KNOWLEDGE OF CHRONIC COMPLICATIONS AMONGST DIABETIC PATIENTS IN THE VHEMBE DISTRICT OF LIMPOPO PROVINCE, SOUTH AFRICA

by

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Dissertation Submitted in Fulfillment of the Requirements for the Degree:

Magister Curationis (MCur)

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April 2018

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DECLARATION

I, **Motsharine Selina**, declare that "**Knowledge of Chronic Complications Amongst Diabetic Patients in the Vhembe District of Limpopo Province, South Africa**" submitted for an MCur degree at the University of Venda, has not previously been submitted for a degree at this or any other university, and that it is my own work in design and execution and that all reference material contained herein has been duly acknowledged.

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Date Signed : 13 April 2018

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DEDICATION

This research is dedicated to those who have supported me all the time, through their love, sacrifices, encouragement, and for always reassuring me that everything will be all right: my daughter, Mufunwa, and my mother, Johanna Motsharine.

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ACKNOWLEDGEMENTS

- ***Above all, I would like to thank God the Almighty, for giving me the strength and perseverance throughout the study period.***

- I wish to express my truthful gratitude to the following persons for their respective contributions to this study:

- My supervisor, Dr N.J. Ramakuela, and co-supervisor, Dr S.A. Mulondo, for their input, motivation and supervision throughout my study.

- My husband, Pastor Ndou Wilson Ntsieni, for his love and assistance during my study.

- My mother, Mrs T.J. Motsharine, for her inspiration throughout my life.

- My daughter, Mufunwa, for her encouragement and understanding when I was constantly engaged with my research project.

- The Head of Department, Mrs R.J. Mashau; my colleagues: Mrs E.N. Vhuromu, Mrs T.E. Mutshatshi and Mrs S. Makherana, who offered visicn and stimulus for my research.

- The Department of Health in the Vhembe District, Limpopo Province, and all the clinical health institutions for granting me the permission to conduct the study.

- Professor D.C. Hiss, for editing and typesetting assistance (Annexure G).

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ABSTRACT

Diabetes mellitus is a global health issue affecting people of all ages. It is defined as a non-communicable chronic disease caused by abnormal insulin production, impaired insulin utilization or both. Its prevalence and complications is increasing rapidly. The aim of this study was to assess knowledge of Diabetes mellitus chronic complications among diabetic patients in the Vhembe district of the Limpopo Province, South Africa. The study objectives were: to assess the knowledge of Diabetes mellitus chronic complications amongst diabetic patients; to determine the knowledge of diabetic patients regarding self-care practice, control and management of diabetes in the Vhembe District, and to identify challenges faced by diabetic patients regarding chronic complications of Diabetes mellitus in the Vhembe District

A quantitative descriptive design was used. The study population was diabetic patients who were visiting the selected 4 hospitals, 2 health centers and 2 clinics were in Thulamela Municipality. Convenient sampling was used to sample 259 respondents (184(71%) females and 75(29%) males) and to select the 8 health care services. A structured, closed-ended self-administered questionnaire in Tshivenda was used to collect data on the day that diabetic patients were coming for follow-up treatment, and after they had been attended to by the health care providers. Data were analyzed using the Statistical Package for Social Science (SPSS, version 23). Ethical issues and measures to ensure reliability and validity were adhered to throughout the study. .

The results show that only112 of respondents (43%,) had knowledge regarding micro-vascular complications, a smaller number (32%; n=84) of the respondents had knowledge about macro-vascular complications, whilst few (26%; n=67) had knowledge relating to nervous system complications. Recommendations to the Department of Health, health care providers, dieticians and future researchers were made in order to improve the

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management of diabetes mellitus with minimal complications, and to reduce the burden of this disease.

Keywords: chronic complications, diabetes mellitus, knowledge, patient.

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LIST OF ACRONYMS AND ABBREVIATIONS

AMI	Acute Myocardial Infarction
CHD	Coronary Heart Disease
CVD	Cardiovascular Disease
DHIS	District Health Information System
DM	Diabetes Mellitus
DoH	Department of Health
FPG	Fasting Plasma Glucose
GDM	Gestational Diabetes Mellitus
HbA1c	Glycated Haemoglobin
IDF	International Diabetic Federation
KRCNSCDM	Knowledge Regarding Central Nervous System Complications of Diabetes Mellitus
KRDMC	Knowledge Regarding Diabetes Mellitus Complications
KRMAVCDM	Knowledge Regarding Macro-Vascular Complications of Diabetes Mellitus
KRMIVCDM	Knowledge Regarding Micro-Vascular Complications of Diabetes Mellitus
OGTT	Oral Glucose Tolerance Test
PVD	Peripheral Vascular Disease
RAAS	Renin-Angiotensin-Aldosterone-System

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SA	South Africa
SEMDSA	Society for Endocrinology, Metabolism and Diabetes of South Africa
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

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CHAPTER 1

1. OVERVIEW OF THE STUDY

1.1 Introduction

Diabetes mellitus (DM) is a global health issue affecting people of all ages. It is defined as a non-communicable chronic disease caused by abnormal insulin production, impaired insulin utilization, or both. Its prevalence is increasing rapidly, and it is associated with micro- and macro-vascular complications (Lewis, Heitkemper, O'Brien & Bucher, 2007:1253). The aim of this study was to assess the knowledge of DM chronic complications among diabetic patients in the Vhembe district of the Limpopo Province, South Africa. The researcher assume Knowledge or lack thereof can be considered as one of the important factors that cause people to behave in a certain way. Gaps in knowledge or information received by DM patients regarding diabetes and related complications may result in destructive health behaviors.

Patients suffering from DM are expected to have adequate knowledge for success of long-term maintenance therapy and metabolic control of diabetes, and this depends mainly upon patients' compliance with the therapeutic plan and a fundamental change in their behavior. Knowledge of diabetes by diabetic patients can prevent the impending chronic complications of DM, which impact significantly on the quality of life of diabetic patients. The major chronic complications of DM include cardiovascular diseases, nephropathy, neuropathy and retinopathy (International Diabetic Federation, 2006:6).

According to Kisokanth, Prathapan, Indrakumar and Joseph (2013:2), self-management of DM can be achieved through self-management education.

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Education enables the patient to become more knowledgeable and be an active respondent in diabetes care. Diabetes education programs encourage patients to have an applied understanding of procedures on self-management of diabetes and related conditions. Diabetes education brings about good results such as changes in attitudes, knowledge, and self-care behaviors of patients.

Mogotlane, Mokoena and Chauke (2005:47) also indicated that patients' education is imperative in equipping diabetic patients with knowledge regarding diabetes complications. Diabetic patients should be empowered to accept self-management; these include self-monitoring of blood glucose, compliance with medications, and complying with dietary plans and exercise programs, thereby preventing complications of diabetes (Mogotlane, Mokoena & Chauke, 2005:47).

International research studies show that DM complications are commonly present at the time of diagnosis of type 2 diabetes although the actual rates have varied between studies. In the Netherlands, retinopathy was found in 7.6% of people with screen-detected diabetes, impaired foot sensitivity in 48.1% and microalbuminuria in 17.2%, myocardial infarction in 13.3%, ischaemic heart disease in 39.5% and peripheral arterial disease in 10.6% (International Diabetic Federation, 2006:6). The International Diabetic Federation, 2006:6, indicated that there is increase in the prevalence of DM and its related complications.

Globally it is estimated that 382 million people suffer from diabetes. North America and the Caribbean are the regions with a higher prevalence, where there are 36,755 people with diabetes (11%), followed by the Middle East and North Africa with 34,571 people with diabetes (9.2%). Western Pacific regions with higher number of people with diabetes with prevalence of 8.6 %. About 70-80% of people with DM die of cardiovascular diseases, about 10% to 20% die of nephropathy. People with DM are 15 to 40 times more likely to acquire

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neuropathy related to lower limb amputation (International Diabetic Federation, 2006:6).

Mohyud Din Chaudhary and Mohyud Din Chaudhary (2010:84) conducted a study in Pakistan regarding awareness of diabetic risk factors and complications in diabetic patients, which shows that in 338 patients, more than half of patients (55.62%) were aware of diabetes chronic complications. Mwangi, Githinji and Githinji (2011:145) conducted a study in Kenya regarding knowledge and awareness of diabetic retinopathy amongst diabetic patients in Kenyatta National Hospital, and their findings show that out of 100 respondents, 83% were aware of retinopathy, and they also had knowledge of its risk factors and prevention.

Ramesh, Vijaya, Kumar, Gopinath, Gavaskar and Gandhi (2011:532) in the study about diabetic knowledge of rural community and drug utilization pattern in a tertiary care hospital, indicated that out of a study sample of 300 diabetic patients none of them were aware that erectile dysfunction is a complication of diabetes. About 68% of patients did not know about diabetes cardiovascular complications. From the three early complications that were asked, 61% of patients knew none of them and 39% of patients knew one. According to Jones (2013:61), there is a low level of public awareness and knowledge about diabetes in Kenya. Awareness differs according to education and region. Many patients had poor behaviors towards diabetes, 41% show reluctance in adopting healthier lifestyles. Although adequate knowledge is associated with good practice for diabetes prevention, 49% with sufficient knowledge failed to put that into practice (Jones, 2013:61). Jones' (2013:61) findings concur with the observations of a study that was conducted by Godwin, Ovenseri, Ogbomo, Abokyi, Kuffuor and Abokyi (2013:271) in Ghana. Their findings show that only 15 (3.8%) out of 390 diabetes patients had knowledge of diabetes eye complications

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Ashok, Vankunder, Munasi, Padhyegurjar, Jennifer and Shekhar (2013:46) studied DM and risk factors in a tertiary care hospital in the Kancheephrum district in India. The findings of the study show that out of 123 diabetes patients 80 (65%) had good knowledge of diabetes. About 109 (88.6%) were aware of self-care practices and 79 (64.2%) had knowledge about diabetes complications. Whilst Kasinathan, Girijakumari, Marimuthu, Ramar and Muthusamy (2013:41) studied the awareness on type 2 diabetes and its complications among the Sivaganya district population in Timilnandu. The findings show that knowledge about risk of complications of diabetes was poor. Out of 539 respondents, 74 (11%) were not aware of diabetes complications. Awareness about diabetes, including knowledge of complications of diabetes, was poor. The study indicated that the majority of diabetes patients were not well-informed about diabetes and its complications by their medical doctors.

Moodley and Rambiritch (2007:16) assessed the level of knowledge of DM among diabetic patients in a primary health care setting in clinics in the Kwazulu-Natal. They showed that there was a profound need for an improvement in the awareness of diabetes management and its complications in the primary health care sectors. Continuing education on DM and its complications for primary health care providers is crucial and should be accompanied by a regular assessment of their DM awareness.

Moreover, the study conducted by Mashige, Notshweleka, Moodley, Rahmtoola, Sayed, Singh and Sardiwalla (2008:95) assessed the level of DM patients' knowledge on DM, its complications and management in Durban, SA, focused on diabetic retinopathy as one complication of DM. The results of the study show that patients had adequate knowledge of DM and its management, but their knowledge regarding ocular diabetic effects was inadequate.

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Globally, there are guidelines for management of DM. The American Diabetes Association (2014) stipulated the following guidelines for diabetic care:

- **Prevention** of type 2 diabetes through on-going support programme targeting weight loss and increased physical activity;
- **Screening and management** of modifiable cardiovascular diseases risk factors, e.g., obesity, hypertension and dysplipdaemia and controlling of dysplipdemia and antiplatelet therapy;
- **Self-monitoring** of blood glucose;
- **Screening and management** for micro-vascular complications such as nephropathy and retinopathy;
- **Gestational diabetes screening and diagnosis**;
- **Life style modification** which include: nutrition therapy, physical activity and smoking cessation;
- **Diabetes self-management education and support**, bariatric surgery in type 2 diabetes and foot care;
- **Vaccination and immunization** against influenza for diabetic patients aged more than 6 months, pneumonicocial polysaccharide vaccine for all patients aged more than 2 years and more than 65 years, hepatitis B vaccine for those not vaccinated aged 19-59 years;
- **Psychosocial assessment** and diabetic care in older diabetes patients;
- **Screening for cystic fibrosis-related diabetes**;

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- **Diabetes management for children and adolescents**;
- **Management of hypoglycaemia**.

The South African government has introduced general guidelines in the hospitals and clinics for the management of DM, in order to prevent complications. The DM patient's knowledge and adherence to those guidelines may prevent diabetes complications. According to Lewis et al. (2007:1277), the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) (2012:79), and Guidelines for Management of Type 2 Diabetes Mellitus (2012:79).

The guidelines are as follows:

- **Blood glucose monitoring:** Patients with DM should be instructed to monitor blood glucose at home and record results;
- **To take insulin** as prescribed and to carry some form of glucose at all times in order to treat hypoglycaemia;
- **Exercise:** DM patients should follow a medically supervised exercise programme;
- **Diet:** DM patients should have an individualized meal plan as per a dietician's instructions.
- **DM patients should undergo an annual eye examination** by an ophthalmologist;
- **DM patients should to examine their feet** at home;
- **DM patients should do an annual urine testing** for protein;

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- **DM patients are supposed to know the symptoms of hypoglycaemia**;
- **DM patients should quit smoking**; and
- **DM patients should** have other medical conditions treated, e.g., high blood pressure and high cholesterol
- **DM patients should wear medic alert disc** for DM patients (Lewis et al., 2007:1277; Guidelines for Management of Type 2 Diabetes Mellitus, 2012:79).

Igbojiaku, Harbor and Ross (2013:4) conducted a study regarding compliance with guidelines at a regional hospital in Kwazulu Natal, South Africa. The findings of the study showed poor compliance with existing diabetes guidelines (SEMDSA, 2009). About 750 diabetes files were studied, and out of 750 files, 80% of patients had high values of glycated haemoglobin (HbA1c).

A study that assessed the knowledge, attitudes and practices about diabetes among 100 diabetic patients at Pondicherry village in India found that patients had inadequate knowledge regarding diabetes complications. About 30% of the patients indicated that DM affect kidneys , 16% indicated that DM affect the eyes and 12% said DM affect peripheral nerves. Only 6% knew about Heart-related complications (Mangaiarkkarasi, Nitya, Mehar & Ramaswamy, 2012:1189). According to Mbanya, Motala, Sobngwi, Assah and Enoru (2010:2256), in Africa, retinopathy affects 15–55% of patients, with a high proportion of proliferative retinopathy and macular edema.

In individuals with type 2 diabetes, 21–25% had retinopathy at diagnosis of diabetes and 9.5% of those with type 1 diabetes. Diabetes patients with duration of 5 to10 years were diagnosed with 32–57% nephropathy, coronary heart disease affected 5–8% of individuals with diabetes and cardiomyopathy

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affected up to 50% of all patients with type 2 DM. About 15% of people with stroke have diabetes, and up to 5% were presenting with cerebrovascular accidents during diagnosis. Prevalence of peripheral vascular disease varies from 4% to 28% (Mbanya et al., 2010:2256).

The researcher assumed that the Vhembe District which is the area for this study was not excluded from this prevalence. In the Thulamela municipality, in the Vhembe district of the Limpopo Province, there is a private renal dialysis unit; the researcher speculated that the renal dialysis unit is operating due to an increased number of patients suffering from chronic renal failure. When interviewed on the 24 February 2014, the professional nurse working at the renal dialysis unit in the Vhembe district reported that among 53 patients who were being dialyzed in the renal unit, 30 were diabetic patients.

1.2 Study Rationale

Diabetes care is a lifelong responsibility and careful management and early treatment strategies may reduce the risk of complications. Studies conducted by Mashige et al. (2008:98) regarding knowledge of DM, its complications and management in Durban, South Africa, recommended that further studies should be done to assess diabetes knowledge in other provinces among the rural and urban population. This prompted the researcher to investigate the knowledge of diabetes chronic complications amongst diabetic patients in the Vhembe district of the Limpopo Province.

1.3 Problem Statement

The researcher is a professional nurse and a community member in the Vhembe District. Relatives, family members and neighbors with DM kept on approaching the researcher with chronic complications related to DM. When explaining the problems, they seemed not to relate those complains to DM complications. For example, some asked about foot problems which included diabetic foot, foot amputations, eyes and kidney problems, but without

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relating the problems to DM complications. This indicated a gap in knowledge regarding diabetic complications in the diabetic population at Vhembe district of Limpopo Province, South Africa.

According to the Vhembe District Health Information System (DHIS, 2013), about 180 diabetic patients who consulted the regional referral hospital in the Vhembe district on a monthly basis for a period of three months were found to be diagnosed with diabetic foot ulcers. More than 100 diabetic patients who consulted had eye problems, of which 40 were diagnosed with cataracts due to DM. About 7 patients diagnosed with renal problems were referred to Polokwane Provincial Hospital for renal dialysis every 3 to 4 weeks (DHIS, 2013). Therefore, the question that needed to be asked was whether diabetic patients in the Vhembe district were well informed about the chronic complications related to diabetes mellitus. The researcher was therefore, interested in assessing the knowledge of DM chronic complications among diabetics in Vhembe district.

1.4. Aim of the Study

The aim of this study was to assess the knowledge of DM chronic complications among diabetic patients in the Vhembe district of the Limpopo Province, South Africa.

1.5 Research Objectives

Research objectives of the study were to:

- **Assess** the knowledge of DM chronic complications amongst diabetic patients in the Vhembe district of Limpopo Province, South Africa.
- **Determine** knowledge of DM patients regarding self-care practice, control and management of diabetes in the Vhembe district of Limpopo Province, SA.

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- **Identify** challenges faced by diabetic patients regarding chronic complications of DM in the Vhembe district of Limpopo Province, SA.

1.6 Research Assumption

The following assumption guided the study:

- Lack of knowledge regarding DM chronic complications exposes the diabetic population to suffer DM chronic complications.

1.7 Significance of the Study

The findings of this study may help in improving knowledge of DM patients regarding diabetes chronic complications in the Vhembe district of Limpopo Province, SA. The results of the study may assist the health care providers in the Vhembe district of Limpopo Province to amend health education of DM patients regarding self-health care practices, control and management of diabetes, which may improve the prevention of diabetes complications. Findings of the study may assist health care providers to recognize and implement the correct strategies according to the types of complications.

The health care system may benefit by reducing DM patient stay in the hospital and decrease workload on health care professionals. Nursing education may benefit, as the findings may be used to enhance the nurse training curriculum. The results of the study may provide recommendations for novel areas of research. The Department of Health and the economy of the country could potentially reduce overall health care costs and the burden of disease if patients are well informed of DM and its management.

1.8 Theoretical/Conceptual Framework

A theoretical framework is the foundation of a study (Polit & Beck, 2008:754). Grove, Burns and Gray (2013:734) defined a theoretical framework as an

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abstract, logical structure of a study that enables the researcher to link the findings to a nursing body of knowledge. The researcher conceptualized the study in the Pender health promotion model (Alligood & Tomey, 2010:438). Good management or health promotion of DM depends on knowledge and motivation of diabetic patients. The model is based on social cognitive theory, expectancy value theory and the nursing perspective of holistic human functioning. The model outlined the variables that are factors that may affect the knowledge of individuals regarding their health conditions. The model was helpful in discussion of some of the findings of the study. In the health promotion model, Pender outlined variables that affect subsequent health actions that were hoped to be health promotion behavior, including personal and psychological factors. These factors include variables such as self-esteem, self-motivation, personal competence, perceived health status and definition of health.

Individuals with a positive self-esteem, self-motivation and personal competence are more likely to engage in health promotion behavior (Alligood & Tomey, 2010:438). In this study, the researcher assumed that diabetic patients who are motivated and have knowledge regarding complications of DM will engage themselves in the management of DM in order to attain positive outcomes such as personal fulfillment, self-esteem, optimal well-being and productive living.

The researcher views the outlined variables in the Pender health promotion model as factors that may affect the knowledge of individuals regarding their health conditions and related complications. The health promotion model assumes that health professionals constitute a part of the interpersonal environment which influences human behavior in their daily life. In this study, the researcher assumed that health education given by professionals to diabetic patients may influence their behavior towards the management of diabetes throughout their life.

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The health promotion model's theoretical propositions indicate that people commit to engaging in behaviors from which they anticipate deriving personally valued benefits. People are more likely to commit and engage in health promotion behaviors when significant others model the behavior, and expect that behavior to occur. The provision of assistance and support enables the behavior to occur. Therefore, based on the theoretical proposition of this model, the researcher proposed that diabetic patients can commit to know about diabetes and its related complications if they are made aware of the benefits of acquiring such knowledge, and they will engage in health promotion behavior when they get assistance and support from the health professionals and significant other.

1.9 Definition of Concepts

1.9.1 Knowledge

Knowledge refers to knowing that is expressed in a form that can be shared or communicated with others (Chinn & Kramer, 2011:3). According to the health promotion model, knowledge refers to personal competence of DM patients regarding management of DM to attain optimal well-being and productive living (Alligood & Tomey, 2010:438). In this study, knowledge refers to relevant information and understanding about the causes and prevention of diabetes complications by diabetic patients.

1.9.2 Diabetes Mellitus

Diabetes mellitus is a chronic multisystem disease related to abnormal insulin production, impaired insulin utilization or both (Lewis et al., 2007:1253). In this study, diabetes mellitus refers to a chronic medical condition caused by abnormal secretion and underutilization of insulin.

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1.9.3 Chronic

Chronic refers to long-term, persistent difficulties (Morrison-Valfre, 2013:129). In this study, chronic means an incurable, life-long illness.

1.9.4 Complications

Complications refer to the disease or injury that develops during the treatment of the pre-existing disorder (Mosby, 2009:412). According to the health promotion model, complications refer to undesired effects of DM that occur when DM patients do not engage in good management of DM and health promotion behavior (Alligood & Tomey, 2010:438). In this study, complications refer to problems that arise from the diabetes condition.

1.9.5 Patients

Patient refers to a person who is waiting for or undergoing medical treatment and care (Bernam, Snyder, Kozier & Erb, 2008:12). In this study, a patient is a person diagnosed with DM and who is receiving medication in the hospital or at primary health care services.

1.10 Summary

This chapter dealt with overview of the study. The chapter covered the following: introduction and background, study rationale, problem statement, aim of the study, research objectives, research assumption, and significance of the study, theoretical frame framework, and definition of concepts. The subsequent chapter highlights the existing literature about DM and related chronic complications.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Purpose of literature review was to fit the proposed study into the present knowledge, to reveal different ways in which the proposed research study is similar to, or different from other previous studies conducted, and to reflect that the researcher understands the current issues related to the topic of the proposed research. This chapter deals with the existing body of knowledge regarding diabetes mellitus (DM) and related chronic complications. The chapter presents a literature that was reviewed under the following headings: explanation of DM, types of DM, global prevalence of DM, impact of DM chronic complications and knowledge of DM complications by diabetes patients. Knowledge of DM patients regarding self-care and challenges of patient diagnosed with DM complications.

2.2 Diabetes Mellitus

Diabetes is a non-communicable chronic disease in which the body is unable to produce insulin or cannot properly use the insulin it produces. Consequently, the system is no longer self-regulated and the level of sugar in the blood goes beyond the normal limits (threshold). Repeated and prolonged episodes of hyperglycemia can damage blood vessels and nerves, leading to the well-known devastating diabetes complications (retinopathy, neuropathy, nephropathy, amputation and cardiovascular disease

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(Boutayeb, Lamlili, Boutaye, Maamri, Ziyyat & Noureddine Ramdani, 2012:56). According to the World Health Organization (WHO, 2006:8), diabetes can be diagnosed on any of the following criteria: Fasting plasma glucose (FPG) ≥ 7.0 mmol/l (126 mg/dl) or 75 g oral glucose tolerance test (OGTT) with FPG ≥ 7.0 mmol/l (126 mg/dl) and/or 2 hour plasma glucose ≥ 11.1 mmol/l (200 mg/dl) or glycated haemoglobin (HbA1c) ≥ 6.5% /48 mmol, or random plasma glucose ≥ 11.1 mmol/l (200 mg/dl) in the existence of classical diabetes symptoms.

Asymptomatic individuals with a single abnormal test should have the test repeated to confirm the diagnosis, except when the result is explicitly elevated. Plasma glucose assessment remains a fundamental diagnostic criterion for the establishment of disease in patients. According to Lewis et al. (2007:1219), the normal blood glucose ranges approximately from 70 to 120 mg/dl (3.9 to 6.66 mmol/l). When blood glucose is less than 70 mg/dl (3.9 mmol/l), it is considered low. Blood glucose is considered high when it is more than 120 mg/dl (6.66 mmol/l).

2.2.1 Types of Diabetes Mellitus

The literature of this study concentrated only on the four common types of DM in the Vhembe district of Limpopo Province, and only the etiology and pathophysiology were outlined.

2.2.1.1 Type 1 Diabetes Mellitus

Type 1 DM or insulin-dependent diabetes mellitus (IDDM) occurs as a result of ineffective insulin action or insulin deficiency—it is associated with a lack of effective insulin secretion by the pancreas. This type of diabetes was previously called juvenile DM because the majority of those affected are younger than 30 years old (Mogotlane et al., 2005; Lewis et al., 2007:1255).

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- **Aetiology and Pathophysiology of Type I Diabetes Mellitus**

Type 1 DM is the end result of a long-standing process in which the body's own T cells attack and destroy pancreatic beta (β) cells, which are the source of the body's insulin or the pancreatic beta cells are atrophic or have been destroyed by autoimmune processes. In addition, autoantibodies to the islet cells cause a reduction of 80-90% of normal β cell function before hyperglycemia and other manifestations occur. A genetic predisposition and exposure to a virus are factors that may contribute to the pathogenesis of immune related type 1 diabetes. Occasionally, type 1 diabetes may be caused by non-immune factors of unknown etiologies. Administration of insulin is required for survival, thus the term 'insulin-dependent DM' (Mogotlane et al., 2005:33; Lewis et al., 2007:1255).

2.2.1.2 Type 2 Diabetes Mellitus

Type 2 DM is the most prevalent type of diabetes, accounting for over 90% of patients with diabetes; it usually occurs in people over 35 years of age and 80-90% of patients are overweight at the time of diagnosis.

- **Aetiology and Pathophysiology of Type 2 Diabetes Mellitus**

In type 2 diabetes, the pancreas continues to produce normal endogenous insulin or excessive amounts of insulin, but response /sensitivity of the target cells to insulin is decreased. Insulin secretion may be normal, but the sensitive or target tissues such as the liver, adipose tissue, and skeletal muscles are unable to respond normally to insulin-stimulated glucose uptake, thus the term 'insulin resistance', or it normally occurs mainly in people over the age of 30 years, thus the term 'maturity' or 'adult onset DM'. Multiple factors contribute towards the development of type 2 diabetes. The most powerful risk factors are believed to be obesity, specifically abdominal and visceral adiposity. Also, genetic mutations that lead to insulin resistance and higher risk for obesity have been found in many people with type 2 diabetes

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(Mogotlane et al., 2005:33; Lewis et al., 2007:1255).

2.2.1.3 Type 3 Diabetes Mellitus

Type 3 DM (gestational DM) develops during pregnancy in about 2-4% of pregnant women as a result of glucose intolerance, thus the term 'gestational DM'. There is a risk of women with gestation developing DM later in life, (Mogotlane et al., 2005:33; Lewis et al., 2007:1255). This diabetes is diagnosed in the first trimester during pregnancy (Sellers, 2012:247).

- **Aetiology and Pathophysiology of Type 3 Diabetes Mellitus**

Gestational diabetes develops during pregnancy and occurs in about 7% of pregnancies in United States (Mogotlane et al., 2005:33). Pregnancy alters carbohydrate metabolism, and is considered as a state of accelerated starvation or diabetogenic state. The increased levels of estrogen, progesterone and human placental lactogen present during pregnancy, produce resistance to insulin in the maternal tissues, therefore the blood glucose levels remain raised longer than in the non-gravid state (Sellers, 2012:247).

2.2.1.4 Type 4 Diabetes Mellitus

Type 4 DM or malnutrition-related DM Type 4 DM has been added by the World Health Organization (WHO) (Mogotlane et al., 2005:33).

- **Aetiology and Pathophysiology of Type 4 Diabetes Mellitus**

The onset is between 10-40 years of age. It usually occurs in underdeveloped countries. It is associated with nutrition, but the role of nutrition as a cause of DM is unknown, and insulin is required for this type of DM (Mogotlane et al., 2005:33).

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2.3 Global Prevalence of Diabetes Chronic Complications

According to Din Chaudhary and Din Chaudhary (2010:84), in 2005 the WHO has predicted the number of patients with diabetes to rise globally from 100 million patients to 360 million patients in 2030. The number may rise due to a sedentary lifestyle and increased obesity in the population. In 2010, the WHO has predicted an increase of 17% in the prevalence of DM in the developing world, with an estimated 228 million people with diabetes in developing countries accounting for as much as 75% of the world's diabetic population by 2025 (Din Chaudhary& Din Chaudhary, 2010:84).

The findings of the study that was conducted regarding the prevalence of diabetic retinopathy in various ethnic groups indicate that the prevalence of diabetic retinopathy, sight problem and macular edema are higher in people of Africa, south Asian, Latin American and indigenous tribal descent compared to the white population (Sivaprasad, Gupta, Nwaobi & Evans, 2012:347). This might be due poor blood glucose control, hypertension and difficulties in accessing health care facilities. Several studies regarding knowledge of diabetes complications in South Africa specifically focused on retinopathy, an eye-related complication, whereas there is no available research studies regarding other complications related to DM. Diabetes is a major cause of heart-related diseases which account for about 50% of deaths, and it has been identified that heart failure increased with diabetes patients. According to Tesfaye and Gill (2011:4), more than 400 million people in Africa have DM.

In South Africa, 2.6 million people between the ages of 20-79 years have been diagnosed with DM and the prevalence of diabetes in adult South Africans is 9.27%. By 2035, the International Diabetic Federation (IDF) estimates that more than 41.5 million Africans will develop diabetes and 66 million will suffer from impaired glucose tolerance (World Diabetes Conference, 2013:4).

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In a study involving 300 randomly selected black African patients from primary care in Cape Town, South Africa, the prevalence of any grade of retinopathy was 55% – proliferative and pre-proliferative retinopathy 16%, and cataracts 8%.

The prevalence of chronic complications was indicated to be high amongst the Zulu diabetes patients in South Africa. Out of 253 Zulu diabetic respondents, 117 (46%) had been admitted to hospital due to diabetes-related complications. Diabetes retinopathy was present in 40.3% patients, renal complications was present in 46.4% patients, 16.6% of patients had peripheral vascular complications and multiple surgical toe amputation was present in 7.5% of respondents (Rotchford & Rotchford, 2002:539).

2.4 Impact of Diabetes Mellitus Chronic Complications

The following complications are considered the most dangerous, costly and the cause of death among diabetes patients:

2.4.1 Macro-Vascular Complications

These are complications caused by atherosclerotic deposits of lipids within the inner layer of large and medium-size vessel walls, resulting in accelerated cardiovascular disease (CVD) such as coronary heart disease (CHD) and acute myocardial infarction (AMI) which is higher in type 1 DM than type 2 DM. It occurs in people with impaired glucose tolerance (Mokgotlane et al., 2005:45); Lewis et al., 2007:1283).

2.4.2 Micro-Vascular Complications

Tissues most vulnerable to micro-vascular complications are the eyes (retinopathy) and kidneys (nephropathy). Micro-vascular complications result from changes in small blood vessels that are unique to diabetes and occur in both types 1 and 2 diabetes. The basement membrane of the capillaries

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thickens, impairing the exchange of nutrients, gases and wastes. Diabetes is the leading cause of blindness and end stage renal disease (Lewis et al., 2007:1283).

2.4.2.1 Neuropathy

Studies in the Arab world showed a prevalence of neuropathy ranging between 38-94% in diabetic foot cases. Sensory neuropathy is a major component leading to the development of diabetic foot ulceration. Loss of protective sensations such as pain may predispose the patients to recurrent injuries without feeling its occurrence (Ahmed, Elsharief & Alsharief, 2011:56).

A study on diabetic foot disease in the United Kingdom (UK) shows that diabetes carries an increased risk of a person undergoing lower extremity amputation 23 times higher than of a person without diabetes. About 34,109 amputations have been performed over a three year period in England, of which 16,693 (48.9%) were in people with diabetes. The amputation rates in England for people with diabetes varies ten-fold-both major range 0.22-2.20 per 1000 person-years and minor range 0.30-3.25 per 1000 person-years (McInnes, 2012:4).

In 2012, when Novo Nordisk assisted "Munna ndi nnyi" a local non-profit organization in the Vhembe district, in up-skilling community workers through diabetic training program which was being led by the company's medical training manager and a qualified podiatrist screened 253 patients, 168 were found to be non-diabetes, 85 had diabetes. When doing foot screening 38% of patients were identified as medium risk and 51% as high risks with one patient having gangrene and with 17% having retinopathy (Medical Chronicle, 2012:10).

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2.4.2.2 Nephropathy

According to McInnes (2012:5), diabetes is also commonly associated with kidney disease, as the high levels of blood glucose damage the blood-filtering capillaries in the kidneys resulting in a condition known as diabetic nephropathy. The manifestations of diabetic kidney disease range from asymptomatic leakage of protein into the urine (micro-albuminuria, macro-albuminuria and proteinuria) to end-stage kidney disease, which requires treatment with kidney dialysis or a kidney transplant. It is estimated that around 16% of the Australian adult population has kidney damage that is evidenced by protein or blood in the urine or reduced kidney function. In those with diabetes; micro-albuminuria is present in 21.0% of the population while macro-albuminuria is present in 4.3%. The prevalence of micro- and macro-albuminuria increases with increasing glycaemia, affecting 11.0% of those with pre-diabetes, 17.8% of those with undiagnosed diabetes, and as many as 32.6% of those with known diabetes (McInnes, 2012:5).

In Australia, the annual number of people with diabetes who began dialysis or had a kidney transplant has risen dramatically since 1980, with almost all the rises being due to type 2 diabetes. Diabetes is now the single most common cause of end-stage kidney disease since 1980-2009. (Diabetes Australia, 2012:20). In the UK, kidney disease accounts for 21% of deaths in type 1 and 11% in type 2 diabetes (McInnes, 2012:5).

2.4.2.3 Retinopathy

Diabetes is the leading cause of blindness in people of working age in the UK and there are 4,200 people in England who are blind as a result of diabetic retinopathy. This number increases by 1,280 each year (McInnes, 2012:5). The results of a study that was conducted in China about the prevalence of chronic complications of type 2 DM indicate that out of 1.524 subjects, diabetes chronic complications were diagnosed in 52% patients, 33.4% had macro-vascular complications and 34.7% had micro-vascular complications.

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The prevalence of cardiovascular conditions 30.1%, neuropathy 6.8%, nephropathy 17.8%, ocular lesions 10.7%, and foot disease were 14.8% (Liu, Fu, Wang & Xu, 2010:3).

2.5 Knowledge of DM Chronic Complications by Diabetes Patients

The available literature regarding knowledge of diabetes complications by diabetes patients reflect India as one of the countries that has conducted various studies related to diabetic knowledge and its related complications. The study about awareness and knowledge of diabetes in Chennai, India shows that out of 4951 patients with DM, only 19% had knowledge about diabetes complications. About 55.7% (2756) were unable to specify a single organ which can be affected by diabetic complications (Mohan, Raj, Shanthirani, Dadda, Unwin, Kapur & Mohan, 2005:285).

The results of a study about diabetic retinopathy awareness in India from the total study population of 25400, showed that 701 patients knew that diabetes could affect many organs in the body; 674 patients indicated that their physician did not tell them about eye-related problems; 713 patients were aware that DM could affect the eyesight; 698 patients indicated that they were not educated about the complications of DM, especially diabetic retinopathy; 576 patients were not aware that diabetes could result in blindness (Mahesh, Elias, Sandhya, Giridhar, Sankaranarayanan & Thomas, 2006:19). The findings of a study that was also conducted in India regarding awareness of DM among 648 college degree students in Mandya City, show that the following common complications were not identified by the study respondents: impotence 533 (82.25%), ulcer on foot 459 (70.83%), loss of sensation 453 (69.91%), repeated skin infections 407 (62.81%), stroke 398 (61.42%) (Poornima, Ragavendra & Shivakumar, 2012:1). The findings indicate that awareness and knowledge regarding diabetes is still inadequate in India.

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Almeida, Souza, Holanda and Souza (2014:2237), assessed the knowledge of users regarding chronic complications of DM in Zona da Mata of Pernambuco, Brazil. Out of 101 respondents, 73.96% had satisfactory knowledge regarding DM complications. In Kaduna, Nigeria, Nehad, Istabraq, Jyothi, Husain and Umar (2012:46) assessed knowledge and awareness of diabetic and non-diabetic population with regard to DM. Their findings show that, amongst 340 subjects, 42.4% were aware of DM complications. Knowledge about diabetes symptoms and its complications was again found to be good in a study on knowledge, attitude and practices of diabetic patients in the United Arab Emirates, where out of 575 respondents, 33% had good knowledge, 36% had fair knowledge, and only 31% had poor knowledge (Fatma, Mohamed, Juma, Bachar, Nicolas & Karin, 2013:4).

Al-dahan, Albaik, Alomran, Aldahan and Albaik (2013:117) studied the awareness and knowledge of diabetes among Al-Wazarat Family Medicine Health Center attendants in Saudi Arabia. Knowledge of diabetes complications by respondents was suboptimal. Out of 467 respondents, 234 (50.1%) were aware of nephropathy, 207 (44.3%) of blindness, 205 (43.9%) of stroke, 200 (42.8%) of neuropathy, 147 (31.5%) of gangrene. This was regarded as a low score in terms of knowledge of DM complications.

The results of an investigation of diabetic patients' knowledge regarding ocular complications in the Western Cape, South Africa, showed that there was a common misconception among 50% of diabetic patients. The misconception was that, if their vision is good and they could see clearly then there was nothing wrong with their eyes. About 27% felt that the statement which said: 'If one can see right, there's nothing wrong with eyes', was untrue, and 22% were not sure if the statement was true or not. About 60% of the respondents agreed that eye disease can develop even if the diabetes is under control, whereas 27% did not know if this statement was true or not, and 12% believed it was false (Clarke-Farr, Nel & Wilkinson, 2006:140).

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South African nurses, including nurses in the Vhembe District of the Limpopo Province, have added to the body of knowledge pertaining to diabetes complications. However, none of these studies focused on all diabetes-related chronic complications. A study that was conducted by Khomela & Maluleke (2010:8) in the Limpopo Province at a clinic under the Thulamela municipality in 2010 only assessed the knowledge of DM patients regarding eye complications related to diabetes and the findings of the study showed that diabetes patients had inadequate knowledge regarding the disease and eye complications that are associated diabetes.

2.6 Knowledge of DM Patients Regarding Self-Care

The findings of a study on evaluation of T2DM (Type 2 diabetes mellitus) related knowledge and practices of Omani patients indicate that out of 106 respondents, only 11 (10.6%) were smokers. It was noted that 81.81% of them reduced the frequency or quit smoking after they were diagnosed with T2DM (Al Bimani, Khan & David, 2014:5). The respondents admitted to practice self-monitoring of blood pressure and about 76% got their blood pressure checked. Almost half of the patients (49.1%) never used herbs to control diabetes because they mistrusted the safety and efficacy of herbal medicines (Al Bimani et al., 2014:5).

In contrast, there were only 2 patients who constantly preferred and used substitutes or traditional medicines to manage their symptoms. Fewer than 40% of the patients admitted to consistent exercise and above 56% followed the commended controlled and scheduled diet. Respondents (60.4%) were compliant toward drug therapy as they never neglected the dose of their antidiabetic medications. About 64 patients reported to use table sugar to manage their hypoglycaemic symptoms; on the other hand 15% of the respondents had no knowledge of dealing with these symptoms (Al Bimani et al., 2014:5).

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According to Maina, Ndegwa, Njenga and Muchemi (2010:6), about 539 (27.2%) out of 1982 respondents had good knowledge of diabetes; 52% had good attitude and practices towards diabetes. The attitude of community towards diabetes and their lifestyle characteristics such as diet, physical activity and health-seeking behavior was evaluated.

The results show that only 28% of respondents agreed with statements relating to readiness to participate in physical activity, altering eating traditions and upholding 'good' body weights. Approximately 813 (41%) of the respondents did not show any readiness to embrace these healthier lifestyles, while 41% of all respondents had good practices while the rest 59% had bad practices in relation to diabetes prevention. About 75% of the respondents had poor dietary practices, 72% did not partake in regular exercise and over 80% did not monitor their body weight (Maina et al., 2011:6).

According to Gul (2010:129), patients' awareness about diabetes in Pakistan was low. In 100 respondents the mean of accurate answers for glycemic control, risk factors and complications was 33.5%, 69% and 39%, respectively. About 61% of the patients repeatedly checked blood sugar, but only few knew target blood glucose values. Only one sixth of all the patients could correctly answer questions concerning nutrition. Knowledge about eye and renal complications was too low. The knowledge, attitude and practice scores were low in most areas of diabetes care. The knowledge about antidiabetic drugs was also low, 58% of the patients knew that diet, oral hypoglycaemic drugs as well as insulin can help control blood sugar.

The findings of Godwin et al. (2013:220), in a study conducted at Korle-Bu Teaching hospital, Ghana, concur with those of Gul's (2010), because out of 390 respondents, only 103 (26.4%) patients knew the type of DM they were suffering from. Knowledge on ocular effects of DM was low and only 15 (3.8%) knew that it could affect the eyes. Respondents' attitude to routine eye

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examination was poor. About 135 (34.6%) had never had an eye examination ever since being diagnosed with diabetes. Diabetic patients' knowledge of DM and its ocular signs, and the attitude of diabetic patients towards eye examination were poor. Only 255 (65.4%) indicated having had an eye examination after being diagnosed with diabetes, of which only 181 (46.4%) had had a dilated fundus examination. About 168 (65.85%) showed that they only examined their eyes if their vision got poor. Approximately 255 patients that had their eyes examined after diagnosis; about 220 (86.3%) were informed on the ocular effects of DM. Respondents revealed poor practices with regard to eye examination with only 19.5% having done their last ocular examination within one year with 34.6% never having had an eye examination since being diagnosed with DM.

2.7 Challenges of Patients Diagnosed with Diabetes Complications

According to Burgess, Msukwa and Beare (2013:4), the challenges of diabetes and its complications are experienced mainly by the working age population. Diabetes retinopathy is the commonest cause of blindness in the working population. It decreases the economic activity, affects individual, family and national economies. In Malawi, there is restricted community subsidy; this means that individual patients and their families may have to use huge amounts of their salary on diabetes complications management in many Sub-Saharan African countries. Services for recognition and management of diabetes retinopathy are undeveloped.

There is shortage of ophthalmologists. Ways of referral between primary and secondary care, and between diabetic clinics and ophthalmic services are not well organized. Patients do not have a family physician to assist them negotiate services for diabetic complications. There is low doctor-to-patient ratio, which results in short consultation times. There is lack of systematic evaluation and monitoring of the complications of diabetes (Burgess et al., 2013:4).

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Kumpatla, Kothanda, Tharkar and Viswanathan (2013: 106) indicated that the period of stay in hospital, number of visits made for post-surgical dressings, hospital charges, laboratory charges and medical consultations were challenges faced by patients with diabetes complications. Lengthy hospital stay in patients with foot complications and those who had more than one complication was also a challenge. Diabetes patients with more than one complication were second in the levels of main direct health care cost estimates per admission. It is known that with aging and period of diabetes the patients develop diabetic complications, surgery or laser photocoagulation treatment (22.3%) and foot amputation (19%).

Terence and Verla (2011:1) studied diabetic-related amputation in the North West Region of Cameroon. The results of the study showed that out of 89 patients, there was an extensive variance in the period of their hospitalization, predominantly due to procedures that were performed, like double amputation that required months of hospitalization whereas certain patients left the hospital immediately after a procedure was done. About 78% of the total number of patients was amputated whereas the remaining 22% were undergoing debridement. Causes of amputation and debridement comprised necrosis, gangrene, diabetic foot, ulcer, cellulitis, ischaemia and septicaemia. About 65% of the amputation cases were caused by diabetic gangrene in the lower and upper extremities. Amputation procedures performed included above knee amputation, below knee amputation, hand and toe amputation and double amputation of the limb where below knee amputation was done. The mostly performed procedure was below knee amputation with 57.8% of the total cases. About 25% of the cases were above knee amputation whereas a minor percentage of 4.7% were done in both below knee amputation and above knee amputation. Toe amputations involved 10.9% of the cases while the outstanding 1.6% was a diabetic hand amputation. About 22% of the amputated cases were reported dead as a result of the amputated limb, and 57% of death cases were as a result of above knee amputation procedure.

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2.8 Summary

Based on the evidence presented in the literature review, DM patients do not have adequate knowledge about DM and related complications. This chapter discussed the general aspects of DM, the impact of DM chronic complications, knowledge of DM chronic complications by diabetes patients, knowledge of DM patients regarding self-care practice, control, management of diabetes and challenges faced by patients diagnosed with DM chronic complications.

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CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The previous chapter reviewed and discussed literature related to diabetes patients' knowledge of diabetes mellitus (DM) chronic complications. This chapter will deal with the research methodology in detail. This chapter outlines the methodological approaches used to determine knowledge of DM chronic complications by diabetes patients in the Vhembe district of the Limpopo Province. The quantitative method was used in this study. The sections include: approach, design, population frame, sampling procedure and technique, sample size, data collection methods, data presentation and analysis. The chapter will also present a narrative of the measures used in this study to ensure reliability and validity, and ethical considerations. The research design and method facilitated the achievement of the research objectives, which were to:

- Assess the knowledge of DM chronic complications amongst diabetic patients in the Vhembe district.
- Determine knowledge of DM patients regarding self-care practice, control and management of diabetes in the Vhembe district.
- Identify the challenges faced by diabetic patients regarding the chronic complications of DM in the Vhembe district.

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3.2 Research Approach and Design

This study employed a quantitative, non-experimental approach using descriptive design. The quantitative approach is a valuable, formal, objective and systematic process that assisted the researcher in this study to obtain numerical data for understanding aspects regarding the topic under investigation (Grove, Burns & Gray, 2013: 26). A descriptive design enabled the researcher to obtain information about the topic of the study and to provide a picture of situations as they occurs (Grove et al., 2013:215).

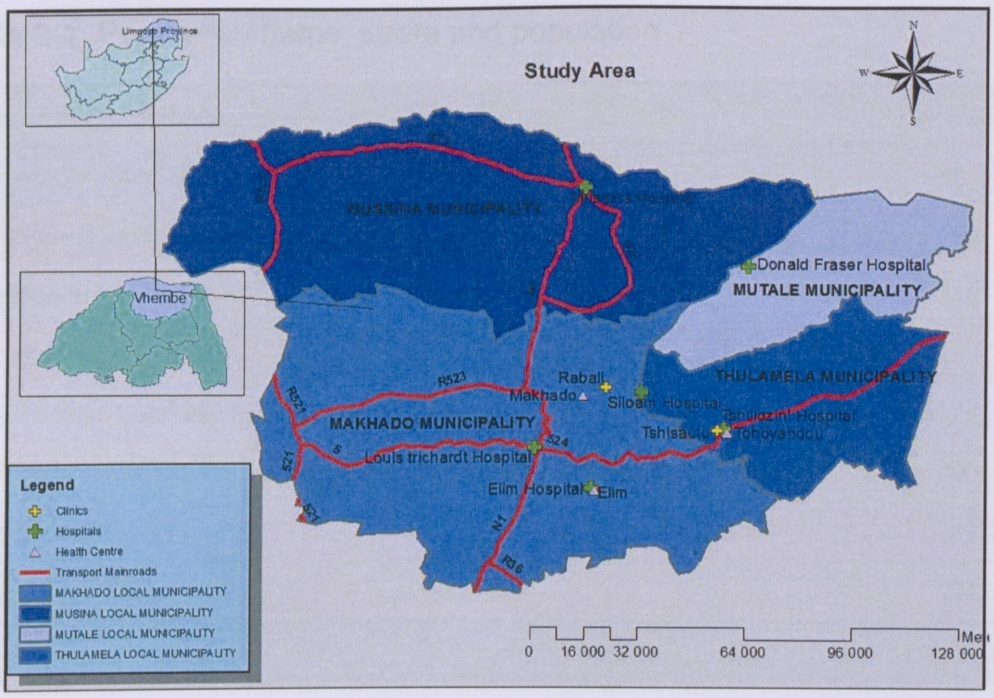
In this study, variables were not manipulated, and there was no attempt to establish causality because the researcher only focused on respondents' knowledge without experimenting (Brink, Van der Walt & Rensburg, 2012:179). The study design helped the researcher to identify gaps in the knowledge regarding diabetes complications in Vhembe district of the Limpopo Province, and to make judgments based on the results (Grove et al., 2013:26; Brink et al., 2012:112).

3.3 Research Setting

The study was conducted in the Limpopo Province of South Africa, which consists of 5 districts. The District of study was the Vhembe district which consists of 4 municipalities (Figure 3.1). Two municipalities, i.e., Thulamela Municipality and Makhado Municipality were selected for the study because they consisted of a large number of diabetic patients. The study was conducted in four hospital gateway clinics, two health centers and two clinics of the two selected municipalities. The study was conducted at Tshilidzini Hospital Gateway Clinic, Donald Fraser Hospital Gateway Clinic, Thohoyandou Health Centre, and Tshisaulu Clinic in the Thulamela Municipality, the Siloam Hospital Gateway Clinic, Louis Trichardt Memorial Hospital Gateway Clinic, and the Makhado Health Centre and Rabali Clinic in Makhado Municipality. The health center and clinics were selected because of large number of DM patients they serve as reflected in the population

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frame of this study.



Adopted: The Vhembe district municipality, health services map 2013/2014

Figure 3.1: The Vhembe district municipality health services map

3.4 Population

Vhembe district consist of 7 hospitals, 3 health centers and 112 clinics. The study population was diabetic patients in the Vhembe district. The year 2014 three months statistics obtained from the Vhembe District Health Information System is summarized in Table 3.1.

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Table 3.1: Population frame: strata and population

Names of hospital/Strata	Population
Tshilidzini Gate Way Clinic	400
Donald Fraser Vhufuli Tshitereke Gate Way Clinic	193
Thohoyandou Health Centre	210
Tshisaulu Clinic	193
Siloam Hospital Gate Way Clinic	175
Louis Trichardt Memorial Hospital	300
Makhado Health Centre	187
Rabali Clinic	194
Total (N)	**1852 (100%)**

(Department of Health, Vhembe district, 2014)

3.4.1 Target Population

The target population of the study was type T1DM and T2DM patients who were visiting selected health care services, to collect treatment and follow-up consultations as per appointment schedules, and who were willing to participate or give voluntary consent and respond to the questionnaire.

3.5 Sample and Sampling

3.5.1 Sample

A sample is a subset of population elements. An element is the most basic unit about which information is collected (Polit & Beck, 2008:339). The sample of this study was diabetic patients who were 18 years and older, mentally competent, and who voluntarily signed the consent form and those who gave a verbal consent.

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3.5.2 Sampling of the Institutions

For the purpose of this study, 4 hospital gate way clinics, 2 health centers and 2 clinics were conveniently sampled because of the large number of DM patients who were consulting in those institutions.

3.5.3 Sampling of the Respondents

The researcher obtained permission from the health care services managers to conduct the study on the DM patients (Annexures C and D). The managers in each clinic assisted the researcher by informing the diabetic patients of the researcher's purpose and the objectives of the study. The researcher explained the purpose of the study and the contents of consent form in the language that the patients understood best (Annexure E). Convenient sampling was used to sample the respondents of the study. Convenience sampling is one method of non-probability sampling, which involves using the most conveniently available people as study respondents.

Advantages of this method are that it is inexpensive, accessible and usually less time- consuming than other types of sampling methods. This method provides a means to conduct studies on topics that cannot be done using probability sampling. The researcher conveniently sampled the respondents, because only DM patients who were found in the selected health services for follow-up treatment were included in the study until the desired sample size was reached (Grove et al., 2013:351). Respondents who agreed to participate and satisfied the inclusion criteria were requested to sign a consent form were included in the study.

3.5.4 Sampling Criteria

Diabetic patients who were 18 years and older, mentally competent, and who

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voluntarily signed the consent form and those who gave a verbal consent were included in the study.

3.5.4.1 Inclusion Sampling Criteria

Inclusion sampling criteria are characteristics that a subject or element must possess to be part of the target population (Grove et al., 2013:353). Diabetic patients who were 18 years and older, mentally competent, and who voluntarily signed the consent form, and those who gave verbal consent to participate in the study and who were not participating in any other research study at that period were included as study respondents.

3.5.4.2 Exclusion Sampling Criteria

Exclusion sampling criteria are characteristics that can cause a person or element to be excluded from the target population (Grove et al., 2013:353). Diabetic patients who were under 18 years of age, mentally incompetent and who have been diagnosed with DM for a period less than 1 year were excluded from the study.

3.5.5 Sample Size

The researcher calculated the sample size following a guideline for sampling as outlined previously (de Vos et al., 2011:225). The guideline indicates that the larger the population, the smaller the percentage of the population that will be included in the study. The smaller the percentage of that population, the larger the sample size (de Vos et al., 2011:224); therefore 14% of the population from each selected health care service was the sample size in this study. The sample size was 259 diabetic patients from the selected health care services (Table 3.2).

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Table 3.2: Population frame: strata, visits and study sample

Names of hospital/Strata	Regular visits Population	Percentage suggested	Number of respondents (Sample)
Tshilidzini Gate Way Clinic	400	14%	56
Donald Fraser Vhufuli Tshitereke Gate Way Clinic	193	14%	27
Thohoyandou Health Centre	210	14%	29
Tshisaulu Clinic	193	14%	27
Siloam Hospital Gate Way Clinic	175	14%	25
Louis Trichardt Hospital Gate Way Clinic	300	14%	42
Makhado Health Centre	187	14%	26
Rabali Clinic	194	14%	27
Total	**N=1852**	**14%**	**n=259**

3.6 Data Collection

Data collection is the precise, systematic gathering of information relevant to the research purpose or specific objectives, question, or hypothesis of the study (Grove et al., 2013:733). In quantitative research, the questionnaire is the predominant mode for data collection.

3.6.1 Preparation for Data Collection

The researcher contacted the health care services managers to inform them about the proposed study and the planned dates for data collection. The researcher wrote the letters requesting for permission to collect data from the selected health care services (Annexures B and C). The letter explained the purpose of the study and approval from the University of Venda Research

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Ethics Committee (UVREC, Annexure A), permission letter to collect data from Limpopo Department of Health Research Committee (Annexure C), and permission from Vhembe District office were attached (Annexure D).

3.6.2 Pre-Test

Before the final data collection was conducted, Questionnaires were first given to the statisticians who pointed out that all the questions should be answered in such a way that the results can be put in a numerical form and percentages. Pre-test was conducted on about 24 (10% which was almost 10% of the sample of this study) of DM patients at Muledane Clinic in Vhembe district and the clinic was not included in the main and final data collection phase. The pre-test study was done in order to improve face and content validity of the questionnaire, and to estimate how long it would take to complete the questionnaire. Questionnaires (Annexure F) written in Tshivenda were used to collect data after it was identified that the patients who are visiting the clinic that was chosen for pre-test purpose, is predominately used by Venda speaking people. Unschooled respondents were assisted as follows: the researcher read the questions for them in a clear, consistent manner and the answers were documented according to the particular respondent's answer.

The answered questionnaires were read, interpreted in order to determine any potential problems. Findings were then correlated to ascertain whether it is measuring what it is supposed to measure. The questionnaire was modified accordingly based on the findings of the pre-test study (De Vos et al., 2011:237).

3.6.3 Data Collection Instrument

A structured, closed-ended questionnaire that was used for data collection was adopted from Mangaiarkkarasi, Nitya, Mehar and Ramaswamy (2012). . Before data collection, few questionnaire that were adopted from

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Mangaiarkkarasi et al., (2012), was modified to suit the respondents in the Vhembe district. Questionnaire was formulated in English and in Tshivenda languages (Annexure F). In order to overcome language barriers, the researcher translated the questionnaires from English to Tshivenda.

Closed-ended questions were chosen because they are easier to administer and to analyze when compared with open-ended questions. Furthermore, administering closed-ended questions is less time-consuming than administering open-ended questions. Respondents can complete more closed-ended than open-ended questions at the allotted time. The instrument was divided in seven sections. In the first section, the following were presented: demographic characteristics of the respondents. In the second section, the clinical characteristics of respondents were collected. The third section collected the respondents' knowledge regarding self-care practice, control and management of DM. The fourth section collected the information regarding respondent's knowledge about macro vascular chronic complications of DM.

The fifth section collected respondent's knowledge about micro-vascular chronic complications of DM. The sixth section collected information regarding respondents' knowledge about nervous system complications in relation to DM. The seventh section, challenges faced by diabetic patients regarding chronic complications of DM in the Vhembe district.

3.6.4 Method of Data Collection

Data collection was guided by the research problem, purpose and objectives of the study. Data were collected by the researcher and a research assistant who is a qualified researcher. Prior conducting data collection, a two days orientation was given to the research assistant regarding how data will be collected. Remuneration was paid to the research assistant as per agreement. A structured, closed-ended questionnaire that lasted about 20-30 minutes was used as the instrument of data collection. A separate room that

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was arranged earlier with the personnel in-charge of the health care service was used for data collection. The researchers collected data at the selected health care services of study on the day that diabetes patients were visiting the health care services for follow-up treatment, and after they have been attended to by the health care providers.

Respondent's language preferences were considered during the process of data collection. A Tshivenda questionnaire was repeatedly used to collect data from respondents in all institutions because respondents were predominately Tshivenda speaking. Uneducated respondents were assisted as follows: the researchers read the questions for them in clear, consistent manner and the answers were documented according to the particular respondents' answer. Each researcher collected data from about 128 respondents; data were collected from approximately 5 respondents per researcher per day in a period of three months.

3.7 Data Analysis

Data were analyzed using the following steps:

- Cleaning of the data to avoid missing data. By checking the questionnaire to verify and confirm if all variables are attended to.

- Data entry that employed measures such as frequency distribution, measures of central tendency, and measures of relationship between variables. These made it possible and easy for the researcher to describe the findings.

- Data were analysed using the Statistical Package for Social Science (SPSS) version 23, from which tables and charts were constructed. The Chi-square tests of associations between some variables were performed and interpreted. The Chi-square test was used to determine the statistical significance of the knowledge of diabetic patients

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regarding DM chronic complications at a 0.05 significance level.

Data summaries and research findings were presented using charts and tables (De Vos et al., 2011:253).

3.8 Measures to Ensure Reliability and Validity

3.8.1 Reliability

Reliability refers to the extent to which a measuring instrument is repeatable and consistent. Reliability of the instrument means that if the same instrument is used at different times or administered to different subjects from the same population, findings should be the same. (Maree, 2012:215). To ensure reliability for this study, the same structured, closed-ended questionnaire that was used to collect data from respondents who participated in pilot study was changed, simplified and modified to be easily understood by respondents. The questionnaire was then used to collect data from the respondents who participated in the final study.

3.8.2 Validity

Validity refers to the extent to which an instrument "looks" valid. In other words, does the instrument appear to measure what is supposed to measure? (Maree, 2012:217).

3.8.2.1 Face Validity

The instrument of data collection was scrutinized and analyzed by the statistician to ensure a high degree of face validity, and by doing a pre-test study before final data collection (Grove et al., 2013:201).

3.8.2.2 Content Validity

To ensure content validity of the data collection instrument, the researcher

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presented a provisional version to the supervisors and the statistician for their comments before finalizing the instrument (Maree, 2007:217).

3.8.2.3 Bias and Errors

According to de Vos et al. (2011:232), bias refers to a deviation from the true, or expected. Bias in a study tends to distort the findings from what they should be without the bias. The sampling procedure in this study did not allow all members of the population of interest to have equal chance to be included in a study sample, which led to a sampling bias (de Vos et al., 2011:232).

However, DM and diabetic chronic complications affect people the same regardless of their setting. Therefore, this suggests that sampling bias will not have a major consequence on the results of the study. The researcher was not interested in generalization of findings, but concerned with assessing knowledge of respondents with regard to DM chronic complications.

3.9 Ethical Considerations

An important ethical aspect of the research study is having the research project approved and permission to conduct the study granted from the relevant authorities. Every research study is bound to abide by the ethical norms that have been established by law or tradition which stipulates what researchers' obligations are to their human subjects, their scientific colleagues and society, in order to safeguard the interest of the public (de Vos et al., 2011:115). Ethics is a set of moral principles that are suggested by individual persons or a group of people. They are then subsequently widely accepted. They offer rules and behavioral expectations about the most correct conduct towards experimental subjects and respondents, employers, sponsors, other researchers, assistants and students (de Vos et al., 2011:115). It is ethics that defines what is not legitimate to do, or what a moral research procedure involves. In this study, everything that was agreed upon by the researcher such as respect for human rights and other ethical

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considerations were observed throughout the study.

3.9.1 Ethical Clearance and Permission to Conduct the Study

The researcher obtained ethics clearance from the University of Venda Research Ethics Committee (UVREC, Annexure A). To achieve the objectives of the study, permission was sought from the following departments: University of Venda Higher Degree Committee and The Department of Health Limpopo Province Research Committee, Department of health Vhembe District that authorized the researcher to collect data from the following institutions: Tshilidzini Hospital gate way clinic, Donald Fraser Hospital gate way clinic, Siloam Hospital gate way clinic and Louis Trichardt Memorial Hospital gate way clinic, Thohoyandou Health Centre, Makhado Health Centre, Rabali and Tshisaulu clinic.(Annexures B & D)

3.9.2 Informed Consent

The researcher gave the respondents full information regarding the study, i.e., the benefits and risks of the study so that they give consent to continue with the study being well informed. Informed consent was obtained from the potential respondents and relevant structures, respondents were asked to sign a consent form which described the study, assured respondents' confidentiality, and indicated their freedom to stop participation (Annexure E).

3.9.3 Voluntary Participation

In this study, voluntary participation was ensured by giving full information to respondents and explaining the purpose of the study. Respondents were allowed to withdraw from participating at any time if they felt they could not continue without fear of being victimized (Polit & Beck, 2008:173).

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3.9.4 Confidentiality and Anonymity

According to Brink, Van der Walt, & Van Rensburg (2012:172), confidentiality is the researcher's management of the private information shared by a subject that must not be shared with others without the authorization of the subject. It is an individual's right to determine the time, extent of, and general circumstances under which personal information will be shared with or withheld from other people (Grove et al., 2013:172). According to Brink et al. (2012:38), anonymity literally means namelessness; therefore, the process of anonymity refers to a researcher's ability to keep respondents' identity undisclosed with regard to their participation in the research study.

Respondents were reassured about confidentiality and anonymity as no personal information was going to be shared with other people, except for the researcher and supervisors of the study. Confidentiality and anonymity was also ensured because no personal information was disclosed to anyone who was not directly involved in the study and the respondents' names were not used, but they were allocated codes.

Data were group and analyzed so that individual cannot be identified by their response, and findings were described in a way that respondents cannot be identified from their responses. Only the researcher and the statistician had access to the completed questionnaires. Data collected from the respondents were put strictly under lock and key as a means of ensuring confidentiality. The researcher would destroy the questionnaires once the research report had been accepted and for a period of 3 years.

3.9.5 Principle of Justice

This principle encompasses:

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3.9.5.1 Right to Fair Treatment

Selection of respondents was based on research requirements not on vulnerability or position of certain people; there was neither discrimination nor prejudice against individuals. All agreements made with the respondents were honored (Polit & Beck, 2008:173).

3.9.5.2 Right to Privacy

Protection of the privacy of the respondents in this study was ensured by using codes during data collection instead of using respondents' real names.

3.9.6 Principle of Beneficence

Beneficence is the most fundamental ethical principle in research, which imposes a duty on researcher to minimize harm and maximize benefits (Polit & Beck, 2008:170). The principle covers the following dimensions:

3.9.6.1 The Right to Freedom from Harm and Discomfort

For the purpose of this study, the researcher avoided asking the respondents questions that led respondents to reveal sensitive personal information that can cause emotional harm and discomfort.

3.9.6.2 The Right to Protection from Exploitation

Respondents were assured that the information they might provide was not going to be used against them in any way (Polit & Beck, 2008:171). Exploitation of respondents was avoided by not exposing the respondents to situations for which they have not been prepared. The questionnaire was completed within agreed time.

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3.10 Summary

This chapter dealt with the research design and methodology that was used to collect and analyze the data for this study. A quantitative, descriptive design was chosen to determine the knowledge of diabetes chronic complications by diabetic patients in the Vhembe district of the Limpopo Province. It also included a full description of the research setting, population, sampling, measures to ensure validity and reliability. A structured, closed-ended questionnaire was used as instrument for data collection. All measures to ensure reliability, validity and ethical considerations were observed. Chapter 4 deals with the presentation of the research findings.

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CHAPTER 4

PRESENTATION OF THE RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The previous chapter concentrated on the research design and methods used in this study. The purpose of the study was explained to respondents, and verbal and written consent was obtained from respondents before the data collection process. Data were collected in Tshivenda according to the respondents' language preference. This chapter deals with the presentation of the research findings in the form of charts and tables.

4.2 Presentation of the Findings

The charts and tables illustrate the number and percentage of respondents' biographic data, the distribution in number and percentage of respondents by age, gender, level of education and employment status.

4.2.1 Demographic Characteristics of Respondents

4.2.1.1 Age of Respondents

Figure 4.1 shows that the ages of respondents (n=259) varied as follows: Those who were less than 30 years (2%; n=6); 30-40 (16%; n=41); 40-45 (16%; n=41); 46-60 (38%; n=99), and more than 60 years (44%; n=113).

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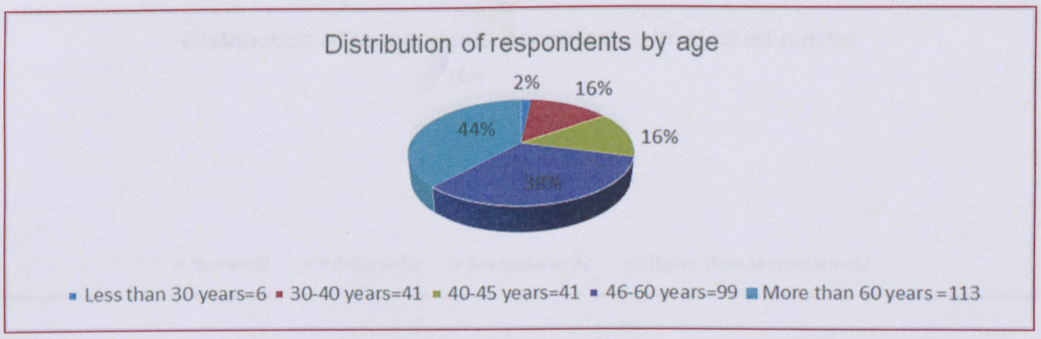


Figure 4.1: Distribution of respondents according to age

4.2.1.2 Gender of Respondents

Figure 4.2 displays that of the 259 respondents, 184 (71) % were females and 75 (29%) were males.

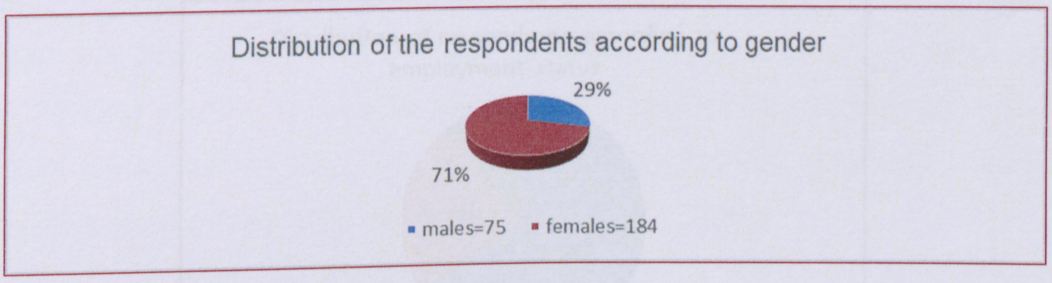


Figure 4.2: Distribution of respondents according to gender

4.2.1.3 Level of Education of Respondents

Figure 4.3 illustrates that just 97 (38%) of the respondents had secondary school education and only 42 respondents (16%) had higher than secondary educational qualifications. Of the respondents, 68 (26%) had no education and 52 (20%) only completed primary school.

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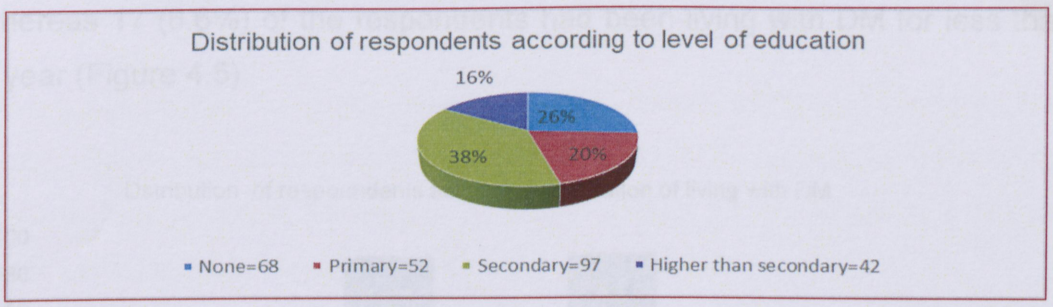


Figure 4.3: Distribution of respondents according to level of education

4.2.1.4 Employment Status of Respondents

Figure 4.4 summarizes the employment status of the respondents. Of the 259 respondents, 171 (66%) were unemployed, 60 (23%) were employed and 28 (11%) were self-employed.

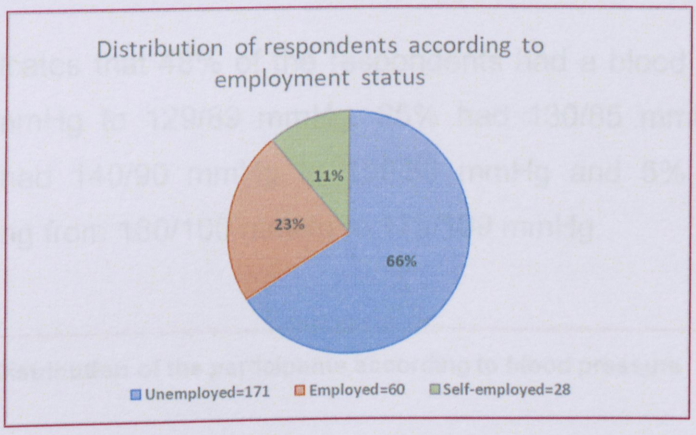


Figure 4.4: Distribution of respondents according to employment status

4.2.2 Clinical Characteristics of Respondents

4.2.2.1 Distribution of Respondents According to Duration of Living with Diabetes

About 90 (34.7%) of respondents had been living with DM for 6-10 years,

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whereas 17 (6.6%) of the respondents had been living with DM for less than a year (Figure 4.5).

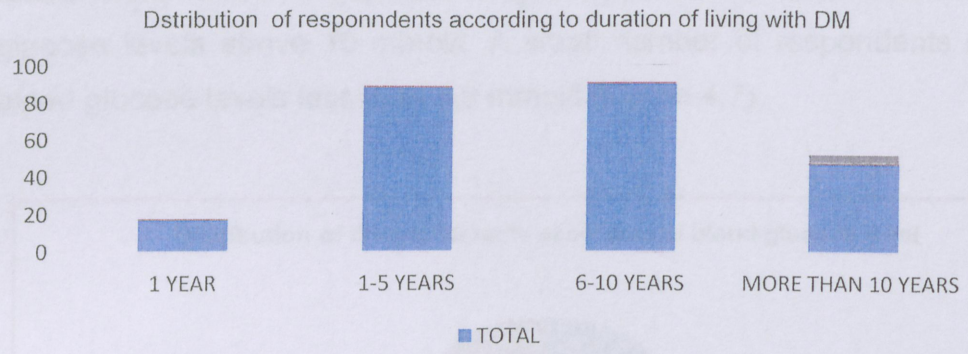


Figure 4.5: Distribution of respondents according to duration of living with diabetes

4.2.2.2 Distribution of Respondents According to Blood Pressure

Figure 4.6 indicates that 48% of the respondents had a blood pressure less than 120/85 mmHg to 129/89 mmHg, 25% had 130/85 mmHg to 139/89 mmHg, 22% had 140/90 mmHg to 159/89 mmHg and 5% had a blood pressure ranging from 160/100 mmHg to 179/109 mmHg.

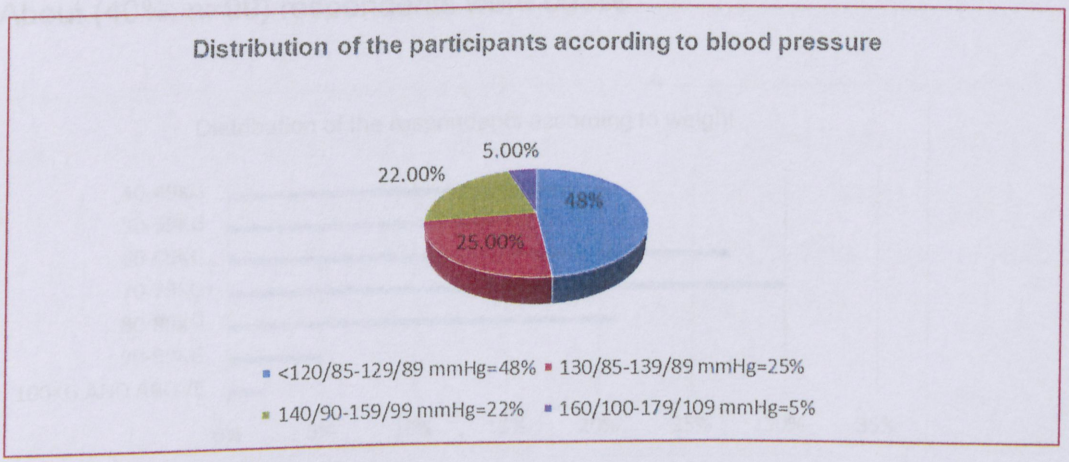


Figure 4.6: Distribution of respondents according to blood pressure

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4.2.2.3 Distribution of Respondents According to Blood Glucose Level

During the process of data collection, (57%) respondents had blood glucose levels within normal acceptable ranges; about (42%) respondents had blood glucose levels above 10 mmol/l. A small number of respondents (1%) had blood glucose levels less than 3.9 mmol/l (Figure 4.7).

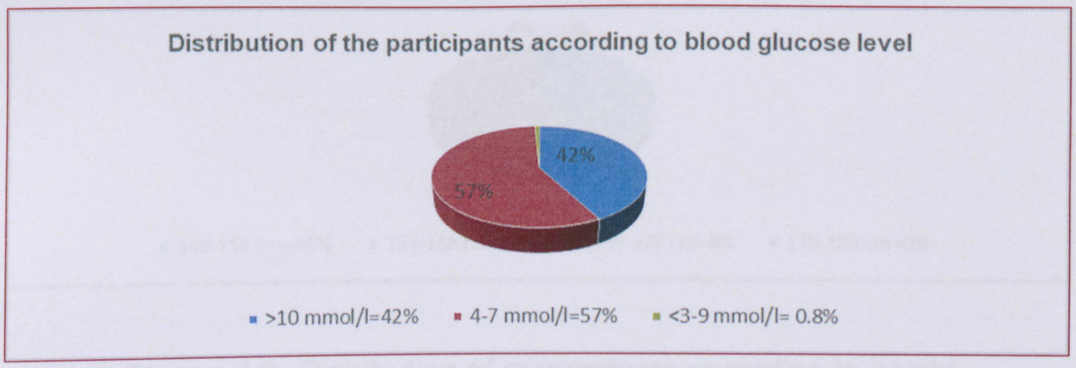


Figure 4.7: Distribution of respondents according to blood glucose level

4.2.2.4 Distribution of Respondents According to Weight

Distribution of the respondents' weight is outlined in Figure 4.8. Findings of the study reveal that about 38% (n=95) of respondents were overweight. About (40%; n=99) respondents were obese.

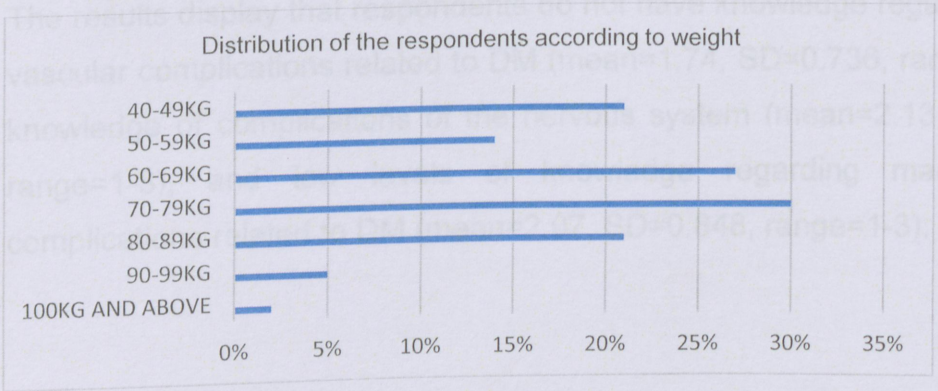


Figure 4.8: Distribution of respondents according to weight

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4.2.2.5 Distribution of Respondents According to Height

Figure 4.9 shows that about 0.4% of respondents' height was ranging from 179 to 188 cm, 4% ranged from 169 to 178 cm, 45% from 149 to 158 cm and 51% ranged from 159-168 cm.

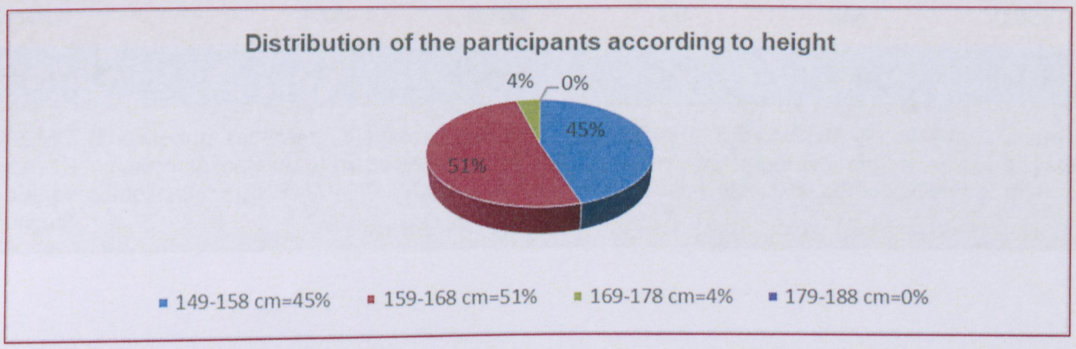


Figure 4.9: Distribution of respondents according to height

4.2.3 Summary of Responses to the Research Instrument

Table 4.1 summarizes the respondents' responses to the research instruments and lists the instruments established reliability coefficients. Patients on average have knowledge regarding chronic complications of DM (mean=1.18, SD=0.383, range=1-2).

The results display that respondents do not have knowledge regarding micro-vascular complications related to DM (mean=1.74, SD=0.736, range=1-3), no knowledge of complications of the nervous system (mean=2.13, SD=0.798, range=1-3), and low levels of knowledge regarding macro-vascular complications related to DM (mean=2.07, SD=0.848, range=1-3).

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Table 4.1: Summary statistics and reliability coefficients of the study's instruments

Instrument	Mean	SD	Range	N	Reliability
KRDMC	1.18	0.383	1-2	259	0.70
KRMIVCDM	1.74	0.736	1-3	259	0.799
KRNS	2.13	0.798	1-3	258	0.823
KRMAVCDM	2.07	0.848	1-3	258	0.719

KRDMC (knowledge regarding diabetes mellitus complications); KRMIVCDM (knowledge regarding micro vascular complications of diabetes mellitus); KRNS (knowledge regarding central nervous system diabetes complications); KRMAVCDM (knowledge regarding macro vascular complications of diabetes mellitus)

4.2.4 Knowledge of Self-Care Practices, Control and Management of Diabetes Mellitus and Selected Demographic Factors

In this section, a Chi-square analysis was conducted to examine the relationship between various demographic characteristics and knowledge regarding self-care practices, control, and management of diabetes mellitus. Table 4.2 summarizes statistics according to demographic breakdown for KRDMC, KRMIVCDM, KRNSCDM and KRMAVCDM. Table 4.3 shows that the knowledge regarding self-care practices, control, and management of DM is independent of age, gender, level of education and the duration of living with DM.

The age of a diabetic patient does not determine the level at which one acquires knowledge regarding self-care practices, control, and management of DM (X^2=0 5.017, p=0.171). Also, in Table 4.4, it is evident that knowledge regarding self-care practices, control, and management of DM is shown to be independent of the respondents' gender (X^2=0.923, p=0.337). Moreover, with regard to the level of education (Table 4.5), the results show that the respondents' level of education does not play a role in determining their level of knowledge regarding self-care practices, control, and management of

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diabetes DM (X^2=1.252, p=0.741). Finally, the time that an individual has lived with the condition (Table 4.6) does not determine the knowledge regarding self-care practices, control, and management of DM (X^2=0.851, p=0.932).

4.2.5 Knowledge of Micro-Vascular Complications Related to Diabetes Mellitus and Selected Demographic Factors

A Chi-square analysis was conducted to examine the relationship between various demographic characteristics and the knowledge regarding micro-vascular complications related to DM. Table 4.7 shows age and level of education are all significantly related to patients' knowledge regarding micro-vascular complications related to DM while gender and duration of illness with the condition are shown to be statistically insignificant to the dependent variable.

Patients' age determines their level of knowledge regarding micro-vascular complications related to DM (X^2=14.743, p=0.022). Knowledge regarding micro-vascular complications related to DM also depends on their level of education (X^2=20.642, p=0.002; Table 4.9). Conversely, knowledge regarding micro-vascular complications related to DM were shown to be independent of gender (X^2=3.388, p=0.184; Table 4.8) and the duration of living with DM (X^2=11.786, p=0.161; Table 4.10).

4.2.6 Knowledge of Complications Related to the Nervous System and Selected Demographic Factors

To examine whether some demographic factors influence knowledge of complications related to the nervous system, we conducted a Chi-square analysis to answer the question. Gender (Table 4.11) and level of education (Table 4.13) are all significantly related to patients' knowledge of complications related to the nervous system while age (Table 4.11) and duration of illness (Table 4.14) with the condition are shown to be statistically

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not having any influence on the dependent variable.

Patients' gender (Table 4.12) and level of education (Table 4.13) determine their level of knowledge of complications related to the nervous system (X^2=11.603, p=0.003) and (X^2=17.451, p=0.008), respectively. Knowledge of complications related to the nervous system does not depend on patients' age (X^2=11.305, p=0.079; Table 4.11) and duration of living with DM (X^2=8.624, p=0.375; Table 4.14).

4.2.7 Knowledge of Macro-Vascular Complications Related to Diabetes Mellitus and Selected Demographic Factors

A Chi-square analysis was conducted to examine the relationship between various demographic characteristics and the knowledge regarding macro-vascular complications related to DM. Table 4.16 shows that gender is insignificantly related to patients' knowledge regarding macro-vascular complications related to DM while age (Table 4.15), level of education (Table 4.17) and duration of illness (Table 4.18) with the condition are shown to be statistically significant to the dependent variable.

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Table 4.2: Summary statistics according to demographic breakdown for KRDMC, KRMIVCDM, KRNSCDM and KRMAVCDM

Variable		N	KRDMC		KRMIVCDM		KRNSCDM		KRMAVCDM	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total		259	1.18	0.383	1.74	0.736	2.13	0.798	2.07	0.848
Gender	Male	75	1.21	0.412	1.63	0.673	2.09	0.701	2.17	0.812
	Female	184	1.16	0.370	1.79	0.757	2.15	0.835	2.03	0.861
Age	Less than 30 years	6	1.33	0.516	1.17	0.408	1.50	0.548	1.17	0.408
	30-40	41	1.07	0.264	1.59	0.706	1.95	0.865	1.73	0.867
	46-60	99	1.17	0.379	1.68	0.667	2.10	0.780	2.07	0.828
	More than 60 years	113	1.21	0.411	1.88	0.788	2.26	0.777	2.24	0.816
Level of Education	None	68	1.22	0.418	2.03	0.772	2.44	0.741	2.41	0.738
	Primary school	52	1.17	0.382	1.71	0.750	2.10	0.774	2.02	0.804
	Secondary	97	1.15	0.363	1.70	0.710	2.01	0.814	1.98	0.917
	Higher than secondary	42	1.17	0.377	1.40	0.544	1.95	0.764	1.79	0.750
Duration of living with diabetic mellitus	Less than 1 year	17	1.18	0.393	1.59	0.870	2.00	0.866	1.71	0.985
	1 year	17	1.24	0.437	1.76	0.664	2.24	0.752	2.18	0.809
	1-5 years	88	1.19	0.397	1.73	0.754	2.02	0.821	1.94	0.894
	6-10 years	90	1.16	0.364	1.78	0.683	2.30	0.741	2.27	0.761
	More than 10 years	47	1.17	0.380	1.74	0.793	2.02	0.821	2.02	0.821

KRDMC (knowledge regarding diabetes mellitus complications); KRMIVCDM (knowledge regarding micro vascular complications of diabetes mellitus); KRNS (knowledge regarding nervous system diabetes complications); KRMAVCDM (knowledge regarding macro vascular complications of diabetes mellitus)

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Table 4.3: Respondents' knowledge of self-care practices, control and management of diabetes mellitus according to age group

Variable			Knowledge regarding self-care practices, control, and management			Statistic	X^2value	df	p-value
			Yes	No	Total				
Age	Less than 30 years	Count	4	2	6				
		Expected Count	4.9	1.1	6	Pearson Chi-Square	5.017[a]	3	0.171
	30-40 years	Count	38	3	41	Likelihood Ratio	5.520	3	0.137
		Expected Count	33.7	7.3	41	Linear-by-Linear Association	1.672	1	0.196
	46-60 years	Count	82	17	99	No. of Valid Cases	259		
		Expected Count	81.4	17.6	99				
	More than 60 years	Count	89	24	113				
		Expected Count	92.9	20.1	113				
Total (n)		Count	213	46	259				
		Expected Count	213	46	259				

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Table 4.4: Respondents' knowledge of self-care practices, control and management of diabetes mellitus according to gender

Variable			Knowledge regarding self-care practices, control and management			Statistic	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
			Yes	No	Total						
Gender	Male	Count	59	16	75	Pearson Chi-Square	0.923[a]	1	0.337		
		Expected Count	61.7	13.3	75	Continuity Correction	0.610	1	0.435		
	Female	Count	154	30	184	Likelihood Ratio	0.897	1	0.343		
		Expected Count	151.3	32.7	184						
Total (n)		Count	213	46	259						
		Expected Count	213	46	259						

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Table 4.5: Respondents' knowledge of self-care practices, control and management of diabetes mellitus according to education level

Variable			Knowledge regarding self-care practices, control and management			Statistic	X^2-value	df	p-value
			Yes	No	Total				
What is your level of education?	None	Count	53	15	68	Pearson Chi-Square	1.252[a]	3	0.741
		Expected Count	55.9	12.1	68	Likelihood Ratio	1.217	3	0.749
	Primary school	Count	43	9	52	Linear-by-Linear Association	0.886	1	0.3
		Expected Count	42.8	9.2	52	No. of Valid Cases	259		
	Secondary	Count	82	15	97				
		Expected Count	79.8	17.2	97				
	Higher than secondary	Count	35	7	42				
		Expected Count	34.5	7.5	42				
Total (n)		Count	213	46	259				
		Expected Count	213	46	259				

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Table 4.6: Respondents' knowledge of self-care practices, control and management of diabetes mellitus according to duration of diabetic mellitus

Variable			Knowledge regarding self-care practices, control and management			Statistic	X^2-value	df	p-value
			Yes	No	Total				
How long have you been living with diabetes?	Less than 1 year	Count	14	3	17	Pearson Chi-Square	0.851	4	0.932
		Expected Count	14	3	17	Likelihood Ratio	0.830	4	0.931
	1 year	Count	13	4	17	Linear-by-Linear Association	0.304	1	0.582
		Expected Count	14	3	17	No. of Valid Cases	259		
	1-5 years	Count	71	17	88				
		Expected Count	72.4	15.6	88				
	6-10 years	Count	76	14	90				
		Expected Count	74	16	90				
	More than 10 years	Count	39	8	47				
		Expected Count	38.7	8.3	47				
Total (n)		Count	213	46	259				

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4.2.8 Knowledge About Self-Care Practice, Control and Management of Diabetes Mellitus (Frequency table)

Table 4.7: Respondents' who took medication without missing doses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	236	90.8	91.1	91.1
	No	23	8.8	8.9	100.0
	Total	259	100.0	100.0	
Missing	System	0	.0		
Total		259	100.0		

Table 4.8: Respondents' assistance with taking of medication.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yourself	225	86.5	86.9	86.9
	Family members	34	13.1	13.1	100.0
	Total	259	100.0	100.0	
Missing	System	0	.0		
Total		259	100.0		

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Table 4.9: Respondents' necessity for taking medication.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	To control sugar level	219	84.2	84.6	84.6
	To lower blood sugar level	40	15.4	15.4	100.0
	Total	259	100.0	100.0	
Missing	System	0	.0		
Total		259	100.0		

Table 4.10: Type of medication taken by respondents for diabetes mellitus.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Injection	30	11.5	11.6	11.6
	Tablets	229	88.1	88.4	100.0
	Total	259	100.0	100.0	
Missing	System	0	.0		
Total		259	100.0		

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Table 4.11: Practice of blood glucose self-monitoring on daily basis by respondents.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	30	11.5	11.7	11.7
	No	226	86.9	88.3	100.0
	Total	256	98.5	100.0	
Missing	System	3	1.1		
Total		259	100.0		

Table 4.12: Respondents' frequency of monitoring blood sugar level per day.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once	26	10.0	55.3	55.3
	Twice	7	2.7	14.9	70.2
	Three times	1	.4	2.1	72.3
	Others	13	5.0	27.7	100.0
	Total	46	17.7	100.0	
Missing	System	213	82.2		
Total		259	100.0		

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Table 4.13: Respondents who visited clinic for regular blood sugar monitoring.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	250	96.5	96.5	96.5
	No	7	2.7	2.7	99.6
	Don't know	1	.4	.4	100.0
	Total	258	99.6	100.0	
Missing	System		0		
Total		259	100.0		

Table 4.14: Respondents' frequency of visit clinic for regular blood sugar monitoring.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Once a week	14	5.4	5.4	5.4
	Once a month	241	93.0	93.1	98.5
	Once a year	2	.8	.8	99.2
	Others	2	.8	.8	100.0
	Total	259	100.0	100.0	
Missing	System	0	0		
Total		259	100.0		

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Table 4.15: Respondents who experienced thirst, dizziness, fatigue, headache, blurred vision and sweating.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	108	41.6	42.2	42.2
	No	147	56.5	57.4	99.6
	Don't know	1	.4	.4	100.0
	Total	256	98.5	100.0	
Missing	System	3	1.1		
Total		259	100.0		

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Table 4.16: What respondents did when experiencing thirst, dizziness, fatigue, headache, blurred vision and sweating.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Visit nearest clinic/medical practitioner	60	23.1	50.4	50.4
	Sleep	23	8.8	19.3	69.7
	Takes snacks	12	4.6	10.1	79.8
	Check blood glucose level	17	6.5	14.3	94.1
	Others	7	2.7	5.9	100.0
	Total	119	45.8	100.0	
Missing	System	140	54.0		
Total		259	100.0		

Table 4.17: Necessity of carrying snacks by respondents to prevent low blood sugar level.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	231	88.8	89.5	89.5
	No	27	10.4	10.5	100.0
	Total	258	99.2	100.0	
Missing	System	1	0.3		
Total		259	100.0		

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Table 4.18: Carrying of snacks by respondents all time when they travel.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	193	74.	74.8	74.8
	No	65	25.0	25.2	100.0
	Total	258	99.2	100.0	
Missing	System	1	0.3		
Total		259	100.0		

Table 4.19: Reason of carrying snacks when travelling.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	To keep your sugar within normal ranges	81	31.2	38.4	38.
	To prevent low blood sugar	114	43.8	54.0	92.4
	To raise blood sugar level	9	3.5	4.3	96.7
	Others	5	1.9	2.4	99.1
	5	2	.8	.9	100.0
	Total	211	81.2	100.0	
Missing	System	48	18.5		
Total		259	100.0		

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Table 4.20: Types of snacks that respondents carry.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Green Apple	92	35.4	41.6	41.6
	Bread with peanut butter	25	9.6	11.3	52.9
	Sweets	72	27.7	32.6	85.5
	Cake	2	.8	.9	86.4
	Others	30	11.5	13.6	100.0
	Total	221	85.0	100.0	
Missing	System	38	14.6		
Total		259	100.0		

Table 4.21: Necessity of consuming high fiber diet.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	232	89.5	89.6	89.6
	No	26	10.0	10.0	99.6
	5	1	.4	.4	100.0
	Total	259	99.6	100.0	
Missing	System	0	0		
Total		259	100.0		

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Table 4.22: Respondents who had machine to monitor blood glucose at home (glucometer).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	55	21.2	21.2	21.2
	No	196	75.4	75.7	96.9
	Don't know	8	3.1	3.1	100.0
	Total	259	99.6	100.0	
Missing	System	0	0		
Total		259	100.0		

Table 4.23: How respondents took care of their eyes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Apply an eye ointment	22	8.5	8.6	8.6
	Wear sun glasses	54	20.8	21.0	29.6
	Visit eye sister/ophthalmologist	67	25.8	26.1	55.6
	Others	113	43.5	44.0	99.6
	5	1	.4	.4	100.0
	Total	257	99.2	100.0	
Missing	System	2	0.7		
Total		259	100.0		

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Table 4.24: Respondents' last time of visiting eye practitioners e.g. ophthalmologist?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 week	9	3.5	3.5	3.5
	Less than 1 month	24	9.2	9.3	12.7
	Less than 6 month	26	10.0	10.0	22.8
	Less than 1 year	44	16.9	17.0	39.8
	Never visited eye practitioners	81	31.2	31.3	71.0
	7	1	.4	.4	100.0
	Total	259	100.0	100.0	
Missing	System	0	0		
Total		259	100.0		

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Table 4.25: Respondents who did regular exercises.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	178	68.5	68.7	68.7
	No	75	28.8	29.0	97.7
	Don't know	5	1.9	1.9	99.6
	4	1	.4	.4	100.0
	Total	259	100.0	100.0	
Missing	System	0	0		
Total		259	100.0		

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Table 4.26: Respondents' knowledge of micro-vascular complications related to diabetes mellitus according to age group

Variable			KRMIVCDM				Statistic	χ^2-value	df	p-value
			Yes	No	Don't Know	Total				
Age	Less than 30 years	Count	5	1	0	6	Pearson Chi-Square	14.743[a]	6	0.022
		Expected Count	2.6	2.4	1	6	Likelihood Ratio	15.298	6	0.018
	30-40 years	Count	22	14	5	41	Linear-by-Linear Association	9.810	1	0.002
		Expected Count	17.7	16.1	7.1	41	No. of Valid Cases	259		
	46-60 years	Count	43	45	11	99				
		Expected Count	42.8	39	17.2	99				
	More than 60 years	Count	42	42	29	113				
		Expected Count	48.9	44.5	19.6	113				
Total (n)		Count	112	102	45	259				
		Expected Count	112	102	45	259				

KRMIVCDM=Knowledge Regarding Micro-Vascular Complications Related to Diabetes Mellitus

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Table 4.27: Respondents' knowledge of micro-vascular complications related to diabetes mellitus according to gender

Variable			KRMIVCDM= Knowledge Regarding Micro-Vascular Complications Related to Diabetes Mellitus				Statistic	χ^2-value	df	p-value
			Yes	No	Don't Know	Total				
Gender	Male	Count	36	31	8	75	Pearson Chi-Square	3.388[a]	2	0.184
		Expected Count	32.4	29.5	13	75	Likelihood Ratio	3.651	2	0.161
	Female	Count	76	71	37	184	Linear-by-Linear Association	2.563	1	0.109
		Expected Count	79.6	72.5	32	184	No. of Valid Cases	259		
Total (n)		Count	112	102	45	259				
		Expected Count	112	102	45	259				

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Table 4.28: Respondents' knowledge of micro-vascular complications related to diabetes mellitus according to level of education

Variable			KRMIVCDM				Statistic	χ^2-value	df	p-value
			Yes	No	Don't Know	Total				
Level of Education	None	Count	19	28	21	68	Pearson Chi-Square	20.642[a]	6	0.002
		Expected Count	29.4	26.8	11.8	68	Likelihood Ratio	22.636	6	0.001
	Primary school	Count	24	19	9	52	Linear-by-Linear Association	17.450	1	0.000
		Expected Count	22.5	20.5	9	52	No. of Valid Cases	259		
	Secondary school	Count	43	40	14	97				
		Expected Count	41.9	38.2	16.9	97				
	Higher than secondary school	Count	26	15	1	42				
		Expected Count	18.2	16.5	7.3	42				
Total (n)		Count	112	102	45	259				
		Expected Count	112	102	45	259				

KRMIVCDM=Knowledge Regarding Micro-Vascular Complications Related to Diabetes Mellitus

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Table 4.29: Respondents' knowledge of micro-vascular complications related to DM according to duration of illness

Variable			KRMIVCDM				Statistic	X^2-value	df	p-value
			Yes	No	Don't Know	Total				
Duration of illness with diabetes mellitus	Less than 1 year	Count	11	2	4	17	Pearson Chi-Square	11786[a]	8	0.161
		Expected Count	7.4	6.7	3	17	Likelihood Ratio	12.696	8	0.123
	1 year	Count	6	9	2	17	Linear-by-Linear Association	0.443	1	0.506
		Expected Count	7.4	6.7	3	17	No. of Valid Cases	259		
	1-5 years	Count	40	32	16	88				
		Expected Count	38.1	34.7	15.3	88				
	6-10 years	Count	33	44	13	90				
		Expected Count	38.9	35.4	15.6	90				
	More than 10 years	Count	22	15	10	47				
		Expected Count	20.3	18.5	8.2	47				
Total (n)		Count	112	102	45	259				
		Expected Count	112	102	45	259				

KRMIVCDM=Knowledge Regarding Micro-Vascular Complications Related to Diabetes Mellitus

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Table: 4.30 Knowledge regarding micro-vascular complications of diabetes mellitus

		n=259 n (%)
Respondents knowledge that uncontrolled diabetes mellitus causing diabetes complications.		
Yes		222(86%)
No		2(0.7%)
C=Don't know		35(14%)
Respondents' awareness that unmanaged diabetes mellitus can affect your kidneys.		
Yes		121(47%)
No		6(2.3%)
Don't know		132(51%)
Respondents' awareness that unmanaged diabetes mellitus can cause eye problems or blindness.		
Yes		205(79%)
No		1(0.4%)
Don't know		47(18%)
Respondents' awareness that uncontrolled diabetes mellitus can cause feet problems.		
Yes		143(55%)
No		7(3%)
Don't know		109(42%)
Respondents' awareness that uncontrolled diabetes mellitus can cause hands problems.		
Yes		99(38%)
No		0(0%)
Don't know		160(62.2%)

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Table 4.31: Respondents' knowledge of complications of the nervous system according to age group

Variable			KRNS				Statistic	χ^2-value	df	p-value
			Yes	No	Don't Know	Total				
Age	Less than 30 years	Count	3	3	0	6	Pearson Chi-Square	11.305[a]	6	0.079
		Expected Count	1.6	2.1	2.3	6	Likelihood Ratio	13.068	6	0.042
	30-40 years	Count	16	11	14	41	Linear-by-Linear Association	8.109	1	0.004
		Expected Count	10.6	14.3	16.1	41	No. of Valid Cases	258		
	46-60 years	Count	25	38	35	98				
		Expected Count	25.4	34.2	38.4	98				
	More than 60 years	Count	23	38	52	113				
		Expected Count	29.3	39.4	44.2	113				
Total (n)		Count	67	90	101	258				
		Expected Count	67	90	101	258				

KRNS=Knowledge Related to Complications of the Nervous System

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Table 4.32: Respondents' knowledge of complications of the nervous system according to gender

Variable		KRNS= Knowledge Related to Complications of the Nervous System				Statistic	χ^2-value	df	p-value
		Yes	No	Don't Know	Total				
Gender	Male	Count	15	38	22	75	Pearson Chi-Square	11.603[a]	2	0.003
		Expected Count	19.5	26.2	29.4	75	Likelihood Ratio	11.318	2	0.003
	Female	Count	52	52	79	183	Linear-by-Linear Association	0.246	1	0.620
		Expected Count	47.5	63.8	71.6	183	No. of Valid Cases	258		
Total (n)		Count	67	90	101	258				
		Expected Count	67	90	101	258				

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Table 4.33: Respondents' knowledge of complications of the nervous system according to level of education

Variable			KRNS				Statistic	χ^2-value	df	p-value
			Yes	No	Don't Know	Total				
Level of Education	None	Count	10	18	40	68	Pearson Chi-Square	17.451[a]	6	0.008
		Expected Count	17.7	23.7	26.6	68	Likelihood Ratio	17.384	6	0.008
	Primary school	Count	13	21	18	52	Linear-by-Linear Association	12.651	1	0.000
		Expected Count	13.5	18.1	20.4	52	No. of Valid Cases	258		
	Secondary school	Count	31	33	32	96				
		Expected Count	24.9	33.5	37.6	96				
	Higher than secondary school	Count	13	18	11	42				
		Expected Count	10.9	14.7	16.4	42				
Total (n)		Count	67	90	101	258				
		Expected Count	67	90	101	258				

KRNS=Knowledge Related to Complications of the Nervous System

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Table 4.34: Respondents' knowledge of complications of the nervous system according to duration of illness

Variable			KRNS				Statistic	X^2-value	df	p-value
			Yes	No	Don't Know	Total				
Duration of illness with diabetes mellitus	Less than 1 year	Count	6	5	6	17	Pearson Chi-Square	8.624[a]	8	0.375
		Expected Count	4.4	5.9	6.7	17	Likelihood Ratio	8.887	8	0.352
	1 year	Count	3	7	7	17	Linear-by-Linear Association	0.298	1	0.585
		Expected Count	4.4	5.9	6.7	17	No. of Valid Cases	258		
	1-5 years	Count	28	29	30	87				
		Expected Count	22.6	30.3	34.1	87				
	6-10 years	Count	15	33	42	90				
		Expected Count	23.4	31.4	35.2	90				
	More than 10 years	Count	15	16	16	47				
		Expected Count	12.2	16.4	18.4	47				
Total (n)		Count	67	90	101	258				
		Expected Count	67	90	101	258				

KRNS=Knowledge Related to Complications of the Nervous System

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Table: 4.35 Respondents' Knowledge regarding nervous system complications

		n=259 n (%)
Respondents' awareness that diabetes mellitus Complications results in feeling of feet and hands numbness or tingling sensation.		
Yes		113(44%)
No		1(0%)
Don't know		145(56%)
Respondents' awareness that diabetes mellitus complications results in feeling of pins and needles/pain in feet and hands.		
Yes		156(60%)
No		5(2%)
Don't know		98(38%)
Respondents' awareness that diabetes mellitus complications results in sensory loss and later followed by loss of motor function.		
Yes		107(41%)
No		3(1%)
Don't know		149(58%)
Respondents' awareness that diabetes mellitus complications results in sexual dysfunction.		
Yes		157(61%)
No		4(2%)
Don't know		97(37%)
Respondents' awareness that diabetes mellitus complication results in loss of protective sensation.		
Yes		102(39%)
No		2(1%)
Don't know		154(60%)
Respondents' awareness that diabetes mellitus complication results in bowel incontinence, urinary retention and diarrhoea.		
Yes		76(29%)
No		13(5%)
Don't know		170(66%)
Respondents' awareness that diabetes mellitus complication results in anorexia, nausea, vomiting, and feeling of fullness.		
Yes		65(25%)
No		15(6%)

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Table 4.36: Respondents' knowledge of macro-vascular complications related to diabetes mellitus according to age group

Variable			KRMAVCDM				Statistic	X^2-value	df	p-value
			Yes	No	Don't Know	Total				
Age	Less than 30 years	Count	5	1	0	6	Pearson Chi-Square	20.950[a]	6	0.002
		Expected Count	2	1.7	2.4	6	Likelihood Ratio	21.463	6	0.002
	30-40 years	Count	22	8	11	41	Linear-by-Linear Association	16.279	1	0.000
		Expected Count	13.3	11.4	16.2	41	No. of Valid Cases	258		
	46-60 years	Count	30	31	37	98				
		Expected Count	31.9	27.3	38.7	98				
	More than 60 years	Count	27	32	54	113				
		Expected Count	36.8	31.5	44.7	113				
Total (n)		Count	84	72	102	258				
		Expected Count	84	72	102	258				

KRMAVCDM=Knowledge Regarding Macro-Vascular Complications of Diabetes Mellitus

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Table 4.37: Respondents' knowledge of macro-vascular complications related to diabetes mellitus according to gender

Variable			KRMAVCDM=Knowledge Regarding Macro-Vascular Complications of Diabetes Mellitus				Statistic	X^2-value	df	p-value
			Yes	No	Don't Know	Total				
Gender	Male	Count	19	24	32	75	Pearson Chi-Square	2.592[a]	2	0.274
		Expected Count	24.4	20.9	29.7	75	Likelihood Ratio	2.658	2	0.265
	Female	Count	65	48	70	183	Linear-by-Linear Association	1.578	1	0.209
		Expected Count	59.6	51.1	72.3	183	No. of Valid Cases	258		
Total (n)		Count	84	72	102	258				
		Expected Count	84	72	102	258				

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Table 4.38: Respondents' knowledge of macro-vascular complications related to diabetes mellitus according to level of education

Variable			KRMAVCDM				Statistic	X^2-value	df	p-value
			Yes	No	Don't Know	Total				
Level of Education	None	Count	10	20	38	68	Pearson Chi-Square	28.422[a]	6	0.000
		Expected Count	22.1	19	26.9	68	Likelihood Ratio	30.715	6	0.000
	Primary school	Count	16	19	17	52	Linear-by-Linear Association	15.293	1	0.000
		Expected Count	16.9	14.5	20.6	52	No. of Valid Cases	258		
	Secondary school	Count	41	16	39	96				
		Expected Count	31.3	26.8	38	96				
	Higher than secondary school	Count	17	17	8	42				
		Expected Count	13.7	11.7	16.6	42				
Total (n)		Count	84	72	102	258				
		Expected Count	84	72	102	258				

KRMAVCDM=Knowledge Regarding Macro-Vascular Complications of Diabetes Mellitus

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Table 4.39: Respondents' knowledge of macro-vascular complications related to diabetes mellitus according to duration of illness

Variable			KRMAVCDM				Statistic	X^2-value	df	p-value
			Yes	No	Don't Know	Total				
Duration of illness with diabetes mellitus	Less than 1 year	Count	11	0	6	17	Pearson Chi-Square	24.310[a]	8	0.002
		Expected Count	5.5	4.7	6.7	17	Likelihood Ratio	28.503	8	0.000
	1 year	Count	4	6	7	17	Linear-by-Linear Association	2.658	1	0.103
		Expected Count	5.5	4.7	6.8	17	No. of Valid Cases	258		
	1-5 years	Count	37	18	32	87				
		Expected Count	28.3	24.3	34.4	87				
	6-10 years	Count	17	32	41	90				
		Expected Count	29.3	25.1	35.6	90				
	More than 10 years	Count	15	16	16	47				
		Expected Count	15.3	13.1	18.6	47				
Total (n)		Count	84	72	102	258				
		Expected Count	84	72	102	258				

KRMAVCDM=Knowledge Regarding Macro-Vascular Complications of Diabetes Mellitus

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Table 4.40: Respondents' Knowledge regarding macro vascular complications of diabetes mellitus

		n=259 n (%)
Respondents' awareness that diabetes that uncontrolled diabetes mellitus can cause ischaemic heart disease.		
Yes		104(40%)
No		13(5%)
Don't know		142(55%)
Respondents' awareness that diabetes that uncontrolled diabetes mellitus can cause stroke.		
Yes		123(47%)
No		12(5%)
Don't know		124(48%)

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Table: 4.41 Respondents' Knowledge regarding nervous system complications.

			n=259 n (%)
Respondents' awareness that diabetes mellitus Complications results in feeling of feet and hands numbness or tingling sensation.			
Yes			113(44%)
No			1(0%)
Don't know			145(56%)
Respondents' awareness that diabetes mellitus complications results in feeling of pins and needles/pain in feet and hands.			
Yes			156(60%)
No			5(2%)
Don't know			98(38%)
Respondents' awareness that diabetes mellitus complications results in sensory loss and later followed by loss of motor function.			
Yes			107(41%)
No			3(1%)
Don't know			149(58%)
Respondents' awareness that diabetes mellitus complication results in sexual dysfunction.			
Yes			157(61%)
No			4(2%)
Don't know			97(37%)

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Respondents' awareness that diabetes mellitus complication results in loss of protective sensation.			
Yes			102(39%)
No			2(1%)
Don't know			154(60%)
Respondents' awareness that diabetes mellitus complication results in bowel incontinence, urinary retention and diarrhoea.			
Yes			76(29%)
No			13(5%)
Don't know			170(66%)
Respondents' awareness that diabetes mellitus complication results in anorexia, nausea, vomiting, and feeling of fullness.			
Yes			65(25%)
No			15(6%)
Don't know			179(69%)

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Table: 4.42 Challenges faced by Respondents due to chronic complications of diabetes mellitus in Vhembe district

		n=259 n (%)
Respondents' who had complications related to diabetes mellitus.		
Yes		147(57.0%)
No		111(43%)
Don't know		1(0%)
Complications that respondents had, related to diabetes mellitus.		
Eye		89(34%)
Heart		3(1%)
Kidneys		13(5%)
Foot		25(10%)
Sexuality		17(7%)
Participants who had challenges due to diabetes mellitus complications.		
Yes		88(34%)
No		171(66%)
Challenges that participants were faced with.		
Lack of support system		10(4%)
Poor work performance		15(6%)
Sexual dysfunction		23(9%)
Depression		40(15%)

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4.2.8 Summary

The presentation of the study findings in this chapter was executed using charts and tables. Chi-square results were also presented to illustrate the relationship between various demographic characteristics and knowledge regarding self-care practices, control, and management of diabetes mellitus. Chapter 5 deals with the discussion and interpretation of the research findings.

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CHAPTER 5

DISCUSSION AND INTERPRETATION OF THE FINDINGS

5.1 Introduction

The previous sections presented the study findings. This section deals with the discussion and interpretation of the research findings as summarized in Tables 4.3 to 4.18.

The following are presented:

- **Demographic Characteristics of the Respondents** (age, gender, level of education and employment status);
- **Clinical Characteristics of Respondents** (blood pressure, blood glucose level, height, weight and duration of living with DM);
- **Respondents' Knowledge of Self-Care Practice, Control and Management of DM**;
- **Respondents' Knowledge of Micro-Vascular Complications of DM**;
- **Respondents' Knowledge of Macro-Vascular Complications of DM**;
- **Respondents' Knowledge of Complications of the Nervous System**;
- **Challenges that are Faced by Diabetic Patients Regarding Chronic Complications of DM** in the Vhembe district of the Limpopo Province.

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5.2 Demographic Data

5.2.1 Age of the Respondents

A large number of respondents were in the older age group, 46-60 (39%; n=96), more than 60 years (43%; n=107). These results indicated that DM is common amongst people between 46-60 and those above 60 years, presumably because old age groups in rural areas are more likely to utilize public health services than younger age groups. Though DM can occur at any age, the other reason might be that DM is usually common at the age of 35 years or older (Lewis et. al, 2011:1219).

In support with the above statement, the respondents younger than 30 years might be few because young age group are likely to be financially independent and afford private health care services for follow-up care and DM management. This might explain the lower percentage of respondents lower than 30 years than older group in this study. Younger people who are financially independent often have a good self-esteem, self-motivation and personal competence, which, according to the health promotion model influence a positive behavior towards health.

The greater percentage of respondents in the older age group in this study is consistent with the findings from other studies in SA. The study that was conducted in Durban, South Africa, assessed the level of diabetic patients' knowledge of DM, its complications and management among 106 respondents aged 30 years and older; a large number (67%) of the respondents were elderly people between 50 and 69 years (Mashige et al., 2008:98).

This finding contrasts with finding of Al-Dahan et al.(2013:109) who assessed knowledge of diabetes among Al-Wazarat Family Medicine Health Centre attendants, and the results showed that most (42%) of the respondents were less than 30 years, (45.6%) were 30-49 years of age and (12.8%) were above 50 years of age. While assessing knowledge amongst the distributed age groups, the Chi-square results in Table 4.7 outlined that patients' age determines one's knowledge regarding micro-vascular complications related to DM (X^2=14.743, p=0.022).

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Respondents at a young age had greater knowledge about micro-vascular complications than older respondents; this might be because youngsters are more educated than the older group. They can also access health information through media, health-related pamphlets and books. This findings differs with those reported by Obirikorang, Obirikorang, Anto, Acheampong, Batu, Stella, Constance & Brenya (2016:3) who found that 22.2 % of the elderly (80–99 years) had knowledge on diabetic complications compared to those in the 20–39 year group (15.8 %), 40–59 years (13.1 %), and 60–79 years (10.0 %).

5.2.2 Gender of the Respondents

This study found that of the 259 respondents, 184 (71%) were females and 75 (29%) were males. These results indicated that DM is more common in females than in males. This is also consistent with the findings in other SA studies. In a study in Durban, South Africa, which assessed the level of diabetic patients' knowledge of DM, its complications and management among 106 respondents aged 30 years and older, females (65%) were more than males (35%) (Mashige et al., 2008:98).

The findings were also affirmed by the study conducted by Hoque et al. (2009:91) about assessment and knowledge of diabetes among Al-Wazarat Family Medicine Health Centre attendants in America—the study showed that most 126 (68.47%) respondents were females and fewer 58 (31.5%) were males. The great percentage of female respondents than males might be due to the fact that females live longer than males (Lewis et al., 2011:1461), and because females are presumably more conscious about good health practices. This supports the health promotion model in that perceived health status influences engagement in health promotion behavior.

This study also observed an association between gender and the knowledge of diabetic complications amongst respondents using Chi-square analysis. The Chi-square results reflected that respondents knowledge regarding micro-vascular complications were independent of gender (X^2=3.388, p=0.184) This finding contrast with observations by Obirikorang et al. (2016:3), Nisar, Khan, Qudri and Sher (2008:671) who conducted studies among diabetics living in Pakistan and that found male diabetic respondents had greater knowledge of diabetic complications compared to females respondents.

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5.2.3 Distribution of Respondents According to Level of Education

According to the health promotion model, understanding the health education given will be influenced by the level of education of the person being taught. The results of this study found that about 97 respondents (37%) had secondary school education and only 42 respondents (16%) had higher than secondary educational qualifications. Other educational categories are shown in Table 4.3.

The findings of this study are almost identical to the study conducted by Hoque, Islam, Khan and Ahasan (2009:91) who outlined the respondents of the study as follows: 63.3% had attained education below secondary school certificate, 19.6% had secondary school certificate and higher secondary school certificate, and 14.5% had certificate above higher secondary level.

The Chi-square test was conducted to assess knowledge of respondents regarding micro- and macro-vascular complications of DM. The results outlined that knowledge of respondents regarding micro-vascular complications depends on patients' level of education (X^2=20.642, p=0.002), and knowledge regarding macro-vascular complications also depends on patient level of education (X^2=28.442, p=0.000).

Therefore, respondents who were educated had knowledge about both micro- and macro-vascular complications of DM compared to those who were uneducated. The researcher presumed that literate respondents had greater awareness and knowledge about those complications because understanding or knowledge is influenced by level of education. Findings of this study is consistent with those of Obirikorang et al. (2016:3) who found that all (100%) of respondents who had completed tertiary education had knowledge followed by those who had completed senior high school (40%), junior high school (33.3%), and basic school (22%) .

5.2.4 Distribution of the Respondents According to Employment Status

Many (66%) of the respondents were unemployed. A few numbers were employed (23%), and fewer (11%) were self-employed. The percentages of these are shown in Figure 4.4.

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The greater proportion of respondents who were unemployed in this study might be due to the large number of respondents who are unschooled because only 97 respondents (37%) had secondary school education and only 42 respondents (16%) had higher than secondary educational qualifications.

According to the study findings of Hartayu, Mi, & Suryawati, (2012:3), the study respondents were distributed as follows: 30% were employed, 40% were unemployed, and 30% were self-employed. The findings agree with the findings of this study because in both studies respondents' percentage of unemployment is high. According to health promotion model, individuals' knowledge level is also influenced by unemployment. Unemployment affects the self-esteem of an individual which in turn affects the attitude and action towards health promotion behavior of the affected individual.

5.3 Clinical Characteristics of the Respondents

5.3.1 Distribution of the Respondents According to Blood Pressure Level

Findings of the study show that 48% of respondents had high blood pressure (Figure: 4.6). This finding contrast with results of the study conducted by Abougalambou, Mohamed, Sulaiman, Abougalambou and Hassali (2010: 185) who found that the majority of the respondents (92.7%) had high blood pressure. In this study the researcher considered the percentage (48%) to be high. High blood sugar damages the walls of the small blood vessels in the eye, altering their structure and function. As part of this condition, called diabetic retinopathy, these vessels may thicken, leak, develop clots, close off, or grow balloon-like defects called micro-aneurysms. Repeatedly, fluid collects in the part of the retina; this condition is called macular oedema. In advanced cases, the retina is deprived of its blood supply and grows new, but imperfect, vessels-a process called neovascularization (Lewis et al., 2011:1248).

These breakable vessels in the eyes can bleed, creating vision-impairing hemorrhages, scar tissue, and separation of the retina from the back of the eye or retinal detachment (Mwangi, Githinji & Githinji, 2011:141). The high incidence and poor control of raised blood pressure with diabetes pose a bigger risk for future development of nephropathy (Nehad et

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al., 2012:49). The health promotion model theoretical propositions indicate that people commit to engaging in behaviors from which they anticipate deriving personally valued benefits. Therefore, based on the findings of this study, the researcher believes that some of the respondents in the Vhembe district of Limpopo Province lack knowledge regarding the importance of management of the blood pressure in order to keep their blood pressure within accepted normal ranges. This lack of knowledge may results DM patients incurring many complications.

5.3.2 Distribution of the Respondents According to Blood Glucose Level

The normal blood glucose level ranges between 3.9 to 6.66 mmol/l (Figure: 4.7). Numerous theories exist as to how and why a high blood glucose level damages cells and tissues resulting in chronic complications of DM (Lewis et al., 2011:1247). During the process of data collection, 143 (57%) of respondents had blood glucose levels within normal acceptable ranges, about 104 (42%) of respondents had blood glucose above 10 mmol/l, a small number 2 (1%) had blood glucose which was less than 3.9 mmol/l. These findings are differs with the findings of Wabe, Angamo and Hussein (2011:421) who found that out of 347 respondents only 41.8% were managing and maintaining their blood sugar level within normal ranges .

The health promotion model theoretical propositions implicate variables such as self-esteem, self-motivation, personal competence, perceived health status and definition of health. Individuals with a positive self-esteem, self-motivation and personal competence are more likely to engage in health promotion behavior (Alligood & Tomey 2010:438). Therefore, the researcher believes that respondents in this study who were motivated and had knowledge regarding management of DM engaged themselves in the good management of their blood sugar and attained a positive outcomes and optimal well-being.

5.3.3 Distribution of the Respondents According to Weight

Distribution of respondent's weight is outlined in Figure 4.8. Findings of the study shows that about (38%; n=95) of respondents were overweight. About (40%; n=99) respondents were obese. This finding is supported by Ghodsi, Hamayeli, Meharbani, Avand and

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Ahmadzadeh (2014:69) who indicated that out of a total sample, 33% of respondents were overweight. Obesity is considered a risk factor associated with macro-vascular complications (Lewis, Dirksen, Heitkemper, Bucher and Camera, 2011:1247). Therefore, it is important for DM patients to control their weight so that it is maintained within normal ranges to prevent diabetes macro-vascular complications.

5.3.4 Distribution of the Respondents According to Height

Respondent's height distribution in this study were as follows: about 0% of the respondents' height ranged from 179 to 188 cm, 4% ranged from 169 to 178 cm, 45% from 149 to 158 cm and 51% ranged from 159-168 cm.

5.3.5 Distribution of the Respondents According to Duration of Living with Diabetes

Roughly 88 (34%) of respondents had been living with DM for 1-5 years. A few (7%) respondents were living with DM for less than a year. The percentages of these and other categories are shown in Figure 4.5. Knowledge of respondents was not associated with duration of living with DM. The finding of this study is almost consistent with the finding by Moawad, Badawy, Al-saffar, AL-Hamdan and Awadien (2014:9) who outlined the distribution of respondents according to duration of living with diabetes as follows: less than 1 year (37.3%), 1-5 years (42.1%), 5-10 years (12.1%), more than 10 years (8.55%).

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5.4. Knowledge About Self-Care Practice, Control and Management of Diabetes Mellitus

5.4.1 Respondents Who Took Medication Without Missing a Dose

Table 4.7 highlights the respondents' responses to this section. Respondents who takes medication without missing (90.8%; n=236). This finding is consistent with the findings of a study conducted Clarke-Farr et al. (2006:12) in that 87% of the respondents believed that taking their medication exactly as prescribed was very important. Findings of the study shows that respondents who sometimes miss taking medication (8%; n=19). These findings are almost same as the findings of Al-Maskari, El-Sadig, Al-Kaabi, Afandi, Nagelkerke and Yeatts, (2013:6) who studied the Knowledge, Attitude and Practices of Diabetic Patients in the United Arab Emirates. Their finding was that out of 575 DM patients, only 10% confessed non-compliance with their medications. The findings of this study were confirmed by Thabit, (2013:27); Parvin, Jahan, Rahman, Ahamed, Roy and Bhuiyan, (2014:6755).

These findings are also corroborated by the theoretical framework in which this study was conceptualized, because the model outlined variables that affect subsequent health actions that advance health promotion behavior; these include personal and psychological factors. These variables incorporate self-esteem, self-motivation, personal competence, perceived health status and definition of health. Individuals with a positive self-esteem, self-motivation and personal competence are more likely to engage in health promotion behavior (Alligood & Tomey, 2010:438). In this study, the researcher believed that diabetes patients who are self-motivating in taking DM medication without missing the doses, are engaged in health promotion behavior. Therefore, these patients minimize the chances of developing diabetes-related complications.

5.4.2 Respondents Who Were Assisted with Taking Their Medication

Many (225; n=86.5%) respondents indicated that they take medications independently without assistance, and only few (34; n=13.1%) get assistance from family members. The percentages of these are shown in Table 4.8. The theory in which this study is

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conceptualized agrees with the findings of the study. People are more likely to commit and engage in health promotion behaviors when significant others model the behavior, and expect that behavior to occur. Provision of assistance and support enables the behavior to occur. Therefore, based on the theoretical proposition of this model, the researcher identified some of DM patients who are engaged in taking their medications because they get assistance and support from significant others (George, 2011:547).

According to Kisokanth, Prathapan, Indrakumar, & Joseph (2013:2), social support offered to DM patients is imperative. The social support was referred to the individual's perception that assistance is readily available when one needs it. The assistance can be attained from numerous sources, including friends, family members and physicians. Understanding the process that motivates self-care will enable diabetes specialist nurses to provide diabetes treatment which goes beyond the education, symptoms management and compliance. Contribution by family members in providing care may also lead to the effective self-management of DM (Kisokanth, et al., 2013:2).

5.4.3 Necessity for Taking Diabetes Medication

The results in table 4.9 outlined that 15.4% of respondents were taking medications to lower their blood glucose level. Many respondents 84.2% were taking medications to control the blood sugar level, this is supported by the health promotion model theoretical propositions which indicate that people commit to engaging in behaviours from which they anticipate deriving personally valued benefits. Therefore, based on the findings of the study the researcher identified that diabetes patients committed themselves in taking DM medications in order to control their blood sugar level (George, 2011:547).

5.4.4 Medication Taken for Diabetes Mellitus

Many (88.1%; n=229) respondents were on oral medication. Few (11.5%; n=30 respondents were on insulin injection. This finding are in keeping with results of the study conducted by Abramczyk (2013:3), whose findings revealed that many of the patients were only on oral drugs (56.8%), about 20% were on insulin only and about 18.5% were on insulin and oral drugs.

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5.4.5 Practice of Self-Daily Blood Glucose Monitoring

Kisokanth et al. (2013:2) and Lewis et al. (2011:1233) indicated that self-monitoring of blood glucose is a cornerstone of diabetes management. It enables the patient to make self-management decisions regarding diet, exercise and medication. Every effort should be made by all involved with diabetes care to support self-monitoring of blood glucose as part of an overall self-management strategy. Self-monitoring of blood glucose is crucial, the patient might manage their disease independently with self-monitoring of blood glucose and they may have a better understanding about the factors that affect their disease. Self-monitoring of blood glucose and insulin administration is regarded vital for the daily management of diabetes. As indicated in table 4.11, the findings of the study display that a large number (86.9%; n=226) of respondents do not practice daily monitoring of blood glucose. A lesser number (11.5%; n=30) of respondents were practicing daily blood glucose monitoring. Most of the respondents monitored their blood glucose once a month at the clinics. These may be due to the large number of respondents who could not afford to buy the glucostix machine because they were unemployed, and another cause may be that most of the respondents do not have information regarding the importance of purchasing a glucostix machine. The percentages of these are shown in Table 4.11.

The study finding concurs with findings of Phillips, Mashige and Clarke-Farr (2012:71) who indicated that only few (29%) out of 73 respondents measured their blood glucose daily. This is further supported by of Zighor and Simmons (2002) as quoted in Thabit (2013:27), whose findings revealed that just 3% of respondents were monitoring their blood sugar daily at home. The health promotion model theoretical propositions indicate that people commit to engaging in behaviours from which they anticipate deriving personally valued benefits. Therefore, the researcher believes that diabetic patients would have purchased the glucostix machines if they were taught the importance of the glucostix machines.

5.4.6 Frequency of Monitoring Blood Sugar Level per day

The research findings in table 4.12 confirm that out of all the respondents (100%; n=259), few (10.0%; n=26) were practicing blood glucose monitoring once a day, very few (2.7%; n=7) managed to monitor their blood sugar level two times a day, only patient managed to

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monitor blood glucose level three times a day.

Many (82%; n=213) respondents did not monitor the blood sugar level because they don't have glucostix machines. The percentages of these are shown in Table 4.12. The findings contrast with the findings by Coker and Fasanmade (2005) as quoted in Unachukwu, Young and Uchenna (2011:20), who stated that 50% of their patients practiced either blood or urine glucose monitoring. In the study by Coker and Fasanmade (2005) as quoted in Unachukwu, et al., (2011:20), the frequency of monitoring was relatively poor. The utmost frequency of monitoring was once daily in six patients, eight others monitored their blood glucose 1–2 times a week, while in four patients the frequency of monitoring was as low as one time to two times in a month.

The Pender health promotion model assumes that health professionals constitute a part of the interpersonal environment which influences human behaviour in their daily life (Alligood & Tomey, 2010:438). In this study, the researcher assumed that if health professionals give health education to diabetic patients regarding the importance of frequent monitoring blood sugar, this may influence the diabetic patient's behaviour towards monitoring of blood glucose level throughout their lives.

5.4.7 Respondents Who Visit Clinic for Blood Sugar Monitoring

Study findings show that many (96.5%; n=250) of the respondents visit clinics for blood glucose monitoring. Very little (2.7%; n=7) do not visit the clinic regularly for blood sugar monitoring. The percentages of these are shown in Table 4.13. In suport of these findings, Clarke-Farr et al. (2006:137) indicated that a total of 98% patients stated that measuring their blood sugar was important.

5.4.8 Frequency of Visiting Clinic for Blood Glucose Monitoring

Almost all (93.0%; n=241) of the respondents visit the clinics per schedule on a monthly basis for blood glucose monitoring. This might be because most of the respondents do not

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have a glucostix machine to monitor blood glucose at home. As reflected in table 4.14 only 5.4% (n=14) of respondents monitor their blood sugar level once a week because they do have glucostix machine at home. The percentages of these and other categories are shown in Table 4.14.The findings of this study were opposed by Nwonkowo, Nandy and Nwonkowo (2010:31) as quoted in Thabit (2013:27) who outlined that only 38.4% of the respondents did visit health institutions for blood sugar monitoring on a monthly basis, and 29.8% reported visits to the doctor on appointment. In contrast with the above findings the findings of the study that was conducted by Lacksman, Nuthi and Valsangkar (2014:12) found that 68% of respondents monitored their blood glucose sugar at the clinic once in six months.

5.4.9 Necessity of Carrying Snacks to Prevent Hypoglycemia

Izadi, Hosseini and Pazham (2015:144) outlined that a patient who takes insulin would have to carry a bag full of sugar, biscuits, water, lemon juice and some sandwiches in order to eat any minute the blood sugar drop down.The results in table 4.17 show that a large number (88.8%; n=231) of respondents acknowledged the importance of carrying snacks to eat when travelling, in order to prevent low blood glucose level. The researcher commend such practice as it will assist in virtuous management and control of blood glucose, hence preventing complications like hypoglycemia and insulin reactions to diabetes patients who are on insulin injection. In contrast with the above findings; Gawand, Gawali and Kesari (2016:37) identified that the majority of patients (69.64%) didn't carry snacks while travelling.

5.4.10 Respondents Who Carry Snacks All the Time When Travelling

Amongst 259 respondents, the majority of respondents (74%; n=193) indicated that they carry snacks when they travel. This suggests that even though 88.8% (n=231) of respondents have acknowledged the necessity of carrying snacks when travelling, only 74% (n=193) do carry the snacks when travelling, whereas (25.0%; n=65) do not carry snacks when travelling as indicated in Table 4.18. In affirmation with the above findings, Gawand et al. (2016:3) indicated that majority of patients (69.64%) didn't carry snacks while travelling.

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5.4.11 Respondents' Reasons for Carrying Snacks When Travelling

The study establish that only (43.8%; n=114) carry snacks to prevent low blood sugar (hypoglycaemia). The percentages of these and other categories are shown in Table 4.19. This finding is supported by Lacksman, Nuthi and Valsangkar (2014:12) who outlined that out of 150 respondents 52 (34.7%) consume sugar, 23 (15.3%) consume food items to manage hypoglycemia. The health promotion model theoretical propositions indicate that people commit to engaging in behaviours from which they anticipate deriving personally valued benefits. Therefore, the researcher assumes that the respondents in this study did not carry snacks when travelling because they were not taught the importance of such practice.

5.4.12 Types of Snacks Respondents Carry

The results of the study show that about 35.4% of respondents carry green apples as snacks to prevent hypoglycaemia. Almost the same percentage (27.7%) of respondents carry sweets as snacks, whereas 9.6% carry bread and peanut butter. Very few respondents carry pap as snack to prevent hypoglycaemia. Izadi et al. (2015:144) stated that a patient who takes insulin would have to carry a bag full of sugar, biscuits, water, lemon juice and some sandwiches in order to eat any time the blood sugar drops.

5.4.13 Necessity for Consuming High Fiber Diet in Diabetes Mellitus Care by Respondents

The majority (89.5%; n-232) of respondents indicated that it is necessary for DM patients to consume a high fibre diet. This is important because fibre will prevent constipation and delayed gastric emptying (Lewis, et al., 2011:1250). This finding is in contrast with those of the study by Ranasinghe, Pigera, Kutulanda, Ishara, Jayasekara and Jayawardena (2015:5) who found that respondents did not consider the necessity of taking high fibre; instead they consumed low levels of fibre. The health promotion model theoretical propositions indicate that people commit to engaging in behaviours from which they anticipate deriving personally valued benefits. Therefore, the researcher assumes that the respondents in this study knew the importance and benefits of consuming high fibre diet because many of the respondents indicated that it is necessary for DM patients to

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consume high fibre diet.

5.4.14 Respondents Who Had a Glucometer to Monitor Blood Glucose at Home

As shown in table 4.21, the majority (75.4%; n=196) of respondents did not have a device to monitor blood glucose (glucometer), few (24%; n=63) had glucometer to monitor blood glucose at home. This is might be because of unemployment and lack of knowledge regarding where to purchase the device. The findings are supported by Unachukwu et al. (2011: 20) who indicated that in the study of 90 patients, only 24 (27%) had glucometers. In contrast to the above findings, the study about awareness regarding DM and its complications in type 2 diabetic patients by Thabit (2013:27) revealed that 52.4% of respondents had their own glucometers. This concurs with findings of Phillips et al. (2012:71) who indicated that 82% of respondents had glucometers.

Ejegi, Ross and Naidoo (2016:2) confirmed the findings by Thabit (2013:27) and Phillips et al. (2012:71) that forty-eight patients (24%) had a glucometer at home, whilst 68 (34%) were able to check their sugar levels at home or at a nearby pharmacy. The health promotion model theoretical propositions indicate that people commit to engaging in behaviours from which they anticipate deriving personal valued benefits. Therefore, the researcher assumes that the respondents in this study did not buy glucometers because they did not know the importance and benefits of the device.

5.4.15 Respondents' Practice of Routine Eye Care

Many (43.5%; n=113) of the respondents do not take care of their eyes, i.e., by wearing sun glasses or visiting eye practitioners. These might be due to lack of information by diabetes patients with regard to care of eyes in order to prevent eye complications such as cataract and retinopathy. The findings were affirmed by Bodunde, Odusan, Ogunsemi, Ajibode and Raimi (2014:10) who showed that amongst 148 respondents, 49 (33.1%) did not know that routine eye examination is necessary in diabetics. The findings were further affirmed by Phillips et al. (2012:71), who outlined that 61% of respondents did not have regular eye examination. The above findings contrast with those reported by Phillips et al. (2012:71), viz., that out of 73 respondents, 24% of had eye examination in previous years.

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5.4.16 Respondents' Last Visit to Ophthalmologist

Most (68%; n=169) of the respondents do not visit eye practitioners for examination of eye. This might be due to lack of information regarding importance of routine visiting of eye practitioners for diagnosis and management purposes. Out of 259 respondents, only (44%; n=113) visited the eye practitioners for eyes examination. The percentages of these and other categories are shown in Table 4.22. This result concurs with findings of the study conducted by Ovenseri-Ogbomo, Ovenseri, Abokyi, Kuffuor and Abokyi (2013:220), who indicated that attitude to routine eye examination was poor. Amongst 390 respondents, 135 (34.6%) never had an eye examination since being diagnosed with DM; 255 had their eyes examined at least once after diagnosis of DM; most of the patients reported having been examined by ophthalmologists (59.2%) and optometrists (50.6%).

The findings are also confirmed by Clarke-Farr et al. (2006:134); Mun, O'Leary, Fonseca-Becker, Rosario, Burguess, Aquilar, Fickes and West (2008:1893); Al Bimani, Khan, & David (2014:3). The health promotion model assumes that health professionals constitute a part of an interpersonal environment, which influences human behaviour in their daily life (George, 2011:547). In this study, the researcher assumed that health education given by professionals to diabetes patients regarding the importance of eye care may influence their behaviour towards visiting eye practitioners throughout their life.

5.4.17 Respondents Who Do Regular Exercises

The results of the study outlined that many (70%; n=175) respondents do regular exercises. Regular, consistent exercise is considered an essential part of diabetes and prediabetes management. Exercise decrease insulin resistance and lower the blood glucose level, contribute to weight loss. The therapeutic benefits of exercise may result in decreased need for diabetes medicine (Lewis et al., 2011:1233). In suport of these findings, Clarke-Farr et al. (2006:137) indicated that amongst 98 respondents, 62% reflected that exercise was a very important part of diabetes management. This notion was further suported by Padma, Bele, Bodhare and Valsangkar (2012:5) who reported that from a sample of 117 diabetic patients, 71 (61.68%) were aware of the importance of exercise for the control of DM. The health promotion model theoretical propositions indicate that

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people commit to engaging in behaviours from which they anticipate deriving personally valued benefits. Therefore, the researcher believes that about 70% of diabetic patients who engage in doing exercises were taught the benefits thereof. In contrast with the above findings, Al-Bimani et al. (2014:3) indicated that less than 40% of the patients declared that they do regular exercise.

5.5 Respondents' Knowledge of Micro-Vascular Complications of Diabetes Mellitus

5.5.1 Respondents' Awareness that Uncontrolled Diabetes Mellitus Results in Complications

Study findings shows that many (86%; n=222) respondents are aware that uncontrolled DM results in diabetes complications. Few (14%; n=35) respondents did not have such knowledge (Table 4.27). The findings of this study are congruent with the findings of a study conducted by Bodunde et al. (2014:10). A total of 148 patients were studied. One hundred and twenty three (123) (83.1%) were aware that diabetes could affect other parts of the body. The findings were supported by Al-Bimani et al. (2014:3) who indicated that around (65.1%) respondents knew that diabetes could affect other body organs and lead to multiple complications. Findings of this study are supported by the Pender health promotion model who indicated that health professionals constitute part of an interpersonal environment, which influence human behaviour in their daily life (George, 2011:547). In this study, the researcher assumed that the respondents had knowledge about complications of DM, because they were given health education by health care professionals.

5.5.2 Respondents Awareness that Unmanaged Diabetes Mellitus Can Affect the Kidneys

The majority (47%; n=121) of respondents have indicated that they were aware of diabetes complications as reflected in Table 4.27. However, respondents' awareness with regard to kidney-related complications was poor. The findings show that about (51%; n=132) respondents did not have knowledge that unmanaged DM can affect the kidneys. Only (47%; n=121) of respondents were aware of such complications. This is supported by Mangaiarkkarasi et al. (2012:191) who found that patients have limited knowledge about complications of diabetes; (30%) of them felt that kidneys were mainly affected by DM.

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These findings contrast with the results of a study conducted in India because 51.4% out of 500 respondents knew that unmanaged DM can affects kidney Anil, Neethu, Shintu, Rathan, Suvetha, Senthil and Yunsheng (2014:1088). Bodunde et al. (2014:10) also confirmed respondents' sufficient knowledge by reflecting that out of 148 respondents, 54% were aware that it can affect the kidneys. Kavitha and Aruna (2014:19) found that out of 100 patients, 89% had adequate knowledge on macro-vascular complications; 61% and 90% had inadequate knowledge about retinopathy and nephropathy, respectively.

Findings of the study are supported by the Pender health promotion model which specifies that health professionals constitute part of an interpersonal environment, which influences human behaviour in their daily life (George, 2011:547). Based on the findings of this study, the researcher assumed that respondents (43%; n=106) of this study who had knowledge that unmanaged DM can affect the kidneys were offered health education by health care professionals when visiting health care services.

5.5.3 Respondents' Awareness that Unmanaged Diabetes Mellitus Can Cause Eye Problems or Blindness

Knowledge of respondents regarding eye problems or blindness as complications of unmanaged DM was presented to be good, because out of (100%; n=259 respondents), the majority (81%; n=211) had knowledge that unmanaged DM can cause eye problems or blindness. Few respondents (18%; n=47) were not aware. In support of these findings, Bodunde et al. (2014:10) indicated that amongst 148 respondents, 77.7% were aware that DM can affect the eyes.

These findings differ with those of the study by Godwin et al. (2013:220) in that out of 390 respondents, knowledge on ocular effects of DM was low and only 15 (3.8%) knew that it could cause cataracts or diabetic retinopathy. This poor knowledge is affirmed by Mun et al. (2008:1893) who indicated that 30% of respondents knew that blindness was a known complication of DM. Bodunde et al. (2014:10), Mangaiarkkarasi et al. (2012: 1191), Kavitha and Aruna, (2014:19) further affirmed these findings by indicating that respondents had inadequate knowledge about diabetes eye complications.

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Findings of the study are supported by the Pender health promotion model which posits that health professionals constitute part of an interpersonal environment which influences human behaviour in their daily life (George, 2011:547). Based on the findings of this study, the researcher assumed that respondents (83%; n=206) who had knowledge that unmanaged DM can cause eye problems or blindness, were given health education by health care professionals when visiting health care services.

5.5.4 Respondents Awareness that Unmanaged Diabetes Mellitus Can Cause Foot Problems

The study showed that more than half of the respondents (55%; n=143) were aware that unmanaged DM can cause foot problems, whereas 42% (n=109) were not aware. Even though half of respondents were aware of foot problems, the researcher determined that the number of respondents who do not have such knowledge is high. In suport of these findings, Mun et al. (2008:1893) indicated that half of the respondents had the knowledge that diabetic foot is one of the complications of DM. Bodunde et al. (2014:10) also confirmed respondents' awareness by reflecting that amongst 148 respondents, 66.2% knew that unmanaged DM results in foot problems. Based on the findings of this study, the researcher assumed that (83%; n=206) respondents who had knowledge that unmanaged DM can cause foot problems, were given health education by health care professionals when visiting health care services.

5.5.5 Respondents Awareness that Unmanaged Diabetes Mellitus Can Cause Hand Problems

Awareness of respondents regarding hand problems was very poor—the majority of respondents (59%; n=155) did not have knowledge, and only 36% (n=94) had such knowledge. This finding concurs with the study conducted by Ullah, Afridi, Rahim, Ashfaq, Khan, Shabbier and Rahman (2015:362) in that only 47-65% of respondents knew about numbness and tingling sensation of the hands as complications of DM. The findings are further supported by Mangaiarkkarasi et al. (2012: 1191) who found that few patients (12%) had limited knowledge about hand complications of diabetes.

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5.6 Respondents' Knowledge of Macro-Vascular Complications Of Diabetes Mellitus

5.6.1 Respondents Awareness that Uncontrolled Diabetes Mellitus Can Cause Ischaemic Heart Disease

Respondents' awareness of diabetes complications regarding the heart was very poor. Only 40% (n=104) of respondents had knowledge, whereas 55.0% (n=142) did not. These findings were supported by Mangaiarkkarasi et. al. (2012: 1191) who found that patients had limited knowledge about heart-related complications as only 6% of respondents had knowledge.

These findings were affirmed by Anil et al. (2014:1088), who outlined that amongst 500 respondents, 42.8% reported that unmanaged DM affects blood vessels whereas 42% reported that it affects the heart.

5.6.2 Respondents' Awareness that Uncontrolled Diabetes Mellitus Can Cause Stroke

The results of the study reflected awareness of respondents that uncontrolled DM can cause stroke (47%; n=123) whereas 48% (n=124) were not informed. Therefore, the researcher concluded that respondents' knowledge regarding stroke as a complication of DM is inadequate.

This finding concurs with Poornima et al. (2012:286) who provided evidence that of the 245 respondents, 61.42% did not have knowledge of stroke as a complication of DM.

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5.7 Respondents' Knowledge of Complications of the Nervous System

5.7.1 Diabetes Mellitus Complications Result in Feeling of Numbness or Tingling Sensation in Feet and Hands

Knowledge of respondents regarding numbness or tingling sensation was poor. Respondents (44%; n=113) who had such knowledge were fewer than those who did not know that feeling of feet and hands numbness or tingling sensation are complications of DM (56%; n=145). This finding concurs with those of the study conducted by Ullah et al. (2015:362) who found that 47-65% of respondents new about numbness and tingling sensation as complications of DM. The findings are further supported by Mangaiarkkarasi et al. (2012: 1191) who found that patients have limited knowledge about complications of diabetes in that 12% knew about peripheral nerves whereas the study that was conducted in India showed that 52.8% respondents knew that some of the complications of DM were foot complications (Anil et al., 2014:1088).

5.7.2 Diabetes Mellitus Complications Result in Feeling of Pins and Needles/Pain in Feet and Hands

The knowledge of respondents about feeling of pins and needles/pain in feet and hands as complications of DM was good (60%; n=156) compared to those who did not have such knowledge (38%; n=98). This finding concurs with those of the study conducted by Ullah et al. (2015:362) who found that 47-65% of respondents knew about a tingling sensation as complications of DM. The findings are further supported by Mangaiarkkarasi et al. (2012: 1191) who found that patients have limited knowledge about complications of diabetes; only 12% of respondents knew about peripheral nerves whereas the study that was conducted in India shows that 52.8% respondents knew that some of the complications of DM were foot complications Anil et al. (2014:1088). Lewis et al. (2011:1249) confirmed that pain that affects hands is one of complications related to diabetic autonomic neuropathy.

5.7.3 Diabetes Mellitus Complications Result in Sensory Loss Followed by Loss Of Motor Function

The results of the study shows that many (58% n=149) respondents did not have

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knowledge that one of DM complications is sensory loss and later followed by loss of motor function. Few (41%; n=107) respondents had such knowledge. However, Sibidla (2014:22) showed that about 72% of patients verbalized that they knew about neuropathy, and sensory nerves appeared to be the most affected because almost all respondents had lost protective sensation.

5.7.4 Diabetes Mellitus Complications Result in Sexual Dysfunction

The respondents' knowledge about sexual dysfunction as a complication of DM was good (61%; n=157), whereas 37% (n=97) did not have such knowledge. In contrast to the findings of this study, the study that was conducted in India showed that out of 300 patients, none of them were aware that erectile dysfunction is also a complication of diabetes (Ramesh et al., 2011: 532). This is supported by Poornima et al. (2012:286), who outlined that of the 245 respondents surveyed, 82.25% did not have knowledge regarding impotence as a complication of DM.Diabetes Mellitus Complications Result in Loss of Protective Sensation

The results of the study indicate that out of 259 respondents, only 39% (n=102) had knowledge that DM complications include loss of protective sensation. Poornima et al. (2012:286) confirmed that many (69.91%) respondents did not have knowledge regarding loss of protective sensation as complications of DM.

5.7.5 Diabetes Mellitus Complications Result in Bowel Incontinence

A large number of respondents (69%; n=179) were not aware that DM complications result in bowel incontinence. The percentages of these and other categories are shown in Table 4.32. Though the respondents in this study were not aware of bowel incontinence as a diabetes complication, Krishnan, Babu, Walker and Pappachan (2013:55) confirmed that diabetic patients may present with fecal incontinence as a complications of DM.

5.7.6 Diabetes Mellitus Complications Result in Urinary Retention

The majority of respondents (69%; n=179) were not aware that DM complications result in urinary retention. The percentages of these and other categories are shown in Table 4.32.

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Lewis et al. (2011:1250) corroborated that urinary retention is one of the complications related to diabetic autonomic neuropathy.

5.7.7 Diabetes Mellitus Complications Result in Diarrhoea

A large number of respondents (69%; n=179) were not aware that DM complications is diarrhoea. The percentages of these and other categories are shown in in Table 4.32. Although respondents in this study were not aware of diarrhoea as a complication of DM, Krishnan et al. (2013:55) confirmed that diabetic patients may present with diarrhoea as a complication of DM.

5.7.8 Diabetes Mellitus Complications Result in Anorexia

The study findings indicate that large number of respondents did not have information about anorexia as a complication of DM. Study findings shows that out of 259 respondents, 69% (n=179) did not have such knowledge. Only 25% (n=65) had knowledge about such complications. Lewis et al. (2011:1250) confirmed that anorexia is one of the complications related to diabetic autonomic neuropathy.

5.7.9 Diabetes Mellitus Complications Result in Nausea

The study findings indicate that the majority of respondents (69%; n=179) did not have information about nausea as complications of DM. Only 25% (n=65) had knowledge about such complications. Findings of this study are substantiated by Amer Shakil, Robert, Church, Shobha and Rao (2008:1) who stated that about 5-12% of diabetes respondents reported to be having knowledge of nausea as complication of DM.

The findings were further confirmed by recent reports (Diabetes UK Facts and Statistics, 2015:13), i.e., that autonomic neuropathy can have incapacitating effects on numerous functions of the body. Autonomic neuropathy results in gastro paresis or delayed emptying of the stomach leading to nausea, which affects to 50% of people with diabetes.

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5.7.10 Diabetes Mellitus Complications Result in Vomiting

Diabetes UK Facts and Statistics (2015:13) indicate that autonomic neuropathy can have severely debilitating effects on various functions of the body. Gastro paresis – delayed emptying of the stomach leading to vomiting affects up to 50% of people with diabetes at some time. The study findings indicate that large number of respondents did not have information about vomiting as complications of DM.

Study findings shows that out of 259 respondents, the majority (69%; n=179) did not have such knowledge. Only 25% (n=65) had knowledge about such complications. The findings by Moawad, Badawy, Al-saffar, AL-Hamdan and Awadien (2014:11) are in agreement with the findings of this study because in their sample of 85 respondents, only 21% knew of vomiting as a complication of DM.

5.7.11 Diabetes Mellitus Complications Result in Feeling of Fullness

The study findings indicate that large number of respondents (69%; n=179) did not have information about feeling of fullness as complications of DM. Only 25% (n=65) had knowledge about such a complication. Findings of this study are supported by the research conducted by Amer Shakil et al. (2008:1) who concluded that only 5-12% of diabetes respondents reported to be having knowledge of feeling of fullness as a complication of DM.

Lewis et al. (2011:1250) confirmed that a feeling of fullness is experienced by diabetic patients as one of the complications related to diabetic autonomic neuropathy.

5.8 Challenges Faced by Respondents due to Chronic Complications of Diabetes Mellitus in Vhembe District

5.8.1 Respondents Who Have Complications Related to Diabetes Mellitus

The results of the study shows that out of 259 respondents, 57.0% (n=147) had

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complications related to DM. This number is alarming as compared to the number of those who did not have complications related to DM. Only 43% (n=111) of respondents did not have complications related to DM. Complications were analysed according to age groups. The findings show that above 34% of each age group had complications related to the eyes, 25% feet and 7% sexuality. About 44% did not have DM-related complications. These might be due lack of knowledge regarding the control and poor practices in the management of DM.

The findings were supported by Ghodsi, Meharbani, Avand, Bordbar, and Ahmadzadeh (2014:69) who indicated that number of respondents with neurologic disorders (33.8%), cardiovascular disorders (26.8%), nephropathy (11.7%), retinopathy (10.4%), and diabetic foot (2.4%). The findings were affirmed by Awad et al., as quoted in Wafula (2001:2) who indicated that 70% of the patients had significant gastrointestinal symptoms, 41% respondents had nausea and vomiting, 28% had constipation and 7% had diarrhoea as complications of DM.

5.8.2 Types of Complications Respondents Have Related to Diabetes Mellitus

The results of the study showed that among 57.0% (n=147) of respondents who had DM complications, about 34% (n=89) had eye complications. This finding is consistent with those reported by Mun et al. (2008:1893) who identified that out of 20 respondents, approximately 40% of diabetic patients have some degree of retinopathy and 17.2% (n=43) had feet problems. Dixit & Kumar (2014) also confirmed that out of 323 persons across India, 8.7% stated that they suffered from foot ulcers or blisters due to DM. The findings of this study showed that 5.2% (n=13) of respondents had kidney problems.

This finding is almost congruent with the findings by Hoque, Islam, Maleque Khan and Ahasan (2009:92) who identified that out 184 respondents, 15.2% had renal disease and 13% had sex problems. Chin & Huang (2013:21) confirmed the above findings by outlining that in the study about development and validation of a diabetes foot self-care behaviour scale, every second respondent had diabetes neuropathy.

5.8.3 Respondents Who Have Challenges Due to Diabetes Mellitus Complications

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Results of the study reflect the number of respondents who had challenges due to diabetes complications to be less than those who did not have challenges. Only 34% (n=88) of respondents had challenges, whereas 66% (n=171) did not have challenges.

5.8.4 The Challenges that Respondents Are Faced With

Kisokanth et al. (2013:2) indicated that depression may negatively affect how individuals take care of themselves. Factors such as loss of interest, reduce decision making ability and fatigue are likely to contribute to the poor self-management of DM. Furthermore, Barahi (2015:4) inferred that depression is the most important mental illness affecting patients with diabetes, and the risk of developing the condition is higher in patients with diabetes-related complications. It is found that up to a third of patients with diabetic foot ulcers have depressive disorders. The results shows that 15% (n=40) of respondents experienced depression. This is supported by Diabetes UK Facts and Statistics (2015:13) in that people with diabetes are twice likely to suffer an episode of depression for a longer period. About 9% (n=23) of respondents had a challenge of sexual dysfunction, 6% (n=15) had poor performance at work, 4% (n=10) had a challenge of lack of support.

5.9 Summary

This chapter presented the findings of the study through charts and tables. Demographic characteristic of the respondents, the clinical characteristics of respondents, knowledge of respondents about self-care practice, control and management of DM, knowledge regarding micro-vascular complications of DM, knowledge regarding macro-vascular complications of DM respondents' knowledge regarding complications of the nervous system and challenges faced by diabetic patients regarding chronic complications of DM in the Vhembe district of Limpopo Province.

The results of this study were also discussed and interpreted in this chapter. The results show that a large number of respondents (86%, n=222) had knowledge that uncontrolled DM results in diabetes complications. This was critically appraised by the researcher.

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Respondents' knowledge regarding micro-vascular complications was very good specifically to eye and foot related complications, but poor regarding hands and kidneys complications. However, when results were analysed focusing on the respondents' knowledge of specific macro-vascular complications, the knowledge was poor. Knowledge about nervous system was also reflected to be generally very poor; because about 60-70% respondents did not have much knowledge of nervous system complications in relation to DM. The results of a study are consistent with the results of study about diabetic retinopathy awareness in India. The findings indicate that awareness and knowledge regarding diabetes is still inadequate in India.From the total study population of 25400, 698 patients indicated that they were not educated about the complications of DM, especially diabetic retinopathy; 576 patients were not aware that diabetes could result in blindness (Mahesh, Elias, Sandhya, Giridhar, Sankaranarayanan & Thomas, 2006:19).Therefore the researcher assume that health care providers in Vhembe district of Limpopo province are not giving adequate information regarding diabetes and its related complications.

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CHAPTER 6

RECOMMENDATIONS, CONCLUSIONS AND LIMITATIONS OF THE STUDY

6.1 Introduction

The previous chapter encapsulated the analysis and findings and interpretations of the answers provided by DM patients regarding knowledge of diabetes complications. The findings were analyzed, discussed and interpreted. This chapter provides recommendations, conclusions and limitations of the study.

6.2 Recommendations

6.2.1 Diabetes Patients

DM patients need to be encouraged to buy blood glucose monitoring devices, so that they can do self-monitoring of blood glucose in their convenient time or on daily basis if possible. DM patients should be actively involved in self-care management of DM to reduce health care burden and help achieve optimal control of the disease with minimal DM complications. Health practitioners should encouraging diabetes patients to visit eye practitioners, e.g., ophthalmologist/trained eye sister every year for eye examination.

6.2.2 Recommendations to the Department of Health

The health promotion model theoretical propositions indicate that people commit to engaging in behaviors from which they anticipate deriving personally valued benefits. People are more likely to commit and engage in health promotion behaviors when significant others model their behavior, and expect that behavior to occur. Provision of assistance and support enable the behavior to occur.

The researcher propose that diabetes patients can commit to know about diabetes and its related complications if they are made aware of the benefits of acquiring such knowledge, and they will engage in health promotion behavior when they get assistance and support

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from the health professionals and significant others (George, 2011:547).

Therefore, based on this theory, the researcher recommends that the Department of Health (DoH) should strengthen the following: organize the continuous education campaigns in assembly areas, e.g., churches and community centers; advertise diabetes-related occasions and events on International Diabetic Day.

The DoH should use various social networking sites like Facebook, Twitter and many more can also be considered for increasing awareness about DM chronic complications among the diabetes population at large. The DoH should design and develop individualized diabetes educational programs that could help in diabetes management and improvement of quality of life.

6.2.3 Recommendations to Health Care Providers

Diabetes health education should be given to diabetic patients on a regular basis in hospitals and clinics. Government and health care providers should roll out an education campaigns on macro-vascular complications and nervous system complications in relation to DM. Health care providers should take time to describe in depth diabetes complications, causes and prevention to minimize complications. Prevention of DM complications will help the patients with DM to lead an improved quality of life.

6.2.4 Recommendations to Dieticians

Dieticians in the health care services should plan, educate and discuss the individualized DM nutrition with patients in order to reinforce compliance to correct diabetes diet which will help in controlling blood sugar and prevention of complications.

6.2.5 Recommendations for Further Research

The researcher identified that the DM population do not have knowledge regarding macro-vascular and nervous system complications. Therefore, the researcher proposes that future research should study the knowledge of diabetes patients regarding the macro-vascular complication and nervous system complications because the researcher identified that

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there are limited studies that were conducted regarding such complications.

6.3 Limitations of Study

The outcomes of this study should be considered within the context of certain parameters. The knowledge of diabetes complications amongst diabetic patients was based on patients, selected from 7 hospitals, 3 health centers and 112 clinics of the Vhembe district of the Limpopo Province in SA. Although this may not apply to diabetic patients across SA as a whole, however, these results provide an overview of the various areas of knowledge and education that need to be addressed in terms of diabetes and its related complications. The study focused on the knowledge of patients and did not consider if the health care providers were aware about patients' knowledge regarding diabetes complications. Despite these limitations, this investigation contributed to the researcher's understanding of the gap in such knowledge.

6.4 Conclusions

DM imposes a lifelong threat on the affected individuals and their families. The study subjects were mostly women 172 (69.0%); this might be so because women turn to live longer than men (Lewis et al., 2011:1461). The results of this study show that there was no significant association between age, gender, employment status, level of education, duration of DM and knowledge of diabetes complications amongst diabetes patients. Diabetic patients in the Vhembe district seemed to be not adequately informed about all DM chronic complications; they displayed inadequate or unsatisfactory knowledge regarding DM complications. Therefore, it can be concluded that people with DM in Vhembe district should be given a need-based quality diabetic education that is personalized to their clinical manifestations and circumstances. Constant education of diabetes and its complications is vital and this should be supplemented by a consistent assessment of their knowledge.

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ANNEXURE A

ETHICS CLEARANCE CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms S Motsharine
Student No: 11640996

PROJECT TITLE: **Knowledge of chronic complications amongst diabetes patients in Vhembe District of Limpopo**

PROJECT NO: **SHS/16/PH/09/1506**

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr NJ Ramakuela	University of Venda	Supervisor
Mrs SA Mulondo	University of Venda	Co-Supervisor
Ms S Motsharine	University of Venda	Investigator - Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: June 2016
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Prof. G.E. Ekosse

University of Venda
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ANNEXURE B

REQUEST TO LIMPOPO PROVINCE DEPARTMENT OF HEALTH TO CONDUCT THE STUDY

The Head of Department

Department of Health

Limpopo Province

Vhembe District

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT RESEACH

I, Motsharine Selina, a master's degree student at the University of Venda, under the Department of Advanced Nursing Science., hereby request for permission to conduct a research study at Tshilidzini hospital gate way clinic, Louis Trichardt memorial hospital gate way clinic, Donald Fraser Vhufuli Tshitereke gate way clinic, Siloam hospital gate way clinic Makhado health centre, Thohoyandou Health Centre, Tshisaulu and Rabali clinic of Limpopo Province in the Vhembe District.

Research topic

Knowledge of diabetes chronic complications amongst diabetic patients in the Vhembe District of the Limpopo province

The purpose of study is to:

Determine the knowledge of diabetes chronic complications amongst diabetic patients in the Vhembe District of the Limpopo province

The questionnaire will be completed within 15-30 minutes.

The following ethical standards will be observed throughout the research process to preserve the name and dignity of the participants:

- Informed consent will be signed voluntarily or under no pressure.

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- Voluntary participation and freedom to withdraw without penalty
- Data collected will only be accessed by my supervisor and independent coder.
- Raw data will be kept under lock and key to ensure confidentiality
- Names of the participants will not be mentioned during discussion.
- The research summary will be made available for the Head of Department of Health.

Granting the researcher permission to conduct the research study will be of benefit to the selected health care services and the community at large.

Yours faithfully

Motsharine S.

Signature of the researcher: ..... **Date**: .....

Contact no: 072 431 4746

LIBRARY

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ANNEXURE C

PERMISSION FROM THE LIMPOPO PROVINCE DEPARTMENT OF HEALTH TO CONDUCT THE STDUDY

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Enquiries: Latif Shamila (015 293 6650) Ref:4/2/2

Motsharine S
University of Venda
Private Bag X5050
Thohoyandou

Greetings,

RE: Knowledge of chronic complications amongst diabetes patients in Vhembe District of Limpopo

The above matter refers.

1. Permission to conduct the above mentioned study is hereby granted.
2. Kindly be informed that:-
   - Research must be loaded on the NHRD site (http://nhrd.hst.org.za) by the researcher.
   - Further arrangement should be made with the targeted institutions, after consultation with the District Executive Manager.
   - In the course of your study there should be no action that disrupts the services.
   - After completion of the study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   - The above approval is valid for a 3 year period.
   - If the proposal has been amended, a new approval should be sought from the Department of Health.
   - Kindly note, that the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated.

Head of Department

Date 31/08/2016

18 College Street, Polokwane, 0700, Private Bag x9302, POLOKWANE, 0700
Tel: (015) 293 6000, Fax: (015) 293 6211/20 Website: http/www.limpopo.gov.za

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ANNEXURE D

PERMISSION FROM THE VHEMBE DISTRICT DEPARTMENT OF HEALTH TO CONDUCT THE STUDY

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OFHEALTH
VHEMBE DISTRICT

LIMPOPO PROVINCE
VHEMBE DISTRICT
20 SEP 2016
P/BAG X5009 THOHOYANDOU 0950
DEPARTMENT OF HEALTH

Ref : 4/2/2
Date : 20.09.2016
Enq : Muvari MME

To: Ms Motsharine S

Dear SIR/Madam

Re: Request to conduct research on " Knowledge of Diabetes chronic complications amongst diabetic patients in the Vhembe District of Limpopo Province".

1. The above matter has reference.
2. The request you submitted to the District for conducting research has been received and well considered.
3. The District has as a consequence no objection to your wish in conducting your research at our facilities.
4. You are however advised to make the necessary arrangements with the facilities you wish to visit.

Yours in service

20/9/2016

DISTRICT CHIEF DIRECTOR DATE

Private Bag X5009 THOHOYANDOU 0950
OLD parliamentary Building Tel (015) 962 1000 (Health) (015) 962 4958 (Social Dev) Fax (015) 962 2274/4623
Old Parliamentary Building Tel: (015) 962 1818, (015) 962 1852, (015) 962 1754, (015) 962 1001/2/3/4/5/6 Fax (015) 962 2373, (015) 962 227

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ANNEXURE E

INFORMED CONSENT

Dear respondent

You are requested to participate in a research study conducted by Ms Motsharine S; a master's degree student at the University of Venda, under the Department of Advanced Nursing Science. The purpose of study is to determine the knowledge of diabetes chronic complications amongst diabetic patients in the Vhembe District of the Limpopo province. Kindly note that you will not be remunerated for participating in this study.

I _____ hereby consent to participate in the study entitled "Knowledge of diabetes chronic complications amongst diabetic patients in the Vhembe District of the Limpopo province". I realise that my participation in this study is entirely voluntary, and I may withdraw from the study at any time I wish. If I decide to continue my participation in this study, I will continue to be treated in the usual and customary fashion.

My anonymity is granted by the researcher and data will under no circumstances be reported in such a way that they would reveal my identity. The condition of the study has been fully explained to me and I fully understand the circumstances of my participation.

Participant's Signature: ..... **Date:** .....

Researcher's Signature: ..... **Date:** .....

Researcher's contact: 072 431 4746

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ANNEXURE F

QUESTIONAIRE

Research topic: Knowledge of diabetes chronic complications amongst diabetic patients in Vhembe District of Limpopo province.

Researcher: Motsharine S

The purpose of the questionnaire in this study is to determine and describe knowledge of diabetes patients regarding chronic complications of diabetes in Vhembe District of Limpopo Province. You are kindly requested to give your own truthful answer. Answer by making a cross(x) in the appropriate space or spaces provided. Thank you for your voluntary participation and co-operation.

SECTION A

RESPONDENT CODE ☐

Kindly complete this questionnaire with an "x" in the space of box provided

Section A

1. DEMOGRAPHIC CHARACTERISTIC OF THE PARTICIPANTS

1.1 How old are you?

A=Less than 30 years	
B=30-45	
C=46-60	
D=More than 60 years	

1.2 What is your gender?

A=Female	
B=Male	

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1.3 What is your level of education?

A=None	
B=Primary school	
C=Secondary school	
D=Higher than secondary	

1.4 Are you?

A=Employed	
B=Self-employed	
C=Unemployed	

2. THE CLINICAL CHARACTERISTICS OF PARTICIPANTS

2.1 How long have you been living with diabetes?

A=Less than 1 year	
B=1 year	
C=1-5years	
D=6-10 years	
E=More than 10 years	

2.2 What is your recent weight?

2.3 What is your recent height?

2.4 What is your recent blood pressure?

2.5 What is your recent blood glucose level?

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3. KNOWLEDGE ABOUT SELF-CARE PRACTICE, CONTROL AND MANAGEMENT OF DIABETES MELLITUS

3.1 Do you take medication without missing doses?

A=Yes	
B=No	

3.2 If yes who is assisting you to take medication?

A=Yourself	
B=Family members	

3.3 Why is it necessary to take medication?

A=To control blood sugar level	
B=To Lower blood sugar level	

3.4 What type of medication do you take for diabetes mellitus?

A=Injection	
B=Tablets	
C=Others; specify	

3.5 Are you practicing blood glucose self-monitoring on daily basis?

A=Yes	
B=No	

3.6 If yes; how many times per day do you monitor your blood sugar level?

A=Once	
B=Twice	
C=Three times	
D=Others	

3.7 Are you visiting clinic for regular blood sugar monitoring?

A=Yes	
B=No	

3.8 If yes; when do you visit clinic for regular blood sugar monitoring?

A=Once a week	
B=Once a month	
C=Once a year	
D=Others	

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3.9 Do you feel any thirst?

A=yes	
B=no	

3.10 Do you feel dizzy?

A=yes	
B=no	

3.11 Do you feel any fatigue?

A=yes	
B=no	

3.12 Do you have any headache?

A=yes	
B=no	

3.13 Do you feel experience blurred vision?

A=yes	
B=no	

3.14 Do you feel experience sweating?

A=yes	
B=no	

3.15 If yes; what do you do?

A=Visit nearest clinic/ medical practitioner	
B=Sleep	
B=Takes snacks	
C=Check blood glucose level	
D=Others; specify	

3.16 Is it necessary to carry snacks to prevent low blood sugar level?

A=Yes	
B=No	
C=Don't know	

3.17 Do you carry snacks all time you travel?

A=Yes	
B=No	

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3.18 If yes why do carry snacks all time you travel?

A=To keep your blood sugar within normal ranges	
B=To prevent low blood sugar	
C=To raise blood sugar level	
D=Others; specify	

3.19 What types of snacks do you carry with you?

A=Green apple	
B=Bread with peanut butter	
C=Sweets	
D=Cake	
E=Others; specify	

3.20 Is it necessary to consume high fibre diet in diabetes mellitus care?

A=Yes	
B=No	
C=Don't know	

3.21 Do you have a machine to monitor blood glucose at home (glucometer)?

A=Yes	
B=No	

3.22 How do you care for your eyes?

A=Apply an eye ointment	
B=Wear sun glasses	
C=Visit eye sister/ ophthalmologist	
D=Others; specify	

3.23 When last did you visit eye practitioners e.g. ophthalmologist?

A=Less than 1 week	
B=Less than1 month	
C=Less than 6 month	
D=Less than 1 year	
E=Others; specify	

3.24 Do you do regular exercises?

A=Yes	
B=No	

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4. KNOWLEDGE REGARDING MICRO-VASCULAR (SMALL BLOOD VESSELS) COMPLICATIONS OF DIABETES MELLITUS

4.1 Are you aware that uncontrolled diabetes mellitus cause diabetes complications?

A=Yes	
B=No	
C=Don't know	

4.2 Are you aware that unmanaged diabetes mellitus can affect your kidneys?

A=Yes	
B=No	
C=Don't know	

4.3 Are you aware that unmanaged diabetes mellitus can cause eye problems or blindness?

A=Yes	
B=No	
C=Don't know	

4.4 Are you aware that uncontrolled diabetes mellitus can cause feet problems?

A=Yes	
B=No	
C=Don't know	

4.5 Are you aware that uncontrolled diabetes mellitus can cause hands problems?

A=Yes	
B=No	
C=Don't know	

5. KNOWLEDGE REGARDING MACRO-VASCULAR (LARGE BLOOD VESSELS) COMPLICATIONS OF DIABETES MELLITUS

5.1 Are you aware that uncontrolled diabetes mellitus can cause ischaemic heart disease?

A=Yes	
B=No	
C=Don't know	

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5.2 Are you aware that uncontrolled diabetes mellitus can cause stroke?

A=Yes	
B=No	
C=Don't know	

6. KNOWLEDGE REGARDING NERVOUS SYSTEM COMPLICATIONS

6.1 Diabetes mellitus Complications results in feeling of feet and hands numbness or tingling sensation?

A=Yes	
B=No	
C=Don't know	

6.2 Diabetes mellitus complications results in feeling of pins and needles/pain in feet and hands?

A=Yes	
B=No	
C=Don't know	

6.3 Diabetes mellitus complications results in sensory loss and later followed by loss of motor function?

A=Yes	
B=No	
C=Don't know	

6.4 Diabetes mellitus complications result in sexual dysfunction (loss of libido, erectile problem?

A=Yes	
B=No	
C=Don't know	

6.5 Diabetes mellitus complications result in loss of protective sensation?

A=Yes	
B=No	
C=Don't know	

6.6 Diabetes mellitus complications result in bowel incontinence?

A=Yes	
B=No	
C=Don't know	

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6.7 Diabetes mellitus complications result in urinary retention?

A=Yes	
B=No	
C=Don't know	

6.8 Diabetes mellitus complications result in diarrhoea?

A=Yes	
B=No	
C=Don't know	

6.9 Diabetes mellitus complications result in anorexia?

A=Yes	
B=No	
C=Don't know	

6.10 Diabetes mellitus complications result in nausea?

A=Yes	
B=No	
C=Don't know	

6.11 Diabetes mellitus complications result in vomiting?

A=Yes	
B=No	
C=Don't know	

6.12 Diabetes mellitus complications result in feeling of fullness?

A=Yes	
B=No	
C=Don't know	

7. CHALLENGES FACED BY DIABETIC PATIENTS REGARDING CHRONIC COMPLICATIONS OF DIABETES MELLITUS IN THE VHEMBE DISTRICT

7.1 Do you have complications related to diabetes mellitus?

A=Yes	
B=No	

7.2 Which complications do have related to diabetes mellitus?

A=Eye	
B=Heart	

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C=Kidneys	
D=Foot	
E=Sexuality	

7.3 Do you have any challenges due to diabetes mellitus complications?

A=Yes	
B=No	

7.4 Indicate the challenges that you are faced with?

A=Lack of support system	
B=Poor work performance	
C=Sexual dysfunction	
D=Depression	
E=Others; specify	

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FOMO YA THENDELANO

Vha kho u humbelwa u dzhenelela thoduluso dzine dza kho u itwa nga Vho Selina Motsharine vha ne vha vha mu tshudeni wa digirii ya masters Yunivesithi ya Venda kha mu hasho wa zwa vhu ongi. Ndivho khulwane ya thoduluso ndi u toda u divha nga ha ndivho ya ma sia nda itwa a vhulwadze ha swigiri kha vha lwadze vha swigiri. Kha vha dzhiele nzhele uri u dzhenelela kha thoduluso i dzi a zwi na mbandelo.

Nne----------Ndi kho u tenda u dzhenelela kha thoduluso fhasi ha thoho i no ri ndivho ya ma si a nda itwa a vhulwadze ha swigiri kha vha lwadze vha swigiri kha Tshitiriki tsha Vhembe kha phurovintsi ya Limpopo. Ndo zwi limuwa uri u dzhenelela kha thoduluso i dzi ndi nga u funa hanga, ndi nga litsha u i sa phanda na u dzhenelela kha thoduluso arali ndi tshi funa. Hone nda funa u i sa phanda u dzhenelela kha thoduluso, ndi nga i sa phanda nda di fariwa nga ndila thonifheaho.

Thaluso ya vhune hanga na mafhungo o the a thoduluso zwi do itwa tshiphiri nga mu todulusi. Ndo talutshedzwa nyimele ya thoduluso nda i pfesesa. Ndi pfesesa nga vhudalo nyimele ya u dzhenelela kha thoduluso iyi.

Dzina la Mufhinduli.....

Tsaino ya Mufhinduli.....Datumu.....

Dzina la mu todulusi.....

Tsainao ya mu todulusi.....Datumu.....

Founu ya todulusi: 072 431 4746

MBUDZISO DZA THODULUSO

Thoho ya thoduluso: ndivho ya ma si a nda itwa a vhulwadze ha swigiri kha vha lwadze vha swigiri kha Tshitiriki tsha Vhembe, kha phurovintsi ya Limpopo.

Mutodulusi: Motsharine S

Ndivho khulwane ya thoduluso ndi u toda u divha nga ha ndivho ya ma sia nda itwa a vhulwadze ha swigiri kha vha lwadze vha swigiri. Vha humbelwa u fhindula mbudziso nga u fulufhedzea. Kha

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vha fhindule nga u nwala (x) ngomu ha tshi bogisi. Ndi kho u livhuwa tshumisano yavho khathihi na u dzhenelela nga u funa ha vho.

TSHIPIDA TSHA U THOMA: MAFHUNGO A VHUNE A MUFHINDULI

KHOUDU YA MUFHINDULI

1.1. Vhana minwaha mingana?

A=Fhasi ha minwaha ya 30	
B=30-45	
C=46-60	
D=I no fhira 60	

1.2 Vha munna kana mufumakadzi?

A=mufumakadzi	
B=munna	

1.3 Tshikolo vho dzhena u swika kha murole u fhio?

A=A thongo dzhena	
B=phuraimari	
C=Sekondari	
D=U fhira sekondari	

1.4 Vha a?

A=shuma	
B=Di shuma	
C=Shumi	

TSHIPIDA TSHA U VHUVHILI

2. NYIMELE YA MUTAKALO YA MUFHINDULI

2.1 Ndi tshifhinga tshingafhani vhakho tshila na vhulwadze ha swigiri?

A=fhasi ha nwaha muthihi	
B=ndi nwaha muthihi	
C=nwaha 1- 5	
D=minwaha ya 6-10	
E=minwaha I no fhira 10	

2.2 Tshileme tsha vho ndi tshi ngafhani?

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2.3 Vhulapfu havho ndi vhu ngafhani?

2.4 Mutsiko wa malofha avho ndi ngafhani?

2.5 Swigiri ya malofha avho ndi ngafhani?

TSHIPIDA TSHA VHURARU

3. NDIVHO NGA HA U DI THOGOMELA NA U LANGA VHULWADZE HA SWIGIRI.

3.1 Vha nwa mushonga vha sa pfuki?

A=Ee	
B=Hai	

3.2 Arali phindulo I ee; ndi nnyi a no vha thusa?

A=Vhone vhane	
B=Mirado ya muta	

3.3 Ndi ngani zwi zwa ndeme u nwa mishonga?

A=U langa swigiri	
B=U tsitsa swigiri	

3.4 Vha shumisa mishonga i fhio u langa swigiri yavho?

A=Dzhegiseni	
B=Philisi	
C=Zwinwe vho	

3.5 Vha a tsheka swigiri ya malofha avho duvha nga duvha?

A=Ee	
B=Hai	

3.6 Arali phindulo I ee; vha tsheka swigiri yavho lu ngana nga duvha?

A=Luthihi	

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B=Luvhili	
C=Luraru	
D=Zwinwe vho	

3.7 Vha ya dalela kiliniki u tshekiwa swigiri ya malofha avho?

A=Ee	
B=Hai	

3.8 Arali phindulo I ee; vha ya lini kiliniki u tsheka swigiri ya malofha avho?

A=Luthihi kha vhege	
B=Luthihi kha nwedzi	
C=Luthihi kha nwaha	
D=Zwinwe vho	

3.9 Vha a pfesa dora?

A=Ee	
B=Hai	

3.10 Vha a pfesa dzungu?

A=Ee	
B=Hai	

3.11 Vha a pfesa u neta?

A=Ee	
B=Hai	

3.12 Vha a pfesa u renwa nga thoho?

A=Ee	
B=Hai	

3.13 Vha a pfesa u sa vhona zwa vhudi ?

A=Ee	
B=Hai	

3.14 Vha a bvesa mabiko?

A=Ee	
B=Hai	

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3.15 Arali phindulo l ee; vha ita mini?

A=Vhaya kiliniki ya tsini/ Dokotela ni	
B=Vha a edela	
C=Vha la zwiliwa zwi tuku	
D=Vha tsheka swigiri ya malofha avho	
D=Zwinwe vho	

3.16 Ndi zwa ndeme u dzula vho fara zwiliwa zwituku nyana u itela u thivhela uri swigiri isi tselese fhasi malofhani?

A=Ee	
B=Hai	

3.17 Vha dzula vho fara zwiliwa zwituku nyana musi vha nyendoni?

A=Ee	
B=Hai	

3.18 Arali phindulo i ee; ndi ngani vha tshi fara zwiliwa zwituku nyana musi vha nyendoni?

A=U langa swigiri uri l dzula i kha maimo a vhudi	
B=U thivhela uri swigiri i si tsele fhasi	
C=U gonyisa swigiri malofhani	
D=Zwinwe vho	

3.19 Vha fara zwiliwa de?

A=Apula li dala	
B=Vhurotho ho dodzwa bodoro ya nduhu	
C=Malegere	
D=khekhe	
E=Zwinwe vho	

3.20 Ndi zwa ndeme u la zwiliwa zwo dalaho masephenene?

A=Ee	
B=Hai	

3.21 Vha na mutshini wa u tsheka swigiri hayani?

A=Ee	
B=Hai	

3.22 Vha thogomela hani mato avho?

A=vha do dza mishonga wa mato	
B=vha ambara ngilasi dza u thivhela duvha	
C=vha dalela muongi wa mato/dokotela wa	

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mato	
D=zwinwe vho; kha vha taluse	

3.22 Vho fhiledza lini u dalela vha ongi kana dokotela wa mato?

A=fhasi ha vhege	
B=fhasi ha nwedzi	
C=Fhasi ha minwedzi ya rathi	
D=Fhasi ha nwaha	
E=Zwinwe vho; kha vha taluse	

3.23 Vha ya ita nyonyoloso tshifhinga tshothe?

A=Ee	
B=Hai	

TSHIPIDA TSHA VHUNA

4.1 NDIVHO NGA KHOMBO DZA VHULWADZE HA SWIGIRI KHA TSINGA THUKHU DZA MALOFHA.

4.1.1 Vhulwadze ha swigiri vhusa langiwi vhu na masia nda itwa asi a vhudi?

A=Ee	
B=Hai	
C=Thidivhi	

4.1.2 Vhulwadze ha swigiri vhusa langiwi vhu vhaisa dzi tswio?

A=Ee	
B=Hai	
C=Thidivhi	

4.1.3 Vhulwadze ha swigiri vhusa langiwi vhu vhaisa mato?

A=Ee	
B=Hai	
C=Thidivhi	

4.1.4 Vhulwadze ha swigiri vhusa langiwi vhu ita uri muthu avhe na thaidzo ya milenzhe?

A=Ee	
B=Hai	
C=Thidivhi	

4.1.5 Vhulwadze ha swigiri vhusa langiwi vhu disa thaidzo ya zwanda?

A=Ee	
B=Hai	
C=Thidivhi	

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4.2 Ndivho nga khombo dza vhulwadze ha swigiri kha tsinga khulwane dza malofha.

4.2.1 Vha a zwi divha uri vhulwadze ha swigiri vhu sa langiwi vhu nga disa vhulwadze ha mbilu?

A=Ee	
B=Hai	
C=Thidivhi	

4.2.2 Vha a zwi divha uri vhulwadze ha swigiri vhu sa langiwi vhu nga disa vhulwadze ha sitirouku?

A=Ee	
B=Hai	
C=Thidivhi	

TSHIPIDA TSHA VHUTANU

5. NDIVHO MA LUGANA NA MASIA NDA ITWA KHA SISITEMU I LANGAHO ZWIPFI ZWA MUVHILI.

5.1 Vhulwadze ha swigiri vhu nga ita uri milenzhe na zwanda i fe zwipfi?

A=Ee	
B=Hai	
C=Thidivhi	

5.2 Vhulwadze ha swigiri vhu nga ita uri vhapfe u nga vha kho thavhiwa nga dzi nelete kha milenzhe na kha zwanda?

A=Ee	
B=Hai	
C=Thidivhi	

5.3 Vhulwadze ha swigiri vhu nga I ta uri zwipfi zwa muvhili na ku shumele kwa muvhili ku si tsha vha kwa vhudi?

A=Ee	
B=Hai	
C=Thidivhi	

5.4 Vhulwadze ha swigiri vhu nga i ta uri vhu dzekani vhu si tsha vha nga ndila ya vhudi?

A=Ee	
B=Hai	
C=Thidivhi	

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5.5 Vhulwadze ha swigiri vhu nga i ta uri vha xelelwe nga zwipfi zwi no tsireledza mu vhili?

A=Ee	
B=Hai	
C=Thidivhi	

5.6 Masia nda itwa a vhulwadze ha swigiri a nga ita uri vha tshuluwe?

A=Ee	
B=Hai	
C=Thidivhi	

5.7 Masia nda itwa a vhulwadze ha swigiri a nga l ta uri vha sa tsha shisha zwa vhudi?

A=Ee	
B=Hai	
C=Thidivhi	

5.8 Masia nda itwa a vhulwadze ha swigiri a nga ita uri vha di shishele?

A=Ee	
B=Hai	
C=Thidivhi	

5.8 Masia nda itwa a vhulwadze ha swigiri a nga ita uri muthu a di kakele?

A=Ee	
B=Hai	
C=Thidivhi	

5.9 Masia nda itwa a vhulwadze ha swigiri a nga ita uri vha vhe na u silingwa?

A=Ee	
B=Hai	
C=Thidivhi	

5.10 Masia nda itwa a vhulwadze ha swigiri a nga ita uri vha vhe na u sa funa zwiliwa?

A=Ee	
B=Hai	
C=Thidivhi	

5.11 Masia nda itwa a vhulwadze ha swigiri a nga ita uri vha vhe na utanza?

A=Ee	
B=Hai	
C=Thidivhi	

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5.12 Masia nda itwa a vhulwadze ha swigiri a nga ita uri vha vhe na u pfa thumbu yo zwimbelwa?

A=Ee	
B=Hai	
C=Thidivhi	

TSHIPIDA TSHA VHURATHI

6. KHAEDU DZA MA SI A NDA I TWA A VHULWADZE HA SWIGIRI DZO LIVHANAHO NA VHA LWADZE VHA RE NA VHULWADZE HA SWIGIRI KHA TSHITIRIKI TSHA VHEMBE.

6.1 Vhana manwe masia nda itwa a vhulwadze ha swigiri?

A=Yes	
B=No	

6.2 Masia nda itwa a hone ndi a no kwama mini?

A=Mato	
B=Mbilu	
C=Tswio	
D=Milenzhe	
E=Vhudzekani	

6.3 Vha na dzi khaedu dzi no e la na na masia nda itwa a vhu lwadze ha swigiri?

A=Ee	
B=Hai	
C=Thidivhi	

6.4 Arali phindulo i Ee, kha vha sumbedze khaedu dzi ne vha kho tangana nadzo.

A=U sa wana thikhedzo	
B=U sa shuma zwa vhudi mushumoni	
C=U sa tsha shuma zwa vhudi kha vhu dzekani	
D=U vha mutsiko	
E=Zwinwe vho; kha vha taluse	

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ANNEXURE G

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To whom it may concern.

I hereby confirm that I edited
SELINA MOTSHARINE'S
MCur thesis,

Title:
KNOWLEDGE OF CHRONIC COMPLICATIONS AMONGST DIABETIC PATIENTS IN THE VHEMBE DISTRICT OF THE LIMPOPO PROVINCE, SOUTH AFRICA

in April 2017.

I wish this student well in their endeavours.

Catherine Hutchings

Catherine Hutchings

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ANNEXURE G

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13 December 2017

To Whom it May Concern

This serves to confirm that I have edited the language, spelling, grammar and style of the MCur thesis by **Selina Motsharine**, titled: **"Knowledge of Chronic Complications Amongst Diabetic Patients in the Vhembe District of Limpopo Province, South Africa"** The manuscript was also professionally typeset by me.

Sincerely Yours

Cert. Freelance Journalism, Dip. Creative Writing, MSc (Medicine), PhD

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