AN ASSESSMENT OF THE LEVEL OF KNOWLEDGE OF DIABETICS AND PRIMARY HEALTH CARE PROVIDERS IN A PRIMARY HEALTH CARE SETTING, ON DIABETES MELLITUS

BY

LUSHENDRAN MANIKUM MOODLEY (B.PHARM)

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Department of Pharmacology
Faculty of Health Sciences
University of KwaZulu-Natal (Westville)
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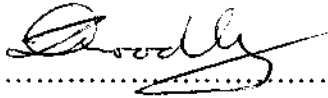**Supervisor : Professor V. Rambiritch**

To my wife and parents……..

DECLARATION

This document describes original work by the author and has not been submitted in any form to any other University. Where the work of other authors has been used, it has been duly acknowledged in the text.

The research described in this study was supervised by Prof V Rambiritch, MMed (Clinical Pharmacology) PhD, Department of Pharmacology, University of KwaZulu-Natal, Westville.

The research was conducted at the KwaMashu Polyclinic, Osindisweni Hospital and Tongaat Clinic in KwaZulu-Natal, South Africa.

Lushendran Manikum Moodley

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LIST OF ABBREVIATIONS

ABC	Cumulative results of Clinics A, B and C
ADA	American Diabetes Association
ARTI	Acute Respiratory Tract Infection
CVD	Cardiovascular Disease
DKT	Diabetes Knowledge Test
DKA	Diabetic Keto-acidosis
DCCT	Diabetes Control and Complications Trial
FBTG	Full Blood Triglycerides
fig.	Figure
HbA1c	Glycosylated Haemoglobin
n	Number represented by study population
NCD	Non-Communicable Disease
NIDDM	Non Insulin Dependent Diabetes Mellitus
NO.	Number
PHCN	Primary Health Care Nurse
RN	Registered Nurse
SN	Staff Nurse
SPSS	Statistical Package for the Social Sciences
TBC	Total Blood Cholesterol
UKPDS	United Kingdom Prospective Diabetes Study
US	United States of America
VA	Veterans Affairs
WHO	World Health Organisation
YR	Year
YRS	Years

ABSTRACT

Diabetes mellitus is a global disease grossly and chronically affecting the quality of life of the affected patients. It places a huge burden on the economy in terms of the financial costs incurred for diabetes treatment and its co-morbidities, and work hours lost due to sick days. In the past, South Africans diagnosed with the condition have been of the affluent urban community. Now, due to westernisation of the rural community, it is fast becoming prevalent in the African population.

The increase in the number of peripheral clinics post-apartheid has provided essential health care to the masses. There has been an increase in screening for diabetes and easier access to treatment for the outer lying communities. An important point that needs to be considered though is the quality of care administered, and patients' knowledge of the disease. These are integral components to attaining optimal disease control.

It would thus be valid to assess the understanding of the primary health care patient on his or her actual perception of the disease state and the impending problems that may arise. It would also be appropriate to investigate the quality of care administered to these patients. The study was therefore aimed at clinics in the KwaZulu-Natal region where 56,9% of the people live in rural areas, with an estimated 65% literacy rate and unemployment standing at over 50%. The patients in the rural clinics, who are on the outer ring of media hype on health focus, and who realistically, have limited access to the 'kaleidoscope' of health care that the urban and private patients enjoy, would be of particular interest.

This was a cross sectional descriptive study involving diabetic patients visiting 3 primary health care clinics in Kwa-Zulu Natal (anonomised A, B and C). Clinics were selected on the outskirts either bordering or actually within a rural area. The patients were chosen on convenience sampling. All patients visiting the diabetic clinic would be chosen on a voluntary basis. Informed consent was

obtained from each patient. The patients could be either type-1 or type-2 diabetics. South Africans of Indian origin will be referred to as Indians and Black Africans as Africans as per the Department of Home Affairs classification. Staff who attended to the diabetic patients at these clinics were also interviewed. The staff number would depend on those providing care at the time of study.

A two-part patient questionnaire was designed (Appendix 3). Section A investigates a basic patient history (demographics and disease state) while section B is a basic knowledge test on diabetes mellitus. Diabetes knowledge was assessed modifying a version of the Michigan's Diabetes Research and Training Centre's Brief Diabetes Knowledge Test.

The nurse questionnaire consisted of mostly close-ended questions and two open-ended questions (Appendix 5). The questionnaire served to establish the understanding of staff treating these diabetic patients on diabetes mellitus and its treatable complications, their management of patients and possible barriers to treatment.

121 of the 181 patients (66.9%) passed the diabetic knowledge test. The best pass was in Clinic B (74.2%) and the worst in Clinic C (50%) (p<0.05). There was a higher pass in the female than the male group with 69.8% of the female population passing compared to 60% of the male (fig.9).The overall data across the three clinics indicates a better pass by the Indian than the African population. 75.9% of the Indian patients passed in comparison to 52.2% of the African patients. It should be emphasized that a difference in knowledge scores illustrates a lack of history in the particular group to diabetes mellitus and is a legacy of apartheid where there were inequalities in education, health services and all other spheres of life.

Clinic B was represented by a younger nursing staff, followed by Clinic A which was mostly represented by middle aged nurses (40-49year age group) and Clinic

C who had the largest number of nurses in the 50-59year age group. 40% of the nurses from Clinic A and 36.4% of the nurses from Clinic C reported having post-basic training in diabetes mellitus with none being reported by Clinic B (fig. 31). These results correlate to nurse reports of self-perceived diabetes knowledge. Clinic C showed more nurses who qualified more than 16 years ago (fig. 32). Therefore, the number of years post qualification of the nursing sisters in Clinic C may be an important factor when considering the poor performance of the patient population of Clinic C.

All three clinics counselled their patients regularly (monthly) on diet, exercise, compliance and foot care with the nurses in Clinic C reporting the highest consistency in counselling (fig. 34). However, their patients produced the poorest results. This could be due to inconsistency in the answers given by the nurses of Clinic C or counselling being delivered inappropriately.

There is a problem with regard to the understanding of the diabetes disease by the African population. The increase in the awareness of diabetes mellitus in Indians may be due to the early identification and high prevalence of the disease and its co-morbidities in the Indian community for many years. Thus, majority of the African study population being type-2 diabetics and above the age of forty grew up during the apartheid era and consequently lacked the benefit of appropriate health care and education.

We therefore need to ensure that our health care providers are continuously trained and provided with the essentials in order to comprehensively care for diabetic patients. We further need to ensure that the quality of training of our healthcare providers are of the highest level and that there are follow up evaluations on a regular basis in the clinical environment.

CHAPTER ONE – INTRODUCTION

The prevalence of diabetes in African communities is increasing with ageing of the population and lifestyle changes. Traditional rural communities still have a low prevalence, at most 1-2% whereas 1-13% or more adults in urban communities have diabetes mellitus (Diabetes in Africa, 2003). Epidemiological information, however, concerning disease patterns amongst blacks in Southern Africa reflects an increase in the incidence of asthma, diabetes and hypertension, which were previously recognised more in urban black populations (Reeve et al, 1986). Type-2 diabetes is the predominant form (70-90%), the rest being represented by typical Type-1 patients and patients with atypical presentations that require more pathophysiological insight. Increasing sedentary lifestyles coupled with fast growing urban cultures and modified diets is predicted to triple the prevalence of diabetes mellitus in the next 25years (Diabetes in Africa, 2003).

In view of the late diagnosis of type-2 diabetes mellitus, these patients have various long-term complications, increasing the burden of diabetes on health care systems in African countries. It is therefore in the interest of these countries, especially South Africa which has one of the fastest growing western cultures, to design and implement suitable diagnostic, management and treatment protocols as well as appropriate education for the patients.

Diabetes mellitus is thus a widespread condition in Africa. 225million of an estimated 541million people aged between 20-79years have diabetes (e-ATLAS). Research into the management of this disease at primary health care level in South Africa have revealed only a third of the patients being well managed and 40% of the patients having blood glucose levels within the study limits. One of the major shortcomings for this was a lack of health education (Beattie & Kalk, 1998).

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The greatest weapon in the fight against diabetes mellitus is knowledge. Therefore, information can help people assess their risk of diabetes, motivate them to seek proper treatment and care, and inspire them to take charge of their disease for a life-time (Zimmerman et al, 1999).

Diabetes mellitus is a heterogeneous group of disorders, connected by raised plasma glucose concentration and disturbance of glucose metabolism. Glucose is under-utilised with resulting hyperglycaemia (New diagnostic, 1998). The current classification of diabetes mellitus proposed by the American Diabetes Association (The expert committee, 1997), and accepted in a slightly revised form as a working classification by the World Health Organisation (WHO, 1999), is an attempt at staging diabetes mellitus. This takes into account current knowledge on the aetiology and natural history of the disease and has therapeutic implications, acknowledging the following types of diabetes mellitus which are mostly accepted; Type-1, Type-2 and Gestational.

Type-1 diabetes mellitus is termed insulin dependent diabetes or juvenile-onset diabetes. It results from a cell-mediated autoimmune destruction of the insulin-secreting pancreatic beta-cells. The cornerstone to treatment of the Type-1 diabetes mellitus patient is adequate insulin supplementation and this is potentiated by proper education, diet and exercise (The expert committee, 1997).

Type-2 diabetes mellitus was formerly known as non-insulin dependent diabetes mellitus (NIDDM), type-2 or adult onset diabetes mellitus. Two disorders represent the new knowledge type-2 diabetes mellitus. The first is a decreased ability of insulin to act on the peripheral tissues and the second is the dysfunction of pancreatic beta-cells (Dinneen et al, 1992, Homodelarche, 1992 and Weyer et al, 2001). Type-2 diabetic patients are usually older at the onset of the disease presenting with minimal symptoms. Due to the insidious onset of this type of diabetes mellitus, treatment begins with basic modifications in diet, and counselling with regard to exercise and regular self-monitoring of plasma

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glucose. Recent evidence outlines the benefits of these interventions in delaying the onset of diabetes in high-risk individuals (Toumilehto et al, 2001).

The principal chronic complications of diabetes mellitus are retinopathy, neuropathy, angiopathy and nephropathy (Cerne, 2000). Diabetic complications may be divided into the large vessel (macrovascular) or small vessel (microvascular) diseases. Macrovascular disease incorporates atherosclerotic vascular disease which results in coronary heart disease, stroke and peripheral vascular disease. These developments are not specific to diabetes but they occur in increased frequency and with increased severity amongst diabetic patients. This is more so in the non-insulin dependent diabetes mellitus patients and is the key factor for the increased mortality in this group of patients. Risk factors for macrovacular disease include obesity, smoking, hypertension, excess alcohol intake and sedentary lifestyle (Mayer, 1981).

Microvascular disease affects the small blood vessels. It primarily involves the development of diabetic retinopathy and nephropathy and may also be important in the aetiology of neuropathy. A study of 148 diabetic patients visiting Kaohsiung Medical University Hospital over a period of one year in 2001, of all the newly diagnosed Type-2 diabetic patients, 18.2% had nephropathy and 25.5% had retinopathy (Tzeng, 2001). Similar studies carried out over a ten year period in Durban, South Africa revealed a prevalence of retinopathy in 53.2% of type-1 diabetic patients and 23.4% with nephropathy. It was interesting to find here as well that the development of retinopathy occurred earlier in Blacks than in Indian patients. For the type-2 diabetes mellitus group it was found that 64.5% had retinopathy and 25% with nephropathy (Microvascular, 2001).

Small vessel disease may also cause diffuse cerebrovascular disease with resulting cerebral atrophy. Microangiopathy involving the small vessels of the myocardium may be responsible for the poorer prognosis in diabetic patients following myocardial infarction (Mayer, 1981). The link between cardiovascular

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disease (CVD) and diabetes mellitus is widely recognised and well established following findings from several investigations revealing that the incidence of CVD is at a higher rate in diabetes mellitus patients than in the general population (Hu et al, 2002; Norhammar et al, 2002 and Kowalska et al, 2001).

Many diabetic patients are totally unaware of the potential problems that may affect their feet. Due to peripheral neuropathy, many injuries occur and if feet are not examined regularly, one could be faced with severe ulcerations, leading in some cases, to amputation. Results from studies done in Bronx, New York reflect that diabetic patients are only likely to have foot examinations from primary care if they have co-existing peripheral vascular disease (Wylie-Rosett, 1995).

Acute complications of diabetes mellitus includes hypoglycaemia, hyperglycaemia and diabetic ketoacidosis. Hypoglycaemia is lowered blood glucose levels. It may be caused by exogenous, endogenous or functional causes. In general, hypoglycaemia occurs when blood glucose levels are below 1.95mmol/L in newborns for the first 48hours of life and 2.5-3.3mmol/L in children and adults. The symptoms of hypoglycaemia result from neurogenic reaction and from cellular malnutrition. Symptoms frequently vary among individuals but tend to be consistent for each person. Neurogenic reactions occur when the decrease in blood glucose is rapid with tachycardia, palpitations, diaphoresis, tremors, pallor and arousal anxiety. Cellular malnutrition provide further symptoms including headache, dizziness, irritability, fatigue, poor judgement, confusion, visual changes, hunger, seizures, and coma. Hyperglycaemia is characterised by thirst, polyuria and dizziness while the clinical manifestations of ketoacidosis include hyperventilation, anorexia, ketonuria, nausea, abdominal pain and thirst (Zinder, 1998).

A review of the quality of care received by public primary care patients in five clinics in Cape Town (1991) revealed that the examinations for treatable complications were inadequate and that simple protocols and in-service

education is likely to improve the care of and health outcome for diabetic patients at these sites (Levitt & Zwarenstein, 1996). Patient education is a crucial facet of diabetes control (Gossain et al, 1993), and it has been cited in the literature as a significant factor that increased patient knowledge of diabetes. Diabetes education was also found to enhance patients' knowledge to diabetes control regimens and to have a positive effect on glycaemic control (Peyrot & Rubin, 1994).

Due to the high incidence of the rapidly developing complications in diabetic patients, it would be valid to assess the understanding of the primary health care patient on his or her actual perception of the disease state and the impending problems that may arise. The study will be aimed at clinics in the KwaZulu-Natal region where 56,9% of the people live in rural areas, with an estimated 65% literacy rate and unemployment standing at over 50% (South African Statistics). The patients in the rural clinics, who are on the outer ring of media hype on health focus, and who realistically, have limited access to the 'kaleidoscope' of health care that the urban and private patients enjoy, would be of particular interest.

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CHAPTER TWO – LITERATURE REVIEW

2.1 Prevalence of Diabetes

It is universally known that doctors do not deal with diseases alone but with patients that are ill or concerned about their health (Katz, 1984). Diabetes mellitus, a major underlying contributory factor to the number of deaths in South Africa (Bah, 2003), requires a great deal of knowledge by both the patient and attending medical professionals. Due to urbanisation and westernised trends of obesity (Westaway et al, 2003) coupled with the high prevalence of hypertension (Westaway et al, 1999) there is an increase in the number of black diabetics in South Africa (Levitt et al, 1993).

Attempts to predict the prevalence of diabetes internationally has been performed several times. In 1994, the International Federations Directory (Triennial report, 1994) estimated over 100 million people worldwide had diabetes mellitus (type-1 and type-2). The World Health Organisation (King et al, 1998) in 1995 estimated the global burden at 135 million reaching 299 million by 2025. Amos et al, (1997) calculated a current global prevalence of 124 million people and estimated an increase to 221 million people by the year 2010. It is phenomenal that their figures are so similar. It benchmarks the global crisis of diabetes mellitus and clearly illustrates a disease pattern that is universal. Diabetes mellitus is now prevalent in every population in the world and epidemiological evidence infers that without proper prevention and control programmes, diabetes will likely continue to increase globally. King et al, (1998) predicts a rise of the world diabetic population residing in developing countries from 62% in 1995 to 75% in 2025. This is therefore not a disease purely affecting developed nations.

Due to complications of the disease, (i.e. macrovascular and microvascular complications including coronary artery disease, diabetic nephropathy and

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neuropathy, peripheral vascular disease and stroke) reduced life expectancy is fast becoming a financial burden worldwide. Thus, this is one of the more challenging health problems unfortunately not receiving the recognition of its current magnitude, for its potential complications has a huge impact on medical personnel together with monetary implications (Sobngwi et al, 2001).

The prevalence of diabetes in sub-Saharan Africa for the age group 20-79 is 1.1% with an estimated 2.5 million sufferers, thus cementing the suggestion that the global trend is the increase in the incidence and prevalence of diabetes mellitus in Africa (King et al, 1998).

Studies in South Africa between 1959-1985 reflected low prevalence of diabetes mellitus in black South Africans (Goldberg et al,1969; Politzer & Sachs,1967). Omar et al. (1993) using the revised WHO criteria for diagnosis of diabetes indicated a prevalence of 5% in the urban South African black population with an increase in prevalence of the Indian population of South Africa showing a 7.6% prevalence in males and 13.5% in females (Omar et al, 1985). More recent statistics of prevalence revealing 8% in South African blacks (Levitt et al, 1997) is evident of the growing burden of diabetes mellitus on the South African economy, exceeding prevalence rates in African Americans (Anderson et al, 1996).

2.2 Primary Health Care in South Africa

The Black and Indian population of South Africa comprise a huge percentage of the public health care sector. In the years since the inception of the new government, South Africa has made many steps towards closing the gap between the privledged and disadvantaged groups. Major transformations in the health care system had to be made in order to facilitate this progress.

The aim of the new government was to improve the health of South Africans and in order to achieve this, focus would have to be on the disadvantaged rural

population. The rural population who bear the greatest burden of disease due to poverty are paradoxically given less care as most private and public health care focus is on the urban populations. As many as 90% of black South African diabetes mellitus patients rely on government health facilities with only 8% having access to private medical aid (Westaway et al, 2005). A uniform distribution of health care across the country would be necessary in order to make health accessible and overcome the inequalities of the past. The primary aim of the government was to create more peripheral services in the rural areas including water, sanitation, housing and health care services (Dyer, 1995). Health care services would be rendered via primary health care clinics. Patients were to be cared for by primary health care nurses where doctors were not available or attended to the more serious.

The South African government agreed to allocate 100 million rand to the rural clinics building project in 1995 and Dr Nkosazana Zuma said that a further 65 million rand is earmarked for the financial year end 1995-6 (Dyer, 1995). The target was one clinic per 10 000 of the population and in order to achieve this a further 1400 clinics had to be erected. Dr Coen Slabber, director general of the Department of National Health related that the clinics will hopefully relieve the current burden on provincial hospitals where three quarters of the national health budget is spent.

But even as we try to rectify this wrong and realign the priorities of the South African health system, there is a realisation that there is an existing health care structure in rural areas that are not being used effectively. These clinics usually lack patient educators, are overwhelmed with patient numbers compounded by staff shortages and physical resources, leading to overall poor staff morale (Westaway et al, 2005). Thus the questions are asked, does the nurse have suitable knowledge to adequately care for the chronically ill patients suffering from hypertension, diabetes mellitus etc.? Do they have sufficient human resources to cater for the hundreds of patients attending the clinic daily? Human

resources do not only refer to the amount of hands in assistance but the competency of staff as well. Together with this, many other barriers may be present to prevent a smooth flow of patient care.

2.3 Staff knowledge and attitudes towards diabetes mellitus

Studies performed to assess the knowledge, attitudes and practices of staff attending to diabetic patients in the primary health care sector in both South Africa and abroad have discovered many shortfalls in the overall quality of care. Goodman et al, (1997) after auditing staff knowledge at twelve public sector ambulatory health centres in Cape Town reported gaps of knowledge in doctors and nurses regarding the pathophysiology of diabetes mellitus and signs and symptoms of diabetic emergencies. Only 33% were aware that proper control of hypertension is important in the prevention of diabetic nephropathy and 69% were aware of how to adequately handle hyperglycaemia. Also interesting in the results of the study was the failure in communication between the doctors, registered nurses, primary health care nurses and staff nurses.

Etzwiler (1967), years ago reported a deficit in knowledge of diabetes mellitus care amongst medical personnel. Thus, in compounding the latent attitude of nurses to diabetic patients, studies indicate that nurses do not have sufficient knowledge and preparation to comprehensively care for diabetic patients (Drass et al, 1989; Gossain et al, 1993: Kamal et al, 2001). The above studies aimed to contrast the actual and perceived knowledge of nurses involving diabetes mellitus. Although no significant difference was made in that the actual and perceived knowledge were more or less similar, an average score of +/- 70% was achieved by nurses in all three studies. Lack of knowledge on the subject matter was evident in different areas which proved that nurses were not sufficiently competent to comprehensively manage diabetic patients.

Levitt et al (1996) reported after a review of quality of care in ambulatory outpatient diabetes clinics at community health centres in black areas in Cape Town, that fewer than 48.9% of patients visiting the clinic resulted in a change of management of the patient. Furthermore, examination of feet was performed in fewer than 4.7% of patients. Beattie et al, (1998) reported only 33% of all diabetic patient records to be well managed in a primary care setting in South Africa with only 40% of patients having acceptable blood glucose levels. These statistics are obviously concerning as patients with diabetes need optimal care. This is two fold, one is having close supervision to monitor the progress of their disease state in terms of complications, insulin secretion and sensitivity etc. and two is that genuine care by health personnel will confer a state of awareness as to the importance of their disease to the patient. It is unfortunate though studies monitoring the improvements in diabetes patient care show a very slow progression towards patient and staff awareness of diabetes mellitus (Hiss et al, 1994). This therefore raises huge concern for the South African health system as we are highly dependent on the primary health care nurse for the management of chronically ill patients in rural areas and even clinics on the periphery of urban areas.

As discussed in the introductory chapter, South Africa is currently focusing strongly on human resource development. Uys & Naidoo (2004) described and compared the quality of nursing service and care in three health districts in the KwaZulu-Natal Province. In order to identify deficiencies which could be addressed by education and training, it might be useful to measure the quality of care given by nurses. From March to August 2002 a survey was done in six hospitals and six clinics in three health districts of the KwaZulu-Natal province of South Africa. Five different aspects of care was evaluated; hand-over from one nursing shift to another, implementation of universal precautions, patient satisfaction, nursing records, and management of chronic illnesses. All these aspects were evaluated using checklists based on record reviews or direct observation, except for patient satisfaction, which was evaluated by

questionnaires. The average scores on the different aspects varied from 11% (for nursing records) to 73% (for management of chronic diseases). Specific problems became evident. In one district, three out of four hand-overs between shifts of nurses scored less than 50%. In all three districts the use of protective gear scored low (43%). While the average score for management of chronic illnesses were high at 73%, the blood pressures of only 23% was within the target range, and the blood sugar of only 38% of patients were controlled. Patient satisfaction averaged 72% across the three districts. The quality of care measurements identified specific training needs, but other management strategies are probably also indicated.

Throughout South Africa, primary clinical care is mainly provided by nurses. In line with this, most professional nurses of the former Bloemfontein local authority completed a one year "Advanced Diploma in Health Assessment, Diagnosis and Treatment" course at the University of the Free State. This study (Louwagie et al, 2002) aimed to compare the clinical competencies of nurses who obtained this diploma with those who did not. The primary objective was to assess the clinical management of one chronic and one acute disease (diabetes mellitus and acute respiratory tract infections in adults, respectively) for these two groups of nurses. Relationships between quality of care and nurses' and clinics' characteristics were also examined since they could be predictors of quality of care, independent of the influence of training. Records of 286 consecutive visits for adults with diabetes and 293 consecutive visits for adults with an acute respiratory tract infection (ARTI) were reviewed. Nurses completed questionnaires on nurse characteristics, while the researchers obtained the information about the clinics. Recording of important generic (for ARTIs) and disease-specific steps (for diabetes) in patient management were assessed. Results for patients of "trained" and "non-trained" professionals were compared and adjusted for nurses', clinics' and patients' characteristics. There was generally little evidence of patients being thoroughly managed. Formal training was marginally associated with better care for ARTIs (p = 0.06) but not for

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diabetes (p = 0.47). Other factors associated with more thorough care were years of experience in curative primary health care (p = 0.006) and additional nursing degrees for ARTIs (p = 0.03) and the presence of enrolled or assistant nurses at the clinic for diabetes (p = 0.06). Fixed clinics generally performed better than mobile and satellite clinics.

Goodman et al (1997) audited staff knowledge, attitudes and practices in the interest of improved public sector primary care for diabetics. An external audit using face-to-face, private, questionnaire-based interviews was conducted in twelve public sector ambulatory health centres in Cape Town. The target population included non-specialists, principal staff members (N = 35) -12 doctors, 10 primary health care nurses (PHCNs), 7 registered nurses (RNs) and 6 staff nurses (SNs). Knowledge of chronic diabetic complications was adequate, e.g. diabetic eye disease was mentioned by 100% of staff. There were gaps in knowledge of pathophysiology and of signs and symptoms of diabetic emergencies, e.g. < 33% knew control of hypertension to be important in the prevention of diabetic nephropathy. Knowledge of appropriate care of patients with hypoglycaemia (94% mentioned glucose administration) was better than that of hyperglycaemia (69% mentioned intravenous fluids). Problems were reported in inter-staff communication within (approximately 50%) and between (approximately 75%) disciplines by doctors, PHCNs and RNs. Staff/patient communication problems were reported by approximately 75% of staff. Solutions suggested by staff included meetings between staff members and with management, in-service training programmes and appointment systems for patients. Despite logistic, organisational and communication-related problems, most staff enjoy and believe in the value of their work. This study reveals deficiencies in in-service training with consequent gaps in knowledge and practice.

Davidson (2005) investigated whether diabetes care directed by nurses following detailed protocols and algorithms and supervised by a diabetologist results in

meeting the evidence-based American Diabetes Association (ADA) process and outcome measures more often than care directed under usual care in a minority population. Studies were mainly conducted in two Los Angeles County clinics. In clinic A, nurse-directed diabetes care was provided to 252 patients (92% Hispanic and 2% African-American) referred by their primary care providers. These patients were hierarchically matched with 252 diabetic patients in clinic B (79% Hispanic and 19% African American). When nurse-directed care was abruptly discontinued in clinic A for administrative reasons, it was reestablished in clinic B. Those patients were randomly selected from a teaching clinic, and the outcomes in 114 patients who completed 1 year were compared with outcomes derived the year before receiving nurses' care. The following process and outcome measures were assessed in the study; 1) number of visits, 2) diabetes education, 3) nutritional counseling, 4) HbA_{1c}, 5) lipid profiles, 6) eye exams, 7) foot exams, 8) renal evaluations, and 9) ACE inhibitor therapy in appropriate patients. For patients under nurse-directed diabetes care in both clinics A and B, almost all process measures were carried out significantly more frequently than for the appropriate control patients. Under the care of nurses in clinic A, HbA_{1c} levels fell 3.5% from 13.3 to 9.8% in the 120 patients who were followed for at least 6 months, as compared with a 1.5% fall from 12.3 to 10.8% under usual (physician-directed) care in clinic B. During the year before enrolling in nurse-directed care in clinic B, mean HbA_1C levels decreased from 10.0 to 8.5%. At the end of a year under the nurses' care, the values fell further to 7.1%. The median value fell from 8.3 to 6.6%. The conclusion was that specially trained nurses who follow detailed protocols and algorithms under the supervision of a diabetologist can markedly improve diabetes outcomes in a minority population. This approach could help blunt the increased morbidity and mortality noted in minority populations.

Non-communicable diseases (NCD's) such as hypertension, asthma, diabetes and epilepsy are placing an increasing burden on clinical services in developing countries and innovative strategies are therefore needed to optimize existing

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services. Coleman et al, (1998) describes the design and implementation of a nurse-led NCD service based on clinical protocols in a resource-poor area of South Africa. Diagnostic and treatment protocols were designed and introduced at all primary care clinics in the district, using only essential drugs and appropriate technology. The protocols enabled the nurses to control the clinical condition of 68% of patients with hypertension, 82% of those with non-insulin-dependent diabetes, and 84% of those with asthma. The management of NCD's of 79% of patients who came from areas served by village or mobile clinics was transferred from the district hospital to such clinics. Patient-reported adherence to treatment increased from 79% to 87% (P = 0.03) over the 2 years that the service was operating. The use of simple protocols and treatment strategies that were responsive to the local situation enabled the majority of patients to receive convenient and appropriate management of their NCD at their local primary care facility.

2.4 Patient knowledge and management of diabetes

At the other end of the coin is the knowledge of the patients suffering from diabetes mellitus on their disease. Evidence supports diabetic patient knowledge improves self management of the diabetes preventing the acute and chronic complications of the disease. Diabetes being one of the more complicated chronic diseases involves a more significant amount of patient awareness in terms of diet, exercise, drug administration and early recognition of plausible complications. Thus patient education is not solely aimed at making them more knowledgeable about their disease, but to help them better manage their treatment and adapt their diabetes control to changes in daily life (Assal et al, 1997). As patients may be knowledgeable, regular diabetic counselling influences behavioural changes that improves patient self management which in turn improves glycaemic control and health status. Peyrot, (1999) and Westaway et al, (2003) reported only 8% of black South African diabetics achieving optimal metabolic control (HbA_1cB 7%) with 25% achieving acceptable metabolic control

(HbA$_1$cB 8%) with white patients having 22% optimal metabolic control and 39% acceptable metabolic control. Levitt et al, (1997) showed similar findings in black South African diabetic patients having poor ability to manage their disease.

Thus, patients need to understand the fundamentals of this complex chronic illness in order to manage it properly. For this reason, the American Diabetic Association and other national agencies have recommended diabetes education (Mensing et al, 2002). The three fundamentals to proper management of these patients have been identified as improving patients understanding of diabetes, providing support for behaviour change, and empowering patients to assume the primary management role for their illness (Norris et al, 2002; Glasgow and Anderson,1999).

In the United States of America (U.S.) the Veterans Affairs (VA) health care system has shown a prevalence of 17% diabetes mellitus in comparison to 6% present in the general U.S. population (West et al, 2002). An evaluation of patient knowledge of VA diabetic patients was carried out (West et al, 2002), with 282 surveys returned with 229 patients meeting the inclusion criteria (75% of questions had to be answered and consent forms signed). This was a cross-sectional study that utilised the Diabetic Knowledge Test (DKT) and a general demographic questionnaire. The knowledge test was designed to assess the patients basic knowledge of diabetes with respect to diet, glucose monitoring, foot care, disease complications, sick-day management, proper use of insulin, adverse effects of insulin and other factors that influence blood glucose levels. The demographic questionnaire was used to identify knowledge of diabetes self-care practices and specific patient characteristics including age, race, age of onset of diabetes, educational level and smoking status. Patients were asked to rate their perception of their own diabetes self care knowledge on a scale of 1 to 10 with 10 being the highest and 1 the lowest. Of the 229 respondents 71 scored >/= 75% on the DKT, 76 scored 60-74% and 82 scored </= 59%. Significant outcomes were that Non-Caucasians on average scored 10% lower than

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Caucasian veterans (p=0.01). As patient age increased by 10years, the DKT score decreased by 3% (p=0.02). The number of years of diabetes did not have an impact on DKT scores, but patients on insulin and had had diabetes mellitus for a longer period, had higher ratings of their knowledge of diabetes self-care practices (p=0.01). Patients that had diabetes for a shorter duration and had recently attended a diabetes programme did not score higher on the DKT, and they rated their knowledge of diabetes self-care practices lower (p=0.01). There was no association found between DKT scores and patients HbA1c values, smoking status, body mass index or interest in learning more about diabetes.

Hawthorne et al, (1999) reported the discrepancies in diabetic knowledge in a population of Pakistani Moslems attending general practices and secondary care clinics at the Manchester Diabetes Centre. Patients with type-2 diabetes took part in a one-to-one semi-structured interview and gave blood for haemoglobin A1c levels. Two hundred and one patients participated in the study. Knowledge on diabetic diets averaged a good 72% with 66% of the patients claiming to perform regular glucose tests. However, only 24% knew how to manage persistent hyperglycaemia, with women worse than men (19% vs 31%). Women also failed to understand why glucose levels should be monitored and had poorer glycaemic control overall (HbA1c 8.8% vs 8.1%, P=0.04). Fifty four patients were completely illiterate but had similar knowledge scores to readers however displaying a poorer ability to handle problem scenarios. Forty five of these fifty four patients were women and multiple regression analysis showed that they were most likely to have the poorest glycaemic control. No major differences were found between patients and hospital attenders, or between patients with or without known complications except that hospital attenders had more complications and poorer control. It was concluded that women who could not read in this population group had poorer control and required more intensive, culturally suited health education and support.

Badruddin et al, (2002) assessed the knowledge, attitude and practices of patients attending a diabetes care unit in Pakistan. The sample included one hundred type 2 diabetic patients seen by the dietician sequentially during the period July to December 2000. Data regarding the patients characteristics, knowledge, attitude and practices was collected through a questionnaire administered individually by the dieticians. The questionnaire contained queries about patients general characteristics e.g. age, sex, family size, their knowledge of diabetes and their self-care practices such as dietary habits, exercise pattern and home monitoring of blood glucose. Other assessments included measurement of height and weight. Information regarding HbA1c, Total Blood Cholesterol (TBC) and Fasting Blood Triglyceride (FBTG) levels were obtained from medical records.

Table 1: A questionnaire that was designed to assess diabetic knowledge of patients contained 17 questions about Diet, Insulin and Diabetes.

Misconceptions	Agree (%)
Insulin is the last treatment and should be avoided as much as possible	42
Insulin is an addiction	25
The insulin dose keeps on increasing and at one stage it stops working	35
Insulin causes severe hypos	35
If strict diet control is done, insulin can be avoided	37
Human insulin can be extracted from the human pancreas	15
If someone experiences hypos or infection insulin can be stopped	28
Karela water and Jaman seeds are very effective in reducing blood sugar	64
Under root vegetables are not allowed in diabetes	65
Besan and Channa reduces blood sugar	64
Ghee increases weight but oil does not	34
Milk should not be taken during infections	22
Diabetes is caused by a diabetic virus	27
Diabetes is an epidemic disease	14
A bad shock can cause diabetes	43
No diet control is needed after tablets	22
If one spouse has diabetes, the other can get it	28

One point was given for each correct answer. A total score of 12 or above was taken as having a good knowledge, 6-11 as having a fair knowledge and less than 6 as having a poor knowledge of diabetes. The result of the knowledge aspect of the study showed only 13% having good knowledge, 34% having fair knowledge and the majority 54% having poor knowledge.

Kapur et al, (1997) also assessed the perceptions, attitudes and practices of diabetic patients in urban India. The study design was initial listing followed by a qualitative survey using a structured questionnaire. Eight hundred and twenty four adults with diabetes, visiting randomly selected pharmacies to buy anti-diabetes medicines from four metros viz. Ahmedabad, Lucknow, Patna and Cochin were randomly selected for listing and questioned about their current anti-diabetic medicine. The cities selected were fairly representative of urban India. Four hundred and seventy five of these eight hundred and twenty four patients were selected for a detailed face to face interview lasting several hours in their homes. The selection was based purely on patients' willingness to be interviewed and type of treatment. Of the four hundred and seventy five patients selected for the study, 144 were on insulin (1), 104 were on combination of insulin and tablets (2) and 227 on tablets alone (3). 56% were males and 44% were females. Their overall mean age was 54.5 +/-12.7yr and for different groups were 52.6 +/-15.4yr. (1), combination 55.2+/-11.9yr. and 55.4+/-11.0yr. with the tablet only group. The mean age at diagnosis was 42.5+/-12.8yr. Only 5% of the patients monitored their blood sugar levels at home with the remaining 95% using pathology labs. Frequency of home blood sugar monitoring was higher for insulin users (11%) as compared to tablet users (2%). Astonishingly more tablet only patients willingly got their sugar tested in comparison to the combination patients. Amongst the insulin only group, 40% tested blood sugar once a month, only 22% more than once a month and 38% measured blood sugar bimonthly or less frequently. Amongst tablet users, the frequency of blood sugar testing was even worse, with only 20% measuring once a month, 30% once in two months, 18% once in three months, and 17% once in six months. Patients were further asked what level of blood sugar ensured that their diabetes was under control. They indicated from a given list that it should be the fasting and post meal glucose level that was the most important criteria to diabetic control. Almost 40% were unable to indicate any value for fasting blood glucose and 34% for postprandial value. The mean value for those responding was 117.8+/-69.3mg/dl and postprandial 174.3+/-83.9mg/dl. The mean values are fairly close to the ideal and

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may indicate that many patients are fairly well aware about the target values. Whether the targets are implemented in real life is another issue.

Foot ulcers are a major cause of morbidity in people with diabetes (Mason et al, 1999). Amputation rates are increased 15-30 fold in diabetes (Currie et al, 1998) and are linked to considerable mortality. The primary cause of diabetic limb amputation is a result from major trauma or repetitive injury leading to ulceration (Edmonds et al, 1996). An intervention in the prevention of diabetic limb amputation is correct foot care practice by the patient (Barth et al, 1991). Guidelines (International working group on the diabetic foot, 1999) recommend annual screening for the diabetic foot and the identified patients to receive advanced foot care and education additional to that given to all people with diabetes. Minimum risk patients should be advised on foot hygiene, nail care, footwear, avoidance of trauma and management of possible foot problems. In addition high risk patients should seek professional nail care and education of the role of peripheral neuropathy on foot disease. Pollock et al, (2004) compiled a questionnaire to determine the knowledge and practice of foot care in diabetic patients in Middlesborough, South Tees, UK. Contributory risk factors to diabetic ulcers and barriers to adequate foot care were identified and patients at high risk of ulceration were compared to low risk. The mean knowledge score was 6.5 (S.D.2.1) out of a possible 11. There was a possible correlation between the score and having received advice on foot care (6.9 vs 5.4, P=0.001). Deficiencies in knowledge included the inability to sense minor injury to feet (47.3%), proneness to ulceration 52,4% and effect of smoking on circulation (44,5%). 24.6% never visited a chiropodist and 18.5% failed to inspect their feet. Barriers to foot care practice was mainly due to co-morbidity. Those with high risk feet showed a higher (6.8) but not significant knowledge score compared to those at low risk (6.5) and their foot care practise was better.

Although type 2 diabetes is a recognised health priority in South Australia, Aboriginal people with diabetes do not utilise the mainstream diabetes health

services on a regular basis for health care. This means that Aboriginal clients have the potential to develop diabetes-related problems and, furthermore, are not in a position to make informed decisions about health care issues. This lack of client empowerment is contrary to the goals of contemporary diabetes health care and, as a result, Aboriginal clients suffer the consequences of ineffective management with a compromised lifestyle. To identify how this situation might be improved, a qualitative study by King (2001) funded by Diabetes Australia was undertaken in South Australia. The overall goal was, firstly, to identify the reasons why Aboriginal people with diabetes do not attend mainstream health agencies on a regular basis and secondly, if possible, to improve attendance. Thus, Aboriginal health professionals (n = 43) were recruited from the 8 statistical divisions of South Australia and interviewed about Aboriginal diabetes health care issues. In Part 1 of this series, the research findings indicated the beliefs and attitudes held by clients about diabetes, their lack of knowledge about management issues, their responses to diabetes, the effects of diabetes on their lifestyle and the strategies that diabetes health professionals used to help their clients deal with diabetes health issues. In Part 2 the research findings indicated the importance of the Aboriginal health worker to the successful diabetes management of Aboriginal clients, the constraints that affect the delivery of diabetes health care and the recommendations made by health professionals to improve the standard of diabetes health services.

The ability of health care practitioners to implement and maintain patient-centred interventions over time is the key in closing the gap between the scientific base for the treatment of diabetes and the care and outcomes patient's experience. (Williams and Zeldman, 2002) Patients do not always display understanding of all parameters making disease management difficult. This could be due to patients not understanding the disease or also those that are knowledgeable but still follow an unhealthy lifestyle.

Matwa et al, (2003) conducted a study to explore and describe the experiences and footcare practices of diabetic patients who live in the rural areas of Transkei.The former Transkei is a predominantly rural region of the Eastern Cape Province. The poor infrastructure in this area results in inaccessibility of the available health services. The majority is ill equipped to deliver optimum diabetes care. There is an increase of lower limb amputations and lack of knowledge among patients with diabetes mellitus in the former Transkei. These complications can be prevented by patient education on self-management and appropriate footcare procedures. A sample of 15 participants was drawn from Umtata Hospital Diabetic Clinic register through predetermined selection criteria. The sample consisted of five men aged 49-74 years, and ten women aged 30-64 years. Five patients (two men and three women) had foot ulcers or an amputation, while ten patients had no obvious foot problems. Direct observation of footcare was done with eight patients from the sample. Findings revealed predominantly negative experiences in the internal and external environments of the persons with diabetes mellitus; as well as poor footcare knowledge and practices. The recommendations relate to improving diabetes mellitus as well as their footcare knowledge and skills through education; promoting adherence to treatment regimens; providing emotional support; improving their self-image; changing health beliefs; improving the quality of care in public health facilities; and increasing awareness among employers of persons with diabetes mellitus.

Erasmus et al, (1999) assessed glycaemic control in type 2 black diabetics attending the diabetic clinic at a peri-urban hospital. Baseline glycosylated haemoglobin levels were measured and a subsequent estimation was carried out in those patients who attended a follow-up consultation to see whether current recommended targets for glycosylated haemoglobin levels were being attained. Out of 708 patients, mean age 56.3 years, 14.7% were insulin treated and 85.3% were non-insulin-treated. Target values of HbA1c < 7% were achieved in only 20.1% (142) of patients. Although mean glycosylated haemoglobin levels were significantly higher in females (p= 0.03), the proportion of poorly controlled

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diabetics was similar in the two sexes. Patients whose HbA1c levels fell within the target values had diabetes of significantly shorter duration than those exhibiting poor control (5.0+0.2 vs 7.03+0.5 years). Obesity was present in 562 patients (79.4%). Target values were only achieved in 16.4% of non-obese and 21% of obese diabetics, with mean glycosylated haemoglobin levels being significantly higher (p<0.05) in the former group (10.3+0.4% vs 9.5+0.2%). Similar results were observed with respect to type of treatment, with only 14.4% of insulin-treated and 21% of non-insulin-treated diabetics achieving target values. The follow-up HbA1c estimation did not show any difference in the glycaemic control status of patients, with only 19.9% of them achieving the target values. Dietary advice (though minimal) seemed to have no impact on the metabolic control of the patients. These results suggest that glycaemic control was poor irrespective of sex, duration, BMI, educational status, dietary advice and type of treatment with recommended target values not being achieved in the majority of patients. Behavioural changes through health educational programmes need to be instituted with both patient and medical personnel being motivated.

Weatherspoon et al, (2005) compared glycemic control of black and white patients under treatment for non-insulin-dependent diabetes mellitus (NIDDM). Medical records of patients with NIDDM were reviewed at 19 of 24 clinics or health centers in a specified area of north central Florida. Data was abstracted from the charts of all non-Hispanic black (n = 248) or white (n = 280) patients who met preset eligibility criteria. The mean +/- SD age was 58 +/- 14 years; the mean +/- SD duration of diabetes was 9 +/- 7.5 years. Of 528 patients, 220 were treated with oral hypoglycemic agents, 269 were treated with insulin, 28 were treated with diet alone, and 11 were treated with a combination of oral agents, diet, and insulin. Glycosylated hemoglobin was > or = 8% for 47% of black women, 41% of black men, 38% of white men, and 29% of white women. The less favorable control status of the black women persisted within categories of age (40-59 years or > or = 60 years), treatment (insulin or oral hypoglycemic agents), time since

diagnosis (less than versus greater than or equal to the median of 7 years), and obesity (noted versus not noted in chart). In multiple logistic regression analyses controlling simultaneously for these variables, the odds (95% confidence interval [CI]), compared with white women, of having glycosylated hemoglobin > or = 8% were 2.2 (1.4, 3.4) for black women and 1.5 (0.8, 2.9) and 1.4 (0.8, 2.5) for black and white men, respectively. Black women were therefore more likely than white women or men to have glycosylated hemoglobin > or = 8%. This difference was not readily explained by age, type of treatment, time since diagnosis, or a notation of obesity in the medical record, although an effect of obesity cannot be excluded on this basis.

2.5 Pathophysiology

Diabetes mellitus is a heterogeneous group of disorders, connected by raised plasma glucose concentration and disturbance of glucose metabolism. Glucose is under-utilised with resulting hyperglycaemia (New diagnostic, 1998).The current classification of diabetes mellitus proposed by the American Diabetes Association (The expert committee, 1997), and accepted in a slightly revised form as a working classification by World Health Organisation(WHO, 1999), is an attempt of staging diabetes mellitus. This takes into account current knowledge on the aetiology and natural history of the disease and has therapeutic implications, acknowledging the following types of diabetes mellitus which are mostly accepted; Type-1, Type-2 and Gestational.

2.5.1 Type 1 Diabetes - Lack of Insulin production by the Beta Cells of the Pancreas

Physical injury to the pancreatic beta-cells or auto-immune cellular mediated destruction due to viral infections or autoimmune disorders can lead to Type1 diabetes mellitus. (Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998) The other cell types present in the Islet of Langerhans ie. alpha

and delta cells are preserved. The consequence of this preservation is that glucagon is still secreted from the pancreatic alpha cells but with the loss of insulin due to pancreatic beta cell destruction, this makes the body think it is in an accelerated phase of starvation or fasting. Within a normal individual who is fasting the body still secretes adequate amount of insulin to balance the effects of glucagon. As a consequence insulin and ketone production occurs at a rate in the liver that the body cannot utilise. If the glucose levels were to rise to even 5 to 10 times the normal amount there is no insulin secretion as the pancreatic beta cells are destroyed. This results in large amounts of ketones and glucose being exposed to the kidney where osmotic diuresis is created. The formation of keto acids which are moderately strong organic acids causes a severe metabolic acidosis which if not treated with insulin may cause death from acidosis and dehydration known as diabetic ketoacidosis.

The onset of type-1 diabetes occurs mostly between 15-20 years of age with an increased prevalence in the younger age groups and for this reason it is also referred to as juvenile onset diabetes mellitus. This type of diabetes may develop very abruptly over a period of a few days or weeks being characterised by increased blood glucose, increased utilisation of fats for energy and for formation of cholesterol by the liver and also depletion of body proteins (Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998)

Type-1 diabetes in an adult may initially present as type-2 diabetes with a progressive deterioration in metabolic control, eventually leading to insulin dependency. This form is called latent autoimmune diabetes mellitus in adults (Cohen, 1997)

2.5.2 Type-2 diabetes mellitus

Type 2 diabetes is far more prevalent than type-1 accounting for between 85-95% of all cases of diabetes mellitus. The onset of type-2 diabetes occurs predominantly after the age of 40. Most of the cases are between the ages of 50-60years with a few as young as 20 years. There is a slow progression in the disease therefore referred to as adult onset diabetes mellitus (Boron, 2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998).

In contrast to type 1 diabetes mellitus, type 2 diabetes mellitus is characterised by decreased or raised levels of insulin. This is due to a lack of sensitivity of the target tissues to insulin known as insulin resistance. Some of the causes of insulin resistance are obesity, excess glucocorticoids, excess growth hormone, pregnancy (gestational diabetes), polycystic ovary disease, mutations of the insulin receptor or autoantibodies around it. As a result there is a large amount of carbohydrates not utilised leading to an increase in the amount of glucose in the blood which again stimulates a compensatory increase in insulin levels. This eventually leads to a "burning out" of the pancreatic beta cells causing an eventual decreased insulin secretion (Boron,2003; Guyton,1997; Herfindal,1996 & Kumar, 2004).

Table 2 Clinical Characteristics of Patients with Type-1 and Type-2 diabetes mellitus (Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998).

Features	Type I	Type II
Age	less than 20 years	Usually more than 30 years
Weight	Thin	Obese
Plasma insulin	Low or absent	Normal to high
Plasma glucagon	High, can be suppressed	High, resistant to suppression
Plasma glucose	Increased	Increased
Insulin sensitivity	Normal	Reduced
Therapy	Insulin	Weight loss, oral hypoglycaemics
Urine	Ketones and glucose	Glucose only
Breath	Acetone smell	Normal

2.5.3 Gestational Diabetes

This is a term used to describe the glucose intolerance that occurs during pregnancy and returns to normal after delivery. This condition is normally asymptomatic. Women who have a history of gestational diabetes, are old, and come from certain ethnic backgrounds but many cases occur in women who do not fall in any of these categories. For this reason there is a necessity for screening with random plasma glucose testing in every trimester of pregnancy and by oral gluocose tolerance testing if results are in the region of 7mmol/L or more during the random tests. Since the renal threshold for glucose falls during normal pregnancy and glucose tolerance decreases the condition could be easily

misdiagnosed. Treatment is inititiated with a diet plan but most patients require insulin cover during pregnancy. Oral agents cross the placenta and may be a potential risk to the foetus. (Boron,2003; Guyton,1997; Herfindal,1996 & Kumar, 2004).

2.5.4 Clinical presentation of Diabetes Mellitus

(Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004; Sainani, 1998 & Cohen, 1997)

2.5.4.1 Acute Presentation

Young people often have a 2-6 week history and present with three major symptoms:

- polyuria
- thirst
- weight loss
- ketoacidosis may be a presenting feature if the above three symptoms are not recognised and treated promptly in a type-1 diabetic patient

2.5.4.2 Subacute Presentation

The clinical onset of symptoms may take several months to years to present. Again thirst and polyuria is a diagnostic feature coupled with complaints of lack of energy, blurry vision (due to glucose induced changes of refraction) and opportunistic infections of candida eg. Balanitis.

2.5.4.3 Complications as the presenting feature

These include:

- Staphylococcal skin infections
- Retinopathy noted on visit to optician
- Tingling and numbness in feet (polyneuropathy)
- Impotence
- Arterial disease, resulting in myocardial infarct or peripheral gangrene

2.5.5 Diagnosis of diabetes mellitus

(Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998)

Urinary glucose – simplified or more complicated quantitative laboratory tests may be used to determine the quantity of glucose in the urine. The normal individual may lose undetectable amounts of glucose in the urine compared to that of a diabetic individual who may lose glucose in small to large amounts in the urine in proportion to the severity of the disease and intake of carbohydrates.

Fasting blood glucose and insulin levels – the fasting blood glucose levels in the early morning should be between 80-90mg/100ml with 110mg/100ml considered to be the upper limit. Patients who have glucose levels higher than this in the blood plasma may be at a risk of diabetes mellitus and should be monitored.

Type-1 patients present with low levels of insulin during fasting or even after a meal compared to type II patients where insulin levels are higher than normal and increases further after a meal.

Glucose tolerance test – if a normal individual is given 1 gram of glucose per kilogram of body weight the plasma glucose levels will rise from 90mg/100ml to

around 120-140mg/100mls and fall back to within normal limitis of +/-90mg/100ml over a 2 hour period.

In a diabetic patient whose plasma glucose levels hover between 110-140mg/100mls, if he/she were to be given the equivalent of 1 gram glucose per kilogram body weight the plasma glucose levels will rise tremendously to almost 200mg/100mls taking approximately 4-6hours to return to its previous levels.

A further diagnosis in this test can be done by measuring plasma insulin levels to distinguish between type-1 and type-2 diabetes mellitus. Insulin levels are raised after the ingestion of glucose in type-2 diabetes whereas they remain constant in type-1.

Acetone breath – acetoacetic acid in the blood which increases in quantity as diabetes worsens is converted to acetone which is highly volatile and vaporises. Thus one can smell acetone on the breath of diabetics, particularly type I diabetics and a small percentage of type II diabetics where insulin resistance has increased greatly.

Glycosylated Haemoglobin (Haemoglobin A_1C) – Glycosylated haemoglobin is a chemical reaction between glucose and phosphorylated sugar. Haemoglobin is exposed to the glucose in blood and when there is a higher concentration of glucose in the blood, there will be more glycohaemoglobin formation. Thus, haemoglobin is an important index for glycaemic contol than hyperglycaemia or glucosuria since it gives a long-term indication of glycaemic control. For a non-diabetic patient glycosylated haemoglobin is between 3 and 8% and for a poorly controlled diabetic between 8 and 20%. Glycohaemoglobin gives a clinical indication of glycaemic control of the previous sixty days and is thus a clinically useful gauge of glycaemic control. (Herfindal, 1996)

2.5.6 Intervention Studies on Diabetes

Two studies, the Diabetes Control and Complications Trial (DCCT, 1993) and the United Kingdom Prospective Diabetes Study (UKPDS, 1998) proved that proper control of diabetes in type I and type II patients respectively, effectively reduces the risks of complications of diabetes mellitus.

The DCCT was a clinical study conducted from 1983-1993 by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The study involved 1441 type I diabetic patients covering 29 medical centres in Canada and America. Patients had diabetes for at least a year and no more than 15 years and were to show no indications of diabetic eye disease. This study aimed to investigate two treatment regimens – standard and an intensive regimen on the complications of diabetes mellitus. Patients were randomly assigned to the two groups.

Results of the study showed that intensive therapy decreased the risk of developing diabetic retinopathy by 76% and slowed the progression of eye disease present in volunteers at the beginning of the study by 54%. Intensive glucose control slowed the development and progression of diabetic kidney disease and diabetic neuropathy by 50%. Participants in the study revealed showed significantly low risks of developing high cholesterol.

The UKPDS was co-ordinated by the Diabetes Research Laboratories in Oxford and was the largest clinical study of diabetes spanning 20 years and recruiting more than 5000 patients with type II diabetes in 23 clinical centres in England, Northern Ireland and Scotland. Results revealed reduced risks of the complications of diabetes just as the DCCT reflected. The UKPDS revealed that intensive glucose control reduces the risk of major diabetic eye disease by a quarter and kidney damage by a third. Close blood pressure monitoring in hypertensive diabetic patients reduces the risk of death from long-term

complications of diabetes by a third, strokes by more than a third and serious deterioration of vision by more than a third. It further demonstrates a cost saving due to the decreased amount of medicines required by patients which outweighed the costs of the intensive patient management.

The study clearly showed the benefits of the intensive strategy with no impairment on the quality of life apart from a few patients experiencing more frequent hypoglycaemic episodes (The Diabetes Monitor).

2.5.7 Complications of Diabetes Mellitus

As people with diabetes live longer, we now know that complications can occur over time, even though their blood sugar levels may be controlled by regular insulin use or by taking tablets called oral hypoglycaemic (blood glucose lowering) medications. Complications are generally more common in people who have difficulty in maintaining their blood sugar at acceptable levels, a condition sometimes called 'brittle diabetes'. As a result, doctors place great emphasis on maintaining blood glucose levels as close to normal as possible. Diabetic complications can be classified as either acute or chronic.

2.5.7.1 Acute complications of diabetes

Diabetics are susceptible to two major acute metabolic complications:
Diabetic acidosis for type-1 diabetics
Hyper-osmolar non-ketogenic coma for type-2 diabetics

2.5.7.1.1 Diabetic ketoacidosis

Diabetic ketoacidosis (DKA) develops when absolute insulin deficiency and excess contra-insulin hormones increase hepatic glucose production, decrease peripheral glucose utilization, and stimulate release of fatty acids from fat cells

and production of ketones by the liver. These changes cause hyperglycemia, osmotic diuresis, volume depletion, and acidosis. This condition primarily occurs in the type 1 diabetic and, if progressive, can result in coma and numerous metabolic derangements. The coma is usually preceded by a day or more of frequent urination and severe thirst along with severe fatigue, nausea and vomiting, and mental confusion. (Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998)

2.5.7.1.2 Hyperosmolar non-ketogenic coma

This is usually the result of profound dehydration as a result of not taking enough fluids or due to fluid loss from events such as pneumonia, burns, stroke, a recent operation, or certain drugs such as phenytoin, diazoxide, glucocorticoids and diuretics.With a death rate of over 50 per cent, this is a true medical emergency. Prompt medical attention is warranted to save life. The condition may develop over a period of days or weeks.

Symptoms include weakness, severe thirst, weight loss, progressively worse signs of dehydration, loss of skin elasticity, dry mouth and membranes, racing heart beat and low blood pressure (Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998).

2.5.7.2 Chronic Complications

Table3. Co-morbidities of Diabetes Mellitus

Tissue or Organ Affected	What Happens	Complications
Blood vessels	Atherosclerotic plaque builds up and blocks large or medium-sized arteries in the heart, brain, legs, and penis. The walls of small blood vessels are damaged so that the vessels do not transfer oxygen normally and may leak	Poor circulation causes wounds to heal poorly and can lead to heart disease, stroke, gangrene of the feet and hands, erectile dysfunction (impotence), and infections
Eyes	The small blood vessels of the retina become damaged	Decreased vision and, ultimately, blindness
Kidney	Blood vessels in the kidney thicken; protein leaks into the urine; the blood is not filtered normally	Poor kidney function; kidney failure

Nerves	Nerves are damaged because glucose is not metabolized normally and because the blood supply is inadequate	Sudden or gradual weakness of a leg; reduced sensations, tingling, and pain in the hands and feet; chronic damage to nerves
Autonomic nervous system	The nerves that control blood pressure and digestion are damaged	Swings in blood pressure; swallowing difficulties and altered digestive function, with bouts of diarrhea
Blood	White blood cell function is impaired	Increased susceptibility to infection, especially of the urinary tract and skin
Connective tissue	Glucose is not metabolized normally, causing tissues to thicken or contract	Carpal tunnel syndrome; Dupuytren's contracture

(Boron,2003; Guyton,1997; Herfindal,1996; Kumar, 2004 & Sainani, 1998)

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CHAPTER THREE - METHODOLOGY

3.1 Study Design

This was a cross sectional descriptive study involving 181 patients visiting 3 primary health care clinics in Kwa-Zulu Natal. Clinics were selected on the outskirts either bordering or actually within a rural area. The number of patients chosen would be adequate to provide a confidence level of 95% and a confidence interval of between 5-7%.

Permission for the study was applied for in writing to the Ethics Committee of University of Kwa-Zulu Natal (Appendix 1) and then to Prof. Green Thompson (Head of Department of Health – Kwa-Zulu Natal) (Appendix 2). A similar letter was addressed to the managers of each clinic seeking permission for the study.

The patients were chosen on convenience sampling. All patients visiting the diabetic clinic would be chosen on a voluntary basis. Informed consent was obtained from each patient. The patients could be either Type-1 or Type-2 diabetics. South Africans of Indian origin will be referred to as Indians and black Africans as Africans as per Department of Home Affairs classification.

Staff who attended to the diabetic patients at these clinics were also interviewed. The number of staff would depend on those providing care at the time of study.

3.2 The patient questionnaire (Isizulu translation included)

A medium length, two-part questionnaire was designed (Appendix 3). It consists of mostly close-ended and a minimal number of open-ended questions to keep the study as specific as possible. The questionnaire is divided into two sections. Section A investigates a basic patient history of the disease while section B is a basic knowledge test on diabetes mellitus. Diabetes knowledge was assessed

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modifying a version of the Michigan's Diabetes Research and Training Centre's Brief Diabetes Knowledge Test (Fitzgerald et al, 1998). The test was created for adults with either type-1 or -2 diabetes.

3.3 The staff questionnaire (Isizulu translation included)

This consists of mostly close-ended questions and two open-ended questions (Appendix 5). The questionnaire serves to establish the understanding of staff treating these diabetic patients on diabetes mellitus and its treatable complications, their management of patients and possible barriers to treatment.

3.4 Results and Discussion

The Statistical Package for the Social Science (SPSS) and Microsoft Excel packages would be utilised to generate the statistical results of the study. This will reflect:

- The number of patients that actually are aware of their disease state and complications surrounding their disease state.
- The level of care provided by the health care provider.
- A possible correlation to patient understanding of the disease and level of care provided by the health care provider.
- A possible correlation regarding the number of years of disease state and knowledge about the disease.
- A possible correlation between knowledge and tablet/insulin treated patients.

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CHAPTER 4 – RESULTS AND DISCUSSION

In this study of "An assessment of the level of understanding of diabetes by primary health care patients", the results and the discussion will be presented in the following format:

4.1 Patient questionnaire

4.1.1 Patient demographics

4.1.2 Diabetes knowledge scores overall and per clinic, and compared to patient demographics

4.1.3 Care received as perceived by patients and compared to test scores

4.2 Health professional questionnaire

4.2.1 Nurse demographics

4.2.2 Nurse reports regarding understanding of diabetes and quality of care given

4.3 Correlation between patient knowledge, care and demographics

4.1 Patient Questionnaire

This questionnaire was aimed at describing patient demographics, quantifying patient level of knowledge on diabetes and assessing the quality of care received by diabetic patients attending three primary care clinics (anonomised as A, B and C). This study complies with ethics obligations. All patients signed consent forms (Appendix 4) and confidentiality was maintained at all times. Data was captured from the questionnaires by the primary researcher and given to the statistician in a number format only. The clinics are unaware of the patients who participated in the study or of other clinics that were included in the study.

The patients surveyed in this study included all diabetic patients attending the clinics on the day the questionnaire was administered. Patients filled in the forms individually or were assisted in the process by the researcher or an interpreter, both serving only as means of data capturing and not influencing the outcome of the process itself. This was ensured by patients answering questions not audible to others and by the researcher not displaying any body language either indicating approval or disapproval to questions being answered. An Isizulu translation of both the questionnaire and informed consent forms was made available to patients who preferred this language medium.

The questionnaire (Appendix 3) comprised three focus areas, namely:

- The demographics of the patient population attending the clinic
- The level of knowledge the patient possesses in terms of diabetes mellitus
- The quality of care as perceived by these patients

Section A of the questionnaire aimed to assess the demographics and quality of care received by the study population. The demographics reflected the gender,

age, race, language, residence, number of years post-diabetes diagnosis and the type of diabetic drug treatment.

The quality of care component of the questionnaire investigated the frequency of glucose testing at the clinic, extent and level of counselling on diabetes, the type of counselling received (i.e. diet, exercise and administration of medication), and the frequency of screening for blood pressure, visual function, lipids, kidney and liver function, and foot ulceration.

Section B of the questionnaire was designed to assess patient knowledge on diabetes. There was a total of thirteen multiple choice questions assessing key areas of diabetic knowledge. The questions were aligned and modified to the Basic Diabetes Knowledge Test (Fitzgerald et al, 1998) covering knowledge of glucose level awareness, symptoms and treatment of hypoglycemia, diabetic diet, knowledge of related and non-related morbidities to diabetes, exercise and foot care. The questions were designed to test patient understanding of diabetes management.

The graphs, results and discussion that follow in this sub-section will focus on performance by patients in the test. The response from the three clinics are presented holistically and in a comparative format for all three facets presented i.e. demographics, knowledge of disease and quality of care received. All data was subjected to statistical analysis and a p-value of <0.05 was regarded as significant.

4.1.1 Patient Demographics with reference to number and gender distribution per clinic

ABC = Total of three clinics
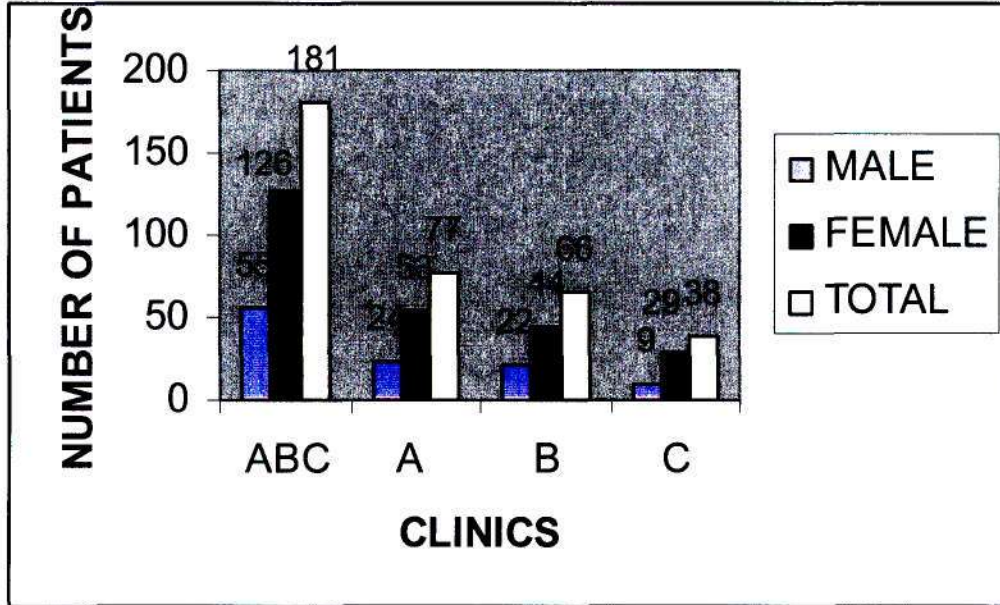
Figure 1 : Graph representing the number and gender of patients in study

The total study population comprised 181 patients with 77 patients (42.5%) from Clinic A, 66 patients (36.5%) from Clinic B and 38 patients (21%) from Clinic C. There were more female than male patients in the study population (69.7%, n = 126). This was also reflected in the individual clinics. The percentage distribution between the male and female population per clinic is as follows; Clinic A (female 69%), Clinic B (female 67%) and Clinic C (female 76%). The distribution between the male and female population is consistent with the findings of Omar et al, (1985) who established a 7.6% male and 13.5% female prevalence in public health care dependant diabetics. Omar et al, (1985) thus showed a distribution ratio of females (63.9%) and males (36.1%) which is similar to this study of 69.7% females and 30.3% males.

Figure 2 : Race distribution amongst clinics and overall patient population

Figure 3 : Language distribution amongst clinics and overall patient population

There were a larger number of Indian patients (fig.2) in the study representing 61.9% (n=112) of the population and African patient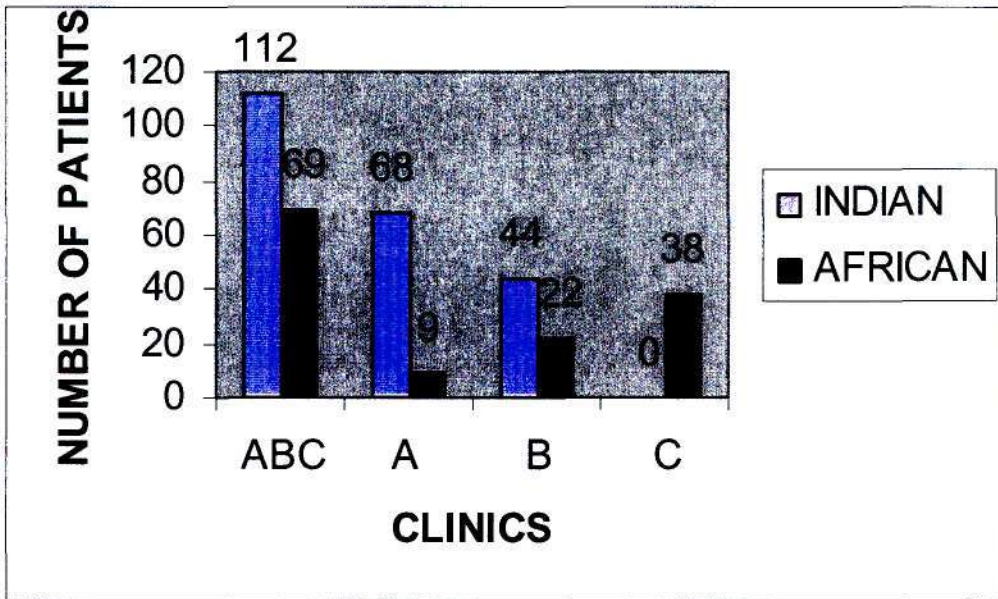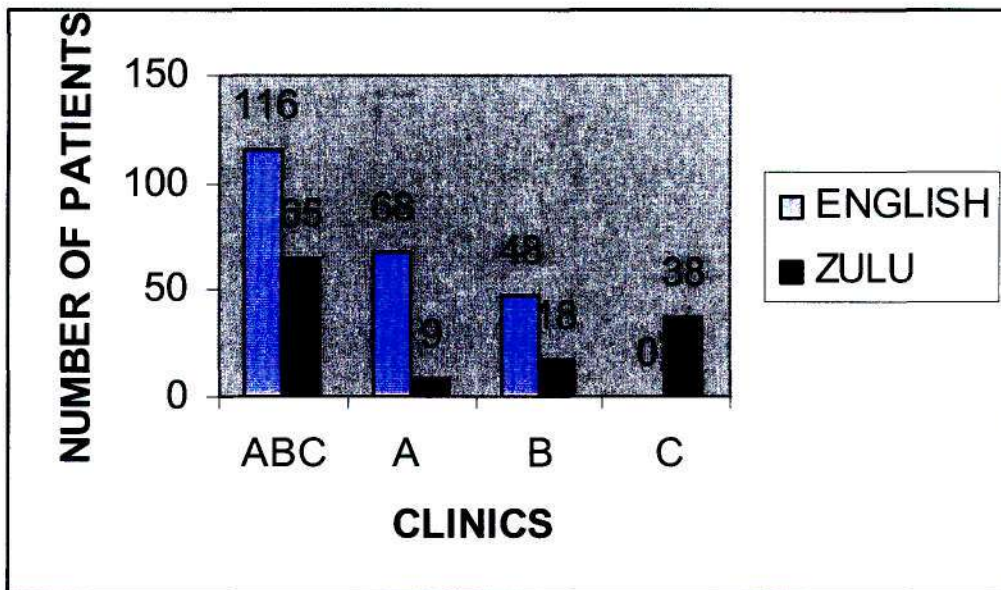s comprising the remaining 38.1% (n=69). The race distribution per clinic was as follows; Clinic A, (Indian 88%, African 12%), Clinic B (Indian 67%, African 33%) and Clinic C (African 100%).

The two races identified in the total study cohort (i.e. Indians and Africans) are predominant in this area under study and are dependant on government health care facilities. As many as 90% of black (i.e. African) South African diabetes mellitus patients rely on government health facilities with only 8% having access to private medical aid (Westaway et al, 2005). A further difference in race distribution amongst the clinics is due to the locality of the population in the area surrounding the primary care facility. Clinic A and B have a larger proportion of Indian patients as these clinics were located closer to townships having a larger Indian population and Clinic C serviced a surrounding community which was predominantly African. The population distribution is closely linked to apartheid and the Group Areas Act which restricted individuals to specific areas based on race.

Language distribution in the study population is presented in Figure 3. The majority comprised the English speaking group making up 64.1% (n=116) of the study population with the remaining 35.9% (n=65) being the Zulu speaking group. The language distribution per clinic is as follows; Clinic A (English 89%, Zulu 11%), Clinic B (English 73%, Zulu 27%) and Clinic C (Zulu 100%).

There is a similarity between the language distribution and race distribution in the total study population and per clinic. Most of the African patients attending the clinics preferred Zulu as their medium of communication with the Indian patients preferring English. This is due to Indian patients being historically educated in English in comparison to African patients who were predominantly educated in their ethnic language.
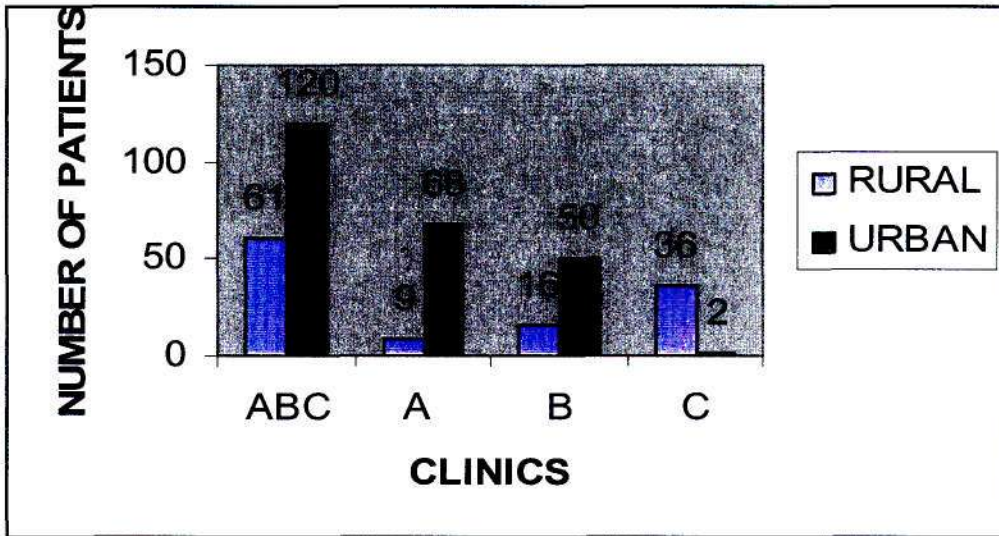
Figure 4 : Geographical distribution of patients amongst clinics and overall
population
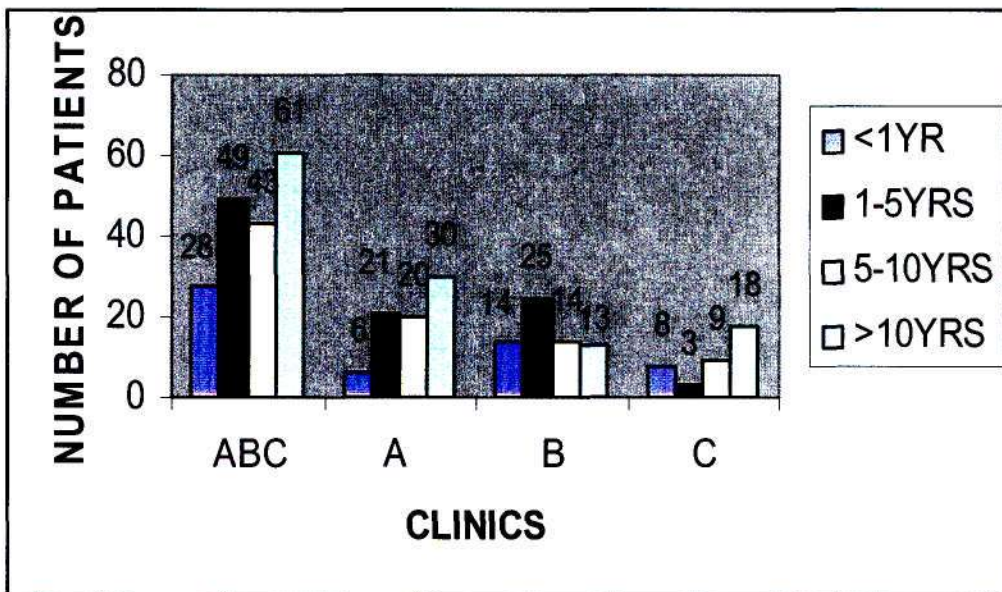
Figure 5 : Number of years diabetes post-diagnosis in all patients and per clinic

The geographical distribution of the study population is presented in figure 4, with 66.3% (n=120) being urban dwellers and the 33.7% (n=61) residing in rural areas. The residential distribution per clinic is as follows; Clinic A (urban 88%, rural 12%), Clinic B (urban 76%, rural 24%) and Clinic C (urban 5%, rural 95%).

The largest number (n= 61 or 34%) of patients (fig.5) was diagnosed more than 10years ago, followed by 27% (n=49) of patients having been diagnosed between 1-5years ago. The rest of the study population (n = 43 or 24%) of patients being diagnosed 5-10years ago and the remaining 28 patients (15%) less than a year ago. Clinics A and C had more patients who were diagnosed more than 10years ago in comparison to Clinic B where most of the patients fell into the1-5year category.
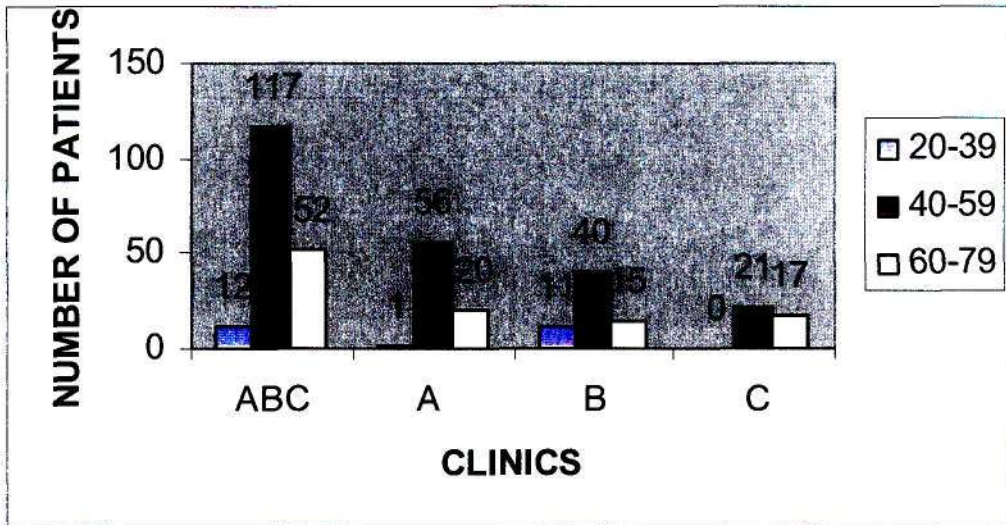
Figure 6 : Age distribution of patients within the clinics and overall study
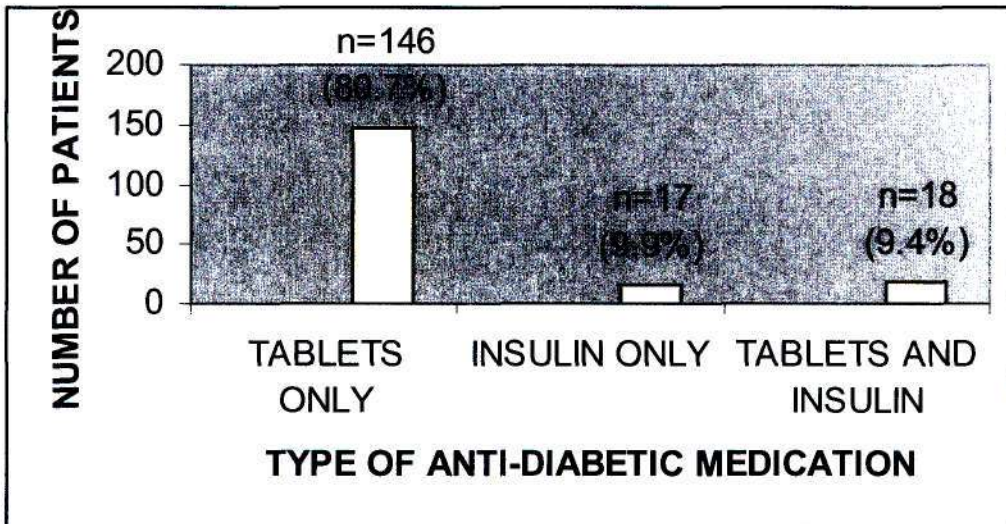
Figure 7 : Type of anti-diabetic medication patients are on in study

In Figure 6, the age distribution in the total study population and per clinic is presented. Majority of the patient population fell into the 40-59yr age group (70.6%, n=117) with the 60-79yr age group having 28.7% (n=52) of the total study population and the 20-39yr age group having 0.7% (n = 12). An analysis of the age distribution amongst the clinics reveals majority of all three Clinic's populations within the 40-79yr age group. Apart from Clinic A which had a single patient in the 20-39yr old grouping, Clinic B showed 16.6% (n = 11) of its diabetic population in this age category. This is therefore suggestive of type-2 diabetes mellitus.

Table 4: An analysis of the age versus the time of diagnosis

AGE	TIME OF DIAGNOSIS			
	< 1 year ago	1-5 yrs ago	5-10yrs ago	> 10yrs ago
20-39yrs	6 (50%)	6 (50%)	nil	nil
40-59yrs	18 (15.4%)	31 (26.5%)	31 (26.5%)	37 (31.6%)
60-79yrs	5 (9.6%)	10 (19.2%)	11 (21.2%)	26 (50%)

The type of anti-diabetic medication used by the study population is presented in Figure 7. The majority of patients are on oral medication (80.7%) with the remaining population 9.9% and 9.4% being on insulin only and both insulin and tablets respectively.

There is a strong correlation between the type of anti-diabetic medication and the number of years post-diagnosis, to age. Since 80.7% of the population is on oral anti-diabetic medication and more than 99% of the patient population above the age of forty, this strongly correlates to age, duration, and treatment of type-2 diabetes. Furthermore, the number of years post-diagnosis places the majority of the population in the forty year age group. Type-2 diabetes, being a disease of maturity indicates that the study population is predominantly of this type. Type-2 diabetes is an ageing disease, due to insulin deficiency or insulin resistance or

both (Dinneen et al, 1992, Homodelarche,1992 and Weyer et al, 2001) which usually begins around forty years of age and is initially treated by diet and oral hypoglycemic agents.

4.1.2 Diabetes Knowledge Results

Reference would be made in the following section to the number or percentage of patients passing the diabetes knowledge test. The patients who pass the test are defined as those who achieve greater than 50% in the knowledge based part of the questionnaire i.e. patients answering 7 or more questions correctly of the total 13.
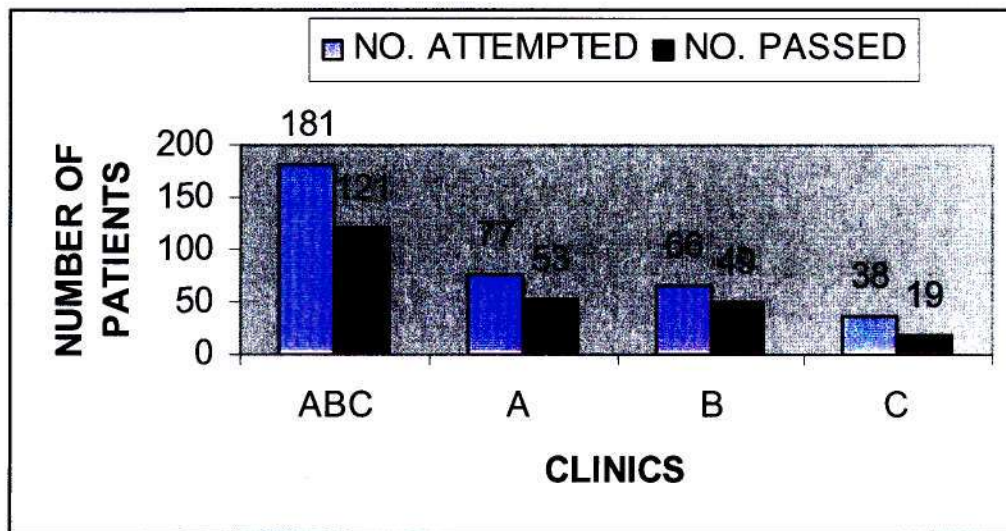
Figure 8 : Number of patients passing per clinic

A total of 121 of the 181 patients (66.9%) passed the test. The best pass was in Clinic B (n = 49 or 74.2%) and the worst in Clinic C (n = 19 or 50%). These results were statistically significant (p<0.05).
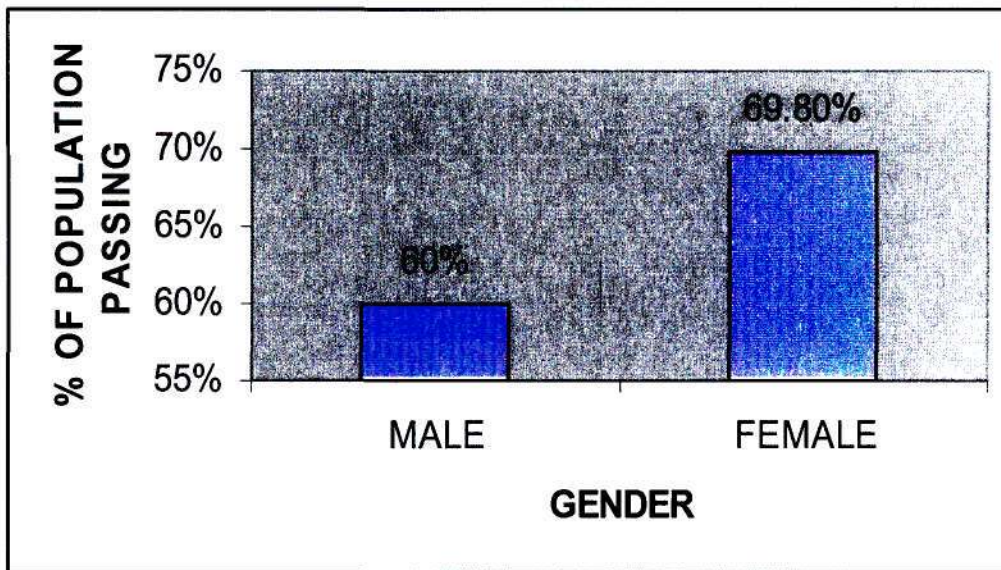
Figure 9 : Percentage of patients passing in relation to gender

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There was a higher pass in the female group than the male group with 69.8% (n= 88) of the females passing compared to 60% (n = 33) of the male population.

The above results obtained are not consistent with results from international studies. Hawthorne et al (1998), reported discrepancies in diabetic knowledge in a Pakistani Moslem population attending general practices and secondary care clinics at the Manchester Diabetes Centre. Two hundred and one patients participated in the study. Only 24% knew how to manage persistent hyperglycaemia, with women worse off than men (19% vs 31%). Women also failed to understand why glucose levels should be monitored and had poorer glycaemic control overall (HbA1c 8.8% vs 8.1%, P=0.04). It was concluded that women who could not read in this population group had poorer control and required more intensive, culturally suited health education and support.

This international study is comparable with the present study in that it assesses patients utilising secondary health care clinics. The apparent poor knowledge of diabetes amongst the Pakistani Moslems could be attributed to

miscommunication stemming from language barriers and illiteracy similar to South Africa. It is thus recommended that clinics should cater to the language needs of the population i.e. Isizulu in Kwa-Zulu Natal. Further emphasis should be placed upon educating the youth and care givers of diabetics on the management of diabetes.
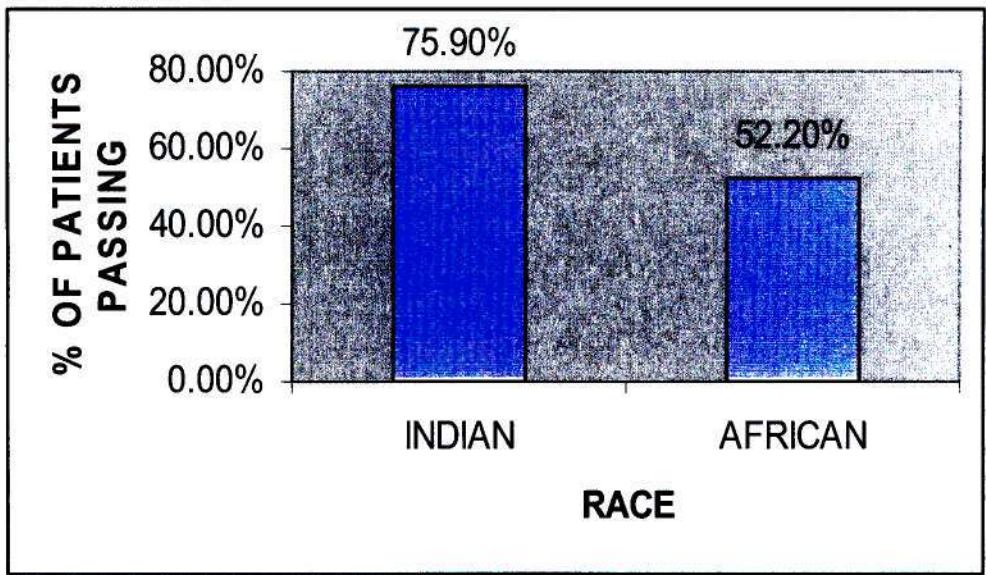
Figure 10 : Percentage of patients passing in the different race groups
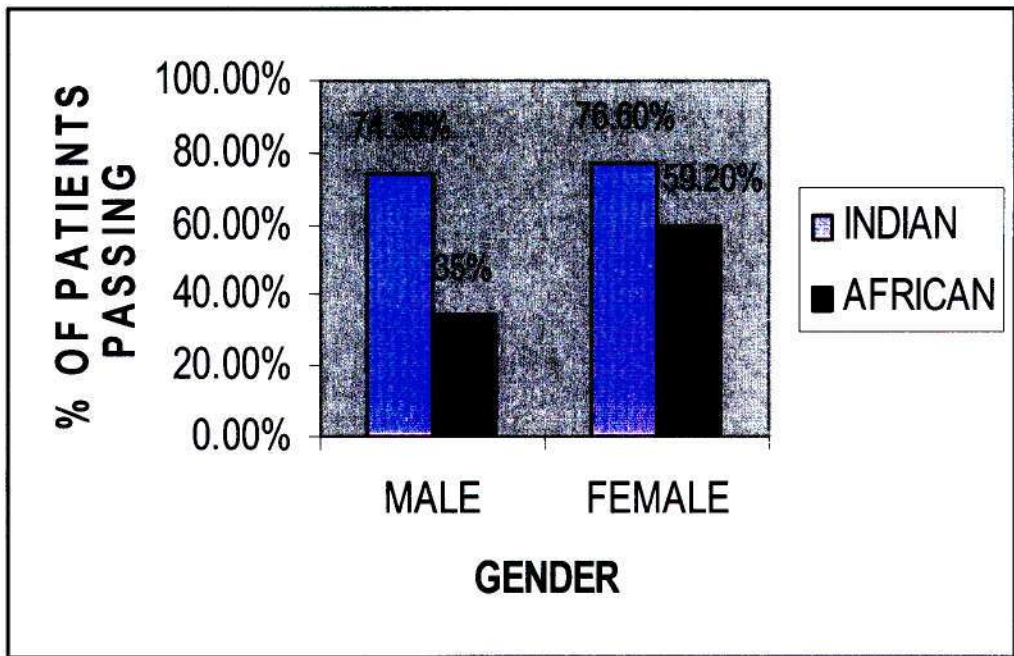
Figure 11 : Percentage of patients passing in the different race groups clustered by gender
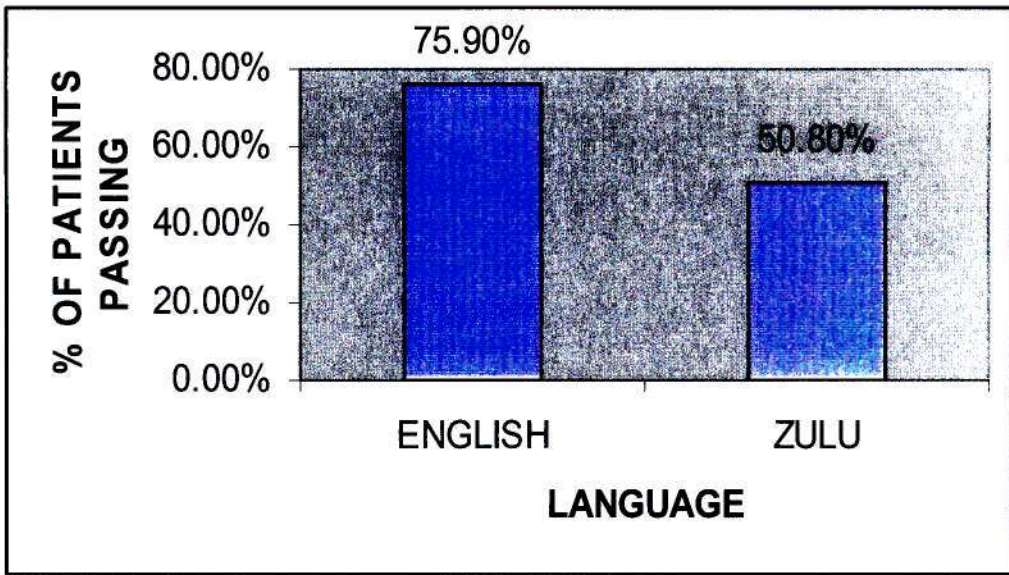
Figure 12 : Percentage of patients passing in the different language groups
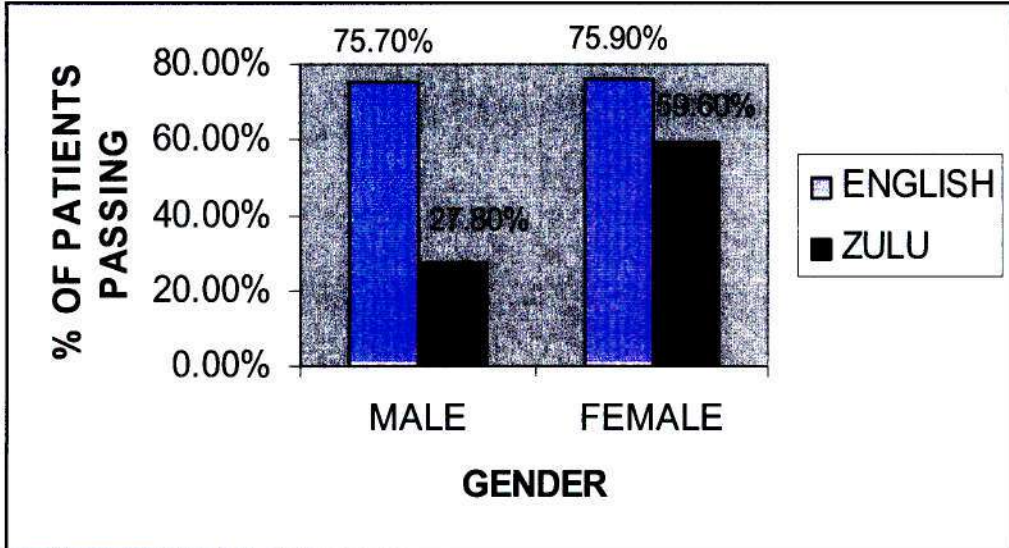
Figure 13 : Percentage of patients passing in the different language groups clustered by gender

There was a better pass in the Indian group (75.9%) than the African group (52.2%) of patients. The trend with the female patient being more knowledgeable is clearly evident in the African group where only 35% of the male population passed in comparison to 59.2% of the female population. The discrepancy of the pass between the two race groups does not in any way infer lack of intelligence in either population group but rather stems from inequalities of the past and will be discussed later.

The pass in the English speaking group (75.9%) was significantly higher than the Zulu speaking group (50.8%) as shown in (fig.12). Figure 13 shows the pass rate between the Zulu speaking male and female patient. It is evident that the Zulu speaking male patient showed poorer results. A sub-analysis indicates that African male patients who preferred Zulu were not as successful in the test as the English speaking African male patient. There was a 7.2% difference in the pass rate between these two groups. It is thus easier for the English speaking African to respond and benefit from counselling. This brings up the issue of counselling being administered in the right medium and will be addressed in the recommendations.

Figure 14 : Percentage of patients passing in relation to geographical positioning
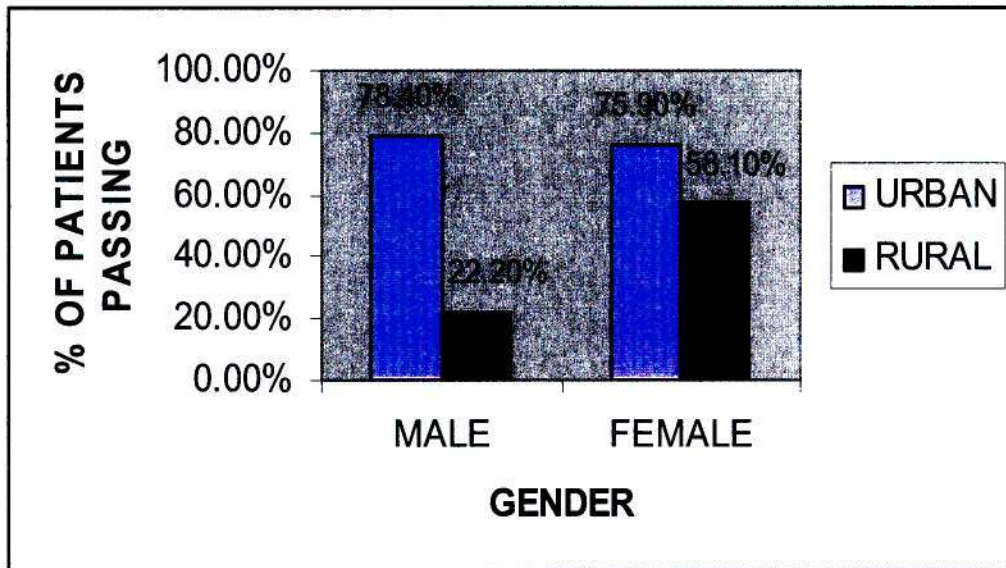
Figure 15 : Percentage of patients passing in relation to geographical positioning
clustered by gender

The above (fig.14) indicates 76.7% of the urban population passing the test compared to 47.5% of the rural dwellers. There was a particularly high failure rate in the rural male group with only 22.2% passing the test in comparison to 58.1% of the rural female patients (fig.15). The urban male patient had a similar pass rate to the female urban patient with 78.4% and 75.9% respectively.

African urban patients had a better pass than the African rural patients. 52.2% of the African urban patient population passed compared to 47.5% of the African rural dwellers. Since all Indian patients resided in an urban environment, no deductions can be made in this regard. The better performance by urban African dwellers are not solely due to accessible health care in the past and present, but also due to their increased awareness of diabetes that was highly prevalent in urban communities.

The research findings of King (2001) into the Aboriginal diabetic patients in rural South Australia indicated a lack of knowledge about management issues, and the effects of diabetes on their lifestyle. Thus, rural dwellers living out of the circle of the urban health hub would have to be counselled more thoroughly and regularly to bring them to par with urban dwellers. In the South African scenario, a huge proportion of the rural population accessing peripheral clinics are Africans. There is a need for these clinics to provide consistent professional health care at all times.
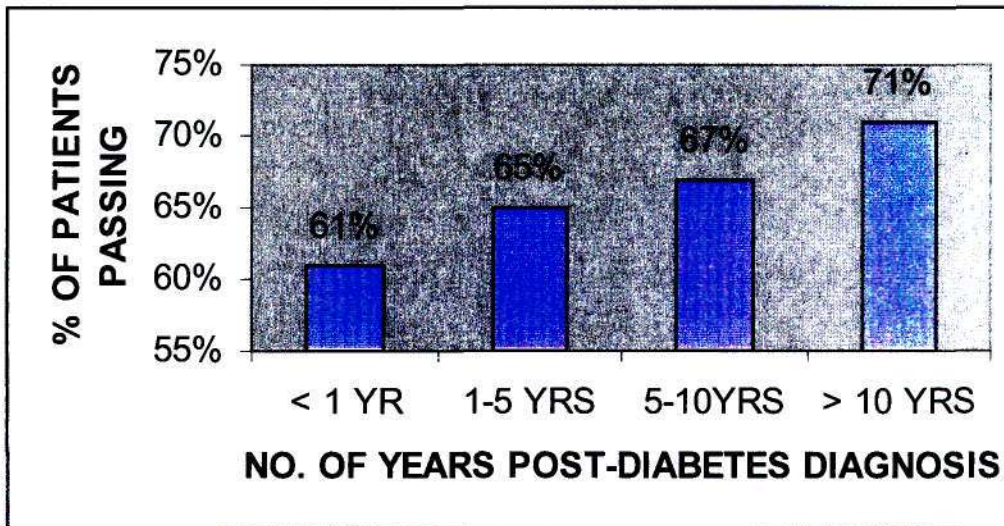
Figure 16 : Percentage of patients passing in relation to the number of years post-diabetes diagnosis
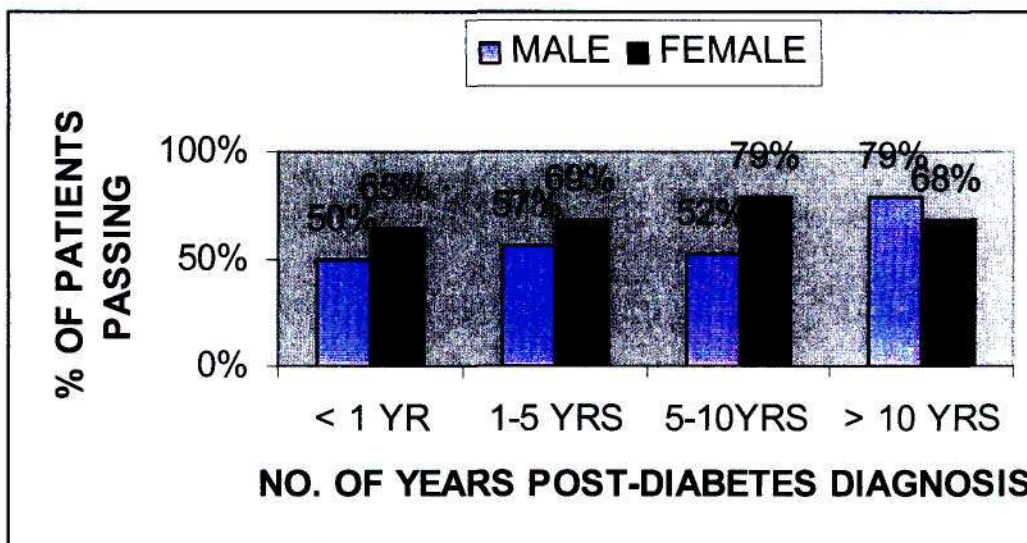
Figure 17 : Percentage of patients passing in relation to the number of years post-diabetes diagnosis clustered by gender

The above figures represent the percentage of patients passing versus the number of years post diabetes diagnosis overall (fig.16) and then clustered by gender (fig.17).

There is a progressive increase in the number of patients passing the diabetes knowledge test with an increase in the number of years post-diagnosis. The pass rates of patients who were diagnosed less than a year ago was 60.7%, 1-5years ago 65.3%, 5-10years ago 67.4% and more than 10years ago 70.5% respectively. These findings are not consistent with West et al, (2002) who found no significant increase in knowledge scores with the number of years post-diagnosis in the Veterans clinic in the United States. This could be due to a slower learning progression in this study population where understanding of the disease is time dependant in comparison to the study performed by West et al, (2002).

Patients of Clinic B who had the best pass overall had the smallest percentage of patients diagnosed more than ten years ago. This suggests that patients in Clinic B had a better general knowledge of diabetes despite being diagnosed less than 10years ago. The reason for this could be due to more consistent, intensive counseling being done by the sisters of this clinic.
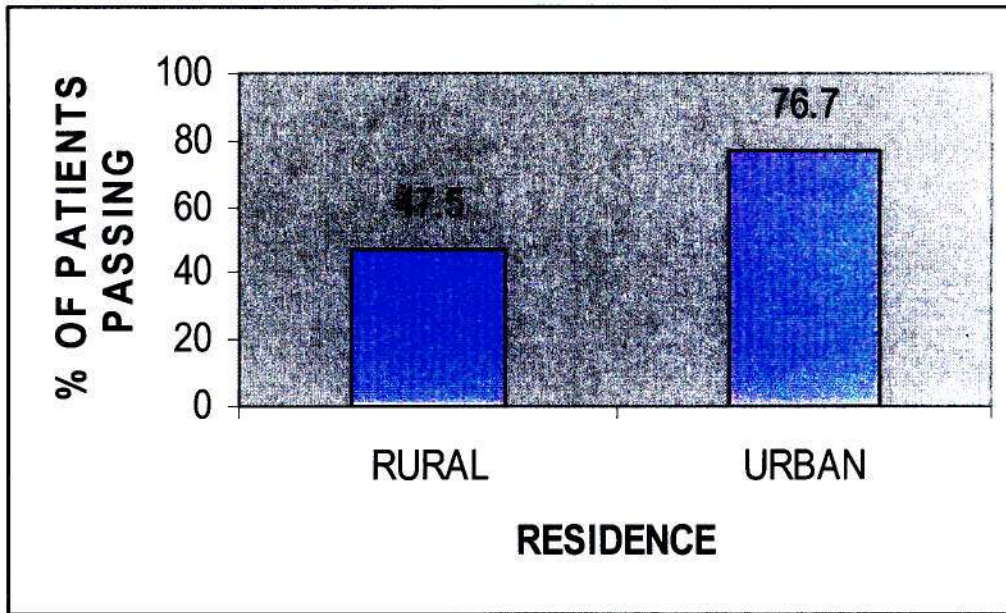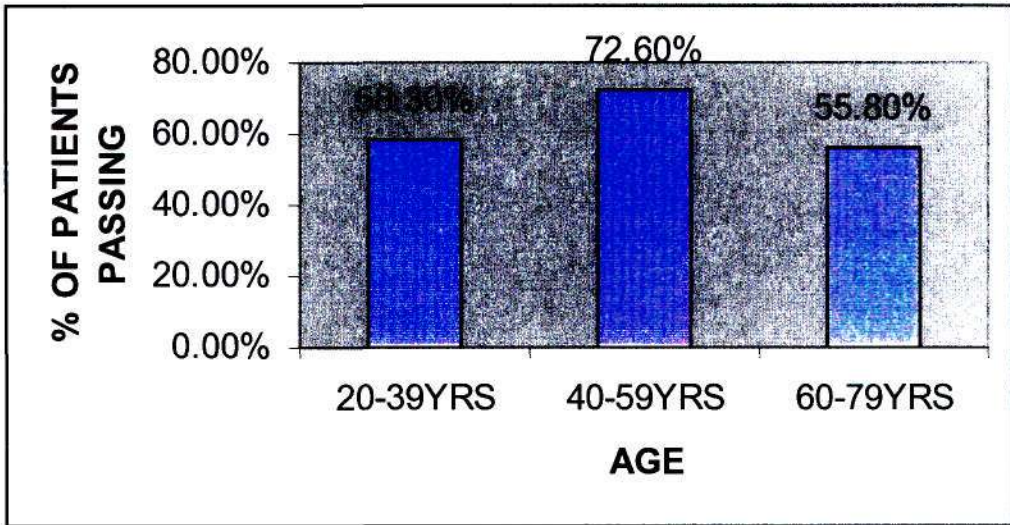
Figure 18 : Percentage of patients passing in relation to age
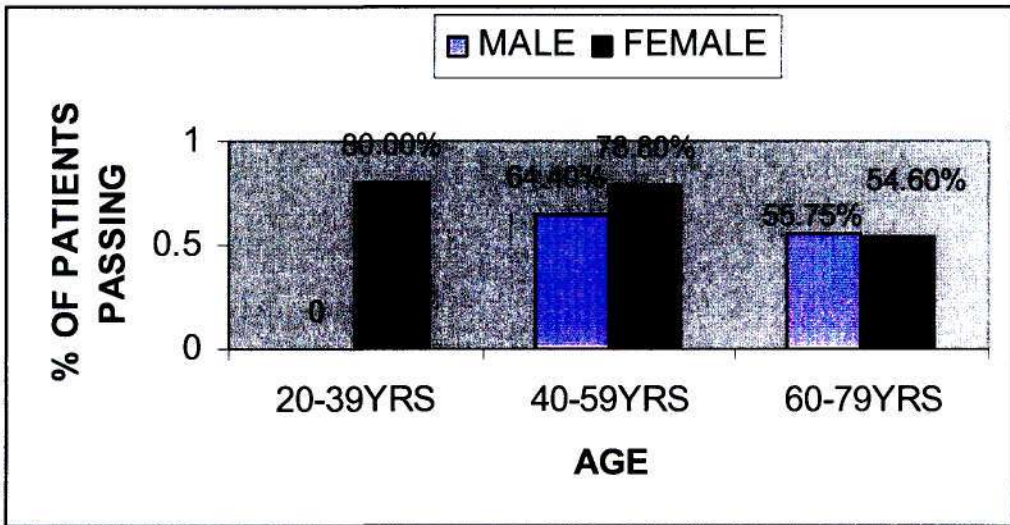
Figure 19 : Percentage of patients passing in relation to age clustered by gender

The best pass overall (in all three clinics) (fig.18) was achieved in the 40-59year age group. The 60-79year age group had the worst pass overall. Clinic C (fig.6) which had the worst pass overall also had the most patients in this age group. The reason could be two fold; a) the older patients understood diabetes poorly or b) the older age group performed so badly because most patients were from Clinic C. Analysis shows 12 of 17patients (71%) in Clinic C failing in the 60-79year age group. This is above the average for the three clinics together in this age category. It can be concluded that a poor performance by Clinic C was responsible for the overall poor pass in this age group. The patients in this older age group of Clinic C are all African and survivors of apartheid and its historic inequalities including lack of education, basic health care and health education. They would undoubtedly have less familiarity with this predominantly urban disease.

The percentage of patients passing in the male and female age group in the total study population (fig.19) indicates that the understanding of diabetes between the genders in the age grouping of 60years and more were similar. There were only two male patients in the 20-39year age grouping where both failed. The pass rate in the 20-39year female group was 80%. West et al, (2002) reported a decrease of 3% in the knowledge score of diabetic patients for every 10year increase in age. A similar trend is observed in this study if we compare patients from the age of 40 onwards. There is a decline in knowledge score as we progress from the 40-59year group to the 60-79year group. Since patients in the 20-39year groups are insufficient in number, analysis of the 40-year onwards groups are considered.
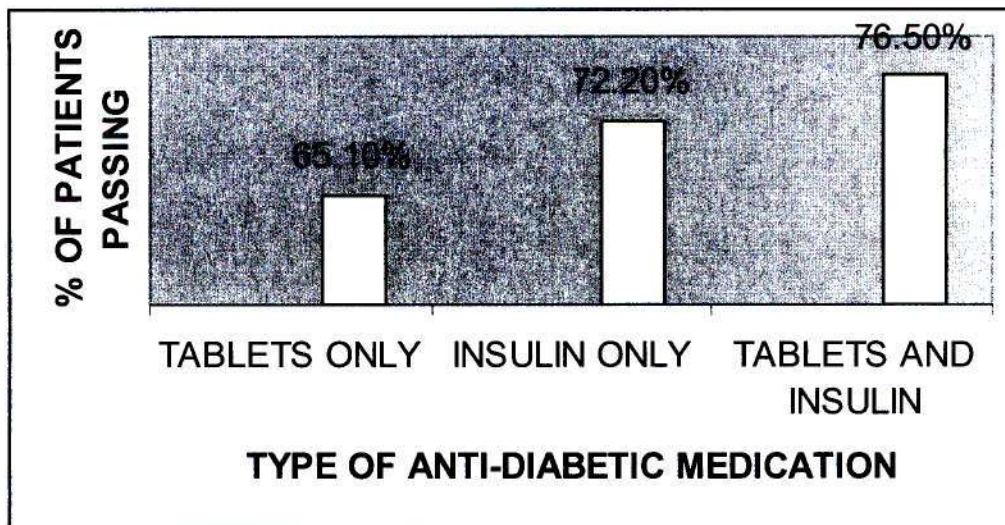
Figure 20 : Percentage of patients passed in relation to the type of anti-diabetic medication used

Figure 20 presents the percentage passed in each of the medication groups. There was an increase in the number of patients passing the test (achieving more than 50%) as one progresses from tablets only, to insulin only and to both tablets and insulin. A greater number of patients on the combination of both tablets and insulin passed the diabetes knowledge test (76.5%) compared to only 65.1% of the patients passing who were on tablets only.

More intensive counseling (i.e. diet, medication and exercise together) was received by the insulin group than the tablet only group. This is deduced by the observation that the insulin treated patients had a better knowledge score than the tablet treated patients. The more intensive counselling of the insulin treated group is due to this group requiring closer monitoring and detailed information in order to control their state of the diabetes disease and prevent insulin dose-related complications.

% PASSED PER QUESTION
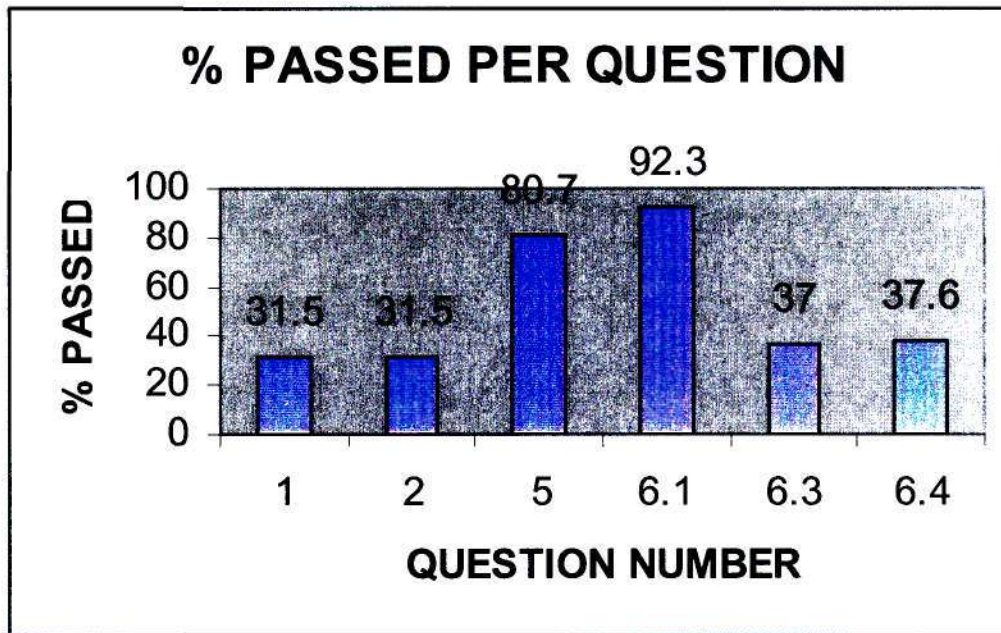
Figure 21 : Percentage of patients passing specific questions in the diabetes knowledge test

The above graph represents responses to specific questions of the diabetes knowledge test. The worst performance was evident in two questions. Question one focused on the ability of the patient to identify the symptoms of hypoglycemia. Only 31.5% of the patient population answered this question (being able to identify the symptoms of hypoglycemia) correctly. Only 31.5% of the patient population understood the significance of plasma glucose monitoring following a finger prick analysis (question two). Kapur et al, (1997) who assessed diabetic patients in urban India reported only 60% of patients having knowledge and understanding of fasting blood glucose levels and only 34% on the significance of postprandial glucose value. These results are higher than those found in this study with 31.5% of the patients understanding the significance of blood glucose levels. This is significant as the key to optimal diabetes self management is being able to identify plasma glucose levels. A lack in understanding of self-glucose monitoring leads to poor prognosis in terms of complications.

Another area of poor performance were questions (6.3) and (6.4) (Appendix 3) as only 37% and 37.6% of the patient population answered correctly. These questions aimed to assess whether patients were able to identify the associated co-morbidities of diabetes. In these two questions patients failed to point out that there was no association between diabetes and asthma or cancer. Patients need to identify that diabetes mellitus is not an epidemic or related to other prevalent endemic diseases like asthma or cancer. They need to understand that poor management of the disease could definitely lead to major co-morbidities like blindness, renal failure etc. These results on the misconception of the disease coincides with the study of Badruddin et al, (2002) who assessed the knowledge, attitude and practices of patients attending a diabetes care unit in Pakistan where 7% of the patients thought diabetes was caused by a diabetic virus with 43% believing a bad shock can cause diabetes and 14% answering diabetes to be an epidemic disease. Thus patient education in terms of the myths to the cause of diabetes should be addressed and clarified as well as associated complications of the disease.

The patients performed best (92.3%) in identifying blindness as a complication of diabetes and associating fat (80.7%) with heart disease. The remaining questions were answered correctly by 50-70% of the population which reflects a poor understanding of diabetes. In order for patients to manage their disease properly, a minimum of 80% of the questions should have been answered correctly since only the very basic essential questions surrounding diabetes were incorporated in the questionnaire (Assal et al, 1997).

Only 57.5% of the population identified maize (phuthu) as high carbohydrate content food. Hawthorne et al, (1999) identified 72% of Pakistani Moslems in Manchester Diabetes Centre having adequate knowledge on diabetic diets. Maize is a staple diet. This lack of knowledge by the population on diet compounded by the limitation of adequate nutrition could be a predictor to co-morbidities later.

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Only 53% of the population was knowledgeable on basic foot hygiene (question 8 in patient questionnaire). Matwa et al, (2003) also reported poor foot hygiene amongst patients in the Transkei resulting in limb amputations. Pollock et al, (2004) reported a mean knowledge score on foot care of 6.5 (S.D.2.1) out of a possible 11 by diabetic patients in Middlesborough, South Tees, UK. Deficiencies in knowledge in the afore mentioned study included the inability to sense minor injury to feet (47.3%), proneness to ulceration 52,4% and effect of smoking on circulation (44,5%). 24.6% never visited a chiropodist and 18.5% failed to inspect their feet. These results are similar to the findings in this study where 47% of patients failed to correctly answer the question regarding foot care.

4.1.3 Quality of care as perceived by patients compared to knowledge scores
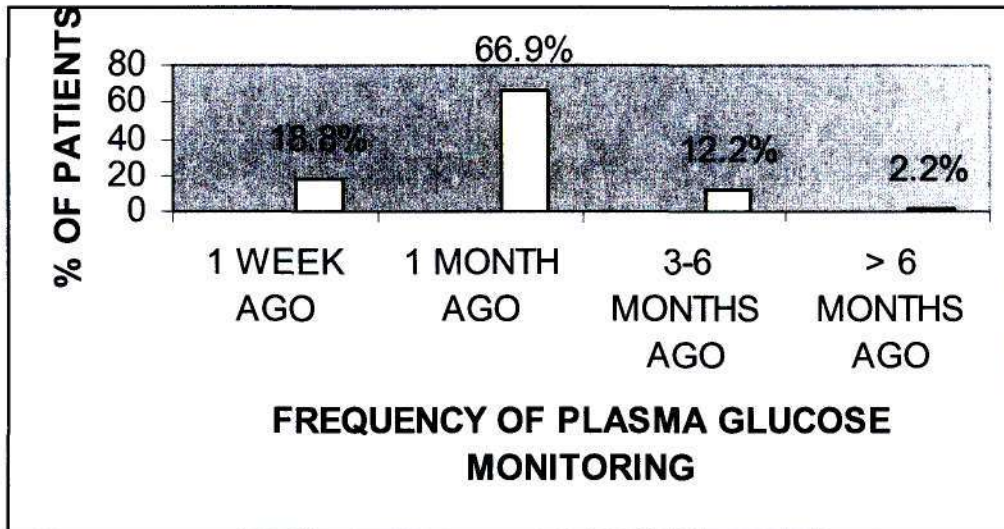
Figure 22 : Patients reporting frequency of glucose testing
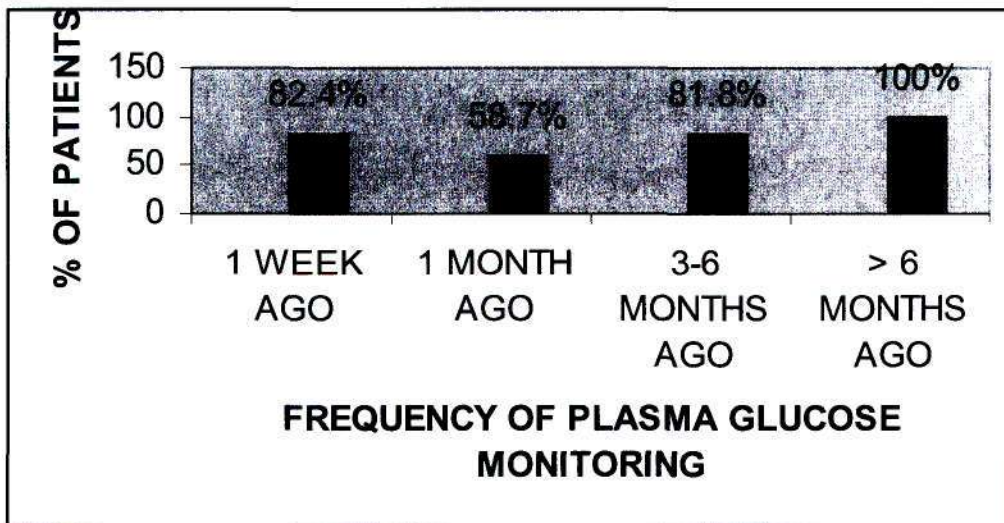
Figure 23 : Percentage of patients passing in relation to the frequency of blood glucose testing

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Figure 22 illustrates the frequency of testing of blood at all times (i.e. blood glucose levels) by patients or by nursing personnel in the clinic. The majority of patients (66.9%) had their glucose levels assessed on a monthly basis by the clinic. 18.8% of the population performed self-blood glucose monitoring i.e. on a weekly basis. This was deduced since any frequency of testing that was more than once monthly would have to be a patient initiative.

The above results are better than those reported by Kapur et al, (1997) who assessed the perceptions, attitudes and practices of diabetic patients in urban India. Kapur et al, (1997) reported only 5% of patients in urban India performing self-blood glucose monitoring. Kapur also reported in the insulin only group, 40% tested blood sugar once a month, only 22% more than once a month and 38% measured blood sugar every two months or less frequently. Amongst tablet users, the frequency of blood sugar testing was 20% measuring once a month, 30% once in two months, 18% once in three months, and 17% once in six months. The increased self-monitoring in the insulin group is self explanatory as these patients are likely to experience more fluctuations in plasma glucose levels having progressed to a more severe stage of the disease. This is indicative of the different attitude or approach of insulin-treated patients compared to the tablet-treated patients. Insulin-treated patients who are more likely to experience the symptoms of hypoglycaemia or hyperglycaemia are made aware of the importance of blood glucose monitoring and control.

A sub-analysis of the frequency of testing in this study for the different medication groups were as follows:

Insulin only; 17% once a week, 50% once a month, and 33% every 3-6months.Tablet only; 17% once a week, 73% once a month, 8.2% every 3-6months and 2% more than 6monthly.Thus the frequency of blood glucose monitoring by patients were higher in this study.

Figure 23 represents the relationship between the frequency of blood glucose testing to the results achieved in the diabetes knowledge test. As can be seen, the results are inconsistent. One would have expected that patients who test their blood glucose once monthly to have a better diabetic knowledge than those who test less frequently. The results of this study however indicated that patients who test their glucose every 3-6months and more than 6 monthly have shown better diabetes knowledge than those who perform the tests monthly. However, there is an indication that patients who test their plasma glucose weekly have better knowledge than those that do monthly. The importance is that patients who test weekly are more likely to grasp an understanding of glucose levels and its significance. This can be deduced as an increased frequency of testing would increase the likelihood of counseling and understanding of plasma glucose levels. The battle of diabetes self-management is only won when patients are consciously aware of the importance of maintaining healthy, consistent blood glucose levels. A possible explanation for patients that test every 3-6months having an unusually high pass is that these patients fall either in the female, Indian or English speaking groups. Further statistical analysis of the data collected would have to be made to confirm this assumption.
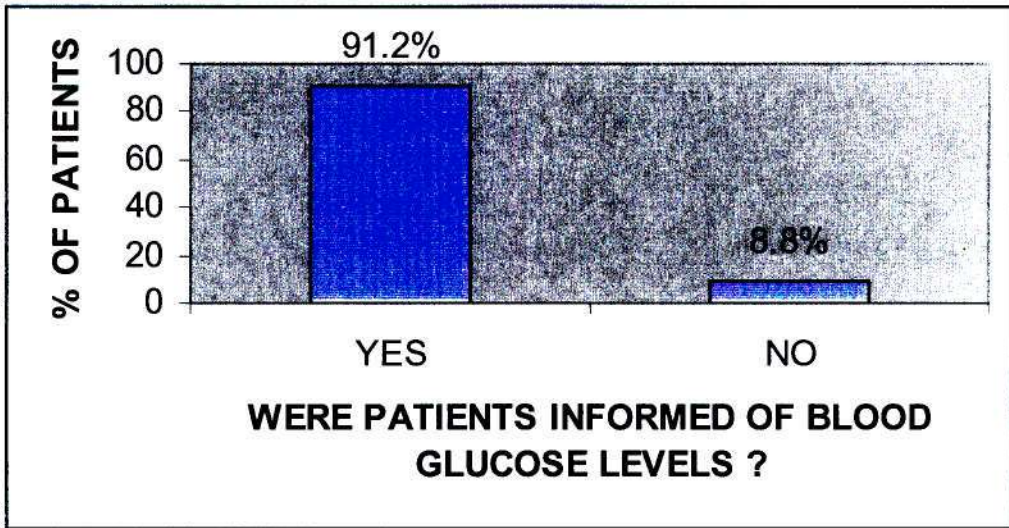
Figure 24 : Percentage of patients informed of their blood glucose levels
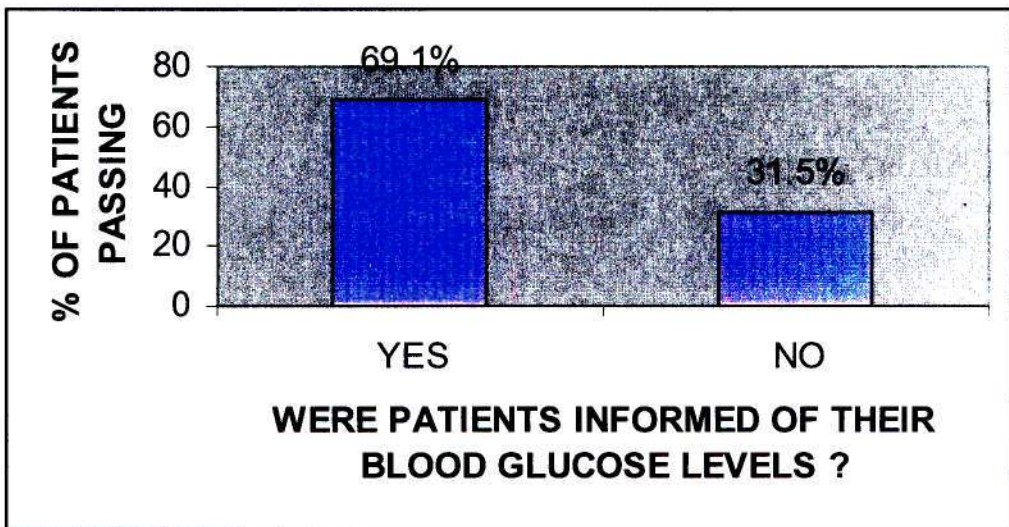
Figure 25 : Percentage of patients passing in relation to being informed or not of their blood glucose results

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91.2% of the patient population was informed of their glucose levels after being tested by the clinic sister (figure 25). Figure 26 shows a greater pass rate (67.9%) for the patients being informed of their glucose levels than those that were not (37.5%). This reflects that patients who were more knowledgeable of their blood glucose levels are more likely to have a better general knowledge of diabetes mellitus.

A sub-analysis was performed of patients that were or were not informed of their blood glucose levels to passing the specific question in the diabetes knowledge test regarding blood glucose levels. 34% (56 of 165) of the patients informed of their glucose levels answered the question correctly compared to 6.25% (1 of 16) who were not told of their blood glucose levels answering correctly. These findings indicate the need for patients to be educated and informed of their glucose levels post test.

D – DIET   E- EXERCISE   M – DOSE OF MEDS
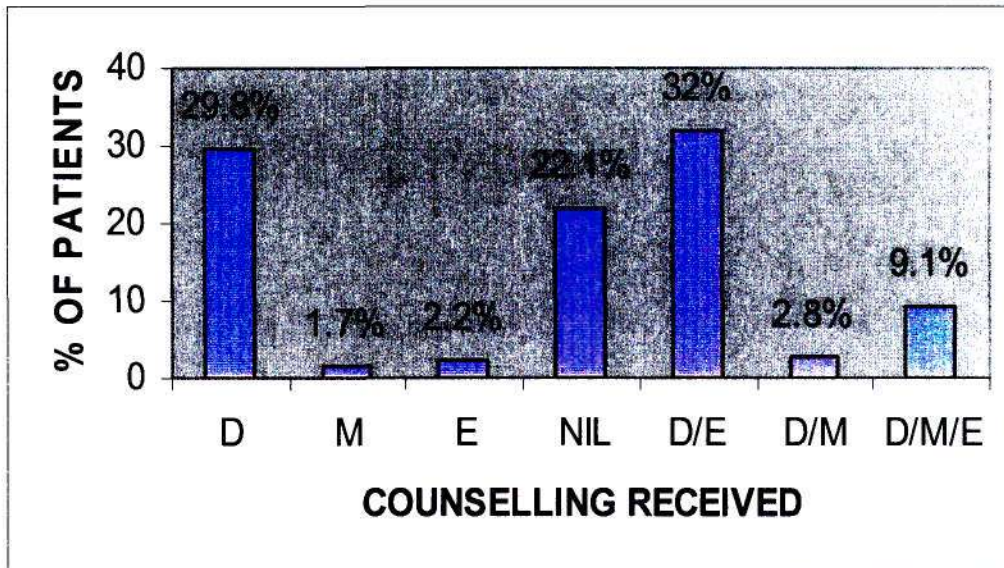
Figure 26 : Percentage of patients counselled on the various topics

D – DIET   E – EXERCISE   M – MEDICATION DOSE
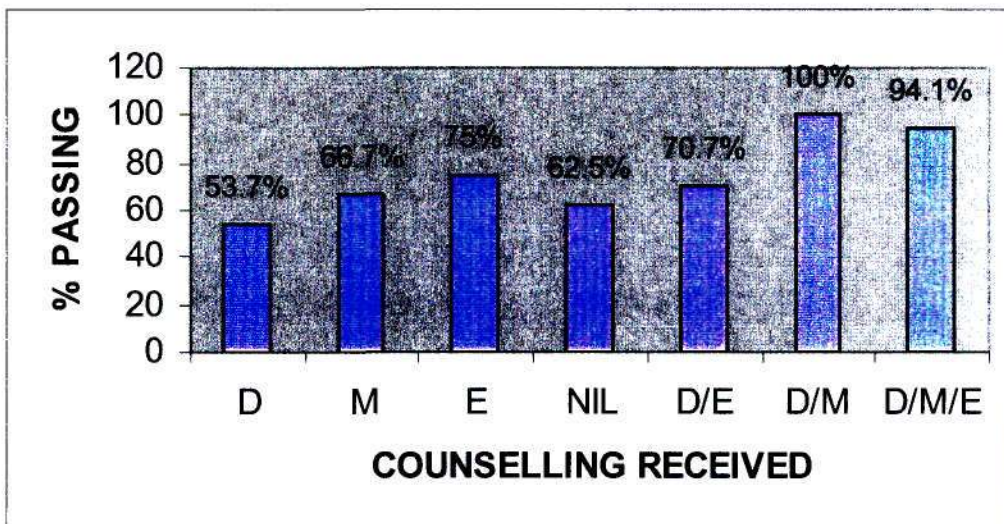
Figure 27 : Percentage of patients passing in relation to counselling received

Studies (Mensing et al, 2002) have shown that the quality and extent of diabetes counselling has a major influence on patient self-management. Patient feedback as to the type of counselling received with regard to diet, dose of medication and exercise is presented in figure 26. These results show whether the patient received counselling in only one, a combination of them or no counselling in the topics indicated. A greater part of the study population were counselled on a combination of diet and exercise (32%), 29% on exercise only, 22.1% not been counselled at all and 9.1% of the population reporting counselling on all three, i.e. diet, exercise and dosing of medication. This was verified by analysing the data obtained from the patient questionnaires.

A correlation between the percentage of patients passing the diabetes knowledge test to the type of counselling received is presented in figure 27. Patient pass rate increased when there was a combination of counselling rather than counselling on one topic alone. The patient population who reported having no counselling at all were one of the poorer performers in the diabetes knowledge test.

4.2 Nursing Questionnaire

The data to be presented was collected from three primary health care clinics (referred to as Clinics A, B and C for confidentiality purposes). The nurses included in the study all consented to participate in this study and attended to outpatient diabetics in the clinic on the day/s this questionnaire based study was administered (Appendix 5).

The questionnaire (Apendix 5) comprised three areas.

- The demographics of the nursing staff
- The perceived level of knowledge of the nursing staff concerning diabetes
- The quality of care given to patients as perceived by the nurses

The responses from the nurses of the three clinics are presented holistically and in a comparative format for all three facets i.e. demographics, perceived knowledge of disease and quality of care administered.

4.2.1 Demographics of nursing population
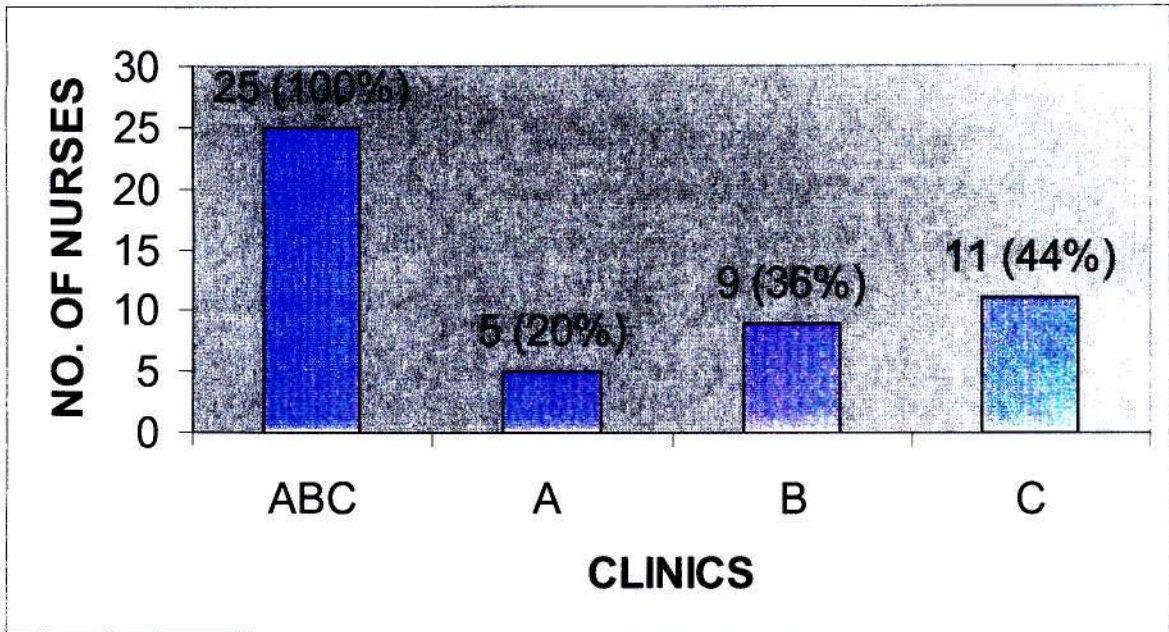
Figure 28: Number of nurse participants per clinic
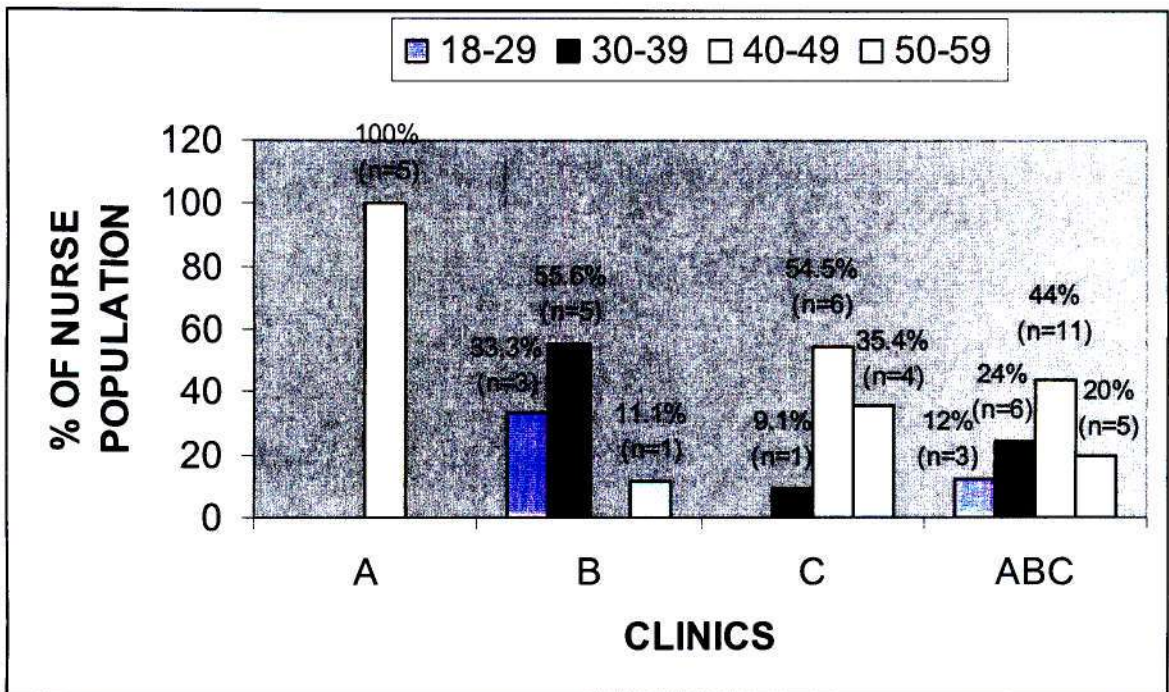
Figure 29: Age distribution amongst nurse population per clinic
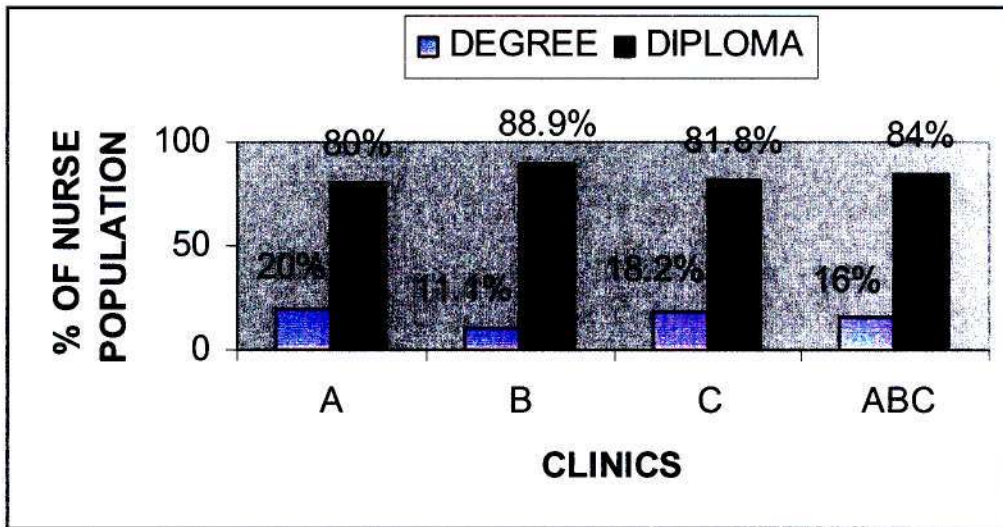
Figure 30: Qualifications of the nursing staff
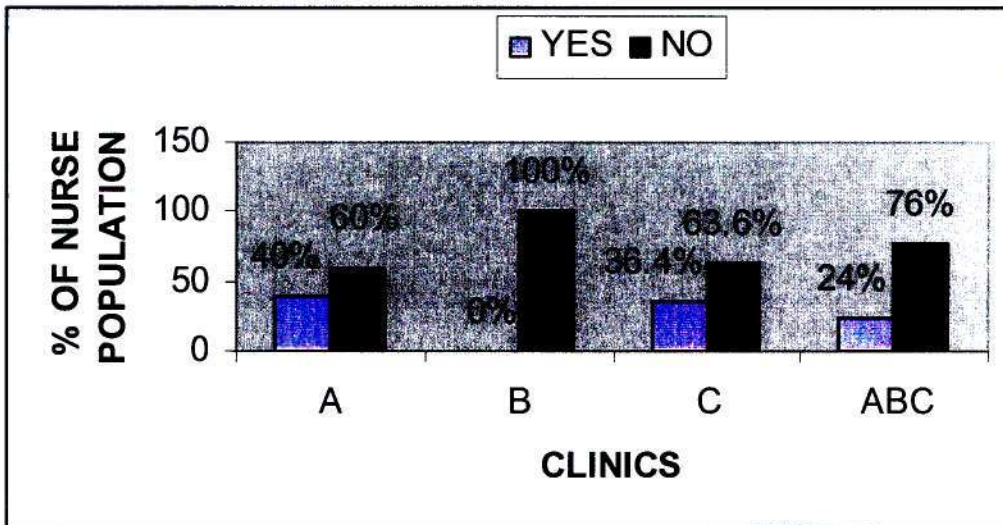
Figure 31: Percentage of nurse population having post-basic diabetic training
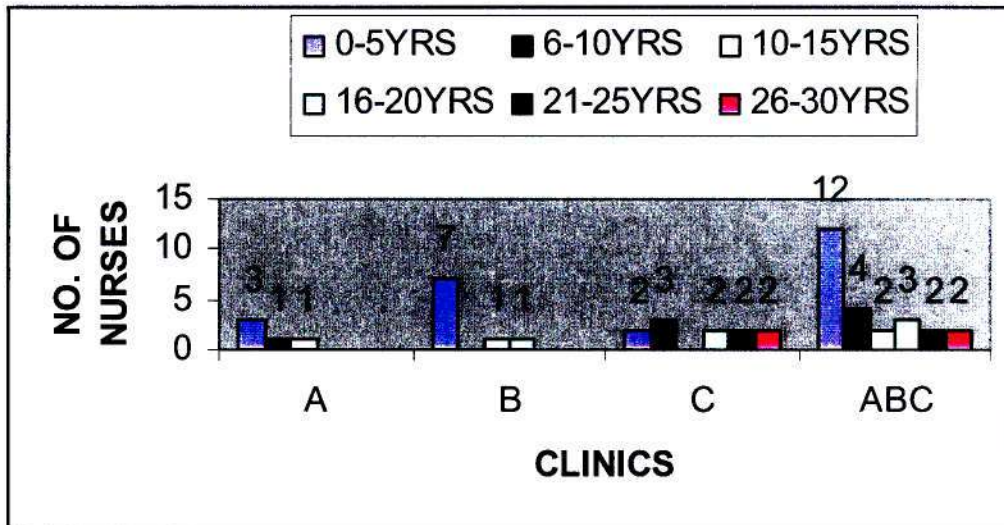
Figure 32: Number of years post-qualification of the nurses amongst the different clinics and in total

The above three graphs represent the qualification obtained by the nurses (fig.30), post-basic training in diabetes (fig.31) and the number of years post-qualification respectively (fig.32). There was no difference amongst the clinics with regard to nurse qualification as most nurses had a diploma qualification. 40% of the nurses from Clinic A and 36.4% of the nurses from Clinic C reported having post-basic training in diabetes mellitus with 100% of the nursing population from Clinic B reporting having no post-basic training on diabetes mellitus. These results correlate to nurse reports of self-perceived diabetes knowledge. Clinic A reported having the best and Clinic C the second best understanding with regards to the pathology, management, medical regimen and complication of the disease. No correlation could be made from the post-basic training results to the frequency of patient counselling reported by the nurses.

A comparison amongst the clinics regarding years post-qualification (fig.32) shows a similar pattern between Clinics A and B having more nurses qualifying between 1-5years ago. Clinic C showed more nurses being qualified more than 16 years ago. As crucial as work experience is, the constraints of human

resources at times makes it impossible for health workers to follow set protocols in outpatient departments. This leads to improper work habits being embedded in health personnel over the years to an extent where the value of protocol and technique is lost (Davidson, 2005). This does not necessarily imply that these protocols and techniques are forgotten.

Thus, continuing education programmes for all health professionals have been implemented in government health facilities which focuses not only on up skilling but also retraining existing qualified personnel. Therefore, the number of years post qualification of the nursing sisters in Clinic C may be an important factor when considering the poor performance of the patient population of Clinic C.

4.2.2 Nurse understanding of disease and their report on quality of care given
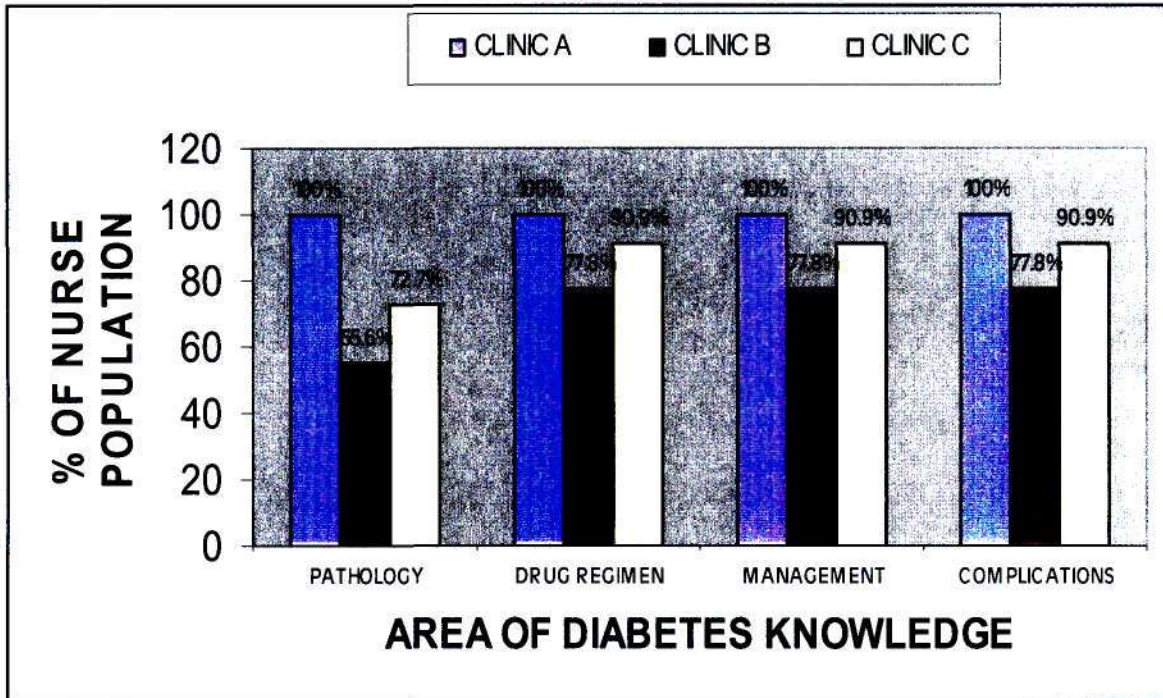
Figure 33: Nurses reporting on diabetes knowledge

The above graph represents feedback by the nurses on their level of understanding regarding the patho-physiology, management, treatment and complications of diabetes mellitus. The response by nurses in Clinic A indicated all nurses (100%) understood all aspects of diabetes mellitus. 90.9% of the nurse population in Clinic C indicated understanding the drug regimens, disease management and complications while 72.7% reported understanding disease pathology. A similar trend was found in Clinic B with 77.8% of the nursing population reporting understanding drug regimens, disease management and understanding while only 55.6% of the nurses understood diabetes pathology. These results correlate with the post-basic training received. Nursing staff of Clinic B who had no post-basic training also reported having the poorest understanding of diabetes.
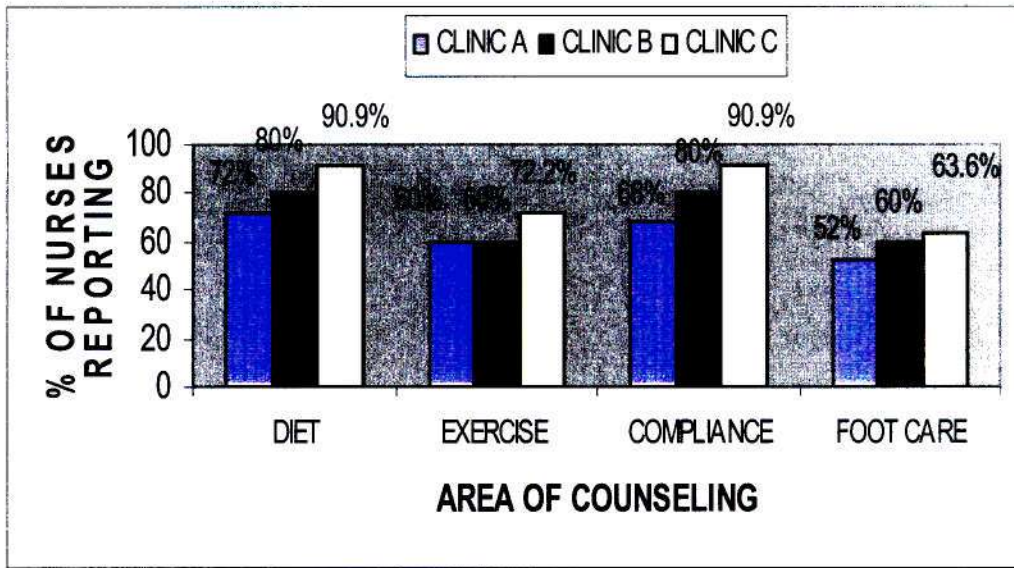
Figure 34: Frequency of counselling of patients by nurses
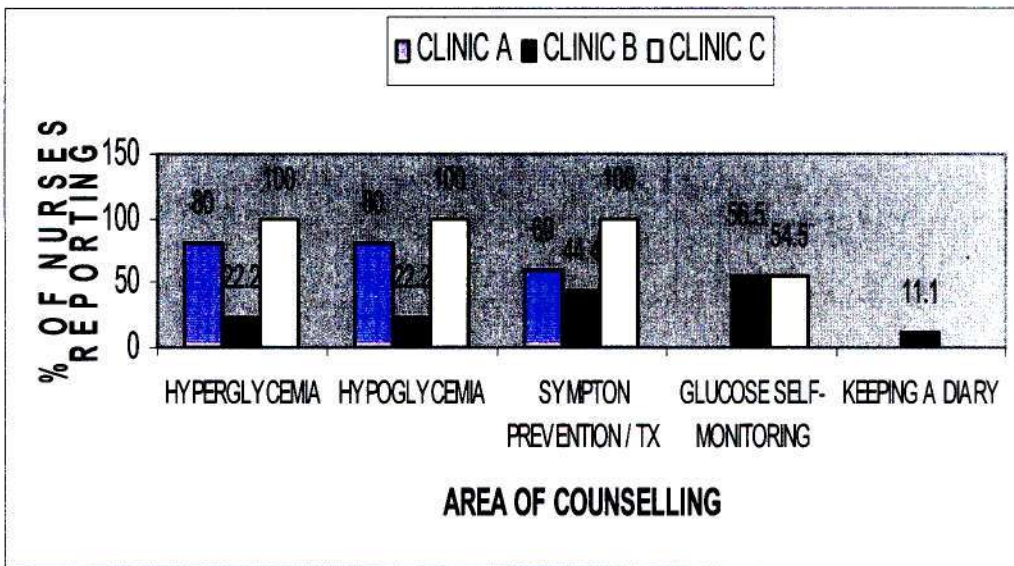
Figure 35: % of Nurses reporting having counselled on specific diabetes related symptoms and complications

The above two graphs are reports by nurses on the frequency of patient counselling. Figure 34 illustrates that all three clinics have been counselling their patients regularly (monthly) on diet, exercise, compliance and foot care with the nurses in Clinic C reporting the highest consistency in counselling. However, their patients produced the poorest results. This could be due to inconsistency in the answers given by the nurses of Clinic C or counselling being delivered inappropriately. Clinic B had a higher percentage overall in frequency of counselling than Clinic A which correlates to the reports of patients and also the results produced in that Clinic B performed better than Clinic A.

Figure 35 represents reports by the nurses on the type of counselling given. Clinic B reported the least counselling in the first 3 of the 5 categories; hyperglycaemia, hypoglycaemia and symptomatic treatment with Clinic C reporting the highest frequency of counselling. Clinic B reported the greatest frequency in counselling of glucose self monitoring and keeping a diary - an indication of awareness of diabetes management. Clinic C has only an African population of patients. The lack of financial resources to these patients makes it difficult to self-monitor glucose levels. It would thus be futile for the sisters of Clinic C to counsel patients on keeping of a diary.

4.3 Comparison between patient knowledge and demographics with nursing
    care when appropriate

Before discussing the above result, it should be emphasised that a difference in knowledge scores does not infer lack of intelligence in any of the race groups but rather a lack of history in the particular group to diabetes mellitus and also inequalities of the past with regard to proper education, health services and health as indicated by Hawthorne et al, (1999) who studied Pakistani Moslems attending a Manchester Diabetic Clinic.

The following comparison will be discussed holistically (i.e. all three clinics) and on an individual clinic basis.

4.3.1 Overall

The overall data across the three clinics indicates a better pass by the Indian population than the African population. Figure 10 illustrates the percentage passed in each group with 75.9% of the Indian patients passing and 52.2% of the African patients. Also, the African male patients showed a lower percentage pass rate than the African female patients (fig 11).

Asset et al, (1997) found that knowledgeable patients receiving regular counselling are more likely to maintain better glycaemic control.. Peyrot, (1999) and Westaway et al, (2003) reported only 8% of African South African diabetics achieving optimal metabolic control (HbA_1C 7%) with 25% achieving acceptable metabolic control (HbA_1C 8%). White patients had 22% optimal metabolic control and 39% acceptable metabolic control. Levitt et al, (1997) showed similar findings in African South African diabetic patients having poor ability to manage their disease. West et al, (2002) reported Caucasian patients having on average a 10% increase in diabetic knowledge test scores than Non-Caucasian patients within the Veterans Affairs health care system in the United States. Optimal

patient self-management of diabetes is dependant on patient knowledge. The poor glycaemic control reported in the above studies by African patients is thus an inference of poor understanding of diabetes.

With a relationship between knowledge and glycaemic control, a comparison can be made between this study and the ones above that show diabetic knowledge of the African population to be less than that of either the Indian or White population. There may be a problem with regard to diabetes understanding by the African population. This is attributed to the inequalities of the past with the white population enjoying better health care facilities both private and public. A further advantage by the white population was health education gained not only at school, private or public health care but by media coverage. This was unfortunately a huge disadvantage to the black community previously, missing out on urbanization and its influence on communication. This can be overcome by encouraging health education in schools and by using the appropriate language and medium of communication to educate the public on diabetes. Education should therefore not be limited to clinics and diabetic patients only. The increase in the awareness of diabetes mellitus in Indians may be due to the high prevalence of the disease and its co-morbidities in the Indian community for many years (Omar et al, 1985).

An important point of consideration is the lack of recognition of the prevalence of diabetes in the African population previously. Diabetes mellitus has been a major disease in both the White and Indian communities in South Africa but has only lately become increasingly recognized in the African community. Earlier studies in South Africa between 1959-1985 reflected low prevalence of diabetes mellitus in black South Africans (Goldberg et al,1969; Politzer & Sachs,1967). Omar et al. (1993) using the revised WHO criteria for diagnosis of diabetes indicated a prevalence of 5% in the urban South African black population with an increase in prevalence of the Indian population of South Africa showing a 7.6% prevalence in males and 13.5% in females (Omar et al, 1985). More recent statistics shows

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prevalence of diabetes increasing to 8% in South African blacks (Levitt et al, 1997). This is evidence of the growing burden of diabetes mellitus on the South African economy exceeding prevalence rates in African Americans (Anderson et al, 1996).This could be due to urbanisation of the African population (leading sedentary lifestyles and changes in diet) or an increase in screening of the African patients.

4.3.2 Clinic A

Of the Indian patient population 17 of 68 patients (25%) failed in clinic A compared to 10 of 44 patients (22.7%) in clinic B. This data is however limited in that there were no Indian patients at the time of study present in clinic C. The higher pass in the population of clinic B is correlated to care received by the nursing personnel since both populations shared similar patient demographics.

The percentage of African patients that failed in Clinic A was 78% (7 of 9). This was worse than that of Clinic B (31.8%) and Clinic C (50%). This means that Clinic A which may have had a superior overall pass than Clinic C does not necessarily have counselling techniques that are better. As discussed earlier, diabetes being common in Indian communities would need a greater focus in terms of counselling in the African population to improve patient knowledge. Thus, the nurses of Clinic A who have reported having an excellent knowledge of the diabetes disease need to utilise this knowledge to effectively counsel their patients.

4.3.3 Clinic B

This was the best performing clinic with regards to the number of patients passing the diabetes knowledge test. This clinic had a younger group of nurses in comparison to Clinics A and C. More nurses were distributed in the 18-29 year and 30-39 year category. There is thus a need to investigate if the younger group

of nurses (newly qualified) have had better undergraduate training with regard to diabetes mellitus or perhaps more exposure during ward rounds due to the disease becoming more prevalent in the rural clinics and hospitals.

The results illustrated in figure 32 on nurse post-basic training are not conclusive. This is due to the patients of Clinic B having the best overall results despite the nurses of this clinic reporting having no post-basic training in diabetes mellitus. A lack of post-basic training is consistent with findings by Goodman et al, (1997) who reported gaps in knowledge by nurses in ambulatory health centers in Cape Town. Davidson (2005) concluded after studies done in two Los Angeles county clinics that specially trained nurses who follow detailed protocols and algorithms under the supervision of a diabetologist can markedly improve diabetes outcomes in a minority population. This approach could help blunt the increased morbidity and mortality noted in South African patients seeking care in primary health care facilities.

Clinic B has the most number of sisters with the least number of years post-qualification (fig. 33).The question then arises, are these newer qualified sisters having a greater impact with regard to diabetes mellitus? Will re-training of the older qualified clinic nurses aid in improving diabetes awareness? From the results of the survey, the sisters of Clinic B reported the least understanding of the disease (fig. 34) yet Clinic B was the best performing clinic.

Etzwiler (1967), reported a deficit in knowledge of diabetes mellitus amongst medical personnel. Other studies also indicated that nurses do not have sufficient knowledge and preparation to comprehensively care for diabetic patients (Drass et al, 1989; Gossain et al, 1993: Kamal et al, 2001) and this is compounded by the latent attitude that nurses show towards diabetic patients. Although no significant difference was made in that the actual and perceived knowledge were more or less similar, an average score of +/- 70% was achieved by nurses in all three studies. Lack of knowledge on the subject matter was evident in different

areas which showed that nurses were not sufficiently able to comprehensively manage diabetic patients.

Clinic B nurses who reported the most inconsistent counselling with regard to hyperglycaemia, hypoglycaemia and symptomatic treatment (fig. 36) ironically had patients who produced the best results. These results indicate that the counselling by the sisters of Clinic B, though inconsistently done, was well received by the patients.

4.3.4 Clinic C

According to figure 35, the nurses in Clinic C reported the highest consistency in counselling yet produced the poorest results. These results infer that the sisters of Clinic C over rated themselves in this area or that the patients of this clinic did not respond well to their counselling technique. This could therefore be an area of research for the future, to physically observe the quality of counselling administered to diabetic patients and their understanding thereafter by quantifying their level of knowledge.

These results can also explain the poor pass rate of Clinic C in comparison to Clinics A and B as Clinic C has African patients only. Clinic C showed an overall pass rate of only 50% in comparison to the other clinics. There was a failure rate of 47.8% in the African population. This 47.8% comprised 27.5% from Clinic C. and 20.3% from Clinics A and B combined. An analysis of the number of African patients failing per clinic shows 19 of 38 (50%) patients in Clinic C. This performance by Clinic C is worse than that of Clinic B where 7 of 22 (31.8%) of the African population failed. Due to the small number of patients above, it would be viable to confirm the above results by utilising a larger patient population from each clinic.

4.4 SUMMARY OF RESULTS

In this study, two questionnaires (Diabetic Patient Questionnaire and Nursing Questionnaire) were constructed to investigate the level of knowledge of diabetic patients attending three government primary health care facilities and the quality of care administered to these patients as perceived by the primary health care providers. This area of study was designed to determine both the level of patient knowledge and patient care in the holistic management of diabetes. This evaluative study is important as the majority of the population in South Africa is still dependent on state health care facilities.

<u>The Patient Questionnaire</u>

The patient questionnaire was designed to inform on patient demographics (i.e. age, race, language preference, place of residence), quantifying patient level of knowledge on diabetes (using thirteen general knowledge questions on diabetes mellitus) and to assess the quality of care received by diabetic patients attending these three primary care clinics (anonomised as A, B and C).

The total study population comprised 181 patients with 77 patients from Clinic A, 66 patients from Clinic B and 38 patients from Clinic C (fig.1). There were more female than male patients (fig.1) in the study population (69.7%). A total of 121 of the 181 patients (66.9%) passed the diabetic knowledge test. The best pass was in Clinic B (n = 49 or 74.2%) and the worst in Clinic C (n = 19 or 50%) ($p<0.05$). There was a higher pass in the female group than the male group with 69.8% of the females passing compared to 60% of the male population (fig 9).

There was a larger number of Indian patients (fig.2) in the study representing 61.9% of the population with African patients comprising the remaining 38.1%. The race distribution per clinic was as follows; Clinic A, (Indian 88%, African 12%), Clinic B (Indian 67%, African 33%) and Clinic C (African 100%). The two

races identified in the total study cohort (i.e. Indians and Africans) are predominant in this area under study and are dependant on state health care facilities.

The data across the three clinics indicates a better pass by the Indian group than the African group. Figure 10 illustrates the percentage passed in each group with 75.9% of the Indian group passing and 52.2% of the African group. Also, the African male patients showed a lower percentage pass rate than the African female patients (fig 11). It should be emphasized that a difference in knowledge scores indicates the neglect of the detection of diabetes, its more aggressive recognition through screening, stemming from the legacy of apartheid where there were inequalities in education, health services and all other spheres of life.

The study population is 66.3% (n =120) urban and 33.7% (n=61) rural (fig.4). There was a particularly high failure rate in the rural male group with only 22.2% passing the test in comparison to 58.1% of the rural female patients (fig.15).

The largest number (n= 61 or 34%) of patients (fig.5) was diagnosed more than 10years ago. There was a progressive increase in the number of patients passing the diabetes knowledge test with an increase in the number of years post-diagnosis (fig. 16). The pass rates of patients who were diagnosed less than a year ago was 60.7%, 1-5years ago 65.3%, 5-10yrs ago 67.4% and more than 10years ago 70.5% respectively.

Majority of the patient population fell into the 40-59year age group (70.6%, n= 117). An analysis of the age distribution amongst the clinics reveals majority of all three Clinic's populations within the 40-79year age groups. The best pass overall in all three clinics (fig.18) was achieved in the 40-59year age group.

The majority of patients are on oral medication (80.7%) with the remaining population 9.9% and 9.4% being on insulin only and both insulin and tablets

respectively (fig.7). A greater number of patients on the combination of both tablets and insulin passed the diabetes knowledge test (76.5%) compared to only 65.1% of the patients passing who were on tablets only.

There is a strong correlation between the type of anti-diabetic medication and the number of years post-diagnosis, to age. Since 80.7% of the population is on oral hypoglycaemic medication and more than 99% of the patient population are above the age of forty, this strongly correlates to age, duration, and treatment of type-2 diabetes.

The poorest results in the diabetic knowledge test was patients knowledge in identifying the symptoms of hypoglycaemia and the significance of plasma glucose monitoring following a finger prick analysis (fig 21). Only 31.5% of the patient population answered each of the above questions correctly. This is significant as the key to optimal diabetes self management is being able to identify symptoms and interpret plasma glucose levels. Another area of poor performance was questions (6.3) and (6.4) (Appendix 3) as only 37% and 37.6% of the patient population passed respectively. These questions aimed to assess whether patients were able to identify the associated co-morbidities of diabetes.

The majority of patients (66.9%) had their blood glucose levels assessed on a monthly basis by the clinic. A sub-analysis of the frequency of testing in this study for the different medication groups were as follows:
Insulin only; 17% once a week, 50% once a month, and 33% every 3-6months.
Tablet only; 17% once a week, 73% once a month, 8.2% every 3-6months and 2% more than 6monthly.

91.2% of the patient population was informed of their glucose levels after being tested by the clinic sister (fig.25). Figure 26 shows a greater pass rate (67.9%) for the patients being informed of their glucose levels than those that were not (37.5%). This reflects that patients who were more knowledgeable of their blood

glucose levels are more likely to have a better general knowledge of diabetes mellitus.

A greater part of the study population were counseled on a combination of diet and exercise (32%), 29% on exercise only, 22.1% not been counseled at all and 9.1% of the population reporting counseling on all three that is diet, exercise and dosing of medication (figure 26). Patient pass rate increased when there was a combination of counseling rather than counseling on one topic alone (fig.27).

Nursing Questionnaire

The nursing questionnaire (Apendix 5) comprised three areas: the demographics of the nursing staff, the perceived level of knowledge of the nursing staff concerning diabetes, and the quality of care given to patients as perceived by the nurses.

The majority of the nursing population 44% (n=11) fell in the 40-49yr age category, with 24% (n=6) in the 30-39yr category, 20% (n=5) in the 50-59yr old category and the remaining 12% (n=3) in the 18-29yr age group.

Clinic B was represented by a younger nursing staff, followed by Clinic A which was mostly represented by the middle aged nurses (40-49yr age group) and Clinic C who had the largest number of nurses in the 50-59yr age group.

40% of the nurses from Clinic A and 36.4% of the nurses from Clinic C reported having post-basic training in diabetes mellitus with 100% of the nursing population from Clinic B reporting having no post-basic training in diabetes mellitus (fig.31). These results correlate to nurse reports of self-perceived diabetes knowledge. Clinic A reported having the best and Clinic C the second best understanding with regards to the pathology, management, medical regimen and complication of the disease. No correlation however, could be made from the

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post-basic training results to the frequency of patient counseling reported by nurses.

A comparison amongst the clinics regarding years post-qualification (fig. 32) shows a similar pattern between Clinics A and B having more nurses qualifying between 1-5years ago. Clinic C showed more nurses who qualified more than 16years ago. Therefore, the number of years post qualification of the nursing sisters in Clinic C may be an important factor when considering the poor performance of the patient population of Clinic C. Thus, continuing education programs for all health professionals have been implemented in government health facilities which focuses not only on up skilling but also retraining existing qualified personnel.

All three clinics counselled their patients regularly (monthly) on diet, exercise, compliance and foot care with the nurses in Clinic C reporting the highest consistency in counselling (figure 34). However, their patients produced the poorest results. This could be due to inconsistency in the answers given by the nurses of Clinic C or counselling being delivered inappropriately. Clinic B had a higher percentage overall in frequency of counselling than Clinic A which correlates to the reports of patients and also the results produced in that Clinic B performed better than Clinic A.

Diabetes mellitus has been a recognised major disease in both the White and Indian communities in South Africa but has only recently become recognised in the African community. This may account for a lack of understanding of diabetes in the African population. An important point of consideration is the lack of recognition of the prevalence of diabetes in the African population previously.

This was unfortunately a huge disadvantage to the black community previously, missing out on urbanisation and its influence on communication. This can be overcome by encouraging health education in schools and by using the

appropriate language and medium of communication to educate the public on diabetes. Education should therefore not be limited to clinics and diabetic patients only. Thus, the increase in the awareness of diabetes mellitus in Indians may be due to the high prevalence of the disease and its co-morbidities in the Indian community for many years.

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5.1 Limitations

- The absence of Indian patients in Clinic C

- Direct observation of nurse counselling diabetic patients

- Identification of co-morbidities in the diabetic population and establishing a possible correlation to patient knowledge

- Open-ended questions identifying problems experienced by patients and nurses at clinics

- Comparator study in the private sector

5.2 CONCLUSION

There is a problem with regard to diabetes understanding by the African population. This stems from the lack of prevalence of diabetes mellitus in the past in the African population group. Therefore, the increase of the awareness of diabetes mellitus in the Indian group may be due to the high prevalence of the disease and its co-morbidities in the Indian community for many years. The majority of the African study population being type-2 diabetics and above the age of forty grew up during an era where they consequently lacked the benefit of appropriate health care and health education.

The pass of the Indian group, although being higher in number than the African population does not necessarily mean that they have sufficient knowledge to comprehensively manage their diabetes. There were many loopholes present in the knowledge of the Indian population group clearly indicating that intensive counselling is required.

The mushrooming of primary health clinics in rural areas has increased screening for diabetes, unveiling the high prevalence of diabetes and its co-morbidities in these areas. We, however, should not be satisfied with the increase in healthcare provision to rural areas. We need to ensure that our health care providers are continuously trained and provided with the essentials in order to comprehensively care for diabetic patients. We further need to ensure that the quality of training of our healthcare providers are of the highest level and that there are follow up evaluations on a regular basis in the clinical environment.

There is thus the need for an increase in the awareness of diabetes in the primary health care facilities focusing not only in the screening of diabetes and its co-morbidities but also on patient education and counselling.

5.3 Recommendations

- Using the appropriate language and technique when counselling patients on diabetes

- More aggressive counselling to older patients since there is a decrease in score with age

- Provision of consistent professional health care in rural clinics at all times

- Rural dwellers living out of the circle of the urban health hub would have to be counseled more thoroughly and regularly to bring them to par with urban dwellers

- Patients should consistently be educated and informed of their glucose levels post test

- Re-training of older nurses on the treatment and pathologies regarding diabetes mellitus

- Continuing medical education on diabetes with primary care personnel

- Education of nurses on different counseling techniques and the importance of proper counselling in diabetes

- Education of youth (health education) on chronic disease management and prevention

- Improve frequency of screening for foot ulcerations, cholesterol, kidney function, hypertension and eye examinations in diabetic patients

APPENDIX 1: Ethical Clearance from University of KwaZuluNatal

UNIVERSITY OF
KWAZULU-NATAL

19 August 2005

Mr L M Moodley
6 Taiwantsingh Road
Temple Valley VERULAM
4340

e-mail : lushenm@dit.ac.za

Dear Mr Moodley

PROTOCOL : An assessment of the level of knowledge of diabetics and primary health care providers in a primary health care setting, on diabetes mellitus. L M Moodley, Pharmacology (Westville). Ref.: H145/05

The Biomedical Research Ethics Committee considered the abovementioned application and the protocol was approved at its meeting held on 5 July 2005 pending appropriate answers to queries raised. These conditions have now been met, the study is given full ethics approval and may begin as at today's date : 19 August 2005.

Please ensure that a letter of permission from the local authorities and Province's acknowledgement that they are aware of the study are obtained before the study begins. Copies of these letters must be forwarded to this office.

This approval is valid for one year from 19 August 2005. To ensure continuous approval, an application for recertification should be submitted a couple of months before the expiry date.

May I take this opportunity to wish you everything of the best with your study. Please send the Biomedical Research Ethics Committee a copy of your report once completed.

Yours sincerely

PROFESSOR A DHAI
Chair : Biomedical Research Ethics Committee

c.c.   Professor V Rambiritch, Pharmacology, Westville.

APPENDIX 2: Permission from Department of Health

DEPARTMENT OF HEALTH

PROVINCE OF KWAZULU-NATAL

SPECIAL SUPPORT SERVICES

Natalia, 330 Longmarket Street, Pietermaritzburg, 3201
Private Bag X9051, Pietermaritzburg, 3200
Tel.: 033 395 2692/ 395 2761, Fax.: 033 345 4433

`02 SEP 2005`

Mr L M Moodley
6 Talwantsingh Road
Temple Valley
VERULAM
4340

Dear Mr Moodley

APPLICATION TO CONDUCT RESEARCH : AN ASSESSMENT OF THE LEVEL OF KNOWLEDGE OF DIABETICS AND PRIMARY HEALTH CARE PROVIDERS IN A PRIMARY HEALTH CARE SETTING, ON DIABETES MELLITUS

Your e.mail dated 23rd August 2005 refers.

Please be advised that authority is granted for you to undertake a research study "An Assessment of the Level of Knowledge of Diabetics and Primary Health Care Providers in a Primary Health Care Setting, on Diabetes Mellitus", at KwaMashu Polyclinic, Kwa-Dabeka Clinic, Addington Clinic and Osindisweni Hospitals, provided that :-

(a)   Prior written approval is obtained from the Head of the institutions concerned;

(b)   The interviews are conducted outside the target group's hours of duty;

(c)   There is no disruption of service delivery and patient care is not compromised;

(d)   Confidentiality is maintained;

(e)   The Department is acknowledged; and

(f)   The Department is provided with a copy of the report on completion.

Yours faithfully

SUPERINTENDENT-GENERAL 01.09.05
HEAD : DEPARTMENT OF HEALTH
KWAZULU-NATAL

Umnyango Wezempilo   *Departement van Gesondheid*

APPENDIX 3: Patient Questionnaire (English and isiZulu)

DIABETES PATIENT QUESTIONNAIRE

Male☐Female☐   DOB: ………

Home language: ………. Race: ……………….

Place of residence (township):………………………

Section A (place a tick in the blocks below where applicable)

1.How long have you had diabetes mellitus ?

less than one year ☐ 1-5years ☐   5-10years ☐ more than 10 years ☐

2. Are you on:

☐ tablets for treating your diabetes
Please tick which tablet/s you are on :   Glibenclamide   ☐
                                               Gliclazide   ☐
                                               Metformin   ☐
                                               Other:……………..
                                               …………………….

☐ insulin for treating your diabetes
Please state which insulin you are on: …………………….
                                              …………………….

3. When was your last blood glucose test done?
1 week ago ☐ 1month ago ☐3-6months ☐   More than 6months ago ☐

4. Are you informed of your blood glucose levels whether it was high
or low?   Yes ☐   No ☐

5. What advice were you given based on your blood glucose levels?
Diet ☐   exercise ☐   ↑/↓ dose of medication ☐   Nil ☐

6. What other tests are done for you on the visit to the clinic?

Blood pressure	monthly ☐	6monthly ☐	yearly ☐	never ☐
Eye test	monthly ☐	6monthly ☐	yearly ☐	never ☐
Foot examination	monthly ☐	6monthly ☐	yearly ☐	never ☐
Kidney test	monthly ☐	6monthly ☐	yearly ☐	never ☐
Cholesterol test	monthly ☐	6monthly ☐	yearly ☐	never ☐
Liver function test	monthly ☐	6monthly ☐	yearly ☐	never ☐

SECTION B (Circle only one answer for each question below)

1. When someone with diabetes has an increased heart rate, starts to sweat and tremor, he or she has:

    a. Low blood sugar

    b. High blood sugar

    c. Do not know

2. What do you think is a high value for a blood sugar test?

    a. less than 4

    b. 4 -7

    c. 7-11

    d. more than 11

3. Which of the following should be used to treat low blood sugar?

    a. glass of water only

    b. 2 or 3 sweets

    c. 1 glass of diet soda

    d. peanut butter

4.1 Potatoes are:
rich in carbohydrates ☐   low in carbohydrates ☐   do not know ☐

4.2 Phuthu is:
rich in carbohydrates ☐   low in carbohydrates ☐   do not know ☐

5. Foods rich in fat increases your risk of:

    a. kidney disease

    b. heart disease

    c. eye disease

6. Can diabetes cause:

6.1 blindness?	Yes ☐	No ☐	Don't know ☐
6.2 kidney disease?	Yes ☐	No ☐	Don't know ☐
6.3 asthma?	Yes ☐	No ☐	Don't know ☐
6.4 cancer?	Yes ☐	No ☐	Don't know ☐
6.5 a heart attack?	Yes ☐	No ☐	Don't know ☐

7. For a person with diabetes, what effect does exercise have on blood sugar?

    a. raises it

    b. lowers it

    c. has no effect

8. The best way to take care of your feet is:

    a. inspect and wash them each day

    b. massage them with alcohol each day

    c. soak them for one hour each day

    d. buy shoes a size larger than usual

9. Is there any other treatment you take for your treating your blood sugar other than the medication you receive from the clinic?

....
....
....
....
....

I-QUESTIONNAIRE YEZIGULI EZINOSHUKELA

Ubulili : Male[i]Female[i]   Usuku lokuzalwa: ………

Ulimi lwasekhaya: ……….   Uhlanga: ……………..

Indawo Yokuhlala(ilokishi):……………………….

Section A (khetha impendulo evumelana nawe)

1.Sekuyisikhathi esingakanani unoshukela?
Ngaphansi konyaka ☐   1-5 yeminyaka ☐ 5-10yeminyaka ☐
ngaphezulu kweminyaka eyishumi ☐

2. Ingabe uthatha :
☐ amaphilisi okwelapha isifo sikashukela
Khetha amaphilisi owathathayo :   Glibenclamide   ☐
                                          Gliclazide   ☐
                                          Metformin   ☐
                                          Amanye:……………….
                                          …………………….
☐ I-insulin ukwelapha isifo sikashukela
Yisho ukuthi nhloboni ye-insulin oyisebenzisayo:…………………
                                          …………………….
                                          …………………….

3. Wagcina nini ukuhlola izinga le-glucose egazini lakho?
Esontweni elledlule ☐   enyangeni eyedlule ☐
ezinyangeni ezintathu kuya kweziyisithupha ezedlule ☐
ngaphezu kwezinyanga eziyisithupha ezedlule ☐

4. Unalo ulwazi lokuth uneglucose engakanani egazini lakho, iphansi noma iphezulu blood?
        Yebo ☐   Cha ☐

5. Iziphi izeluleko owazinikwa mayelana namazinga e-glucose egazini lakho?
Ukudla ⁚   ukuzilolonga ⁚   ↑/↓ isikalo semithi | lutho |

6. Yikuphi okunye ukuhlolwa okwenziwa emtholampilo uma uvakashele khona?

I-Blood pressure ngenyanga ☐ ezinyangeni eziyisithupha☐ ngonyaka☐ akukaze ☐

Ukuhlolwa kwamehlo ngenyanga ☐ ezinyangeni eziyisithupha☐ ngonyaka ☐ akukaze ☐

Ukuhlolwa kwezinyawo ngenyanga ☐ ezinyangeni eziyisithupha☐ ngonyaka ☐ akukaze ☐

Ukuhlolwa kwezinso ngenyanga ☐ ezinyangeni eziyisithupha☐ ngonyaka ☐ akukaze ☐

Ukuhlolwa kwe-cholestorol ngenyanga ☐ ezinyangeni eziyisithupha☐ ngonyaka ☐ akukaze ☐

Ukuhlolwa kwesibindi ngenyanga ☐ ezinyangeni eziyisithupha ngonyaka ☐ akukaze ☐

SECTION B (Khetha impendulo eyodwa kulemibuzo engezansi)

1. Uma umuntu onoshukela eqala eshayelwa inhliziyo ngamandla, ajuluke abe nedumbe lomuntu usuke eno:

   a.Shukela ophansi (Low blood sugar)

   b.Shukela ophezulu(High blood sugar)

   c.Angazi

2. Ucabanga ukuthi yiliphi iznga likashukela egazini eliphezulu?

a.Ngaphansi kuka -4

b.Kusuka ku- 4 – kuya ku-7

c.Kusuka ku-7- kuya ku-11

d.Ngaphezulu kuka-11

3. Yikuphi kulokhu okulandelayo okufanele kusetshenziswe ukwelapha ushukela ophansi?

a. Ingilazi yamanzi

b. Amaswidi amabili noma amathathu

c. 1 ingilazi ye-diet soda

d. ibhotela lamantongomane (peanut butter)

4.1 Amazambane:
anama-carbohydrates aphezulu ☐ anamacarbohydrates aphansi ☐ angazi ☐

4.2 UPhuthu :
lunama-carbohydrates aphezulu ☐ lunama-carbohydrates aphansi ☐ angazi ☐

5. Ukudla okunamafutha amaningi kwenyusa ingozi:

   a. yesifo sezinso

   b. yesisfo senhliziyo

   c. yesifo samehlo

6. Ingabe ushukela ungakubangela:

6.1 ukungaboni?   Yebo ☐   Cha ☐   Angazi ☐

6.2 isifo sezinso?   Yebo ☐   Cha ☐   Angazi ☐

6.3 I-asthma?   Yebo ☐   Cha ☐   Angazi ☐

6.4 umdlavuza/cancerr?   Yebo ☐   Cha ☐   Angazi ☐

6.5 I-heart attack?   Yebo ☐   Cha ☐   Angazi ☐

7. Kumuntu onoshukela, ukuzilolonga kuba namuphi umphumela?

   a. kuyawuphakamisa

   b. kuyawehlisa

   c. akunamphumela

8. Indlela engcono yokunakekela izinyawo zakho:

   a. ukuzihlola uzigeze nsuku zonke

   b. ukuthela uzihlikihle ngogologo

   c. ukuzicwilisa emanzini nsukuzonke

   d. ukuthenga izicathulo eziwusayizi othe xaxa

9. Ingabe ikhona enye indlela ozelapha ngayo isifo sikashukela ngale kwalena yemithi yasemtholampilo?

....
....
....
....

APPENDIX 4: Patient Informed Consent (English and isiZulu)

PATIENT INFORMATION LEAFLET

You are being invited to participate in a questionnaire based study, details of which are as follows:

1. QUESTIONNAIRE

    The questionnaire contains two sections. The first obtains a brief patient history on the disease state and the second is to test basic knowledge concerning diabetes mellitus.

2. PURPOSE OF THE STUDY

    The purpose of the study is to see how much the patient knows on diabetes mellitus. Their understanding of the management and treatment of the disease and the long term complications that may arise.

    This study has been approved by the Biomedical Research Ethics Committee of the University of Kwa-Zulu Natal (Nelson R. Mandela School of Medicine) and the Department of Health, KZN.

3. WHAT WILL BE EXPECTED OF YOU

    All that would be expected of you is to fill in a short questionnaire. You can choose to fill it on your own or have the administrator of the questionnaire assist you in filling out your chosen answers.

4. RISKS

    There are no risks to this study. Only your time is required.

5. BENEFIT

    Your voluntary particpation in this trial will help in improving the management of diabetes mellitus. The results of the study will be forwarded to the Department of Health and recommendations will be made which areas of attention are important when managing diabetes patients.

6. CONFIDENTIALITY

Your medical history and results of your basic knowledge test will remain strictly confidential during the study.

7. FINANCIAL CONSIDERATIONS

There will be no financial benefits or costs to you or your family for participating in this trial.

8. OBTAINING INFORMATION

You are entitled to ask questions regarding this study and you can contact Mr L. Moodley at 084 2777062 (Cell) or 031 204 2395(W)).

You may contact the Chairperson of the Biomedical Research Ethics Committee at the Nelson R Mandela School of Medicine at 031-260 4604 if you have questions about your rights as a research subject.

9. WITHDRAWAL

Your participation is voluntary and you are free to withdraw from this trial at any time without it affecting the quality of care and medication that you received from the hospital/clinic currently.

Ikhasi Ngolwazi Ngocwaningo

Uyamenywa ukuba uzimbandakanye nalolucwaningo, imininingwane imi ngaloluhlobo:

1. I-QUESTIONNAIRE

I-questionnaire iqukethe izingxenye ezimbili contains two sections. Eyokuqala idinga umlando ngesiguli kanti eyesibili ihlola ulwazi olukhona esigulini ngesifo sikashukela..

2. Inhloso yocwaningo

Inhloso yalolucwaningo ukubheka ulwazi olukhona ezigulini ngesifo sikashukela. Lapha kubalwa ukudlondlobala kwaso, ukuphathwa kwaso kanye nezinkinga ezingaba khona.Ulwazi luwumgogodla wokwelashwa kwalesifo, lolucwaningo lubheke ukuqondisisa mayelana nobudlelwane phakathi kolwazi lweziguli ngesifo kanye nokuphathwa kwendlela yokuhlengwa kweziguli.

Lolucwaningo lugunyazwe i Biomedical Research Ethics Committee yase University of Kwa-Zulu Natal kanye noMnyango wezeMpilo, eKZN

3. KUZODINGEKANI KUWE ?

Okuzodingeka kuwe ukuba ugcwalise iquestionnaire emfishane. Ungakhetha ukuyigcwalisa wedwa noma ucele usizo ekugcwaliseni izimpendulo ozikhethile.

4. IZINGOZI

Akunazingozi kulolucwaningo kodwa kudingeka isikhathi sakho kuphela.

5.UMVUZO

Ukubamba kwakho iqhaza kulolucwaningo kuzosiza ekuphuculeni indlela okuphathwa ngayo lesisifo sikashukela.Your participation in this trial will help in improving the management of diabetes mellitus. Imiphumela yalolucwaningo izodluliselwa eMnyangweni WezeMpilo wesifunda kanye neziphakamiso ezitholakele.

6. UKUDALULWA KOLWAZI

Umlando wakho kanye nolwazi lwakho kuzohlala kuyimfihlo ngesikhathi sokwenziwa kocwaningoYour medical history and results of your basic knowledge test will remain strictly confidential during the study.

7. EZEZIMALI

Akukho nzuzo ngokwezezimali ezotholwa nguwe noma umndeni wakho ngokuzimbandakanya kwakho nalolucwaningo.

8. UKUTHOLAKALA KOLWAZI

Unegunya lokubuza imibuzo mayelana nalolucwaningo. Ungathintana noMr L. Moodley ku 032 5333701 (H) or 031 204 2395(W).

9. UKUHOXA

Ukuzimbandakanya kwakho kulolucwaningo akuphoqelekile kanti unelungelo lokuhoxa noma yinini kulolucwaningo ngale kokuzibeka esimweni esiyinkinga ngokwesifo sikashukela.

INFORMED CONSENT FORM (PATIENT)

TITLE OF RESEARCH PROJECT

AN ASSESSMENT OF THE LEVEL OF KNOWLEDGE OF DIABETICS AND PRIMARY HEALTH CARE PROVIDERS IN A PRIMARY HEALTH CARE SETTING, ON DIABETES MELLITUS.

NAME OF SUPERVISOR : PROF V RAMBIRITCH

PARTICIPANTS ALLOCATED NUMBER: ....

PLEASE TICK THE APPROPRIATE ANSWER

1. **Have you read the research information sheet?**

YES   NO

2. **Have you had an opportunity to ask questions regarding the study?**

YES   NO

3. **Have you received satisfactory answers to your questions?**

YES   NO

4. **Have you had an opportunity to discuss the study with your researcher?**

YES   NO

5   **Have you received enough information about this study?**

YES   NO

6   **Do you understand the implications of the study?**

YES   NO

7   **Do you understand that you are free to withdraw from this study at anytime and without giving reasons for withdrawing?**

YES   NO

8   **Do you agree to voluntarily participate in the study?**

YES   NO

9   **Do you understand that you have the right to anonymity and confidentiality?**

YES   **NO**

If you have answered "NO" to any of the above, please obtain the information before signing.

I ....hereby give consent for the proposed study on me as part of the above mentioned research project.

Participant's Name:.........................   **Signature:**......................

Witness Name:...............................   **Signature:**......................

Researcher's Name: Mr LM Moodley   **Signature:**......................

M.Clin Pharm Student

UKZN

I-FORM LOKUNIKEZA IMVUME

ISIHLOKO SOCWANINGO

UKUHLOLWA KWEZINGA LOLWAZI EZIGULINI EZIPHETHWE ISIFO SIKASHUKELA MAYELANA NESIFO ESIBAPHETHE KANYE NOKUXHUMANA KWALO NEQOPHELO LOKWELASHWA ABAKUTHOLAYO.

IGAMA LIKAMELULEKI : PROF V RAMBIRITCH

INOMBOLO YALOWO OBAMBE IQHAZA:

KHETHA IMPENDULO EVUMELANA NAWE

1. Usulifundile ikhasi elichaza ngocwaningo?

YEBO   CHA

2. Ulitholile ithuba lokubuza imibuzo mayelana?

YEBO   CHA

3 Ingabe ugculisekile ngezimpendulo ozitholile?

YEBO   CHA

4 Ulitholile ithuba lokubonisana nomcwaningi ngalolucwaningo?

YEBO   CHA

5 Ingabe uthole ulwazi olwanele ngalolucwaningo

YEBO   CHA

6 Ingabe uyayiqonda imiphumela yalolucwaningo?

YEBO   CHA

7 Ingabe uyazi ukuthi unelungelo lokuhoxa kulolucwaningo ngale kokubeka izizathu zokuhoxisa kwakho?

YEBO   CHA

8. Ingabe uyavuma ukuzimbandakanya nalolucwaningo ngokuthanda kwakho?

YEBO   CHA

9. Ingabe uyazi ukuthi unelungelo lokuthi ungagagulwa futhi nokugodlwa kwemininingwane yakho?

YEBO   CHA

Uma uphendule wathi "CHA" kweminye yemibuzo engenhla, thola ulwazi ngaphambi kokusayina.

Mina ....ngiyagunyaza lapha ucwaningo oluzokwenziwa ngami njengengxenye yocwaningo lonkana.

Sayina lapha wena oyingxenye yocwaningo :.......................

Sayina lapha uma ungufakazi noma umngani wocwaningwayo (uma engakwazi ukuzisayinela).......................

Igama lomcwaningi : Mr LM Moodley   Signature:.......................

M.Clin Pharm Student

UKZN

APPENDIX 5: Nurse Questionnaire (English and isiZulu)

QUESTIONNAIRE FOR HEALTH PERSONNEL

DATE OF BIRTH: ....

DEGREE/ DIPLOMA: .... **YEAR OF QUALIFICATION:** ....

(PLEASE PLACE A TICK TO YOUR SELECTED ANSWER BELOW)

1. Have you had post-basic training on diabetes mellitus?   yes ⁱ   no ⁱ
If yes, please state the type of qualification: ....

2. How would you rate your understanding on the following regarding diabetes mellitus?

Pathophysiology	Poor □	Good □
Treatment regimens	Poor □	Good □
Management	Poor □	Good □
Complications	Poor □	Good □

3. Do you think your patients understand this disease (diabetes)? yes ⁱ   no ⁱ

4. Have often have you been able to counsel your patients on the following?

4.1 proper diet	monthly □	3monthly □	6monthly □	yearly □
4.2 exercise	monthly □	3monthly □	6monthly □	yearly □
4.3 compliance with medication	monthly □	3monthly □	6monthly □	yearly □
4.4 foot care	monthly □	3monthly □	6monthly □	yearly □

5. Have you counseled your patients to recognise the symptoms of: ?

5.1 hyperglycaemia	sometimes □	always □
5.2 hypoglycaemia	sometimes □	always □

6. Have you taught your patients how to prevent and treat the above symptoms?
                    sometimes □   always □

7. Have you encouraged your patients to self-monitor their blood glucose levels?
                    sometimes □   always □

8. Do they present a diary of their self-monitored glucose test results to you?
                    sometimes □   always □

Comments : If you have any specific comments to the questions raised above, please indicate here :
....
....
....
....

QUESTIONNAIRE YABASEBENZI BEZEMPILO

USUKU LOKUZALWA:

DEGREE/ DIPLOMA :   **UNYAKA EYATHOLWA NGAWO:**

(KHETHA OKUKODWA LAPHA NGEZANSI)

1.Sewuke wathola ukuqeqeqshwa okuthe xaxa ngesifo sikashukela?
      Yebo   □   Cha   □
      Uma uthi yebo chaza ngokohlobo lwe-qualification :
....

2. Ulubona lunjani ulwazi lwakho ngalezizihloko mayelana nesifo sikashukela?

Pathophysiology	luncane	□	lukhulu □
Treatment regimens	luncane	□	lukhulu □
Management	luncane	□	lukhulu □
Complications	luncane	□	lukhulu □

3. Ucabanga ukuthi iziguli ziyazi ngalesifo sikashukela)?   yes ⌐   no ⌐

4. Uke wakhona ukweluleka iziguli zakho ngalokhu okulandelayo?

4.1 Ukudla ngendlela efanele   nyangazonke □   ezinyangeni ezintathu □
                                       ezinyangeni eziyisithupha □   minyaka yonke□
4.2 Ukuzilolonga   nyangazonke □   ezinyangeni ezintathu □
                                         ezinyangeni eziyisithupha □   minyaka yonke□

4.3 Ukuthathwa kwemithi   nyangazonke □   ezinyangeni ezintathu □
                                         ezinyangeni eziyisithupha □   minyaka yonke□

4.4 Ukunakekelwa kwezinyawo   nyangazonke □   ezinyangeni ezintathu □
                                         ezinyangeni eziyisithupha □   minyaka yonke□

5. Usuke waluleka iziguli ngokubona izimpawu zalokhu okulandelayo : ?
5.1 hyperglycaemia   ngesinye isikhathi □   njalo □
5.2 hypoglycaemia   ngesinye isikhathi □   njalo □

6. Usuzifundisile iziguli zakho ukuvikela nokwelapha lezimpawu ezingenhla?

                                             ngesinye isikhathi ⌐   njalo ⌐

7. Sewuke waqguqguzela iziguli zakho ukuba zibheke amazinga kashukela egazini?

ngesinye isikhathi ☐ njalo ☐

8. Ingabe bakunika imiphumela yokuzihlola I-glucose abazenzela bona bebodwa?

ngesinye isikhathi ☐ njalo ☐

Imibono : Uma unemibono ethize mayelana nemibuzo engenhla, yibhale lapha :
....
....

APPENDIX 6: Nurse Informed Consent (English)

SECTION 4 :NURSE INFORMATION LEAFLET

You are being invited to participate in a questionnaire based study, details of which are as follows:

1. QUESTIONNAIRE

   The questionnaire contains nine questions of which all for the exception of one is multiple choice. This open ended question is reserved for any comments you may have to add with regards to th questions asked or the study as a whole.

2. PURPOSE OF THE STUDY

   This study aims to assess the understanding you have on the disease state of diabetes mellitus and its complications.

   This study has been approved by the "Ethics Committee" of the University of Kwa-Zulu Natal and the Department of Health, KZN.

3. WHAT WILL BE EXPECTED OF YOU

   All that would be expected of you is to fill in a short questionnaire. You can choose to fill it on your own or have the administrator of the questionnaire assist you in filling out your chosen answers.

4. RISKS

   There are no risks to this study. Only your time is required.

5. BENEFIT

   Your participation in this trial will help in improving the management of diabetes mellitus. The results of the study will be forwarded to the Department of Health and recommendations will be made which areas of attention are important when managing diabetes patients.

6. CONFIDENTIALITY

   Your identity and the answers from your questionnaire will remain strictly confidential during the study.

7. FINANCIAL CONSIDERATIONS

There will be no financial benefits or costs to you for participating in this trial.

8. OBTAINING INFORMATION

You are entitled to ask questions regarding this study and you can contact Mr L. Moodley at 084 2777062 (Cell) or 031 204 2395(W)).

8 WITHDRAWAL

Your participation is voluntary and you are free to withdraw from this trial at any time without it affecting in any way your employment at this clinic/hospital.

INFORMED CONSENT FORM (NURSE)

TITLE OF RESEARCH PROJECT

AN EVALUATION OF THE LEVEL OF KNOWLEDGE OF PRIMARY HEALTH CARE DIABETIC PATIENTS ON THEIR DISEASE.

NAME OF SUPERVISOR : PROF V RAMBIRITCH

PARTICIPANTS ALLOCATED NUMBER: ....

PLEASE TICK THE APPROPRIATE ANSWER

1. Have you read the research information sheet?

YES   NO

1. Have you had an opportunity to ask questions regarding the study?

YES   NO

2. Have you received satisfactory answers to your questions?

YES   NO

3. Have you had an opportunity to discuss the study with your researcher?

YES   NO

4. Have you received enough information about this study?

YES   NO

5. Do you understand the implications of the study?

YES   NO

6. Do you understand that you are free to withdraw from this study at anytime and without giving reasons for withdrawing?

YES   NO

7. Do you agree to voluntarily participate in the study?

YES   NO

8. Do you understand that you have the right to anonymity and confidentiality?

YES   NO

If you have answered "NO" to any of the above, please obtain the information before signing.

I ....hereby give consent for the proposed study on me as part of the above mentioned research project.

Participant's Name:..........................   Signature:.......................

Witness Name:................................   Signature:.......................

Researcher's Name: Mr LM Moodley   Signature:.......................

M.Clin Pharm Student

UKZN