (32.7%). However, up to half of the patients in the control group had normal HbA1c/glycaemic control at study commencement. This might be due in large part to the fact that the control group hospital is has a more organised diabetes association to complement the management received from the health care team.

Baseline analysis further showed that patients in the intervention group had a significantly higher level of HbA1c than patients in the control group. This could not be forestalled because the patients' level of glycaemic control as indicated by HbA1c could not be ascertained before the beginning of the study when samples were taken at baseline and there were no previously published data to compare with. Nevertheless, the within-group analysis shows that, while DM patients in the intervention group had a significant reduction in the HbA1c level at three-month post-intervention signifying improvement in glycaemic control, the patients in the control group had a significant increase in HbA1c level at the three - month follow up, signifying a worsening of glycaemic control.

The improvement in glycaemic control in the intervention group is in keeping with the findings of Hu et al (2014) who carried out a one – group pre-test post-test intervention study. The finding is also similar to that of García et al, (2015). In the control group, however, the increase/worsening of glycaemic control could be linked to the self-indulgent and poor dietary adherence that occurs commonly among diabetes patients during festive seasons. It is worthy of note that the three-month post-intervention data were collected around December, following DAN week and leading up to the new year celebration; hence some diabetes patients in the control group defaulted probably defaulted.

Moreover, the patients in the intervention group still had a reduction in glycaemic control at six-month post-intervention. This finding agrees with that of Pamungkas et al (2017); Garcia – Huidobro et al, (2011) and Keogh et al, (2011). Comparison of three and six - month post-intervention HbA1c of patients in the intervention and control groups revealed no significant difference. Even though the HbA1c level of patients in the intervention group decreased significantly following the intervention, the baseline incompatibility made it difficult to have a significant difference between the intervention and control groups, post-intervention. Nevertheless, similar to what was found in this study, Williams et al (2014) and Wichit *et al* (2017), reported a lack of significant difference among a group of diabetes patients' HbA1c following a family-oriented intervention.

Additionally, there was an appreciable increase in the proportion of DM patients in the intervention group with a normal HbA1c level following the intervention. This was not so in the control group. Authors have pointed out that as little as a 1% decrease in HbA1c value is

associated with a reduction in the risk of developing complications of DM, (Tang et al, 2015; Sinclair et al, 2013). It has also been stated that the achievement of an HbA1c level of 7% and below is linked to a reduction in microvascular complications, (Williams et al, 2014).

Furthermore, in this study, the HbA1c level of DM patients in the intervention group improved by 1.1%, at three – month post-intervention following a one-day educational intervention that was followed by complimentary SMS messages sent to family members and an educational booklet given to all patients and family members in the intervention group. This level of improvement is similar to that reported by other authors as published by Pillay et al (2015) in a systematic review and network meta-analysis for effect moderation on behavioural programmes for type 2 DM. The author further observed that diabetes self - management education (DSME) that included support programmes with duration ≥ 11 contact hours caused a minimum of 0.4% reduction in HbA1c. It could, therefore, be asserted that the educational intervention followed by SMS text messages and the provision of diabetes education booklet was effective in the achievement of a substantial reduction in HbA1c level.

Likewise, at six-month post-intervention, the HbA1c level of DM patients in the intervention group had decreased by 1%, while that of patients in the control group This value is reported to be associated with a 21% reduction in diabetes-related mortality, 37% reduction in the risk of developing microvascular complications particularly diabetic retinopathy and 14% reduction in the risk of developing myocardial infarction (Stratton et al, 2000, In Federation of European Nurses in Diabetes, [accessed 2018]; UKPDS group [1998] In Baxter et al [2016]).

5.9 SUMMARY AND CONCLUSION.

This study was carried out to measure HbA1c and quality of life as outcomes of family-integrated diabetes education among individuals with type 2 diabetes mellitus. Therefore, a quasi-experimental design was employed involving diabetes patients in two teaching hospitals in Southwest Nigeria into intervention and control groups. A total of 170 diabetes patients and a corresponding number of family members were recruited at baseline; with 88 being in the control group and 82 in the intervention group. Baseline data obtained from all the patients

included diabetes knowledge, diabetes self -care knowledge, diabetes self - management, perception of family support and determination of HbA1c level. Data from all family members at baseline focused on diabetes knowledge and diabetes self - care knowledge.

An educational intervention, comprising lecture, discussion, family goal setting as well as questions and answers session, was carried out for the participants in the intervention group. Each participant received a booklet. This was followed by three SMS text messages to the family members before the next follow – up appointment which was three and six months after the intervention. Immediate post-intervention data on knowledge was obtained from both patients and family members. Post-intervention data on diabetes knowledge was also obtained from the control group.

Three months after the intervention, DM patients in both intervention and control groups were invited to complete the questionnaire on diabetes self - management, perception of family support and quality of life. Their HbA1c was checked. This was repeated at six months post-intervention for participants in both intervention and control groups. Participants in the control group were given the same educational intervention at the end of the study for ethical reasons. They were also provided with the same booklet.

Results showed a significant improvement in the diabetes knowledge of patients and family members in the intervention compared to those in the control group, post-intervention. Repeated measures ANOVA showed significant improvement in the diabetes self - management, perception of family support, quality of life and HbA1c level of patients in the intervention group at three months post-intervention. There was also a significant difference between the baseline results and six months post-intervention results of patients in the intervention group. However, some improvements were also seen in the control group and this was probably due to a series of health promotion activities organized during the Diabetes Association week. The greatest improvement among patients in the intervention group was seen in the HbA1c level which reduced significantly after three months whereas that of those in the control group increased significantly.

It was concluded that including family members in diabetes-education improved the diabetes knowledge of family members significantly and got a majority of them inducted into offering care and support to their relatives living with diabetes. This can also act as a spur for them to

personally adopt a healthier lifestyle to prevent the onset of type 2 diabetes mellitus. The family-integrated diabetes education similarly improved and reinforced patients' knowledge with regards to diet, exercise, self-blood-glucose monitoring, care of the feet, adherence to prescribed medications and the necessity of timely follow-up; as these areas were covered during interaction with the patients.

Most importantly, the intervention led to a substantial decrease in the glycosylated haemoglobin level of patients. This is associated with a decrease in the risk of developing neuropathy, retinopathy, nephropathy, cardiovascular accidents, among others. Moreover, the HbA1c test that was carried out for the patients three times, at about three- month intervals, was a practical way of instilling in the patients the necessity to carry out this test every three months to prevent the aforementioned diabetes complications. Additionally, improvement in the quality of life and perception of family support, which are important social and psychological domains, were seen among the patients following the family-integrated intervention.

However, strategies need to be developed to sustain the interest of family members in getting properly educated about diabetes to continue to adequately offer support and together with persons living with diabetes and health care practitioners achieve optimal glycaemic control.

5.10. RECOMMENDATIONS

Based on the results of this study, the following are recommended:

1. There is a need for nurses to help change the orientation of family members of individuals with diabetes as many of them do not readily see the need for diabetes patients, although this orientation changed among family members who took part in the intervention programme.
2. Nurses should adequately educate family members along with individuals with diabetes. This should be done routinely and not just at the point of diagnosis to ensure that they continue to provide support.
3. There is a need for nurses to better organize the diabetes clinics to ensure that all patients receive DM education because, in this study, some patients reported that they had never had DM education in the past, yet they had been attending DM clinic.

Hence, the need to work with nursing clinical units/heads of nursing to suggest ways to better structure diabetes education

4. There is a need for better support from the employer of family members of people with DM so that they find it easy to attend the clinic routinely with the patient.
5. It is recommended that SMS be used to complement and reinforce the education that patients receive.

5.11.CONTRIBUTION TO KNOWLEDGE

1. This study was the first quasi-experimental study in Nigeria (probably in Africa) to examine the association between diabetes management and family support, despite the close-knit nature of African families
2. Evidence from the study shows family-integrated education is effective. Thus, it ought to be part of the protocol in all hospitals, especially since family members tend to misunderstand the disease.
3. Few studies measure family outcome in type 2 diabetes mellitus related research, all over the world and there is none to the Researcher's knowledge in Nigeria. This is the first study to measure family outcome in the form of pretest and post-test knowledge of the disease.
4. "*E so fun won o"* meaning "Tell them…" was a frequent refrain from patients. This was concerning how some family members try to discourage People Living With diabetes from taking their medications. Thus, there is a need for further qualitative study on the family's opinion on DM.
5. There are very few studies in Nigeria that use glycosylated haemoglobin (HbA1c) as a measure of glycaemic control, despite its high level of objectivity and superiority over Fasting Blood Glucose (FBG), in predicting complications. This study is one of the few ones and has given insight into the true state of glycaemic control of type 2 – diabetes patients who participated in this study.

5.12. STUDY LIMITATION

1. The Diabetes Association week educational and other programmes, as well as those that took place after the week in the control group hospital, might be responsible for the improvements seen in the group.

2. The cluster randomization (involving hospitals in two different cities) made it difficult to get groups who were very compatible, although using patients in the same study setting might have led to contamination.
3. Family members could not get two days' permission from their workplace, hence the educational intervention had to take place in one day although all educational contents were covered as the Researcher was aware of this beforehand.

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APPENDIX 1

INFORMED CONSENT FORM

Title of Research: "Effects of family –integrated diabetes education on glycaemic control and quality of life of diabetes patients in selected hospitals in south – west Nigeria"

Name and affiliation of researcher: This study is being conducted by Lucia Yetunde Ojewale of the Department of Nursing, Faculty of Clinical Sciences, College of Medicine, University of Ibadan, Ibadan.

Sponsor of research: This study will be sponsored by the researcher

Purpose of the research: This research is being conducted to determine what impact the education of patients and their family members can have of the glucose control and quality of life of type 2 diabetes patients through a direct influence on knowledge of diabetes, self care and better adherence to treatment regimen.

Procedure of the research: I will interview participants in this study or ask them to complete the questionnaire themselves if they can read and write. Research assistants will be at hand to clarify difficult areas. You and your family member will be invited to participate in four teaching sessions. Each session will last for 90 minutes and take place twice a week – Tuesday or Wednesday or Thursday – for two weeks. You will be required to answer questions about your knowledge of diabetes and diabetes self care, your adherence to diet, medication, exercise and self monitoring of blood glucose, your perception of the support given by your family and your general feeling of well being.

I will also check the result of the tests prescribed by your doctors and record. I will ask you some of the questions asked before the commencement of the study.

After three months, I will ask you the questions I asked at the beginning of the study and this will be repeated at six months.

Expected duration of research: This research will take about 2hours of your time the first time, then 90 minutes of your time the 2^{nd}, 3^{rd} and 4^{th} times. 40 minutes of your time will be required at the end of three and six months.

Risks: I do not anticipate any risk to your person in participating in this research.

Cost to the participants: Your participation in this research will not cost you anything, financially because your transportation fare will be paid for the days you attend the teaching sessions.

Benefit: The research will help us understand more whether teaching you about diabetes along with your family member will improve your diabetes self care knowledge, your adherence to your treatment, your quality of life and blood glucose level.

Confidentiality: The research does not require recording your name. Coding of the information obtained from you will be carried out using numbers and will and will not be traceable to you. Your name will not appear in any publication or reports that originate from this study.

Voluntariness: Your participation in this research is completely voluntary.

Alternatives to participation: If you decide not to participate, this will not affect your treatment or the way the nurses relate with you in any way.

Due inducements: You will not be paid any fees for participating in this research but your transportation fare will be provided and you will be given refreshment after each of the four teaching sessions. You will also be compensated for lost wages due to the hours spent attending the teaching sessions.

Consequences of participant's decision to withdraw from research and procedure for orderly termination of participation

You can choose to withdraw from the study at any time. Please note that some of the information that has been obtained from you before you choose to withdraw may have been modified or used in publications or reports. However, the researcher promises to make an effort to comply with your wishes as much as possible.

Modality of providing treatments and action to be taken in case of injury or adverse events: If you suffer any injury as a result of your participation in this research, you will be treated at the University College Hospital and the researcher will bear the cost of treatment.

What happens to research participants when the research is over: The findings of this research will be communicated to the nurses and doctors taking care of you and you will be informed about anything that may affect your health.

Statement about sharing of benefits among researchers

No commercial benefit is likely to ensue from this research.

Any apparent or potential conflict of interest

There is no conflict of interest on the part of the researcher

Statement of person obtaining informed consent:

I have fully explained this research to _____ and have given sufficient information, including about risks and benefits, to make an informed decision.

DATE: _____ SIGNATURE: _____

NAME: _____

Statement of person giving consent:

I have read the description of the research or have had it translated into language I understand. I have also talked it over with the nurse to my satisfaction. I understand that my participation is voluntary. I know enough about the purpose, methods, risks and benefits of the study to judge that I want to take part in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form.

DATE _____ SIGNATURE:_____

NAME: _____

Appendix 2 **(Questionairre for Patients)** **Phone No for follow up:**

……...

DEPARTMENT OF NURSING
COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN

Title of research: Effects of family – integrated diabetes education on quality of life and glycaemic control among type 2 diabetes patients in south western Nigeria

SECTION A: SOCIODEMOGRAPHIC DATA, HISTORY OF DIABETES AND DIABETES EDUCATION

Instruction: Please, kindly provide correct answers to the following questions

1. Sex: a. Male b. Female ☐
2. How old are you? (Age in years as at last birthday) _____
3. What year were you diagnosed of having type 2 diabetes mellitus? _____
4. How many years ago were you told by your doctor that you have diabetes? _____ years
5. Which type of diabetes did your doctor say that you have?

a. Adult onset diabetes/type 2 b. Juvenile onset diabetes mellitus/type 1

6. If you have type 1 DM, please, **STOP** here.

If you have type 2 Diabetes mellitus, please **CONTINUE**

7. Are you presently **USING INSULIN** to treat your type 2 diabetes? a. Yes b. No
8. What is your highest level of education? a. Postgraduate degree (MSc or PhD)

b. Tertiary education: HND\BSc/B.Ed/B.A. c. Secondary School

d. Primary School e. No formal education

9. On average, how much do you earn every month (in naira) _____
10. Have you had diabetes education before? a. Yes b. No
11. Do you have a glucometer for checking your blood glucose level regularly? a. Yes b. No
12. How is the person who will come with you for family education related to you?

A. Spouse b. Child c. Parent d. Extended family relation e. Carer

SECTION B: Diabetes Knowledge Test: In this section, please, answer Questions **1 – 23 if you are USINGINSULIN** and **answer 1 – 14 if you are NOT USING insulin**.

Instruction: Circle the **MOST APPROPRIATE** option. Choose **ONLY ONE** option.

1. The diabetes diet is:
   a. the way most Nigerian people eat b. a healthy diet for most people
   c. too high in carbohydrate for most people d. too high in protein for most people
   e. I do not know the answer

2. Which of the following is highest in carbohydrate?
   a. Roast chicken b. Cheese c. Boiled yam d. Ground- nut e. I do not know the answer

3. Which of the following is highest in fat? a. Low fat milk b. Orange juice
   c. Corn d. Honey e. I do not know the answer

4. Which of the following will contribute a very small amount of carbohydrate or energy i.e. "free food"? a. Any unsweetened food b. Any dietetic food c. Any food that says "sugar free" on the label d. Any food that has less than 20 calories per serving
   e. I do not know the answer

5. Glycosylated hemoglobin (hemoglobin A1) is a test that is a measure of your average blood glucose level for the past: a. One day b. One week. c. 6-10 weeks d. 6 months
   e. I do not know

6. Which is the best method for testing blood glucose level?
   a. Urine testing b. Blood testing c. Both are equally good d. I do not know

7. What effect does unsweetened fruit juice have on blood glucose? a. Lowers it
   b. Raises it c. Has no effect d. makes it fluctuate e. I do not know

8. Which should not be used to treat low blood glucose? a. 3 cubes of Sugar
   b. Orange juice c. diet soft drink d. Skim milk like Three - crowns milk e. I do not know

9. For a person in good control, what effect does exercise has on blood glucose?
   a. Lowers it b. raises it c. Has no effect d. I do not know

10. Infection is likely to cause: a. an increase in blood glucose b. decrease in blood glucose c. no change in blood glucose d. I do not know

11. The best way to take care of your feet is to: a. look at and wash them each day
b. massage them with alcohol each day c. soak them for one hour each day
d. buy shoes a size larger than usual e. I do not know

12. Eating foods lower in fat decreases your risk for:
a. nerve disease b. kidney disease c. heart disease d. eye disease
e. I do not know

13. Numbness and tingling may be symptoms of:
a. kidney disease b. nerve disease c. eye disease d. liver disease

14. Which of the following is usually **NOT** associated with diabetes: a. vision problems
b. kidney problems c. nerve problems d. Lung problems e. I do not know

NOTE: PLEASE, STOP HERE IF YOU ARE NOT USING INSULIN, & GO TO SECTION C - F

15. Signs of ketoacidosis include : a. shakiness b. sweating c. Vomiting
d. low blood glucose e. I do not know

16. If you are sick with serious catarrh causing fever/ viral flu, which of the following changes should you make? a. Take less insulin b. Drink less liquids
c. Eat more proteins d. Test for glucose and ketones more often e. I do not know

17. If you have taken intermediate-acting insulin (NPH or Lente), you are most likely to have hypoglycaemia in: a. 1-3 hours b. 6-12 hours c. 12-15 hours d. .more than 15 hours
18. You realize just before lunch time that you forgot to take your insulin before breakfast. What should you do now?
a. Skip/Omit lunch to lower your blood glucose
b. Take the insulin that you usually take at breakfast
c. Take twice as much insulin you usually take at breakfast
d. Check your blood glucose level to decide how much insulin to take
e. I do not know
19. If you are beginning to have hypoglycemia, you should: a. exercise b. Lie down and rest c. drink some juice/Soft drink d. take regular insulin
e. I do not know

20. Low blood glucose may be caused by: a. too much insulin b. too little insulin

c. too much food d. too little exercise e. I do not know

21. If you take your morning insulin but skip breakfast your blood glucose level will usually:

a. increase b. decrease c. remain the same d. Fluctuate e. I do not know

22. High blood glucose may be caused by:
    a. not enough insulin b. skipping meals
    c. delaying your snack d. large ketones in your urine e. I do not know

23. Which one of the following will most likely cause an insulin reaction/ hypoglycaemia?
    a. heavy exercise b. Infection c. over eating d. not taking your insulin e. I do not know

SECTION C: 30-item Diabetes self-care Knowledge Questionnaire (DSCKQ-30)

Please, tick 'Yes' if you agree OR 'No' if you do not agree to each of the statement below.

No.	Questions	Yes	No
1	Since glycosylated haemoglobin (HbA1C) test is expensive, fasting blood sugar (FBS) test can be used in place of it to monitor blood sugar control over time.		
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.		
3	Only the doctors should make plans on how a person with diabetes can achieve his/her target goals.		
4	Blood glucose level should be measured before and after every planned physical activity.		
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).		
6	Regular exercise does not reduce the need for insulin or other diabetic drugs.		
7	Maintaining a healthy weight is not important in the management of diabetes.		
8	A person with diabetes should only ask for help when he/she feels sick from his/her healthcare team.		
9	Cigarette smoking and excessive alcohol intake can worsen diabetes		
10	A person with diabetes taking medicines when he/she feels good is waste of money.		
11	Taking Alcohol while on diabetic drugs is not a serious problem.		
12	Medication is more important than diet and exercise in control of diabetes.		
13	Instructions about drugs and other self-care practices sometimes may not be strictly followed.		
14	Regular medical checkups are not essential when a person with diabetes is feeling well.		
15	Taking low dose Aspirin (Vasoprin®, Emprin®) tablet every day decreases risk of having heart attack and stroke.		
16	Diabetes Drugs are not taken throughout the life time of a person with		

	diabetes.		
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.		
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.		
19	A person with diabetes should take extra care of his/her feet especially when cutting his/her toenails		
20	Tight elastic hose or socks are not bad for a person with diabetes.		
21	A person with diabetes should take care of his/her teeth and brush and floss his/her teeth every day.		
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.		
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.		
24	A person with diabetes should report any change in his eyesight to his doctor.		
25	Self-blood glucose monitoring (SBGM) allows doctor and other healthcare team to gather data for clinical decision-making.		
26	Self-blood glucose monitoring (SBGM) enables a person with diabetes to monitor and react to changes in his/her blood sugar levels; it allows him to integrate his diabetes into the life style he wants to live.		
27	Shaking, confusion, behavioural changes and sweating are signs of high blood sugar.		
28	Prolonged high blood sugar level can cause eye problem or even blindness.		
29	Monitoring blood pressure is not as important as monitoring blood glucose for a person with diabetes.		
30	Prolonged uncontrolled blood sugar level can cause heart attack, stroke and kidney problems.		

Section D: Diabetes Self-Management Questionnaire (DSMQ).

Instruction: The following questions ask about how you have been managing your diabetes. Please, **t**ick under the column provided the option which best **applies** to you in response to the statements in No 1 -16. Please, tick only one option and answer all the questions.

		Does not Apply to	Applies to me to Some	Applies to Me to a Considerable	Applies to me Very

		me	Degree	Degree	much
1	I check my blood sugar levels with care and attention.				
2	The food I choose to eat makes it easy to achieve optimal blood sugar levels.				
3	I keep all doctors' appointments recommended for my diabetes treatment				
4	I take my diabetes medication (e. g. insulin, tablets) as prescribed.				
5	Occasionally I eat lots of sweets or other foods rich in carbohydrates.				
6	I record my blood sugar levels regularly (or analyse The value chart with my glucometer)				
7	I tend to avoid diabetes-related doctors' appointments.				
8	I do regular physical activity to achieve Optimal blood sugar levels.				
9	I strictly follow the dietary recommendations given by my doctor or diabetes specialist.				
10	I do not check my blood sugar levels frequently enough as would be required for blood glucose control.	achieving good			
11	I avoid physical activity, although it would improve my diabetes.				
12	I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets).				
13	Sometimes I have real 'food binges' (not triggered by hypoglycaemia).				
14	Regarding my diabetes care, I should see my medical practitioner(s) more often.				
15	I tend to skip planned physical activity.				
16	My diabetes self-care is poor.				

Section E: Perception of family support

The following statements refer to feelings and experiences that occur to most people at one time or another in their relationships with their families. For each statement there are three possible answers: Yes, No, Don't know. Please circle the answer you choose for each item.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Undecided
1. My family gives me the **moral support** I need to manage my **diabetes.**					

2. I get **good ideas** about how to do things or make things concerning diabetes from my family.					
3. Most other people are closer to their family than I am.					
4. When I confide in the members of my family who are closest to me concerning my diabetes, I get the idea that it makes them uncomfortable.					
5. My family enjoys hearing about what I think.					
6. Members of my family share many of my interests and are interested in my diabetes					
7. Certain members of my family come to me when they have problems or need advice.					
8. I rely on my family for emotional support regarding coping with diabetes					
9. There is a member of my family I could go to if I were just feeling down about diabetes without feeling funny about it later.					
10. My family and I openly discuss and express what we think as far as my diabetes is concerned					
11. My family is sensitive to my personal needs					
12. Members of my family also come to me for emotional support.					
13. Members of my family are good at helping me solve problems to do with my diabetes.					
14. I have a deep sharing relationship with a number of members of my family.					
15. Members of my family get good ideas about how to do things or make things from me.					
16. When I confide in members of my family, it makes me uncomfortable.					
17. Members of my family seek me out for companionship.					
18. I think that my family feels that I'm good at helping them solve problems.					

19. Other people's family relationships are more intimate than mine.					
20. I wish my family were much different.					

Section F: Quality of life (Well -being questionnaire).

Please, circle a number on each of the following scales to indicate how often you feel each phrase has applied to you in the past few weeks:

S/No	Question	All the time	Sometimes	Rarely	Not at all
1	I feel that I am useful and needed				
2.	I have crying spells or feel like it				
3.	I find I can think quite clearly				
4.	My life is pretty full				
5.	I feel downhearted and blue				
6.	I enjoy the things I do				
7.	I feel nervous and anxious				
8.	I feel afraid for no reason at all				
9.	I get upset easily or feel panicky				
10.	I feel like I'm falling apart or going to pieces				
11.	I feel calm and can sit still easily				
12.	I fall asleep easily and get a good night's rest				
13.	I feel energetic, active or vigorous				
14	I feel dull or sluggish				
15.	I feel tired, worn out, used up or exhausted				
16	I wake up feeling fresh and rested				
17.	I have been happy, satisfied or pleased with my personal life				

18.	I have felt well-adjusted to my life situation				
19.	I have lived the kind of life I wanted to				
20	I have felt eager to tackle my daily tasks or make new decisions				
21.	I have felt I could easily handle or cope with any serious problem or major change in my life				
22.	My daily life has been full of things that were interesting to me				

Please, make sure you have considered each of the 22 statements and have circled a number on each of the 22 scales.

Section G: HbA1c result----------

Yoruba (For diabetes patient) **Phone No for follow up: ……...**

DEPARTMENT OF NURSING

COLLEGE OF MEDICINE

UNIVERSITY OF IBADAN

Section A: IBEERE NIPA OLUKOPA

E jowo e dahun awon ibeere won yi nitooto ati lododo

1. Àbùdá ako tàbí abo
   a. Ako (b) Abo

2. Omo odún mélòó ni yín? (Ojó orí láti ojó ìbí tí ó kojá) _____
3. Odún wo ni onísègùn ye yín wò pé e ní ìtò súgà onísòrí kejì?
4. Ó ti tó odún mélòó tí dókítà so fún yín pé e ní ìtò súgà? Odún _____
5. Irú ìtò súgà wo ní dókítà só pé e ní?
   a. Ìtò súgà abágbà dé/onísorí kéjì
   b. Ìtò súgà olójewéwé/onísorí kínní
6. Tí ó bá se pé ìtò súgà onísòrí kínní ni e nì, È DÚRÓ ní ibí tí a dé yìí.
   Tí ó bá wá se pé onísòrí kejì ni tiyín; E TÈSÍWÁJÚ
7. Ǹjé e ń lo oògùn insúlìnnì láti tojú ìtò súgà onísòrí kejì yín
   a. Béèni (b) Béèkó
8. Irú ilé ìwé wo ló ga jù tí e lo?
   a. Ìmò ìjìnlè kejì àti ìketa (MSC tàbí Ph.D) (b) Ilé ìwé gíga: HND/BSC/BSC/B.ED/B.A
   e. Ilé ìwé Girama (e) Ilé ìwé alákóbèrè. (e) N kò kàwe
9. Èló ni o ń wolé fún e lósù (ní náirà) _____
10. Sé o ti gbó nípa ìtò suga po rí?
    a. Béèni (b) Béèkó
11. Ǹjé o ní èro àyèwò iye súgà tó wà lára láti máà fi se àyèwò iye súgà tó wà nínú èjè rè lóòrèkóòrè?
    a. Béèní (b) Béèkó
12. Báwo ni eni ti yóò bá a yín wá fún ìdánilékòó se jé sí i yín?
    a. Oko/Aya (b) Omo (c) Òbí (d) àwon ebí mí (e) Olùtójú

Section B: Ibeere nipa imo nipa aisan ito suga

E jowo a falayipo eyi ti o ba je idahun si awon oro ti a gbe kale yi

1. Oúnje tí àwon tó ní àrùn ìtò súgà lè je ni
   (a) Oúnje tí àwon omo orílèèdè Nàíjíríà lè je (b) Oúnje tó péye fún òpòlopò ènìyàn (c) Oúnje tí ó kún fún okun àti agbára jù fún àwon ènìyàn (d) tí ó kún fún èròjà asara lóore púpò jù (e) E mi ko mo
2. Èwo nínú àwon èyí ni ó fún ni lágbára púpò jùlo?

(a) Adìe tí a yan (b) Wàrà (c) Isu sísè (d) Èpà líló (e) E mi ko mo

3. Èwo ni òrá inú rè pò jù?(a) Mílìkì tí òrá rè kéré (b) Omi osàn (c) Àgbàdo (d) Oyin (e) E mi ko mo

4. È wo nínú àwon oúnje wònyí ni kòní súgà púpò tí ó se ara lóore

(a) Oúnje tí kò bá dùn jù (b) Oúnje tí a yà sótò fún àwon kan láti má a je

(c) Oúnje tí wón bá ti ko sí àkólé rè pé kò ní súgà (d) Oúnje ìjóko ekan tí kálórì inú rè kò tó ogún

(e) Emi ko mo

5. Glycosylated haemoglobin – Àyèwò èjè tí óye káse láti ìgbàdégbà láti mo ìdíwòn súga nínú eje wa (HBA1c).

Fún ìdíwòn ìgbàwo ló ye ká seé? (a) Ojo kankan (b) Osè kan (c) Ose mefa si méwà

(d) Laarin osù méfà. (e.) E mi ko mo.

6. Èwo ni ònà tí ódára jù láti mò iye súgà inú èjè (a) Àyèwò ìtò (b) Àyèwò èjè (c) Méjèjì ló dára (d) emi ko mo

7. Ipa wo ni omi osàn tí kò bá dun ńkó nínú súgà inú èjè?

(a) yíò dínkù si (b) yíò je kópò si (c) kìí kó ipa Kankan (d.) emi ko mo

8. Ewo ni ko ye lati fi toju súgà ti o ba lo sile ju? (a) suga koro meta b. omi osan c. oti elerindodo ti kalori re kopo d. Miliki ti ati yo ora ara re kuro bi Three Crown milk (e) Emi ko mo

9. Fún eni tí ara rè bá dápé, ipa wo ni eré ìdárayá ńkó nínú súgà ara eni béè?

(a) ó má nje ko lolè (b) ó ma nje ko gòkè si (c) kò nipa kankan tó ńkó (d.) emi ko mo

10. Ó seése kí kòkòrò àrun fa: (a) Kí súgà inú èjè pò si (b) Kí súgà inú èjè dínkù si (c) Kí iyípadà Kankan má si nínú súgà inú èjè (d) Emi ko mo.

11. Ònà tó dára jùlo láti tójú esè wa ni kí: (a) kamáyèwò àti kí a máfò wón lójoojúmó (b) kiamáa fi sípírítì raá lójoojúmó. (c) Má re wón s'ómi fún wákàtí Kan lójoojúmó (d) Kí a ra bàtà tí ó ju ese lo (e) Emi ko mo.

12. Jíje oúnje tí òrá inú rè kéré, yíò je kí ewu àti kó àwon nkan tí mo fé dárúko yìí dínkù:

(a) Àìsàn inú isan (b) Àìsàn inú kídìnrín (c) Àìsàn okàn (d) àìsàn inú èdò. (e) Emi ko mo.

13. Pájápajá àti kí ara kù rìrì leè jé àpeere (a) àìsàn kídìnrín (b) àìsàn inú isan (c) àìsàn ojú (d) àìsàn inú èdò (e) Emi ko mo.

14. E wo nínú àwon nkan wònyí ni kò ní ǹkan se pèlú àìsàn arun súgà.

(a) àrun ojú (b) àìsàn kidirin (c) àìsàn inú isan (d) àìsàn edo fooro (e) Emi ko mo.

EDURO BAYI TI E KO BA LO INSULINI. KI E TESIWAJU SI SECTION C

15. Ewo ninu Àwon wonyi ni àmìn pé ènìyàn ní iyofe (complication) àìsàn súgà ti o n fa ki suga eje loole ju, de ibi pe ara n so ora - ara di suga (ketoacidosisi):

(a) Gbígbòn (b) Aagun (c) Eebi (d) ki súgà ara eni ma kere. (e) Emi ko mo.

16. Tí ó ba rè ó tí o ní àìsàn ofinkìn, èwo nínú ǹkan wòn yí ni ó ye làti máase?

(a) Din Insuli jíje re ku (b) Din ǹkan olómi mimu kù (c) Je oúnje asara lóore si. (d) Máase àyèwò súgà inú èjè re lòrè kórè. (e) Emi ko mo.

17. Tí o bá ti lo Insulin aláarín tí à ń pè ní Intermediate (NPH or Lente), ó seé se kí súgà èjè re loole ju de ibi pe yo fa òyì kíkó ní igba wo. (a) Láàrín wákàtí kan sí wákàtí meta (b) Láàrín wákàtí méfà si méjìlá

(c) Láàrin wákàtí méjìlá sí méèdógún (d)ju wákàtí méèdógún lo (e) E mi ko mo

18. Tí o bá sà dédé rántí nígbà tí oúnje òsán ti sún mó gan pé oòlo insulin ki o tó jeun láaró. Kíni o ma se.

(a) Má je oúnje òsán láti lè dín súgà ara re kù (b) Mu iye insulin tí o má ńsábà mú ni àárò

(c) Mu ìlopo méjì iye insulin tí o má ńsábà mu ní àárò (d) Ye iye súgà inú èjè re wò láti lè mo iye insulin tí o ye kí o mu. (e) E mi ko mo

19. Kíni ó ye kí o se tí súgà èjè re bá lo sílè jù (a) Eré ìdárayá (b) Kí odùbúlè kí o sin mi

(c) Kí o mu olómi osàn tabi elerin ododo (d) Kí o máamu insulin re dédé.

(e) E mi ko mo

20. Àwon ǹkan wònyí lè fa kí súgà ara eni lolè. (a) Tí mímu insulin bá ti pò lápò jù

(b) Ti insulin bá ti kéré jù (c) oúnje àjejù. (d) Tí eré ìdárayá kò bá pò tó. (e) E mi ko mo

21. Ti o bá lo insulin re ní àárò, sùgbón tí o kò jeun, súgà inú èjè re yóò sáabà

(a) Pòsi (b) Dín kù (c) Wà lóju kan náà (d.) lo soke lo sodo (e) E mi ko mo

22. Èwo nínú àwon nkan wònyí ni ó leè fa kí súgà pòjù nínú èjè? (a) Kí insulin má tó (b) Àì jeun dédé (c) ài máje ìpanu lásìkò (d) ki súgà inú èjè farahàn díè(e) E mi ko mo

23. Èwo nínú àwon wònyí ni o lee je ki súgà inú èjè lo sílè ju, tí ó leè fa hypoglysemia. (a) Tí ènìyàn bá se eré ìdárayá púpò jù (b) kòkòrò ara (c) Jí jeun ní aje jù (d) kí ènìyàn má mu insulin re bí o se ye. (e) E mi ko mo

Section C: Ibeere Ogbon nipa imo itoju ara eni

E jowo e fi amin si isale ' Beeni' ti e ba faramo oro ti a ko sise yi, TABI ki e fi amin si isale ' Beeko' ti e ko ba faramo awon oro naa.

	Ìbéèrè	Béèni	Béèkó
1.	Níwon bí àyèwò Èmógílóbi onígilaikosíléètì (tí a máa ń se ní osù métà métà) ti wón fún àwon ènìyàn, a le lo àyèwo súgà inú èjè aláìtíìjeun láti mójuto ìtójú súgà inú èjè fún opo igba pípe		
2.	Gbogbo ìkìlò nípassè oúnje tí irúfé eni tí ó ní ìtò súgà gbodò maa je ni onísègùn gbodò ko síta, kódà bí irúfé eni béè kò lè ko tabi kà, ebí irú eni béè kan gbodò wà tí yó se alàyé fún-un		
3.	Onísègùn nìkan ni ó gbódò se ètò bí eni tí ó ni ìtò súgà se leè kógo já.		
4.	Agbódò se òdiwòn gúlókóòsì tí ó wà nínú èjè sáájú àti léhìn eré ìdárayá tí a là kalè se pàtàkì.		
5.	Síse eré ìdárayá fún ogún tàbí ogbòn ìséjú fún ojó méta nínú òsè kan se patàkì (Àpeere eré ìdárayá béè ni kí á sáré rìn, àwon isé inú ilé, gígun àkàsò nínú ilé).		
6.	Eré ìdárayá síse lóòrékòòrè kò dín lílo insulínì àti àwon oògùn ìtò súgà yòókù kù.		
7.	Síse àmújótó omi - ara eni kò se pàtàkì nínú itójú àrùn ìtò súgà.		
8.	Kí eni tí ó ní ìtò súgà bèèrè fún ìtójú lówó àwon onísègùn olùtójú rè nìkan nígbà tí ó ba ń sàisàn.		
9.	Sìgá mímu àti otí àmujù máa ń mú ìtò súgà burú síi.		
10.	Kí eni tí ó ní ìtò súgà máa lo òògùn nigbatí ara rè yá jé ìfowó sòfò.		
11.	Otí mímu fún eni tí o ń lo oògùn fún ìtójú ìtò súgà kì í se ìsòro rárá.		
12.	Oògùn lílò se pàtàkì jùlo fún ìtójú ìtò súgà ju irúfè oúnje àti eré ìdárayá lo.		
13.	Kò se dandan kí eni tí ó ni ìtò súgà tèlé àwon àlàyé lórí oògùn lílò ati àwon ònà ìtójú ara eni mìíràn.		
14.	Àyèwo loorekoore ko pon dandan fún alárun ìtò súgà tí ó ti ń gbádun.		

15.	Lílo oogun bí asipiríni níwònba ní ojoojúmó dín ewu àti ní àisàn okòn àti ìrolápá-rolésè ku jojo.		
16.	Ki i se gbogbo ojó ayé ni eni tí o ní àrùn ìtò súgà fi máa ń lo oògùn yìí.		
17.	Ni ìbèrè pèpè ìsàmúlo ìtójú oni insúlíìni fún eni tí o nílò rè gbodo fún irú eni béè ni ìmòran tí ó peye lórí àmójú to onígúlú kóósì tí ara eni.		
18.	Àgbooye gbódò wà láàárín eni tí ó ni àrùn ìtò súgà àti dókità rè tí irú eni béè kò bá ní owó láti ra oògùn tàbí yí igbé ayé kan padà.		
19.	Eni tí ó ní ìtò súgà gbódò mójútó esè won nígbà tí wón bá ń ge èékánná won.		
20.	Àwon ìbòwóbosè tí ó fún ko burú fún eni tí ó bá ni àrùn ìtò súgà.		
21.	Eni tí ó ń ìtò súgà gbódo sàmójútó eyín kí ó si fó eyin re lójoojúmó.		
22.	Tí súgà inú èjè bá kù díè kí ó se déédé, ó seése kí onítò súgà ní okun síi, mú omi níwòn, kí ó sì máse tò púpò		
23.	Enikéni kò gbódò se àyèwò fún eni tí ó ní àrùn ìtò súgà àyàfi onísègùn tí ó pójúowó àti àwon onímò ìsègùn mìíràn ní ilé ìwòsàn.		
24.	Alárùn ìtò súgà gbódò fi iyàtò kíyàtò tí ó bá sàkíyèsí nínú àgó ara re tó dókítà rè létí		
25.	Ìtójú onígúlúkóòsì ara eni (SBGM) se ìrànlówó fún dókítà àti àwon elétò ìlera mìíràn láti ní ìmòtélè fún ìpinnu.		
26.	Amojútó onígúlúkóòsì ara eni (SBGM) ń ran alárùn ìtò súgà lówó láti mójútó àwon àyípadà nínú ìwòn súgà tí ó wà nínú èjè: Èyí yóò ràn lówó láti soìrírí ìtò súgà di ìrírí kí ó sì gbé irúfé ayé tí ó fé.		
27.	Ìgbònrìrì, ìpòrurù, àyípadà ìwà àti lilaagùn jé ìfarahàn òpò súgà nínú èjè		
28.	Arun suga olojo pipe lè fa àrùn ojú, kódà ìfójú		
29.	Àmójútó ìfúnpá kò se béè se pàtàkì fún àmójútó gúlúkóòsì tí ó wà nínú èjè eni tí ó ní àrùn yìí		
30.	Àìmójúkó ipò súgà nínú èjè lóòrèkóòrè le fa àìsàn okàn, àìsàn rolápá rolésè àti àwon ìsòro kídìnrín.		

ÌPIN D: ÌBÉÈRÈ ISÉ ÌWÁDÌÍ ONÍTÓJÚ-ARA-ENI TI ÌTÒ SÚGÀ

Ìtúsónà:Àwon ìbéèrè yìí níí se pèlú bí e ti ń se ìtójú ìtò súgà yín. E ronu si bi e ti toju diabetes yin fun ose mejo seyin. Ewo ninu awon oro yi lo baa yin mu ju. E jòwó, e máàkì àwon àkámó tí ó wà níwájú ìbéèrè kòòkan bí ó ti ba a yin mu ní ìdáhùn sí àwon gbólóhùn ìkínní sí ìkerìndínlógún. Ìdáhùn kan pére ni kí e máàkì, kí e si dáhùn gbogbo ìbéèrè.

		Ko ba mi mu	Oba mi mu die	Oba mimu pupo	Oba mi mu pupo gan
1.	Mo máa ń farabalè láti se àyèwò ipò súgà				

	ara mí pèlú ìsóra [ ] N kò nílò odiwon súgà inú èjè gégé bí òkan lára ìtójú mi.				
2.	Àwon oúnje tí mo yàn láàyò láti máa jé mú kó rórùn láti ni òdiwòn súgà inú èjè tó se déédé				
3.	Mo máa ń se déédé pèlú gbogbo àwon àsìkò àyèwò tí dókítá dá fún ìtójú ìtò súgà mi				
4.	Mo máa ń lo àwon òògùn ìtò súgà mí (bí insúlìnnì tabi òògùn oníkóro) bí ó ti ye. [ ]Oògùn ìtò súgà/insúlìnnì kò sí nínú ìtójú mi				
5.	Ní ìgbákòòkan, mo máa ń jé àwon oúnje tí ó dún tí ó sì ní òpòlopò okùn/kaboháyídíréètì.				
6.	Mo máa ń se àkosílè ìwon súgà inú èjè mi lóòrèkóòrè (tàbí se ìtúpalè ìwon rè pèlú èrò àyèwò súgà ara mi) [] Òdiwòn súgà inú èjé kò sí lára ìtójú mi.				
7.	Mo máa ń gbìyànjú láti sá fún àwon dókítà onímò nípa ìtò súgà.				
8.	Mo máa ń se àwon isé tàbí ìdárayá tí a lè rí láti ní ìwon súgà tí ó se déedé nínú èjè mi.				
9.	Mo máa ń tèlé gbogbo ìmòràn oúnje jíje tí dókítà tábì onímò nípa ìtójú ìtò súgà fún mí láìyesè.				
10.	Mi kìí se àyèwò ìwòn súgà inú èjè mí déédé tó láti lè ní àyorísí ìkápá súgà inú èjè tí ó dára.				
11.	Mo máa ń sá fún àwon ìdárayá bí ó tilè jé pé won á rán ìdíkú ìtò súgà mi lówó.				

12.	Mo lè fé gbàgbé tàbí má lo òògùn ìtò súgà mi (bíí insúlínnì tabi òògùn oníkóró)				
13.	Ìgbà mìíràn, mo, máa ń ní ìsòrò oúnje (tí kìí se àìtò súgà, nínú èjè ló fàá)				
14.	Látàrí ìtójú ìtó-súgà mi, o ye ki n ma ri Onísègùn ito suga mi ju bi mo se n ri won				
15.	Mo lè fójúfo àwon orísìí ìdárayá tí mo ti fé se				
16.	Ìtójú ìtò súgà fúnra mi kò dára				

ÌPÍN E: ÈRÒ/ÌHÀ TI ÀTÌLÉYÌN ÌDÍLÉ

Àwon gbólóhùn tí ó wà ní ìsàlè yìí ń sé àfihàn àwon èrò àti ìrírí tí àwon ènìyàn ní nínú ìbásepò won pèlú àwon ìdílé won ní àkókò kan tàbí òmínràn. Ìdáhùn méta òtòòtò ni ó wà fún òkòòkan won; *Ó kàn mi dáa dáa, Ó kàn mi dé àyè tó lápeere, Ó kàn mi ni ònà púpò, Ko kàn mí*. *E jòwó,* è yí òdò sí ìdáhùn tí é mú fún òkòòkan.

		Mio f'aramo rara	**Mio f'ara mo**	**Mo f'ara mo**	**Mo f'ara mo gan**
1.	Àwon ebí mi máa ń fún mi ní àtìléyìn tí mo nílò láti se ìtójú ìtò súgà mi.				
2.	Àwon èbí mi máa ń là mí lóye lórí bí mo se lè se nìkan tabi se ìtójú ìtò súgà mi.				
3.	Àwon elòmííràn súnmó ìdílé won ju bí mo se sún mó tèmi lo				
4.	Nígbà tí mo bá fi inú hàn àwon ebí mi tí ó sún mó mi, nipa ìtójú ìtò súgà mi, o ma n dabi wipe o n ni wón lára.				
5.	Àwon ebí mi máa fe ń gbó nípa ohun tí mo ń rò.				
6.	Àwon ebí mi máa ń pín nínú àwon ohun				

	tí ó kàn mí ati lori ìtójú ìtò súgà mi.				
7.	Àwon kan nínú ìdílé mí máa ń wá sí òdò mí nígbà tí won bá ní ìsòro tàbí tí wón nílò ìmòràn.				
8.	Mo gbékélé àwon ìdílé mi fún àtìlèyìn onítara nipa ìtójú ìtò súgà mi.				
9.	Ó ní enìkan nínú ebí mi tí mo lè tò lo tí irewesi okan ba n bami nipa ìtójú ìtò súgà mi láìkábámò nípa síse béè léyìnòreyìn.				
10.	Èmi àti àwon ebí mi máa ń fi inú hàn ara nípa ohun tí a ń rò nípa àwon orísìí nǹkan.				
11.	Àwon ebí mi máa ń mú ìpèsè ohun tí mo nílò ní òkúnkúndùn.				
12.	Àwon ebí mi máa ń wá sí òdò mí fún àtìléyìn onítara.				
13.	Àwon ebi mi máa ń ràn mí lówó láti tán àwon ìsòro mi.				
14.	Mo ní ìfarakínra ìbásepo tó jínlè pèlú púpò nínú àwon ebí mi.				
15.	Àwon ebí mi máa ń gba ìmòràn tí ó dára lórí bí wón se lè se nǹkan lówó mi.				
16.	Mo máa ń kábámò tí mó bá fi inú hàn àwon ìdílé/ebí mi.				
17.	Àwon ebí mi máa ń fé kí ń bá won farakínra.				
18.	Nínú èrò mi, àwon ebí mi rò pé mo lè bá won tán ìsòro won dáadáa.				
19.	Ìbásepò ebí àwon elòmíì dára ju tí èmi lo				

20.	Ó wùmí kí àwon ebí mí yàtò díè				

IPIN F. IBEERE LORI ETO ILERA

Jowo fi nomba to je o logun ni bi ose meloo kan seyin sinu akamo ti o niwaju awon oro wonyi

Ibeere	Ni gbogbo igba	Nigba omiran	O s'owon	Kosi rara
1. Mo lero pe mo wulo ati wipe won nilo mi				
2. O dabi wipe mon nfe sokun				
3. Mo ri wipe mo le ronu daadaa				
4. Aye mi kun fofo				
5. Irewesi okan ma maa n bami				
6. Mo n gbadun awon nnkan to mi n se				
7. Mo ma n gbon, nkan osi nkamilara				
8. Eru n bami lai nidi				
9. Inu tete n bi mi tabi mo maa n gbon				
10. O dabi wi pe mo n yapa				
11. Ara mi n bale mo si njo koo jeje				
12. Mo tete n sun, mo si n sun gbadun lale				
13. Mo ni agbara ati okun				
14. Aare n mu mi tabi mo nse siosio.				
15. O n re mi tenutenu pupo				
16. Ara mi n ji pepe ti mo ba ji, okan mi nbale pelu				
17. Inu mi dun pelu igbesi aye ti mo n gbe.				
18. Ayipada to ye ti ba igbe aye mi				
19. Mo n gbe igbe aye to wumi				
20. Mo n tiraka lati wa ojutuu si isoro to nko mi lojojumo tabi se ipinnu titun				
21. Mo lero pe mo le dojuko isoro to n ko mi loju tabi latifarada ayipada nla ni inu aye mi				
22. Igbesi aye mi kun fun awon ohun to n dun mo mi.				

SECTION G: HbA1C ----------

Appendix 4: (For family members) **Phone No for follow up: ……...**

DEPARTMENT OF NURSING
COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN

Title of research: Effects of family – integrated diabetes education on quality of life and glycaemic control among type 2 diabetes patients in south western Nigeria

SECTION A: SOCIODEMOGRAPHIC DATA

1. Sex: a. Male b. Female ☐

1b. Marital Status a. Single b. Married c. Widowed d. Separated/Divorced

2. How old are you? (Age in years as at last birthday) _____

3. What is your highest level of education? a. Postgraduate degree (MSc or PhD)

b. Tertiary education: HND\BSc/B.Ed/B.A. c. Secondary School

d. Primary School e. No formal education

4. On average, how much do you earn every month (in naira) _____

5. Have you had Diabetes education in the last one to two months? a. Yes b. No

5b. If you have had diabetes education in the last one month, from whom and where you did get this?

a. Researcher b. On line/Internet c. At the hospital d. Others: (Please specify)…….

6. Is your relative taking insulin injection?

a. Yes b. No

7. How would you rate your knowledge of diabetes?

a. Good b. average c. Poor d. Non existent

SECTION B:DIABETES KNOWLEDGE TEST

Instruction: Circle the **MOST APPROPRIATE** option. Choose **ONLY ONE** option.

Answer Questions **1- 23** if your relation **IS USING INSULIN** and **1-14** if your relation is **NOT USING INSULIN**

1. The diabetes diet is:

a. the way most Nigerian people eat b. a healthy diet for most people

c. too high in carbohydrate for most people d. too high in protein for most people e. I do not know

2. Which of the following is highest in carbohydrate?

a. Roast chicken b. Cheese

c. Boiled yam d. Ground- nut e. I do not know

. Which of the following is highest in fat?

a. Low fat milk b. Orange juice

c. Corn d. Honey e. I do not know

4. Which of the following will contribute a very small amount of carbohydrate or energy i.e. "free food"? a. Any unsweetened food b. Any dietetic food c. Any food that says "sugar free" on the label d. Any food that has less than 20 calories per serving e. I do not know

5. Glycosylated hemoglobin (hemoglobin A1) is a test that is a measure of average blood glucose level for the past: a. One day b. One week. c. 6-10 weeks d. 6 months e. I do not know

6. Which is the best method for testing blood glucose level?

a. Urine testing b. Blood testing c. Both are equally good e. I do not know

7. What effect does unsweetened fruit juice have on blood glucose?

a. Lowers it b. Raises it c. Has no effect d. makes it fluctuate e. I do not know

8. Which should not be used to treat low blood glucose? a. 3 cubes of Sugar

b. Orange juice c. diet soft drink d. Skim milk like Three - crowns milk

e. I do not know

9. For a person in good control, what effect does exercise have on blood glucose?
   a. Lowers it b. raises it c. Has no effect e. I do not know
10. Infection is likely to cause: a. an increase in blood glucose b. a decrease in blood glucose c. no change in blood glucose e. I do not know
11. The best way to take care of the feet of a person with diabetes is to:
    a. look at and wash them each day b. massage them with alcohol each day
    c. soak them for one hour each day d. buy shoes a size larger than usual
    e. I do not know
12. Eating foods lower in fat decreases a diabetic patient's risk for:

a. nerve disease b. kidney disease c. heart disease d. eye disease e. I do not know

13. Numbness and tingling may be symptoms of:

a. kidney disease b. nerve disease c. eye disease d. liver disease e. I do not know

14. Which of the following is usually <u>not</u> associated with diabetes?

a. vision problems b. kidney problems c. nerve problems d. lung problems e. I do not know

IS YOUR FAMILY MEMBER USING INSULIN?

A. YES B. NO

IF YES, CONTINUE WITH QUESTIONS 15 – 23 & SECTION C. IF NO, STOP, AND MOVE TO SECTION C

15. Signs of ketoacidosis include:

a. shakiness b. sweating c. Vomiting d. low blood glucose e. I do not know

16. If a person with diabetes is sick with serious catarrh causing fever/ viral flu, which of the following changes should he/she make?
    a. Take less insulin b. Drink less liquids c. Eat more proteins
    d. Test for glucose and ketones more often e. I do not know
17. If a person with diabetes has taken intermediate-acting insulin (NPH or Lente), he/she is most likely to have hypoglycaemia in: a. 1-3 hours b. 6-12 hours
    c. 12-15 hours d. more than 15 hours e. I do not know
18. If a person with diabetes realize just before lunch time that they forgot to take their insulin before breakfast. What should they do now?
    a. Skip/Omit lunch to lower their blood glucose b.Take the insulin that they usually take at breakfast
    c. Take twice as much insulin they usually take at breakfast
    d. Check their blood glucose level to decide how much insulin to take e. I do not know
19. If a person with diabetes is beginning to have hypoglycemia, they should:
    a. exercise b. lie down and rest c. drink some juice/Coke
    d. take regular insulin e. I do not know
20. Low blood glucose may be caused by:
    a. too much insulin b. too little insulin c. too much food
    d. too little exercise e. I do not know
21. If a person with diabetes take their morning insulin but skip breakfast, their blood glucose level will usually:
    a. increase b. decrease c. remain the same d.fluctuate e. I do not know

22. High blood glucose may be caused by:
    a. not enough insulin b. skipping meals
    c. delaying your snack d.large ketones in your urine e. I do not know

23. Which one of the following will most likely cause an insulin reaction/ hypoglycaemia?
    a. heavy exercise b. Infection c. over eating
    d. not taking your insulin e. I do not know

SECTION C: 30-item Diabetes self-care Knowledge Questionnaire (DSCKQ-30)

Please, tick 'Yes' if you agree OR 'No' if you do not agree to each of the statement below.

No.	Questions	Yes	No
1	Since glycosylated haemoglobin (HbA1C) test is expensive, fasting blood sugar (FBS) test can be used in place of it to monitor blood sugar control over time.		
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.		
3	Only the doctors should make plans on how a person with diabetes can achieve his/her target goals.		
4	Blood glucose level should be measured before and after every planned physical activity.		
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).		
6	Regular exercise does not reduce the need for insulin or other diabetic drugs.		
7	Maintaining a healthy weight is not important in the management of diabetes.		
8	A person with diabetes should only ask for help when he/she feels sick from his/her healthcare team.		
9	Cigarette smoking and excessive alcohol intake can worsen diabetes		
10	A person with diabetes taking medicines when he/she feels good is waste of money.		
11	Taking Alcohol while on diabetic drugs is not a serious problem.		
12	Medication is more important than diet and exercise in control of diabetes.		
13	Instructions about drugs and other self-care practices sometimes may not be strictly followed.		
No.	Questions	Yes	No
14	Regular medical checkups are not essential when a person with diabetes is feeling well.		
15	Taking low dose Aspirin (Vasoprin®, Emprin®) tablet every day decreases risk of having heart attack and stroke.		
16	Diabetes Drugs are not taken throughout the life time of a person with diabetes.		
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.		
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.		
19	A person with diabetes should take extra care of his/her feet especially when cutting his/her toenails		

20	Tight elastic hose or socks are not bad for a person with diabetes.		
21	A person with diabetes should take care of his/her teeth and brush and floss his/her teeth every day.		
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.		
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.		
24	A person with diabetes should report any change in his eyesight to his doctor.		
25	Self -blood glucose monitoring (SBGM) allows doctor and other members of healthcare team to gather data for clinical decision-making.		
26	Self- blood glucose monitoring (SBGM) enables a person with diabetes to monitor and react to changes in his/her blood sugar levels; it allows him to integrate his diabetes into the life style he wants to live.		
27	Shaking, confusion, behavioural changes and sweating are signs of high blood sugar.		
28	Prolonged high blood sugar level can cause eye problem or even blindness.		
29	Monitoring blood pressure is not as important as monitoring blood glucose for a person with diabetes.		
30	Prolonged uncontrolled blood sugar level can cause heart attack, stroke and kidney problems.		

Appendix 5 For **family members**

Yoruba version of Instrument

DEPARTMENT OF NURSING
COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN

SectionA: IBEERE NIPA OLUKOPA

E jowo e dahun awon ibeere won yi nitooto ati lododo

1. Àbùdá ako tàbí abo

   (a) Ako (b) Abo

2. Omo odún mélòó ni yín? (Ojó orí láti ojó ìbí tí ó kojá) _____

3. Irú ilé ìwé wo ló ga jù tí e lo?

b. Ìmò ìjìnlè kejì àti ìketa (MSC tàbí Ph.D) (b) Ilé ìwé gíga: HND/BSC/BSC/B.ED/B.A

(c.) Ilé ìwé Girama (d.) Ilé ìwé alákóbèrè. (e) N kò kàwe

4. Èló ni o ń wolé fún yin lósù (ní náìrà) _____

5. Sé e ti gba eko nípa ìtò suga rí? (a) Béèni (b) Béèkó

6. Se ebi yin ngba insulin lati teju ito suaga? (a) Béèni (b) Béèkó

7. Bawo ni elero wipe imo yin nipa ito suga se po to? A. O dara gan b. O dara die c. O kere pupo d. Kosi imo rara

Section B: Imo nipa aisan ito suga. Ti ojulumo yin ko ba lo INSULINI e dahun ibeere lati 1 – 14; sugbon ti Ojulumo yin ba n LO INSULINI, E dahun Ibeere 1- 23.

E jowo a falayipo eyi ti o ba je idahun si awon oro ti a gbe kale yi

1.Oúnje tí àwon tó ní àrùn ìtò śugà lè je ni

(a) Oúnje tí àwon omo orílèèdè Nàíjíríà lè je (b) Oúnje tó péye fún òpòlopò ènìyàn (c) Oúnje tí ó kún fún okun àti agbára jù fún àwon ènìyàn (d) tí ó kún fún èròjà asara lóore púpò jù

2. Èwo nínú àwon èyí ni ó fún ni lágbára púpò jùlo?
(a) Adìe tí a yan (b) Wàrà (c) Isu sísè (d) Èpà lílò

3. Èwo ni òrá inú è pò jù?(a) Mílìkì tí òrá rè kéré (b) Omi osàn (c) Àgbàdo (d) Oyin

4. È wo nínú àwon oúnje wònyí ni kòní súgà púpò tí ó se ara lóore
(a) Oúnje tí kò bá dùn jù (b) Oúnje tí a yà sótò fún àwon kan láti má a je
(c) Oúnje tí wón bá ti ko sí àkólé rè pé kò ní súgà (d) Oúnje ìjóko ekan tí kálórì inú rè kò tó ogún

5. Glycosylated haemoglobin – Àyèwò èjè tí óye káse láti ìgbàdégbà láti mo ìdíwòn súga nínú eje eni ti o ba ni aisan ito suga (HBA1c) - Fún ìdíwòn ìgbàwo ló ye ká seé?
(a) Ojo kankan (b) Osè kan (c) Ose mefa si méwà (d) Laarin osù méfà.

6. Èwo ni ònà tí ódára jù láti mò iye súgà inú èjè
(a) Àyèwò ìtò (b) Àyèwò èjè (c) Méjèjì ló dára

7. Ipa wo ni omi osàn tí kò bá dun ńkó nínú súgà inú èjè
(a) yíò dínkù si (b) yíò je kópò si (c) kìí kó ipa Kankan.

8. Ewo ni ko ye lati fi toju súgà ti o ba lo sile ju? A. suga oro meta b. omi osan c. elerin ododo ti kalori re kopo d. Miliki ti ati yo ora ara re kuro bi Three Crown milk

9. Fún eni tí ara rè bá dápé, ipa wo ni eré ìdárayá ńkó nínú súgà ara eni béè
(a) ó má n mú lolè (b) ó ma n mú gòkè si (c) kò nipa Kankan tó ńkó

10. Ó seése kí kòkòrò àrun fa: (a) Kí súgà inú èjè pò si (b) Kí súgà inú èjè dínkù si (c) Kí iyípadà Kankan má si nínú súgà inú èjè

11. Ònà tó dára jùlo láti tójú esè fun eni ti o ba ni ito suga ni: (a) ki o máa yèewò àti kí o máa fò wón lójoojúmó (b) Ki o máa fi sípírítì raá lójoojúmó. (c) Ki o máa re wón s'ómi fún wákàtí kan lójoojúmó (d) Kí a ra bàtà tí ó ju ese lo

12. Jíje oúnje tí òrá inú è kéré yíò je kí ewu àti kó àwon ǹkan tí mo fé dárúko yìídínkù:
(a) Àìsàn inú isan (b) Àìsàn inú kídìnrín (c) Àìsàn okàn (d) àìsàn inú èdò.

13. Pájápajá àti kí ara kù rìrì leè jé àpeere (a) àìsàn kídìnrín (b) àìsàn inú isan
(c) àìsàn ojú (d) àìsàn inú èdò

14. E wo nínú àwon nkan wònyí ni kò ní ǹkan se pèlú àìsàn arun súgà.

(a) àrun ojú (b) àìsàn kidini (c) àìsàn inú isan (d) àìsàn edo fooro

15. Ewo ninu Àwon wonyi ni àmìn pé èníyàn ní iyofe (complication) àìsàn súgà ti o n fa ki suga eje l'ole ju de ibi pe ara n so ora - ara di suga (ketoacidosisi) :

(a) Gbígbòn (b) Aagun (c) Eebi (d) ki súgà ara eni ma kere.

16. Tí ó ba rè eni ti o ni aisan ito suga, tí o ní àìsàn ofinkìn, èwo nínú ǹkan wòn yí ni ó ye làti máase?

(a) Insuli jíje re gbódò kéré (b) Má mu ǹkan olómi jù (c) Má a je oúnje asara lóore dáadáa. (d) Máase àyèwò súgà inú èjè re lòrè kórè.

17. Tí eni ti o ni aisan ito suga, bá ti lo Insulin aláarín tí à ń pè ní Intermediate (NPH or Lente), ó seé se kí súgà èjè eni naa loole ju de ibi pe yo fa òyì kíkó ní igba wo.
(a) Láàrín wákàtí kan sí wákàtí meta (b) Láàrín wákàtí méfà si méjìlá
(c) Láàrin wákàtí méjìlá sí méèdógún (d) ju wákàtí méèdógún lo

18. Tí eni ti o ni aisan ito suga, bá sà dédé rántí nígbà tí oúnje òsán ti sún mó gan pé òhun kò lo insulin ki òhun tó jeun láaró. Kíni yió se? (a) Ko gbodo je oúnje òsán láti lè dín súgà ara re kù
(b) Ki ó gba iye insulin tí ó má ńsábà gbà ni àárò (c) Ki ó lo ilópo méjì iye insulin tí ó má ńsábà mu ní àárò (d) Ki eni naa ye iye súgà inú èjè rè wò láti lè mo iye insulin tí o ye kí ó gbà.

19. Kíni ó ye kí eni ti o ni aisan ito suga se tí súgà èjè rè bá lo sílè jù (a) Eré ìdárayá (b) Kí ódùbúlè kí o sin mi (c) Kí ó mu olómi osàn tabi elerin ododo (d) Kí ó máa mu insulin re dédé.

20. Àwon ǹkan wònyí lè fa kí súgà ara eni lolè. (a) Tí mímu insulin bá ti pò lápò jù (b) Ti insulin bá ti kéré jù (c) oúnje àjejù. (d) Tí eré ìdárayá kò bá pò tó.

21. Ti eni ti o ni aisan ito suga bá lo insulin rè ní àárò, sùgbón tí o kò jeun, súgà inú èjè re yóò sáabà

(a) Pòsi (b) Dín kù (c) Wà lóju kan náà

22. Èwo nínú àwon ǹkan wònyí ni ó leè fa kí súgà pòjù nínú èjè? (a) Kí insulin má tó

(b) Àì jeun dédé (c) ài máje ìpanu lásìkò (d) ki súgà inú èjè farahàn díè

23. Èwo nínú àwon wònyí ni o lee je ki súgà inú èjè lo sílè ju, tí ó leè fa hypoglysemia.

(a) Tí ènìyàn bá se eré ìdárayá púpò jù (b) kòkòrò ara (c) Jí jeun ní aje jù (d) kí ènìyàn má mu insulin re bí o se ye.

Section C: Ibeere Ogbon nipa imo itoju ara eni

E jowo e fi amin si isale ‘ Beeni’ ti e ba faramo oro ti a ko sise yi, TABI ki e fi amin si isale ‘ Beeko’ ti e ko ba faramo awon oro naa.

	Ìbéèrè	Béèni	Béèkó
1.	Níwon bí àyèwò Èmógílóbi onígilaikosíléètì (tí a máa ń se ní osù métà métà) ti wón fún àwon ènìyàn, a le lo àyèwo súgà inú èjè aláìtíìjeun láti mójuto ìtójú súgà inú èjè fún opo igba pípe		
2.	Gbogbo ìkìlò nípassè oúnje tí irúfé eni tí ó ní ìtò súgà gbodò maa je ni onísègùn gbodò ko síta, kódà bí irúfé eni béè kò lè ko tabi kà, ebí irú eni béè kan gbodò wà tí yó se alàyé fún-un		
3.	Onísègùn nìkan ni ó gbódò se ètò bí eni tí ó ni ìtò súgà se leè kógo já.		
4.	Agbódò se òdiwòn gúlókóòsì tí ó wà nínú èjè sáájú àti léhìn eré ìdárayá tí a là kalè se pàtàkì.		

5.	Síse eré ìdárayá fún ogún tàbí ogbòn ìséjú fún ojó méta nínú òsè kan se patàkì (Àpeere eré ìdárayá béè ni kí á sáré rìn, àwon isé inú ilé, gígun àkàsò nínú ilé).		
6.	Eré ìdárayá síse lóòrékòòrè kò dín lílo insulínì àti àwon oògùn ìtò súgà yòókù kù.		
7.	Síse àmújótó omi - ara eni kò se pàtàkì nínú itójú àrùn ìtò súgà.		
8.	Kí eni tí ó ní ìtò súgà bèèrè fún ìtójú lówó àwon onísègùn olùtójú rè nìkan nígbà tí ó ba ń sàisàn.		
9.	Sìgá mímu àti otí àmujù máa ń mú ìtò súgà burú síi.		
10.	Kí eni tí ó ní ìtò súgà máa lo òògùn nigbatí ara rè yá jé ìfowó sòfò.		
11.	Otí mímu fún eni tí o ń lo oògùn fún ìtójú ìtò súgà kì í se ìsòro rárá.		
12.	Oògùn lílò se pàtàkì jùlo fún ìtójú ìtò súgà ju irúfè oúnje àti eré ìdárayá lo.		
13.	Kò se dandan kí eni tí ó ni ìtò súgà tèlé àwon àlàyé lórí oògùn lílò ati àwon ònà ìtójú ara eni mìíràn.		
14.	Àyèwo loorekoore ko pon dandan fún alárun ìtò súgà tí ó ti ń gbádun.		
15.	Lílo oogun bí asipiríni níwònba ní ojoojúmó dí ewu àti ní àisàn okòn àti ìrolápá-rolésè ku jojo.		
16.	Ki i se gbogbo ojó ayé ni eni tí o ní àrùn ìtò súgà fi máa ń lo oògùn yìí.		
17.	Ni ìbèrè pèpè ìsàmúlo ìtójú oni insúlíìni fún eni tí o nílò rè gbodo fún irú eni béè ni ìmòran tí ó peye lórí àmójú to onígúlú kóósì tí ara eni.		
18.	Àsogun gbódò wà láàárín eni tí ó ni àrùn ìtò súgà àti dókità rè tí irú eni béè kò bá ní owó láti ra oògùn tàbí yí igbé ayé kan padà.		
19.	Eni tí ó ní ìtò súgà gbódò mójútó esè won nígbà tí wón bá ń ge èékánná won.		
	Ìbéèrè	Béèni	Béèkó
20.	Àwon ìbòwóbosè tí ó fún ko burú fún eni tí ó bá ni àrùn ìtò súgà.		
21.	Eni tí ó ń ìtò súgà gbódo sàmójútó eyín kí ó si fó eyin re lójoojúmó.		
22.	Tí súgà inú èjè bá kù díè kí ó se déédé, ó seése kí onítò súgà ní okun síi, mú omi níwòn, kí ó sì máse tò púpò		
23.	Enikéni kò gbódò se àyèwò fún eni tí ó ní àrùn ìtò súgà àyàfi onísègùn tí ó pójúowó àti àwon onímò ìsègùn mìíràn ní ilé ìwòsàn.		
24.	Alárùn ìtò súgà gbódò fi iyàtò kíyàtò tí ó bá sàkíyèsí nínú àgó ara re tó dókítà rè létí		
25.	Ìtójú onígúlúkóòsì ara eni (SBGM) se ìrànlówó fún dókítà àti àwon elétò ìlera mìíràn láti ní ìmòtélè fún ìpinnu.		
26.	Ìtójú onígúlúkóòsì ara eni (SBGM) ń ran alárùn ìtò súgà lówó láti mójútó àwon àyípadà nínú ìwòn súgà tí ó wà nínú èjè: Èyí yóò ràn án lówó láti soìrírí ìtò súgà di ìrírí kí ó sì gbé irúfé ayé tí ó fé.		
27.	Ìgbònrìrì, ìpòrurù, àyípadà ìwà àti òógùn jé ìfarahàn òpò súgà		

	nínú èjè		
28.	Ìrírí òpò súgà nínú èjè fún ìgbà pípè lè fa àrùn ojú, kódà ìfójú		
29.	Àmójútó ìfúnpá kò se béè se pàtàkì fún àmójútó gúlúkóòsì tí ó wà nínú èjè eni tí ó ní àrùn yìí		
30.	Àìmójúkó ipò súgà nínú èjè lóòrèkóòrè le fa àìsàn okàn, àìsàn rolápá rolésè àti àwon ìsòro kídìnrín.		

APPENDIX 6

DIABETES PATIENTS AND FAMILY MEMBERS' TRAINING MANUAL ON DIABETES AND ITS MANAGEMENT

Adapted from
International Diabetes Federation (IDF) Africa Region Diabetes Education training manual for sub Saharan Africa
&
Diabetes Association of Nigeria National Guideline for diabetes management in Nigeria

Introduction.

Diabetes is on the increase worldwide. It is a chronic condition which requires a life-long behavioural/ lifestyle changes. There are many people who are living healthy lives despite having been diagnosed of having diabetes for many years. It is possible to have diabetes and

live to a ripe old age without complications. This requires a positive attitude towards the condition and a readiness to cooperate with health care workers who are directly involved.

The overall aim of this module and the entire training is to learn about diabetes along with a family member who can give psychosocial support. This is because having diabetes can affect the emotion and the mind and everyone needs the support of others in order to cope with any challenge in life. This support can be easily given by family members since almost everyone live in a family.

MODULE CONTENT.

DIABETES CARE & PATIENT– FAMILY COLLABORATION: EVERYONE TOGETHER

•Diabetesisachroniclifelong condition

•causedbyabsenceorreducedinsulin

•Diabetescare=cooperationpersonwithdiabetes,family membersandhealthcareworkers

•Majorrole (99%)isbythosewithdiabetes

•helpedbywife/husband;siblings,childrenandothers

•Thepersonwithdiabetesshouldopenuptohisfamilymembers abouthisvariousneeds– physical,emotionalandsocial.

Educationis the cornerstone of diabetes care

•Aspectsto befamiliarwith

- ☐ Food education
- ☐ Exercise education
- ☐ Medicationeducation&glucose monitoring
- ☐ Tabletorinjectioneducation
- ☐ Psychosocialeducation-familysupport

FOOD

- ☐ Note: HavingDiabetes makes one eat well.
- ☐ Diabetes food isahealthydiet for most people
- ☐ All familymembers can eatthesame kind of food as those with diabetes

□ Encouragethemandprovide explanations.

□ Itrequireslove anddiscipline

Food types

•Carbohydrate…GIVEEXAMPLES

•Protein …examples and the caloric content

•Fatsandoil

•Vitamins

•Minerals

Ideal breakfast- examples

•Papwith2moinmoin

•2slicesofyamorsweetpotatowithfishormeatstew

•4slicesofbreadwithfish ormeatstew

•18tbsofcookedbeanswithvegetable

•20 table spoonful of boiled ricewithfishorvegetable

Ideal lunch

•Lotsofvegetable

•Little oil

•Fish–betterroasted,NEVER FRIED

•Fist-size portion of‘swallow’, e.g. Amala,eba,fufu,pounded yam,wheat

Approximate weight of 400g.


Dolbys
Signature

Ideal dinner: example

•Agidi/ekowithvegetable

•Iboiledripeorunripe plantainwithfish stew

•Anything onbreakfastlist

•DRINKLOTSOF WATER BEFORE, DURINGANDAFTER MEALS.

•Roastchicken

•Cheese

•Boiledyam

•Groundnut

Low caloriefood for nackingandtimesoftightercontrol

□ Less than20calories/ serving: YES

X Iffoodlabelsays‘nosugar’theyhaveonlyreducedthe amount-NO

X Any unsweetened food - NO. Some high calorie food are not sweet

X Any dietetic food – NO because the caloric value must still be ascertained.

SELF BLOOD GLUCOSE MONITORING

BloodGlucoseMonitoringisawayofcheckingthe concentrationof glucose in the bloodusing a glucometer

What is the purpose?

•Provides quickresponsetotell if the sugar is highor low indicatingachangeindiet,exerciseorinsulin.

•Helpsplanwithhealthcareprofessionals

•Reducesriskofdevelopingcomplicationswithdiabetes.

•Allowspeople with DMtoseeiftheinsulinandothermedicationstheyare takingareworking.

•Gives people with DManideaastohowexerciseandfoodaffecttheirblood sugar

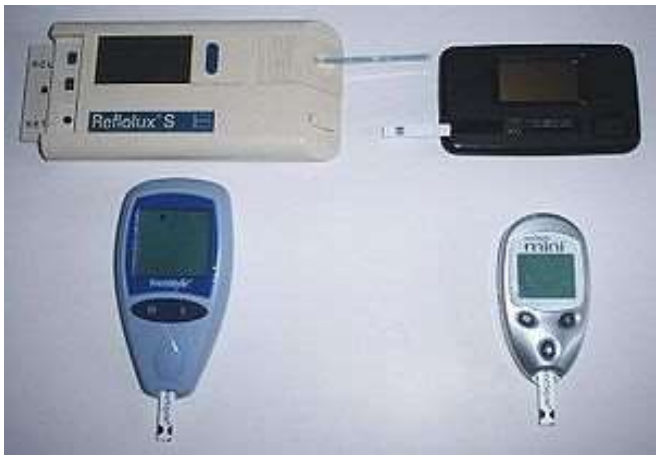
•Maypreventhypoglycemiaorhyperglycemia

When to check blood sugar

- Before food
- 2 hours after meals
- Before physical activity
- 15 minutes after physical activity
- Before bed

What is a glucometer?

- A glucometer is a device used to test the amount of glucose in the blood.
- New models are able to read and calculate the blood sugar within seconds.



Target blood glucose

	Without Diabetes	With Diabetes (normal)	With Diabetes (target)
Before meals	70-115 mg/dL	< 110 mg/dL	80-120 mg/dL
Before bedtime	70-120 mg/dL	< 120 mg/dL	100-150 mg/dL
Hemoglobin A_{1c}	< 6%	< 7%	< 7%

Important to Note that:

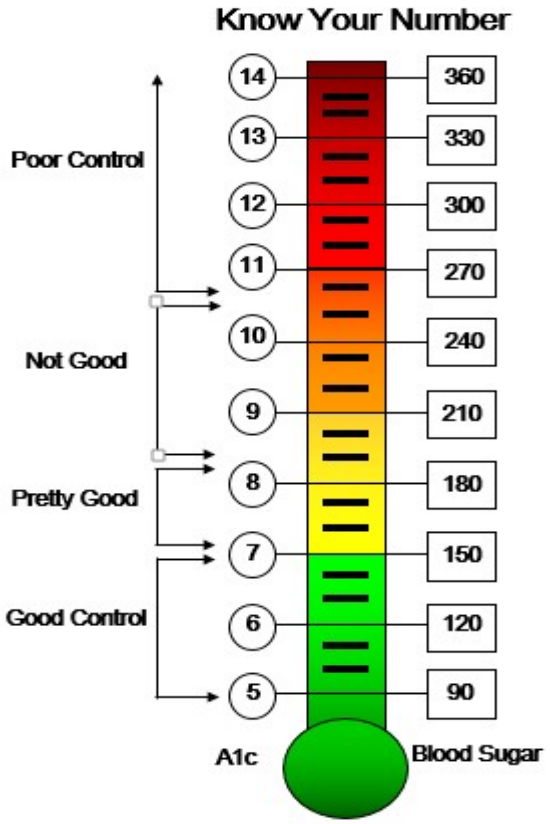
- The best way of checking the amount of sugar in the blood is by testing the blood NOT urine.
- FBG – once or twice a day using a glucometer
- HbA1C – ideally every 3 months (or 6-10 weeks)

Factors associated with blood glucose level

- Exercise: lowers it
- Infection: increases it
- Unsweetened fruit juice – Increase it
- Before starting exercise discuss with Doctor.

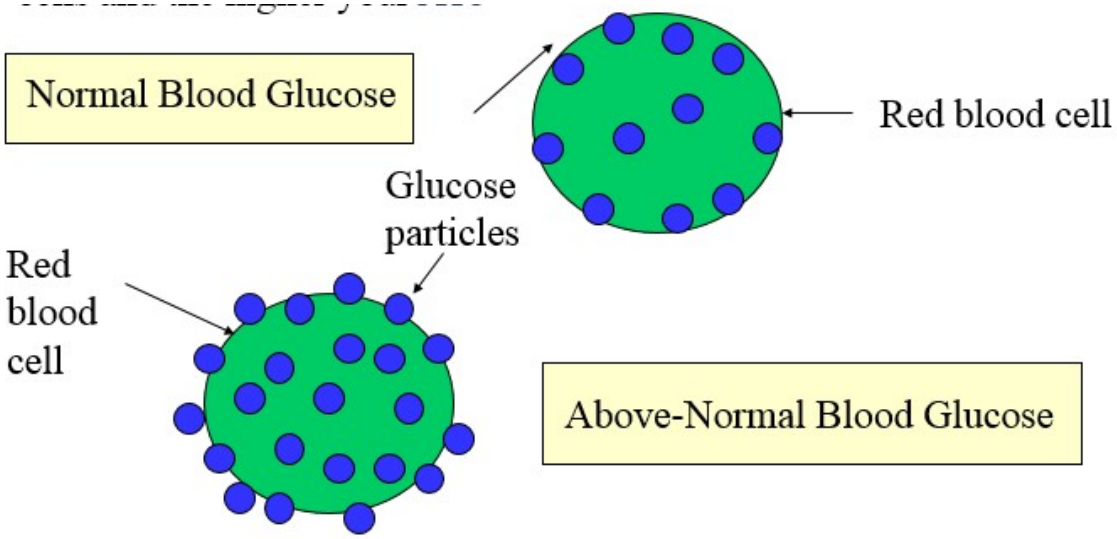
Monitoring Your Diabetes: What does an $\mathbf{A_{1c}}$mean?

An HbA1c/A1c measures how much sugar has been sticking to red blood cells over a 3 month, i.e. 6 – 8 weeks period



An HbA1c is a measure of long-term diabetes control.

The higher your blood sugar, the more sugar that sticks to your red cells and the higher your A1c



- Blood sugars and an A_{1c} at or below goal (7% or less) can protect your:
  - *Heart, brain, blood vessels*
  - Eyes
  - Kidneys
  - Nerves
  - Feet

Sample diabetes records:

Alternating Time Checks - Blood Sugar Log

Name: _____ **MRN:** _____

Insulin Regimen: _____

- On day 1, test your (fasting) blood sugar before breakfast and before taking insulin or other medications. Then test your blood sugar before supper.
- On day 2, test your blood sugar before eating lunch and then before going to sleep.
-Repeat this pattern of testing your blood sugar.
-Goals: Fasting and before meal readings should be 80–120 mg/dL, bedtime readings should be 100–150 mg/dL.

Date	When to Test	Blood Sugar
	Before Breakfast	
	Before Supper	
	Before Lunch	
	At Bedtime	
	Before Breakfast	
	Before Supper	

Date	When to Test	Blood Sugar
	Before Breakfast	
	Before Supper	
	Before Lunch	
	At Bedtime	
	Before Breakfast	
	Before Supper	

Hyperglycaemia/ high blood sugar

- Causes
  - Too much food
  - Too little insulin or diabetes medicine
  - Illness
  - Stress
- Onset
  - Gradual
  - If extremely high or you have type 1 diabetes it may progress to diabetic coma
  - Damage to your eyes, kidneys, and nerves happens over time

Management of hyperglycaemic

- Check fasting blood glucose
- Drink lots of water
- See your doctor if you have been keeping to your management plan

HYPOGLYCAEMIA - Symptoms

- Shaking
- Fast heartbeat

- Sweating
- Dizziness
- Anxiety
- Hunger
- Impaired vision
- Weakness/fatigue
- Headache
- Irritability

Causes

- Too little food
- Too much insulin or diabetes medicine
- Extra activity or exercise

Onset

- Sudden
- May progress to unconsciousness, confusion, or insulin shock

Management

- 3 cubes of sugar
- Orange juice
- Coke – ½ bottle
- Glucose D powder
- Anything that will give instant glucose
- Even skim milk in the house
- If you are taking insulin, you can put a tag in your pocket
- Let your close friends know apart from spouse

Hypoglycemia or Low Sugar:

Step 1- 10 to 15 Grams of Carbs

Pick One of these

½ cup of orange juice

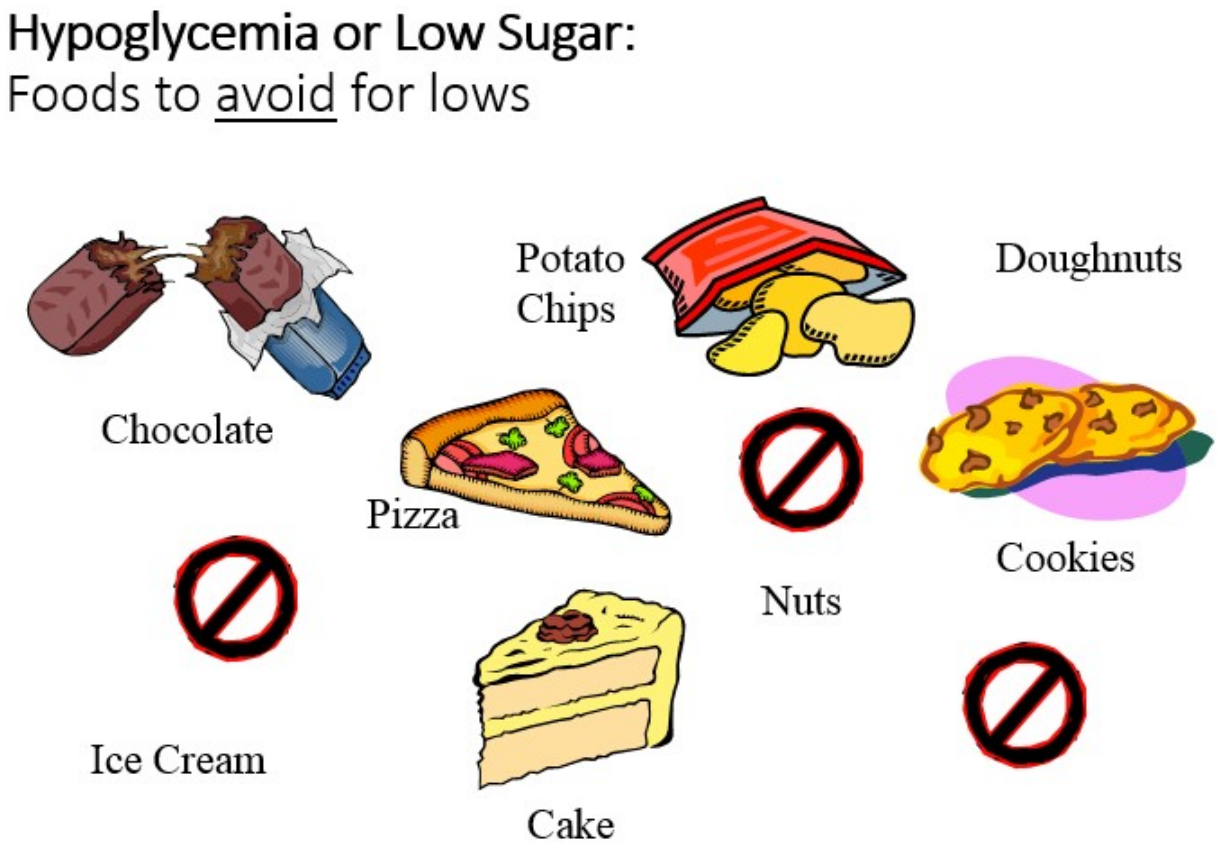
1

½ cup of milk, even skimmed milk

½ bottle of soft drink

In hypoglycaemia, patient should recheck blood sugar after taking a drink

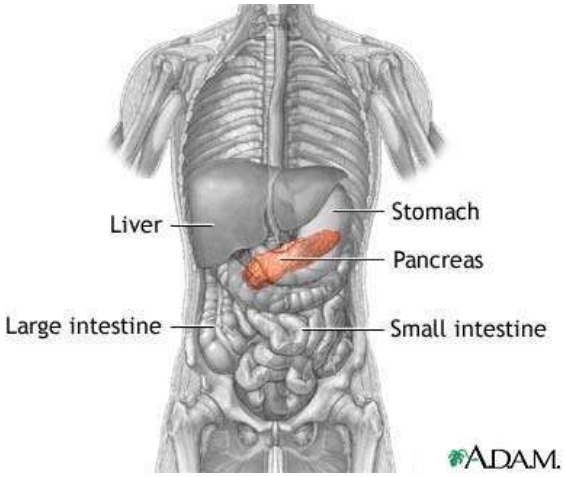
In hypoglycaemia, patient should recheck blood sugar



DIABETES MEDICATIONS: Oral Medication

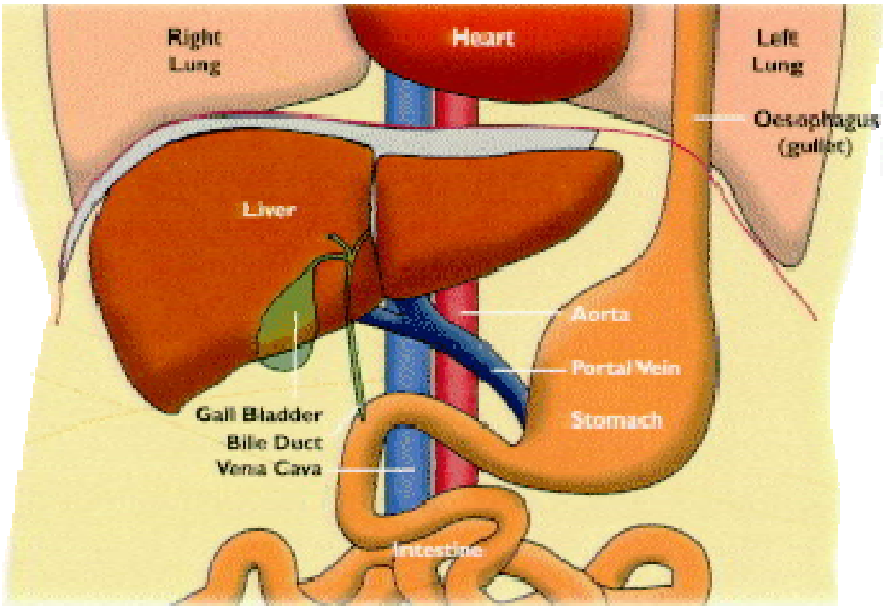
Sulfonylureas: These tell the pancreas to make more insulin

- Main thing to watch out for is having too many **low blood sugars**.
- If this happens, your doctor will give you a lower dose.
- Take the same way everyday



Diabetes medication: Biguanides such asMetformin (Glucophage)

- Tells the liver to stop sending out sugar



- Can help people lose some weight
- Main side effects are upset stomach and diarrhea
    - These usually get better after about 1 week
    - Taking with food can help
- Does **not** cause blood sugar to go too low
- Cannot be used in kidney disease or certain kinds of heart failure. Talk with doctor if you have these.
- Contact doctor if you notice new fatigue, nausea, muscle pain/weakness, or fast breathing because these could be signs of a serious side effect

- Always follow the food – drug instructions : Before/ after/ time before

Diabetes medication: INSULIN

- Used in patients with type 1 and some type 2 diabetes
- Used to replace the insulin your body is no longer able to make
    - You need insulin to move glucose into cells after eating. This lowers blood sugar and provides fuel to your body.
- Available in different formulations
    - Short-acting insulin to take with meals
    - Long-acting insulin to provide baseline insulin
    - Insulin mixes

Types:

- Meal" (fast acting/soluble) Insulin
- Long-Acting Insulin
- Insulin Mixes
- Come in vials or pens

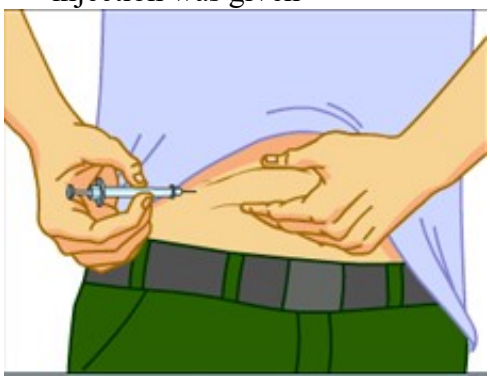
Insulin Mixing

Action	Name	Mix[1]
Very rapid	Lispro / Novo rapid	Yes[2]
Rapid	Crystalline zinc (CZI)	Yes[2]
Intermediate	Neutral Protamine	Yes[2]
	Hagedorn (NPH)	Yes[2]
	Lente zinc	Yes[2]
Long acting	Ultralente zinc	No
	Lantus (glargine)	No
Premixed	80% NPH+20%CZI	No
	70% NPH+30%CZI	No
	50% NPH+50%CZI	No

(1) Mixing different type of insulin has to be from the same source (ie same company)
(2) Mixing different type of insulin has to be from the same source (ie same company)

Giving insulin:

- Pick injection site:
  - Anywhere on belly at least 2 inches away from belly button
  - Outer thighs
  - Backs of arms
- Pinch skin, hold needle like a pencil, and inject at a 45 to 90 degree angle
- Rotate injection sites-next injection should be at least 2 inches from where last injection was given



Insulin side effect: mainly hypoglycaemia

ACTIVITY: Discussion with family about experience with hypoglycaemia

Other side effects:

- Side Effects (continued):
- Soreness or redness at injection site
- You can minimize this by rotating the injection site each time you administer insulin
- Feeling nervous or agitated
- Increased thirst or appetite
- Your dose may need to be changed to help with these symptoms

Insulin Storage:

- Refrigerate all insulin vials while not in-use
- May keep individual insulin vial at room temperature once in-use
- Just avoid exposing vials to high temperatures (over 85 degrees F) for extended periods
- Never freeze insulin – do not use after it has been frozen
- Whether kept in refrigerator or at room temperature, most insulin vials should be discarded 4 weeks after first dose was drawn from it
    - Exception: Levemir is good until 42 days after first use
- Insulin pens – vary widely in expiration dating once in-use– always check with pharmacist for your individual product

FOOT CARE:

- Keep your blood sugars in good control
- Check your feet every day
    - Look for cuts, blisters, red spots, swelling
    - Use a mirror to check the bottoms of your feet or ask someone to help
- Wash your feet every day in warm (not hot) water
    - Dry well, especially between the toes
- Keep your feet soft and smooth
    - Use thin coat of lotion on the tops and bottoms of feet
    - Do not use lotion between your toes
- Trim toenails weekly if you can reach them
    - Trim straight across
    - File edges with an emery board – Do not try to cut
- Protect your feet from hot and cold by avoiding contact with hot water or surfaces and wearing socks to keep feet warm
- Elevate feet when you are sitting and avoid crossing legs
- Stop smoking to improve blood flow to your feet
- Wear Shoes and Socks at All times
    - Never walk barefoot
    - Wear comfortable shoes that protect feet
    - Feel inside of your shoes before putting them on to make sure lining is smooth and no objects are inside

PHYSICAL ACTIVITIY

How does exercise help?

- Reduces the amount of tablet or insulin you will need
- Increases sense of well-being
- Increases flexibility and muscle strength

- Improves cholesterol and other lipids
- If hypertensive, helps to control high blood pressure
- Improves cardiovascular function
- Diminishes potential for weight gain

Before starting

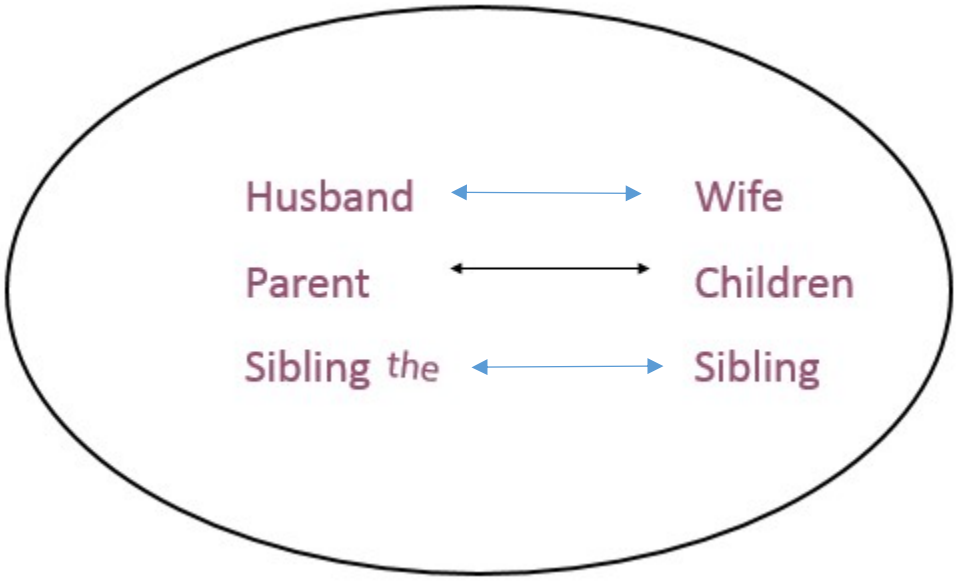
- Consult your doctor
- Adjust insulin and carbohydrate, if necessary
- Check your blood sugar before and after exercising
- Carry sugar
- Wear ID
- Use stomach area for insulin shots

Getting started:

- Start your exercise program slowly
- Be sure it is enjoyable
- At first, exercise may be limited to 5-10 minute periods on 3-4 days a week
- When you are ready, gradually increase the length of time you exercise and the number of days of exercise each week

ACTIVITY: Discussion and collaborative goal setting for exercise

FAMILY SUPPORT & COLLABORATION



- Having diabetes can make a person unhappy and have low self esteem
- Individuals with diabetes who are happy, manage their diabetes better
- Nurses and doctors cannot play this role
- Only the family members and friends can do this
- Support can be in varied forms. It can be physical, psychological, spiritual, social and financial.

Advantages of family – collaboration (from research)

- Increased motivation

- Following regimen – monitoring blood glucose twice a day, maintaining nutrition plan, recording results mostly on own
- HbA1c below 7%
- Improved relationship/communication between spouses: diabetes management; couple reports less fighting
- Same when children are involved
- Improved clinical outcomes and quality of life
- Acceptance
- Letting go
- Diabetes isn't center of family life

Intervention principles

- Expanded definition of "patient" includes spouse or significant other; Emotional response of spouse critical to development of treatment plan
- Help couple identify and work on mutually agreeable goals-e.g., "Would you like for her to be involved?"
- Improve intimacy, trust & sharing
- Don't do more work/worrying than the "patient"

Close, friendly, affectionate, warm and helpful interaction

Other ways in which the family can support with diabetes

- Help create a healthy meal plan for the whole family to combat and prevent diabetes
- Never tempt them to eat something that is prohibited
- Assist your family accept that diabetes is an illness which will not disappear (Prayer and faith? YES, BUT You must let your doctor confirm that a miracle has happened before you stopped your medicine!)
- Learn as much as you can about diabetes and encourage your family to learn too
- Allow your family with diabetes time to adjust to any disturbing news or changes, if the person laments, listen and offer consolation
- Understand that as the patient's blood sugar fluctuates, it affects their mood
- Never belittle or make jest of a spouse, sibling or parent because of diabetes

Conclusion

- Diabetes is a lifelong condition which can be well – managed without developing any complication
- It requires the collaboration of family members
- Family members need to be attentive, affectionate and understanding
- This will make the person with diabetes feel well and manage diabetes better, able to live longer and satisfied life
- The knowledge of diabetes can also help the family member live a healthy lifestyle and prevent diabetes.