Factors relating to poor glycaemic control amongst diabetic patients attending Mitchells Plain Community Health Centre

A mini-thesis submitted in partial fulfilment of the requirements for the degree of Master of Public Health at the School of Public Health, University of the Western Cape

Abdul Khalied Kariem

Supervisor: Dr Hazel Bradley

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Keywords

Diabetes Mellitus

Glycaemic Control

Socio-economic factors

Glycated haemoglobin

Medication

Treatment

Community Health Centre

Primary Health Care

Cape Town

Developing Country

Abbreviations

BMI	Body Mass Index
CHC	Community Health Centre
CNP	Clinical Nurse Practitioner
HbA_{1c}	Glycated Haemoglobin
HPO	Health Promoting Officer
MO	Medical Officer
MPCHC	Mitchells Plain Community Health Centre
NGO	Non-Governmental Organisation
NPO	Non-Profit Organisation
PACK	Practical Approach to Care Kit
SEMDSA	Society for Endocrinology, Metabolism and Diabetes of South Africa
WHO	World Health Organisation

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I would like to thank The Almighty for giving me the strength and fortitude to complete this study.

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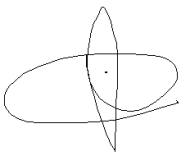
I acknowledge my wife for her love, patience and understanding over the last few years.

Declaration

I declare that **Factors relating to poor glycaemic control amongst diabetic patients attending Mitchells Plain Community Health Centre** is my own work that it has not been submitted before for any degree or examination in any University or College, and that all the sources I have quoted or used haven indicated and acknowledged as complete references.

Dr A.K. Kariem November 2017

Signed: 

Abstract

Background

Diabetes is a serious public health problem accounting for the second highest cause of death in South Africa in 2015. Poor diabetic control causes various micro- and macro-vascular conditions of which management is expensive and ultimately results in a poor quality of life and death. Globally, less than one third of the population attains diabetes control of an HbA_{1c} of less than 7%. However, little is known about the extent of control in South Africa.

Setting: Mitchells Plain is a predominantly coloured township in Cape Town of approximately 310 000 people of which 39.9% are unemployed. There is good access to basic and health services in the community, however, despite good access to these services it is becoming evident that diabetes control is poor in the community, resulting in an increase in complications. At Mitchells Plain Community Health Centre (CHC) diabetic patients attend the chronic diseases club daily where they are seen by one of four clinical nurse practitioners (CNPs) or a senior medical officer.

Aim: The aim of this study was to assess diabetes control and the factors that influence diabetes control among patients attending Mitchells Plain CHC.

Methodology

Study Design: This study was a cross-sectional analytical study which examined the relationship between diabetes and several variables.

Study Population and Sampling: All Type-2 diabetic patients older than 18 years, attending the chronic diseases club at Mitchells Plain CHC were included. A total of 340 patients were selected and interviewed and a folder review was conducted over a four-month period between November 2016 and February 2017.

Data Collection: Data was collected using an interviewer-led patient questionnaire and a folder review which had been piloted in another similar CHC. The patient interviews and folder review were both conducted by the researcher.

Data Analysis: Data was captured on Excel and analysed using Epi Info 7 to determine the prevalence of poor diabetes control at Mitchells Plain CHC and risk factors associated with poor control. Descriptive analysis was used to summarise data. The various variables were

grouped and frequencies and percentages determined. With regards to epidemiological measures of association, variables were categorised and chi-squared tests were used to assess whether glycaemic control was statistically significant at a p value ≤ 0.05.

Results

The sample population comprised 324 patients (16 were excluded due to incomplete data) of which 63 (19.4%) patients had an HbA_{1c} of 7% or less with a mean HbA_{1c} of 9.16 and a median of 8.8. Four socio-demographic factors - age, gender, source of income and marital status showed a statistically significant association with glycaemic control. No other variables showed any statistical association of significance. Less than a third of patients reported receiving any form of diabetic education and 18.5% belonged to a support group. Many gaps with the clinical management of diabetic patients and adherence to prescribed guidelines were identified. These included annual review guidelines where only 53.4% of patients had an HbA_{1c} done, one patient their feet examined and 12 patients their retinas screened.

Conclusion

The study showed that a large portion of diabetic patients are at risk of cardiovascular disease as a result of their poorly controlled diabetes, with 80.6% remaining above the target HbA_{1c} value of 7%. Specific gaps identified in clinical care provided by clinicians are likely to contribute to these poor outcomes and lack patient of support and education constrain development of empowerment to self-manage diabetes

Recommendations

To address the gaps the following recommendation are made: clinicians be trained with regards to diabetic management; health promotion officers and dieticians be more available to educate and support patients about diabetes management; tailored diabetic or chronic disease stationary be produced for use during clinical consultations; regular audits of diabetic folders be conducted at facilities; and further research be conducted into associated risk factors for poor glycaemic control.

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Chapter One: Introduction

1.1 Background

WHO (2013) defines diabetes as a chronic condition where either the pancreas does not produce enough insulin (Type 1) or where the body cannot effectively use the insulin it produces (Type 2). It is estimated that worldwide that over 300 million people have diabetes and in 2004 1% of this population died as a result of this disease. It is projected to become the seventh leading cause of death worldwide by 2030 (WHO, 2013).

In their study Bradshaw, *et al* (2007) found that 4.3 % of all deaths in South Africa in the year 2000 could be attributed to diabetes and that placed it as the seventh overall cause of mortality in South Africa for that year. Previous mortality data rates diabetes as the sixth highest underlying cause of death in South Africa (Statistics South Africa, 2013). A recently released report from Statistics South Africa (2017) shows the steady increase of diabetes mellitus being the underlying cause of death from fifth in 2013, third in 2014 and second in 2015.

In a report by Groenewald, *et al.* (2008) diabetes was the seventh highest cause of mortality in the City of Cape Town Metropole in 2006 and in the sub-district of Mitchells Plain it was the sixth highest for the same period. South Africa's first demographic and health survey conducted in 1998 found that self-reported prevalence of diabetes in the Western Cape was 4.9% among women and 3.2% among men (eds. Steyn, Fourie and Temple, 2006). The prevalence of diabetes in the Cape Town coloured community was found to be 10.8% in the age group 30 to 65 years; second only to Asians (eds. Steyn, Fourie and Temple, 2006). Recent data indicates increased prevalence of diabetes with amongst urban African population is 13.1% in Cape Town and in the Western Cape prevalence amongst those of mixed ancestry was 26.3% (Amod, *et al.* 2017)

The Society of Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) in their guidelines advocate for an HbA_{1c} of less than 7% consequently, an HbA_{1c} of greater than 7% could be considered as poor control (Amod, *et al.* 2012). Glycated haemoglobin or HbA_{1c} reflects the average plasma glucose over the previous three months in a single measure which can be performed at any time of the day and does not require any special preparation such as fasting. These properties have made it the gold standard for assessing glycaemic control in population (WHO, 2006).

In the introduction of their guidelines of 2012, SEMDSA note that there is limited local data with regards to glycaemic control but it is estimated that more than two thirds of South Africa's Type-2 diabetics have an HbA_{1c} greater than 7% and worldwide less than 50% of Type-2 diabetics achieve glycaemic control even in developed countries (Amod, *et al.* 2012).

Diabetes is an expensive disease to manage especially considering the management of its complications. The total annual cost of diabetes in the Sub-Saharan Africa region was estimated to be US$67 billion. In South Africa in 2005 the average cost of treating hyperglycaemia in hospital amounted to R5309 per admission (Hall, *et al.*, 2011). The mean cost of treating a patient with diabetes in 2015 was USD 918.9 and 57 319 diabetes related deaths (Amod, *et al.* 2017)

1.2 Study Setting

Mitchells Plain forms part of the City of Cape Town Metropole and is the largest coloured township of Cape Town; 91% of the population is coloured with 7.3% black (City of Cape Town, 2013). Mitchells Plain's population is estimated to be about 310 000 (City of Cape Town, 2013) with an unemployment rate of 39.9% (Department of Social Development, 2008). The population have good access to services but despite this there is a high incidence of crime related, in particular, to gangsterism and substance abuse including alcohol, Tik (methamphetamine) and heroin.

Mitchells Plain sub-district is one of the largest health sub-districts of the Metro District. The total population served is estimated at more than 537 000 people and covers an area of approximately 5000 hectares (City of Cape Town, 2013). Primary level healthcare is provided in the sub-district, with two Non-Governmental Organisations providing home-based care in the community. The City of Cape Town provides women and child health as well as TB and some HIV care at eight clinics; of which one has limited adult chronic care. The provincial government provides adult curative and chronic care at one Community Health Centre (CHC), Mitchells Plain CHC and Mitchells Plain Hospital is the district hospital catering for the community.

Mitchells Plain CHC is the major provincial government primary health care facility serving the people of Mitchells Plain and surrounding areas of Philippi (excluding Browns Farm and Crossroads). The burden of disease of patients attending the facility ranges from non-communicable disease such as diabetes (forms about 28% of total caseload for medical officers) and communicable diseases such HIV/AIDS and TB.

Currently, the clinical staff of the facility comprise four medical officers, four community service medical officers, one family physician and six clinical nurse practitioners. The chronic disease clubs run daily with a mix of patients. These patients are consulted by four clinical nurse practitioners and supported by a senior medical officer which sees problem patients as well. On arrival the patients' vitals are checked in the club room where they will receive a talk and advice about the various chronic diseases and its management by health promotion officers. Dieticians are available once a week to provide education and support to patients. The clubs are designed to provide education as well as to streamline consultations in order to give most attention to those patients who are poorly controlled.

1.3 Problem Statement

Diabetes is a leading cause of mortality and morbidity worldwide which is as a result of poor glycaemic control. Worldwide it is estimated that approximately 15% to 31% of patients with diabetes were reaching target levels (HbA_{1c} less than 7%) (Khattab, *et al.*, 2010). In South Africa, and at Mitchells Plain CHC in particular, this figure is not known. Folb, *et al.* (2015), in their study in two districts in the Western Cape, found a mean HbA_{1c} of 9.1% with more than 77% of patients having an HbA_{1c} of greater than 7% target. These findings were similar to the Integrated Chronic Disease Audit of 2014 conducted at various health facilities within the Western Cape which showed that only 18% of patients had an HbA_{1c} of 7% or less (Western Cape Government 2014). Poor diabetes control results in micro- and macro-vascular conditions, resulting in an increase in morbidity and mortality, the consequences of which is both difficult and expensive to manage (Hall, *et al*., 2011). This study will determine the extent of poor glycaemic control and assess possible risk factors (socio-economic patient, provider and system factors) amongst patients attending Mitchells Plain CHC so as to guide possible interventions to improve glycaemic control at this CHC.

1.4 Aim and Objectives

The aim of this study was to assess diabetes control and the factors that influence diabetes control among patients at Mitchells Plain CHC.

The objectives of the study are as follows:

1. To describe the extent of glycaemic control of patients at Mitchells Plain CHC.
2. To assess possible risk factors in patients with poor glycaemic control.
3. To assess the management of diabetic patients with reference to diabetic guidelines.

Chapter Two: Literature Review

2.1 Introduction

A review of available literature was conducted to determine possible patient, especially socio-economic, provider and system and system factors that may contribute to poor glycaemic control especially in a primary health care setting. Most of the studies that have been conducted specifically looking at factors that contribute to poor control of diabetes were carried in developed countries, with only a few available from developing countries. In addition, the studies relating to patient factors were often based at hospitals and specialised diabetic care facilities and not at a primary health care level. The studies of provider factors included primary health care clinics but only one was based in a South Africa with the rest in developed countries.

2.2 Patient Factors

It is evident that various patient factors play a role in poor glycaemic control. The factors vary from socio-economic to physiological factors of the patients themselves. A review and meta-analysis conducted by Sanal, *et al.* (2011) looked at patient, disease and treatment related factors associated with glycaemic control. Significant findings were that microvascular disease was associated with poor control as well as poor adherence to treatment including diet, medication and exercise.

2.2.1 Duration since diagnosis: Duration since diagnosis has been cited as a significant factor in several studies. Khattab, *et al.* (2010) referred to treatment greater than seven years as an associated factor to poor control. Their study was conducted on type-2 diabetics in Jordan. Other studies by Almutairi, *et al.* (2013), Juarez, *et al.* (2012) and Benoit, *et al.* (2005) also found poorer control in groups of patients who have been on diagnosed for greater than seven years. In their study on diabetic patients in Mexico, Ramirez, *et al.* (2016) found that in their uncontrolled group the average duration from diagnosis was 10.4 years. Juarez, *et al.* (2012) found that patients that were more than ten years on treatment were nine times more likely to be poorly controlled than patients treated for three years or less in a study conducted in Hawaii. Similarly, Donnelly, *et al.* (2007) found HbA_{1c} was lower in patients with a shorter duration of treatment amongst their study population which included all type-2 diabetic patients in a town in Scotland. Almutairi, *et al.* (2013) conducted their

study at a Diabetic Centre in Saudi Arabia while Benoit, *et al.* (2005) looked at diabetics of low income and mixed ethnicity in San Diego.

2.2.2 Medication: The number of medication a patient takes each day may influence glycaemic control. Juarez, *et al.* (2012) found that poor control existed among patients using 15 or more different medication. They grouped number of medication as less than five, five to nine, 10 to 14 and 15 or more. Only the 15 or more group showed any significance for poor glycaemic control.

2.2.3 Age: In their study on management of diabetes and hypertension at primary health care facilities within Cape Town, Steyn, *et al.* (2008) showed that pensioners were more likely to have good glycaemic control than younger patients. Juarez, *et al.* (2012) found that patients aged under 35 years had a higher risk of poor control. This finding was not supported by other similar studies (Khattab, *et al.* 2010 and Benoit, *et al.* 2005). One difference between Juarez, *et al.* (2012) and other studies is that they defined poor control as having an HbA_{1c} of greater than 9%. De Vries, *et al.*, (2004) also found younger onset of diabetes as a significant factor. Almutairi, *et al.* (2013) found that the highest percentage of poor control was among the age group of 60 years and older.

2.2.4 Gender: Misra and Lager (2009) found that gender differences influence glycaemic control in diabetic patients. Similarly, Yigazu and Desse (2017) found amongst the Ethiopian people at Shanan Gibe Hospital women had a significantly poorer glycaemic control than men whereas Ramirez, *et al.* (2016) in their study of diabetics in Mexico found that women had better glycaemic control. However, Donnelly, *et al.* (2007) did not find any relationship between gender and glycaemic control

2.2.5 Education levels: The general understanding is that low educational levels equal poor control and this view is supported by Khattab, *et al.* (2010) and Goudswaard, *et al.*, (2004). Similarly, Yigazu and Desse (2017) in their study population of patients in the Southwest of Ethiopia found in their study that illiterate people and those with primary school education had the poorest glycaemic control. In contrast, Almutairi, *et al.* (2013) found no significant association with educational levels although a large proportion of patients with no education were poorly controlled.

2.2.6 Income levels: Within Cape Town Steyn, *et al.* (2008) found that patients that were unemployed were at a greater risk of poor control whilst pensioners were likely to have good control. Patients that worked had an odds ratio of one in their study which meant that there was no difference between having good control and poor control in this group. Benoit, *et al.* (2005) found that within low income groups those without medical insurance were associated with poor control. This view was not supported by Almutairi, *et al.* (2013) in their study on diabetic patients in Al-Madinah diabetic centre Saudi Arabia. However, this was supported by Juarez, *et al.* (2012) who found that patients with less access to healthcare due to financial reasons were more prone to poor control. Similarly, De Vries, *et al.*, (2004) found that low socio-economic levels played a significant role in glycaemic control in a diabetic patient.

2.2.7 Adherence to treatment, diet and exercise: Khattab, *et al.* (2010) found that non-adherence to medication and not following diet plans as set out by nutritionists were significant risk factors for poor control. Donnelly, *et al.* (2007) also found that poor adherence to treatment contributed to poor control. In a meta-analysis of 14 controlled trials, Warburton, *et al.* (2006) showed that exercise contributed to clinically significant lower HbA_{1c} values in diabetic patients. Although no studies were found specifically looking at the effects of fast food on glycaemic control, a prospective study by Pereira, *et al.* (2005) showed a positive correlation between fast food consumption and the development of type-2 diabetes.

2.2.8 Self –Monitoring: Quite a number of studies have found an association between self-monitoring and glycaemic control. Alleman, *et al.* (2009) conducted a meta-analysis of randomised control trials which compared patients that self-monitored blood sugar levels to those who did not. A total of 15 trials were included and they found a significant reduction of HbA_{1c} among patients that self-monitored. Steyn, *et al.* (2008) stated that chronic patients that self-managed lead to improved compliance and better outcomes. Their study emphasised that self-management support given should be tailored to the patients' cultural background. In their cohort study, Karter, *et al.* (2001), also found lower HbA_{1c} levels in patients that self-monitored frequently. This study included more than twenty-four thousand diabetic patients. A systematic review by Clar, *et al.* (2010) found that although there was a statistically significant reduction of HbA_{1c} levels amongst patients that self-monitored it was of limited clinical effectiveness and less likely to be cost effective.

2.3 Provider and System Factors

Several provider and system factors have been associated with care of diabetes patients and diabetes control. This relates to the management of clinicians providing care to the diabetic patients at facilities as well as external infrastructure issues such as transport which exists in the community.

2.3.1 Clinician attitudes and knowledge: Health provider attitudes and lack of knowledge have been implicated in poor diabetic care (Daniels, *et al.* 2000). A number of years ago, Daniels, *et al.*, (2000) explored health professionals' attitudes towards the national guidelines for diabetes and hypertension management at a primary care level. This was a qualitative study conducted in the form of focus groups, observation and discussions at four community health centres in Cape Town, South Africa. It found that guidelines were not implemented or followed by the clinicians. The importance of this is that for quality care to occur not only the patient and health system barriers but the health professional's knowledge, attitudes and practices needs to be addressed (Daniels, *et al.*, 2000).

Some years later Mash, *et al.* (2008) conducted an appreciative inquiry at primary health care facilities in Cape Town and concluded that factors including patient loads, time constraints as well as knowledge and skills of clinicians needed to be addressed to improve diabetic care. In their systematic review, Nam, *et al.* (2011) found that diabetes management is influenced by clinicians' communication skills as well as their attitudes, beliefs and knowledge about diabetes. Ramirez (2016) found that a non-satisfactory doctor-patient relationship leads to poor glycaemic control.

Clinical audits are undertaken to ensure adherence to guidelines and to assess outcome of management. A chronic disease audit is conducted annually at provincial health facilities in the Western Cape which looks at specific targets and disease outcomes as well as adherence to guidelines. This annual audit started at a few facilities within the Metro District and has started to filter through to other health districts within the Western Cape (Essel, *et al.*, 2015). Essel, *et al.* (2015) conducted a study to review the usefulness of such an audit and found that the audit was an excellent tool to highlight key areas of concern and therefore bring about change. This was illustrated by the gradual improvements brought about at facilities where the audits were done in key areas of disease management and outcome. This audit tool formed the basis of the folder review tool in this study.

2.3.2 System Barriers: Marshall, *et al.* (2001) identified possible barriers which may exist in providing optimal health care. Marshall, *et al.* (2001) specifically refer to affordability, accessibility and efficiency of care and although many clinicians were confident in instructing patients to make changes they were unable to assist in making them. This is illustrative of the constraints clinicians have to work under at a primary health care facility, such as Mitchells Plain CHC. Mash, *et al.* (2008) refer to the vicious cycle which exist in a facility with a large workload. Clinicians spend little time with patients which leads them to be poorly controlled and this results in them being followed up monthly, adding to the workload. This cycle was broken at a facility where extra time was spent to provide quality consultations to patients leading to improved outcomes, reduced visits and therefore reduced workload. In the study Daniels, *et al.* (2000) conducted on the poor use of diabetes guidelines at primary health care facilities in Cape Town various system barriers were identified. At the time of the study secondary and tertiary level hospitals were referring their patients to primary levels facilities. This added to the workload and complexity of patients seen. Increase workload meant less time for consultations and with staff shortages and financial limitations lead to frustration among clinicians.

2.3.3 Clinical Inertia: Although the clinicians at CHCs in South Africa work under constraints there is often an inability of clinicians themselves to treat diabetic patients appropriately. This is referred to clinical inertia. Clinical inertia is when clinicians fail to intensify treatment when glucose is poorly controlled (Shah, *et al.*, 2005). Pinchevsky, *et al.* (2017) conducted a review of treatment of diabetic patients at a CHC in Johannesburg and found that care was suboptimal and clinical inertia was one of the inherent problems. Steyn, *et al.* (2008) on their study of the poor care of hypertensive and diabetic patients received at facilities within Cape Town found that clinical inertia was a serious problem. A study conducted by Shah, *et al.*, (2005), conducted in Ontario Canada, compared care by specialists to primary care clinicians and found that specialists were more likely to be more aggressive in their management of poor control than primary care clinicians. The study suggested that interventions assisting clinicians overcoming this inertia should assist in achieving improved control.

2.3.4 Access to facility: Patients in Adeniyi, *et al*. (2015) study reported that they had to travel great distances and at great costs to attend clinics where there were doctors and for this reason their glycaemic control was poor. This is supported by Abdelaziz, *et al.* (2006) that showed an association of poor control with poor geographic access to a care centre. A study

conducted some time ago showed that the lack of access to diabetic facilities resulted in poor control and not socio-economic factors (Ismail, *et al.*, 2000).

Chapter Three: Methodology

3.1 Study Design

A cross-sectional study, which looked at the relationship between diabetes and several variables (socio-demographic-patient and provider-system variables) over a short period of time, was conducted. This form of study is suitable because it is both inexpensive and can be done over a short period of time. It is appropriate in the setting of the CHC where there is a lack of funding and time constraints. The findings will be relevant for the population being studied.

3.2 Study Population

The target population was all adult diabetic patients (i.e. older than 18 years) who attended Mitchells Plain CHC. All Type 2 diabetic patients on oral and/or insulin therapy attending the chronic disease club for at least one year for diabetes at the chronic club were included. Newly diagnosed diabetics were excluded, as their glycaemic control is usually initially poor until treatment is initiated and established, as well as Type 1 patients and Type 2 patients on diet only. Patients who did not have an HbA_{1c} done in the preceding 12 months had one done on the day of the interview to determine their level of control.

Initially there were two dedicated days for the diabetes club per week but whilst awaiting approval for the study changes were made that meant all patients with chronic diseases were managed in one chronic disease club with no specific day allocated for a diabetes. Each stabilised chronic disease patient, including diabetes patients, attend the chronic disease club once every six months.

3.3 Sample Size

Research in other countries shows that only about 30% of diabetics reach control which means that there is poor control in about 70% of the diabetic population in these countries (Khattab, *et al.,* 2010). For South Africa this is not known but it is estimated that only a third are controlled, i.e. two thirds not controlled (Amod, *et al.* 2012). The sample size calculation was based on the previous diabetes club system, and since the diabetes population is the same it was still considered appropriate for the study. The total diabetes study population size was approximately 2200 (about 180 patients per week for 12 weeks) attending club for three-month period. Using 90% confidence with a margin of error of ± 4% and 67% as possible level of poor control gives a sample size of 320 patients (with the aid of Statcalc on Epi Info

7). This constitutes about 15% of the total study population. To reduce the chances of repeat sampling the study was conducted within a four-month period as follow-up appointments are after five months.

3.4 Sampling Procedure

A multi-stage sampling procedure was originally developed but due to the changes in the club system it could no longer be applied. Instead, ten patients were selected at the chronic diseases club daily during the four-month period between November 2016 and February 2017. Through this process a total of 340 interviews were conducted within the given time frame with 324 questionnaires being fit for analysis.

3.5 Data Collection

Data was collected using two data collection tools: an interview administered Patient Questionnaire and a Folder Review Check Sheet (See Appendix 1 and 2). The Patient Questionnaire was not based on other questionnaires and consisted of closed questions covering basic demographic questions (age, gender, etc.) and various clinical, system and provider-related factors for diabetic control which have been highlighted in the literature. The Folder Review Check Sheet was based on the clinical audit template for chronic diseases of the Western Cape Department of Health. The questionnaire was piloted at Hanover Park CHC, a similar CHC in another sub-district and the necessary adjustments were made. These included adding a category for patients who did not have any form of schooling. The folder review provided details of HbA_{1c}, clinical management at last visit and annual review and confirmed patients' answers where necessary. The HbA_{1c} results were sourced from the patients' records and only results from the last year were used. The patient interviews and folder review were both conducted by the researcher.

3.6 Data Management and Analysis

Data collected were checked for completeness and captured at the end of each day onto a spreadsheet on Excel. Data was captured twice to allow for verification and improve accuracy.

Data was analysed using Epi Info 7. Four important variables identified were the latest HbA_{1c}, age, total number of medications used daily and duration of treatment. The latest HbA_{1c} is directly linked with poor or good control while others have been shown in studies to be associated with poor control (Khattab, *et al.*, 2010 & Juarez, *et al.*, 2012). Descriptive analysis was used to summarise data. The various variables were grouped and frequencies

and percentages determined. With regards to epidemiological measures of association variables were categorised and Pearson Chi-squared tests were used to assess whether glycaemic control was statistically significant at a p value ≤ 0.05.

3.7 Validity, Reliability and Generalisability

3.7.1 Validity: The questionnaire was piloted and adjusted accordingly and this allowed for reproducibility. To reduce selection bias the study population was clearly defined. The sample size selected was representative of the entire study population. Further bias was reduced by using a single interviewer (researcher). Recall bias was reduced by using the patients' folder to confirm patient answers. The questions were clear and unambiguous as to attain the best possible answers from the patients.

3.7.2 Reliability: Reliability was ensured by piloting the questionnaire in a similar population as the study and having experts give guidance on the tool. A standardising Patient Questionnaire was used for all interviews and as the researcher conducted all the interviews there was inter-observer reliability. Questions were clear and unambiguous.

3.7.3 Generalisability: The main outcomes were the prevalence of poor diabetic control and the positive association of certain risk factors with poor glycaemic control amongst the diabetic population of Mitchells Plain CHC. This could be done as the sample of patients were representative of the entire population and the study was done with a high confidence interval and small error margin.

3.8 Ethical Considerations

With this study the four principles of ethics namely Autonomy, Nonmaleficence, Beneficence and Justice with respect to this study have been considered. With regards to autonomy all participants were informed about the study and its purpose as a group and individually in English. Written consent was acquired once the participant had been informed about the details of the study and that they understood their rights and roles therein. Participant's details were strictly confidential as no information regarding name or address or even folder number was noted. They had the right to withdraw from the study at any point and could contact me if they had any questions about the study. It was clear to the participants that whatever decision they made there were no repercussions and there were no rewards for their participation either.

Nonmaleficence is the principle ensuring no harm, direct or indirect, happens to the participants (Wassenaar, 2007). With the use of the participant information sheet (see Appendix 3) and the informed consent (see Appendix 4) and I ensured that the participants saw the study as openly as possible with the participants free to ask questions or make statements at any given time during the course of the study. Any information contained in their folders was also held in strictest confidence and did not influence them negatively. Patients would be recalled if any abnormal blood results were reported for the day. Patients were reassured that high values would be appropriately addressed and not negatively influence the patients.

In respect to beneficence the ultimate outcome of this study will be to improve care for all diabetic patients who receive treatment at Mitchells Plain CHC. To ensure justice the participants were any and all recommendations, stemming from this study, for improvement of care would be of direct benefit to all. If at any point the patients were not happy with the proceedings of the study, contact details of my supervisor as well as my own details were made available to participants to voice their concerns or complaints.

This study was approved by the University of the Western Cape Senate Research Committee and permission provided by the Western Cape Government Department of Health and the facility management of Mitchells Plain Community Health Centre. An ethics letter was provided by the University of the Western Cape (registration number 14/10/41); see Appendix 5.

Results, feedback and recommendations will be provided to patients and staff in the form of feedback sessions to be held at the club room of the CHC. Results will also be forwarded to the Programmes Directorate of the District Health Services which oversees management of chronic diseases of lifestyle in the province as well as to the Directorate of Health Impact Assessments.

Chapter Four: Results

4.1 Introduction

This study was conducted on Type-2 diabetics attending the chronic diseases club at Mitchells Plain CHC during the period of November 2016 to February 2017.

4.2 Socio-Demographic Profile of Diabetes Patients

Out of 340 patients interviewed, 324 were analysed, the other 16 folders had to be excluded as their bloods were either rejected at the laboratory or the patients refused blood tests on the day. The largest proportion of diabetics were female (73.8%) and of coloured race (96.3%). Of the patients interviewed the majority where over the age of 40 (96.3%) with 59% of the sample over the age of 60 years. Out of the 324 patients 236 were receiving a social grant or an old age pension with only 36 (11%) having some form of employment. Only 5 patients (1.5%) had some form of tertiary education with 14.8% finishing grade 11 or 12. More than half of the patients (55.6%) have less than or up to grade 8 level of education. See Table 1.

Table 1: Socio-Demographic Profile of Diabetes Patients (n=324)

Category		Frequency (Percentage)
Age (Years)	*≤40 years*	12 (3.7%)
	41 to 59 years	121 (37.3%)
	≥60 years	191 (59%)
	Mean 60.9 Median 61.5	
Gender	*Male*	85 (26.2%)
	Female	239 (73.8%)
Race	*Coloured*	312 (96.3%)
	Black	11 (3.4%)
	White	1 (0.3%)
Marital Status	*Married*	191 (58.9%)
	Single	24 (7.4%)
	Divorced	32 (9.9%)
	Widow/er	77 (23.8%)
Source of income	*Employed*	36 (11.1%)
	Pension/Grant	236 (72.9%)
	None	25 (7.7%)
	Spouse	27 (8.3%)
Highest education level attained	*None/Other*	17 (5.3%)
	Grade 1 to 8	163 (50.3%)
	Grade 9 & 10	91 (28.1%)
	Grade 11 & 12	48 (14.8%)
	Tertiary	5 (1.5%)

4.3 Glycaemic Control of Diabetes Patients

Out of the sample of patients of 324 participants, 173 (53.4%) had their HbA_{1c} done in the previous 12 months. Patients who had not had their HbA_{1c} done in the preceding 12 months had it done on the day of the interview. Thereafter it was found that out of the total sample 63 (19.4%) patients had an HbA_{1c} of seven (target for glycaemic control) or the mean for the sample was 9.16% with a median of 8.8%. See Table 2.

Table 2: Glycaemic control of Diabetes Patients (n=324)

HbA1c done in last 12 Months?	**Frequency (Percentage)**
Yes	173 (53.4%)
No	151 (46.6%)
HbA1c below target (≤ 7%)	
Yes	63 (19.4%)
No	261 (80.6%)
HbA1c	Mean 9.16%; Median 8.8%

4.4 Clinical, Behavioural and System-Related Factors of Diabetes Patients

The mean duration of having diabetes was 10.2 years. Of the 324 diabetic patients 213 (68.5%) were on oral medication with the rest on either insulin only or a combination. Few patients reported side effects to medication (12%) with only 14.8% admitting to missing some doses of medication. Patients that smoked or used alcohol was less than three quarters of the sample, 22.2% and 10.5% respectively. Only 195 patients said they did some form of exercise on a regular basis with 69.7% of them exercising daily and 18.5% one to days per week. More than half of the patients interviewed admitted to eating fast food or fried food (59%) and of these 50.9% ate fast food no more than once per month. Most patients (63.6%) prepared their own food at home. See Table 3.

Table 3: Clinical and Behavioural Profile of Diabetes Patients (n=324)

Category		Frequency (Percentage)
Clinical Factors		
Duration of Diabetes (years)		Mean 10.2 Median 10
Type of diabetic treatment		
Oral		213 (65.8%)
Insulin		15 (4.6%)
Combination		96 (29.6%)
Side-effects of medication		39 (12%)
Omits medication at times		48 (14.8%)
Owns glucometer (home testing)		176 (54.3%)
Owns glucometer and keeps a diary (n=176)		26 (14.8%)
Exercise		195 (60.2%)
Duration (n=195)	*Daily*	136 (69.7%)
	1-2 days/wk	36 (18.5%)
	3-4 days/wk	23 (11.8%)
Behavioural Factors		
Smoking		72 (22.2%)
Alcohol		34 (10.5%)
Fast Food		191 (59%)
How often (n=191)	*Once/month*	97 (50.9%)
	1-2/week	88 (46%)
	>2/week	6 (3.1%)
Household cook	*Self*	206 (63.6%)
	Spouse	55 (17%)
	Relative	56 (17.3%)
	Other	7 (2.1%)

Patients where initially asked their perceptions on how they felt clinicians were managing their diabetes. Overall 99% of the patients were satisfied with how clinicians managed their diabetes with 91.6% saying that clinicians showed an interest in their disease. More than three quarters (75.6%) of patients felt that they were involved in decision making with regards to their management with 23.4% feeling they had no say (Table 4). Taxis were the single most popular means of getting to and from the facility, 42% and 46.9% respectively. Walking was also a common means of getting to and from the CHC (19% and 22.2%

respectively). Thirty-nine patients had their own vehicle while 72 relied on lifts to get them to the CHC and 46 needed a lift to get home (Table 4).

Table 4: System-Related Factors of Diabetes Patients (n=324)

Category	Frequency (Percentage)		
Satisfaction with clinical management at facility			
	Yes	No	Unsure
Overall satisfied	321 (99%)	3 (1%)	0
Satisfied with clinicians	297 (91.6%)	24 (7.4%)	3 (1%)
Satisfied with their involvement	245 (75.6%)	76 (23.4%)	3 (1%)
Mode of transport			
	From home to facility	From facility to home	
Taxi	136 (42%)	152 (46.9%)	
Bus	7 (2.2%)	7 (2.2%)	
Walk	62 (19%)	72 (22.2%)	
Lift	72 (22.2%)	46 (14.1%)	
Train	3 (1%)	3 (1%)	
Own	39 (12%)	39 (12%)	
Hire	3 (1%)	3 (1%)	
Other	2 (0.6%)	2 (0.6%)	

4.5 Risk Factors in Patients with Poor Glycaemic Control

Various risk factors were assessed and analysed. These were grouped according socio-demographic, clinical and behavioural and system factors. The following tables illustrate the outcomes of the χ^2 analysis of these variables. There was associated significance between four socio-demographic factors and glycaemic control; age, gender, marital status as well as income source. The other variables did not show any significant See Table 5.

Table 5: Association of Socio-Demographic Factors and Glycaemic Control (n=324)

Risk Factor		Above HbA1c Target f (%)	Below HbA1c Target f (%)	χ^2	p-value*
Age Groups	*≤40 years*	12/12 (100%)	0/12 (0%)	**16.33**	**0.0003**
	41 to 59 years	109/121 (90.1%)	12/121 (0.9%)		
	≥60 years	140/191 (73.3%)	51/191 (26.7%)		
Gender	*Male*	66/85 (77.6%)	19/85 (22.4%)	**0.4**	**0.04**
	Female	195/239 (81.6%)	44/239 (18.4%)		
Marital Status	*Married*	158/191 (82.7%)	33/191 (17.3%)	**10.2**	**0.01**
	Single	22/24 (91.7%)	2/24 (8.3%)		
	Divorced	28/32 (87.5%)	4/32 (12.5%)		
	Widow/er	53/77 (68.8%)	24/77 (31.2%)		
Income Source	*Employed*	35/36 (97.2%)	1/36 (2.8%)	**14.77**	**0.02**
	Pension/Grant	178/236 (75.4%)	58/236 (24.6%)		
	None	22/24 (91.7%)	2/24 (8.3%)		
	Spouse	25/27 (92.6%)	2/27 (7.4%)		
Education	*None/Other*	11/17 (64.7%)	6/17 (35.3%)	5.14	0.27
	Grade 1 to 8	133/163 (81.6%)	30/163 (18.4%)		
	Grade 9 to 10	71/91 (78%)	20/91 (22%)		
	Grade 11 & 12	41/48 (85.4%)	7/48 (14.6%)		
	Tertiary	5/5 (100%)	0/5 (0%)		

*χ^2 comparison of proportion: p-value in bold show significance.

The clinical and behavioural variables did not show any significant association with glycaemic control (Table 6).

Table 6: Association between Clinical and Behavioural Factors and Glycaemic Control (n=324)

Risk Factor		Above HbA1c Target f (%)	Below HbA1c Target f (%)	χ^2	p-value*
Type of Treatment	*Combination*	85/96 (88.5%)	11/96 (11.5%)	5.64	0.06
	Oral	164/213 (77%)	49/213 (23%)		
	Insulin	12/15 (80%)	3/15 (20%)		
Duration of Treatment	*< 6 years*	83/105 (79%)	22/105 (31%)	0.81	0.85
	6 to 10 years	93/117 (79.5%)	24/117 (20.5%)		
	11 to 15 years	27/33 (81.8%)	6/33 (38.7%)		
	> 15 years	58/69 (84%)	11/69 (16%)		
Treatment Adherence	*Omits medication*	40/48 (83.3%)	8/48 (16.7%)	0.28	0.6
Self-Monitoring	*No monitoring*	34/148 (23%)	114/148 (77%)	2.17	0.14
Exercise	*None*	106/129 (82.2%)	23/129 (17.8%)	0.4	0.55
Smoking	*Yes*	61/72 (84.7%)	11/72 (15.3%)	1.03	0.31
Alcohol	*Yes*	31/34 (91.2%)	3/34 (8.8%)	2.74	0.09
Fast Food	*Yes*	160/191 (83.8%)	31/191 (16.2%)	3.07	0.08
Cook	*Self*	171/206 (83%)	35/206 (17%)	2.57	0.5
	Spouse	41/55(74.5%)	14/55 (25.5%)		
	Relative	44/56 (78.6%)	12/56 (21.4%)		
	Other	5/7 (71.4%)	2/7 (28.6%)		

*χ^2 comparison of proportion: p-value in bold show significance.

There were no significant association between system factors and glycaemic control in this study (Table 7).

Table 7: Association between System Factors and Glycaemic Control (n=324)

Risk Factor		Above HbA1c Target f (%)	Below HbA1c Target f (%)	χ^2	p-value*
Counselling	*None*	179/224 (79.9%)	45/224 (20.1%)	0.19	0.66
Support Groups	*Does not belong to*	216/263 (82.1%)	47/263 (17.9%)	2.21	0.14
Transport to CHC	*Taxi*	113/136 (83.1%)	23/136 (16.9%)	3.03	0.88
	Bus	6/7 (85.7%)	1/7 (14.3%)		
	Walk	48/62 (77.4%)	14/62 (22.6%)		
	Lift	56/72 (77.8%)	16/72 (22.2%)		
	Train	3/3 (100%)	0/3 (0%)		
	Own	31/39 (79.5%)	8/39 (20.5%)		
	Hire	2/3 (66.7%)	1/3 (33.3%)		
	Other (Bike)	2/2 (100%)	0/2 (0%)		
Transport from CHC	*Taxi*	127/152 (83.6%)	25/152 (16.4%)	4.23	0.75
	Bus	5/7 (71.4%)	2/7 (28.6%)		
	Walk	57/72 (79.2%)	15/72 (20.8%)		
	Lift	34/46 (73.9%)	12/46 (26.1%)		
	Train	3/3 (100%)	0/3 (0%)		
	Own	31/39 (79.5%)	8/39 (20.5%)		
	Hire	2/3 (66.7%)	1/3 (33.3%)		
	Other(Bike)	2/2 (100%)	0/2 (0%)		
Average Distance from CHC	*< 3km*	78/103 (75.7%)	25/103 (24.3%)	5.21	0.16
	3 to 5.9km	165/197 (83.8%)	32/197 (16.2%)		
	6 to 8.9km	14/20 (70%)	6/20 (30%)		
	≥9 km	4/4 (100%)	0/4 (0%)		

*χ^2 comparison of proportion: p-value in bold show significance.

4.6 Clinical Management of Diabetes Patients

Table 8 displays the clinical management of patients and their outcomes in line with the South African Diabetes Guidelines. Less than a third (30.9%) of patients in the sample reported had ever received diabetes counselling with only 18.5% belonging to diabetes support groups in the community. Only two patients did not have their blood pressures done

at the previous visit and only 26% where under the target blood pressure of 140/80 mmHg. Annual examination of eyes showed that 12 (3.7%) had this done within the previous 12 months and only one person had their feet examined. Annual blood tests which included HbA_{1c}, creatinine and cholesterol and showed that 53.4% had their HbA_{1c} done with 19.4% reaching target, 53.4% had their creatinine done with 90.2% below target and cholesterol was done in 163 (50.3%) of the patients with 114 (69.9%) reaching target.

The prescribing of simvastatin and aspirin has set indications in the guidelines. Review of the prescribing of these two medicines may indicate clinician adherence to guidelines. Simvastatin was indicated in 315 cases with 254 (80.6%) of these patients having it prescribed and with Aspirin, 87 (26.8%) patients were eligible with 72 (82.7%) of these patients having it prescribed.

Table 8: Diabetes Treatment and Clinical Outcomes with reference to South African Diabetic Management Guidelines (n=324)

Category			Frequency (Percentage)	Below Target Frequency (Percentage)
Diabetes counselling and support				
Ever received diabetes counselling		*Yes*	100 (30.9%)	
		No	224(69.1%)	
Attend diabetes support groups in the community		*Yes*	60 (18.5%)	
		No	264 (81.5%)	
Visit Review				
Blood Pressure (Target ≤ 140/80 mmHg)		*Yes*	322 (99.4%)	84 (26%)
		No	2 (0.6%)	238 (74%)
Annual Review				
Examination	Foot Examination	*Yes*	1 (0.3%)	
		No	319 (98.5%)	
		N/A	4 (1.2%)	
	Retinal Screen &Visual Acuity	*Yes*	12 (3.7%)	
		No	312 (96.3%)	
Blood tests	Hba1c (glycaemic control)	*Yes*	173 (53.4%)	63 (19.4%)
		No	151 (46.6%)	261 (80.6%)
	Creatinine (kidney function)	*Yes*	173 (53.4%)	156 (90.2%)
		No	151 (46.6%)	17 (9.8%)
	Cholesterol	*Yes*	163 (50.3%)	49 (30.1%)
		No	161 (49.7%)	114 (69.9%)
Urine Analysis		*Yes*	94 (29%)	
		No	230 (71%)	
Simvastatin (all diabetics ≥ 40 years or stroke, heart attack and heart disease)				
Eligible (n=324)			315 (97.2 %)	
Prescribed (n=315)			254 (80.6%)	
Aspirin (secondary prevention for stroke and heart attack or heart disease)				
Eligible (n=324)			87 (26.8 %)	
Prescribed (n=87)			72 (82.7%)	

Chapter Five: Discussion

5.1 Introduction

This chapter highlights the key findings of the study assessing diabetes control and factors that influence diabetes control among patients in Mitchells Plain CHC and discusses them in the light of published literature on the topic. It commences with a discussion of the socio-demographic profile of the patients then focuses on glycaemic control and the clinical, behavioural and system factors associated with glycaemic control and finally clinical management of diabetes patients at the Community Health Centre.

5.2 Glycaemic Control of Diabetes Patients

The study has shown that 53.4% of patients had an HbA_{1c}, the gold standard of monitoring glycaemic control in diabetics, done within the preceding 12 months. The mean HbA_{1c} this sample was 9.2%. Adequate glycaemic control ($HbA_{1c} \leq 7\%$) was found in 63 patients (19.4%) of the sample. This means that 80.6% of diabetic patients did not have adequate control with 64.8% of the sample having an HbA_{1c} of 8% or greater. As part of clinical review of a diabetic patient an HbA_{1c} has to be done at least once every 12 months and for adequate glycaemic control an HbA_{1c} of 7% or less is required which relates to risk reduction for cardiovascular disease (Amod, *et al.* 2012 & Aschner, *et al.* 2014).

A recent study conducted by Pinchevsky, *et al.*, (2017) in Johannesburg found that 19.3% of their sample had an HbA_{1c} of less than 7% with a mean HbA_{1c} of 9.1%. Folb, *et al.*, (2015) studied patients of the Western Cape in two health districts. They found a mean HbA_{1c} of 9.1% with 77% of patients having an HbA_{1c} of greater than 7%. Out of 1842 patients on 704 had an HbA_{1c} test done equalling 38.2%. In another local study Steyn, *et al.*, (2008) had a mean HbA_{1c} of 8.8%. The Integrated Chronic Disease Audit of 2014 shows only 18% of patients having and HbA_{1c} of ≤7% with 77% of patients having their HbA_{1c} done (Western Cape Government 2014).

Globally Khattab, *et al.* (2010) placed the world average of glycaemic control achieved between 15% and 31%. Their study looked at factors influencing glycaemic control among Type 2 diabetics in Kuwait and they found that only 34.9% reached an HbA_{1c} of ≤ 7%.

The results show that at Mitchells Plain CHC we have poor control but it is on par with other CHCs within the Metro District, South Africa and globally including developed nations such as the United Kingdom (31% reaching an HbA_{1c} of ≤ 7%) (Khattab, *et al.* 2010). With

regards to number of HbA_{1c} done we seem to fair much better than other districts within the Western Cape but poorer than the Metro District as a whole.

5.3 Socio-Demographic Factors

The mean age was 60.9 years with 96.3% being older than 40 years. Females accounted for 73.8% of the sample and 96.3% of the sample where of the coloured race.

A recent study by Pinchevsky, *et al.,* (2017) done at a primary health care facility in Johannesburg showed a mean age of 53.9 years with females accounting for 53.9% of their sample. Steyn, *et al.,* (2008) study looked at patients with hypertension and diabetes at CHC's within Cape Town. There sample consisted of 1089 participants of which 455 (41.8%) where diabetics. The mean age for their entire sample was 60.3 years with more than half pensioners. Women made up 78.8% of their sample with approximately half the sample having primary level education or none. Although this study sample is of hypertensive and diabetes patients the profile is very similar to that of our study and may represent the profile of chronic diseases of lifestyle within Cape Town. WHO (2016) shows the prevalence of diabetes amongst men and women in South Africa to be 7.7% and 11.8% respectively.

The larger difference between male and female numbers seen in our study population, and also with Steyn, *et al.,* (2008), may be as a result of poor health seeking behaviour of men. Pinkhasov, *et al.* (2010) said men are less likely to seek health care (doctors' visits, emergency departments) than women.

Almost all, 96.3% of the sample were of the coloured race reflecting the population group served by Mitchells Plain CHC. Mitchells Plain is the largest coloured township in Cape Town and it served only by the CHC which also drains a small part of Philippi which consists mainly of black people. Studies have shown that the coloured population within the Western Cape to be most at risk of developing diabetes with the prevalence of diabetes within the Western Cape was estimated to be 7.2% (Bailey, *et al.,* 2016) and within the coloured population it is as high as 28.2% (Erasmus, *et al.,* 2012).

5.4 Clinical, Behavioural and System Related Factors

The study found that the average duration of diabetes from diagnosis was 10.2 years with 65.8% on oral medication only, 4.6% on insulin only and 29.6% on a combination of both oral medication and insulin (sample consisted only of Type-2 diabetics). With regards to self-monitoring and self-management 176 of the patients in our study owned a glucometer with only 14.8% of these patients keeping a diary of their glucose readings.

In comparison the CHC in Johannesburg showed 22.2% on oral medication, 9.1% on insulin and 38.9% on combination therapy, the rest were not on any medication (Pinchevsky, *et al.,* 2017). In their study Steyn, *et al.,* (2008) assessed 18 out a possible 35 facilities in Cape Town during 1999. Their study looked at diabetes as well as hypertension and they found 68.8% of the diabetic patients where on oral medication and 9.5% on insulin only with the remainder on combination therapy (21.7%). This study's results are fairly similar to our own despite the studies being almost 20 years apart.

Approximately 85% of patients in our study reported that they were compliant with their medication. Lifestyle factors 22.2% smoked, 10.5% drank alcohol and 59% of patients ate fast or fried foods. Steyn, *et al.,* (2008) found that 20% of their participants smoked and that about 80% took their medication as prescribed. Although their study included hypertensive patients as well the results are fairly similar. The Western Cape has the highest prevalence of smokers in South Africa (32.9%) (Reddy, *et al.,* 2015). According to the Human Sciences Research Council alcohol is the most abused substance within the Western Cape with a prevalence of 39% to 64% with higher levels of problem drinking among coloured people in relation to other races (Harker, *et al.,* 2008).

A large portion (69%) of the sample reported that they did not receive any education with regards to their diabetes as well as 81% of patients that did not belong to a support group within the community. For other patients in our study said they were satisfied (99%) with how their diabetes was managed at the facility with 96% of patients believed that clinicians were concerned or took an interest in their condition. Almost a quarter (23.4%) of patients said that they were not involved in decision making with regards to their management.

Steyn, *et al.,* (2008) found their participants to be poorly educated about their chronic diseases as well as clinical inertia being present within these facilities. Although our study did not specifically look at clinical inertia it is evident by the similarities between this study and ours that little has changes since 1999. According to Steyn, *et al.,* (2008) "Successful treatment of people with hypertension, diabetes and other chronic diseases has many facets and requires a collaborative approach from all involved. In the final analysis, patients with chronic conditions self-manage their disease, with improved compliance leading to improved outcomes." Although more than three quarters of the patients felt they were involved in their treatment it is understandable that the lack of knowledge of their disease may mean that patients are not aware of what being involved in their management really entails. Goudge, *et*

al. (2009) looked at the management of chronic diseases in Mpumalanga. One of their main findings was that the interaction between patient and clinician or provider was crucial and setup whether chronic management would fail or succeed. Our study has shown that this interaction is very poor. There is a lack of continuity of care as well as time constraints leaves little for such a relationship to exist. It is a matter of quantity versus quality. Skills of clinicians may not be at its best and needs continuous review and intervention. Dieticians are not readily available as they only attend the facility once per week and Health Promoters are not always available to give education to patients in need.

5.5 Factors Associated with Poor Glycaemic Control

The study found significant associations between four factors and glycaemic control: Age, Gender, Marital Status and Source of Income.

5.5.1 Age: Age was significantly associated with glycaemic control (p 0.0003). Patients receiving grant or pension made up 72.9% with 11.1% employed with those over 60 years managing best.

Steyn, *et al.*, (2008) also showed that older diabetics where more likely to have good control. Juarez, *et al.* (2012) found that patients aged under 35 years had a higher risk of poor control. This study used an HbA_{1c} of 9% as their measure of control. However, Khattab, *et al.* (2010) did not find any association with age and glycaemic control but noted that other studies found that younger diabetics where poorly controlled.

5.5.2 Gender: Our studied showed that gender played a significant role in glycaemic control (p 0.04) with men having better control than women. Yigazu and Desse (2017) conducted a study in Southwest Ethiopia on diabetic patients at Shanan Gibe Hospital. They found that the larger proportion of the uncontrolled diabetics were women. Misra and Lager (2009) studied gender and ethnicity effects on patients with diabetes in the United States. They found that ethnic and gender variations exist and does play a role in how patients deal with their diabetes and their glycaemic control. Further analysis is needed to assess its role in glycaemic control.

5.5.3 Marital Status: The analysis showed that marital status was associated with glycaemic control with a p 0.01. Sandberg, *et al.* (2006) stated that diabetic patients fared better with marital support. Further analysis may be needed to further assess how it may

influence glycaemic control, although other studies have shown positive influence of marital status on outcomes.

5.5.4 Source of Income: Income or income source was associated with glycaemic control with a p 0.02. In this sample those who were working showed a tendency to poorer control compared with those receiving an old age pension and social grant managing better.

Steyn, *et al.,* (2008) found working as a factor had no influence on glycaemic control; participants who were at risk of poor control were the unemployed but pensioners were a variable for good control which is reflected in our study. Benoit, *et al.* (2005), Juarez, *et al.* (2012) and De Vries, *et al.,* (2004) that found people of low socio-economic levels were prone to poor control. Almutairi, *et al.* (2013) found no relation to income levels.

No other risk factors proved to be significant but Steyn, *et al.*, (2008) showed their participants with less than grade 10 education to be at risk of poor glycaemic control which our study did not find. In our study more than half the sample (55.6%) had primary level education or none. Despite the high number of patients not receiving diabetic education and nor belonging to a support group this did not prove to be a significant factor for poor control.

The older age groups having better control correlates with the better control of patients on an old age pension or grant. In comparison patients who were younger and working we more likely to have poor glycaemic control. The older group being more mature and having limited income would probably be more frugal with their money and choices surrounding what food to buy and eat. Those with greater income may have access to a greater variety of food (good and bad). The pensioners probably do not have many dependants if any and choice of food would be theirs in comparison to patients who are working with multiple dependants needing to provide food that can feed them all. Usually this would include too much starch (carbohydrates) as they are cheap and can be stretched among multiple people. Further study may be warranted especially looking at the eating habits and profile of these two groups.

5.6 Clinical Management of Diabetes Patients

The study assessed clinical management with a folder review similar to the template used for regular clinical audits in the Western Cape, to assess clinical outcomes (for example blood pressure and annual HbA_{1c}) and adherence to guidelines. It also reviewed the patients' perceptions of how clinicians managed their diabetes.

5.6.1 Annual review: In the sample not a single patient received the full range of tests and examinations specified in the guidelines. In the sample 53.4% of the patients had an HbA_{1c} done but this is only reciprocated in the number of creatinine done but not the number of cholesterols done. These blood tests are routinely done together and should therefore be the same. These tests and examinations are done to screen for complications of diabetes including renal disease, retinopathy and peripheral vascular disease and neuropathy. These would lead to significant morbidity for the patients and even mortality. The Western Cape Government conducts and annual Integrated Chronic Disease Audit (ICDA) which for diabetes looks at these indicators to assess clinical outcome and adherence to guidelines in all health districts within the Western Cape. It takes a small sample of 10 folder to review various indicators for the chronic diseases most treated; including diabetes. In 2014 43 health facilities in the Metro District participated in this audit (including Mitchells Plain CHC). In relation to our study the ICDA (for the Metro District) showed 70% of patients had an HbA_{1c} done with creatinine and cholesterol 77% and 71% respectively (Western Cape Government 2014).

The HbA_{1c} shows treatment outcome, it is used to assess the impact of treatment over a period of 12 months or less depending on the review period. The value to clinicians is to assess treatment and adjust accordingly. Without this value it would not be possible to adjust treatment appropriately. Although the number of HbA_{1c} done at our CHC is far below that of the Metro District for 2014 it must be noted that the ICDA is done on 10 folders per chronic condition.

Of major concern would be foot examination, retinal screening and urine dipsticks. From our study it showed only one, 12 and 94 patients had these examinations done respectively. This leaves a great gap on screening for the aforementioned conditions. Retinal screening sat at 30% for the entire Metro District with foot examination done in 42% of patients (Western Cape Government 2014).

The reviews done at each visit shows good coverage of examinations done blood pressures were done on 99.4% of the patients with 92.9% of weights done. However only six patients had a documented body mass index (BMI).

From this study it is apparent that clinicians do not adhere to treatment guidelines. This is evident with the lack of blood tests performed (HbA_{1c} done in 53.4%) and procedures done

(foot examination in only one out of 319 patients). Pinchevsky, *et al.* (2017) found that 68.8% of patients had an HbA_{1c} done.

Being a primary healthcare facility in a middle to low income area means a large population of uninsured patients that need access to health facilities. A large proportion of the patients seen at the CHC are for chronic diseases of lifestyle. Haque, *et al.* (2005) looked at barriers to initiating insulin in type 2 diabetics at primary healthcare facilities in Cape Town. They stated that system barriers were time and continuity of care with clinician barriers being experience and knowledge. At Mitchells Plain CHC there is often a large patient load and this coupled with inexperienced community service medical officers and CNP's may lead to results being seen here. This view is supported by a study conducted at four CHC's within the Western Cape (Daniels, *et al.*, 2000). It appears little has changed since this study was conducted in 1997. In an appreciative inquiry by Mash, *et al.* (2008) found that to improve diabetic outcomes certain factors needed to be addressed including patient loads, time constraints, continuity of care as well as knowledge and skills of clinicians.

5.6.2 Patient Education and Support: Although no significant association was found between patients not having any diabetic education and poor glycaemic control it is a point of concern that only 100 (31%) patients said that they had some form of education provided to them. When asked, many patients admitted to have heard of support groups and some even belong to some. The support groups in the community are facilitated by NGOs, funded by the provincial government, and provide a basic services of blood pressure and blood sugar checks as well as support with regards to chronic diseases. An added benefit is that patients can collect their chronic prepacked medication at these groups. Steyn, *et al.* (2008) envisioned community-based healthcare workers as a possible solution for the increasing patient loads and lack of education and support at the CHCs. Unfortunately, the patients using these services often only collect their medication or have someone collect it on their behalf. Therefore, they fail to receive the full benefit of these services which could be the reason why our results of poor glycaemic control are still similar to Steyn, *et al.* (2008) which was conducted in 1999. The facility's own HPOs run their own diabetic support groups, some based at the facility. These are usually run in the afternoon once a week, however they may not be convenient for some patients especially those that work or live a distance from the CHC.

As van Dam, *et al.* (2004), Bastiaens, *et al* (2009) and Gilden, *et al.* (1992) have shown there is a definite place for patient education and support in the management of diabetes and results show that this is a major gap within services at the CHC. In their study on diabetics in Mthatha in the Eastern Cape South Africa, Adeniyi, *et al*. (2015) found that patients who lacked basic knowledge of their disease had poorer control. A further issue is that even though there is a wide coverage by the NGOs only 168 (51.9%) people had heard of them and only 61of the 168 (36.3%) make use of their services. Also, the NGOs only cover the central Mitchells Plain area with no NGOs providing these services in the Philippi area which is in the catchment area of Mitchells Plain CHC.

5.6.3 Patients' perception on Management: Only three patients felt they were not satisfied with the manner in which their diabetes was being managed at the CHC; 24 patients felt that clinicians were unconcerned or not interested in their health and 76 (23.5%) patients felt they were not involved in their own management. That almost a quarter of the patients interviewed felt they were not involved in there management is alarming. This has ethical implications as with regards to a patient's autonomy. This paternalistic approach may be counterproductive and may result in the poor glycaemic control we want to prevent. Heisler, *et al.* (2007) showed in their study the importance of educating a patient and allowing them to make informed decisions about their management. Bastiaens, *et al* (2009) further illustrates the positive outcome of patient empowerment when they were educated and supported in terms of their own management.

5.6.3 Self-Monitoring and Self-Management: Self-monitoring entails having a glucometer at home and self-testing. Our study does not show an association of not doing self-testing at home with poor glycaemic control nor does it indicate that people that do self-test have good glycaemic control.

From our study it is evident that the CHC does not provide adequate education or support to the patients. This support and education is integral for the success of self-management.

The Western Cape Health Department provides glucometers and testing strips to patients on insulin only (combined or monotherapy). Type 2 diabetics on oral therapy only are not provided. From our study results it shows that 176 out of the 324 had a glucometer at home and self-tested. Further analysis showed that of the 176 patients 87 where on oral only treatment. This meant that these patients would have to buy their own strips. Of the 87

patients 71 where either pensioners, grant recipients or had no source of income. Cost of strips is about R160 for 50 strips (R3.20 per strip/test). The patients that kept a diary of readings (26 out of 176 patients with a glucometer) were unaware that the diaries should be brought to each diabetic follow up visit.

Studies however have shown its effectiveness with reducing HbA_{1c} in patients. Both Mash, *et al.* (2008) and Haque, *et al.* (2005) speak on patient empowerment, a good clinician – patient relationship and skills development for clinician and patient will improve outcome. Alleman, *et al.* (2009) Karter, *et al.* (2001) found self-management and monitoring improves glycaemic control. This view is further supported by Poolsup, *et al.* (2009), Klonoff (2008) and Hou, *et al.* (2014). Locally Steyn, *et al.* (2008) also recommends this form of management. In the SEMDSA guidelines for diabetes management education and support (basic and detailed diabetes knowledge) and more detailed forms an important key to the success of self-management (Amod, *et al.* 2012). Reviewing the 2012 SEMDSA Guidelines with the new 2017 guidelines, both place emphasis on a dedicated diabetic clinic for the management of diabetes. This is not possible at a CHC as all chronic diseases needs to be catered for and a mixed bag of patients are seen on a daily basis. With regards to self-management of diabetes the 2012 guidelines refer to it as Diabetes Self-Management Education (DSME) (Amod, *et al.* 2012) and the new 2017 refers now to Diabetes Self-Management Education and Support (DSME/S) (Amod, *et al* 2017*)*. More detail is provided with regards what this comprises and how to successfully manage diabetes. DSME/S is an integral part of diabetes care (Amod, *et al* 2017*).*

Chapter Six: Conclusions and Recommendations

6.1 Conclusions

The study found that only 19.4% of the sample met the therapeutic goal of an HbA_{1c} of 7% or less. This means 80.6% were defined as having poor glycaemic control. The greatest concern lies with the sample of patients with an HbA_{1c} of 8% or greater which made up 64.8% of the sample population as this group would have the greatest cardiovascular disease risk. These would include retinopathy, nephropathy and neuropathies as micro-vascular complications and stroke and heart attacks as macro-vascular complications.

Other gaps in clinical care of diabetes were identified at Mitchells Plain CHC, with just over half the patients having their HbA_{1c} done: only one patient out of 320 having foot examination; and 12 patients had retinal screening conducted at annual review. This situation is likely to result in a lack of prevention and intervention of diabetic complications. These findings were supported by the annual clinical audit conducted at the CHC (Chronic Disease Audit, 2017)

Four variables, Age, Gender, Income and Marital status, were found to be significantly associated with poor glycaemic control. Further analysis is necessary to ascertain their impact but it allows clinicians to target certain groups for more intense interventions. Groups such as the employed and under 40 years of age could have more time spent educating and supporting them to reduce their risk of poor glycaemic control.

In addition to these four variables, a key aspect that emerged from the study was the lack of education and support patients received at the CHC which is likely to lead to lack of empowerment and capability to self-manage their diabetes.

Most agree that diabetic care is multifactorial, needs to be individualised and patients do best through good support and education (Alleman, *et al.* 2009, Karter, *et al.* 2001 and Gilden, *et al.* 1992), especially when the patients are self-empowered and involved in their own management (Mash, *et al.* (2008), Steyn, *et al* (2008) & Bastiaens, *et al.* 2009).

Finally, several factors appear to play a role in the glycaemic control of diabetic patients in this setting and it is evident that patient need to be holistically managed and supported, using tailored set of guidelines to best attain best health outcomes.

6.2 Recommendations

It is evident that various factors affect glycaemic control of diabetic patients at Mitchells Plain CHC. Whilst there is no single quick fix to manage diabetes optimally, and it is recognised as one the hardest diseases to manage as a diabetic and as a clinician, there are several interventions that could be introduced at Mitchells Plain CHC which may improve care and outcomes for diabetes patients. In particular, a great gap noted was the lack of diabetic education and support given to patients. This was further confounded by the findings which showed poor adherence by clinicians to guidelines

The following recommendations are proposed:

1. Regular training and updates should be provided to clinicians and other staff regarding diabetic management;
2. HPO's and dietician should be more available to provide education and nutritional support at CHC, as at present dieticians is only available once weekly;
3. Tailored diabetic or chronic disease stationary to prompt clinician about annual reviews and to make it easier to review previous visits;
4. Regular audits of diabetic folders instead of the single annual audit, as a means of improving clinical care;
5. Further research into associated risk factors for poor glycaemic control.

References

Abdelaziz, A.B., Soltane, I., Gaha, K., Thabet, H., Tlili, H. and Ghannem, H. (2006) Facteurs déterminants du contrôle glycémique des patients diabétiques de type 2 suivis en première ligne. Revue d'Épidémiologie et de Santé Publique 54 p. 443 - 452

Adeniyi, O.V., Yogeswaran, P., Wright, G., Longo-Benza, B. (2015) Diabetic patients' perspectives on the challenges of glycaemic control. *African Journal of Primary Healthcare and Family Medicine* 7:1

Alleman, S., Houriet, C., Diem, P. and Stettler, C. (2009) Self-monitoring of blood glucose in non-insulin treated patients with type 2 diabetes: a systematic review and meta-analysis. *Current Medical Research and Opinion*. 25:12 p. 2903-2913

Almutairi, M.A., Said, S.M. and Zainuddin, H. (2013). Predictors of Poor Glycemic Control Among Type Two Diabetic Patients. *American Journal of Medicine and Medical Sciences.* 3:2 p. 17 – 21

Amod A., Ascott-Evans B.H., Berg G.I., Blom D.J., Brown S.L., Carrihill M.M., Dave J.A., Distiller L.A., Ganie Y.N., Grobler N., Heilbrunn A.G., Huddle K.R.L., Janse van Rensburg G., Jivan D., Joshi P., Khutsoane D.T., Levitt N.S., May W.M., Mollentze W.F., Motala A.A., Paruk I.M., Pirie F.J., Raal F.J., Rauff S., Raubenheimer PJ, Randeree HAR, Rheeder P, Tudhope L., Van Zyl D.J., Young M. (2012). The 2012 SEMDSA Guideline for the Management of Type 2 Diabetes (Revised). *JEMDSA* 17:2 (Supplement 1) p. S1-S95

Amod, A., Bayat, Z., Coetzee, A., Dave, J.A., Kinvig, T.E., Mohamed, Paruk, I., Pirie, F.J. (eds.) (2017) SEMDSA 2017 Guidelines for the Management of Type 2 diabetes mellitus. *JEMDSA* 22:1 (Supplement 1) p. S1- S196

Aschner, P., Beck-Nielsen, H., Bennett, P., Boulton, A., Colagiuri, R., Colagiuri, S., Franz, M., Gadsby, R., Gagliardino, J.J., Home, P., McGill, M., Manley, S., Marshall, S., Mbanya, J.C., Neil, A., Ramachandran, A., Ramaiya, K., Roglic, G., Schaper, N., Siminerio, L., Sinclair, A., Snoek, F., Van Crombrugge, P., Vespasiani, G., Viswanathan, V., Sim, K. (2014) Global Guideline for type 2 diabetes. *Diabetes Res Clin Pract* Apr 104:1 p. 1-52

Bailey, S.L., Ayles, H., Beyers, N., Godfrey-Faussett, P., Muyoyeta, M., du Toit, E., Yudkin, J.S., Floyd S. (2016) Diabetes mellitus in Zambia and the Western Cape province of South Africa: Prevalence, risk factors, diagnosis and management. *Diabetes Research and Clinical Practice* 118 p. 1–11

Bastiaens, H., Sunaert, P., Wens, J., Sabbec, B., Jenkins, L., Nobelse, F., Snauwaert, B., Van Royen, P. (2009) Supporting diabetes self-management in primary care: Pilot-study of a group-based programme focusing on diet and exercise. *Primary Care Diabetes* 3 p. 103-109

Beaglehole, R., Bonita, R. and Kjellstrom, T. (1997). Ch 3 – Types of Study. In *Basic Epidemiology*. Geneva: World Health Organisation.

Benoit, S.R., Fleming, R., Philis-Tsimikas, A., and Ming Ji (2005). Predictors of glycemic control among patients with Type 2 diabetes: A longitudinal study. *BMC Public Health.* 5:36

Bradshaw, D., Norman, R, Pieterse, D. and Levitt N.S. (2007). Estimating the burden of disease attributable to diabetes in South Africa in 2000. *S Afr Med J.* 97 p. 700 – 706

Chin, M.H., Cook, S., Jin, L., Drum, M.L., Harrison J.F., Koppert, J., Thiel, F., Harrand, A.G., Schaeffer, C.T., Takashima and H.T., Chiu S. (2001). Barriers to Providing Diabetes Care in Community Health Centers. *Diabetes Care.* 24 p. 268 – 274

Chronic Disease Audit conducted at Mitchells Plain CHC as part of the Annual Integrated Chronic Disease Audit of the Western Cape. Mitchells Plain CHC 2017

City of Cape Town (2013). *2011 Census Suburb Mitchells Plain*. City of Cape Town [Online] Available from: http://www.capetown.gov.za/en/stats/2011CensusSuburbs/2011_Census_CT_Suburb_Mitchells_Plain_Profile.pdf

City of Cape Town (2013). *City of Cape Town – 2011 Census – Mitchells Plain Health District.* City of Cape Town [Online]

Available from:

https://www.capetown.gov.za/en/stats/2011%20Census%20%20Health%20District%20Profiles/Mitchells%20Plain%20Health%20District.pdf

Clar, C., Barnard, K., Cummins, E., Royle, P. and Waugh, N. (2010) Self-monitoring of blood glucose in type 2 diabetes: systematic review. *Health Technology Assessment* 14:12

Daniels, A., Regien, B., Otten, J., Levitt, N.S., Steyn, K. Martell, R., Dick, J. (2000). Ambivalence of Primary Health Care Professionals Towards The South African Guidelines for Hypertension and Diabetes. *S Afr Med J.* 90 p. 1206 – 1211

De Vries, J.H., Snoek, F.J., Heine, R.J. (2004) Persistent poor glycaemic control in adult Type 1 diabetes. A closer look at the problem. *Diabetic Medicine* 21 p. 1263–1268

Donnelly, L.A., Morris, A.D. and Evans, J.M.M. (2007) Adherence to insulin and its association with glycaemic control in patients with type 2 diabetes. *The Quarterly Journal of Medicine* 100 p. 345-350

Erasmus, R.T., Soita, D.J., Hassan, M.S., Blanco-Blanco, E., Vergotine, A., Kengne, A.P., Matsha, T.E. (2012) High prevalence of diabetes mellitus and metabolic syndrome in a South African coloured population: Baseline data of a study in Bellville, Cape Town. *S Afr Med J* 102(11) p. 841-844

Essel, V., van Vuuren, U., De Sa, A., Govender, S., Murie, K., Schlemmer, A., Gunst, C., Namane, M., Boulle, A., and de Vries, E. (2015) Auditing chronic disease care: Does it make a difference? *African Journal of Primary Healthcare and Family Medicine* 7:1

Folb, N., Timmerman, V., Levitt, N.S., Steyn, K., Bachmann, M.O., Lund, C., 5 Bateman, E.D., Lombard, C., Gaziano, T.A., Zwarenstein, M., Fairall, L.R. (2015) Multi-morbidity, control and treatment of non-communicable diseases among primary healthcare attenders in the Western Cape, South Africa. *S Afr Med J* 105(8) p. 642-647

Franco, M., Orduñez, P., Caballero, B., Tapia Granados, J.A., Lazo, M., Bernal, J.L., Guallar, E., and Cooper, R.S. (2007) Impact of Energy Intake, Physical Activity, and Population-wide Weight Loss on Cardiovascular Disease and Diabetes Mortality in Cuba, 1980–2005. *American Journal of Epidemiology* 166:12 p. 13740 - 1380

Goudswaard, A.N., Stolk, R.P., Zuithoff, P., Rutten, G.E.H.M. (2004) Patient Characteristics Do Not Predict Poor Glycaemic Control in Type 2 Diabetes Patients Treated in Primary Care. *European Journal of Epidemiology* 19:6 p. 541-545

Goudge J., Gilson, L., Russell, S., Gumede, T., Mills, T. (2009) Affordability, availability and acceptability barriers to health care for the chronically ill: Longitudinal case studies from South Africa. *BMC Health Services Research* 9:75

Groenewald, P., Bradshaw, D., Daniels, J., Matzopoulos, R., Bourne, D., Blease, D., Zinyakatira, N. and Naledi, T. (2008). *Cause of death and premature mortality in Cape Town, 2001 – 2006.* Cape Town. South African Medical Research Council

Hall, V., Reimar, W.T., Henriksen, O. and Lohse, N. (2011). Diabetes in Sub Saharan Africa 1999-2011: Epidemiology and public health implications. A systematic review. *BMC Public Health.* 11:564

Haque, M., Navsa, M., Emerson, S.H., Dennison, C.R., Levitt, N.S. (2005) Barriers to initiating insulin therapy in patients with type 2 diabetes mellitus in public-sector primary health care centres in Cape Town. *Journal of Endocrinology, Metabolism and Diabetes of South Africa*, 10:3 p. 94-99

Harker, N., Kader, R., Myers, B., Fakier, N., Parry, C., Flisher, A.J., Peltzer, K., Ramlagan, S., Davids, S. (2008) Substance abuse trends in the Western Cape a review of studies conducted since 2000. Cape Town. Human Sciences Research Council.

Health Knowledge (2011). *Epidemiology for Practitioners*, Viewed 2nd November 2013, from http://www.healthknowledge.org.uk/e-learning/epidemiology/practitioners

Heisler, M., Cole, I., Weir, D., Kerr, E.A. and Hayward, R.A. (2007) Does Physician Communication Influence Older Patients' Diabetes Self-Management and Glycemic Control? Results from the Health and Retirement Study (HRS). *Journal of Gerontology* 62A:12 p. 1435 - 1442

Hou, Y., Li, W., Qiu, J. and Wang, X. (2014) Efficacy of blood glucose self-monitoring on glycemic control in patients with non-insulin-treated type 2 diabetes: A meta-analysis. *International Journal of Nursing Sciences* 1 p. 191 - 195

Hu, F.B. (2011) Globalization of Diabetes. *Diabetes Care* 34 p. 1249 - 1257

Ismail, I.S., Nazaimoon, W.M.W., Mohamad, W.B.W., Letchuman, R., Singaraveloo, M., Pendek, R., Faridah, I., Rasat, R., Sheriff, I.H. and Khalid, B.A.K. (2000). Sociodemographic determinants of glycaemic control in young diabetic patients in peninsular Malaysia. *Diabetes Research and Clinical Practice* 47 p. 57 – 69

Juarez, D.T., Sentell, T., Tokumaru, S., Goo, R., Davis, J.W. and Mau, M.M. (2012) Factors Associated With Poor Glycemic Control or Wide Glycemic Variability Among Diabetes Patients in Hawaii, 2006–2009. *Prev Chronic Dis* 9:120065

Karter, A.J., Ackerson, L.M., Darbinian, J.A., D'Agostino Jr., R.B., Ferrara, A., Liu, J. and Selby, J.V. (2001) Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanente Diabetes registry. *The American Journal of Medicine* 111:1 p. 1-9

Khattab, M., Khader, Y.S., Al-Khawaldeh, A. and Ajlouni, K. (2010). Factors associated with poor glycemic control among patients with Type 2 diabetes. *Journal of Diabetes and its Complication.* 24. p. 84 – 89

Klonoff, D.C., (2008) New Evidence Demonstrates That Self-Monitoring of Blood Glucose Does Not Improve Outcomes in Type 2 Diabetes— When This Practice Is Not Applied Properly. *Journal of Diabetes Science and Technology* 2:3 p. 342 - 348

Mash, R., Levitt, N.S., van Vuuren, U., Martell, R. (2008) Improving the annual review of diabetic patients in primary care: an appreciative inquiry in the Cape Town District Health Services, *South African Family Practice* 50:5 p. 50-50d

Misra, R., Lager, J. (2007) Ethnic and gender differences in psychosocial factors, glycemic control, and quality of life among adult type 2 diabetic patients. *Journal of Diabetes and its Complications* 23 p. 54-64

Nam, S., Chesla, C., Stotts, N.A., Kroon, L., Janson, S.L. (2011) Barriers to diabetes management: Patient and provider factors. *Diabetes Research and Clinical Practice* 93 (1) p. 1 - 9

Pereira, M.A., Kartashov, A.I., Ebbeling, C.B., van Horn, L., Slattery, M.L., Jacobs Jr, D.R. and Ludwig, S. (2005) Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *The Lancet* 365:9453 p. 36 – 42

Piette, J.D. and Kerr, E.A. (2006) The Impact of Comorbid Chronic Conditions on Diabetes Care. *Diabetes Care* 29:3 p. 725-731

Pinchevsky, Y., Butkow, N., Chirwa, T., Raal, F. (2017) Treatment Gaps Found in the Management of Type 2 Diabetes at a Community Health Centre in Johannesburg, South Africa. *Journal of Diabetes Research* 2017

Pinkhasov, R.M., Wong, J., Kashanian, J., Lee, M., Samadi, D.B., Pinkhasov, M.M., Shabsigh, R. (2010) Are men short-changed on health? Perspective on health care utilization and health risk behaviour in men and women in the United States. *International Journal of Clinical Practice* 64 (4) p. 475-487

Poolsup, N., Suksomboon, N., Rattanasookchit, S. (2009) Meta-analysis of the benefits of self-monitoring of blood glucose on glycemic control in type 2 diabetes patients: an update. *Diabetes Technology and Therapeutics* 11:12 p. 775–784

Ramirez, L.D.H., Soto A.F., Valenzuela C.L.C., Ochoa M.C., Gonzalez H.R., Lopez M.C.M. (2016) Factors Influencing Glycemic Control in Patients with Diabetes Type II in Mexican Patients. *Journal of Family Medicine* 3(2)

Reddy, P., Zuma, K., Shisana, O., Kim, J., Sewpaul, R. (2015) Prevalence of tobacco use among adults in South Africa: Results from the first South African National Health and Nutrition Examination Survey. *S Afr Med J* Sep 21:105 (8) p. 648-655

Republic of South Africa, Department of Social Development (2008). *Building sustainable livelihoods in Mitchells Plain.* Pretoria, Chief Directorate Communication [Online] Available from: http://www.communinet.co.za/Mitchells_Plain_background.pdf [Downloaded 26th February 2013]

Robson, C. (2006). Ch 4 – General Design Issues. In *Real World Research:* West Sussex: John Wiley and Sons. p. 70 – 80

Robson, C. (2006). Ch 5 – Fixed Designs. In *Real World Research:* West Sussex: John Wiley and Sons. p. 81 - 93

Sanal, T.S., Nair, N.S. and Adhikari, P. (2011). Factors associated with poor control of type 2 diabetes mellitus: A systematic review and Meta-analysis. *Journal of Diabetology.* 3:1

Sandberg, J., Trief, P.M., Greenber, R.P., Graff, K. and Weinstock, R.S. (2006) "He Said, She Said": The Impact of Gender on Spousal Support in Diabetes Management. *Journal of Couple and Relationship Therapy* 5:2 p. 23-42

Shah, B.R., Hux, J.E., Laupacis, A., Zinman, B. and Van Walraven, C. (2005). Clinical Inertia in Response to Inadequate Glycemic Control. *Diabetes Care.*28 p. 600–606

Simmons, D. (2001). Personal Barriers to Diabetes Care: Is It Me, Them, or Us? *Diabetes Spectrum.* 14:1 p. 10–12

Statistics South Africa (2013). *Mortality and causes of death in South Africa, 2010: Findings from death notification.* Pretoria. Statistics South Africa

Statistics South Africa (2017). *Mortality and causes of death in South Africa, 2015: Findings from death notification.* Pretoria. Statistics South Africa

Steyn, K., Fourie, J. and Temple, N. (eds.). (2006). *Chronic Diseases of Lifestyle in South Africa: 1995 - 2005. Technical Report*. Cape Town. South African Medical Research Council [Online]

Steyn, K., Levitt N.S., Patel, M., Fourie, J., Gwebushe, N., Lombard, C., Everett, K. (2008). Hypertension and diabetes: Poor care for patients at community health centres. *S Afr Med J* 98:8 p. 618-622

Strauss, K., MacLean, C., Troy, A. and Littenberg, B. (2006) Driving Distance as a Barrier to Glycemic Control in Diabetes. *The Journal of General Internal Medicine* 21 p. 378-380

van Dam, H.A., van der Horst, F.G., Knoops, L., Ryckman, R.M., Crebolder, H.F.J.M. and van den Borne, B.H.W. (2005) Social support in diabetes: a systematic review of controlled intervention studies. *Patient Education and Counselling* 59 p. 1-12

Warburton, D.E.R., Nicol, C.W., Bredin, S.S.D. (2006) Health benefits of physical activity: the evidence. *Canadian Medical Association Journal* 174(6) p. 801-809

Wassenaar, D.R. (2007). Ch 4 – Ethical issues in social science research. In Terre Blanche, M. Durrheim, K. (Eds). *Research in Practice: Applied Methods for the Social Science*: p. 67–79. Cape Town: UCT Press.

Western Cape Government: Health, 2014, *Integrated Chronic Disease Audit Report 2014*, Cape Town

WHO (2013) *Factsheet: Diabetes* [Online]. Available from: http://www.who.int/mediacentre/factsheets/fs312/en/index.html [Accessed 18th July 2013]

WHO (2006) *Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia: report of a WHO/IDF consultation*. Geneva: WHO

WHO (2016) *Diabetes Country Profile 2016* [Online]. Available from: http://www.who.int/diabetes/country-profiles/en/ [Accessed 4th December 2017]

Wild, S., Roglic, G. Green, A., Sicree, R., King, H. (2004) Global Prevalence of Diabetes. *Diabetes Care* 27 p. 1047 - 1053

Yigazu, D.M., Desse, T.A., (2017) Glycemic control and associated factors among type 2 diabetic patients at Shanan Gibe Hospital, Southwest Ethiopia. *BMC Res Notes* 10:597

Yki-Järvinen, H. (2001) Combination Therapies with Insulin in Type 2 Diabetes. *Diabetes Care* 24(4) p. 758-767

Appendices

Appendix 1

Patient Questionnaire

Date: ☐

Questionnaire Number: ☐ Collector: ☐

Demographics

1. Age					
2. Gender	M			F	
3. Race	B	C	W	I	O
4. Marital Status	M	S	D	W	
5. Employed/ Self-Employed a. If "Yes" Monthly Income b. If "No" then Pension or Grant	Y		N		
	P	G	N		
6. Highest Level of Education	Primary	High (Grd 8-10)	High (Grd 11-12)	Tertiary	

Patient Factors

7. How long have you been diagnosed with diabetes?			
8. Do you have any other chronic illness? a. If "Yes" what?	Y	N	
	HPT	Epilepsy	Asthma
	COPD	Thyroid	Other
9. How long have you been on medication for diabetes?			
10. What type of medication do you take for diabetes?	Insulin	Oral	Combination
11. Do you experience any side-effects of the medication? a. If "Yes" have you ever not taken your meds because of this? b. How often has this happened? c. If "No" any reason why you would not take your meds?	Y	N	
	Y	N	
	Once/month	1-2 / week	More than 2/ week
	Y	N	

12. Do you own a glucometer?	Y		N	
a. If "Yes" how often do you use it?	1-2 days/ week	Every Second day	Daily	>1/Daily
13. Do you do any exercise?	Y		N	
a. What kind of exercise (including walking, housework, gardening)?				
b. How often	1-2 days/week	3-4 days/week	Daily	
c. Any factors that prevent you from exercising?	Y		N	
Such As?				
14. Do you smoke?	Y		N	
15. Do you use alcohol	Y		N	
16. How often do you eat fast foods?	Once/month	1-2/week	>2 /week	Never

System and Provider Factors

17. Have you ever received any lifestyle counselling / education at the CHC about diabetes?	Y		N	
a. If "Yes" what it included	Diet	Exercise	Smoking	
b. By whom?	Dr	Nurse	HPO	Dietician
c. When?				
18. Are you satisfied in the way your diabetes is managed?	Y	N	U	
19. Do the clinicians seem to be concerned about you?	Y	N	U	
20. Do the clinicians allow you to be involved in decisions with	Y	N	U	

regards to your treatment?					
21. Do you belong to any support groups or Clubs?	Y		N		
a. If "Yes" which one					
b. Where you meet					
c. If "No" have you heard of the support group/ clubs?	Y		N		
22. How do you usually travel to the CHC?	Public Transport		Own Vehicle	Lift	Walk
	Taxi	Bus			
23. How far (Km)					
24. How Much cost (R)					
25. Do you encounter any problems when travelling to the CHC?	Y		N		
a. If "Yes" such as?					

Appendix 2

Folder Review

1. Type of Diabetes	Type 1 (Insulin)	Type 2 (Insulin only)	Type 2 (Oral only)	Type 2 (Combination)
2. Latest HbA_{1c}				
3. Total number of all chronic medication prescribed (at last visit)?				

Visit Review (If essential procedures were performed at the last visit)

			Last Value	Within Target?
4. Blood Pressure	Y	N		140/80
5. Weight	Y	N		N/A
6. BMI	Y	N		<25
7. Foot Inspection	Y	N		N/A

Annual Review (If essential procedures or test were done in the last 12 months)

8. HbA_{1c}	Y	N		<7
9. Comprehensive Foot Exam	Y	N		N/A
10. Retinal Screening	Y	N		N/A
11. Visual Acuity	Y	N		N/A
12. Urine Dipstix	Y	N		N/A
13. Serum Creatinine	Y	N		<120
14. Random Total Cholesterol	Y	N		<4.5
15. Total Number of Test (8 – 14)				
16. Number within target				

Meds

	Eligible		Prescribed	
Simvastatin	Y	N	Y	N
Aspirin	Y	N	Y	N

Appendix 3

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: 27 21 959 2809, Fax: 27 21 959 2872

E-mail: soph-comm@uwc.ac.za

INFORMATION SHEET

Project Title: Factors relating to poor glycaemic control amongst diabetic patients attending Mitchells Plain Community Health Centre

What is this study about?

This is a research project being conducted by Dr AK Kariem at the University of the Western Cape. This study is part of my course requirements for my Master of Public Health degree. We are inviting you to participate in this research project because you are a diabetic patient attending the diabetic club at Mitchells Plain CHC. The purpose of this research project is to determine the amount of patients with poor sugar control and which factors may influence this.

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

In this study we will be asking for the assistance of diabetic patients at our facility to participate. Patients with diabetes will be randomly selected on the day of their appointment. Those selected will have the right to refuse to participate. Those who participate will be asked questions from a questionnaire. Some of the questions that would be asked are highest education level, marital status and if you own a glucometer. There will be no repercussions for you if you chose not to take part and for those who do take part the process will not extend the duration of your visit to our facility. There will be no form of personal benefit derived from this study for those who chose to participate. This means that no reward either financial or gifts or any other form will be gained personally.

Would my participation in this study be kept confidential?

We will do our best to keep your personal information confidential. To help protect your confidentiality we do not record names or folder numbers therefore your answers will be completely anonymous and confidential.

What are the risks of this research?

Some questions may make you feel uncomfortable and may prevent you from providing an honest answer. We assure you that there are no repercussions from participating in this study and be assured that all information is confidential. All procedure undertaken, such as the finger prick, are part of your normal visit. No additional testing or procedures will be done in this study. You may also freely withdraw from the study at any time.

What are the benefits of this research?

The benefits from this study would be to improve diabetic care for all patients at this facility. This research is not designed to help you personally, but the results may help the investigator learn more about diabetes control. We hope that, in the future, other people might benefit from this study through improved understanding of the factors that influence diabetes control.

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

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

What if I have questions?

This research is being conducted by Dr AK Kariem at the University of the Western Cape. If you have any questions about the research study itself, please contact Dr AK Kariem at: Mitchells Plain CHC; telephone: 021 392 5161

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

Director

Prof Helene Schneider

School of Public Health

University of the Western Cape

Private Bag X17

Bellville 7535

hschneider@uwc.ac.za

Dean of the Faculty of Community and Health Sciences:

Prof Jose Frantz

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

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

Appendix 4

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: 27 21 959 2809, Fax: 27 21 959 2872

E-mail: soph-comm@uwc.ac.za

Consent Form

Title: Factors relating to poor glycaemic control amongst diabetic patients attending Mitchells Plain Community Health Centre

I, _____, hereby agree to participate in the study on diabetes at Mitchells Plain CHC. I do so freely and under no coercion. I understand that I may withdraw my consent at any time and I will not be negatively affected by my decision.

The purpose and process of the study has been explained to me in language that I understand. I am aware that I will not personally benefit directly from it. All my questions have been answered satisfactorily.

I also understand that this consent form is not linked to the questionnaire in anyway and my answers are private and confidential.

The contact number of Dr Kariem has been provided if I have any questions or concerns.

Signature of Participant: _____

Date: _____

Appendix 5

UNIVERSITY of the WESTERN CAPE

OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT

29 January 2015

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape approved the methodology and ethics of the following research project by:
Dr AK Kariem (School of Public Health)

Research Project:	Factors relating to poor glycaemic control amongst diabetic patients attending Mitchells Plain Community Health Centre.
Registration no:	14/10/41

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

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

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

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

Appendix 6

Guidelines for Diabetes Management summarised from the JEMDSA 2013 Guidelines (Amod, *et al*, 2012)

Target of Treatment	
Target Group	**HbA_{1c}**
Young with no or low Cardiovascular risk (CVR)	<6.5%
Most People	<7%
Elderly, High or established CVR and poor short term prognosis	<7.5%
Treatment	
Lifestyle Modification Plus	
Step 1: Initiate at least one drug from diagnosis	Metformin
Step 2: Combine any two drugs	Metformin plus Sulphonylurea (SU)
Step 3: Combine three drugs	Metformin plus SU and Insulin
Step 4: Refer	

Treatment steps to be followed within three months if HbA_{1c} >7% (or individualised target).

Metformin optimum dose 2g daily (1g twice daily) with maximum 2550mg daily.

Recommendations for Diabetic Visits	
Each Visit	Blood Pressure, BMI, Waist Circumference, Foot Inspection
Annually	Comprehensive foot exam Retinal Screening Referral to educator or dietician Urine dipsticks Lipid profile Serum creatinine and potassium and GFR
HbA_{1c}	Three monthly if not target Six monthly if target