QUALITY OF DIABETIC CARE AMONG PATIENTS WITH DIABETES MELLITUS TYPE 2 AT OSHIKUKU HOSPITAL IN NAMIBIA

A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PHARMACY (CLINICAL PHARMACY)

OF

THE UNIVERSITY OF NAMIBIA

BY

CLARICE MULENGA KAYOMBO

201137259

OCTOBER 2022

MAIN SUPERVISOR: Dr. Francis Kalemeera (School of Pharmacy, UNAM)

CO-SUPERVISOR: Prof. Lauren Jonkman (School of Pharmacy, University of Pittsburgh, UNAM)

ABSTRACT

Introduction: Diabetes Mellitus Type 2 (T2DM) is a major public health problem worldwide, including in Namibia with an estimated prevalence of 5.4 %. The World Health Organisation (WHO) recommends quality care which includes promotion of blood glucose (BG) control, diet, physical activity, monitoring of blood pressure (BP), lipids, regular screening for T2DM complications, education on diabetes, and self-care practices. The study aim was to assess the quality of care offered to patients with T2DM, describe glycaemic control of patients and serve as a gap analysis to identify areas that need improvement.

Methods: This cross-sectional study evaluated diabetes quality measures including glycaemic control, co-morbidity management, diabetes knowledge, and self-management activities amongst outpatients at Oshikuku District Hospital in Namibia. Data was collected from health record review and patient interviews using a standard questionnaire. Data was analysed using descriptive statistics. Diabetes control was defined as an A1C <8%. Predictors of diabetes and hypertension control were determined through binary and logistic regressions. The groups were assessed for any variable differences, using Pearson's Chi-square test. The confidence level was set at 95% and the p-value at <0.05. A correlation analysis was done on knowledge and treatment outcomes. This research was approved by the Ministry of Health and Social Services.

Results: A total of 108 patients with T2DM were recruited, however only 84 had available A1Cs and were included in the analysis. All were Namibian. Most were female (63.1%) and married (81.0%). Few had tertiary level education (6.0%). Many were unemployed (59.5%), and pensioners (58.3%). Most (60.7%) had poor glycaemic control with an average A1C of 10.24%. Fewer than one-third of patients had annual monitoring for A1C (29.8%) and lipids (29.8%). Fewer than 25% were prescribed statins. Most (82%) had hypertension with few (16%) at goal. Foot (11.9%) and eye examinations (13.1%) were performed infrequently. Many (69%) had low diabetes knowledge. The only factor found to predict poor glycaemic control was a BMI greater than 25 (OR=1.2).

Conclusion: The quality of diabetic care at Oshikuku Hospital was below for all markers of quality including A1C testing and control, co-morbidity management, and self-management. Hence there is need to develop interventions to improve the quality of care, which may ultimately improve treatment outcomes.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMNS AND ABBREVIATIONS

A1C	Glycated Haemoglobin
BG	Blood Glucose
BMI	Body Mass Index
BP	Blood Pressure
CDC	Centres for Disease Control and Prevention
DKT	Diabetes Knowledge Test
DM	Diabetes Mellitus
DPN	Diabetic Peripheral Neuropathy
DR	Diabetic Retinopathy
ED	Erectile Dysfunction
FPG	Fasting Plasma Glucose
HbA1C	Haemoglobin A1C
HCW	Health Care Worker
HDL	High Density Lipoprotein
HTN	Hypertension
HW	Health Worker
JCAT	Joslin Clinical Analytic Tool
LDL	Low Density Lipoprotein
MoHSS	Ministry of Health and Social Services
NCD	Non-Communicable Disease
NICE	National Institute for Health and Care Excellence

NIP	Namibia Institute of Pathology
OR	Odds Ratio
OPD	Out- Patient Department
QoC	Quality of Care
QoL	Quality of Life
RBG	Random Blood Glucose
RBS	Random Blood Sugar
RR	Relative Risk
SDSCA	Summary of Diabetes Self Care Activities
SSA	Sub-Sahara Africa
T2DM	Type 2 Diabetes Mellitus
UNAM	University of Namibia
WHO	World Health Organisation

ACKNOWLEDGEMENTS

I would like to thank **Jehovah God, my Father,** for his everlasting love and grace that enabled me to do this study. For his perfect plans for my life ..(“**For I know the plans I have for you,' declares the Lord, 'plans to prosper you and not to harm you, plans to give you a hope and a future. '” — Jeremiah 29:11.** To my Supervisors **Dr Francis Kalemeera and Prof. Lauren Jennifer Jonkman;** thank you so much for your guidance, advice and support which made my study a success. God bless you abundantly always in everything. **My dearest late Dad, Col. Chrispine kashekele Kayombo and my Mum, Mary Mwenya Chansa-Kayombo,** your encouragement, understanding and support helped me to achieve this great success. I love you! My sisters and brothers, **Isabell, Chris, Amy, Matete and Brian,** thank you for your support during my study. My research assistant, **Ms. Hilaris Tomas** (CHS, St martins Oshikuku Hospital), thank you for being an enthusiastic in helping me to collect data for this study. May God bless you richly! The Senior Medical Officer of Oshikuku hospital, **Dr. Samuel Awe**, and other health care workers who assisted me during the time of my study, may the lord continue blessing you. Many thanks to the statistician, Mr **John Banda (**University of Zambia) for your help and guidance in data analysis.

DEDICATIONS

To my late Dad, **Col. Chrispin Kashekele Kayombo,** thank you for encouraging me to excel high in my education. I have made it this far because of your encouragement and spiritual guidance during the time you were here on earth. So many times, I felt like giving up, but the voice of your teachings and encouragements echoed on in my mind. Forever my Hero. Continue resting in peace.

To my mum, **Mrs. Mary Mwenya Chansa-Kayombo**, you taught me to work hard and always continue to encourage me even when I feel like giving up. I believe you will be proud of this work.

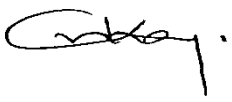
My beloved sister and friend, **Isabel Kayombo-Tembo**, thank you for being the best cheerleader and support. Will forever be grateful.

DECLARATIONS

I, Clarice Mulenga Kayombo, hereby declare that this study is a true reflection of my own research and that this work has not been submitted for a degree at any other educational institution.

This thesis partly or as a whole, may not be reproduced in any form be it by means of (e.g. electronic, mechanical, photocopying or recording or by any other means) without prior permission from the author, or the University of Namibia.

I, Clarice Mulenga Kayombo , grant The University of Namibia the right to produce this thesis in whole or in part, in any manner or format, which the University of Namibia may deem fit, for any person or institution requiring it for study and research; provided the University of Namibia shall waive this right if the whole thesis has been or being published in a manner satisfactory to the University



_____ October 2022

Clarice Mulenga Kayombo Date

CHAPTER 1

1.**0 INTRODUCTION**

1.1 Background

Diabetes Mellitus Type 2 (T2DM), a chronic illness, is a major public health problem worldwide, with an estimated 422 million adults living with the disease in 2014 (1). The World Health Organization (WHO) estimates that the burden of T2DM among the adult population has doubled to 8.5% from an estimated 4.75% in 1980 (1). The prevalence is increasing annually among countries in Sub-Saharan Africa; the burden of T2DM in Namibia is estimated at 5.4 %(2). In Namibia, the risk factors associated with T2DM such as overweight, obesity and physical inactivity are reported to be 39.1%,16.8%, and 29.7% respectively(2).

The WHO recommends that people with T2DM should receive quality and comprehensive clinical and supportive care from an interdisciplinary team(3). This multidisciplinary approach assumes that individuals with diabetes play an active role in their care (3). Quality diabetic care includes promotion of blood glucose control as measured by random blood glucose (RBG) and glycated haemoglobin (A1C). Quality diabetic care and control can be achieved through combination of five elements; 1) diet, 2) physical activity, 3) medications as well as monitoring of 4) blood pressure (BP) and 5) lipid (LDL, High Density Lipoprotein [HDL] cholesterol, and triglycerides) control to reduce cardiovascular risks and other complications. In addition diabetic care monitoring should include regular screening for nephropathy, peripheral neuropathy, and retinopathy to facilitate timeous interventions, and education on diabetes and ideal self-care practices (1,3,4). The needs of individuals should be addressed while taking into consideration cultural preferences and

willingness to change (3). The National Institute for Health and Care Excellence (NICE) guidelines recognizes patient knowledge about diabetes as a cornerstone for glycaemic control, hence recommend offering structured education to adults with diabetes and their families or carers at diagnosis with annual reinforcement and review(3). The American Diabetes Association (2018) recommends A1C monitoring at least twice a year in patients meeting treatment goals (A1C <7%) and quarterly after therapy change or before meeting glycaemic goals (4). The BP target has been set at less than 140/90mmHg for those at average risk, and less than 130/80mmHg for those at higher risk of cardiovascular disease (4). The set target levels for lipids are: < 1.8mmol/l for Low Density Lipoprotein cholesterol (LDL); <2.3mmol/l for triglycerides; <4mmol/l for total cholesterol; and >1.0mmol/l for High Density Lipoprotein cholesterol (HDL), recommended for annual monitoring (4–6).

Patients with T2DM are predisposed to risks of long-term complications that include retinopathy, nephropathy, and neuropathy. In addition, peripheral arterial and cerebrovascular disease, cataracts, erectile dysfunction, and non-alcoholic fatty liver disease which makes regular monitoring very essential component of care (7).

The type of facility or level of care that patient accesses care from can sometimes affect the quality of care since not all facilities have specialists or are able to provide all prescribed services. Prior to this study, it was not known whether the quality of care and the intended therapeutic outcomes for diabetic patients at Oshikuku District Hospital were achieved in accordance with the set standards.

Consequently, the objectives of this study were to close these information gaps by estimating the prevalence of good glycaemic control, the extent of compliance with the WHO's recommendations for monitoring and treatment of patients with diabetes, by assessing the frequency of A1C, serum lipid tests, eye and foot examinations, and

the antidiabetic and antihyperlipidemic medicines. Further, the study assessed patients' knowledge on diabetes, and by evaluating their self-care practices. In addition, this study investigated the predictors of poor glycaemic control, and uncontrolled high blood pressure. Overall, the study was designed to identify areas that need improvement in the care for patients with diabetes.

1.2 Statement of the problem

The WHO projects that diabetes will be the seventh leading cause of disease globally by 2030(8). Currently, the unprecedented increase in incidence of T2DM cases among middle- and low-income countries is a public health concern(8). Moreover, high quality care provision for persons with diabetes remains a challenge for healthcare systems globally with evidence of suboptimal care and outcomes (9). In the African region, gaps exist between best practices in diabetic care despite the scale-up of guidelines available, with WHO reporting full guideline implementation to be at only 35% in African region (1).

The Namibia National Demographic Survey of 2013 reported that among 35-64 year old men and women in Omusati region (which houses Oshikuku District), the prevalence of diabetes was 6.1% and 2.6% respectively (10). Among those taking antidiabetic medications, only 1.1% out of 110 men and 0.5% out of 265 women had normal fasting blood glucose (10). This data highlights the poor diabetes control among those diagnosed with diabetes in the region and the potential for diabetes related complications. Oshikuku District has continued to report an increase in the number of newly diagnosed patients with diabetics. There were 143 new cases in 2018-19 financial year compared to 114 in 2017-18 (11). District hospitals in Namibia currently operate without specialized clinics for non-communicable diseases which may lead to gaps in care. If T2DM is to be controlled, there is a need for improved

health system organization and development of sustainable strategies to address diabetic care policy related issues (12). In addition, there is need for enhanced epidemiologic data collection to enable predictions of changes in prevalence, complications and mortality (12). Training of health workers and development of care protocols suited to the local population, addressing of adherence issues, patient education and empowerment, community involvement and if possible the formation of diabetes association all ultimately affect diabetes management and control(12). High quality management remains essential as the number of patients with diabetes will continue to rise, and our goal as health care professionals is to ensure that individuals receive the care they need to stay healthy. Whether the five quality elements of diabetic care were implemented at Oshikuku Hospital was unknown.

1.3 General objective

To assess the quality of diabetic care at Oshikuku Hospital based on the standards published by the WHO.

Specific Objectives

The specific objectives to achieve the aim of the study will include:

1. Describe characteristics of patients with T2DM at Oshikuku hospital
2. To estimate the prevalence of good glycaemic control
3. To estimate level of compliance with the WHO's recommendations for monitoring patients with diabetes.
4. Assess patient knowledge on diabetes, self-care practices and effects on treatment outcomes
5. To identify factors that are associated with
    - poor glycaemic control and
    - uncontrolled blood pressure

1.4 Hypothesis

Null hypothesis: Adequate knowledge of diabetes mellitus is not associated with

- better glycaemic control
- controlled blood pressure
- better self-care practices

Alternative hypothesis: Adequate knowledge on diabetes mellitus is associated with

- better glycaemic control
- controlled blood pressure
- better self-care practices

1.5 Significance of the Study

The T2DM cases are increasing in Namibia with an average prevalence of 5.4% (2). Uncontrolled T2DM can lead to micro- and macro-vascular complications including as eye problems, cardiovascular diseases, nephropathy, and neuropathy, as well as poor wound healing leading to limb amputations (1). Findings from the study will highlight the current practice and enable identification of gaps in care that need interventions as well as set a basis for setting up a special clinic for non-communicable diseases in Oshikuku.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Search strategy

Data search for articles included in the literature review was done using Pubmed and Google Scholar; only full text articles and literature with a 10year publication limit were included. Search key words were quality of care, Type 2 diabetes mellitus, glycemic control, monitoring, patient knowledge and diabetes self-management behaviours.

2.2 Conceptual Framework

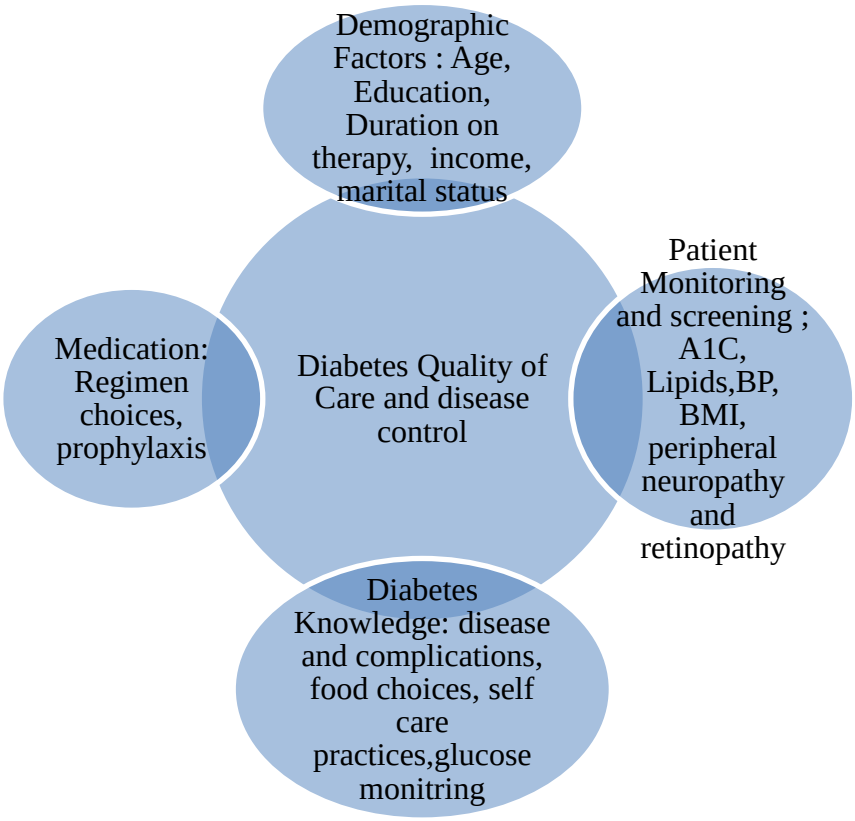


Figure 1: Conceptual framework on Quality of care for Diabetes Management and disease control.

A conceptual framework was developed to illustrate the link among all components or factors that contribute to quality of care and T2DM control (Figure 1).

Quality of care and disease control can be achieved through having several factors in place such as regular monitoring of glycaemic control, BP, lipids and screening for diabetes complications(1,3,4,13) . Control of these factors is dependent on having patients on right therapy for condition and age and taking into consideration co-morbidities that also ultimately affect management (4,5). Patients with T2DM are supposed to be encouraged to be responsible for their own health through adherence to recommended selfcare practices that involve, correct food choices, regular exercises, self-monitoring, recognising of disease complications and foot care (14,15). Patients should be supported through provision of continuous education on the disease, its management and importance of adherence to recommended practices and medicines (16). Ultimately, quality of care and success of management consists of several factors that are linked and hence were included among the study variables

2.3 Quality of Care

Living with diabetes requires access to systematic, ongoing and organised care from skilled health-care providers. Disease prognosis can be improved with basic and relatively inexpensive interventions involving medication, health education and counselling, and consistent follow-up. The care provided should include a periodic review of metabolic control and complications, and a care plan that involves patients in decisions regarding therapy and future interventions. (1)

People living with diabetes are at risk of long-term complications that include retinopathy, nephropathy, and neuropathy(7). In addition, peripheral arterial and cerebrovascular disease, cataracts, erectile dysfunction, and nonalcoholic fatty liver disease which makes regular monitoring an essential component of care (7). The type of facility or level of care that the patient accesses care from can sometimes affect the quality of care since not all facilities have specialists or are able to provide all

prescribed services. Hence the recommendation for periodic referral for specialist care for services such as, comprehensive eye examinations, laser and surgical treatment of eye complications, complex kidney function tests, and tests of the heart and arteries in the limbs (1).

Several studies on quality of care provided to diabetic patients have been carried out globally with different findings and recommendations reported. The Diabcare Africa study conducted in six sub-Saharan Africa (SSA) countries provided evidence for the gaps in care such as accessibility to recommended monitoring services and complications assessment that need interventions if outcomes are to improve (17). A study on T2DM treatment gaps in South Africa reported that a significant number of patients did not reach the guideline targets for care and therefore, the authors recommended implementation of evidence based quality care guidelines to ensure better patient outcomes (18).

Improving efficiency in diabetic care is of utmost importance as gaps between ideal and actual care exist in most health care facilities. A systematic review by Tricco et.al assessing the effectiveness of quality improvement strategies targeting health care systems and health care providers reported improvements in diabetic care and treatment outcomes. A recommendation of combined strategies was made as it proved to be more beneficial than health care provider targeted strategies alone.(19) In another systematic review on Quality of Care (QoC) conducted in South Asia, different approaches such as employing diabetic care specific health workers (HW), providing diabetic education and care, and initiating specialized service for diabetes were reported to contribute positively to management and patient satisfaction with the care received. Hence this approach was recommended (20).

Patient care sometimes solely focuses on achieving glucose control targets, but evidence advocates for a holistic approach being more beneficial. There is need to ensure adequate diabetic care, patient focused goals, minimising complications which will ultimately improve the patients' quality of life (21).

2.3 Glycaemic Control

Glycaemic control is very important in people living with T2DM as it is associated with prevention of long term complications such as retinopathy and neuropathy (1). It has also been reported to reduce cardiovascular risk by 9% (22,23). Glycaemic control in clinical practice is usually assessed through measurement of glycated haemoglobin (A1c) as it provides a measure of average plasma glucose over the preceding 8 to 12 weeks. This test is however expensive and not readily accessible at some health facilities. Therefore, in situations of A1C measurement not being possible, fasting plasma glucose (FPG) values can be used to assess glycaemic control and inform treatment (7). The WHO has set A1C targets at <7% for strict control, and <8% in some defined cases such as the elderly, long standing DM, those experiencing hypoglycaemic attacks frequently or in patients with low life expectancy rate (4,7). The target for random blood glucose(RBG) has been set at <11.1mmol/l considering that most patients eat before coming to the hospital or before being attended to at the hospital (7).

International guidelines on management of diabetes recommend monitoring A1C at least twice a year for patients who are well controlled and quarterly for patients not well controlled or those in whom therapy has been changed. Monitoring by RBS should be done at each regular follow up visit (1,4,22).

Glycaemic control remains a major challenge among T2DM with control ranging from 8.2% to 49.2% according to several studies (24–36), with South Africa and Ethiopia

reporting 83.8% and 70.8% of patients with poor control, respectively (26,29). Low education and lack of information were cited among other reasons as contributing factors which need to be addressed to improve patient outcomes.

Evidence from the Diabcare Africa study conducted in six sub-Saharan African countries reported glycaemic control in only a third of the patients with only half benefitting from standard care in Physician managed clinics. The findings were attributed to access to care than quality of care (17). A study in Kenya reported suboptimal control among patients on insulin which was attributed to lack of experience in dose management and titrations. (37)

Fiseha et.al conducted a hospital based cross-sectional study in Ethiopia which reported 70.8% poor glycaemic control among the participants. The major factors associated with poor glycaemic control were rural residence, low educational level and longer duration of therapy. In addition, patients prescribed insulin (AOR = 3.26, 95% CI 1.26–8.48) or oral agents (AOR = 5.12, 95% CI 2.10–12.52) had higher odds of poor glycaemic control compared to insulin and oral medications combined, ($p<0.001$) (29). Further, participants whose occupation was being merchants had worsened control compared to government employees. (29). This study highlighted important factors that can guide decision making especially on medication choices for DM patients.

2.4 Laboratory Monitoring

Laboratory monitoring for care is important among DM patients for early detection of complications to guide the management thereof (1,4,22). Regular monitoring is required for A1C at least twice a year among well controlled patients, full lipid profile at least annually as well as kidney and liver function (6). Access to monitoring remains

a major challenge in sub-Saharan Africa (SSA). Political will, reduction in cost of processes and context specific research were proposed as possible solutions to this problem in a study conducted on access to monitoring services in rural Africa (38). Evidence on the burden of T2DM and its complications in SSA is scanty and can only be improved through regular monitoring which will ultimately aid prioritising of resource allocation, designing of care programs and interventions (39).

An observational real life cohort study by van Bruggen et al., (40) explored the association between full monitoring of biomedical and lifestyle-related target indicators within a care group with lower A1C levels. Compared with incompletely monitored patients, fully monitored patients had significantly lower A1C levels (95% CI) in the first (-2.03 [-2.53 to -1.52] mmol/mol) (-0.19% [-0.23% to -0.14%]), second (-3.36 [-5.28 to -1.43] mmol/mol) (-0.31% [-0.48% to -0.13%]) and third HbA1c profile group (-1.89 [-3.76 to -0.01] mmol/mol) (-0.17% [-0.34% to 0.00%]). The authors recommended a systematic approach for monitoring if control is to be achieved (40). Regular monitoring can also reduce incidences of hospitalisation from complications as reported in a the Journal of diabetes from a study in Thailand (41). The study assessed prevalence of hospitalisation and associated factors among elderly patients with T2DM. Among the findings was 4.9% hospitalisation due to dysglycemia (OR=1.97, p-value <0.001) and a recommendation for regular monitoring to reduce the incidences was made (41).

2.5 Screening for Complications

Treatment of Diabetes does not stop all complications but can slow progression if detected early enough. Diabetes if not well controlled can lead to complications such

as diabetic retinopathy (DR) and loss of vision, peripheral neuropathy, limb amputations and erectile dysfunction which impact negatively on the quality of life. Global prevalence of DR is estimated to be about 35.4% and usually associated with longer disease duration, uncontrolled hypertension and poor glycaemic control (42). DR is reported to have caused 1.9% of moderate or severe visual impairment globally and 2.6% of blindness in 2010 (1). T2DM patients should have a comprehensive eye examination at diagnosis, and every 1 or 2 years thereafter if there is no evidence of DR (4). Optimisation of BG , BP and lipid control have also been reported to reduce DR progression (4). However, despite the guideline recommendations, screening for DR still remains a challenge in most parts of the world, for example, in the United States, about 40% of patients are not annually screened for diabetic retinopathy, while a study involving a cohort of patients with diabetes mellitus from five Canadian provinces showed that 38% of the patients did not undergo any DR screening. Of note, the major themes identified as barriers to screening were cost, access, lack of knowledge on both patients and health care workers (43). The data from this systematic review provides evidence that more needs to be done if the fight against loss of vision secondary to DR is to be won.

Another microvascular complication associated with T2DM is diabetic peripheral neuropathy (DPN). Patients should be screened at diagnosis and at least annually to detect any loss in sensation or foot ulceration as this DPN is the leading cause of foot ulcers which also lead to amputations (4). The Diabcare study involving six sub-Sahara African countries reported prevalence of DPN to be at 48% among study subjects. The key to slowing progression, like in DR, is regular screening, glycemic control and providing pharmacological therapy for the neuropathic pain.

2.6 Knowledge and Self -Care Practices

Diabetes education on knowledge and self-care practices that include self-monitoring of blood sugar level, diet management, physical exercise, adherence to medications, and foot care are the cornerstones of diabetes management. DM requires patients living with the disease to be involved in own care and decision making concerning adherence to therapy, lifestyle choices such as diet, alcohol and tobacco use, exercise, self-monitoring and foot care which ultimately affect treatment outcomes (5). For patients to be able to take charge of their health and make right decisions, there is need to provide education on diabetes and self-care practices that will enable them to take up this important role. Self-care health-related behaviour is determined by beliefs about health and illness, which are based on the person's knowledge of diabetes. A study on self- care practices in Ethiopia reported inadequate self-care practices. Most patients reported irregular self-monitoring of blood sugar (44). Practice of dietary and physical exercise recommendations were inadequately reported by most of the participants. However, adherence to medication prescriptions was reportedly better. Patients generally lacked proper information or knowledge related to the importance of self-care and how it should be practiced (44).

International guidelines guiding the management of T2DM recommend provision of structured education to patients at diagnosis and during scheduled follow-up visits (3). Knowledge gaps exist at diagnosis and should be addressed early enough. A study in Bangladesh proved this among newly diagnosed DM patients. The study reported that approximately 16%, 66%, and 18% of respondents had good, average, and poor basic knowledge respectively. About 90% of respondents did not test their blood glucose regularly; a significant relationship existed between basic knowledge and glucose monitoring (45). It is important henceforth to educate patients about their condition

and self-care practices early enough with regular reinforcements bearing in mind cultural differences and norms of the patients. Education should be provided to patients and if possible family member involvement to be considered (3). Engagement of appropriately trained personnel to deliver information is of utmost importance (5).

Diabetes knowledge is reported to have significant impact on treatment outcomes such as glycemic control hence the advocacy for patient education to be included in care package. In a study on association between health literacy, Diabetes knowledge , self-care and glycemic control, diabetes knowledge (β-0.12; 95% CI 0.01, 0.23) and perceived health status (β-1.14; 95% CI 0.13, 2.16) were significantly associated with glycemic control, whereas health literacy was not associated with glycemic control β-0.03; 95% CI 0.19, 0.13).(46)

A cross sectional study carried out at a university teaching hospital in Ethiopia assessed levels of knowledge about T2DM, self-care behaviours and adherence to medication among DM patients. The knowledge score was determined by dividing the number of correct answers by the total number of questions (23 questions for patients taking insulin and 14 for those receiving oral hypoglycaemic agents). Scores ≥75 %, 74-60 % and ≤59 %, respectively, were labelled as high, medium and low knowledge on diabetes (14). The findings were that 44.9 %, 20.1 % and 34.9 % had low, medium and high diabetic knowledge respectively. The group with high diabetic knowledge was used as reference. Being illiterate (AOR = 3.1, 95%CI: 1.03-9.3), having BMI <18 kg/m2 (AOR = 6.4, 95%CI: 1.2-34.9) and duration of DM< 5 years (AOR = 4.2, 95%CI: 1.9-9.5) were significantly associated with low level of diabetic knowledge. T2DM patients who practiced good self-care (AOR = 0.5, 95%CI: 0.3-0.9) were less likely to have low knowledge. About 157(50.8 %) patients had poor self-care

behaviour and this was associated with level of education and adherence to medication. The proportions of patients with low, medium and high adherence to medication were 24.9 %, 37.9 % and 37.2 % respectively. Being a merchant, having medium level of diabetic knowledge and having good glycaemic control level were associated with low adherence to medications (14). The study recommended a strategic approach that improves health literacy as a cross cutting intervention to ensure effective management.

A study in Pakistan investigated the association of various self-care activities and glycaemic control. Glucose management (P<0.001) was the strongest predictor for an at goal A1C, followed by dietary control (P=0.024) and physical activity (P=0.010), respectively. Linear regression analysis showed that use of oral hypoglycaemic agents only (P=0.003) and higher education level (P=0.005) were significant predictors for higher scores of patients' self-care activities (47). A single blinded randomized controlled trial investigated the effectiveness of a simple outpatient diabetes self-management education programme on patients with T2DM. Compared with the control group, fasting blood glucose, 2 hour postprandial blood glucose, and A1C were significantly improved in the intervention group (2 sessions on self-management) after the intervention (P < 0.01) (48). Mufunda et.al (49) in a cross sectional study in Zimbabwe assessed patients' diabetes awareness and level of diabetes knowledge among adults with diabetes attending an outpatient diabetes clinic at a main referral hospital. Majority respondents had poor general knowledge of diabetes and knowledge of insulin use. The major knowledge gaps identified were related to use of insulin, diet and glycemic control. There was a significant association between attending DM classes with general knowledge about diabetes (p= 0.026) while level of education was an independent determinant of Total Knowledge and Insulin use knowledge scores,

(49). The study highlights importance of education programs as a part of DM care packages.

Another important component of self-care practice is patients being able to know and identify DM complications so they can seek early treatment in case they occur. A study in Ghana assessed level of knowledge of chronic complications among T2DM patients. The findings from the study were that 54.1% and 45.9%, respectively, had inadequate and adequate knowledge of diabetes complications (50). Further analysis to identify factors associated with inadequate knowledge revealed that female gender [AOR = 0.29 (95%CI: 0.14–0.56), p<0.001], older age [AOR = 0.45 (95%CI:0.20–0.99), p = 0.049], primary education [AOR = 0.13 (95%CI: 0.03–0.51), p = 0.004], no formal education [AOR = 0.16 (95%CI: 0.05–0.50), p = 0.002], rural dwellers [AOR = 0.50 (95%CI: 0.27–0.95), p = 0.033] and unknown family history diabetes [AOR = 0.38 (95%CI: 0.17–0.82), p = 0.014] were significantly associated with inadequate knowledge. The study recommended a multisectoral approach to be development of diabetes education programmes to promote healthy self-care behaviours relevant for the prevention of diabetes and its complications (50).

Diabetes causes several pathologies below-the knee: lifetime risk of developing a diabetic foot ulcer is between 19% and 34% (51). Infection develops in 50%–60% of ulcers with approximately 20% of moderate or severe diabetic foot infections resulting in about 85% lower extremity amputations (51). The diabetic foot is a significant contributor to the global burden of disability and reduces the quality of life. Knowledge on foot care and practice is among self-care practices related to DM management. Patients should not only know about it but should practice it daily to reduce incidences of ulcers and amputations that are part of long-term complications.

A review by Manickum et.al on knowledge and practice of DM foot care reported varied level of foot-care knowledge and practice in the studies reviewed (52). The study highlighted need for intervention on foot care as knowledge did not automatically translate into daily practice.

Food choices are important in DM management. It is recommended to include as part of self-care education, dietary advice with personalised meal plans, lifestyle modification, including increasing physical activity and weight loss (3). The NICE guidelines on management of DM in adults of 2015 advocate for high-fibre, low-glycaemic-index sources of carbohydrate in the diet, such as fruit, vegetables, wholegrains , low-fat dairy products and oily fish; and control the intake of foods containing saturated and trans fatty acids (3). A study published in the journal of nutrition and metabolism on dietary habits of T2DM patients reported that a significant number (45.5%) consumed rice mixed meals for all three daily meals and 67% consumed fruits at least once a day. More than three quarters (77%) reported sugar intake in accordance with guidelines while many (71%) consumed full cream milk. Intake of green leafy vegetable was below daily requirements. From the study population, only 14% exercised daily while 69% never exercised. The study revealed the importance of educating patients with type 2 diabetes on dietary changes and more importantly the involvement in regular physical exercises (53).

2.7 Knowledge and Effects on Treatment Outcomes

Studies on association of knowledge and self- management with glycaemic control in patients with T2DM concluded that higher diabetes knowledge, and good self-management practices were significant predictors of good glycaemic control (15,54). However, a similar study reported non-significant and weak negative association

between A1C and diabetes-related knowledge (p=0.404) (16). Similarly, Perera et.al reported higher fasting blood glucose levels among patients with high DM knowledge (55).

There is a need to not only focus on educating patients about DM but to shift focus to self-management as it is cardinal as well. A study in Thailand investigated the relationship of diabetes knowledge, diabetes management self-efficacy and diabetes self-management with blood glucose control among people with type 2 diabetes mellitus. Over half (52.4%) of the study participants failed to control their blood glucose (HbA1c > 7%) and only diabetes management self-efficacy was associated with blood glucose control (AOR = 2.67; 95%CI: 2.20, 3.25) (56).

A study conducted to assess patients' knowledge and compliance with foot care reported that majority of the patients (58%) had poor foot care knowledge while 97 patients (61.8%) had poor diabetic foot care practice. No significant association between knowledge and practice was observed (57).

2.8 Summary

In conclusion, this section reviewed literature on diabetes concerning quality of care, glycemic control, monitoring as part of care, diabetes knowledge education and self-care practices which are all important for treatment success and ultimately affect management outcomes. International treatment guidelines and several studies recommend holistic quality of care for DM patients if the burden of disease is to be controlled. However, evidence from studies shows that gaps in care that require urgent attention still exist. Literature highlights the importance of glycaemic control, annual monitoring, screening for complications as they are all cardinal to management success. Different studies on knowledge and its association to glycaemic control and

other treatment outcomes show contradicting findings which made it necessary to investigate in this study. The following chapter will outline the design and research methodology of the study that was employed to attain the objectives of this study.

CHAPTER 3

3.0 RESEARCH METHODS

3.1 Introduction

Chapter 3 will describe in detail the research methodology that was used to meet the study objectives. This chapter describes the study design, the population, sample size, research instruments, data collection methods, data analysis and ethical considerations that were applied in this study.

3.2 Research Design

The study was cross-sectional by design and employed quantitative methods.

A cross sectional observational design was appropriate for this study as it involves collecting data from a target population at a single point in time and is particularly useful for assessing the true burden of disease or health needs of a population (58).

3.3 Study Setting

The study was conducted at Oshikuku District Hospital in the Omusati region of northern Namibia. The hospital caters for a catchment population of about 106000 people. The hospital also serves as referral site for 18 Clinics and 2 Health Centres. All patients with non -communicable diseases from Oshikuku district visit doctors at Oshikuku District Hospital for regular follow-ups and laboratory monitoring. Laboratory monitoring can only be implemented at this hospital because all the other

health facilities (clinics and health centres) in the district do not have laboratories. During follow-up visits, the nurses conduct the initial examinations namely, the vitals-following which patients proceed to doctors consulting rooms, while those for refills have vitals conducted at nurses' station then proceed to the pharmacy.

3.4 Study Population

The study population comprised of all patients with a diagnosis of T2DM, who receive care and treatment at Oshikuku District Hospital.

3.4.1 Inclusion criteria

The study population from which the study participants were drawn were patients above 18 years with T2DM accessing regular care at Oshikuku District Hospital. Patients should have been on therapy for at least 12 months and consenting to take part in study. T2DM is the common type of diabetes and scheduled monitoring should take place within 12 months of diagnosis and therapy. Based on the above, the following exclusion criteria was applied.

3.4.2 Exclusion criteria

Patients who did not consent, were <18 years of age, on therapy for less than 12 months, not of sound mind due to presence of mental health condition, with Type 1 or gestational diabetes were excluded from the study

3.4.3 Sample Size

It is not usually feasible to study a whole population; hence, a sample of the population is drawn that is statistically representative of the population of interest so that inference to the population can be made based on the results obtained from the sample. A sample size is an estimate of the number of patients required in order to achieve the objectives of the study (59).

The appropriate sample size was calculated as shown below:

Optimal glycaemic control among patients with diabetes ranges from 8.2-49.2% (13–24,). Unfortunately, district level data on glycaemic control in Omusati region is not available. Instead an assumption of good glycaemic control among patients with diabetes was predicted to be 16.2%, which is the rate of control in South Africa (26). The total prevalence of diabetes in the Omusati region was determined by the Namibia demographic and health survey (10). Using Epi info version 7.2.2.16 (CDC, Atlanta, GA, USA) at 95% confidence interval, 80% power, a prevalence of diabetes 3.7% and reported optimal/good glycaemic control of 84%, a sample size of 108 patients was determined to be sufficient for this study to describe factors related to quality of care for people with diabetes.

3.4.4 Sampling

Convenience sampling method was used for the study as it enabled inclusion of participants that were available and meeting the inclusion criteria. All patients who presented at the pharmacy counter for medication refills had their health passports checked for inclusion criteria. Those that met inclusion criteria were invited to participate in the study. The inclusion criteria applied to the study was as shown above.

3.4.5 Recruitment

The Pharmacist reviewed the passport in the process of dispensing to determine if the patient met the inclusion criteria. The doctors were requested to also inform patients about the study, refer them to pharmacy, and upon review of records by pharmacist, those that met inclusion criteria were invited to take part in the study.

3.5 Data Collection Tool

A data collection tool is utilised by researchers to obtain standardised information from all respondents by administering the same instrument. (61) For the purpose of this study, a detailed questionnaire (Annex 1) was utilised to obtain information that helped achieve study objectives. The questionnaire comprised of different sections addressing different study objectives. Quality of care was assessed by adopting the Joslin Clinical Analytic Tool (JCAT) (62) which analyses both process measures (frequency of monitoring) and outcome measures (level of control) of diabetes care. Its main objectives are gauging care effectiveness, identifying specific gaps, and suggesting the need for changes to treatment plans, with an overall goal of improving health outcomes in T2DM (63).

Knowledge of diabetes was assessed using the Revised Diabetes Knowledge Test (DKT)(64) which was tested for reliability and validity by the University of Michigan Diabetes Research Setting. Its objective is assessing patient knowledge about diabetes and its care (64)**.** We used the modified true/false version which required less modification for the Namibian context as it was easier to use bearing in mind that the participants were elderly with little or no education background. The questionnaire had a total of 20 questions for patients who were receiving insulin and 18 for those who were not receiving insulin therapy. Patients on insulin were scored out of 20 while patients not on insulin therapy were scored out of 18. 1 mark was awarded for a correct

answer and zero for wrong or when answer was unknown. For patients on insulin: 1-11 (low), 12-14 (medium), 15 and above (high), while for patients not on insulin, 1-10(low), 11-13 (medium) and 14 and above (high). Scores were graded as high, medium or low.

Diabetes self-care behaviours were assessed using the expanded version of the Summary of Diabetes Self-Care Activities (SDSCA) which measures the frequency of performing self-care activities (diet, exercise, blood glucose testing, foot care and tobacco use) in last 7 days (65). It was adapted to the Namibian context. Adaptation was done by using local terms for food descriptions, as well as explanations of diabetic complications such as neuropathy, medical conditions and exercise. Some of the terms included: numbness-omaiyuvo kaagepo, tingling sensation-uunyangalashe omaiyovu, nerve disease-uuvu wo momithipa, exercises- madhewo, lung disease-uupyakadhi wokomapunga, hypertension- ombizi yalonda, diabetes-omukithi go suuka, diabetes complications-omathindakano gomukithi go suuka, flu-eshikisha, infections-okutambathana All these changes helped participants understand questions better and respond appropriately.

The variables of interest from the mentioned sections of the study questionnaire included:

i. Independent variables were sociodemographic factors: Age, gender, marital status, educational level, occupation, average monthly income. Clinical factors: duration of DM, family history of DM, BMI, number of medications the participant was on and presence of comorbidities. Self-care factors: adherence to recommended diet, physical exercise, smoking, alcohol consumption, self-monitoring of blood glucose and foot care.

ii. Dependent variables: A1C, RBS, BP, lipid profile including LDL and Total cholesterol and diabetes knowledge.

3.6 Piloting of data collection tool

The study tool was piloted before study period to serve as validation procedure. A total number of 10 patients were interviewed during the pilot phase at Oshikuku District Hospital with aid of an interpreter. The patients interviewed during the piloting phase were not included in the study. The piloting also served as training period for the research assistant to ensure uniformity in the way data were collected. Identification of local terms to explain some medical terms such as neuropathy, hypertension, T2DM, exercises for fitness and local food terms representative of different food categories was done during this stage.

3.7 Data Collection Procedure

The study involved collection of numeric and text data. Data was collected between October 2020 and January 2021 a process that was adversely affected by the Corona virus disease pandemic. The pandemic affected data collection in that not all patients presenting to the hospital made it inside the building to be included in the study. Those without complaints had their prescriptions refilled at the hospital entrance to prevent unnecessary congestion in the hospital. Therefore, some patients who could have been included in the study were missed. Data was cleaned by excluding records that had missing relevant data, only complete records were included in the analysis. Data was coded and participant characteristics and information of interest for study excluding patient identifiers were captured using EPI data version 3.0.

3.8 Consent and Questionnaire Administration

Participants that met the inclusion criteria were invited to participate and if interested, were consented for the project using the consent form (Annex 3). The participants were taken to a designated area for the informed consent process to be done by a Pharmacist Assistant who was tasked to only carry out this process. Details of the study, and why the individual was invited was given and at the end, participant was given an opportunity to decide on either to proceed to the interview room or to opt out. The would-be participants were well informed that opting out would under no circumstances compromise on the care they received from the hospital. The Pharmacist (using an interpreter when necessary) brought the participant who consented to be part of the study to a private area for a detailed discussion using the study questionnaire (Annex 1).

The questionnaire consisted of questions to firstly gather socio-demographic data of the participants. Secondly, to establish health status and medication use including history of hospitalisation. Participants' diabetes knowledge was determined and lastly, session concluded by assessing selfcare practices including questions on diet, exercise and foot care practices.

3.9 Record Review and Data Extraction

The Pharmacist reviewed the patient's health passport to extract additional variables critical to the study (age, gender, co-morbidities, current medication, and duration on prescription, investigations and results done during the visit as well as the results of the recommended annual tests, if done in previous twelve months). If the participant had no A1C and lipid profile done in the last 12 months, the participant was then taken to the doctor for investigations to be ordered and then to the nurse at the casualty department for bloods to be drawn, as per guideline recommendation for usual care.

Results of the laboratory work were obtained from Oshikuku hospital National Institute of Pathology (NIP) laboratory and captured onto the data collection sheet, after which they were de-identified by the chief investigator for anonymity to be maintained.

3.10 Validity and Reliability of the study

This study used a pragmatic approach to assessing quality of care among patients with T2DM at Oshikuku hospital which made the results representative of the diabetic care situation in the district. The cross sectional descriptive design selected also enabled study aims to be achieved at minimal cost (58). Further, all study tools used were piloted in this community and were adapted from validated tools used in other studies that had similar objectives (63–65) . The study findings were analysed using recommended statistical techniques for quantitative research (66).

Reliability of study was addressed by utilisation of valid study strategies and techniques relevant to my study objectives. Details of study and findings (site, sample selection, procedures done, data collection tool, consent form) have been included in the dissertation and as appendices. Bias was minimised through random sampling of study participants (66).

3.11 Standards and Targets for Study

3.11.1 Glycaemic control

Glycated haemoglobin (A1c) is the method of choice for measuring glycaemic control. Monitoring should be done at least twice a year for patients with type 2 DM (1). The desirable target for glycaemic control for this study for A1C was set at <8%. The target was relaxed bearing in mind the population that was included in the study. Relaxed targets are recommended in populations such as the elderly, those with long duration

on therapy or in cases where too strict a target may bring more harm than good. (7) The adverse effect of concern in my study population was hypoglycaemia as majority were older adults, did not have capacity to carry out self-monitoring of BG at home. A1C results for the patients who had annual monitoring done before the study were collected from the health passport and recorded on the data collection tool. For participants without records of tests done in the previous year, a venous blood sample was drawn and submitted to NIP laboratory for testing.

Glucose control was also assessed by RBG checks in the study. This test is less expensive and readily available although does not give a true picture of glycaemic control in a patient. Finger prick testing using Accuchek glucometer was done on the day of presentation to the hospital as part of routine care. Result was noted in the health passport and on the data collecting tool. The purpose was to have a comparison with A1C and ultimately make recommendations based on findings that will benefit patients in future. The desirable blood glucose target was set at <11.1mmol in accordance with guideline recommendations (7).

3.11.2 Blood Pressure

Hypertension is a common co morbidity among patients with diabetes and if left uncontrolled can lead to increased risks of microvascular complications. (6)

The recommended target BP readings in diabetic patients is <140/90 mmHg and < 130/80 mmHg in the presence of kidney, eye or cerebrovascular damage , (4)(3). It is against this background that target BP was set at <130/80 mmHg for this study. BP readings were conducted on the patients on the day of presentation at the hospital by nurses as part of routine care. The reading was taken after the patient had rested and settled to avoid getting a wrong reading. The results were documented in the health passport.

3.11.3 Lipid Profile

Cardiovascular risk reduction among DM patients can be achieved through monitoring of lipid profile among others. In case of high risk or levels outside desired ranges, statin therapy should be initiated provided it is not contra indicated.(4) Targets have been set for important parameters such as LDL (< 1.8mmol /l or <2.0mmol/l), triglycerides (<2.3mmol/l), total cholesterol (<4mmol/l) and HDL (>1.0mmol/l)(4,5). For the purpose of this study, two parameters at international standards were included in the study and analysis of lipid control, LDL and total cholesterol. Similar to A1C readings, results were noted from the health passport if available. For participants with not recorded monitoring from previous twelve months, venous blood samples were collected and submitted to the NIP laboratory for testing.

3.11.4 Knowledge Scoring

Knowledge was assessed using the DKT tool (64) which only gives a numerical score of one for each correct answer and zero for a wrong answer. The tool however does not give standards for low, medium and high knowledge. Hence, like in other studies that made use the tool, own definitions were made for this study (48,67).

The standards were set as follows:

Patients on insulin were scored out of 20 while patients not on insulin therapy were scored out of 18. 1 mark was awarded for a correct answer and zero for wrong or when answer was unknown. For patients on insulin: 1-11 (low), 12-14 (medium), 15 and above (high), while for patients not on insulin, 1-10 (low), 11-13 (medium) and 14 and above (high).

3.11.5 Physical activity

Physical activity is part of recommended lifestyle modification for DM patients. It helps with weight management as well as cardiovascular risk reduction. DM patients

are encouraged to engage in moderate aerobic physical activity such as walking for at least 150 minutes per week apart from the usual day to day activity,(4,5)

The above recommendation was used as standard acceptable activity for the study. It was established during the questionnaire administration session how often participants engaged in exercise per week aside from the normal day to day activities around the house.

3.11.6 Foot Care

Foot care in patients with diabetes is important to prevent foot pathologies that may lead to loss of limbs. The standards of foot care for the purpose of this study were adapted from WHO and International Diabetes Federation guidelines which recommend daily feet inspection, daily washing of feet in warm water, drying feet including in between the toes. Inspecting inside shoes before putting them on, wear right size of shoes and avoid walking with bare feet (1,4) The study participants were asked questions relating to foot care and scored accordingly.

3.12 Data Analysis

Analysis was done by descriptive statistics using means, frequencies, proportions, which were documented in tables and charts. For each participant scores for knowledge, diet and exercise were calculated; then mean scores for the included patients were calculated. To evaluate the quality of care the following calculations were made: the proportion of patients who received the recommended follow-up monitoring; the knowledge they received from the Health Care Workers (HCWs); and the patients' general knowledge, practices, and outcomes.

In addition, the patients were divided into two groups based on their A1C value (<8.0% [controlled BG] and ≥8.0% [uncontrolled BG]), RBS <11.1 mmol/l (desirable), Total Cholesterol of <4mmol/l (desirable) , and LDL cholesterol of < 2mmol/l as desirable.

The groups were assessed for any variable differences, using Pearson's Chi-square test. To identify potential risk factors associated with uncontrolled BG and blood pressure, logistic and binary regression analysis were conducted. The confidence level was set at 95% and the p-value at <0.05. The analysis was conducted using SPSS version 26.0.

A correlation analysis was done on knowledge and treatment outcomes.

3.13 Research Ethics

The study was approved by the post graduate committee of the University of Namibia (UNAM), then UNAM Ethics Review Committee and finally by the Ministry of Health and Social Services. (Appendixes 3 and 4)

Respect for Autonomy

Participants were invited to participate with a consent script (Annex 2). Only consenting participants were interviewed for the study.

Beneficence and Justice

This study involved patients from within Oshikuku District that will benefit from future interventions. It was the intention of this investigator to implement quality improvement processes based on the results of this study.

Non- Maleficence

Data and results collected were anonymous. Identifiers were only kept with the data in a locked cupboard until the A1C result was returned from the NIP laboratory, after that, identifiers were destroyed.

CHAPTER 4

PRESENTATION OF RESEARCH FINDINGS

RESULTS

Introduction

Chapter 3 focussed on describing the research methodology that was used to meet the objectives of this study. Chapter 4 will consequently present the study findings. Both descriptive statistics and statistical analyses for significance of association are used to present the findings.

4.1 Socio-demographic characteristics, health status and medical information

A total of 108 T2DM participants were interviewed, but analysis was performed on 84 participants only due to missing vital information (Figure 2).

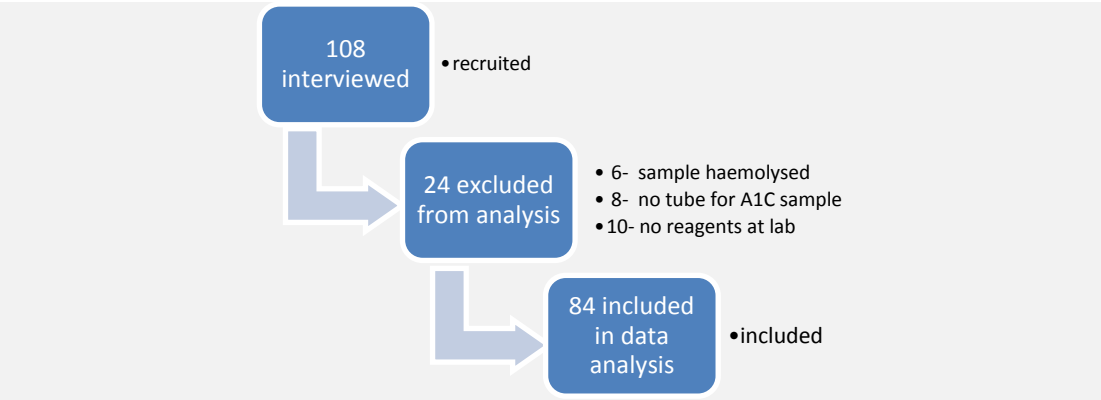


Figure 2 - Flow chart for number of participants included in the study

All the participants were Namibian. Most were female (63.1%) and married (81.0%). Few had tertiary level education (6.0%). Many were unemployed (59.5%), and pensioners (58.3%). Further, most were overweight (65.5%) with BMI >25, hypertensive (82.0%) with BP >130/80 mmHg which was poorly controlled (69.1 %) (Table 1). The average duration on therapy was 6.11years (range 2-31 years), with

majority being on 3.8 medicines (range 1-7 medicines). Lastly, the average number of hospitalisations reported by most participants was about once (mean=0.75, range 1-3 times) (Table 1).

Table 1- Demographic Data

Variables	n	%
Age (years)		
<40	5	6.0%
40-49	11	13.1%
50-59	19	22.6%
≥60	49	58.3%
Nationality		
Namibian	84	100%
Sex		
Male	31	36.9%
Female	53	63.1%
Marital status		
Single	11	13.1%
Married	68	81.0%
Divorced/Separated	1	1.2%
Widowed	4	4.8%
Education		
None	23	27.4%
Primary school	35	41.7%
Secondary school	21	25.0%
College/University	5	6.0%
Employment status		
Formal employment	18	21.4%
Self-employed	4	4.8%
Retired	12	14.3%
None	50	59.5%
Body Mass Index		
Overweight	55	65.5%
Underweight	2	2.4%
Normal	27	32.1%
Hypertension		
No	15	18%
Yes	69	82%
Blood Pressure		
Controlled	11	16.0%
Not controlled	58	84%
Family History of DM		
No	35	41.7%
Yes	49	58.3%
Owned Glucometer		
No	60	71.4%
Yes	24	28.6%
Alcohol Status		
Drinker	24	28.6%
Non-drinker	39	46.4%
Ex-drinker	21	25.0%

Variables	n	%
History of hospitalisation		
No	38	45.2%
Yes	46	54.8%
Reasons for hospitalisations		
Hyperglycaemia	38	79.2%
Hypoglycaemia	9	18.8%
Diabetic ketoacidosis	1	2.1%
Knowledge on DM		
High	5	6.0%
Medium	21	25.0%
Low	58	69.0%
Duration of diabetes (years)	6.11	-
Number of medications taken per day	3.8	-
Number of hospitalisations	0.75	-

The patients were divided into two groups based on glycaemic control measured by A1C (Table 2). The proportion with good glycaemic control (A1C <8) constituted 39.3% (n=33). Between the A1C groups – that is, ≥8.0% and <8.0% groups – there was no difference in statistical association of different variables such as family history of DM (p=0.918); ownership of a glucometer (p=0.596); alcohol consumption (p=0.918); diabetes-related hospitalisation (p=0.481); knowledge on DM (p=0.399); diabetic years (p=0.388);and medicines taken per day (p=0.15), (Table 2) and glycemic control. The reasons for diabetes-related hospitalisation were hyperglycaemia (79.2%); hypoglycaemia (18.8%) and diabetic ketoacidosis (2.1%). (Table 2). Regarding RBS, for most of the patients it was below 11.1 mmol/l. (74%). Most participants were receiving metformin, followed by Insulin (Actraphane®), gliclazide, and glibenclamide (Figure 4 and Table 3). For hypertension most were receiving perindopril, followed by indapamide. The BP was controlled in 16% of the patients. (Table 1). Few were on a lipid lowering medication, and five received aspirin (Table 3). Between the two groups, no significant difference was observed in the proportion of medicines received.

Analysis was further performed on the different demographics, (age, gender, marital status, education level, employment status and BMI) in relation to study variables of interest namely, A1C, RBS, LDL and total cholesterol (Table 4). The purpose was to ascertain if there were any statistically significant differences between the well-controlled and the poorly controlled groups in relation to participants demographics.

With regards to age, there was no noted significant difference among the study variables. It was however noted that the participants in the >60years age band had better control (RBS <11.1 mmol/l= 58.1%, A1C< 8%= 66.7%, LDL< 2mmol/l= 66.7% and 50% for total cholesterol < 4mmol/l) compared to the other age groups, though the results were not statistically significant (Table 4). As expected, the proportion of study participants that met RBS target for both male and female was higher compared to the A1C results (Table 4). Similarly, for marital status, level of education, employment status and BMI, no statistically significant differences observed as shown in Table 4.

Table 2: Comparison of health statuses and knowledge between the A1C groups

Variables	A1C≥8 n (%)	A1C <8 n (%)	P
Family history of diabetes			
No	21 (41.2)	14 (42.4)	0.918
Yes	30 (58.8)	19 (57.6)	
Owns Glucometer			
No	38 (74.5)	22 (66.7)	0.596
Yes	13 (25.5)	11 (33.3)	
Alcohol status			
Drinker	15 (29.4)	9 (27.3)	0.918
Non-drinker	24 (47.1)	15 (45.5)	
Ex-drinker	12 (23.5)	9 (27.3)	
Hospitalisation due to diabetes			
No	21 (41.2)	17 (51.5)	0.481
Yes	30 (58.8)	16 (48.5)	
Knowledge			
High Knowledge	4 (7.8)	1 (3.0)	0.399
Medium knowledge	14 (27.5)	7 (21.2)	
Low Knowledge	33 (64.7)	25 (75.8)	
Duration of diabetes (years)	6.61	5.61	0.338
Number of medications taken per day	4.02	3.58	0.15
Number of hospitalizations	0.97	0.53	0.066

A1C: Glycated Haemoglobin

Table 3: Medication Use

Medications	Total, n (%)	A1C≥8 n (%)	A1C <8 n (%)	p
Metformin	79 (94.1)	47 (92.2)	32 (97.0)	0.661
Actraphane (pre-mixed)	25 (29.8)	19 (37.3)	6 (18.2)	0.105
Gliclazide	24 (28.6)	18 (35.3)	6 (18.2)	0.148
Glibenclamide	23 (27.4)	16 (31.4)	7 (21.2)	0.442
Protaphane (isophane)	2 (2.4)	0	2 (6.1)	0.295
Actrapid (soluble)	1 (1.2)	0	1 (3.0)	0.825
Perindopril	56 (66.7)	35 (68.6)	21 (63.6)	0.813
Indapamide	53 (63.1)	33 (64.7)	20 (60.6)	0.882
Amlodipine	15 (17.9)	10 (19.6)	5 (15.2)	0.819
Atenolol	9 (10.7)	7 (13.7)	2 (6.1)	0.454
Co-amiloride	5 (6.0)	3 (5.9)	2 (6.1)	1.000
Valsartan	3 (3.6)	1 (2.0)	2 (6.1)	0.669
Other antihypertensive	4 (4.8)	2 (3.9)	2 (6.1)	1.000
Verapamil		-	-	-
Simvastatin	21 (25.0)	14 (27.5)	7 (21.2)	0.699
Aspirin	5 (6.0)	3 (5.9)	2 (6.1)	1.000

A1C-glycated haemoglobin

4.2 Compliance with WHO recommendations for monitoring

Only 29.8% had annual monitoring for A1C and full lipid profile done before implementation of this study (figure 3). The rest of the participants had laboratory follow-up investigations conducted during this study.

The findings from the full lipid profile analysis revealed that almost all patients had total cholesterol and triglycerides above the desired range, (Figure 3 and Table 4). Moreover, many had no record of foot and eye examinations in the previous 12 months (Figure 3). Of those who had foot exam (n = 10), one had normal sensation, while nine had reduced sensation. Similarly, few had eye examinations and four out of 11 had retinopathies (Figure 3).

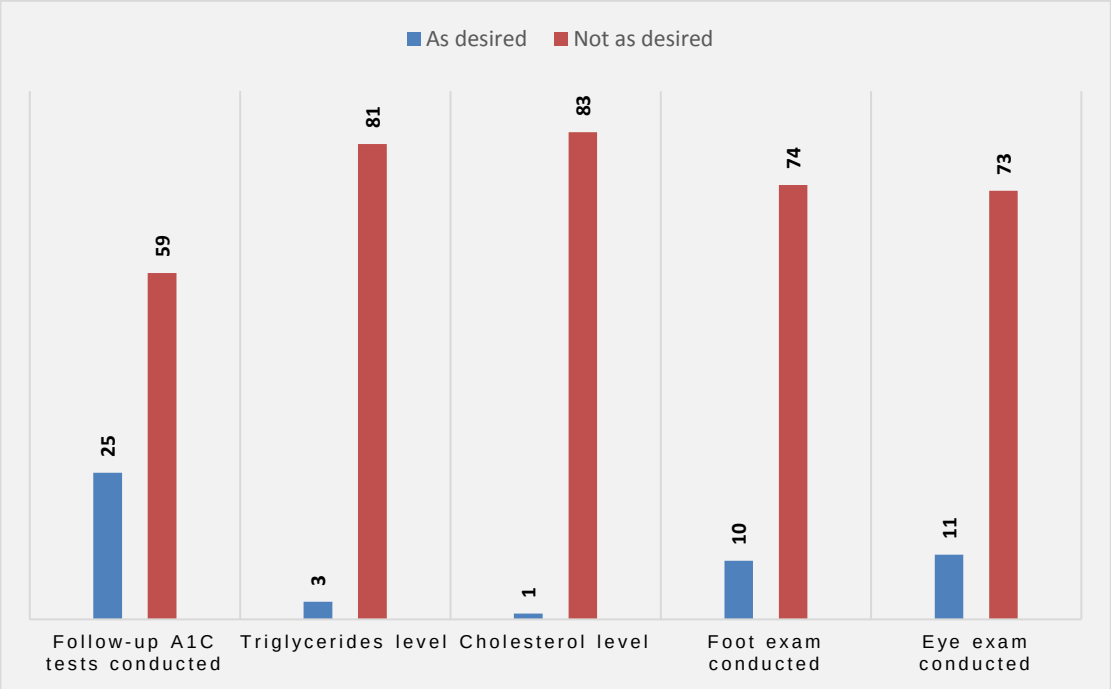


Figure 3: Number of participants who received monitoring and outcomes

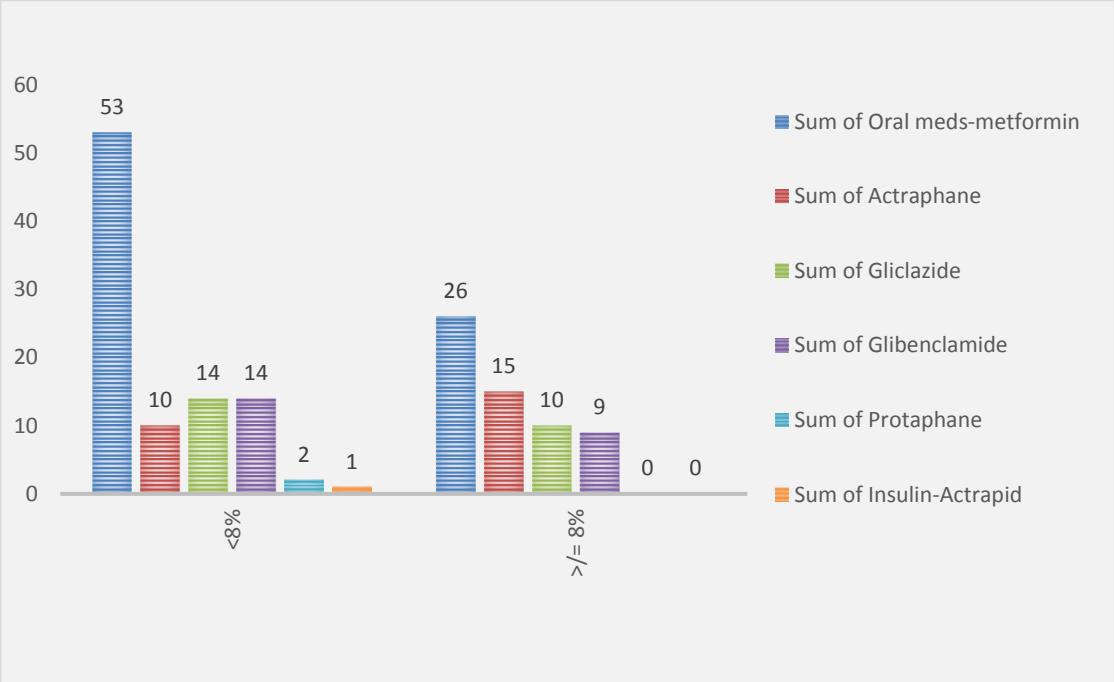


Figure 4: Number of anti-diabetic medicines received by participants according to A1C categories

Table 4- Relationship of demographic variables to diabetes and cholesterol control

Variable	n (%)							
	***RBS*≥ 11.1**	**RBS< 11.1**	**A1C≥8**	**A1C <8**	**LDL≥2**	**LDL<2**	**Total Ch≥ 4**	**Total Ch <4**
Age								
<40	2 (9.1)	3 (4.8)	3 (5.9)	2 (6.1)	4 (5.6)	0 (0.0)	5 (6.4)	0 (0.0)
40 - 49	2 (9.1)	9 (14.5)	8 (15.7)	3 (9.1)	8 (11.3)	1 (33.3)	9 (11.5)	2 (33.3)
50 - 59	5 (22.7)	14 (22.6)	13 (25.5)	6 (18.2)	18 (25.4)	0 (0.0)	18 (23.1)	1 (16.7)
≥60	13 (59.1)	36 (58.1)	27 (52.9)	22 (66.7)	41 (57.7)	2 (66.7)	46 (59.0)	3 (50.0)
p-value		0.828*		0.618*		0.542		0.490
Gender								
Male	9 (40.9)	22 (35.5)	16 (31.4)	15 (45.5)	26 (36.6)	1 (33.3)	28 (35.9)	3 (50.0)
Female	13 (59.1)	40 (64.5)	35 (68.6)	18 (54.5)	45 (63.4)	2 (66.7)	50 (64.1)	3 (50.0)
p-value		0.845		0.282		0.677		0.181
Marital status								
Single	4 (18.2)	7 (11.3)	7 (13.7)	4 (12.1)	9 (12.7)	1 (33.3)	10 (13.7)	1 (16.7)
Married	18 (81.8)	50 (80.6)	41(80.4)	27 (81.8)	58 (81.7)	2 (66.7)	64 (82.1)	4 (66.7)
Divorced/Separated	0 (0.0)	1 (1.6)	1 (2.0)	0 (0.0)	1 (1.4)	0 (0.0)	1 (1.3)	0 (0.0)
Widowed	0 (0.0)	4 (6.5)	2 (3.9)	2 (6.1)	3 (4.2)	0 (0.0)	3 (3.8)	1 (16.7)
p-value		0.614*		1.000*		0.749		0.527
Education								
None	5 (22.7)	18 (29.0)	14 (27.5)	9 (27.3)	19 (26.8)	0 (0.0)	22 (28.2)	1 (16.7)
Primary school	11 (50.0)	24 (38.7)	21(41.2)	14 (42.4)	30 (42.3)	2 (66.7)	32 (41.0)	3 (50.0)
Secondary school	4 (18.2)	17 (27.4)	12 (23.5)	9 (27.3)	17 (23.9)	1 (33.3)	19 (24.4)	2 (33.3)
College/University	2 (9.1)	3 (4.8)	4 (7.8)	1 (3.0)	5 (7.0)	0 (0.0)	5 (6.4)	0 (0.0)
p-value		0.609*		0.882		0.673		0.815
Employment status								
Formal employment	4 (18.2)	14 (22.6)	11(21.6)	7 (21.2)	17 (23.9)	0 (0.0)	17 (21.8)	1 (16.7)
Self-employed	2 (9.1)	2 (3.2)	3 (5.9)	1(3.0)	3 (4.2)	0 (0.0)	4 (5.1)	0 (0.0)
Retired	1 (4.5)	11 (17.7)	5 (9.8)	7 (21.2)	10 (14.1)	0 (0.0)	11 (14.1)	1 (16.7)
None	15 (68.2)	35 (56.5)	32 (62.7)	18 (54.5)	41 (57.7)	3 (100.0)	46 (59.0)	4 (66.7)
p- value		0.282*		0.551*		0.565		0.928
BMI								
Overweight	18 (81.8)	37 (59.7)	35 (68.6)	20 (60.6)	48 (67.6)	1 (33.3)	48 (61.5)	4 (66.7)
Underweight	0 (0.0)	2 (3.2)	1 (2.0)	1 (3.0)	2 (2.8)	0 (0.0)	2 (2.6)	0 (0.0)
Normal	4 (18.2)	23 (37.1)	15 (29.4)	12 (36.4)	21 (29.6)	2 (66.7)	28 (35.9)	2 (33.3)
p- value		0.198*		0.822*		0.667		0.910

RBS; Random Blood Sugar, A1C; Glycated Haemoglobin; Low Density Lipoprotein, TOTAL Ch; Total Cholesterol, BMI; Body Mass Index

4.3 Diabetes knowledge and Self-Care Practices

Knowledge on diabetes was assessed with special attention paid to diet, monitoring and effects of infections, exercise, foot care practices, DM complication and prevention.

General knowledge on assessed themes was noted to be low in most patients with controlled and poorly controlled diabetes: 75.8% and 64.7%, respectively. There was no statistically significant difference in knowledge on diabetes between the two categories on A1C, (Table 2).

Some important notable findings from the knowledge assessment were that less than half (48.8%) of the patients agreed that the diabetic diet was healthy for most people, many did not know what A1C was for nor the difference between urine and blood testing for glucose. Most knew the effects of fruit juice on blood sugar and were aware of which drink to take in case of low blood sugar. Patients also knew the effect of exercise on blood pressure but not on blood sugar. Some (32.1%) thought that high blood sugar levels are caused by too much insulin. Many (98.8%) recognised the importance of doctor's appointments assisting spot early complications, while more than half (59.5%) said that attending Doctor's appointments would stop complications from occurring. (Table 5).

Healthy diet was reported for around 3 ½ days or less in the last seven days. Fruits were taken for about one day in the last seven days; while fat and diary meals were taken for around two times in the last seven days (Table 6). There was no difference in diet patterns between participants with glycaemic control and the corresponding group such as in: following a healthy eating plan in the last seven or 28 days; the number of days of eating fruits; and eating fatty foods in the last seven days. However,

a difference was noted in the average number of days for which carbohydrates were evenly spaced (3.0 vs. 2.2; $p = 0.015$).

Continuous activity for more than 30 minutes was reported to occur in less than three days, but there was no statistically significant difference observed between the A1C groups (Table 6). Few patients reported to have engaged in regular day to day activities, but for only a few days of the last seven days. No difference was observed between the A1C groups (Table 6).

The participants reported checking their feet an average of 4 days in a week, inspecting inside shoes before wearing them and feet washing on daily basis. Soaking of feet was rarely done and drying in between toes on average of 2-3days in a week. (Table 6) there was no significant difference in foot care practices among the well and poorly controlled participants.

There was a positive moderate correlation between the knowledge score and foot care score (Pearson correlation, $r2 = 0.408$, $p<0.001$). A mild correlation between the knowledge score and exercise score was also observed. However, there was no correlation between the knowledge score and diet score, total cholesterol, body mass index, and random blood sugar (Table 7).

Table 5- Knowledge Assessment aggregates

Knowledge Question	True n (%)	False n (%)	Don't Know n (%)
1. The diabetes diet is a healthy diet for most people	41 (48.8)	38 (45.2)	5 (6.0)
2. Glycosylated haemoglobin (HbA1c) is a test that measures your average blood glucose level in the past week	3 (3.6)	6 (7.1)	75 (89.3)
3. A plate of chicken has more carbohydrate in it than a plate of oshifima*	5 (6.0)	68 (81.0)	11 (13.1)
4. Soft drink has more fat in it than milk	11 (13.1)	70 (83.3)	3 (3.6)
5. Urine testing and blood testing are both equally as good for testing the level of blood glucose	0 (0.0)	10 (11.9)	74 (88.1)
6. Unsweetened fruit juice raises blood glucose levels	50 (59.5)	23 (27.4)	11 (13.1)
7. A can of diet soft drink can be used for treating low blood glucose levels	34 (50.1)	37 (44.0)	13 (15.5)
8. Using olive oil in cooking can help prevent raised cholesterol in the blood	79 (94.0)	2 (2.4)	3 (3.6)
9. Exercising regularly can help reduce high blood pressure	80 (95.2)	1 (1.2)	3 (3.6)
10. For a person in good control of diabetes exercising has no effect on blood sugar levels	12 (14.3)	28 (33.3)	44 (52.4)
11. Infection is likely to cause an increase in blood sugar levels	22 (26.2)	20 (23.8)	42 (50.0)
12. Wearing shoes a size bigger than usual helps prevent foot ulcers	27 (32.1)	47 (56.0)	10 (11.9)
13. Eating foods lower in fat decreases your risk for heart disease	82 (97.6)	1 (1.2)	1 (1.2)
14. Numbness and tingling may be symptoms of nerve disease	69 (82.1)	0 (0.0)	15 (17.9)
15. Lung problems are usually associated with having diabetes	11 (13.1)	35 (41.7)	38 (45.2)
16. When you are sick with the flu you should test for glucose more often	12 (14.3)	29 (34.5)	43 (51.2)
17. IF TAKING INSULIN: High blood glucose levels may be caused by too much insulin	9 (32.1)	13 (46.4)	6 (21.4)
18. IF TAKING INSULIN: If you take your morning insulin but skip breakfast your blood glucose level will usually decrease	27 (96.4)	0 (0.0)	1 (3.6)
19. Having regular check-ups with your doctor can help spot the early signs of diabetes complications	83 (98.8)	0 (0.0)	1(1.2)
20. Attending your diabetes appointments stops you getting diabetes complications	50 (59.5)	31 (36.9)	3 (3.6)

***Oshifima – pap made out of millet or maize meal**

Table 6- Diet, exercise, and foot care by A1C category

Activity	Mean days A1C≥8	Mean days A1C<8	p
Diet			
Last SEVEN DAYS had followed a healthful eating plan	2.8	3.5	0.097
DAYS PER WEEK followed eating plan Past Month	2.8	3.4	0.079
Last SEVEN DAYS eat five or more servings of fruits and vegetables	1.4	1	0.326
Last SEVEN DAYS eat high fat foods such as red meat or full fat dairy products	2.2	1.9	0.208
Last SEVEN DAYS spaced carbohydrates evenly through the day?	2.2	3	0.015
Exercise			
Last SEVEN DAYS participated in at least 30 minutes of continuous physical activity?	2.88	2.48	0.428
Last SEVEN DAYS participated in a specific exercise session (such as swimming, walking, biking)	0.63	0.45	0.597
Foot care			
Days last SEVEN DAYS did you checked your feet	4.45	4.03	0.545
Days last SEVEN DAYS inspected the inside of shoes	6.59	7	0.16
Days last SEVEN DAYS washed feet	6.82	7	0.321
Days last SEVEN DAYS soaked feet	0.71	0.18	0.072
Days last SEVEN DAYS dried between toes after washing	2.96	2.15	0.287

Table 7: Correlation between knowledge and dependent variables

			Diet Score	Exercise Score	Foot Care Score	Total cholester
	Knowledge Score	Pearson Correlation	-0.115	0.183	0.408**	-0.
		P-value	0.298	0.096	0.000	0.4
		N	84	84	84	8

4.4 Factors Associated with High A1C and high blood pressure

An increasing body mass index was associated with higher odds of having a poorly controlled blood glucose: OR=1.2. Poor diet was the only factor associated with a high blood pressure (OR=42.3). Patient who had retinopathy had a reduced risk of having a high BP (OR=0.2) (Table 8). None of the other variables were significantly associated with poor glycemic and blood pressure control.

4.5 Other themes noted during data collection

A few important themes were noted during data collection. Regarding diabetic complications, male patients reported having challenges of erectile dysfunction which affected their quality of life. Male patients also reported having challenges of adhering to healthy diet as food choices were not within their control, they only ate what was served.

Table 8: Factors associated with poor A1C outcomes and high blood pressure

Variable	A1C as dependent variable			Hypertension as dependent variable		
	Odds Ratio (OR)	95% confidence interval	p-value	OR	95% confidence interval	p-value
Age	1	(0.9-1.02)	0.185	1	(0.9-1.07)	0.185
Body mass index	**1.2**	(1.03-1.34)	0.021	1.1	(0.9-1.3)	0.085
Gender	0.8	(0.2-2.7)	0.664	0.7	(0.2-2.7)	0.82
Marital status	0.9	(0.3 - 2.9)	0.864	2.5	(0.7-9.4)	0.162
Education level	1.1	(0.4 - 3.0)	0.839	1.5	(0.5-4.0)	0.21
Employment status	1	(0.6 - 1.7)	0.95	0.7	(0.4-1.5)	0.357
Ownership of glucometer	1.1	(0.3 - 4.0)	0.844	0.8	(0.2-3.1)	0.732
Smoking status	UA	_	_	0.7	(0.1-6.4)	0.778
Alcohol status	1.2	(0.5 - 3.0)	0.626	0.6	(0.3-1.6)	0.323
General knowledge on diabetes	0.5	(0.1 - 1.5)	0.194	1.8	(0.5-6.0)	0.553
Diet	3.7	(0.34 - 48.5)	0.327	**43**	(3.0-681)	0.008
Exercise	0.9	(0.1 - 10)	0.899	1.8	(0.1-39)	0.714
Family history of diabetes	2.7	(0.8 - 9.6)	0.131	0.9	(0.2-3.2)	0.906
Neuropathy	1.5	(0.1 - 50.0)	0.819	2.1	(0.5-8.9)	0.295
Retinopathy	3.7	(0.7 - 19.8)	0.126	**0.2**	(0.03-0.9)	0.046
Foot care	1.6	(0.3 - 7.9)	0.535	0.4	(0.08-2.02)	0.261

UA = Un-assessable

CHAPTER 5

DISCUSSION ON STUDY RESULTS

5.1 Introduction

This chapter will focus on discussing the results as well as comparing findings with reports in other studies of similar nature.

5.2 Discussion

This cross-sectional study was carried out to assess the quality of diabetic care as well as describe the prevalence of glycaemic control among T2DM patients receiving regular care for their condition at Oshikuku District hospital, Namibia. Quality diabetic care includes regular monitoring of blood glucose, BP, lipids and control to reduce cardiovascular risks and other complications. Furthermore, advocacy for healthy diet, physical activity, right medications as well as regular screening for nephropathy, peripheral neuropathy, and retinopathy to facilitate for early treatment, and education on diabetes and ideal self -care practices. (1,3,4).

International guidelines set standards for A1C at <7%, however, for this study, glycemic control was set at <8% due to the population that was included in the study. A too strict target would have been inappropriate. Less than half (39%) achieved glycaemic control measured by A1C in contrast to 74% using RBG as marker of glycaemic control. The difference is almost by 100% which if monitoring is solely based on RBS can lead to false sense of control and hence miss early detection of complications. Monitoring of patients glycaemic control should be done using the two parameters, A1C at least twice a year as per guideline and RBG at each clinic visit and results interpreted together for decision making. The findings are consistent with a

study on glycaemic control conducted in Zambia that reported majority (61.3%) of its patients being poorly controlled(33) and a Johannesburg study that reported 19.3% of its subjects achieving therapy targets. (68)

Of note from the study, BMI was the only variable that was statistically associated with poor glycaemic control: as the BMI increased, the risk for an uncontrolled A1C increased. In addition, on comparing the two groups, controlled versus not controlled, it was noted that female gender, duration on therapy, being overweight, primary level education, being married and in no employment were more predominant among those with uncontrolled diabetes although there was no statistically significant difference. This finding is consistent with findings from a study in Ethiopia that reported similar attributes among the poorly controlled patients (29). Regarding medication therapy, the group that did not meet the glycaemic control target had more patients on Actraphane insulin than the controlled (19 vs 6). The difference however was not significant ($p=0.105$) Insulin is more complex in terms of administration and this could have been a contributing factor compared to oral medication. Secondly, patients on insulin had failed on oral medications hence achieving control would be more difficult compared to another group. Another possible factor though not investigated in this study could be storage of insulin at home, Oshikuku is in the northern part of Namibia and temperatures can be really high, unfortunately majority of the population live in rural setup with no refrigeration facilities which can affect the quality of medication and ultimately affect glycaemic control. This finding is as was reported in a study from Zambia where more patients on Insulin therapy did not achieve glycaemic control targets (33).

Dyslipidemia was also noted among most of our study participants with less than 10% of the patients having lipid levels within desirable targets. Lipid control remains an

important component of diabetes management as high lipid levels can increase risks of cardiovascular complications(4). A study in South Africa on factors associated with glycaemic control reported dyslipidemia as a possible attribute (69). Total cholesterol and LDL levels were above desired ranges in majority (92% and 95% respectively) of the patients. The findings are in contract to the findings from a study in Sudan that compared serum lipid profiles of those with desirable glycaemic control with those not controlled. The Sudan study participants had better lipid control (36.6% hypercholesterolemia and 26.6% high LDL) despite 87.2% having A1C levels above therapy targets (70). It was also noted that only 25% of all participants were on lipid therapy and less than half, n=14 (27.5%) of those with undesirable glycaemic control were on lipid therapy

Scientific evidence states that statins reduce the risk of death or CVD events irrespective of age and gender, and across a wide range of cholesterol levels (5). Statin therapy is recommended for all DM patients above the age 40 years due to evidence of reducing cardiovascular risk (3,4). Glycaemic control in presence of high triglyceride levels as the case with the study participants can be of benefit in lipid management. (4). Additionally, lifestyle modification in terms of diet control with less saturated fat consumption has been recommended to be of added benefit. (4). A meta-analysis on primary prevention of major cardiovascular and cerebrovascular events among patients with DM reported that statin therapy in the primary prevention of major cardiovascular and cerebrovascular events in patients with DM was significantly associated with a relative risk (RR) reduction in the first-time occurrence of major cardiovascular or cerebrovascular events (RR 0.75, 95% CI 0.67-0.85), fatal/non-fatal stroke (RR 0.69, 95% CI 0.51-0.92) and fatal/non-fatal myocardial

infarction (RR 0.70, 95% CI 0.54-0.90) and a non-significant RR reduction in all-cause mortality (RR 0.84, 95% CI 0.65-1.09) (71)

Monitoring of patients with T2DM is an important component of the quality care package. An important finding of this study was that majority (70%) of the patients in the study did not have regular monitoring as prescribed by WHO standards (1) and hence had laboratory monitoring done during the study as per protocol. In addition, most did not achieve therapy goals. Of note is that, not all patients who had laboratory investigations ordered during the study had all done due to reasons such as lack of test reagents, some samples haemolysed and missing tubes for ordered tests (Figure 2). This observation points to system factors which lead to care gaps as nurses did not draw samples as per order. Some tests could not be performed due to unavailability of reagents which is also a system factor. District hospitals in Namibia operate without specialised clinics for non -communicable diseases which may be a contributing factor to the gaps in care. The findings from this study are consistent with report from a review article about access to haemoglobin testing in rural Africa which noted low testing of A1C and majority of patients only having RBG test done which has very limited clinical value (38). The review recommended increasing access to A1C testing as a critical step to combat the high diabetes-related mortality rates in rural SSA. Regular monitoring is an important component of care as it enables early identification of patients that need interventions. Importance of regular monitoring is evidenced in a study that assessed full monitoring and effects on glycaemic control. The study reported higher number of patients among the fully monitored attaining treatment targets than the ones that were not fully controlled (40) . In contrast , a study carried out in Johannesburg South Africa had better findings on general monitoring, (A1C, BP and cholesterol), 68.8% (n=357) for A1c, 95.4% (n=495) for BP, and 58.6%

(n=304) for LDL-C. Achievement of therapy goals was not as desired with : 19.3% (HbA1c < 7%), 22.0% (BP < 140/80 mmHg), and 56.3% (LDL-C < 2.5 mmol/l**)** (68)**.** It was noted during review of records that the patients that had laboratory investigations done had been unwell and admitted to hospital and not necessarily as routine care. This observation does not give good picture of quality of care because patients should not have to be unwell to get full care package. There are no staff specialised trained and assigned to attend to these patients, no registers to enable scheduling of appointments or general monitoring.

Screening and early detection of microvascular complications is amongst the recommended monitoring parameters for quality care. Of interest in this study was screening for retinopathy and neuropathy. Diabetic retinopathy is a common microvascular complication that can lead to vision loss (72). It was noted in this study that only 13% of the patients were screened as per guideline recommendations (1). This is very low and worrisome especially that majority of the patients were not at goal in terms of glycaemic control and BP which increases the risk of retinopathy.

Similarly, screening for diabetic peripheral neuropathy was low at only 12% of all patients. Regular screening can lead to early identification of foot pathologies and prevention of further complications such as limb amputations (51). Vision and limb losses both affect the lives of individuals and families negatively and ultimately affect quality of life and hence should be minimised by all medical means possible (51)(43). This low coverage was mainly attributed to the hospital not having an eye clinic for examinations to be done as well as lack of equipment to carry out feet examination. Accessibility and lack of skills are the major reasons for the lack of adherence to recommendations. These barriers to care are similar to reports from a systematic

review published in the Canadian journal of Diabetes that cited accessibility, lack of knowledge and skill competencies as barriers to screening (43).

Despite the barriers to screening being similar, reports in other studies carried out in the developed world like USA (60% coverage) and Canada (62% coverage)show better performance, (43). Although not as low, the review still recommended that identified challenges be addressed if incidences of microvascular complications were to be reduced.

Another important complication of diabetes that was noted during interviews with patients was erectile dysfunction (ED). The affected participants raised the concern and solicited for advice on combating the problem. It was highlighted that the problem had affected their quality of life and brought problems in their homes as the spouses accused them of infidelity. The patients requested for the hospital to allow them bring spouses to the hospital so education on the complication can be made known to the partners. It has been reported that ED has affected about 35% of men living with T2DM in SSA (39). It is an important complication that may not be discussed often with patients but has capacity to affect their quality of life adversely. This was confirmed by a study in Nigeria on quality of life of men living with ED. The findings from the study were that Social relationships and psychological health indices of QOL were adversely affected in men with ED than any other health indices. It was concluded that sexual function promotes psychological well-being as well as interpersonal relationships. Hence, monitoring these indices of QoL in men with ED is important to boost their confidence and self-esteem needed for a better QoL (73)

Hypertension (HTN) is among the top causes of cardiovascular diseases globally. It is a common co morbidity among patients with diabetes. Among our study subjects, 82% were hypertensive on medication and only 16% were controlled. It is of utmost

importance to ensure BP control among patients with DM as lack of control can affect disease prognosis. Similar findings are reported from a study in South Africa where BP control among patients with DM was very low at only 22%, (74) and from a review article published in the cardiovascular journal of Africa involving more than 25000 patients with DM, with less than half (35.2%) achieving therapy targets, (75). Control of BP relies on right choice of medication and adherence as well as lifestyle. Majority of the patients were on angiotensin converting enzyme inhibitor, Perindopril and calcium channel blocker, Amlodipine and Indapamide for diuresis. Obesity a risk factor for DM and HTN was notably high (65.5%) among study participants. The patients also reported very little engagement in exercise for their own health. Participants reported engaging in exercise on less than three days in a week, diet control was also a problem, mean number of days of spacing out carbohydrates was between 2-3 days, consumption of fruits was also very low, just 1 fruit per day the most. Vegetables were rarely consumed, patients reported that they only consumed seasonal vegetables which are mostly available during the rainy season. The poor adherence to healthy diet, lack of exercise could have contributed to patients being overweight and ultimately affecting the BP control. A binary regression analysis carried out to identify possible factors associated with poor BP control among study participants revealed that healthy diet, taking antihypertensive medication increased the odds of having poor BP control. However, these findings should not be interpreted literally that a high score in adherence to good diet increased BP. The most likely association is that when the BP was found to be high the diet practices improved as a control measure.

Knowledge on diabetes and self-care has been advocated for to be important and purported to play a role in therapy success and control. (76) Knowledge on diabetes

and self-care practices was noted to be very low among the patients. Most of these with good glycaemic control (75%), and most amongst those with uncontrolled glycaemia (64.7%) had low knowledge on diabetes and self-care practices. Other studies also reported low knowledge and self-care practice. In Bangladesh only 16% of its study participants having good knowledge on DM and self-care activities, (45) while Ethiopia had 44.9 % of its subjects having low knowledge (14). This is inconsistent with other studies that report good knowledge score despite some knowledge gaps that were revealed which included, knowledge about symptoms of poor control and importance of regular follow ups, (55). Some important information noted from the analysis of the responses on knowledge questions and possible implications. About half of the patients thought a diabetic diet was not healthy for persons without DM and this could be the reason for the observed high BMI and lack of adherence to good diet practices. The patients lacked important knowledge such as what purpose of glycated haemoglobin test was and information it provides in terms of glycaemic control, need for BG monitoring during episodes of infection. The implications of this could account for the low self- monitoring practices among the patients. However, patients recognised the benefits of cooking using olive oil, 95.2% were aware of benefits of exercise on BP control despite not knowing benefits on glycaemic control. Patients generally kept hospital appointments for refills as revealed from the findings on knowledge were most knew the importance of keeping Doctors' appointments and helping with early detection but wrongly believed attending appointments would stop complications from occurring.

Involvement in self-care activities such as exercise was very low. Many did not exercise at all, the only activity they reported engaging in was the regular activity when doing housework. In addition, adherence to healthy diet was also below average.

These lifestyle choices have adverse effects on the patients as noted by most being overweight, with poor BP and glycaemic control.

Foot care was also below average, and the only foot care routine practiced on daily basis was feet washing. Literature recommends daily inspection of feet and checking of inside shoes before wearing them to prevent injuries as well as early detection of any ulceration that may be inside feet to prevent long term adverse events such as feet amputation. This is consistent with findings from a review on knowledge and foot care practice where patients were reported to have adequate knowledge yet did not practice foot care as per recommendation (52).

The low knowledge, poor self-care activities can be attributed to the patients not being well informed about their condition and recommended self- care activities for people living with diabetes. This knowledge gap among patients can be attributed to the hospital not conducting regular health education sessions as recommended. This is not possible due to the nature of hospital that lacks specialised staff to undertake such responsibilities. Neither knowledge nor any of the self-care activities were significantly associated with glycaemic control among the patients in this study despite the poorly controlled having lower knowledge and not practicing good self-care. The findings are in contrast to a study in Pakistan that reported that patients with better self-reported self-care activities achieved better glycaemic control (47)

During discussions with patients, it was reported by the male participants that they had no control on food choices. The women at home were responsible for what was served, and they ate whatever was available which they felt affected them negatively.

Vegetable consumption was also noted by all participants to be seasonal, as most do not engage in growing of vegetables due to unfavourable weather. Participants described they solely depend on seasonal vegetables available mostly during the rainy

season, though some are preserved for use throughout the year. The matters relating to food choices related to individual agency and cultural and socioeconomic factors. These factors can be complicated to address with individuals and requires health care providers to approach with caution when educating patients on need to consider some changes for their own health. There is need for men to also play a role in making food choices especially when health depends on such choices. The idea of consuming vegetables when in season, especially rainy season needs to be addressed and the community encouraged to adopt gardening as part of daily life to supplement dietary needs. More work can also be done around other high calorie processed foods that are readily available including cool drinks and packaged snacks and may be contributing to poor control.

One obvious care gap at Oshikuku District Hospital is that almost all patients reported not having been given any health education by health care workers to enable right self -care. The gap still gets attributed to the nature of providing care to these patients. As stated earlier, care is through general Outpatient Department (OPD) with no standard in place. The care received at each visit solely depends on the health worker that attends to the patient on that day.

A correlation analysis done on knowledge and outcomes such as foot care, exercise, diet, total cholesterol and BMI revealed no correlation with most apart from a positive moderate correlation between knowledge and foot care which was statistically significant score ($r2 = 0.408$, $p<0.001$). A mild correlation between the knowledge and exercise score was observed. The significant correlation can be attributed to the fact that among all the assessed outcomes, foot care was the easiest to do with no extra effort. Daily foot care is a part of daily personal hygiene activities even among non -diabetic patients.

CHAPTER 6

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS OF THE STUDY

6.1 Introduction

Chapter 5 presented the discussions on study results and making comparisons to other research studies. Chapter 6 will present the conclusions and recommendations based on study findings. In addition, the limitations of the study are also highlighted.

6.2 Conclusions from the study

The purpose of this study was to assess the quality of diabetic care at Oshikuku District Hospital, Namibia. In order to achieve this, the following objectives were formulated: first was to describe characteristics of patients with T2DM, second was to determine the prevalence of good glycaemic control among patients with diabetes receiving care (i.e. RBS < 11.1 mmol/L and A1C <8%), third was to estimate level of compliance with WHO recommendations for monitoring of patients with diabetes, fourth was to assess patient knowledge on diabetes , self- care activities and effects on treatment outcomes and lastly to identify factors that are associated with poor glycaemic control and uncontrolled BP. Based on these objectives, the following conclusions were made.

6.2.1 Objective 1: To describe characteristics of patients with T2DM at Oshikuku District hospital

All study participants were Namibian, with most being female (63.1%). Most were married (81 %). Very few (6%) attained a college/university education. Many were unemployed (59.5%), many being pensioners (58.3%). Most were

overweight (65.5%), majority were hypertensive (82) with most (84%) having poorly controlled BP.

It is worth noting that majority of patients being overweight was associated with the poor glycemic and blood pressure control. The low literacy levels also may have affected the patient's knowledge and ultimately their food choices and self-care practices.

6.2.2 Objective 2: To determine the prevalence of good glycaemic control among patients with diabetes receiving care (i.e. RBS < 11.1 mmol/L and A1C <8%)

The prevalence of good glycemic control among patients with T2DM at Oshikuku District hospital based on A1C parameter was very low with only 39.3% (n=33) meeting the desirable target. The prevalence based on RBS was much higher than for A1C with majority 74% (n=62) of study participants meeting the desirable target. However, management decisions cannot be made based on RBS.

Therefore, it is right to say that glycaemic control among patients at Oshikuku District hospital is very poor which increases the risk of diabetic complications among the patients.

There is needed to further investigate the possible factors that may be contributing to this finding which was not fully assessed in this study.

6.2.3 Objective 3: To estimate level of compliance to WHO recommendations for monitoring of patients with diabetes.

The parameters that of interest in terms of monitoring as per WHO standard were A1C, full lipid profile, eye and foot comprehensive examination. The guidelines recommend

for monitoring to be done at least annually among stable patients to assess therapy effectiveness as well as enable early detection of DM complications.

The monitoring laboratory monitoring for A1C and lipids was not up to standard, very few (29.8%) of the patients had monitoring done in the previous 12 months.

In relation to comprehensive eye and foot examination, the findings were not so different from the other findings, only 13% (n=11) had eye examination done and 12%(n=10) had foot examinations done.

Therefore, monitoring of patients was not up to standard and hence there is need to ascertain in future research the contributing factors for this poor performance especially from the health care workers' perspective as it was not explored in this study.

6.2.4 Objective 4: Assess Patient Knowledge on Diabetes, self- care practices and effects on treatment outcomes.

Knowledge on diabetes was assessed based on the following themes; diet, self-monitoring and effects of infections on glucose levels, exercise, foot care practices, DM complication and prevention. Scores were graded as high, medium or low.

General knowledge was low among most patients with no noted statistically significant difference in knowledge on diabetes between the two categories based on A1C (p value- 0.399).

Self-care practices among patients were below average for assessed practices. The mean number of days reported for adherence to healthy diet with balanced food intake for all patients was 3.5 days per week, fruit consumption was also low with majority reporting consumption of only 1 fruit per day when possible. In terms fat and dairy

consumption, they reported low consumption with mean of 2 out of 7 days per week which was the only diet choice that was as recommended. Engagement in exercise for own health was not often with mean number of days of exercise reported being less than 3 days per week.

Foot care practice was not as expected. Inspecting inside shoes before wearing them and feet washing was the only practice engaged in on daily basis probably because it is the easiest and did not require additional effort.

The general conclusion is that diabetes general knowledge among patients was very low, similarly for self-care practices. There is need to consider assessing knowledge of health care workers on DM management in future research as it would help ascertain if it contributes to the low knowledge and below average self-care practices among the patients.

Effect of patient knowledge on treatment outcomes was done through a correlation analysis of knowledge with diet, exercise, foot care, total cholesterol, BMI and RBS. There was a positive moderate correlation between the knowledge score and foot care score (Pearson correlation, $r2 = 0.408$, $p<0.001$) while the rest were not statistically significant. An assumption was made that the finding was only significant probably because it is the easiest to perform by the patient with no extra effort as it is part of the normal daily activities.

In conclusion, patient knowledge had no effect on any of the assessed outcomes apart from on foot care**.**

6.2.5 Objective 5: To identify factors that are associated with poor glycaemic control and uncontrolled BP

Factors associated with poor control were assessed through binary and logistic regression analysis. An increasing body mass index was associated with higher odds of having a poorly controlled blood glucose: OR=1.2. Poor diet was the only factor associated with a high blood pressure (OR=42.3). Patient who had retinopathy had a reduced risk of having a high BP (OR=0.2). None of the other variables were significantly associated with poor glycemic and blood pressure control.

In conclusion, an increasing BMI and poor diet were the only variables associated with poor control of BG and BP while patients with retinopathy were found to have reduced risk of hypertension.

A detailed study to possibly include more patients as well as hypertensive patients without T2DM to explore factors associated with control and poor control can be considered for the future.

6.3 STUDY LIMITATIONS

The study had several limitations which included:

- This study was carried out at one facility which prevented generalisation of results to other facilities in Namibia
- Language barrier
- The lack of capacity of local NIP laboratory to carry out A1C test made it impossible to carry out retests in those patients whose samples haemolysed or those whose tests could not be done due to non-availability reagents. Turnaround time for results was also long.

- Unavailability of specialised clinic for these patients and written standards of care also affected assessment of education provided to patients by health care workers.
- Unavailability of data such as number of diabetic patients in the district, prevalence of good glycemic control led to the sample size calculation being based on regional data which was available in the National Demographic Health Survey of 2010.

6.4 DELIMITATION OF THE STUDY

The primary investigator engaged a research assistant fluent in the local language to carry out interviews and surveys with participants. Only participants with complete health passports records for the previous twelve months were included in the study.

6.5 RECOMMENDATIONS

6.5.1 Introduction

There are several recommendations arising from this study. These recommendations are for the Ministry of Health and Social Services to improve on quality of care provided to patients with diabetes with possible inclusion of other non-communicable diseases and recommendations for future research.

6.5.2 Recommendations to Improve Quality of Care at Facility and Community Level

Health Facility Level

The following recommendations are for facility level consideration:

- MoHSS should consider creating clinics for NCD and recruiting specialist staff for district hospitals to manage patients with these conditions
- Recruit Ophthalmology staff to provide eye care services

- Purchase equipment for foot examination and provide training on use of the tools.
- District hospitals through support of MoHSS should come up with in house clinics that can operate even in the absence of specialists. This can be achieved through sending selected staff to intermediate hospital for training on NCD management then these can attend to patients in a structured manner
- Introduce patient registers as the case with communicable diseases to be able to have record of all patients. This will also aid with tracking which patients are due for monitoring which will in turn improve on quality of care. Care registers will also fill the information gap that is currently prevalent on detailed burden of NCD in Namibia
- Provide continuous in-service training to health care workers for them to keep abreast with new developments in NCD management
- Provide structured guidance and literature on patient care education so that patients receive standard information from all facilities.
- Hospitals to hold education sessions for patients with their families or partners on the disease, its complications, strategies to delay complications and self - care activities
- Facilities to carry out regular clinical audits on the care they provide. This will enable them identify areas that are underperforming, design interventions and evaluate if interventions are having positive impact on service and most importantly on patient treatment outcomes.
- MoHSS through central medical stores should ensure constant supply of statins that are important for managing dyslipidaemias and ultimately reduce cardiovascular and cerebrovascular complications

Community Level

The following are for consideration for implementation at community level:

- **Patient education**: increase awareness on DM and its complications. Emphasise importance of diet control, exercise and foot care for those already on therapy.
- **Support groups:** facilitate creation of support groups or associations for Diabetes where patients can access, share information on best practices as well as provide psychosocial support to each other.
- Consider having health extension workers to care and provide support to patients

6.5.3 Recommendations for Future Research

The following are recommendations for future research:

- Further research is needed on factors that contribute to poor quality of care and glycemic control among patients with T2DM
- Assess health care knowledge on management of T2DM
- In depth study to assess factors associated with control and poor control of patients with T2DM and Hypertension as both conditions are related and can lead to adverse long- term complications.

6.6 SUMMARY

Chapter 6 presented the conclusions of this study, limitations and described the recommendations for MoHSS at facility and community level. All the objectives of this study were met.

6.7 CONCLUSION OF THE STUDY

Quality of care provided to patients at Oshikuku District hospital is of concern. This is evidenced from the low adherence to recommendations for monitoring, screening for complications. Poor glycaemic control, low knowledge and below average practice of self-care practices is also another area of great concern.

Therefore, it is of utmost importance to implement strategies that improve on the quality of care and patient outcomes if management is to improve and eventually contribute positively to treatment outcomes and reduce DM long term complications.

7. REFERENCES

1. World Health Organization. Global Report on Diabetes. Glob Rep Diabetes. 2016;88.
2. World Health Organization. Diabetes Country Profiles. 2016;2016.
3. National Institute for Health and Care Excellence. Type 2 Diabetes in Adults: Management. United Kingdom: NICE; 2015.
4. American Diabetes Association. American Diabetes Association. 8. Pharmacologic approaches to glycemic treatment: Standards of Medical Care in Diabetes—2018. Vol. 41, Diabetes Care. 2018. S73 LP-S85.
5. Aschner P, Adler A, Bailey C, Frcpath E, Colagiuri S, Day C, et al. IDF Clinical Practice Recommendations for managing Type 2 Diabetes in Primary Care Chair: Core Contributors. 2016.
6. American Diabetes Association. Glycemic Targets: Standards of Medical Care in Diabetes 2019. Diabetes Care. 2019 Jan 1;42:S61–70.
7. Diez Espino J. [Diagnosis and Management of Type 2 Diabetes]. Aten primaria. 2010;42:2–8.
8. World Health Organization. WHO Fact Sheet on diabetes. 2017. p. 1–11.
9. Worswick J, Wayne SC, Bennett R, Fiander M, Mayhew A, Weir MC, et al. Improving quality of care for persons with diabetes: an overview of systematic reviews - what does the evidence tell us? Syst Rev. 2013 May 7;2:26.
10. Ministry of Health and Social Services. Demographical Health Survey. Windhoek; 2014.
11. Ministry of Health and Social Services. Annual - Oshikuku District Report 18-2019. 2019.
12. Pastakia SD, Pekny CR, Manyara SM, Fischer L. Diabetes in sub-Saharan

Africa - from policy to practice to progress: Targeting the existing gaps for future care for diabetes. Diabetes, Metab Syndr Obes Targets Ther. 2017 Jun 22;10:247–63.

13. Rodriguez-Gutierrez R, Gonzalez-Gonzalez JG, Zuñiga-Hernandez JA, McCoy RG. Benefits and harms of intensive glycemic control in patients with type 2 diabetes. BMJ. 2019;367.
14. Kassahun T, Gesesew H, Mwanri L, Eshetie T. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: a cross-sectional survey. BMC Endocr Disord. 2016 Dec 31;16(1):28.
15. Al-Qazaz HK, Sulaiman SA, Hassali MA, Shafie AA, Sundram S, Al-Nuri R, et al. Diabetes knowledge, medication adherence and glycemic control among patients with type 2 diabetes. Int J Clin Pharm. 2011 Dec 15;33(6):1028–35.
16. Nazir SUR, Hassali MA, Saleem F, Bashir S, Aljadhey H. Disease related knowledge, medication adherence and glycaemic control among patients with type 2 diabetes mellitus in Pakistan. Prim Care Diabetes. 2016 Apr;10(2):136–41.
17. Sobngwi E, Ndour-Mbaye M, Boateng KA, Ramaiya KL, Njenga EW, Diop SN, et al. Type 2 diabetes control and complications in specialised diabetes care centres of six sub-Saharan African countries: The Diabcare Africa study. 2011;
18. Pinchevsky Y, Butkow N, Chirwa T, Raal F. Treatment Gaps Found in the Management of Type 2 Diabetes at a Community Health Centre in Johannesburg, South Africa. J Diabetes Res. 2017 Oct 10;2017:1–6.
19. Tricco AC, Ivers NM, Grimshaw JM, Moher D, Turner L, Galipeau J, et al.

Effectiveness of quality improvement strategies on the management of Diabetes : A Systematic Review and Meta-Analysis. Lancet. 2012;379(9833):2252–61.

20. Ether S, Saif-Ur-Rahman KM. A systematic rapid review on quality of care among non-communicable diseases (NCDs) service delivery in South Asia. Public Heal Pract. 2021 Aug 27;100180.
21. Rodriguez-Gutierrez R, Gonzalez-Gonzalez JG, Zuñiga-Hernandez JA, McCoy RG. Benefits and harms of intensive glycemic control in patients with Type 2 Diabetes. BMJ. 2019;367.
22. World Health Organization. Implementation tools Package of Essential Noncommunicable (PEN) disease interventions for Primary Health Care in low-resource settings. MscforumOrg. 2013;210.
23. Brown A, Reynolds LR, Bruemmer D. Intensive glycemic control and cardiovascular disease: An update. Nat Rev Cardiol. 2010 Jul;7(7):369–75.
24. Soffian SSS, Ahmad SB, Chan HK, Soelar SA, Hassan MRA, Ismail N. Management and glycemic control of patients with Type 2 Diabetes Mellitus at Primary Care Level in Kedah, Malaysia: A statewide evaluation. PLoS One. 2019 Oct 1;14(10).
25. Alzaheb R, Altemani A. The prevalence and determinants of poor glycemic control among adults with type 2 diabetes mellitus in Saudi Arabia. Diabetes, Metab Syndr Obes Targets Ther. 2018 Jan;Volume 11:15–21.
26. Adeniyi OV, Yogeswaran P, Longo-Mbenza B, Ter Goon D, Ajayi AI. Cross-sectional study of patients with type 2 diabetes in OR Tambo district, South Africa. BMJ Open. 2016 Jul 29;6(7):e010875.
27. Moreira ED, Neves RCS, Nunes ZO, de Almeida MCC, Mendes ABV,

Fittipaldi JAS, et al. Glycemic control and its correlates in patients with diabetes in Venezuela: Results from a nationwide survey. Diabetes Res Clin Pract. 2010 Mar;87(3):407–14.

28. Adekanmbi VT, Uthman OA, Erqou S, Echouffo-Tcheugui JB, Harhay MN, Harhay MO. Epidemiology of prediabetes and diabetes in Namibia, Africa: A multilevel analysis. J Diabetes. 2019 Feb;11(2):161–72.

29. Fiseha T, Alemayehu E, Kassahun W, Adamu A, Gebreweld A. Factors associated with glycemic control among diabetic adult out-patients in Northeast Ethiopia. BMC Res Notes. 2018 Dec 18;11(1):316.

30. Li J, Chattopadhyay K, Xu M, Chen Y, Hu F, Chu J, et al. Glycaemic control in type 2 diabetes patients and its predictors: a retrospective database study at a tertiary care diabetes centre in Ningbo, China. BMJ Open. 2018 Mar 25;8(3):e019697.

31. Viana L V., Leitão CB, Kramer CK, Zucatti ATN, Jezini DL, Felício J, et al. Poor glycaemic control in Brazilian patients with type 2 diabetes attending the public healthcare system: A cross-sectional study. BMJ Open. 2013;3(9):3–8.

32. De P, Banu S, Muthukumar D. Predictors of poor glycemic control in type 2 diabetic patients in South Indian population. Int J Res Med Sci. 2018 Jan 24;6(2):545.

33. Musenge EM, Manankov A, Mudenda B, Michelo C. Glycaemic control in diabetic patients in Zambia. Pan Afr Med J. 2014;19:354.

34. Ufuoma C, Godwin Y, Kester Ad, Ngozi Jc. Determinants of glycemic control among persons with type 2 diabetes mellitus in Niger Delta. Sahel Med J. 2016;19(4):190.

35. Radwan M, Elsous A, Al-Sharif H, Abu Mustafa A. Glycemic control among

primary care patients with type 2 diabetes mellitus in the Gaza Strip, Palestine. Ther Adv Endocrinol Metab. 2018 Jan;9(1):3–14.

36. A Kakade A, R Mohanty I, Rai S. Assessment of factors associated with poor glycemic control among patients with Type II Diabetes mellitus. Integr Obes Diabetes. 2018;4(3).

37. Otieno FC, Mikhail T, Acharya K, Muga J, Ngugi N, Njenga E. Suboptimal glycemic control and prevalence of diabetes-related complications in Kenyan population with diabetes: cohort analysis of the seventh wave of the International Diabetes Management Practices Study (IDMPS). Endocr Metab Sci. 2021 Jun 30;3:100093.

38. Park PH, Pastakia SD. Access to Hemoglobin A1c in Rural Africa: A Difficult Reality with Severe Consequences. J Diabetes Res. 2018;2018.

39. Ekoru K, Doumatey A, Bentley AR, Chen G, Zhou J, Shriner D, et al. Type 2 diabetes complications and comorbidity in Sub-Saharan Africans. EClinicalMedicine. 2019 Nov 1;16:30–41.

40. van Bruggen S, Rauh SP, Kasteleyn MJ, Bonten TN, Chavannes NH, Numans ME. Association between full monitoring of biomedical and lifestyle target indicators and HbA $_{1c}$ level in primary type 2 diabetes care: an observational cohort study (ELZHA-cohort 1). BMJ Open. 2019 Mar 13;9(3):e027208.

41. Kaewput W, Thongprayoon C, Varothai N, Sirirungreung A, Rangsin R, Bathini T, et al. Prevalence and associated factors of hospitalization for dysglycemia among elderly type 2 diabetes patients: A nationwide study. World J Diabetes. 2019 Mar 15;10(3):212–23.

42. Yau JWY, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, et al. Global prevalence and major risk factors of diabetic retinopathy. Diabetes

Care. 2012 Mar;35(3):556–64.

43. Egunsola O, Dowsett LE, Diaz R, Brent MH, Rac V, Clement FM. Diabetic Retinopathy Screening: A Systematic Review of Qualitative Literature. Can J Diabetes. 2021 Feb 3;

44. Tewahido D, Berhane Y. Self-care practices among diabetes patients in Addis Ababa: A qualitative study. PLoS One. 2017 Jan 1;12(1).

45. Saleh F, Mumu SJ, Ara F, Begum HA, Ali L. Knowledge and self-care practices regarding diabetes among newly diagnosed type 2 diabetics in Bangladesh: A cross-sectional study. BMC Public Health. 2012;12(1).

46. Bains SS, Egede LE. Associations Between Health Literacy, Diabetes Knowledge, Self-Care Behaviors, and Glycemic Control in a Low Income Population with Type 2 Diabetes. Diabetes Technol Ther. 2011 Mar 1;13(3):335.

47. Bukhsh A, Khan TM, Nawaz MS, Ahmed HS, Chan KG, Lee L-H, et al. Association of diabetes-related self-care activities with glycemic control of patients with type 2 diabetes in Pakistan. Patient Prefer Adherence. 2018;12:2377–85.

48. Zheng F, Liu S, Liu Y, Deng L. Effects of an Outpatient Diabetes Self-Management Education on Patients with Type 2 Diabetes in China: A Randomized Controlled Trial. J Diabetes Res. 2019 Jan 17;2019:1–7.

49. Mufunda E, Ernersson Å, Hjelm K. Limited knowledge of diabetes in patients attending an outpatient diabetes clinic at a referral hospital in Zimbabwe: A cross-sectional study. Pan Afr Med J. 2018 Mar 5;29.

50. Afaya RA, Bam V, Azongo TB, Afaya A. Knowledge of Chronic complications of Diabetes among persons living with Type 2 Diabetes

Mellitus in Northern Ghana. PLoS One. 2020 Oct 1;15(10).

51. Edmonds M, Manu C, Vas P. The current burden of diabetic foot disease. J Clin Orthop Trauma. 2021 Jun 1;17:88–93.

52. Manickum P, Mashamba-Thompson T, Naidoo R, Ramklass S, Madiba T. Knowledge and practice of diabetic foot care – A scoping review. Diabetes Metab Syndr Clin Res Rev. 2021 May 1;15(3):783–93.

53. Senadheera SPAS, Ekanayake S, Wanigatunge C. Dietary Habits of Type 2 Diabetes Patients: Variety and Frequency of Food Intake. J Nutr Metab. 2016;2016:7987395.

54. Wabe N, Angamo M, Hussein S. Medication adherence in diabetes mellitus and self management practices among type-2 diabetics in Ethiopia. N Am J Med Sci. 2011;418–23.

55. Perera D., De Silva RE., Perera WLS. Knowledge of Diabetes among Type 2 Diabetes patients attending a Primary Health Care Clinic in Sri Lanka. East Mediterr Health J. 2013;19(7):644–8.

56. Hurst C., Rakkapao N, Hay K. Impact of diabetes self-management, Diabetes management self-efficacy and Diabetes knowledge on glycemic control in people with Type 2 Diabetes (T2D): A multi-center study in Thailand. PLoS One. 2020 Dec 1;15(12).

57. Muhammad-Lutfi A, Zaraihah M, Anuar-Ramdhan I. Knowledge and Practice of Diabetic Foot Care in an In- Patient Setting at a Tertiary Medical Center. Malaysian Orthop J. 2014;8(3):22–6.

58. Kaura A. Evidence-Based Medicine: Reading and Writing Medical papers. Dan Horton-Szar, editor. The British Journal of Psychiatry. Mosby Elsevier; 2013. 279 p.

59. Rodríguez del Águila MM, González-Ramírez AR. Sample size calculation. Allergol Immunopathol (Madr). 2014 Sep 1;42(5):485–92.

60. Eid M, Mafauzy M, Faridah A. Glycaemic control of type 2 diabetic patients on follow up at hospital universiti sains malaysia. Malays J Med Sci. 2003 Jul;10(2):40–9.

61. Modesto S, Editor T. Pr eparing your Disser tation at a Distance: A Resear ch Guide. 2013.

62. Labs O, Cleaning D. Joslin Clinical Analytic Tool (JCAT TM) Instructions for Chart Abstractions.

63. Mitri J, Gabbay RA. Measuring the quality of diabetes care. Am J Manag Care. 2016 Mar;22(4 Spec No.):SP147–8.

64. Fitzgerald JT, Funnell MM, Anderson RM, Nwankwo R, Stansfield RB, Piatt GA. Validation of the Revised Brief Diabetes Knowledge Test (DKT2). Diabetes Educ. 2016 Apr 1;42(2):178–87.

65. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes Care. 2000 Jul 1;23(7):943–50.

66. Biggam J. Succeeding with your Master's Dissertation. 2008. 1–280 p.

67. Zowgar AM, Siddiqui MI, Alattas KM. Level of diabetes knowledge among adult patients with diabetes using diabetes knowledge test. Saudi Med J. 2018 Feb 1;39(2):161.

68. Pinchevsky Y, Butkow N, Chirwa T, Raal F. Treatment Gaps Found in the Management of Type 2 Diabetes at a Community Health Centre in Johannesburg, South Africa. J Diabetes Res. 2017;2017.

69. Masilela C, Pearce B, Ongole JJ, Adeniyi OV, Benjeddou M. Factors

associated with glycemic control among South African adult residents of Mkhondo municipality living with diabetes mellitus. Medicine (Baltimore). 2020 Nov 25;99(48):e23467.

70. Awadalla H, Noor SK, Elmadhoun WM, Bushara SO, Almobarak AO, Sulaiman AA, et al. Comparison of serum lipid profile in type 2 diabetes with and without adequate diabetes control in Sudanese population in north of Sudan. Diabetes Metab Syndr Clin Res Rev. 2018 Nov 1;12(6):961–4.

71. De Vries FM, Denig P, Pouwels KB, Postma MJ, Hak E. Primary prevention of major cardiovascular and cerebrovascular events with statins in diabetic patients: A meta-analysis. Vol. 72, Drugs. 2012. p. 2365–73.

72. Emptage NP, Kealey S, Lum FC, Garratt S. Diabetic Retinopathy Preferred Practice Pattern. Prefer Pract Pattern Guidel. 2017;43(1):13–9.

73. Idung AU, Abasiubong F, Udoh SB, Akinbami OS. Quality of life in patients with erectile dysfunction in the Niger Delta region, Nigeria. J Ment Heal. 2012 Jun;21(3):236–43.

74. Pinchevsky Y, Butkow N, Chirwa T, Raal F. Treatment Gaps Found in the Management of Type 2 Diabetes at a Community Health Centre in Johannesburg, South Africa. J Diabetes Res. 2017;2017.

75. Pinchevsky Y, Butkow N, Chirwa T, Raal FJ. Glycaemic, blood pressure and cholesterol control in 25 629 diabetics. Cardiovasc J Afr. 2015 Jul 1;26(4):188–92.

76. Shrivastava SRBL, Shrivastava PS, Ramasamy J. Role of self-care in management of diabetes mellitus. J Diabetes Metab Disord. 2013 Mar 5;12(1).

APPENDICES

ANNEX 1: Study Questionnaire

Date	
Data extracted by	

PART ONE: Socio-demographic characteristics

1. Age	
2. Height (cm)	
3. Weight (kg)	
4. Sex	☐ Male (0) ☐ Female (1)
5. Marital status	☐ Single (0) ☐ Married (1) ☐ Divorced/Separated (2) ☐ Widowed (3)
6. Highest level of education	☐ None (0) ☐ Primary school (1) ☐ Secondary school (2) ☐ College/University (3)
7. Occupation/ employment	☐ Formal employment (0) ☐ Self-employed (1) ☐ Retired (2) ☐ None (3)
8. Family/Social support availability	☐ Yes (0) ☐ No (1)
9. Monthly income (N$)	

PART TWO: Health status and Medication use

10. Duration of diabetes (years)	
11. Family history of diabetes (parent, sibling, child)	☐ No (0) ☐ Yes (1)
12. Number of medications taken every day	
13. Which of the following diabetes complications do you have? (select all that apply)	☐ Neuropathy (0) ☐ Nephropathy (1) ☐ Retinopathy (2) ☐ Cardiovascular disease (3) ☐ Other (4) ☐ Unknown (5)

14. Do you currently have your own glucometer at home?	☐ No (0) ☐ Yes (1)
15. IF YES, how many times do you measure your glucose each day	
16. Cigarette smoking status	☐ Smoker (0) ☐ Never smoker (1) ☐ Ex-smoker (2)
17. IF YES, how many cigarettes do you smoke on an average day?	
18. Do you use other forms of tobacco?	☐ No (0) ☐ Yes (1)
19. Alcohol drinking status	☐ Drinker (0) ☐ Non-drinker (1) ☐ Ex-drinker (2)
20. IF YES, how many drinks do you consumer per week?	
21. Have you ever been hospitalized due to diabetes?	☐ No (0) ☐ Yes (1)
22. IF YES, how many times in the last year?	
23. IF YES, what was the reason?	

PART THREE: Joslin Care Analysis Tool

24. Nationality	☐ Namibian (0) ☐ Non-Namibian (1) where:	
25. Oral diabetes medications (check all that apply)	☐ Metformin (0) ☐ Glibenclamide (1) ☐ Gliclazide (2)	
26. Insulin (check all that apply)	☐ Actrapid (soluble) (0) ☐ Protaphane (isophane) (1) ☐ Actraphane (pre-mixed) (2)	
27. Antihypertensive medications (check all that apply)	☐ Perindopril (0) ☐ Amlodipine (1) ☐ Verapamil (2) ☐ Co-amiloride (3) ☐ Indapamide (4) ☐ Atenolol (5) ☐ Valsartan (6) ☐ Other (7):	
28. Lipid medication	☐ Simvastatin (0) ☐ Other (1):	
29. Aspirin	☐ No (0) ☐ Yes (1)	
Laboratory investigations:	Date	Most recent result
30. BP		

31. RBS		
32. A1C		
33. Total cholesterol		
34. LDL		
35. HDL		
36. Trigs		
37. SCr		
38. Urine albumin/creatinine ratio		
39. Diabetic foot exam		☐ Normal sensation (0) ☐ Reduced sensation (1) ☐ No documented result (2)
40. Diabetes eye exam		☐ No retinopathy (0) ☐ Retinopathy (1) ☐ Macular oedema (2) ☐ No macular oedema (3) ☐ No documented result (4)

PART FOUR: Diabetes Knowledge Test

Please read each statement to the patient and then indicate whether the patient thinks it is true or false by putting a tick next to either TRUE or FALSE. If patient does not know the answer, please put a circle around DON'T KNOW.

41. The diabetes diet is a healthy diet for most people	☐ True (0)	☐ False (1)	☐ Don't Know (3)
42. Glycosylated haemoglobin (HbA1c) is a test that measures your average blood glucose level in the past week	☐ True (0)	☐ False (1)	☐ Don't Know (3)
43. A plate of chicken has more carbohydrate in it than a plate of oshifima	☐ True (0)	☐ False (1)	☐ Don't Know (3)
44. Soft drink has more fat in it than milk	☐ True (0)	☐ False (1)	☐ Don't Know (3)
45. Urine testing and blood testing are both equally as good for testing the level of blood glucose	☐ True (0)	☐ False (1)	☐ Don't Know (3)
46. Unsweetened fruit juice raises blood glucose levels	☐ True (0)	☐ False (1)	☐ Don't Know (3)
47. A can of diet soft drink can be used for treating low blood glucose levels	☐ True (0)	☐ False (1)	☐ Don't Know (3)
48. Using olive oil in cooking can help prevent raised cholesterol in the blood	☐ True (0)	☐ False (1)	☐ Don't Know (3)
49. Exercising regularly can help reduce high blood pressure	☐ True (0)	☐ False (1)	☐ Don't Know (3)
50. For a person in good control of diabetes exercising has no effect on blood sugar levels	☐ True (0)	☐ False (1)	☐ Don't Know (3)

51. Infection is likely to cause an increase in blood sugar levels	☐ True (0)	☐ False (1)	☐ Don't Know (3)
52. Wearing shoes a size bigger than usual helps prevent foot ulcers	☐ True (0)	☐ False (1)	☐ Don't Know (3)
53. Eating foods lower in fat decreases your risk for heart disease	☐ True (0)	☐ False (1)	☐ Don't Know (3)
54. Numbness and tingling may be symptoms of nerve disease	☐ True (0)	☐ False (1)	☐ Don't Know (3)
55. Lung problems are usually associated with having diabetes	☐ True (0)	☐ False (1)	☐ Don't Know (3)
56. When you are sick with the flu you should test for glucose more often	☐ True (0)	☐ False (1)	☐ Don't Know (3)
57. IF TAKING INSULIN: High blood glucose levels may be caused by too much insulin	☐ True (0)	☐ False (1)	☐ Don't Know (3)
58. IF TAKING INSULIN: If you take your morning insulin but skip breakfast your blood glucose level will usually decrease	☐ True (0)	☐ False (1)	☐ Don't Know (3)
59. Having regular check-ups with your doctor can help spot the early signs of diabetes complications	☐ True (0)	☐ False (1)	☐ Don't Know (3)
60. Attending your diabetes appointments stops you getting diabetes complications	☐ True (0)	☐ False (1)	☐ Don't Know (3)

PART FIVE: Summary of Diabetes Self-Care Activities

The following questions will ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

Self-care recommendations	
61. Which of the following has your health care team (doctor, nurse, pharmacist, dietician, or diabetes educator) advised you to do? Please check all that apply:	☐ Follow a low-fat eating plan (0) ☐ Follow a complex carbohydrate diet (1) ☐ Reduce the number of calories you eat to lose weight (2) ☐ Eat lots of food high in dietary fibre (3) ☐ Eat lots (at least 5 servings per day) of fruits and vegetables (4) ☐ Eat very few sweets (for example: desserts, non-diet sodas, candy bars) (5) ☐ Other (specify):_____(6) ☐ I have not been given any advice about my diet by my health care team (7)
62. Which of the following has your health care team (doctor, nurse, pharmacist, dietician or diabetes educator) advised you to do? Please check all that apply:	☐ Get low level exercise (such as walking) on a daily basis. (0) ☐ Exercise continuously for at least 30 minutes at least 3 times a week. (1) ☐ Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.) (2) ☐ Engage in a specific amount, type, duration and level of exercise. (3)

	☐ Other (specify): _____ (4) ☐ I have not been given any advice about exercise by my health care team. (5)
63. Which of the following has your health care team (doctor, nurse, pharmacist, dietician, or diabetes educator) advised you to do? Please check all that apply:	☐ Test your blood sugar using a drop of blood from your finger and a colour chart. (0) ☐ Test your blood sugar using a machine to read the results. (1) ☐ Test your urine for sugar. (2) ☐ Other (specify):_____ (3) ☐ I have not been given any advice either about testing my blood or urine sugar level by my health care team (4)
64. Which of the following medications for your diabetes has your doctor prescribed? Please check all that apply:	☐ An insulin shot 1 or 2 times a day. (0) ☐ An insulin shot 3 or more times a day. (1) ☐ Diabetes pills to control my blood sugar level. (2) ☐ Other (specify): _____ (3) ☐ I have not been prescribed either insulin or pills for my diabetes (4)

Diet								
65. How many of the last SEVEN DAYS have you followed a healthful eating plan?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
66. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
67. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
68. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full fat dairy products?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
69. On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
Exercise								
70. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity including walking)	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
71. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

as swimming, walking, biking) other than what you do around the house or as part of your work?								
Medications								
72. On how many of the last SEVEN DAYS, did you take your recommended diabetes medication?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
Blood sugar testing								
73. On how many of the last SEVEN DAYS did you test your blood sugar?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
74. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
Foot care								
75. On how many of the last SEVEN DAYS did you check your feet?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
76. On how many of the last SEVEN DAYS did you inspect the inside of your shoes?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
77. On how many of the last SEVEN DAYS did you wash your feet?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
78. On how many of the last SEVEN DAYS did you soak your feet?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
79. On how many of the last SEVEN DAYS did you dry between your toes after washing?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
Smoking								
80. At your last doctor's visit, did anyone ask about your smoking status?	☐ No (0) ☐ Yes (1)							
81. If you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program?	☐ No ☐ Yes ☐ Do not smoke							
82. When did you last smoke a cigarette?	☐ More than two years ago, or never smoked ☐ One to two years ago ☐ Four to twelve months ago ☐ One to three months ago ☐ Within the last month ☐ Today							

ANNEX 2: Participation Consent Form (English)

A. Declaration by participant

By signing below, I ……..… agree to take part in a research study entitled QUALITY OF DIABETIC CARE AT OSHIKUKU HOSPITAL, OSHIKUKU.

I declare that:

a) I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

b) I have had a chance to ask questions and all my questions have been adequately answered.

c) I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.

d) I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

Signed at (place) .....…..……. on (date) ……...…….. 2020.

..... **.....**

Signature of participant Signature of witness

B. Declaration by investigator

I CLARICE MULENGA KAYOMBO declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use a interpreter. (If a interpreter is used then the interpreter must sign the declaration below.

Signed at (place) .....…..……. on (date) ……...…….. 2020.

..... **.....**

Signature of investigator Signature of witness

C. Declaration by interpreter

I ……declare that I assisted the investigator (name) ……. to explain the information in this document to (name of participant) ……..…….. using the language medium of Oshiwambo.

ANNEX 2: Eziminino Lyaakuthimbinga (Oshiwambo)

A. Egano lyomukuthi mbinga

Moku Shaina mpano, ongame …… ……ta ndi zimine oku kutha ombinga mo shinyangadhalwa shomapekapeko gokutala Ongushu ye siloshipwiyu lya nuuvu yosuuka Oshipangelo Oshikuku mo Namibia

Ota ndi zimine ngeyi kutya:

a. *Onda lesha uuyelele mboka nda pewa wu nasha nomapekaakpeko mwa katelwa omukanda zimino nguka. Ayihe mbika oyil li melaka ndyoka ndi shi nawa.*
b. *Mpoka ndali ndi na omapulo, onda mono omayamukulo ngoka ga yelethi le ndje ayihe mbyoka ya li inayi yela nawa.*
c. *Ondishishi kutya ekuthombinga lyandje momapekaapeko ngaka oli li momukalo go ku iyamba na ina ndi thimikwa oku kutha ombinga.*
d. *Otandi vulu oku huli tha po ekutho mbinga lyandje mokukutha ombinga momapekaapeko ngaka kehe pethimbo ndyoka nda hala na ita pu kala nando oshilanduli sha.*

Eshaino kaha: …… Ehala:…… Esiku:……2020

Edhina lyombangi:…… *Eshanikoakaha……...Ehala:…… Esiku:……2020*

B. **Ekwa shi li paleko okuza komupekaapeki**

Ngame CLARICE MULENGA KAYOMBO otandi kwashilipaleke ngeyi kutya:

a. *Onda fatululila…….. uukatya wo mapekaapeko ngaka .*
b. *Onda gandja ompito opo a pule omapulo na onda gandja omayamukulo komapuloo ge ageshe*
c. *Onda inekela kutya omukuthimbinga okwa yelelwa na okwa uvako uukwatya womapekaapeko ngaka.*
d. *Onda longitha omutoloki ngoka uvuteko elaka lyomukuthimbinga othaathaa, ano omukuthimbinga okwa yelekwa kuukwatya womapekaapeko ngaka. (Omutoloki na shaian pevi lyomukanda nguka)*

Eshaino kaha: …… Ehala:…… Esiku:……2020

Edhina lyombangi:…… *...Eshanikoakaha……...Ehala:……. Esiku:……2020*

C. Ekwashi li paleko lyomu toloki

Ngame…… Ota ndi koleke ngeyi kutya onda kwathela omupekaapeki *Clarice Mulenga Kayombo moku fatulula noku gandja uuyelele kombinga yomapekaapeko ngaka ko mukuthi mbinga …… Nda longitha elaka Oshiwambo.*

Eshaino kaha: …… Ehala:…… Esiku:……2020

ANNEX 3: Participant Information Leaflet (English)

Title of The Research Project: Quality of Diabetic Care at Oshikuku Hospital, Namibia

Principal Investigator: Clarice Mulenga Kayombo

Address: Oshikuku Hospital, Oshikuku

Contact Number: 0816137532

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied and that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Research Ethics Committee at The University of Namibia and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki and Namibian National Research Ethics Guidelines.

1. **What is this research study all about?**

I will conduct the study at Oshikuku Hospital only. It will involve recruitment of 108 Type 2 Diabetic patients that receive care from Oshikuku hospital regularly.

My project aims to check how well we care for you as diabetic patients that come for care at our hospital and the information provided to you in terms of how you should care for your health when living with Diabetes. The results will significantly help us identify areas that the hospital is doing well in terms of care provision and also the areas that need improvement in order to offer services that will improve and sustain your health with minimal disease complications

2. **Why have you been invited to participate?**

I am inviting you to participate in the study because you are a patient living with Type 2 diabetes that receives regular care at Oshikuku which makes your contribution very valuable. Am interested in knowing how much you know about your condition and self-management practices.

3. **What will your responsibilities be?**

Your responsibilities should you consent to take part in the study is to answer preset questions on your condition, diabetes, and also some information that you know on self-management practices. The interview will take approximately 30minutes to complete.

4. **Will you benefit from taking part in this research?**

My study results will help us identify the areas of care that we are offering well and also the areas that need improvement to serve you our patients better. The interventions we will come up with after the study will enable us offer services that will improve and sustain your health with minimal disease complications

5. **Are there in risks involved in your taking part in this research?**

There are no risks involved in taking part in the study and will strive to maintain confidentiality at all times.

6. **If you do not agree to take part, what alternatives do you have?**

You may refuse to take part in the study and they are no alternatives. Not taking part in the study will not affect you or the health care you receive in any way.

7. **Who will have access to your medical records? (Where applicable**)

I will not link your name to results or anything you say in the text of my mini thesis or any other publications. Your information will not be used or shared with other researchers.

1. Will you be paid to take part in this study and are there any costs involved?

You will not be paid to take part in the study and there are no costs involved to you for taking part in the study.

2. Is there anything else that you should know or do?

a) You can contact the principal investigator on cel 0816137532 if you have any further queries or encounter any problems.

b) You will receive a copy of this information and consent form for your own records.

ANNEX 3: Okafo komauyelele go mukuthimbinga (Oshiwambo)

Oshipalanyolo Shopololeka Yomapekapeko: Ongushu ye siloshipwiyu lya nuuvu yosuuka Oshipangelo Oshikuku mo Namibia

Omukonakoni: Clarice Mulenga Kayombo

Ondjukithi: Oshikuku St. Martins hospital

Onomola yongodhi: 0816137532

Oto hiwa wu kuthe ombinga mopololeka yomapekapeko. Alikana lesha uuyelele wa gandja nethimbo, mboka otawu ndjandjukununa mule kombinga yo pololeka ndjika. Alikana pula omuniilonga tiilongo kombinga yo polela ndjika shoka ku ha wuvite. Osha simana wukale wu viteko omawukwatya agehe nkene to kutha ombinga mepekapeko ndika. Ishewe, ekuthopinga lyoye otokala onga omwiiiyambi lela no wa manguluka okuninga omaganeno sho to kutha opinga. Ngele owati ahawe, shino kashi nasha nando. Owa manguluka wuninguluke ngele owali wa zimina okukutha ombinga.

Eilongo ndika olya tambiwako ko kakomitiye komapekapeko hona taka pangele omayikumbato gaantu kosikola yelongo lyopombanda mo University of Namibia nootashi kaningwa mekwatathano noompango dhoka dhatulwapo tadhi wilike dhoongonga hangano yopaigwana yo International Declaration of Helsinki ya Namibia no show ehangano lyopaigwana lyoka tali wilike omapekapeko Namibia National Research Ethics Guidelines .

1. **Epekakeko-yiilongo ndino oli li kombinga yashike?**

Eilongo ndino otali kaningilwa moshipangelo moshikuku omo amuke.Otali kaningwa pamwe naa nawuvu yoludhi olutiyali lwosuuka yeli 108 mboka hamono esiloshipwiyu moshipangelo moshikuku olundji.

Elalakano lyo pololelaka yandje okutala kutya aavu yo suuka ota silwa oshipwiyu nawa ngiini moshipangelo shetu no ku tala wo omauyelele ngoka ga gandjwa nkene omuuvu goosuka tisile oshimpwiyu mule nkalamwenyo ye sho ta lumbu nuuvu wosuuka. Izemo otayi ketu ulukila mpa oshipangelo otashi longo nawa moku sila aanuvu yuusuka oshipwiyu, no showo mpoka twa pumbwa okuninga omalunduluko opo tu gandje eyakulo ndoka tali tweta ponkatu yokukwathela opo tushunithe pevi omaudhigu galwe tageya po ethimbo lyuuvu.

2. **Omolwa shike to hiwa wu kuthe ombinga?**

Otandi kuhiya wukuthe ombinga meilongo ndika molwashi oto lumbu nuuvu wo luudhi olutiyali lwosuuka no ishewe oho mono omayakulo gesiloshimpiyu moshikuku, omagwedhelepo goye oga pumbiwa unene. Onda hala okutseya kutya onkalo yoye yili ngiini, nonkeno to vulu kukala kugweye mwene.

3. **Iinakugwanithwa yoye otayi kala yini?**

Oshinakugwanithwa shoye uuna wapitike wukuthe ombinga momapekaapeko ngaka ; okuyamukula omapulo galongekidhwa kombinga yuuvu tolumbu nawo; uuvu wosuuka (Diabetes Mellitus) nuuyelele mboka wushi nkene omuntu ena okuungaunga nuuvu wosuuka. Omapulapulo ngaka otaga tengenekelwa uule wetata lyowili (ominute omilongo ndatu)

4. **Oto ka monamo omauwanawa gasha mokukutha ombinga momapekapeko ngano?**

Iizemo yomapekapeko ngaka otayi ketukwatha okutothamo iilongasindano /iiwanawa mbyoka tatugandja kwaamboka taalumbu nuuvu wosuuka nokutothamo wo uunkundi meyakulo lyaavu mboka taalumbu nuuvu wosuuka opo omayakulo ga hwepopalekwe.

5. **Opena omashongo, uupyakadhi nenge uunkundi washa mokukutha ombinga momapekapeko ngano?**

Kamuna uupyakadhi tawuziilile mekuthombinga momapekapeko ngaka. Otatuka kambadhala okukaleka ekuthombinga lyoye lyikale popaumwene lela , noitalika ikundwa nayalwe.

6. **Uuna inoopitika wukuthe ombinga momapekapeko ngaka , omahogololo galwe genipo wuna?**

Owapitikwa okutinda okukutha ombinga momapulapulo ,na itashi gumu omayakulo gopaundjolowele ngoka homono.

7. **Olye ngoka tapitikwa okumona omishangwa dhoye dhopaundjolowele (uuna shapumbiwa)?**

Edhina lyoye italika holoka miinyolwa yepekapeko ndika ; miinyolwa yilwe nenge ligandjwe kaapekapeki yalwe. Uuyelele togandja itawu kagandjwa woo kuyo.

8. **Otokafutwa mekuthombinga mepekapeko ndino ? ekuthombinga otali kosha ondando yasha?**

Ekuthombinga lyoye mepekapeko ndika ita li kafutilwa, no ito ka pulwa wufutesha.

9. **Opuna ishewe shimwe nda pumbwa okuninga nenge kutseya?**

c) Oto vulu okukwatathana nomukuluntu gomakonakono konomola yongodhi 0816137532 ngele owuna omapulo ga gwedhwapo nenge puna omaudhigu gasha.

d) Otandi kekupa ombapila yomauyelele ngaka no showo yo maganeno.

ANNEX 4: University of Namibia Approval Letter

UNAM
UNIVERSITY OF NAMIBIA

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: H-G /572/2020 **Date: 10 July, 2020**

This Ethical Clearance Certificate is issued by the University of Namibia Research Ethics Committee (UREC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the Faculty/Centre/Campus Research & Publications Committee sitting with the Postgraduate Studies Committee.

Title of Project: Quality Of Diabetic Care At Oshikuku Hospital, Namibia

Researcher: CLARICE MULENGA KAYOMBO

Student Number: 201137259

Supervisor(s): *Dr. F. Kalameera (Main) Dr. L.J Jonkman (Co)*

Campus: Hage Geingob Campus

Take note of the following:

(a) Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the UREC. An application to make amendments may be necessary.

(b) Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the UREC.

(c) The Principal Researcher must report issues of ethical compliance to the UREC (through the Chairperson of the Faculty/Centre/Campus Research & Publications Committee) at the end of the Project or as may be requested by UREC.

(d) The UREC retains the right to:

(i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,

(ii) Request for an ethical compliance report at any point during the course of the research;

(iii) Cognizance and the observation of Namibia's Research Science and Technology Act, 2004 which makes it compulsory for Non-Namibian based researchers to obtain the compulsory Research Permit from the National Commission on Research Science and Technology (NCRST), FIRST, BEFORE the research can commence.

UREC wishes you the best in your research.

Prof. Dr. J.E. de Villiers: HREC Chairperson

Ms. P. Claassen: HREC Secretary

ANNEX 5: Ministry of Health And Social Services Approval Letter

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2507
Fax: 061 – 222558
E-mail: itashipu87@gmail.com

OFFICE OF THE EXECUTIVE DIRECTOR

Ref: 17/3/3 CMK
Enquiries: Mr. A. Shipanga

Date: 06 October 2020

Ms. Clarice M. Kayombo
Private Bag 5567
Oshakati
Namibia

Dear Ms. Kayombo

Re: Quality of Diabetic Care at Oshikuku Hospital, Namibia.

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3.1 The data to be collected must only be used for academic purpose;

3.2 No other data should be collected other than the data stated in the proposal;

3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

10.14370

W

3.4 A quarterly report to be submitted to the Ministry's Research Unit;

3.5 Preliminary findings to be submitted upon completion of the study;

3.6 Final report to be submitted upon completion of the study;

3.7 Separate permission should be sought from the Ministry for the publication of the findings.

4. All the cost implications that will result from this study will be the responsibility of the applicant and **not** of the MoHSS.

Yours sincerely,

EXECUTIVE DIRECTOR
OF HEALTH AND SOCIAL SERVICES

BEN MANGOMA
EXECUTIVE DIRECTOR

"Health for All"