QUALITY OF DIABETIC CARE AT MUHIMBILI NATIONAL HOSPITAL DIABETIC CLINIC DAR ES SALAAM, TANZANIA

By

Kigocha Okeng'o

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CERTIFICATION

The undersigned certify that she has read and hereby recommend for examination of dissertation entitled **Quality Of Diabetic Care At Muhimbili National Hospital Diabetic Clinic Dar Es Salaam, Tanzania,** in fulfillment of the requirements for the degree of Master of Medicine (Internal Medicine) of Muhimbili University of Health and Allied Sciences.

Lutale

Prof. J. Lutale
(Supervisor)

Date: 1/12/10

DECLARATION
AND

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I, **Kigocha Okeng'o**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature.....Okengo..... Date....30/11/10....

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DEDICATION

This work is dedicated to my beloved husband Onesmo Zakaria Sigalla ,daughter Caroline Sigalla, and mother Nancy Okeng'o.

ABSTRACT

Background: Diabetes is a disease of increasing magnitude worldwide. It leads to acute and chronic complications, which are preventable if there is good diabetic care. Good diabetes care encompasses all good practice patterns, on how diabetic patients should be handled by clinicians and nurses, and good treatment strategies in order to treat and prevent diabetes related acute and chronic complications. Diabetic care can be assessed by several international indicators which have been put forward and improved.

Study objective: To assess the quality of diabetic care at Muhimbili diabetic clinic.

Methodology: This study was a descriptive cross sectional design, conducted at the diabetic clinic of Muhimbili National Hospital, Dar-es-Salaam, Tanzania. The study population was diabetic patients attending the diabetic clinic for the past twelve months or more. The three hundred and eighty three subjects were obtained by systematic sampling technique. Enrolled patients were interviewed through a structured questionnaire. Of the enrolled patients fifty two had their HbA1c measured.

To assess the quality of diabetes care, proportion of patients with their blood glucose, blood pressure, during the current and the previous one visit was determined. Proportion of patients who had records of serum cholesterol, and HbA1c over the past one year was assessed. Proportion of patients who had feet examination, who were given diabetic education, and who had complications like diabetic foot, kidney disease, stroke over the past one year, was also determined.

Results: The majority of the study participants were females 232 (60.6%) with a median (range) age of 47 (4-88) years. Fifty five percent of patients were married and forty eight percent were employed. Proportion of patients with blood sugar measurements on the current visit and previous one visit were 96.8% and 93.7% respectively. Four percent of patients and 3.2% of patients had records of HbA1c and cholesterol measurement respectively. More than

60% of patients had received education on diet, insulin, oral hypoglycemic drugs, foot care and physical exercises. Blood pressure was measured in 68.9% and 31.6% of patients on the current and previous one visit respectively. Blood glucose levels were found high (fasting blood glucose ≥ 6.1 mmol/l and random blood glucose ≥ 11.1 mmol/l in 67.6% of patients during their current visit and especially in those who were aged more than 40 years 47.8% , who were females (59.4%) , were married (59.4%) , and employed 47% . None of the patients with records of HbA1c measurements had reached the target levels of ≤ 6.5% and none of the 52 patients who had their HbA1c measured had reached the target level. Eighty percent of patients with records of cholesterol measurements had target levels < 5.2 mmol/l. On the current visit, 61.7% had diastolic blood pressure less than 80mmHg and 58% had systolic blood pressure less than 130 mmHg, on the previous one visit 37.2% had systolic blood pressure less than 130mmHg and 47.9% had diastolic blood pressure less than 80mmHg. Feet examination was never done in 69.5%of patients. Seven percent of patients had kidney disease, 2.9% had stroke, and 1.8% had diabetic foot.

Conclusion and recommendations

The quality of diabetic care at the Muhimbili Diabetic Clinic was quite satisfactory in terms of blood glucose measurements, diabetic education on diet and foot care. However the quality of diabetes care was not adequate enough in terms of proportion of patients with good or satisfactory blood glucose control, cholesterol and HbA1c measurements, and feet examination .Quality of care assessed using proportion of patients with records of cholesterol measurements and good cholesterol levels was very low. International and national diabetes guidelines need to be made more accessible to the attending medical personnel to remind about attained quality of diabetes care in their clinic and areas which they need to put more efforts to improve.

More interventions for those above forty years of age and married are warranted to improve their glycemic control.

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ABBREVIATION

AACE	American Association of Clinical Endocrinologists
ACE	American College of Endocrinology
ACEI	Angiotensin Converting Enzyme Inhibitor
ADA	American Diabetes Association
BP	Blood Pressure
CHD	Coronary Heart Disease
DBP	Diastolic blood pressure
DM	Diabetes Mellitus
ESRD	End Stage Renal Disease
FBG	Fasting blood glucose
HbA1c	Glycosilated hemoglobin
IDF	International Diabetes Federation
KCCO	Kilimanjaro Centre for Community Ophthalmology
LDL	Low Density Lipoprotein
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health And Allied Sciences
OHGD	Oral Hypoglycemic Drugs
NICE	National Institute for Clinical Excellence
NDEP	National Diabetes Education Program
RBG	Random blood glucose
SBP	Systolic blood pressure
SD	Standard Deviation
SSA	Sub-Saharan Africa
UKPDS	United Kingdom Prospective Diabetes Study

CHAPTER ONE

1.0 INTRODUCTION

1.1 Prevalence and burden of diabetes

Diabetes is a serious condition for the individual and society. Its rapidly increasing global prevalence is a significant cause of public health concern. The number of people with diabetes is expected to increase alarmingly in the coming decades. In 1985, an estimated 30 million people worldwide had diabetes; in 2000, a little over a decade later, the figure had risen to over 150 million. By 2025, the figure is expected to rise to 380 million. The International Diabetes Federation (IDF) estimates that the equivalent of an additional 23 million years of life are lost to the disability and to reduced quality of life caused by the preventable complications of diabetes[1].

Africa is not spared and is in the grip of this epidemic with a prevalence of 1% in rural areas and 1-6% in urban areas, with its load of complications like diabetic retinopathy of any grade varying from 16 to 77% and the severe form of retinopathy representing 15% of all cases. Furthermore, 21-25% of type 2 patients and 9.5% of type 1 patients have retinopathy at diagnosis[2]. Moreover, the image is also bleak for complications like nephropathy which vary between 32-57% after a mean duration of diabetes of 5-10 years, and 5-28% within the first year following the diagnosis of diabetes[3]. In resource-limited countries like Tanzania, the prevalence of diabetes among 20 years of age and above was 1.6% in 1984 [4, 5]. A study done thirteen years later in Dar es Salaam revealed an increase in the prevalence of diabetes to 3.8 % in men and 2.9 % in women, in urban population[6].

This disease burden can be alleviated if good quality care of diabetes is offered to patients, in terms of prompt good treatment, prevention of the disease and its complications. Numerous randomized controlled trials have clearly demonstrated the benefits of meticulous glycemic control, aggressive blood pressure control, control of lipid abnormalities, and aspirin therapy on prevention of diabetic complications. The United Kingdom Prospective Diabetes Study (UKPDS) in type 2 patients, for instance, revealed that tight blood pressure control in type 2

diabetes had a 37% reduction in risk of microvascular disease compared to the less tight control [7].

1.2 Diabetes care

Diabetes care is defined as a field in which there is an international convergence, on good practice patterns, on how patients should be handled by clinicians and nurses, and what should be the treatment outcome in order to prevent acute and chronic complications. Diabetes is a lifelong disease, and ideally good diabetes care should aim at reducing the morbidity and mortality caused by diabetes and its complications through programs that increase awareness of the seriousness of the disease and the value of its treatment and prevention.

The components of good diabetes care primarily include identifying people at high risk for diabetes as well as those who are undiagnosed, and treating them appropriately. The secondary component includes providing education for diabetes self-care to already diagnosed patients and their relatives, which is an ongoing patient -based care centered on accurate information. The third component includes monitoring glycaemic control, cholesterol levels and blood pressure and keeping them to near normal as possible. Thus, this comprehensive care can significantly lower risks for short-term and long-term diabetes complications[8].

Many excellent healthcare professionals, care policies and treatments are available, yet only a very small proportion of people with diabetes are able to benefit fully from them. There have been remarkable improvements in treatment protocols like the National Diabetes Education Program (NDEP) and the International Diabetes Federation (IDF) management guidelines, including laboratory tests and testing intervals. Nonetheless, less dramatic improvements in risk factor control such as good blood pressure, glycemic, or lipid control are being reported. For instance, a study done in the United States in 2000 revealed that only 7.3% of adults with diabetes attained the recommended goals of HbA1c level of less than 7%, blood pressure level of less than 130/80 mmHg and total cholesterol level of less than 200 mg/dL[9]. A study done in the year 2007 at Kilimanjaro Christian Medical Center (KCMC), a northern zone referral

hospital in Tanzania, revealed that only 29% of diabetic patients attending the diabetic clinic regularly had eye examination done in the past year they had attended the clinic. [10] A study done in 2002 at the Muhimbili National Hospital (MNH), a national referral hospital in Dar es Salaam in Tanzania showed that almost none of the diabetic patients monitored their own blood glucose due to lack of glucose monitoring machines and or glucosticks at home[11]. Levitt et al in South Africa documented under recording of complications and a high prevalence of suboptimal glycemic (51.6%) and blood pressure control at a primary care level[12].

There are various reasons for poor diabetes care. In sub-Saharan African (SSA) countries for instance, it is estimated that more than 80% of people live below the poverty line. Populations have great difficulties in meeting basic living needs, including health services. The direct and indirect costs of diabetes are high; thus most people with diabetes simply cannot afford to manage it properly. Drugs like insulin are sold at prices that are prohibitive for many. As a result, some people with diabetes do stop treatment, reduce their dose or shift to cheaper - but unsuitable- oral medication and traditional remedies. Moreover, the unavailability of refrigerators and problems with the supply of electricity (also sold at high prices) make the storage of insulin a challenge. Additionally, in SSA where about 80% - 90% of healthcare system is provided by traditional medicine, many people with diabetes often choose herbal remedies of unproven efficiency and safety, and substitute the care they receive from diabetic clinics and hospitals with treatment from traditional healers[13].

Poor diabetes care is also affected by the lack of basic education. In most sub-Saharan countries there is a deficiency in diabetes education. Every day, the health workers who are involved in diabetes care see people whose beliefs and practices adversely affect the management of their condition. In general, the concept of a chronic disease as an asymptomatic condition is not well understood. In Sudan for instance, it has been documented that people with diabetes tend to cease treatment once acute symptoms, such as polyuria and polydipsia are relieved; believing that their diabetes has been 'cured '. In a belief system in

which diseases are considered the 'will of God', people perceived the emergence of disabling complications as 'fate', rather than an avoidable outcome of poor diabetes control[14].
Furthermore, fear of hypoglycemia has also been reported as a major reason for poor metabolic control because the patient prefers to have a slightly too high than low blood glucose. Injection-related anxiety or needle phobia is also implicated and is associated with higher levels of anxiety, depression, and phobic symptoms[15]. In countries like Sudan were 10% of hospital mortality are due to diabetes, poor diabetes care was considered to be due to severe lack of personnel with even minimal specific diabetic education, with fields like podiatry being unknown. Poorly equipped, critically understaffed, few public diabetic care centers were also incriminated; with the few diabetologists available doing general medicine, and dedicated to teaching[14].

Diabetes self-care requires life-long commitment, and requires modification of one's personal life-style. The term "diabetes self-management" emphasizes the responsibility and role of the patient him/herself in managing the diabetes. There are many reasons for poor diabetes self-care such as stress, lack of time, being away from home, lack of a convenient place to exercise, lack of family support, smoking and living alone. A Finnish study documented 68% of diabetic patients reporting difficulties with the control of smoking, 58% with weight regulation, 54% with exercise and 49% with diet, and only 10% with insulin injections[16].

1.3 Measures of quality of diabetes care

Diabetes care will not improve significantly, especially in the face of this growing pandemic, unless a solid foundation of knowledge has been built about the extent and effectiveness of care today. Only when outcomes are measured and evaluated can weaknesses in strategies, treatment methods and care systems be diagnosed and improvements made.

One of the important components in improving diabetes care is the continuous measurement and monitoring of the preventive and treatment goals of the disease and its complication on international, national, regional and local levels across countries. This eventually enables

national target setting and benchmarking of clinics to identify best-practices and develop the "constructive" competition needed to drive change. In order to measure quality of diabetes care, a number of international indicators were put forward by the International Diabetes Federation and the Organization for Economic Cooperation and Development (OECD) in 2006 [17,18]. These are grouped into indicators assessing the process of diabetes care, indicators assessing the treatment outcomes and indicators assessing the magnitude of diabetes complications.

1.3.1 Indicators of processes of care

Assessment of the process of diabetes care has been summarized to include seven indicators as shown in the table below.

Indicators of processes of care.

Processes of Care Measured by the :
1. Percentage of people with blood pressure measured at every visit
2. Percentage of patients with one or more HbA1C *measured annually
3. Percentage of patients receiving at least one foot examination annually
4. Percentage of patients who received a dilated eye examination or evaluation of retinal photography by an ophthalmologist or optometrist during the current year or during the prior year if the patient is at low risk of retinopathy
5. Percentage of patients with at least one LDL** cholesterol test annually
6. Percentage of patients with at least one test for microalbumin during the measurement year or who had evidence of medical attention for existing nephropathy
7. Percentage of patients educated in one year on diabetic education

*HbA1C : glycated hemoglobin; **LDL: low-density lipoprotein

Indicators which show the processes of diabetes care include blood pressure (BP) measuring at every visit. Intensive control of BP in patients with diabetes reduces diabetes complications and diabetes-related deaths. Blood pressure should be measured annually, and at every routine clinic visit if found to be above target levels (> 130/80mmhg). Where it is elevated, there should be evidence of action to lower it[19].

HbA1c is a good indicator of glycemic control and good glycemic control reduces the risk of micro and macro vascular complications[20]. The American Association of Clinical Endocrinologists/American College of Endocrinology (AACE/ACE) recommends that HbA1c be performed during initial and follow-up assessments, which should occur at no longer than 3 months intervals[21].

Feet examination is another indicator of the process of diabetes care .Feet examination should be dor on patients with neuropathy at every visit. Comprehensive foot care programs can reduce amputatic rates by 45% to 85%. Since major foot amputations result in large decreases in quality of life; they ma be considered to be an indication of failure of diabetes care [22].

All patients newly diagnosed with diabetes should be screened for retinopathy. The International Diabetes Federation (IDF) recommends at least once per year eye check up. The Diabetes Control and Complications Trial (DCCT) revealed that intensive therapy reduced the mean risk of retinopathy by 76% among type I patients [23].

Patients with diabetes mellitus are more likely to develop macrovascular complications associated with the disease and are at an increased risk of morbidity and mortality resulting from it. Hence high level risk factors such as lipid levels should be monitored to prevent cardiovascular disease and stroke among patients with diabetes.

Education is another indicator of the quality of diabetes care and is not only about diabetic drugs, diet or foot care, but also should include education about regular exercises, decreasing obesity and on smoking cessation. NICE[19] recommends that structured patient education be made available to all people with diabetes at the time of initial diagnosis and then as required on an ongoing basis, based on a formal, regular assessment of need. It should also be provided by an appropriately trained multidisciplinary team to either groups of people or individuals with diabetes. The team should include, a diabetes specialist nurse (or a practice nurse with experience in diabetes) who has knowledge on the principles of patient education, a dietitian, and a podiatrician. Sessions should be accessible to the broadest range of people, taking into

account culture, ethnicity, disability and geographical issues, and could be held either in the community or at a local diabetes centre. Educational programmes should use a variety of techniques to promote active learning (engaging individuals in the process of learning and relating the content of programmes to personal experience), adapted wherever possible to meet the different needs, personal choices and learning styles of people with diabetes, and should be integrated into routine diabetes care over the longer term.

For the purpose of this study to assess the processes of diabetes care, we shall use five out of the seven indicators mentioned, namely:

i. The proportion of patients with HbA1c measured
ii. The proportion of patients with cholesterol measured
iii. The proportion of patients with blood pressure measured during the current and one previous visit
iv. The proportion of patients who received at least one foot examination
v. The proportion of patients who were educated on proper use of insulin and or oral hypoglycemic drugs

1.3.2 Indicators assessing the treatment outcome

The quality of diabetes care can also be assessed by determining the proportion of patients attending the health facility attaining good treatment outcomes.

Indicators of assessing treatment outcomes proposed by the IDF are shown in the table below.

Indicators of Assessing Treatment Outcomes.

1. Percentage of patients achieving the target HbA1c level < 6.5%
2. Percentage of patients achieving target blood pressure levels < 130/80 mmHg
3. Percentage of patients achieving target Cholesterol levels< 5.2 mmol/l
4. Percentage of patients achieving target Triglycerides levels < 1.7 mmol/l

A number of indicators assessing treatment outcome have been established, among them the glycated hemoglobin (HbA1c) .On the basis of data from multiple interventional trials, and the International Diabetes Federation (IDF), the target for good glycemic control should be HbA1c values less or equal to 6.5%[20]. At this HbA1c levels the risk of developing long term diabetes complications like nephropathy, retinopathy is remarkably reduced.

Blood pressure is another indicator used to assess the quality of diabetes care and the target BP should be less than 130/80 mm Hg , however if the patient has diabetes nephropathy the target BP should be less or equal to 120/75 mmHg. The percentage of people in whom blood pressure achieves the target level 130/80 mmHg can be ascertained, and also the proportion of those with blood pressure above the target who are receiving treatment involving lifestyle modification and drug therapy[19].

Persons with diabetes are at increased risk for life threatening macrovascular complications like stroke and coronary heart disease (CHD). Lowering serum cholesterol levels reduces the risk for these complications. IDF recommends that a fasting lipid profile be obtained during an initial assessment, and annually as part of the cardiac-cerebrovascular-peripheral vascular module, if the patient has a normal serum lipids profile. If the patient has an abnormal lipid profile or is on treatment it should be checked every 3- 6 months. Additionally the target serum total cholesterol level should be <5.2 mol/l, serum triglycerides <1.7 mol/l, and low density lipoprotein s (LDL) <2.6 mol/l.

For the purpose of this study to assess the quality of diabetes care using the treatment outcomes as proxy, three proportions will be assessed namely:

i. The proportion of patients achieving good glycaemic control as assessed by good glucose levels i.e : Fasting blood glucose: 4.1- 6.0 mmol/l and /or Random blood glucose: 4.1-11.0 mmol/l and HbA1c levels < 6.5%
ii. The proportion of patients achieving target blood pressure control of levels < 130/80 mmHg
iii. The proportion of patients achieving target cholesterol levels < 5.2 mmol/l

1.3.3 Indicators of complications

Another indicator of good diabetes care is by assessing the proportion of patients with diabetes related complications in that health care facility over a period of time. Three rates of diabetes complications have been suggested as shown in the table below.

Indicators of complications.

1. Rates of lower- extremity amputation
2. Rates of kidney disease in persons with diabetes
3. Rates of stroke in persons with diabetes

The extent of complications of diabetes such as end stage renal disease (ESRD), leg amputation, stroke, blindness , have been used to ascertain the quality of diabetes care .

Diabetes is the single most frequent cause of ESRD in industrialized countries .Research on the prevention and retardation of kidney disease in patients with diabetes has consistently shown that it is possible to prevent or retard kidney disease through blood glucose and blood pressure control, and the use of certain specific medications such as angiotensin converting enzyme inhibitors (ACE inhibitors).

Good blood glucose control has been reported by several studies to retard the development of nephropathy .Some cross sectional studies have however failed to demonstrate this correlation. For instance Lutale et al did a study in Dar es Salaam which didn't show a relationship between the level of glycemic control and microalbuminuria (incipient nephropathy). This was however a small cross-sectional study. Prevalence of micro and macroalbuminuria has also been found higher in African than Caucasians of the same diabetes duration suggesting a possibility of genetic or racial predisposition[24].

Two of the main complications of longstanding inadequate glycemic control or poor diabetes management are peripheral vascular disease, and peripheral neuropathy. The combination of those two complications put diabetics at great risk for lower extremity lesions. Careful monitoring and intensive treatment of both neuropathic and arterial disease of the extremities can prevent amputations.

For the purpose of this study, to assess the extent of diabetes related complications at Muhimbili National Hospital diabetic clinic, the proportion of patients with kidney disease, stroke, and diabetic foot will be used.

However indicators of diabetes care such as the indicators of treatment outcome and chronic diabetes complications are more difficult to use because these outcome are subject to the influences of other factors outside the control of health professionals. For instance, to achieve good glycemic control, patients must be able to buy drugs regularly, and conserve them properly. A patient with diabetic foot must be willing to wear adequate shoes, take good care of his foot at homc.

1.4 Problem Statement

Diabetes lowers average life expectancy by up to 15 years, increases cardiovascular disease risk two to four-folds, and is the leading cause of kidney failure, lower limb amputations, and adult-onset blindness worldwide. Good care can tremendously decrease the number of acute and chronic complications. Major effort is needed to improve provision of good diabetes care in the fight against diabetes, and regularly evaluating where we are succeeding and where we are failing.

The quality of diabetic care provided at the MNH diabetic clinic has never been systematically documented.

1.5 Rationale

Many deaths and complications of diabetes can be avoided if patients are managed optimally. In order to improve care, there is need to determine the quality of care given to patients attending the Diabetes Clinic at Muhimbili National Hospital given the paucity of data available.

The study intends to highlight not only the drawbacks but also the achievements in managing patients with diabetes at the Diabetes Clinic and suggest ways to improve it.

CHAPTER TWO

2.0 STUDY OBJECTIVES

2.1 Broad Objective

To assess the quality of diabetic care provided at Muhimbili diabetic clinic, Dar es Salaam Tanzania

2.2 Specific Objectives

1. To determine the proportion of patients having their blood glucose and blood pressure measured during the current and previous one visit
2. To determine the proportion of hypertensive patients achieving the target blood pressure of systolic blood pressure of less than 130 mmHg and /or diastolic blood pressure of less than 80 mmHg during the current visit
3. To determine the proportion of patients achieving target HbA1c < 6.5% and cholesterol levels of 2.0-5.2 mmol/l
4. To determine the proportion of patients who reported feet examination during the past one year
5. To determine the proportion of patients educated on insulin and oral hypoglycemic drug use, type of diet, foot care and physical exercises
6. To assess quality of care by the proportion of complications as reported by the patient (kidney disease, diabetic foot, stroke)
7. To determine the association between glycaemic control and social demographic features (age, sex, marital status, education, occupation)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design:

This was a descriptive cross-sectional study.

3.2 Study setting:

The study was conducted at the diabetic clinic of Muhimbili National Hospital (MNH). MNH is a main referral hospital and is also the teaching hospital of Muhimbili University of Health and Allied Sciences. MNH is situated in the eastern zone of Tanzania in the capital city Dar es Salaam.

It receives referral patients from all over the country, private hospitals and three district hospitals present in the city namely Amana, Temeke, and Mwananyamala hospitals. Diabetic clinics at Muhimbili National Hospital are held every Monday and Thursday. On Mondays it's for patients aged from 0 to 24 years, those using insulin presumably mainly type I patients .On Thursdays for those above 24 years, presumably mainly type 2 patients. The clinic receives about 100 patients per week. It's held in three rooms and run by two diabetologist, a visiting dietician, two pediatricians, three physicians, a resident in internal medicine, one senior nurse officer, one enrolled nurse, and two assistant nurses. Patients are followed up regularly at three to five months intervals for the Thursday clinic and monthly for the Monday clinic, and more regularly if requested by the attending doctor.

Patients attending the Monday clinic are fewer and supported by funds from International Diabetes Federation –children program and thus have their HbA1c measured once every three months, get a free monthly supply of insulin and syringes, a glucose self monitoring machine . They can come back and get free drug refill once the drugs are finished. They also get free 50 strips every three months.

Patients attending the Thursday clinic get a free one month supply of insulin, OHGD, and syringes from the main Muhimbili National Hospital pharmacy. Once the drugs are finished they have to buy them.

3.3 Study population

Diabetic patients attending the Muhimbili diabetic clinic.

3.4.1 Study duration

The study was conducted for nine months from May 2009 to January 2010.

3.4.2 Sample size calculation

Using the prevalence (47%) of patients with random blood sugar >11 mmol/l by Hoffmeister et al in northern Tanzania [26] , the sample size was calculated using the formula below:

$$N = \frac{z^2 P(1-P)}{\varepsilon^2}$$

Where N: sample size

z: critical value 1.96

P: prevalence

ε: maximum error (5%)

N= 383

3.6 Sampling procedure

Systematic sampling method was used to decrease selection bias, in which every 9^{th} patient was selected using the following formula:

k = population size (N) / sample size (n) = 9

N: population of patients attending the clinic for the past one year (from march 2008 to march 2009 (3613 patients))

= 3613/383

= 9^{th} patient

3.7 Inclusion criteria

All patients with diabetes who had attended the diabetic clinic for the past one year and who had consented to participate in the study were recruited.

3.8 Exclusion criteria

Patients with lost records

One hundred and ninety two patients were excluded due to lost records and attending the clinic less than a year.

3.9 Data collection and procedure:

Patients were recruited from the diabetic clinic on Mondays and Thursdays using systematic sampling procedure.

After the patients had been attended by the doctor, interviews were conducted using the questionnaire in appendix 2.

Blood pressure measurements were obtained from the patients folders.

A patient was considered with diabetic foot if he reported foot ulcers or blisters.

Duplicate enrolment was prevented by checking the patient's file number before enrolment.

Measures to audit education for people newly diagnosed with diabetes were done according to NICE recommendations [18].

The presence of a multidisciplinary team including at least a diabetes specialist nurse and a dietitian was assessed by looking at the staff registry. It was also assessed whether sessions were accessible to the broadest range of people, taking into account culture, ethnicity, disability and geographical issues. And whether they were given in Kiswahili, and made available to all people with diabetes at the time of initial diagnosis and then as required, on an ongoing basis, based on the formal, regular assessment of need by checking at the patients files.

3.10 Blood Tests

Records of HbA1c, blood glucose, and cholesterol levels were obtained from patients' files. Furthermore HbA1c levels were determined using DCA 2000 machine on every eighth patient due to budget restrictions. Thus 50 patients had their HbA1c levels checked. HbA1c test was done by preleving 2 mls of the patient's blood and submitting it to the DCA 2000 machine.

3.11 Ethical clearance

Ethical clearance to conduct the study was sought from Muhimbili University of Health and Allied Sciences (MUHAS) and ethical review board and permission to do the study was obtained from the hospital management.

Informed consent to participate in the study was obtained from potential study participants or parents/guardians of the participant if the participant was legally unable to make decisions.

Confidentiality was assured throughout the study.

Patients who were found with complications of diabetes, or poor glycemic control were managed accordingly to the prevailing treatment protocol.

3.12 Data entry, cleaning and analysis

Collected data was checked twice for completeness and consistency, errors or discrepancies were promptly corrected.

Data was entered into the computer using SPSS version 13 software and entry errors checked and corrected. Data was analyzed using SPSS version 13 and Epi info 2000 software was used to construct figures.

3.13 Definition of terms

a) Blood glucose categories

Capillary whole blood levels of fasting blood glucose and random blood glucose were used, and were categorized according to International Diabetes Federation [26] into low, normal or high blood glucose levels as shown below:

Normal or good blood glucose levels:	Fasting blood glucose: 4.1- 6.0 mmol/l and /or Random blood glucose: 4.1-11.0 mmol/l
Low blood glucose levels:	Fasting blood glucose: $\leq$ 4.0 mmol/l and /or Random blood glucose: $\leq$ 4.0 mmol/l
High blood glucose levels:	Fasting blood glucose: $\geq$ 6.1mmol/l and/or Random blood glucose: $\geq$ 11.1 mmol/l

b) Blood pressure categories

Blood pressure levels were categorized according to International Diabetes Federation into two categories of either normal or target blood pressure and high blood pressure as summarized below:

Normal (Target blood pressure): systolic blood pressure of less than 130 mmHg and /or diastolic blood pressure of less than 80 mmHg.

High blood pressure: systolic blood pressure equal or above 130 mmHg and/or diastolic blood pressure equal or above 80 mmHg.

c) Serum cholesterol categories

Serum cholesterol levels were categorized according to International Diabetes Federation groups into good or bad cholesterol levels , where as:

i. **Good cholesterol levels** were between: 2.0-5.2 mmol/l
ii. **Bad cholesterol levels** were : $\geq$ 5.3 mmol/l

d) Glycated hemoglobin (HbA1c)

HbA1c levels were categorized into either good or bad levels of glycemic control

i. **Good HbA1c level**: values equal or less than 6.5%

ii. **Bad HbA1c level**: values more than 6.5%

e) Diabetic clinic visits

i. **Current visit**: the visit the patient made on the day of the interview.

ii. **Previous one visit**: one visit before the current visit regardless of the interval between visits but mainly > 3 months apart.

3.14 Variables

3.14.1 Dependent variables:

The following **indicators of processes of diabetes care** were used:

- Proportion of patients with blood pressure measured during the current and previous one visit
- Proportion of patients with blood sugar measured during the current and previous one visit
- Proportion of patients with one or more HbA1c measured annually
- Proportion of patients educated concerning oral hypoglycemic drugs and insulin use, physical exercises, diet, and foot care in one year

The following **indicators of treatment outcomes** were used:

- Proportion of patients achieving target HbA1c $\leq$ 6.5%
- Proportion of patients achieving target cholesterol level $\leq$ 5.2 mol/l

The following **measurements of complications** were used:

- Proportion of patients with self reported kidney disease
- Proportion of patients with self reported stroke
- Proportion of patients with self reported diabetic foot

The quality of care at the diabetic clinic was considered good if 80% of patients or more satisfied an indicator of diabetes care or less than 80% of patients had complications. Having no internationally set cutoff point of good diabetes care; the cutoff point of good drug adherence in diabetic patients was used in this study.

3.14.2 Independent variables:

- **Age** was collected as a continuous variable from one year to infinity.
- **Marital status** was categorized into whether the patient was single, married or co habiting. Single status included divorced, widow, or separated.
- **Occupation** was categorized into housewife, employed or unemployed. Where employed included self employed, and civil servant.
- **Cigarette smoking** was sub grouped into past smoker, current smoker, never smoked. Past smoker was a patient who had previously smoked and stopped.

CHAPTER FOUR

4.0 RESULTS

This study was done at the Muhimbili diabetic clinic for 9 months, from May 2009 to January 2010. Three hundred and eighty three patients, aged 4 to 88 years met the inclusions criteria and were included in the study. There was no patient who refused to participate in the study.

Table 1 describes the social demographic features of the study population.
The majority were females 232 (60.6%) with median (range) age of 47(4-88) years. Most of the study participants were from Kinondoni district 181 (47.3%) and very few from the neighboring coastal district 4 (1.0%). 57.2% Fifty seven percent of the study population had only attained primary school education levels.

Regarding marital status, most patients were either married (55.1%) or single (44.1%). Forty eight percent of the study population was employed and 33.4% unemployed. The unemployed category constituted mainly students and retired officers. Many patients 337 (88.0%) had never smoked and only 3 (0.8%) were still smoking cigarette.

Table 1. Social demographic and behavioral features of diabetic patients attending the Muhimbili Diabetic clinic.

Characteristics	Frequency N=383(%)
Age range (years)	
≤10	14 (3.7)
11-20	41 (10.7)
21-40	84 (21.9)
41-60	**169 (44.1)**
≥60	75 (19.6)
Sex	
Male	151(39.4)
Female	232(**60.6**)
Place of residence	
Kinondoni	181(**47.3**)
Ilala	104(27.2)
Temeke	94(24.5)
Coast region	4(1.0)
Religion	
Christian	210 (**54.8**)
Muslimu	173 (45.2)
Marital status	
Single	169 (44.1)
Married	211 (**55.1**)
Cohabiting	3(0.8)
Education	
Primary	219(**57.2**)
Secondary	126(32.9)
Vocational training	16(4.2)
Advanced diploma/graduate/higher	22(5.7)
Occupation	
Housewife	71(18.5)
Employed	184(**48.1**)
Unemployed	128(33.4)
Cigarette Smoking	
Current smoker	3 (0.8)
Past smoker	43 (11.2)
Never smoked	337 (**88.0**)

On average most patients (65%) attended the Muhimbili diabetic clinic twice per year, with customary time interval between the current visit i.e. the visit made on the day of the interview and the previous one visit, of 3-5 months.

Table 2 shows the number of patients with blood sugar and blood pressure levels measured on the current and the previous one visit. Ninety seven percent of patients had either random blood glucose or fasting blood glucose measured on the current visit, compared to 93.7% measured on the previous one visit. Two hundred sixty four (68.9%) of recruited patients (including children) had their blood pressure measured on the current visit compared to only121 (31.6 %) in the previous one visit.

Table 2. Proportion of patients with blood glucose and blood pressure measured in the current and previous one visit. (N=383)

	Number of patients	
	n (%)	95% CI
Blood glucose measured on		
Current visit	**371 (96.8)**	**94.4 – 98.2**
Previous one visit	359 (93.7)	90.6 – 95.8
BP* measured on		
Current visit	**264 (68.9)**	**64.0 – 73.5**
Previous one visit	121 (31.6)	27.0 – 36.5

BP*: blood pressure

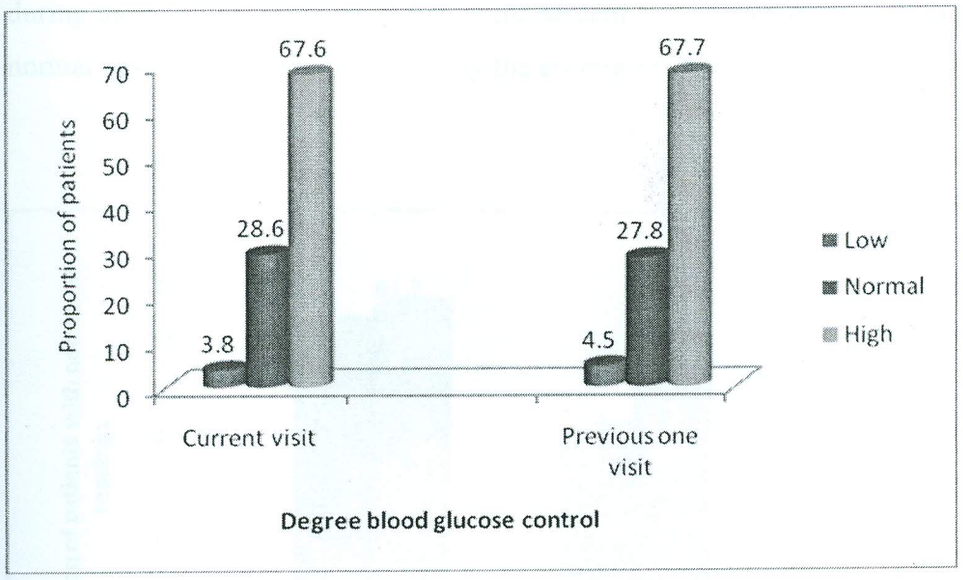


Figure 2. Degree of blood glucose control on the previous one visit and current visit to the diabetic clinic. (N=383).

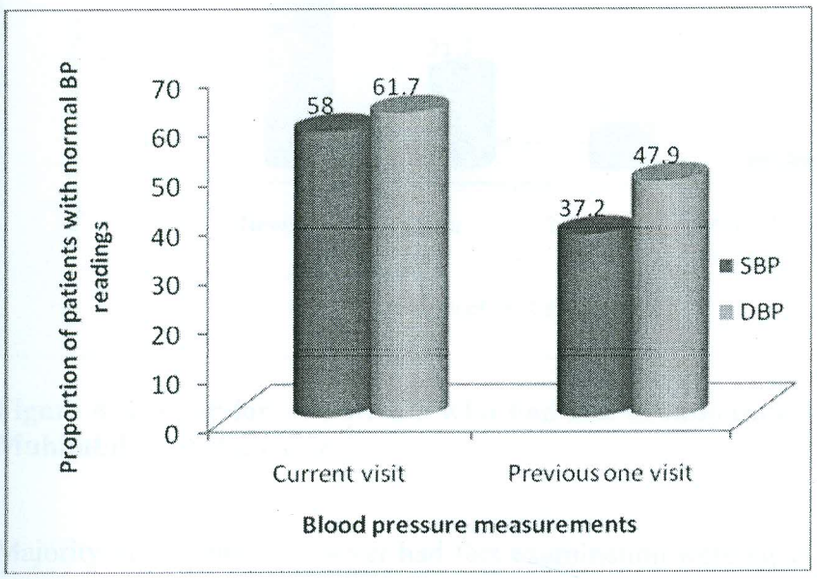
Figure 1 shows the degree of blood glucose (random blood glucose + fasting blood glucose) control during the current and previous one visit to the diabetic clinic. Many of the patients (67.7%) had high blood glucose on the previous one visit. 27.8% had normal blood glucose levels. The same pattern was noticed on the current visit.

On the current visit the mean (SD) fasting blood glucose level was 10.3(5.2) mmol/l and mean (SD) random blood glucose level was 13.2 (6.5) mmol/l. On the previous one visit the mean (SD) random blood glucose level was 12.2 (6.0) mmol/l and the mean (SD) fasting blood glucose level was 11.7 (4.4) mmol/l.

Fifteen patients had records of HbA1c measurements in their files, which were all above the target level of 6.5%. Additionally HbA1c levels were measured in 52 patients which were also all above the target HbA1c level.

Figure 2 shows the proportion of patients with normal blood pressure levels in the study population during the current and the previous one visit .Thirty seven percent of diabetic patients had normal systolic blood pressure, and 47.9 % had normal diastolic blood pressure

during the previous one visit. Sixty eight percent had normal diastolic blood pressure and 58% normal systolic blood pressure during the current visit.



SBP: systolic blood pressure, DBP: diastolic blood pressure

Figure 3. Proportion of patients with normal blood pressure level (SBP <130) and (DBP <80 mmHg) during the current and previous one visit at the Muhimbili diabetic clinic.

Figure 3 shows the number of patients who reported having their feet examined during the past one year. Of the 383 patients interviewed, 69.5% had never had feet examination and 117 reported having their feet examined once (21.7%), 8.8% more than once.

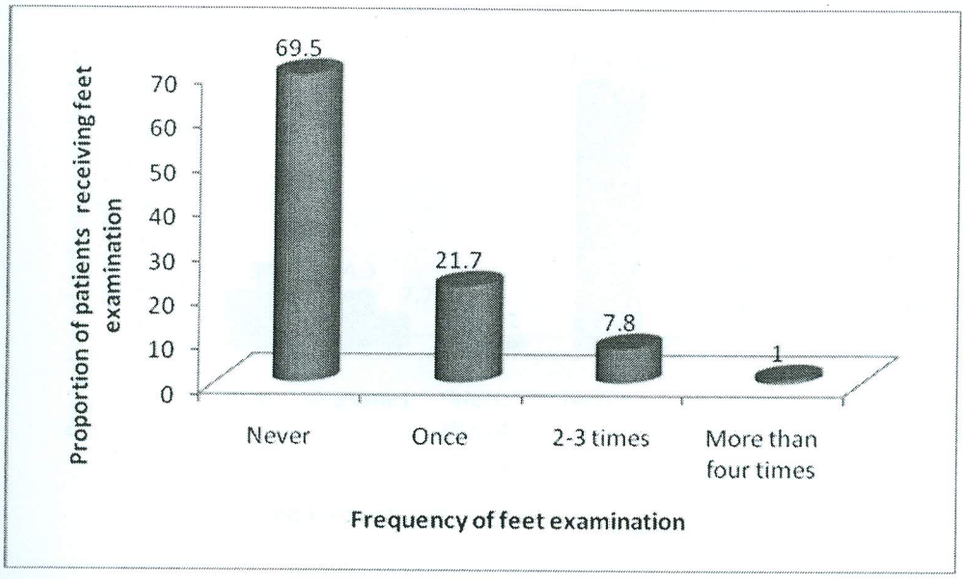


Figure 4. Proportion of patients who had feet examination over the past one year at the Muhimbili diabetic clinic.

Majority of patients who never had feet examination were aged between 41-60 years, females and had duration of diabetes between 1 -5 years. Figure 4 shows that 71.4% of patients who never had feet examination over their past one year of clinic attendance had diabetic foot, and 69.4% had no diabetic foot. Among the patients who had been examined more than once, 14.3% of patients had diabetic foot and 8.8% had no diabetic foot.

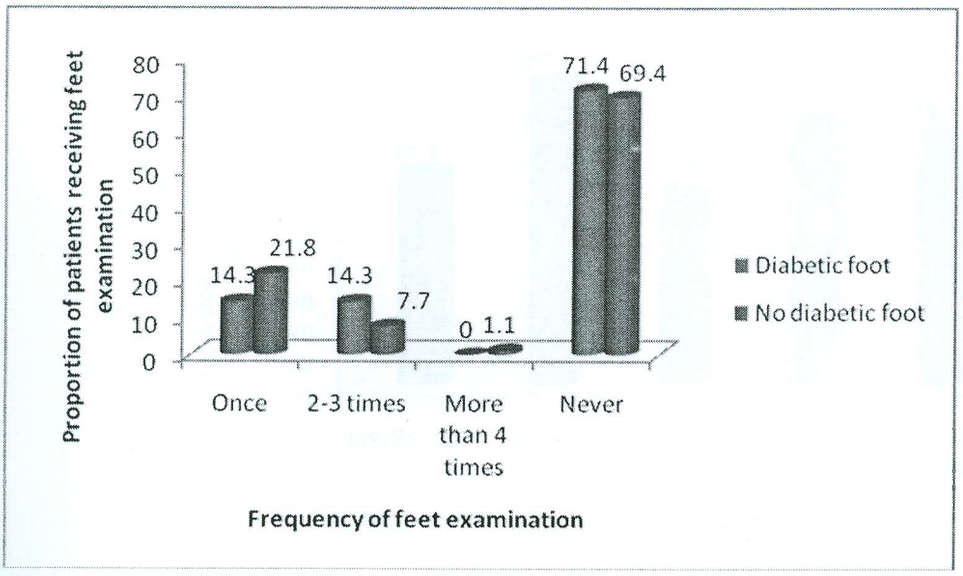


Figure 4. Proportion of patients who reported feet examination over the past one year at the Muhimbili diabetic clinic, according to their diabetic foot status.

At the diabetic clinic a multidisciplinary team including a diabetes specialist nurse, and a dietitian was giving diabetic education in kiswahili the local language, at the time of initial diagnosis and then as required. Education given took into account culture, ethnicity, disability and geographical diversity. Figure 5 reveals that most patients had received some form of diabetic education including insulin and oral hypoglycemic drugs use, diabetes dietary advice, foot care and physical exercises. Many patients (94.8%) admitted having received education on diet modification.

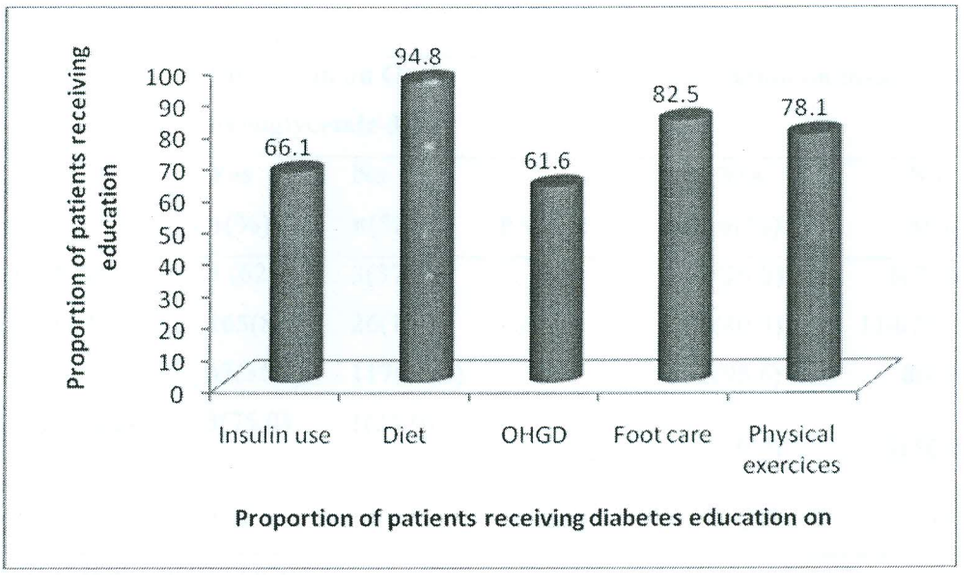


Figure 5. Proportion of patients who reported receiving diabetic education over the past one year at the Muhimbili diabetic clinic. N=383

Table 3 reveals that the majority of patients who were on oral hypoglycemic drugs had significantly received education on oral hypoglycemic drugs (86.5%) and the majority of patients who were on insulin had significantly been educated on insulin (95.6%) ($p<0.0001$).

		Education on Oral hypoglycemic drugs			Education on insulin use		
		Yes n(%)	**No n(%)**	**P value**	**Yes n(%)**	**No n(%)**	**P value**
Method of diabetes control	Diet only	5 (62.5)	3(37.5)		2(25.0)	6(75.0)	
	OHGD	**165(86.4)**	26(13.6)		77(40.3)	114(59.7)	
	Insulin	63(35.0)	117(65.0)		**172(95.6)**	8(4.4)	
	Oral drugs and Insulin	3(75.0)	1(25.0)		2(50.0)	2(50.0)	
Total		236	147	**<0.0001**	253	130	**<0.0001**

OHGD Oral Hypoglycemic Drugs

Table 3. Proportion of patients receiving education on oral hypoglycemic drugs and insulin according to their method of diabetes control

Figure 6 summarizes the type of diabetes complications reported by patients at the time of interview. The percentage of complications like diabetic foot, kidney disease and stroke, reported by patients was quite low. Diabetes foot was the least prevalent complication with only 1.8% of patients.

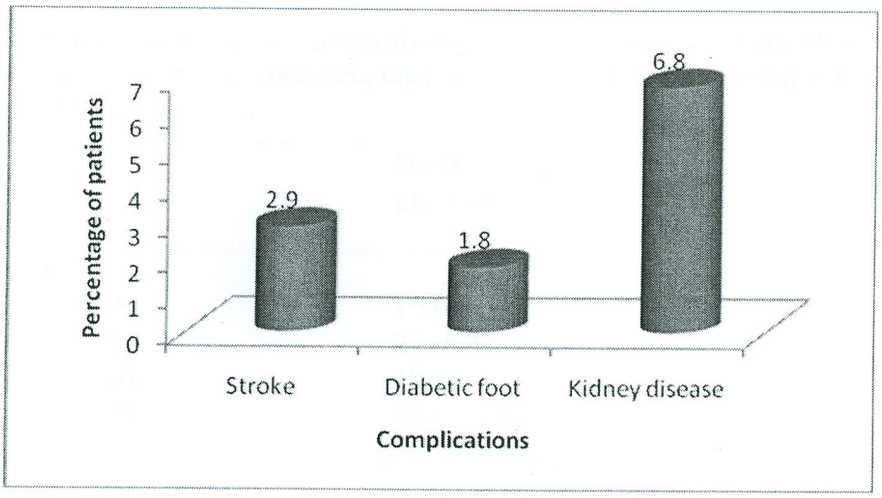


Figure 6. The proportion of patients self-reporting diabetic foot, kidney disease and stroke complications at the Muhimbili diabetic clinic

Table 3 shows some of the social demographic factors associated with poor glycaemic control. A large proportion of patients aged above 40 years had poor glycaemic control compared to those with age less than 40 years, though this was not statistically significant. There was a statistically significant association between poor glycaemic control and sex, with high proportion of married patients having poor glycaemic control ($p<0.0001$) . Also a high proportion of patients with low level of education (primary education) having poor blood glucose control, though not clinically significant compared to higher levels of education ($p<0.09$). Higher proportion of employed patients had higher blood glucose.

Table 4. Association between poor glycemic control on the current visit and social demographic characteristics of age, sex, marital status, education, occupation and smoking habits. (N=251)

	High blood glucose n (%)
Age range (years)	
≤10	10 (4.0)
11-20	21 (8.4)
21-40	49 (19.5)
41-60	120 (**47.8**)
≥61	51 (20.3)
Sex	
Male	102 (40.6)
Female	149 (**59.4**)
Marital status	
Single	101 (40.2)
Married	149 (**59.4**)
Co habiting	1 (0.4)
Education	
Primary	152 (**60.5**)
Secondary	71 (28.3)
Vocational training	13 (5.2)
Advanced diploma/graduate/higher	15 (6.0)
Occupation	
Housewife	56 (22.3)
Employed	118 (**47.0**)
Unemployed	77 (30.7)
Smoking	
Current	1 (0.4)
Past smoker	31 (12.3)
Never smoked	219 (**87.3**)

Few patients 48(12.5%) had records of serum cholesterol measurements over the past one year. Of the available serum cholesterol levels many (72 .9 %) were in the target serum cholesterol level of less than 5.2 mmol/l.

CHAPTER FIVE

5.0 DISCUSSION

This study was aimed at determining the quality of diabetes care provided at the Muhimbili diabetic clinic during a one year period.

Quality of diabetes care was described according to three indicators namely: indicators of the process of diabetes care, indicator assessing treatment outcomes and indicators assessing the magnitude of diabetes complications.

The process of care

The process of care was assessed by six variables. It assessed the proportion of patients with annual HbA1c, and serum cholesterol measurements, as well as annual feet examination and education on effective antihyperglycemic drugs, diet, foot care and exercises. It also assessed quarterly blood pressure measurements and blood glucose levels on the previous and the current visit.

Using proportion of patients with blood glucose measured during the current or previous one visit, over 94% of patients had either fasting or random blood glucose measured. This showed good level of performance compared to North America where Roubideaux et al found 78% of American Indians and Alaska natives had blood glucose tests at each visit [27]. In a tertiary hospital in Sri Lanka 84% of patients had their blood glucose levels checked monthly [28] .Occasionally, lack of glucose measuring sticks makes it impossible to measure patients' blood sugar on every visit in our clinic. Of note also, if a patient reports to the clinic before his scheduled clinic day instead of going to the casualty department, as is required, his blood sugar is not measured unless the attending doctor makes a special request.

When the process of care was assessed using proportion of patients who had HbA1c measured, only 3.9 % had this indicator measured. This indicator showed poor performance. A similar situation was also observed in a largest tertiary hospital in southern Sri Lanka, where only 4%

of patients had HbA1c checked [28]. On the contrary, in a primary health care in Kuwait, 60.8 % of patients had HbA1c measurements [29]. Lack of reagent for the DC 2000 machine which measures HbA1c could explains the poor performance at our diabetic clinic.

When using the proportion of patients with blood pressure measurements during the current or previous one visit there was a wide range of performance. In the previous visit, we had poor performance (31.6%) versus 68.9% in the current visit. This is in contrast to studies done in American Indians where 94% had their blood pressure measured at every visit[27].During the current visit there was an ongoing doctors and nurses diabetes training at the clinic , who measured the blood pressure of patients before they were seen by the attending doctor. This increased manpower measuring blood pressure explains the wide range of performance between the current and previous visit.

Furthermore when the process of care was assessed by using the proportion of patients with cholesterol measurements at least once in their past one year of clinic attendance, only 3.2% patients had cholesterol monitoring records. This shows poor performance of the clinic, compared to countries like Kuwait were 80 % of patients had regular records of cholesterol measurements [29]. This discrepancy could be explained by the high prevalence of hypercholesterolemia in patients in Kuwait than in Tanzania, making clinicians more vigilant in regular monitoring cholesterol levels.

Likewise, when using the indicator assessing feet examination, poor performance of the clinic was noted. Many patients (69.5%) had never had feet examination during their last one year of clinic attendance. Furthermore most patients with diabetic foot had never had feet examination (71.4%).Due to low incidence of diabetic foot, most attending doctors don't think it necessary to examine their patients' feet. In United States Bailey found only 12.3 percent of patients in a diabetic clinic had received feet examination. The author also found that feet of patients at higher risk for limb amputation were not examined with greater frequency at the clinic, although such patients were more often referred to a podiatrist. And the most significant

determinants of physician foot examination were patient recall of foot-related education received at the clinic and interphysician variability [30].

Using the indicator assessing the proportion of patients receiving diabetic education, our study revealed more than 60% of patients received education concerning diabetic drugs, foot care, physical exercises and diet during their past one year of clinic attendance. This was better than in a tertiary medical center in Nigeria where 46.9% of diabetic patients had no knowledge on the type of drugs they were taking [31]. Furthermore using education on insulin and oral hypoglycemic drug use as an indicator of diabetes care, it was found adequate because more than 80% of patients who were on insulin received education on insulin, and more than 80% of patients oral hypoglycemic drug use received education on oral hypoglycemic drug use. Education has become important in successful management of diabetes. It may increase patients' ability to adopt and adhere to complex new diabetes treatments, and thus achieve better blood glucose and blood pressure control. However inspite of our study population receiving adequate diabetic education, very few patients achieved adequate glycemic and blood pressure control. A study done in Ethiopia in a teaching hospital also showed that better knowledge about diabetes was not associated with better glycaemic control. Furthermore only 42.5% of patients attended the diabetes education programme more than once [32]. This is in contrast to findings in Macedonia, were diabetic education led to better glycemic control from an HbA1c 9.2% to 7.7% in one year [33].

Treatment Outcome

The treatment outcome was assessed by the proportion of patients with good glycemic control using blood glucose and HbA1c levels, and the proportion of patients attaining the target blood pressure, and cholesterol levels.

When the treatment outcome was assessed using the proportion of patients achieving the target blood pressure during the current or previous one visit, over 50% of patients had achieved the target blood pressure. This showed similar quality of diabetes care as in an Irish outpatient

diabetic clinic where Agha et al found 49% of patients having the target blood pressure. The researcher concluded that it was difficult to achieve the target blood pressure level in a busy outpatient diabetic clinic [34]. In a Palestinian governmental hospital only 25.4% of diabetic patients had their BP controlled [35]. In a Nigerian diabetic clinic, 41% of diabetic patients had elevated blood pressure [36]. There is also the question of why the target blood pressure of 130/80 mmHg is not attained, given the numerous studies showing that tight blood pressure control in diabetic subjects markedly reduces the risk for cardiovascular disease and stroke [7, 37-38]. One of the explanations given is the focused treatment on lowering the hyperglycemia which might leave practitioners ignoring other comorbidities associated with diabetes. Other hypotheses for the poor control of hypertension in diabetic patients were suggested by Berlowitz when he found 73% of diabetic hypertensive subjects not reaching the target blood pressure. He thought that clinicians had lack of concern or awareness of published guidelines and were not appropriately increasing antihypertensive medications, despite knowing that the levels of blood pressure were still high and above published target goals [39].

Using the proportion of patients achieving good glycemic control by assessing the blood glucose levels, sixty eight percent of patients attending the diabetic clinic had high blood glucose. This showed a poor level of performance of the clinic. Similar findings have been reported in several other countries when using glycemic control as the indicator of treatment outcome .Thus in five centers in Ghana and Nigeria, 73% of diabetic patients had high fasting blood glucose [40]. This is contrary to findings reported in South Africa in a primary nurse led health care clinic were only 17.6 % of patients had fasting blood glucose levels more than 7.0 mmol/l [41]. However in Trinidad and Tobago a study in a primary care unit revealed 46% of the diabetics were hyperglycemic and 19% had glucose >16.7 mmol/L [42]. Disease severity and patient burden being more in our national hospital, could explain the poor glycemic control. However, it was also found that, patients aged more than forty years mainly type 2 diabetic patients, had significantly much higher blood glucose than the younger ones, type 1 patients. This is contrary to Lutale's findings that type 1 patients had poorer glycaemic control than type 2 patients[24]. This could be explained by the fact that, free glucose monitoring machines

are given to all patients attending the monday diabetic clinic i.e to all patients aged less or equal to 20 years. These patients are also given transport fare to and fro the clinic, are given free insulin on monthly basis. While older patients are seen less regularly, 3 to 5 monthly are given one month free drug course and have to buy the rest of the drugs for the following months themselves. Hence inability to achieve this leads to erratic drug use and poor glycemic control. Similar programs exist in Mozambique and Zambia, where governments have set up measures for patients to receive free or subsidized insulin. In Mali no such assistance exists and patients have to bear the total cost of their drugs [43].

It was also found that married patients had poorer glycemic control than the single ones. Most married patients are more than 20 years of age, and thus do not benefit from all the privileges the younger ones do in the clinic. This as well as factors like social stress from in laws and children could contribute to this situation.

When the target level of HbA1c less or equal than 6.5% was used to assess the level of glycemic control of patients attending the diabetic clinic, a low proportion of patients achieving good glycemic control was noted. None of the patients with records or were measured HbA1c, had reached the target level of 6.5% or less. This showed poor performance of the clinic. However, similar findings were documented by Majaliwa et al at the same diabetic clinic, who discovered only one patient with HbA1c < 7% [44]. In Kenya glycemic control was also poor, with studies in Kenyatta National hospital diabetic clinic revealing 60.5% of patients with HbA1c more or equal to 8% [45]. Only 31.7% had HBA1C less than 7 % in a University hospital, in Saudi Arabia[46].

Using the proportion of patients with good cholesterol control, among patients with records of cholesterol measurements, 72.9% had good cholesterol control. In Lebanon Yusef had showed similar results with 88.6% and 66.9% of patients with type 2 diabetes had attained an acceptable level of cholesterol and triglyceride control respectively [47]. However having very few records of cholesterol measurements, makes it difficult to use this indicator of outcome of treatment in qualifying the diabetic care of the clinic as good or bad.

Rates of Complications

The rate of complications was assessed by the number of patients with chronic diabetic complications like stroke, diabetic foot and kidney disease. The rate of chronic complications in a diabetic clinic can reflect the level of diabetic care, thus the lower the rates of complications the better the diabetic care. The quality of care as assessed by the level of complications was good. A similar low proportion of patients with chronic diabetes complications was reported in Saudi patients, where Nielsen et al found 4.7% of patients with diabetic foot [48]. In a diabetic clinic in northern Ethiopia, diabetic nephropathy (2%) was rare; no cases of stroke were reported [49].

5.1 Study limitations

There could have been a recall bias on which type of education the patient had received, or whether they had received feet examination and the frequency of its examination. Attempts to minimize the bias were made by checking at the patients file but very few records were found.

Although the sample size was relatively big, more patients are needed to make it more representative.

5.2 Strengths of the study

This is the first study of its kind at the Muhimbili diabetic clinic. It has provided an estimate of the quality of diabetic care at the Muhimbili diabetic clinic.

Systematic sampling used, decreased selection bias.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The quality of diabetic care at the Muhimbili Diabetic Clinic was quite satisfactory in terms of blood glucose measurements, diabetic education on diet and foot care. However the quality of diabetes care was not adequate enough in terms of proportion of patients with good or satisfactory blood glucose control, cholesterol and HbA1c measurements, and feet examination .Quality of care assessed using proportion of patients with records of cholesterol measurements and good cholesterol levels was very low. Many patients (92.8%) had no records of serum cholesterol levels.

6.2 Recommendations

International and national diabetes guidelines need to be made more accessible to all who offer care at the diabetic clinic to remind them about attained quality of diabetes care in their clinic and areas which they need to put more efforts to improve.

More interventions for those above forty years of age and married are warranted to improve their glycemic control. In this case for instance they can be given free glucose monitoring machines, widely available and subsidized insulin and oral hypoglycemic drugs.

REFERENCES

1. International diabetes Federation *www.info@idf.org*. Accessed on the 25th November 2008
2. Sobngwi E, Mauvais-Jarvis F, Vexiau P et al. Diabetes in Africans. Part 1: epidemiology and clinical specificities. *Diabetes Metabolic* 2001; 27:628-3
3. Sobngwi E , Mbanya JC. Diabetes in Africa. Diabetes microvascular and macrovascular disease in Africa. *Cardiovascular Risk* 2003; 10:97-102
4. Ahrén B and Corrigan C.B. Prevalence of diabetes in north-western Tanzania. *Diabetologia.* 1984;26:333-6
5. McLarty G, Swai A, Kitange M. Prevalence of diabetes and impaired glucose tolerance in rural Tanzania. *Lancet.* 1989 ; 1:871-5.
6. Aspray T, Mugusi F, Rashid S. Rural and urban differences in diabetes prevalence in Tanzania: the role of obesity, physical inactivity and urban living. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 2000 ;94:637-44
7. Turner R, Holman Rury .Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes : UKPDS 38 British Medical Journal 1998;317: 703-13
8. The National Diabetes Education Program (NDEP) guiding principles for diabetes care for health care providers.*www.ndep.nih.gov* .Accessed on 22nd April 2009
9. Saydah S, Fradkin J, Cowie C. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes .*Journal Of American Medical Association* 2004; 291: 335-42
10. Mumba M, Hall A, Lewallen S. Compliance with eye screening examinations among diabetic patients at a Tanzanian referral hospital *Ophthalmic Epidemiology* 2007; 14:306 – 310

11. Smide B, Ekman L, Wikblad K. Diabetes self-care and educational needs in Tanzanian and Swedish diabetic patients: a cross-cultural study *Tropical Doctor.*2002 ; 32:212-6

12. Levitt N.S, Bradshaw D , Zwarenstein M.F et al. Audit of public sector primary diabetes care in Cape Town, South Africa: high prevalence of complications, uncontrolled hyperglycaemia, and hypertension *Diabetic Medicine* 1997 14 :1073 - 1077

13. Awah P. Diabetes and traditional medicine in Africa .*Diabetes Voice* 2006; 51:24-26

14. Ahmed A. Diabetes care in Sudan : emerging issues and acute needs .*Diabetes Voice* 2006 Sept ; 51 (3):13-15

15. Stotland N. Overcoming psychological barriers in insulin therapy. *Insulin* 2006 ; 1:38-45

16. Kneckt M. Psychological features characterizing oral health behavior, diabetes self-care and health status among IDDM patients .*Academic Dissertation*; University of Oulu Finland 2000

17. International Diabetes Federation Type 2 Diabetes Clinical Practice Guidelines For Sub-Saharan Africa July 2006 ***www.idf.org*** accessed on April 15 th 2009

18. Nicollucci A, Greenfield S, Mattke S. Selecting indicators for the quality of diabetes care at the health systems level in OECD countries *International Journal for Quality in Health Care* 2006 18: 26-30

19. National Institute for Clinical Excellence Technology Appraisal Guidance (NICE) 60 Guidance on the use of Patient-education models for diabetes Feb. 2006 ***www.sediabetes.org*** accessed on April 15 th 2009

20. Qaseem A, Vijan S, Snow V .Glycemic control and type two diabetes mellitus: The optimal hemoglobin AIC targets. A guidance statement from the American College of Physicians. *Annals of Internal Medicine* 2007 ;147:417-422

21. National Diabetes Quality Improvement Alliance. Adult diabetes: percentage of patients with most recent A1c level greater than 9.0% (poor control). National Diabetes Quality Improvement Alliance performance measurement set for adult diabetes. Chicago (IL). *National Diabetes Quality Improvement Alliance*; 2003 1: 11

22. Greenfield S, Nicolucci A, Mattke S. Selecting indicators for the quality of diabetes care at the health systems level in oecd countries: OECD Health Technical Papers 2004 *DELSA/ELSA/WD/HT 2004 (15)*

23. Fong D, Aiello L Retinopathy In Diabetes *Diabetes Care* 2004; 27:84-87

24. Lutale J, Hrafnkell T, Zulfiqar A. Microalbuminuria among type 1 and type 2 diabetic patients of African origin in Dar es Salaam Tanzania. *BioMed Central nephrology* 2007;8:2

25. Hoffmeister M, Lyaruu I, Krawinkel M. Assessment of nutritional intake, body mass index and glycemic control in patients with type-2 diabetes from northern Tanzania *Annals of Nutrition and Metabolism* 2005;49:64-68

26. International diabetes federation *www.diabetesguidelines.com* accessed on 11th February 2010

27. Roubidcaux Y, Buchwald D. Measuring the quality of diabetes care for older American Indians and Alaska Natives *American Journal of Public Health* 2004;94:60-65

28. Wijeweera S, Hettige C, Ragunathan M. Diabetic care provided at a diabetic clinic at the largest tertiary care hospital in southern Sri Lanka: an audit. *Galle Medical Journal* 2009;14:45-47

29. Al adsani A, Al Faraj J. Evaluation of the Kuwait diabetes care program on the quality of diabetes care .*Medical Principles and practice* 2008;17:14-19

30. Bailey T,Yu H, Rayfield E ,Patterns of foot examination in a diabetes clinic; *The American The American Journal Of Medicine*,1985;78: 371-374

31. Idogun E, Olumese F. Prevalence of poor glycemic control in diabetics seen in a tertiary medical center *Nigerian Postgraduate Medical Journal* 2007;14:34 -36

32. Barhu Y, Abdulkadir J, Assessment of diabetes education in the teaching hospital, Addis Ababa Ethiopia, *Diabetic Medicine* 1993;10:870-873

33. Milenkovic T, Gavrilovic S, Influence of diabetic education on patient well being and metabolic control *Diabetologia Croatica* 2004: 91-96

34. Agha A, Dillon D, Corbett M. Target blood pressure for patients with type two diabetes is difficult to achieve in the setting of a busy diabetes clinic *Irish Journal of Medical Science* 2003;172:168-170

35. Sweileh M . Target blood pressure attainment in diabetic hypertensives patients: need for more diuretics? *International Journal Pharmacology Therapy* 2009;45:43-8

36. Erasmus R, Oyeyinka G. Microalbuminuria in non-insulin dependent(type2) Nigerian diabetics: relation to glycemic control, blood pressure and retinopathy *Post Graduate Medical Journal* 1992;68:638-642

37. Hansson L, Zanchetti A, Carruthers G. Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. HOT Study Group. *Lancet* 1998;351:1755–1762

38. Tuomilehto J, Rastenyte D, Birkenhager W, Effects of calcium-channel blockade in older patients with diabetes and systolic hypertension: Systolic Hypertension in Europe Trial Investigators. *New England Journal Medical* 1999; 340:677–684

39. Berlowitz R, Ash S, Hickey C. Hypertension management in patients with diabetes: the need for more aggressive therapy. *Diabetes Care* 2003;26:355–35

40. Rotimi C, Daniel H. Prevalence and determinants of diabetic retinopathy and cataracts in West African type 2 diabetes patients ,*Ethnicity and Disease* 2003;13:110-117

41. Van de Sande M, Dippenaar H. The relationship between patient education and glycemic control in South African township *Primary Care Diabetes* 2007;1:87-91

42. Ramdath D, Ramdhanie N, Singh H. Glycaemic control in diabetics attending primary care clinics in a multi ethnic Caribbean country *The Internet Journal of the Third World Medicine* 2004;1

43. International insulin foundation Fact sheet on diabetes in sub-Saharan Africa *www.access2insulin.org* accessed on 22nd March 2010

44. Majaliwa E, Munubhi E, Ramaiya K. Survey on acute and chronic complications in children and adolescents with type 1 Diabetes at Muhimbili National Hospital in Dar es Salaam, Tanzania. *Diabetes Care* 2007;30:2187-2192

45. Otieno F, Kariuki M, Ng'ang'a L. Quality of glycemic control in ambulatory diabetics at the out-patient clinic of Kenyatta Hospital, Nairobi. *East African Medical Journal* 2003;80:406-410

46. Al Turki Y. Prevalence of diabetic foot among diabetic patients attending a primary care clinic at a teaching hospital ,Riyadh, Saudi Arabia ,*Middle East Journal of Age and Ageing* 7:2010 accessed on ***www.me-jaa.com*** **April 2010**

47. Yusef J .Management of diabetes mellitus and hypertension at UNRWA primary health care facilities in Lebanon *Eastern Mediterranean Health Journal* 2000;6:378-390

48. Nielsen J. Diabetes in the Arab World: Prevalence and risk factors. *Practical Diabetes International* 1999; 16:82-86.

49. Gill G, Gebrekidan A, English P, Diabetic complications and glycaemic control in remote North Africa *QJM: an international Journal Of Medicine* 2008;101:793-798