

# A REVIEW OF THE MANAGEMENT OF PATIENTS WITH TYPE 2 DIABETES AT LERATONG HOSPITAL, 2010

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## **ABSTRACT**

**Introduction:** The Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) acknowledge in their guidelines that diabetic care is complex and requires that numerous issues, beyond glycaemic control, be addressed. To further ensure a high quality of care, it is necessary that healthcare workers constantly check whether the standard of care offered is effective, equitable, efficient and humane.

**Aim:** The aim of the study was to review the clinical management of patients with type 2 diabetes at Leratong Hospital in relation to the SEMDSA guidelines for Diagnosis and Management of Type 2 Diabetes Mellitus for Primary Health Care – 2009.

**Methods:** This was a observational descriptive study using data from the charts of 388 patients with type 2 diabetes who access care at Leratong Hospital.

**Results:** The majority of participants were male. Their average age was 55.7 years (range: 33 to 83 years). The glycosylated haemoglobin was documented in 64.95% of patients, weight in 5.67%, blood pressure in 96.39%, lipid in 21.39%, serum creatinine in 90.46%, urine dipstick in 90.91%, patient education in 98.2%, eye examination in 51.8%, foot examination and micro albumin in less than 1%. Optimal control of glycosylated haemoglobin, systolic blood pressure, diastolic blood pressure, cholesterol and triglyceride was noted in 5.56%, 46.72%, 16.8%, 80.77% and 74.67% respectively. Thirty eight percent of patients were on two oral anti diabetic agents, the majority of patients (94.32%) were receiving an ACE inhibitor for blood pressure control, 34.02% were on statin therapy, and 92.01% were on aspirin. Less than 1% were on Clopidogrel and fibrate.

**Conclusion:** overall the quality of management of patients with type 2 diabetes is poor and there is a need for improvement.

## **DECLARATION**

This dissertation is my own work and all primary and secondary sources have been appropriately acknowledged. The dissertation has not been submitted to any other institution as part of an academic qualification.

This dissertation is prepared in partial fulfilment of the requirement of the Master of Medicine degree in Family Medicine at the School of Family and Public Health Medicine, Nelson R Mandela School of Medicine, University of KwaZulu-Natal, Durban South Africa

Signed

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## **ABBREVIATIONS**

ACE Inhibitor: Angiotensin Converting Enzyme Inhibitor

ADA: American Diabetes Association

AntiHPT: Antihypertensive

ARB: Angiotensin Receptor Blocker

BMI: Body Mass Index

BP: Blood Pressure

DBP: Diastolic Blood Pressure

HCTZ: Hydrochlorothiazide

HbA1C: Glycosylated Haemoglobin

HDL: High-density Lipoprotein

LDL: Low-density Lipoprotein

RX: Treatment

SBP: Systolic Blood Pressure

SEMDSA: Society for Endocrinology, Metabolism and Diabetes of South Africa

Std Dev: Standard Deviation

WHO: World Health Organisation

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## Chapter 1 INTRODUCTION

### 1. Introduction

The diabetic pandemic is growing worldwide and is a large contributor to the increasing incidence of chronic disease, particularly in developing countries<sup>1</sup>. In 2010, there were an estimated 285 million patients with diabetes mellitus worldwide, and this number is expected to increase to 438 million by the year 2030.<sup>2</sup> The number of adults with diabetes in sub-Saharan Africa is expected to expand by 98% from 12.1 million in 2010 to 23.9 million in 2030. An exact number is not available due to many people that are undiagnosed and living with type 2 diabetes. Another contributing factor is the paucity of data in Africa<sup>3</sup>

Type 2 diabetes commonly occurs among people over the age of 40 years, although with the increase in obesity it is now not uncommon to diagnose type 2 diabetes in patients under 40 years of age. Africa has not escaped the disease with a prevalence of diabetes of 3.8% compared to the global prevalence of diabetes of 6.4%.<sup>2</sup>

Type 2 diabetes is as result of a number of factors including genetics, unhealthy diet and lack of physical activity. Type 2 diabetes can be effectively controlled by a number of interventions such as lifestyle modification, oral diabetic medication and the use of insulin when oral medication is no longer effective.<sup>4</sup> Failure to adequately manage diabetes can result in macrovascular and microvascular complications, and can result in avoidable deaths. Effective management of diabetes mellitus requires ongoing collaboration between the patient and the health care team. Evidence based guidelines developed by the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) for the diagnosis and management of Type 2 diabetes mellitus in primary health care are available for health care workers in South Africa.<sup>4</sup> The patient needs to be encouraged to give attention to lifestyle issues (exercise, weight loss, diet etc), adherence to medication and, as the disease progresses, the use of insulin. The health care team must be knowledgeable about the disease, its treatment and the need for ongoing monitoring to ensure that any complications arising from the disease are identified early and managed effectively. Correct management of the condition will help minimize the development of complications and (hopefully) ensure a long and healthy life for the patient.

## 2. Background

Type 2 diabetes is the most common form of diabetes accounting for around 90% of all diabetics in sub-Saharan Africa, similar to other regions of the world.<sup>3</sup>

From 1990 to 2000 the prevalence of diabetes mellitus in Africa increased by 30%.<sup>5</sup> Within South Africa, studies show that an estimated 2 to 3 million people are affected by diabetes, with the number rising annually.<sup>5</sup> Of these, up to 1 million people may not even know that they are diabetic.<sup>5</sup> This is a common problem in Africa, where many diabetic patients remain undiagnosed, with figures ranging from 80% in Cameroon to 55% in Cape Town.<sup>6,7</sup> These numbers are mainly made up of patients with type 2 diabetes with the increase in prevalence of diabetes thought to be mainly related to lifestyle changes and increased obesity.<sup>5</sup>

The 2012 SEMDSA Guideline for the Management of Type 2 Diabetes estimate that 6,5% of adults between the age of 20 and 79 years old have diabetes.<sup>8</sup>

Within South Africa, the prevalence of diabetes is higher in urban areas than it is in rural areas.<sup>6,7</sup> The rising prevalence of impaired glucose tolerance is a warning sign is due mainly to increasing obesity and decreased physical activity.<sup>6,7</sup> As type 2 diabetes is occurring in younger people, there are an increasing number of complications due to the disease such as blindness, amputations and kidney problems. These complications will have economic consequences both for the individual and for the country.<sup>9</sup>

Due to its complications, diabetes is associated with significant morbidity and mortality.<sup>9</sup> Complications such as heart disease, stroke, amputation, blindness, kidney failure, cardiovascular disease and hypertension, all of which occur more commonly among diabetic patients lead to a decreased life expectancy.<sup>9</sup> The World Health Organization (WHO) reports that diabetes mellitus is the fourth largest underlying cause of death globally.<sup>9,10</sup> It is therefore very important that diabetic patients receive ongoing high quality care and treatment.<sup>7,10</sup>

Public health services in South Africa are faced with a shortage of doctors and other health care professionals, which has impacted negatively on the quality of care provided to patients.<sup>11</sup> Patients often queue from early in the morning to be seen by a health care professional and to receive their monthly treatment. Access to public health facilities can be a problem for those with limited income, who live far away or have family responsibilities that prevent them from keeping their regular appointments. Poverty and unemployment affect many people who attend these services, and their health status may be affected by a lack of suitable food on a regular basis.

### 3. Problem statement

The effectiveness of the current management and care practices of type 2 diabetes patients at Leratong Hospital is unknown. Based on the profile of patients seen in casualty there is also concern about whether the guidelines, as prescribed by the clinical manager, are being adhered to.

### 4. Aims and objectives

The aim of this study was to review the management of patients with Type 2 diabetes mellitus in relation to guidelines for diagnosis and management of diabetes mellitus for primary care produced by the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) at Leratong Hospital in Gauteng.

Objectives:

- i. To review the demographic profile of patients with type 2 diabetes mellitus presenting for care to Leratong Hospital.
- ii. To review whether processes of care (such as HbA1c, lipid profile, blood pressure, eye examination, weight and BMI) are carried out each month.
- iii. To review the metabolic outcome of patients with Type 2 diabetes mellitus (HbA1C, blood pressure and lipid profile).
- iv. To review the pharmacological management of patients with Type 2 diabetes mellitus in relation to their diabetic (and related) diseases.
- v. To provide recommendations to the hospital manager about ways of improving the care of patients with type 2 diabetes mellitus.

### 5. Definitions

There are many definitions which could be used to define quality of care. However for the purposes of this study I have chosen to use the Institute of Medicine definition which has defined quality of care as ‘the degree to which health services for individuals

and populations increase the likelihood of the desired health outcomes and are consistent with current professional knowledge'.<sup>12</sup>

Furthermore, targets for care consist of two elements: process and outcome measures. Process measures refer to what is actually done and outcome measures comprise the final stage in the structure-process-outcome paradigm. The criteria for evaluating appropriateness typically relates to whether the proposed intervention in a specific clinical setting is consistent with scientific evidence and accepted practice.<sup>12</sup> Theoretically, high quality of care should lead to better outcomes and regular outcome assessment is critical to the evaluation of the quality of care.<sup>12</sup>

## 6. Significance of study

There is minimal information available on whether the SEMDSA guidelines for diabetic care are being implemented at state-funded clinics and hospitals in South Africa and this study aims to assess situation at Leratong Hospital.

## Chapter 2 LITERATURE REVIEW

### 1. Introduction

This chapter will present the signs and symptoms of diabetes mellitus, specifically type 2 diabetes and will review the treatment options available. This will include blood pressure management, lipid treatment and antiplatelet agents. This will be followed by a review of international management guidelines to ensure that patients receive the best quality of care.

### 2. Types 2 Diabetes

The most common factor used to diagnose Type 2 diabetes is hyperglycaemia, which is caused by insulin resistance and / or impaired insulin secretion.<sup>13</sup> Patients who present with symptoms of hyperglycaemia and a blood sugar reading greater to or equal to 11.1mmol/l or two blood sugar readings greater than 11.1 mmol/l are diagnosed with diabetes mellitus.<sup>4</sup> Long-term diabetes can cause macro and micro vascular disease.<sup>7,11</sup> Diabetic micro vascular disease leads to significant morbidity in the form of blindness, end-stage renal disease and limb amputations.<sup>9,13</sup> Diabetic macro vascular disease is characterised by accelerated atherosclerosis, which leads to peripheral gangrene, strokes and premature cardiovascular disease.<sup>9,13</sup>

Beside hyperglycaemia and insulin resistance, over 80% of diabetics are obese and have a host of metabolic abnormalities. These include dyslipidaemia (characterised by an increase in small dense low density lipoprotein (LDL) cholesterol, a decrease high density lipoprotein (HDL) cholesterol, and an increase in triglyceride levels) as well as hypertension. These contribute to the higher incidence of cardiovascular morbidity and mortality which is seen amongst diabetic patients.<sup>13</sup>

### 3. Diabetes Care

In a patient with established diabetes, it is very important to perform a complete medical evaluation in order to classify the diabetes, detect the presence of diabetic complications, review the previous management of diabetes and assist in formulating a management plan, which will be the basis for continuing care.<sup>9</sup> It is also important to educate the patient on all aspects of the disease, as he / she will be a life-long 'partner' in the management of his / her diabetes.<sup>13</sup> Ideally, all patients with diabetes should receive medical care from a physician-coordinated team.<sup>9</sup> A management plan should be drawn up and formulated as a mutual therapeutic alliance between the patient and his/her family, the physician, and other members of the health care team.<sup>9</sup> To carry out the management plan, each aspect of the plan needs to be understood and agreed on by



the patient and his team, and the goals laid out by the treatment plan must be attainable.<sup>9</sup>

SEMDSA, among many other professional organisations, published an algorithm for the glycaemic management of patients with type 2 diabetes in 2009.<sup>4</sup> Diabetes care is complex and requires that many issues, beyond glycaemic control, be addressed. Quality care of the diabetic patient requires particular attention to blood pressure control, management of dyslipidaemia, reduction in associated cardiovascular risk factors, screening for complications of diabetes and assisting patients in their pursuit of an improved quality of life.<sup>9,14</sup> Dyslipidaemia and blood pressure are clear risks for cardiovascular disease in patients with type 2 diabetes and should be treated more aggressively in patients with type 2 diabetes because of increased risk of both macro and micro vascular complications.<sup>9</sup>

To achieve high quality of diabetes care, diabetics clinics must be well organised with well trained and dedicated staff in diabetes care that use effective protocols and appropriate tools. A process of regular audit with the implementation of interventions to improve care needs to be instituted.<sup>8</sup>

## **Blood pressure management**

Blood pressure should be measured at every routine visit and treatment should be instituted if the blood pressure is found to be high.<sup>4,9</sup> Diabetic patient with a systolic blood pressure (SBP) greater than 130mmHg or diastolic blood pressure (DBP) greater than 80mmHg should have their blood pressure confirmed on a separate day. A repeat SBP of 130 mmHg or greater, or DBP of 80mmHg or greater confirms a diagnosis of hypertension.<sup>4,9</sup> A goal of less than 130mmHg and 80 mmHg for SBP and DBP respectively is recommended by the SEMDSA guidelines.<sup>4,9</sup>

Lifestyle modification should be instituted at diagnosis of hypertension in all diabetic patients. If these measures fail to adequately control the blood pressure, pharmacological therapy should be added to life style modification.<sup>4,9</sup> Lifestyle modification for hypertension consists of: weight loss, if overweight; the DASH (Dietary Approaches to Stop Hypertension) diet which includes reducing sodium and increasing potassium intake; ensuring that alcohol is only taken in moderation; and ensuring that patients exercise regularly.<sup>4,9</sup> As regular physical activity helps to maintain weight loss and prevent weight regain, 30-45 minutes of moderate-intensity aerobic physical activity (3-5 days per week initially, gradually increasing the duration and frequency) is recommended.<sup>4</sup>

The drug of choice for diabetic patients with hypertension is an angiotensin converting enzyme (ACE) inhibitor or an angiotensin receptor blocker (ARB) in case of intolerance to the former. In black patients, low dose thiazide is preferable as initial therapy.<sup>4,9</sup>

Multiple drug therapy (two or more agents at maximal doses) are often required to achieve blood pressure targets<sup>4,9</sup>

## **Lipid management**

Lipids should be measured annually or even more frequently if they are high and after the initiation of treatment.<sup>16</sup>

Lipid therapy is implemented in order to gain or maintain reasonable levels of LDL-cholesterol. The SEMDSA guidelines for the management of patients with Type 2 diabetes set the target control for the total-cholesterol at < 4.5mmol/l, LDL-cholesterol at < 2.5mmol/l (or less than 1.8 mmol/l in the presence of ischaemic heart disease, cerebrovascular disease or peripheral vascular disease), HDL- cholesterol >1.0mmol/l (men) and >1.2mmol/l (women) and less than 1.7mmol/l for triglycerides.<sup>16</sup>

Dyslipidaemia is also managed by lifestyle modification. The reduction of saturated fat, trans fat, and cholesterol intake; increase of omega-3, fatty acids, viscous fibre, and plant stanols/sterol; weight loss (if indicated); and increased physical activity should be recommended to improve the lipid profile in patients with diabetes.<sup>4</sup>

Statins are first line agents for lowering LDL-cholesterol in diabetic patients and in accordance with this, statin therapy should be added to lifestyle therapy, regardless of baseline lipid levels for all patients with type 2 diabetes with existing cardiovascular disease or patients older than 40 years of age and who have one or more additional cardiovascular risk factors.<sup>4, 16</sup> For diabetic patients at lower risk (without established cardiovascular disease or under 40 years of age), statin therapy should be considered if the LDL-cholesterol remain > 2.5mmol/l despite adequate glycaemic control and advice on lifestyle.<sup>4, 16</sup> The addition of fibrate or another lipid modifying drug may be necessary in certain specific condition.<sup>4, 16</sup>

## **Antiplatelet agent**

Aspirin is indicated for primary or secondary prevention of cardiovascular problems in patients with type 2 diabetes with increased or established cardiovascular risk factors for patients over 30 years of age.<sup>4,9</sup> In cases where the patient is allergic to aspirin, clopidogrel can be used.<sup>4,9</sup>

## **Improving the quality of care**

In order to ensure the proper management of diabetic patients and that high standards of care are achieved, guidelines targeting (among many others) primary care providers, have been published by professional organizations such as the Canadian Diabetes Association<sup>5</sup>, the American Diabetes Association<sup>9</sup>, the World Health Organization<sup>8</sup> and in South Africa, the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA).<sup>4</sup> When primary care physicians follow these guidelines they play an

important role in helping patients with type 2 diabetes to achieve therapy goals.<sup>10</sup> Unfortunately, many published South African studies show that the quality of diabetic care received by patients in the public sector hospitals and clinics is inadequate and by in large the guidelines are not followed.<sup>13, 15</sup>

Much evidence exists supporting a range of interventions to improve diabetes outcomes.<sup>14</sup> Clinical audit is an accepted and popular method of assessing medical care and is an intervention shown to improve patient care.<sup>14</sup> It is defined by Marshall Marinker as 'the attempt to improve the quality of medical care by measuring the performance of those providing that care, by considering the performance in relation to desired standard and by improving on this performance'.<sup>14</sup>

A clinical audit brings together professionals from all sectors of health care to consider clinical evidence, promote education and research, develop and implement clinical guidelines, improve information management skills, and contribute to the better management of resources—all with the aim of improving the quality of care of patients.<sup>16</sup>

Clinical audit is an important tool which should be used regularly, not only for the Family Physician, but for all health care workers in order to improve the quality of care of their patients. Done repeatedly, clinical audits will help in understanding the level of care being provided to the patient and minimise the gap between clinical practice and guidelines. This on-going process will give valid and important information to health care workers that will help them to improve their practice.

Worldwide, guidelines have been produced to assist health care workers in their quest to render proper care but unfortunately the implementation of the standards of care for diabetes has been less than optimal in most clinical settings.<sup>9</sup>

Family physicians have the professional responsibility of constantly checking whether the standard of care he/she offers is effective, equitable, efficient and humane. There may be evidence of the success of certain interventions but if they are not being implemented they are of no use to the patient.<sup>17</sup>

## **Chapter 3 METHODOLOGY**

### **1. Introduction**

This chapter will review the study design and setting, the population from which the sample was taken, inclusion and exclusion criteria and information about what data was collected. This is followed by how the data was analysed and a description of ethical approval that was received.

### **2. Study Design**

This study used a quantitative, descriptive and retrospective design. It was exploratory in nature and assessed whether guidelines were currently being followed. No interferences or associations were made.

### **3. Study Setting**

The study was carried out at Leratong Hospital, which is a regional level hospital in Gauteng province, South Africa. It has a capacity of 900 beds of which 813 are usable. Leratong Hospital is a public health facility that provides services to the people living in the West Rand District of Gauteng. For historical reasons, the residential areas are largely inhabited by black people, most of whom are unable to afford private medical aid. It is an area characterized by a range of residential houses, ranging from formal houses to informal settlements. A community survey in 2007 showed that 51.48% of the population around the hospital was male. This may be due to the job opportunities and migrant labour which brought men from rural areas to the west rand.<sup>18</sup>

Leratong Hospital serves the population of the West Rand with two district hospitals and one psychiatric hospital, namely: Dr Yusuf Dadoo, Carletonville and Sterkfontein Hospitals. Many clinics and General Practitioners refer their patients to Leratong Hospital.

This site was chosen for convenience as the researcher is an employee at the hospital. Poorly controlled diabetic patients are regularly seen at the hospital – often in casualty. A diabetic clinic, supervised by the Department of Internal medicine is run every Tuesday in the outpatient department and approximately 600 diabetic patients are seen

each month. Patients are seen at monthly intervals or more frequently if their diabetes is poorly controlled. Once patients are stable they are referred back to their local clinic for on-going follow up. The diabetic team at Leratong Hospital consists of three medical officers, a diabetic nurse and a dietician. Patients who need ophthalmological consult are referred to the ophthalmologist in the hospital.

In 2008 the clinical manager at Leratong hospital introduced the SEMDSA guidelines in an attempt to optimise the treatment provided to diabetic patients. As alluded to in the literature review, these guidelines outline investigations that should be done to monitor for complications and targets that should be reached to reduce the development of complications. The researcher has noted that despite these guidelines being introduced, there appears to have been little obvious improvement in patient indicators such, as glycaemic control.

#### 4. Study Population

The study population was all patients with type 2 diabetes who attended the diabetic clinic at the hospital during the study period

#### 5. Study Sample

The study sample was all patients with type 2 diabetes who attended the diabetic clinic at Leratong Hospital from the 1st of January 2009 to the 31st of December 2009. This time period has been chosen for convenience.

Using Epi Info Version 3.2 (C.D.C,2004),with more than 600 type 2 diabetic patients attending the clinic per month, the sample size for a cross-sectional study was calculated at 90% power and 95% confidence level to be 388.

## 6. Data Source

The medical records of all patients with Type 2 diabetes during the study period were examined and the first 388 patients who met the inclusion criteria constituted the sample. This was a convenient sample. However it was assumed that patients present to the clinic in a random order and that files in the pharmacy are in a random order. It was not anticipated that bias was introduced by the sampling method.

## 7. Inclusions and exclusion Criteria

The inclusion criteria consisted of:

- Clinic records of patients with type 2 diabetes.
- Patient who had been treated for type 2 diabetes at the study site for at least 12 months prior to this study.

The exclusion criteria consisted of:

- Type 1 diabetes mellitus
- Gestational diabetes

## 8. Data Collection

Data from the clinic records was transcribed to an audit tool (Appendix 1). This audit tool was based on standards of care established by the SEMDSA Guidelines for diagnosis and management of type 2 diabetes mellitus for primary health care- 2009.

Four categories of data were collected:

1. Demographic details of patients to understand the study population,
2. The standard tests that should have been be done on patients either monthly or annually
3. The results of the tests, and
4. The treatment provided to the patients based on the SEMDSA guideline

The following data was collected

- Demographic data: age, gender and race
- Care processes:
  - HbA1c (at least bi-annually)
  - weight (each regular visit)
  - Body Mass Index (annually)
  - blood pressure (each regular visit)
  - lipid profile (annually or more frequent if high risk patient)
  - serum creatinine (annually)
  - micro albumin (annually if no persistent proteinuria in urine dipstick)
  - comprehensive foot examination (annually)
  - dilated eye examination (annually),
  - patient education (ongoing education on diabetes)
- **Metabolic outcome:** this data was collected to determine the health status of the patients with respect to each variable and to determine whether or not they were within the target ranges considered acceptable
  - HbA1C <7%: optimal, 7-8%: acceptable, >8%: poorly controlled.
  - systolic blood pressure <130 mmHg: optimal, >130 mmHg: poorly controlled.

- diastolic blood pressure: <80 mmHg: optimal,>80mmHg: poorly controlled.
  - total cholesterol: <4.5 mmol/l: optimal.
  - LDL cholesterol: < 2.5 mmol/l: optimal.
  - HDL cholesterol: >1.0 mmol/l (men): optimal,> 1.2 mmol/l (women): optimal.
  - Triglyceride < 1.7 mmol/l: optimal.
- **Pharmacological management:** these data will indicate what treatment options were given to the patients based on their test results
    - Treatment for hyperglycaemia
    - Blood pressure treatment
    - Lipid treatment
    - Antiplatelet agents

## 9. Data Analysis

The extent to which the results obtained met the guidelines was assessed to determine whether patients received the necessary tests, were optimally controlled, acceptably controlled, or poorly controlled as determined by whether or not their results were within acceptable limits, and if appropriate treatment strategies were provided. The data on the research tool was entered into STATA from where it was exported into excel for analysis.

The data was analysed in the following categories



- Demographic data: this was analysed in excel and is presented in a table with number and percent by gender, while the ages were graphed.
- Care processes: presented in a table with number and percentages. All the variables were analysed independently
- Metabolic outcome: the patients' results were aggregated and the descriptive analysis of the quantitative variables including mean, median, range and mode, while categorical variables were summarized with frequency tables and bar charts.
- Pharmacological management: This data was aggregated by variable and analysed for the number and percent of treatments.

#### 10. Ethics

Approval for conducting this study was obtained from the Biomedical Research Ethics Committee of the Nelson R Mandela School of Medicine University of KwaZulu–Natal, South Africa (REF: BE 171/010). Permission to conduct the research study was obtained from the clinical manager of Leratong Hospital.

## Chapter 4 RESULTS

### 1. Introduction

This chapter presents the results of the study and consists of the demographic details, care processes, metabolic outcome and pharmacological management. The demographic data of participants consisted of age, sex and race. The care processes consisted of HbA1C, weight, BMI, BP, lipid profile, serum creatinine, micro albuminuria, urine dipstick, foot examination, eye examination, and patient education. The metabolic outcomes were BP and lipid profile which were ascertained to determine whether they were optimally or poorly controlled and whether HbA1C was optimally, acceptably or poorly controlled. The therapeutic approaches were reviewed in relation to the recommendation of the SEMDSA guidelines for the management of patients with type 2 diabetes.

### 2. Demographic Data

Three hundred eighty eight patients constituted our sample size. Of the 388 patients' records that were obtained, information on gender was missing for 23 patients - see table 1 for other important demographic data. The mean age of the patient was 55.7 years (SD 10.02), ranging from 33 to 83 years. All patients were African.

**Table 1 Gender of participants**

Gender	Number	Percent
Female	171	44.1
Male	194	50.0
Missing	23	5.9
Total	388	100

### 3. Care Processes

Some of the care process data was collected monthly and some annually. However, the data was aggregated and a summary of results is presented.

Patients' education, blood pressure measurement, urine dipstick and serum creatinine were the processes recorded, with more than 90% of these items being recorded in the notes. The quality of the health education given to patients was not assessed – which

may mean that this was not a very helpful variable to measure. Eye examinations, BMI, weight, glycosylated haemoglobin were recorded in 51.8%, 60.31%, 5.67, and 64.95% respectively. Comprehensive foot examinations and micro albumin were recorded in less than 1% of patients while lipid profile was estimated in 21.39% of patients (Table 2).

The low rate of weight measurement compared to BMI measurement is because, according to the guideline, weight should be recorded at each visit while the BMI is calculated only once a year. This will explain the reason for a high percentage of patients having their BMI recorded and a low percentage of patients having their weight recorded.

**Table 2. Care processes**

Characteristics	Number (n=388)	Percentage
HbA1C once	99	25.5
HbA1C twice	153	39.4
Weight	22	5.7
BMI	234	60.3
BP	374	96.4
Lipid	83	21.4
Serum creatinine	351	90.5
Micro albumin	2	0.5
Urine dipstick	353	91.0
Foot examination	1	0.3
Eye examination	201	51.8
Patients education	381	98.2

#### 4. Metabolic Outcomes

Metabolic data is presented in table 3. Some data was missing in some folders. The sample mean HbA1C was  $8.18 \pm 1.17\%$ . The mean systolic and diastolic blood pressures

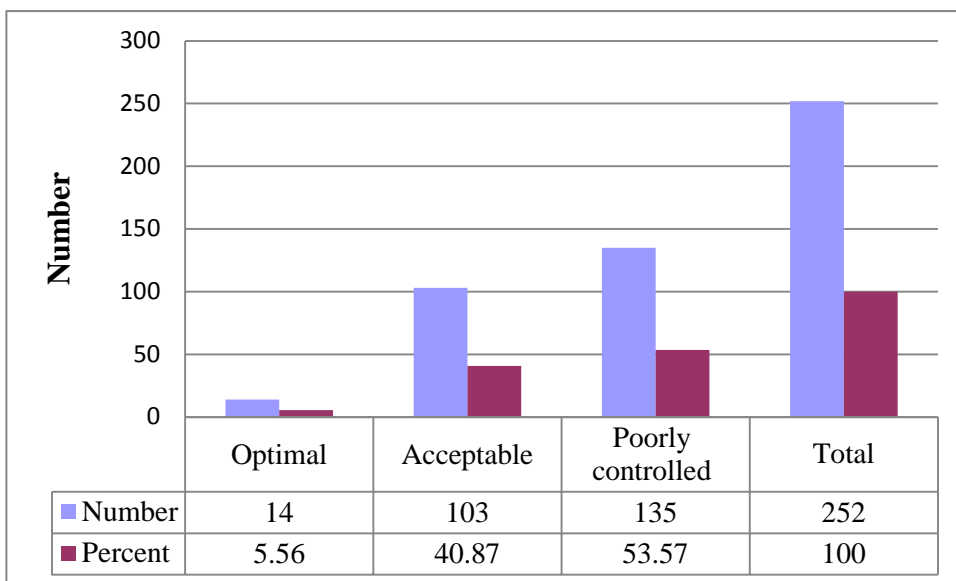
were  $134.7 \pm 15.0$  and  $87.9 \pm 9.6$  mmHg, respectively. The mean total plasma cholesterol concentration was  $3.94 \pm 0.7$  mmol/l. The mean LDL cholesterol level was  $1.99 \pm 0.55$  mmol/l and the mean HDL cholesterol levels were  $1.4 \pm 0.3$  and  $1.7 \pm 0.98$  mmol/l in men and women respectively. (Table 3)

**Table 3. Metabolic outcomes**

Characteristic	number	Mean	Std. Dev*	Min*	Max*	%Opt. control	%Accep control	%Poor control
HbA1C at least once a year	252	8.2	1.2	6.3	12.8	5.6	40.9	53.6
SBP	381	135	15.0	103	197	46.7	-	53.3
DBP	381	88	9.6	57	120	16.8	-	83.2
Total cholesterol	78	3.9	0.7	1.3	5.4	80.8	-	19.2
LDL cholesterol	76	1.99	0.55	0.8	3.5	67.11	-	32.89
HDL cholesterol men	76	1.4	0.3	0.8	2.5	38.1	-	10.5
HDL cholesterol women	75	1.7	1.0	0.5	6.8	39.5	-	11.8
Triglyceride	75	1.2	0.4	1	2	74.7	-	25.3

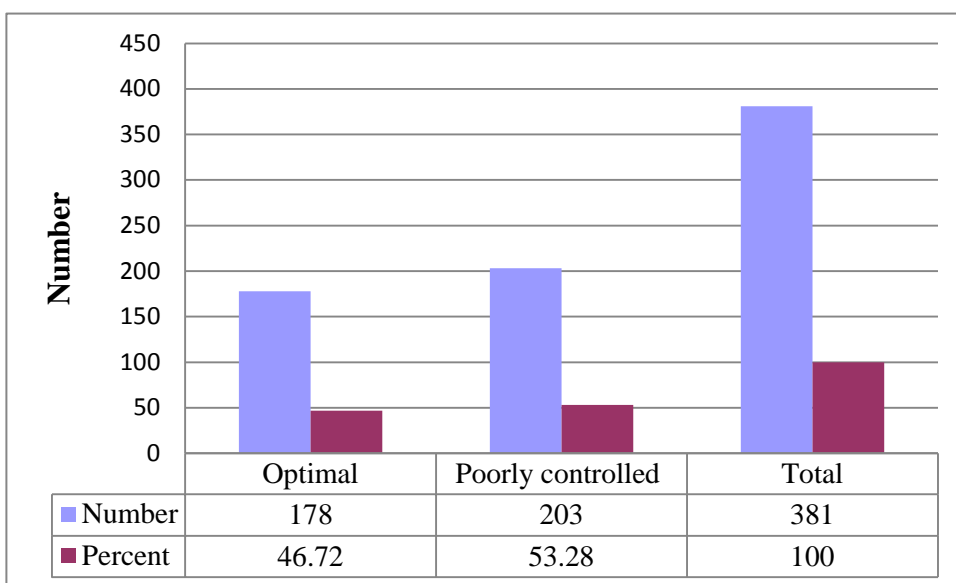
%Opt.cont: percentage of optimal control, %Accep cont.: percentage of acceptable control, %Poor cont: percentage of poor control

Control target of HbA1C: of the 252 patients for whom data was available, only 5.6 % (n=14) were optimally controlled, 41 % (n=103) had acceptable control and more than half were poorly controlled. (Figure 1)



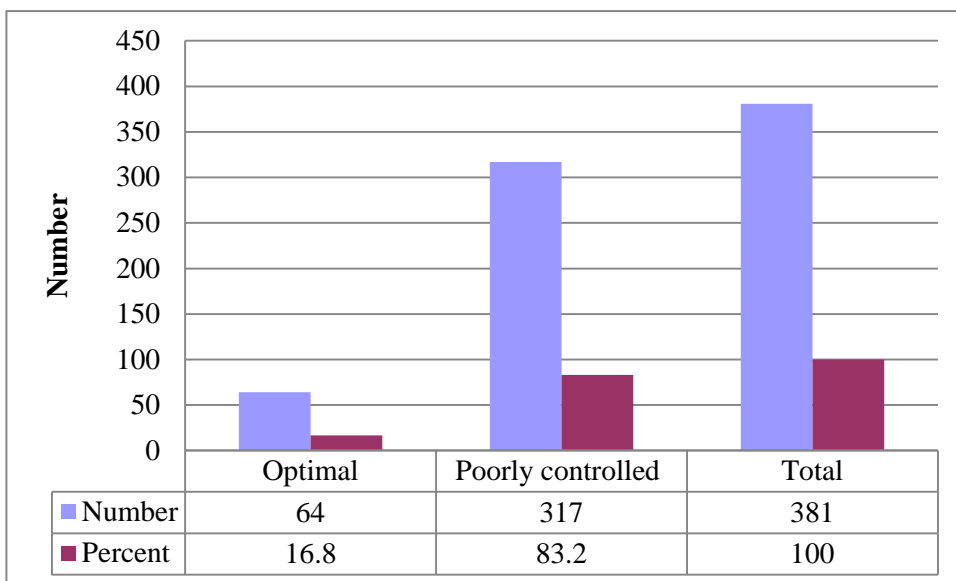
**Figure 1. Control target of HbA1c**

Blood pressure control: the systolic blood pressure of 53.3% (n=203) was poorly controlled which represented more than half of the sample. (Figure2)



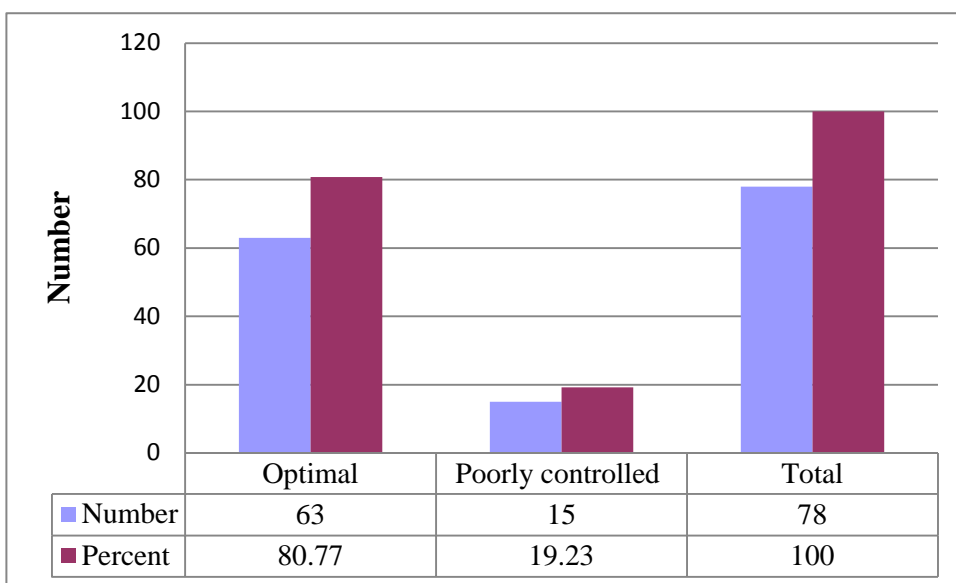
**Figure 2. Control target of SBP**

The diastolic blood pressure of the majority of the patients was poorly controlled, with only 16.8% conforming to the SEMDSA guidelines. (Figure 3)



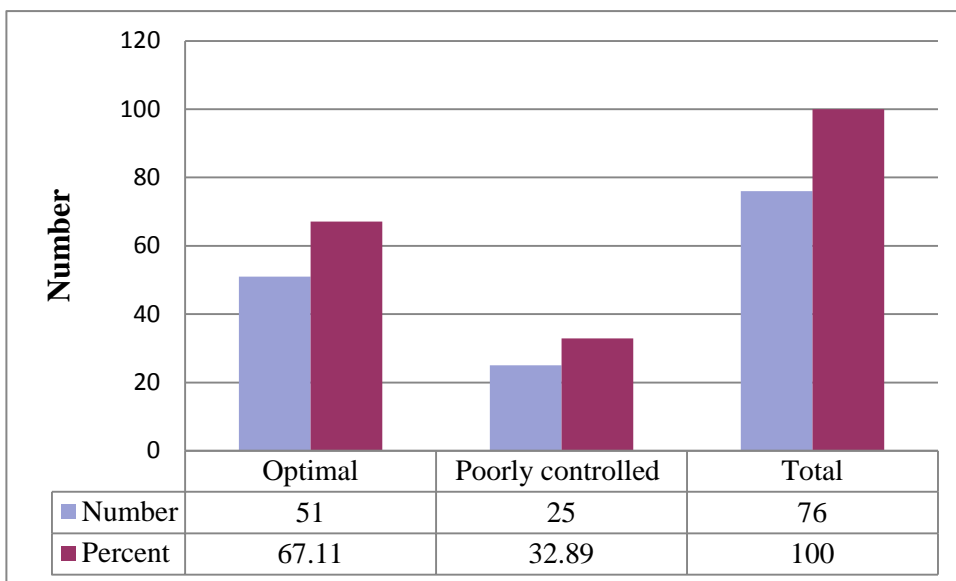
**Figure 3. Control target of DBP**

Lipid profile: Data for total cholesterol in the previous 12 months was available in only 78 patients in whom 80% were well controlled. (Figure 4)



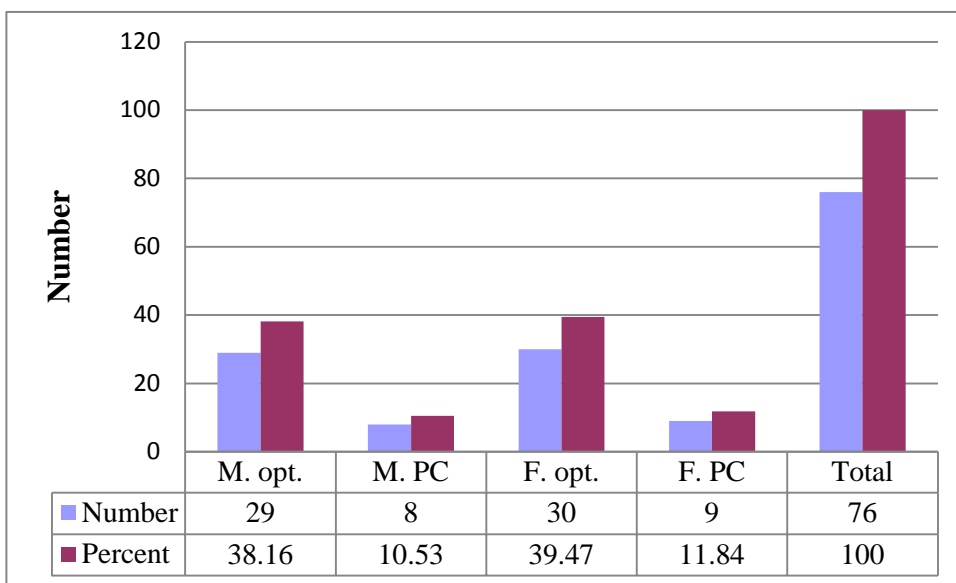
**Figure 4. Control target of cholesterol**

LDL cholesterol control: many patients had data missing for their LDL cholesterol. Of the 76 for whom there was data; two thirds (67.11%) were well controlled, with the remaining third being poorly controlled. (Figure 5)



**Figure 5. Control target of LDL cholesterol**

HDL cholesterol control: while many patients had missing data for HDL cholesterol most of them were well controlled (Figure 6)



**Figure 6. Control target of HDL cholesterol**

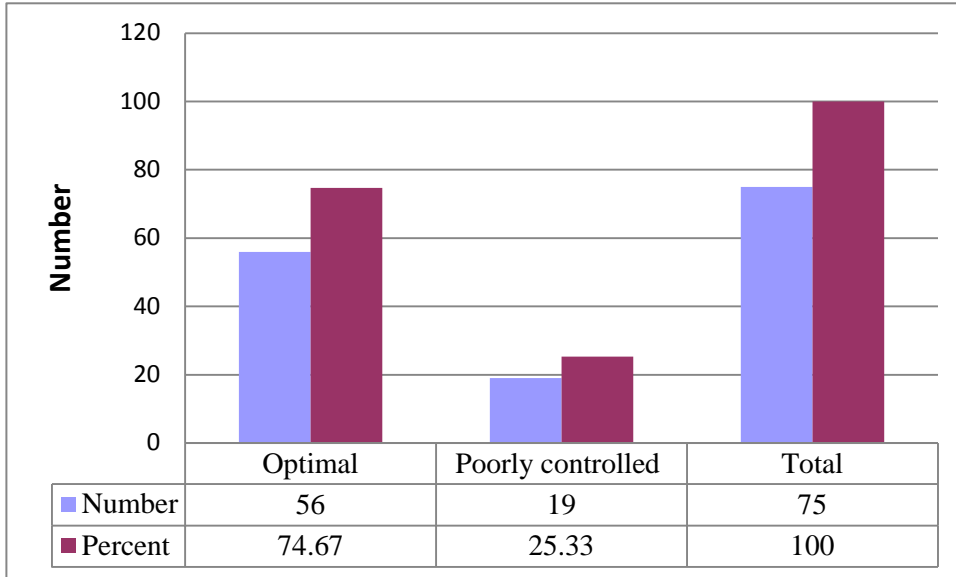
Abbreviations. M.opt: male optimal control

M.PC: male poorly controlled

F.opt: female optimal control

F.PC: female poorly controlled

Data for triglyceride control was found in 75 patients and the majority of them were well controlled (Figure 7).



**Figure 7. Control target of triglyceride**

## 5. Pharmacological management

Table 2 summarizes the pharmacological management of patients.

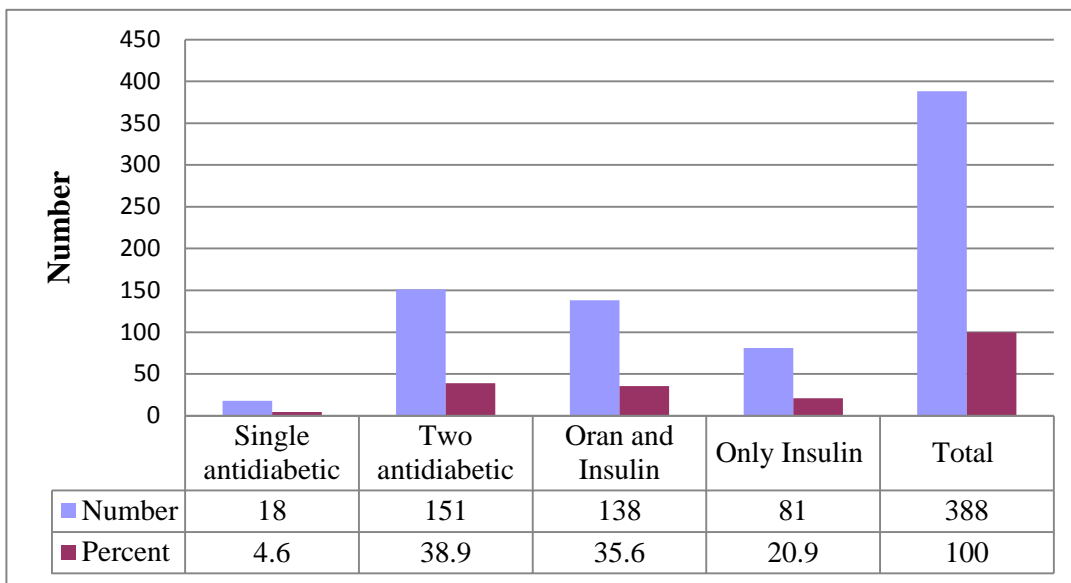
**Table 3. Pharmacological management approach**

Medications	Number (388)	Percent
Single oral diabetic agent	18	4.6
Two orals diabetic agents	151	38.9
Oral diabetic agents and insulin	138	35.6
Insulin	81	20.9
Aspirin	357	92.0
Clopidogrel	2	0.5
Statin	132	34.0



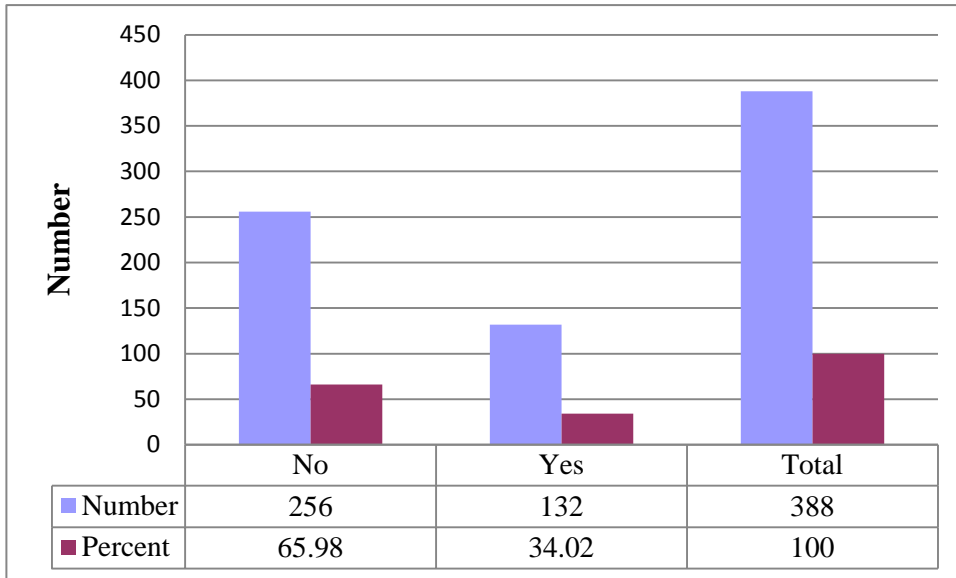
Fibrate	2	0.52
ACE (or ARB)	366	94.3
ACE (or ARB) and HCTZ	351	91
ACE (or ARB), HCTZ, Loop diuretic.	11	3
ACE (or ARB), Loop diuretic.	11	3

Blood glucose management: 4% (n=18) of patients were prescribed one oral diabetic agent; 39% (n=151) of patients were on two oral diabetic agents; 35% (n=138) were on oral diabetic medication and insulin and 21% (n=81) were receiving only insulin (Figure 8). Blood pressure management: 94.3% (n=366) of patients were on ACE (or ARB), 91% (n=351) of patients were prescribed both ACE (ARB) and HCTZ.



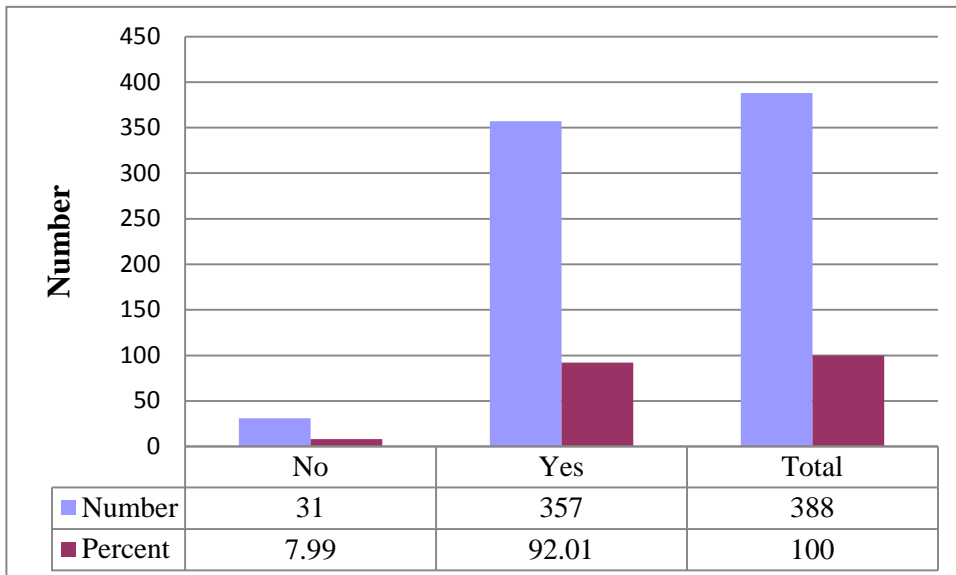
**Figure 8. Blood glucose management**

Lipid management: only 34% (n=132) of patients were prescribed statin therapy (Figure 9). It is important to emphasize the importance of statin therapy among diabetic patients as high lipids are a major contributor to excess mortality due to the increased risk of atherosclerotic vascular disease.



**Figure 9. Lipid management**

Antiplatelet management: 92% (n=357) were receiving aspirin according to the guideline – see Figure 10.



**Figure 10. Aspirin uses**

## Chapter 5 DISCUSSION

### 1. Introduction

This chapter discusses the results of our study in four sections. Firstly the demographic details followed by the care process, thirdly, the metabolic outcomes, and lastly, the therapeutic approach. After this the study limitations and recommendations are discussed.

### 2. Demographics Data

There were more men in this study than women, with a mean age of 56 years. All the patients were black. Although diabetes affects men and women in equal numbers, it is unusual for more men than women to be accessing care and for more men to be enrolled in the study than women. The study population in a study done by Levitt<sup>19</sup> in Cape Town in 1996 on diabetes and complications associated with diabetes was predominately women. Klisiewicz in his study in Johannesburg in 2009 showed that sixty five percent were female and thirty five were male while the mean age for the patients was 59,8%(SD10,77).<sup>20</sup> Further study need to be done to determine whether these figures reflect greater access by men to services or bias due to sample selection and the population served.

### 3. Care Processes

The care processes are activities which should be performed on a regular basis on patients who are being managed for type 2 diabetes. The result showed a wide variation among doctors regarding performing of the expected physical examination and laboratory tests, with some of them done more consistently than others.

Sixty five percent of patients had at least one reported measure of HbA1c. This figure is higher than that reported by Erasmus<sup>21</sup> in the Eastern Cape in 1996 and Levitt<sup>19</sup> in Cape Town who found 24% and 3,4% patients respectively had had their HbA1c checked. However a study on diabetic care provided in Britain by Tunbridge<sup>22</sup> in Newcastle in 1990 showed that 80 % of patient had at least one reported measure of HbA1c per year. A study by Suwatee Pet<sup>23</sup> in 2000 in the United States, found that 94% of patients had their HbA1c recorded annually. The HbA1c gives an indication of long term diabetic care and it is important that health care providers to regularly measure the HbA1c and discuss the implications of an abnormal result with patients.

Only 22% of patients had their weight recorded on each visit, which is much lower than that reported by Erasmus<sup>21</sup> in his study in the Eastern Cape in 1996 and Levitt<sup>19</sup> in Cape Town in 1996 who found that 100% of patients had their weight recorded. Sixty percent of patients in this study had their BMI calculated which is higher than that

found by Goudswaard<sup>21</sup> in his study in Utrecht in 1999 reported that only 29% of patients had their BMI recorded while Martell R while Van Vuuren reported that only 5% of patients had their BMI recorded in their study in Cape Town in 2005.<sup>26</sup> It is not only in South Africa where important details are not recorded. In 2005 Vinker<sup>25</sup> in Israel reporting that only 39 % of diabetic patients had their BMI recorded. Measuring BMI is an important care process as BMI is an objective measure and targets can be set and patients encouraged to lose weight as necessary.

The majority of patients (96%) had their BP checked regularly, and the findings of this study are comparable to a study by Akel M and Hamadeh<sup>10</sup> done in Lebanon in 1999 which found that 85.8% of patients had their BP documented. Tunbridge<sup>22</sup> in his study in Newcastle in 1990 noted that 87% of patient had their BP recorded on a regular basis. These findings are also consistent with the finding of other South African studies. In a study in the Western Cape in 2005, Martel R<sup>26</sup> showed that 88.5% of patients attending the diabetic clinic had their BP checked regularly while Levitt<sup>19</sup> in 1996 showed that 97.5% of diabetic patients had their BPs recorded regularly. This is an important finding as poorly controlled BP is a risk factor for cardiovascular disease in diabetic patients.<sup>13</sup> Measuring the BP and responding to abnormal BP results is not the same. This study did not however look at whether or not health care providers responded appropriately to abnormal BP results. There is a need for further research to look at this aspect of the management of hypertension among diabetic patients.

Despite the guidelines recommending an annual eye examination, eye examination was done in just over 50% of patients. Screening for micro vascular complication (micro albuminuria and diabetes related foot conditions) was also poorly done. This is consistent with the findings of other studies in South Africa and in other parts of the world. Levitt et al<sup>19</sup> in their study done to evaluate the quality of health care received by diabetic patients in Cape Town in 1996, found that eye and foot examination were rarely recorded. Novo A and Jokic<sup>27</sup> in 2007 in Bosnia and Herzegovina found that on average only 50% of patients had a foot or eye examination with even less patients being screened for micro albuminuria. Foot examination is an important preventive measure and should be part of routine care in diabetic patients, as foot disease and amputations for gangrene in diabetic patients is not uncommon.

Blood pressure, urine dipstick and patients' education were all done well and appear to have been systematically incorporated into routine practice. Studies have shown that examinations and screening tests that are incorporated into routine care (often done by nursing staff) are more likely to be done. In 2007, Ohman-Strickland PA<sup>28</sup> assessed whether the quality of diabetes care differed among US practices employing nurse-practitioners, physicians assistants, or neither. They concluded that family practices employing nurse-practitioners performed better than those with physicians only and those employing physicians assistants, especially with regard to diabetes process

measures, as these measurements were more likely to get done in practices employing nurse practitioners.

In South Africa BP measurement, urine dipstix and patient education are within the scope of practice of the nurses. In public hospitals the nurses are responsible for recording vital signs, doing urine dipsticks and conducting patient education, all of which is usually done on each visit before the consultation.

#### 4. Metabolic Outcomes

The mean HbA1c of  $8.2 \pm 1.17\%$  indicates that the level of glycaemic control in our study is suboptimal with only 5.6% (n=14) of patients with HbA1c values which meet the SEMDSA guideline target.<sup>4</sup> This is much worse than the 47% of patients with HbA1c values of less than 7% which Coon and Zulkowski<sup>29</sup> found in 1999 achieved by health care providers in the USA. The findings of this study are worse than those found in Australia in 2003 where Bryant<sup>30</sup> found that 30% of patients met the target value of HbA1c of less than 7%. These findings are worse than the findings of Levitt<sup>19</sup> in Cape Town in 1996 who reported 20% of their patients had a normal HbA1c. It is of concern that guidelines are not being followed in doing HbA1c and even when the blood is taken, the vast majority of patients are not meeting the targets set by the SEMDSA guidelines. Health care providers need to ensure that patients adhere to lifestyle changes and are compliant with their medication. If adequate control is still not being achieved then dosages need to be adjusted or insulin introduced to ensure that patients reach the HbA1c targets.

The mean SBP and DBP in our study were  $135 \pm 15$  and  $87.9 \pm 9.6$ . Coon and Zulkowski in 2002<sup>29</sup> found mean SBP of  $139 \pm 18.8$  and mean DBP of  $75 \pm 11.5$  respectively. Fifty three percent and 83% of patients had SBP and DBP respectively above the recommended targets in our study. However our patients had better controlled SBP than DBP compared to the study done by Coon and Zulkowski<sup>29</sup> where only 28% of the patients had controlled SBP and 79% of the patients had controlled DBP. BP control is often challenging and multiple agents are often required to achieve BP targets.

Of those patients who did have their lipid panel tested, the majority achieved the optimal target. The lack of testing for lipids indicates that the doctors are not requesting the necessary information which will allow them to make an accurate diagnosis of hyperlipidaemia. The doctors are therefore unable to manage abnormal lipids appropriately in order to decrease the risk of atherosclerotic vascular disease.

#### 5. Pharmacological management

The use of ACE or ARB, HCTZ and aspirin in our study is in accordance with the recommendation of the SEMDSA guidelines.<sup>4</sup> However, less than 50% of patients in

our study were getting lipid-lowering medications. With regard to the recommendation of the SEMDSA guidelines, the results suggest a need to increase the number of patients on lipids as the mismanagement of dyslipidaemia in patients with type 2 diabetes leads to an increased risk of cardiovascular disease.

## 6. Limitations

As this was a retrospective study it was not possible to deal with each individual patient, it is difficult to determine which of their physiological factors contribute to what result. This was an observational descriptive study and the results are presented using tables and charts with no statistical testing to determine statistical significance. The sampling method may have introduced bias. Missing data in a number of the patients' files may also have distorted the results.

## **Chapter 6 RECOMMENDATIONS AND CONCLUSIONS**

### **1. Introduction**

The result of this study indicates that physicians at Leratong Hospital's diabetes clinic are not fully complying with the SEMDSA guidelines for the management of patients with type 2 diabetes, which results in the majority of patients not reaching the desired outcomes. Despite evidence that intensive control of cardiovascular risk factors reduces morbidity and mortality in patient with type 2 diabetes, this study revealed that a large number of patients were not achieving recommended treatment targets.

### **2. Recommendations**

The following recommendations are made as a result of this study:

- Guidelines and protocol for diabetes management and care must be available in all consulting rooms for doctors to access.
- A diabetes flow-sheet needs to be included in the diabetic medical record of each patient to facilitate disease management
- A quality improvement programme team should be instituted at the hospital and should meet regularly to address matters relating to appropriate diabetes management and care
- Training of health care workers participating in the management of patients with type 2 diabetes needs to take place on a regular basis
- The importance of record keeping needs to be stressed to all health care staff involved in patient management not only to ensure optimal care for each person, but to enable the clinic performance to be assessed
- More staff need to be allocated to the clinic due to the high patient load and the pressure that this puts the doctors under to see all the patients. Standing orders to allow nurses to perform routine tests would help ensure that, by the time patients are seen by the doctor, a number of tests have been done.

- Further research is needed to understand the barriers to implement diabetes guidelines. A better understanding of such barriers will enable management to implement alternative strategies to improve care to diabetic patients.

### 3. Conclusion

The results of this study indicate that the SEMDSA guidelines are only being adhered to in part by the staff at Leratong Hospital. Those duties performed by the nurses are more likely to be executed, while the doctors do not always request for tests to be done. The quality of care may be compromised by the high patient load at the clinic and the desire by the medical staff to see everyone, resulting in tests being missed in the interest of time. However, the results also show that once tested, patients are not being given the treatment they need to effectively manage their disease, which could result in unnecessary morbidity and early mortality. The lack of data recorded in the patient's files is of concern as it may not accurately reflect the testing done and care provided.

This study has also shown that patients are not receiving the optimal levels of care, even when tests are done. As Leratong Hospital has the facilities and capability to provide high quality care to its patients, it is important for the medical staff to use the guidelines provided and to regularly audit the standard of care provided.

This study should constitute a baseline for the future research and evaluation of the management of type 2 diabetes in relation with SEMDSA Guidelines.



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**APPENDIX**

**AUDIT TOOL FOR THE MANAGEMENT OF DIABETIC TYPE 2**

CHART No ..... Age..... Sex..... Race.....

<b>Key processes of care</b>	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Ju l	Au g	Se p	Oc t	No v	De c
HbA1c at least 2 times a year												
Weight/Waist regular visit												
BMI annually												
Blood pressure at each regular visit												
Lipid profile at least once a year												
Serum Creatinine annually												
Microalbumin measurement annually if no proteinuria												
Urine dipstick at each visit												
Comprehensive foot examination annually												
Eye examination												

for Retinopathy annually												
Patient education												

CHART No ..... Age..... Sex..... Race.....

	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Ju l	Au g	Se p	Oc t	No v	De c
<b>Metabolic Outcome</b>												
HbA1c												
Blood Pressure												
Total Cholesterol												
LDL Cholesterol												
HDL Cholesterol												
Triglyceride s												

CHART No ..... Age..... Sex..... Race.....

	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Ju l	Au g	Se p	Oc t	No v	De c
<b>Therapeutic approach</b>												
Glucose treatment												
• Single antidiab. oral agent												
• Two antidiab. oral agent												
• Oral agent and insulin												
• Insulin therapy												
Blood Pressure RX												
• ACEI or ARB												
• HCTZ												
• Loop Diuretic												
• Beta blocker												
• Other Anti-HTN												
Lipid Treatment												
• STATIN												
• FIBRATE S												
Antiplatelet agents												
• Aspirin												
• Clopidogrel												



