TITLE

PREVALENCE, MAJOR COMPLICATIONS OF DIABETES MELLITUS AND COMPLIANCE IN DIABETIC PATIENTS SEEKING TREATMENT AT KENYATTA NATIONAL HOSPITAL.

BY

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I56/9112/2000

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Public Health and Epidemiology of Kenyatta University.

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or any other award.

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DEDICATION

To my **Mother**, for prayers, inspiration, support and perseverance in nurturing me to maturity and teaching me the essence of hard work and to my wife, Lena Boyani, for her love and persistent encouragement. **To God be the glory**.

ACKNOWLEDGEMENTS

I am indebted to all whose contributions made the completion of this work possible.

I greatly owe my supervisors, **Professor Alloys Orago, Doctor James Waswa** and **Doctor Eva Njenga;** sincere gratitude for much stimulation, inspiration, tolerance and dedication, without which this work would have not been successful. My sincere gratitude goes to all the Lecturers of the Department of Zoology for their motivation and relentless support during my study.

My sincere appreciations go to all the staff of the diabetic clinic and the records Department of Kenyatta National Hospital during my research period. Not to be forgotten are the diabetic patients without whose cooperation this study would have not been realised. I thank the KNH Ethical Research Committee for accepting me to the institution for the research and especially Professor Anastasia N. Guantai, the secretary of the committee.

I acknowledge my Mother who has always been a source of support for my education and through her inspiration, prayers and teaching me the importance of hard work and going where only God could go to see that I achieve. I cannot adequately express my appreciation. I cannot forget my only sister Naomi Moraa for her constant prayers and support throughout my education path. My wife who

was there for me as a source of encouragement and ever-needed support-I love you Honey.

Thanks go also to all my friends and associates who contributed in some way to my educational achievements and made my university education dream be realised. Worthy mentioning are the Mr and Mrs. A. Nyariaro, Mr. R.M Aondo, Mrs Margaret Maina, Mrs.W. Wanderi and I cannot forget all my peers and colleagues, for continued stimulation and moral support during my studies mentioning but a few like Musa Machage, Timothy Abuya, Andrew Nyerere, Denish Okeyo, John Paul Oyore, Dr. Lawrence Oteba, Caroline Nyamunga, Stella Nyambane and Jane Kimoni. Thanks a lot for your support.

Finally, my sincere gratitude goes to Kenya Diabetes Management and Information Centre for supporting the research work and of special mention is the projects Director Mrs. Eva Muchemi, without their material support, patience and dedication this study would not have been realised. **God bless and thank you all.**

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ABBREVIATIONS AND ACRONYMS USED

CHD	-	Coronary heart disease
DHMT	-	District Health Management Team
DM	-	Diabetes mellitus
IDDM	-	Insulin Dependent Diabetes Mellitus
IDF	-	International Federation of Diabetes
KNH	-	Kenyatta National Hospital
NGOs	-	Non Governmental Organizations
NIDDM	-	Non Insulin Dependent Diabetes Mellitus
WHO	-	World Health Organization

OPERATIONAL DEFINITIONS OF TERMS

Diabetes. This is a metabolic disorder, which does not allow the proper metabolism of glucose due to lack of insulin hormone or improper functioning of the cell receptors to utilize glucose (Leslie and Robins, 1995) In this work diabetes shall mean both insulin dependent and non insulin dependent diabetes mellitus.

Diabetic coma. The extreme form of ketoacidosis associated with unconsciousness.

Diabetic counselling. This a professional guidance that is given to a diabetic patient to adjust his /her lifestyle so as to achieve the desired results of blood glucose control

Diabetic ketoacidosis. This is a condition characterized by an absolute or relative deficiency of insulin in which ketone acids accumulate in blood so as to cause a fall in arterial P^H values to less than 7.25.

Diabetic regimen. This is a specific treatment plan that a diabetic patient has been prescribed to follow in order to achieve good blood sugar level control.

Glycogen. The chief form of carbohydrate stored in the body.

Glycosuria. Presence of abnormal amount of sugar in the urine.

Hyperglycaemia. High blood sugar above normal level

Insulin. Is a hormone secreted by the beta cells of the pancreas and is used to stimulate uptake of glucose from the blood into the cells or converting it to glycogen for storage.

Ketonuria. The presence of acetone and other ketones in the urine.

Level of education. This referred to the highest level of formal education attained by respondent.

Level of income. Referred to patients' and spouse monetary income in Kenya shillings, which was later, categorised as low, middle and high income.

Neuropathy. A disorder of the nervous system presenting bizarre symptoms of altered sensation of pain, muscle function, and function of gastrointestinal and urinary tract (Travis, 1996).

Obesity. Being too fat or overweight as compared to body frame and age.

Polydipsia. Excessive feeling of thirst and drinking too much fluids

Polyuria. Passing of too much urine

Prevalence. Frequency of disease in a population at the time a survey is taken.

Retinopathy. Any non-inflammatory disease of the retina.

ABSTRACT

Diabetes mellitus is one of the major public health concerns in Kenya today. The ever-increasing numbers of cases being reported serve as an indicator that this condition is a time bomb. Many complications in this condition whose effects are disastrous and tragic are because of poor control and management practices. This study therefore, sought to investigate the institutional prevalence and burden of the major complications that arise due to late diagnosis and poor management of this condition. The survey determined the prevalence of the disease and the major complications that afflict the diabetics at Kenyatta National Hospital. The results indicated that the prevalence of diabetes mellitus is on the increase. The obtained results indicate that diabetes mellitus is indeed becoming a serious threat to human health and should be addressed with the urgency it requires if its negative effects and resultant complications are to be reversed.

The level of patient compliance to their prescribed regimen was found to be relatively good and was affected by level of income, occupation, education level. It was established that adherence to diabetic regimen is not necessarily influenced by the duration of the illness or suffering contrary to the works of Gicheru, 1978 at the same institution. The results further showed that access to relevant information and stable income are integral to successful management.

The study was carried out in the diabetic clinic at Kenyatta National Hospital. Data was collected using the prevalence/incident survey and patient questionnaire forms. Data was entered and analysed using the statistical package of social sciences (SPSS). Descriptive statistics such as means, standard deviation, frequencies, and percentages were used to determine the prevalence/ incidence of diabetes of the patients that come to seek treatment at KNH. T-test was used to compare the means. Cross tabulations were used to establish relationships between variables. One-way ANOVA was employed to relate late diagnosis and development of complications. Linear regression was used to evaluate risks for diabetes.

It was recommended that the Government and the entire population of Kenya

- Recognize diabetes as a serious public health problem and Design an educational program to create awareness to the general public.
- Develop and implement a National diabetes programme.
- Allocate resources to prevent and manage diabetes. Provide resources for research.
- Make available and affordable insulin and other medications and supplies needed for managing Diabetes. Kenyan population. Struggling families in Kenya are sometimes forced to have to make hard choices between food and medication and therefore the cost of insulin should be subsided for the common man to afford.

CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW.

1.1 GENERAL INTRODUCTION

Diabetes Mellitus is one of the major causes of morbidity and mortality in the developed world and its prevalence in the developing countries is on the increase (Leslie and Robins, 1995). Diabetes is the commonest chronic endocrine disorder to afflict man (WHO, 1985) and is due to the deficiency or absence of insulin or interference with insulin activity causing varying degrees of failure to metabolise and store glucose. This condition represents a spectrum of inherited and acquired disorders, all of which are characterised by elevated blood glucose levels (Leslie and Robins, 1995). WHO (1980) classified Diabetes Mellitus into two types, namely: Type one diabetes also referred to as insulin dependent diabetes mellitus (IDDM) that occurs mainly in children and young adults with a sudden onset and type two diabetes, referred as to non–insulin dependent diabetes mellitus (NIDDM), mainly occurring after the age of 40 years. There is also secondary diabetes and is of two types that are; gestational diabetes that affects expectant women and diabetes that is because of other disease conditions (WHO, *1985*). In general, in peasant population, prevalence is low and most cases are type 1. With urbanisation and increasing prosperity, prevalence rises but most of the cases are of type 2 and occur in the middle aged and the elderly population (Davidson, 1986). As life expectancy increases prevalence also increases, diabetes thus

urbanisation and increasing prosperity, prevalence rises but most of the cases are of type 2 and occur in the middle aged and the elderly population (Davidson, 1986). As life expectancy increases prevalence also increases, diabetes thus becomes an increasingly public health problem (West, 1978; Martin, 2000; WHO, 1980, PAHA /WHO, 1996).

The mechanism through which diabetes is triggered are wide and varied and at times not uniform within the same population. Some of the possible mechanisms commonly quoted in medical literature include genetic factors, environmental and social factors (Leslie and Robins, 1995). Studies done by pyke on identical twins suggested that there is a strong genetic influence in the development of diabetes (W.H.O., 1980). Furthermore, many other studies indicate that diabetes prevalence rates widely fluctuate between different ethnic and racial groups, (West, 1978). Zimmet (1982) argues that changes in the lifestyle of some population have uncovered a hereditary susceptibility of diabetes. Hence changes in 'normal' life-style may bring about changes in nutrition and diet, alcoholism, obesity, stress, physical inactivity; all of which may singly or in combination be catalyst for the onset of diabetes.

In a majority of patients, diabetes is a primary disorder, but it may arise secondary to other diseases that impair function of the pancreas or destroy its structure.

Genetic and dietary factors, infections and stress may each increase the risk of an individual (Davidson, 1986).

1.2 LITERATURE REVIEW

1.2.1 DIABETES: A GLOBAL PERSPECTIVE.

WHO estimated that in 1985, more than 100 million people had diabetes that is some 6% of the world population (WHO, 1985). A study done by WHO estimates that there are 135 million diabetics worldwide and about 500,000 new cases are diagnosed each year (WHO, 1980).

According to the International Diabetes Federation, globally diabetes is a condition in evolution. The incidence of diabetes is rising not only in adults but also in children and adolescents (Jarrett and Shipley, 1998).

A Study undertaken by American Diabetes Association in America in 1998 showed that 15.7 million or 5.9% Americans were diabetic and that each day 2200 people become diabetic.

The same studies have also shown that diabetes is the 6th leading cause of death from diseases in US and based on death certificate data diabetes contributed to 198,140 deaths in the US in 1998, (Martin, 2000).

Mc Carty and Zimmet (1997) calculated that there are 100 million people with diabetes in the world and the number is rapidly increasing, particularly in developing countries (Table 1). In the year 2010, they estimate that there will be more than 200 million people with type 2 diabetes that is the most important cause

of non-traumatic amputations, blindness in adults, renal failure and a major contributing factor for myocardial infarction and cerebral strokes

Table 1: Global Estimates and Projections of Diabetes Mellitus

World/Region	Total population in **1994**('000)	Number of diabetics in **1994**('000)	Projected Number of diabetics in **2000**('000)	Projected Number of diabetics in **2010** ('000)
World	**5,638,219**	**110,186**	**175,331**	**239,250**
Asia	3,346,376	51,237	94,732	138,145
Europe	510,873	18,460	23,714	27,994
Latin America	483,862	12,605	16,469	20,248
North America	286,041	15,085	16,976	18,868
Former USSR	284,654	6,636	10,251	13,852
Africa	698,388	5,299	12,091	18,823
Oceania	28,025	864	1,098	1,320

(Adopted from McCarthy and Zimmet, 1997)

The under 20s report the lowest numbers of diabetic cases in percentage. The prevalence of diabetes is higher among women as compared to men in actual numbers but not on proportion (McCarthy and Zimmet, 1997)

1.2.2 DIABETES IN AFRICA.

"...The myth that existed in the past that diabetes mellitus was rare in the African context is no longer true; in fact diabetes mellitus is just as common, if not commoner, in Africa as in Europe or Asia. Prevalence of diabetes in the Region is estimated to vary between 1 - 5% and is increasing. In some urban and among some ethnic groups it reaches 20%" (Awan and Mungola, 1976).

Public health consequences of ill-managed diabetes like kidney failure, coronary heart disease, blindness, diabetic foot and coma are high. Reliable information on diabetes in the Region is limited. However, studies carried out in certain countries have helped to determine the magnitude of diabetes and some risk factors. Some countries have not even developed specific programmes. Lack of data is often mistaken for non-existence of the problem and often little attention is given to diabetes mellitus. These diseases are caused by a combination of factors that include poverty and urbanization, which lead to changes in lifestyles. As African populations age, due to longer life expectancy, importance of Non Communicable Diseases among them diabetes mellitus increases relative to other causes of ill

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health. Indeed by 2025 about half of Africa population will be living in urban areas while number of African aged over 60 years will increase from present 39 million to 80 million (Mc Carty and Zimmet, 1997). In Africa, the incidence is estimated between 1-2 per cent, but hard data is scarce (Mungola, 1982).

1.2.3 DIABETES IN KENYA

Diabetes mellitus is one of the major public health concerns in Kenya today. The ever-increasing numbers of cases that are being reported serve as an indicator that this condition is a time bomb (Mngola *et al*; 1982). The surge of diabetes is partly attributed to economic growth accompanied by changes in general life-style, as a result many people have developed a propensity for diabetes which was previously non-existent. Since the 1960s, there has been a tremendous increase in the number of known diabetics in Kenya, (Sakwa, 1996). That diabetes is common today is real fact and not fancy any more, (Awan and Mngola, 1976). Unpublished reports from Kiambu District Hospital, Agha Khan Hospital and Kikuyu Mission Hospital for the period between 1998 and 2000 indicated an alarming increase of diabetes mellitus in Kenya. Currently, Kenyatta National Hospital Diabetic Clinic books a minimum of 60 patients every week and about 3 to 5 new cases are seen every week

Random screening camps carried out by Kenya Diabetes Management and Information Centre between years 1999 to 2000, showed that diabetes was common. It was found that about five in every hundred apparently normal people

Random screening camps carried out by Kenya Diabetes Management and Information Centre between years 1999 to 2000, showed that diabetes was common. It was found that about five in every hundred apparently normal people in the camps were diabetic without symptoms and overt prevalence of clinical diabetes was then estimated to around 5 %. The survey also found that 15 per cent of people with diabetes are unaware that preventing high blood glucose levels can help them avoid such complications. Two out of three people with diabetes surveyed said they consider themselves healthy, yet one in three has high blood-glucose levels, which can cause complications. Two out of three people with diabetes surveyed said they consider themselves healthy, yet one in three has high cholesterol and high blood pressure and is already suffering from complications such as heart disease. One-fifth of the people surveyed also have diabetes-related eye problems (Njenga, 1986).

Onyango (1982) showed that diabetes is increasing at an alarming rate and this calls for an all out national effort to combat this disease as there could be many more who have not sought treatment or undiagnosed cases in the country.

1.2.4 EFFECTS OF DIABETES ON THE PATIENT.

A number of effects of diabetes in the patient have been described (Bruess, 1992; Ross and Wilson, 1988; Davidson, 1986; West, 1978) and include:

a) Hyperglycaemia.

It raises blood glucose level, because glucose metabolism by body cells is defective and conversion of glucose to glycogen in the liver and muscles is

diminished leading to gluconeogenesis from protein in response to the deficient intracellular glucose. This may cause diabetic coma, Electrolyte imbalance, dehydration, and acidosis.

b) Glucosuria and polysuria.

The concentration of glucose in the glomerular filtrate is the same as in blood and although diabetes raises renal threshold for glucose, it is not reabsorbed by the tubules. The remaining glucose in the filtrate raises the osmotic pressure, water reabsorption is reduced and the volume of urine produced is increased. This causes electrolyte imbalance and excretion of high specific gravity urine. Polysuria leads to hypovolaemia, extreme thirst and polydipsia.

c) Weight Loss.

In diabetes cells fail to metabolise glucose resulting in weight loss due to gluconeogenesis from amino acids and body protein causing tissue wasting and further increase in blood glucose.

d) Acidosis

This occurs due to the accumulation of intermediate fat metabolite Acetyl coenzyme A. Catabolism of excess body fat releasing some of its energy and production of ketoacids, which accumulate in the body leading to Ketoacidosis (Leslie and Robins, 1995; Ross and Wilson, 1998; Hakim, 1983).

e) Infections.

Diabetics are highly susceptible to infections specifically by bacteria and fungi possibly because phagocyte activity is depressed by insufficient intracellular glucose (Leslie and Robins, 1995;Conor and Boulton, 1989; Davidson, 1991). Infections may cause:

Complications in areas affected by peripheral neuropathy and changes in blood vessels, such as when sensation and blood supply are impaired; Boils and carbuncles; Vaginal candidiasis (thrush). Pyelonephritis are some of the complications that result.

f) Renal failure.

This is due to vascular changes and infection and is common cause of death among the diabetics, (Ross and Wilson, 1998; Abdullah, 1976).

1.2.5 COMPLICATIONS IN DIABETES

The trouble with diabetes is that it is a silent condition. Often people have suffered tissue damage by the time they present themselelves for diagnosis. All diabetics are at a risk from complications, although the risk is reduced if blood glucose is controlled (WHO, 1980; WHO, 1985; Zimmet, 1979; Ross and Wilson, 1998; Leslie and Robins, 1995).

The major causes of mortality and morbidity in diabetes are the complications that arise from it. Significant mortality and morbidity derives from the neuropathy

complications. Renal disease in diabetes is now the leading cause of admission to a renal transplant unit and eye disease is now the third leading cause of blindness in the world (Leslie and Robins, 1995).

Diabetes is today said to be the major leading causes of some major complications. The characteristics of progressive damage of the eye, nerves, heart, stroke, postoperative gangrene etc, are probably direct consequences of inadequate control of diabetes (Pirart, 1977).

Approximately 40 percent of people with diabetes develop complications due to the disease. The detrimental outcomes of diabetes depend on two factors, the severity of the disease and the duration of the disease (Bruess, 1992). Through early diagnosis and close monitoring of blood glucose levels, the onset of these complications can be delayed and/or prevented (Zimmet, 1982; Tattrsal, 1986; Tuomilehto, 1987; Davidson, 1986).

By the time people are diagnosed as having diabetes, 70% of them already have complications like high blood pressure, importance and tissue damage because the disease has gone undiagnosed up to ten years. The onset of diabetes may be slow or dramatic but the effects can be disastrous and even tragic (WHO, 1980). A person with diabetes is more likely than other people to develop; heart attack, stroke, eye problems which can lead to blindness, kidney disease which can lead to kidney failure, foot or leg amputations, frequent infections and sexual dysfunction among other complications (Hukisson 1981;Nathan and Meigs 1997; Feener and

King 1993). Complications of Diabetes at KNH are mainly due to patient's failure to comply with their prescribed diabetic regimens (Sakwa, 1996).

1.2.6 CAUSES COMPLICATIONS IN DIABETES.

Substantial epidemiological data suggest that prolonged elevated blood glucose levels are correlated with complications in a variety of organ systems (Ross *et al;* 1983).

The causes of these complications are varied and include; damage of small and large blood vessels, nerves and decreased ability to fight infections (Davidson, 1986; Feener and King, 1993; Nathan, 1997; West 1978; Zimmet, 1982; 1979).

1.2.6.1 Macro vascular complications

Large vessel disease is the leading cause of mortality and morbidity in subjects with diabetes mellitus. The major manifestation of large vessels disease includes heart disease, cerebrovascular disease, and peripheral vascular disease.

a) Heart disease in Diabetes.

The close association between DM and heart disease has been recognized for a long time. It is estimated that diabetics have a twofold to a fourfold excess risk of developing heart disease hence diabetes accounts for a large number of heart disease cases. From a public health perspective, Diabetics related heart disease is gaining importance as a major contributor of mortality and morbidity (Braxton, 1995).

Mortality from cardiovascular disease is two to four times higher in diabetics than in non- diabetics and most studies have reported that diabetics are 1.5 to 3 times more likely to have coronary heart disease (CHD) than non- diabetics (Barrett, 1985;Pyorala, 1983).

It has been estimated that cardiovascular diseases account for approximately 50 – 60% of all deaths among diabetics (Panzram, 1987; Moss et al, 1991; Ochi *et al.*, 1985; Morish *et al*; 1990).

The vast majority of heart diseases in diabetes are arteriosclerosis-related. Much of the epidemiological data comes from the Framingham study, in which diabetes was associated with congestive heart failure (Crepaldi, 1988).

In the Whitehall study, cardiovascular mortality was approximately two times in men with impaired glucose tolerance than in men with normal glucose tolerance (Fuller 1983; Jarret, 1988).

b) Diabetic foot infection

Few complications of diabetes cause as much morbidity, mortality, and disability as pedal infections. Amputations due to pedal infection in diabetes are second to those that occur due to accidents. Diabetes is the leading cause of all non-accident related amputations (Bild *et al*; 1989).

Patients who have poor knowledge about their own diabetes care or foot care are significantly more likely to suffer pedal infection than those who are knowledgeable (Griffiths G. D and Wieman, 1990). Thus this problem may be more likely to occur in poorer, less educated patients who will be less capable of

making good judgements about whether their lesion requires more aggressive intervention or not (Leslie and Robins, 1995).

1.2.6.2 Microvascullar Complications

a) Diabetic Neuropathy

Diabetic neuropathy encompasses a wide range of abnormalities affecting both peripheral and autonomic nerve function. Neuropathy is the most troublesome, of the major complications afflicting individuals with diabetes (Pirart, 1977).

An increasing prevalence of neuropathies has been found to fairly uniform to accompany increasing duration of diabetes (Brown, 1984). Probably the best data regarding Neuropathy come from the extensive study of nearly 4400 clinic patients undertaken by pirart, who reported a prevalence rate ranging from 7% for individuals within one year of diagnosis to 50% for those with diabetes for more than 25 years (Pirart, 1977).

b) Ocular complications

Diabetes is one of the common causes of blindness (Zimett *et al*; 1992).

Disability due to the impact of diabetes upon the eye arises primarily form retinal disease, proliferative diabetic retinopathy and /or macular oedema, and secondarily from cataracts (Klein, *et al* ; 1984 and Chobro, 1978).

Vision loss has been attributed to both duration of Diabetes, and the age at the time the patient's first eye examination for both IDDM and NIDDM (Klein, et al, 1984).

The development of diabetic retinopathy is disease duration specific (Melton, 1983 and Njenga, 1986).

c) Diabetic nephropathy

Diabetic nephropathy is now the most common cause of new onset and stage renal disease. Diabetic patients are 17 times more likely to develop kidney disease than age-matched members of the general population (Barrett and Orchard, 1984). Nephropathy involves the thickening of membranes that line the glomeruli hence reducing efficiency of ultra filtration process resulting in accumulation of waste products in the blood and elimination of essential blood components such as proteins (Kaplan *et al*; 1993; Brown and Asbury, 1984).

1.2.7 DIABETIC REGIMENS

Rational diabetic therapy of the patient with diabetes requires close co-operation between patient, physician, and diabetes educator. Any regimen prescribed by the physician must fit within the lifestyle of the patient, and be acceptable to him/her. Non-adherence, in fact, is a major source of brittle diabetes (Leslie and Robins, 1995).

For a discussion of rational management of diabetes would be complete without emphasizing the importance of diet, exercise and patient education. Clinical experience has taught that glycaemic control is impossible without appropriate meal planning, self-monitoring of blood glucose, and appropriate insulin adjustment (Kaplan *et al,* 1993).

Appropriate care of the patient with Diabetes Mellitus demands utilization of diabetes educators for implementation of all the necessary tools to achieve glycaemic control. It is quite clear that the primary care provider in the treatment of DM is the patient himself. Appropriate knowledge and motivation inspired by aggressive medical, nursing and nutrition care is imperative for the rational management of the patient with DM (Sakwa, 1996).

1.2.7.1 STRATEGIES FOR PREVENTION OF DIABETES MELLITUS

According to Leslie and Robins (1995), there are three types of preventive approaches in theory, which can be used to target any given disease condition. These include:

Primary prevention – understood as Intervention among the normal population with the aim of targeting the etiological or risk factors associated with a specific disease. For a chronic degenerative disease such as diabetes, primary prevention entails identifying possible risk factors such as diabetes genes and intervening to remove the etiological factors such as environmental factors by dietary restrictions/changes in diet.

Secondary prevention – that is the early identification of a disease and/or the relevant risk factors and how to interrupt or slow down the process. Secondary prevention will entail early diagnosis by intervening during latency phase in subjects with positive marker for diabetes.

Tertiary prevention – which investigates the various clinical complications associated with disease onset and ways to prevent them. Tertiary prevention is not really genuine preventive technique as it focuses on preventing complications associated with clinical function in IDDM onset and may reduce long-term diabetic complications by preserving residual beta cell.

Given that there is no prevention without prediction, preventive attempts should only be trusted on those subjects identified as being susceptible to the disease. Primary prevention of IDDM is currently impractical since the etiological agents involved in the disease process are unknown.

As a first step, secondary prevention of DM requires the implementation of a screening programme to identify individuals at risks (Leslie and Robins, 1995).

1.2.7.2 MANAGEMENT AND TREATMENT OF DIABETES

Specific measures for prevention of the complications in diabetics are not yet available. However, some measures such as cessation of cigarette smoking, increase in physical activity, reduction of dietary fat intake, may help to alleviate the effects of the complications in diabetics (Jamison *et al*, 1993).

The rationale approach to the management of diabetic is based on reducing morbidity and mortality to that of non-diabetic. This requires very early diagnosis of hyperglycaemia and its related metabolic disturbances (hypertension, dylipidaemia) and intensive management based on an understanding of

pathophysiology. Behavioural interventions are important in the treatment of both Type I and Type II diabetes. Patients with Type I diabetes must follow a complex regimen of diet, exercise, and insulin injections. Failure to follow this complicated set of prescriptions can result in increased risk of complications, symptoms and in severe cases, even death (Kaplan *et al*; 1993).

A major goal in IDDM management is to restore efficient energy utilisation as much as possible. Management of IDDM should aim at achieving a balance between food intake as a source of energy, energy expenditure and a source of exogenous insulin. This means that there should be a balance between food intake, activity and insulin dosage. There should be food for activity and extra insulin for extra food so as to avoid hyperglycaemia and hypoglycaemia by reasonable, consistent meal timing and omitting rapidly absorbed simple sugars from regular meal planning (Battista *et al;* 1988).

In NIDDM, there should be total calorie restriction to promote weight reduction for obese patients and a low fat, low carbohydrate diet is recommended together with use of oral hypoglycaemic agents which will lead to improved control of blood sugars. Simple sugars be completely avoided (Kaplan *et a*l.; 1993).

Substantial evidence now suggests that glucose tolerance does return to normal with weight loss for patients with NIDDM. Physical inactivity may be an issue for both Type I and Type II diabetes. Although exercise cannot "cure" diabetes,

regular activity may help maintain glucose control. In addition, regular exercise may help in weight regulation (Wing, 1989).

1.2.8 COMPLIANCE WITH MEDICAL REGIMENS.

Despite major advances in diagnosis and medical therapeutics of diabetes, patients often do not receive optimal benefit from medical care. While diabetes is preventable and controllable, benefits will accrue only if specific treatment recommendations are followed (Haynes *et al*; 1979). Nearly all patient encountered end in being given advise on how to take charge in managing their condition. This advice might include scheduling other appointments, following directions, or adopting a recommended change in behaviour. Non-compliance is the failure to follow such advice. A rapidly growing literature suggests that failure to adhere to therapeutic regimens is a major problem hampering the quality of medical care (Becker, 1985; DiMateo and DiNicola, 1982). The remedy for non-compliance lies in the improvement of the interactions between patients and providers. This approach suggests that providers must obtain more information from, and provide more information to their patients (Inui and Carter, 1985).

It is generally held that compliance with effective therapeutic regimens will result in better health outcomes. More compliant patients usually achieve better outcomes than non-compliant patients. Compliance may be highest where patient expect that the benefits of the treatment outweigh the consequences and when they

believe that they can perform the behaviours required by the regimens (Kaplan and Simon, 1990).

In addition to problems in gaining access to healthcare, patients also fail to achieve many of the benefits of healthcare because they do not follow the recommendations of the providers. Orne and Binik (1989) observed that there was poor correspondence between compliance with various aspects of diabetic regimen. Patients complied with some aspects but failed to comply with many others. Patients view diet and exercise as important but are extremely difficult to achieve. These findings suggest that diabetes programs of the future should emphasise social influences upon barriers to performing the behaviours required to control the condition (Kaplan *et al;* 1993).

The most common reason for terminating insulin treatment was that it was uncomfortable, that it causes irritation as one injects himself/herself. Several studies have reported that patients are more likely to drop out of treatment if they have poor outcome (Kaplan and Atkins, 1987). Being non compliant might mean that the treatment is not working or it is creating new problems. Other studies have demonstrated that diabetic adults deviate from their regimen when it becomes a nuisance.

Studies have shown that patients can productively contribute to therapeutic decision-making and that the time has come to involve patients more actively in the treatment decision process. There should be improved information delivery

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during physician encounters. It is worthy noting that even a small bit of help can make a difference once the patient gets access. For example for those who have to make commitment to change their diets, a single session with a dietician can produce significant benefits (Stetson, *et al* ;1991).

1.2.9 FACTORS WHICH INFLUENCE PATIENT COMPLIANCE

1.2.9.1 Socio-economic factors

a) Patients income

The income of the patient affects the way he/she will manage his/her condition. Therefore prescribed diabetic regimens should be tailored to patients' income. This will enable the patient to comply to the prescribed regimens, as they can be able to afford (Huskisson, 1981). Financial problems make more patients not to comply with the recommended methods of management and control of blood glucose levels. The cost of medication for example insulin and the cost of prescribed more protein diet which are relatively expensive lead to patients' non compliance to the proper general management of their condition (Sakwa, 1996).

b) Patients Knowledge and education

The knowledge acquired by the patient about their diabetic condition is important in the control the patient is able to exert on their diabetes. The amount of diabetic education, knowledge and information acquired by the patient all have a positive effect upon compliance and have an overall effect of reducing the chances of overt complications (Schatz, 1988).

It is expected that the longer the duration, the more compliant he is to the prescribed regimens and treatment, because this patent has gained knowledge and education from the health care provider, family and friends over time (Schatz, 1988).

1.2.9.3 DEMOGRAPHIC CHARACTERISTICS

a) Age and duration of the disease.

When a patient has been down with the condition for quiet some time, then he is expected to master the art and skill of taking care of his/her condition accepts the role he/she has to play in his her own management of the condition (Kaplan, *et. al,* 1996).

According to previous study done by Mngola (1980) it was found out that a much higher incidence of diabetic complications in patients who were diabetic for over 5 years.

The longer the duration one has suffered from known diagnosed diabetes the better the control of blood glucose level (Gicheru, 1978).

b) Sex

Many studies indicate that diabetes prevalence rates widely fluctuate between the sex groups. West (1978) showed that the disease affects more men than the women.

1.3. RATIONALE FOR THE STUDY

The Epidemiological approach to research in diabetes is important for the description of geographical distribution and determinants of diabetes providing the foundation of generation of hypothesis aetiology aiming at identifying ways of possible prevention and provide the basis of optimal planning and dimensioning of health care in diabetes (Leslie and Robbins, 1995).

Data on diabetes is lacking in the Kenyan set up even though cases seem to be on increase. Hence this study will help policy makers and other collaborators such as the NGOS that are working to fight Diabetes to formulate accurate and relevant policy that is based on hard data in the management of this time bomb condition rather dubbed as the disease of civilisation.

This study will also provide information on the complications that arise due to late diagnosis and poor management of diabetes in our country. The study will finally give policy recommendations that are geared towards prevention of the condition to alleviate the disease burden in our country, and to intensify the knowledge of diabetes prevention and diabetes care so as to substantially reduce the incidence of diabetes-related complications and premature mortality.

The results of this study may also be valuable to the medical professionals, NGOs and the Ministry of Health policy makers to make sound policies as pertains to funding and creating programmes in dealing with this condition. Finally, the findings of this study will also contribute to the field of knowledge in Public Health and Epidemiology and may be a basis for future research in the area.

1.3.1 STATEMENT OF THE PROBLEM

Lack of information and knowledge on the prevention, management and control of this condition has resulted in non-compliance of the patients to their diabetic regimen, giving a leeway to development of complications and even early deaths.

On the other hand diabetes poses an economic impact, which is enormous, primarily due to costs, associated with hospitalization for acute and chronic complications, which lead to coronary heart disease, kidney failure, blindness, amputations, strokes and premature death.

Diabetes causes loss of income due to high cost of treatment, for instance diabetes oral drugs cost 3-10$ per month, cost of insulin is $10-25 per 100 units depending on type and some patients use 200 units of insulin per month.

A significant proportion of hospital health care costs are devoted to patients with diabetes related medical problems for example, close to half the patients at Kenyatta National Hospital who receive kidney dialysis or kidney transplantation have renal failure secondary to diabetes

Hence there was need to undertake prevalence research which may lead to designing programmes to meet the needs of those with diabetes and to develop prevention and control programmes to reduce the costs incurred in curative care and the impact of diabetes on the Kenyan population.

1.3.2: RESEARCH QUESTIONS

a) What are some of the socio-economic factors associated with diabetics?

b) Is the prevalence of patients of diabetes mellitus seeking treatment at KNH increasing?

c) What are the common Complications that afflict diabetics at KNH?

d) What are the common methods of diagnosis; are these methods effective?

e) What are the methods of control and treatment that are employed at KNH?

f) What is the level of patient compliance to the prescribed regimens at KNH?

g) Which are the factors that precipitate non-compliance?

1.3.3 JUSTIFICATION FOR THE STUDY

The purpose of this study was to establish prevalence of diabetes mellitus at KNH and to assess the degree of compliance of the diabetics to their prescribed regimens. The study also elucidated reasons for non-compliance and possible solutions to achieve better compliance and management of this condition were suggested.

1.4 HYPOTHESES

a) There is no increase in the prevalence/incidence of diabetes and its complications among diabetic patients seeking treatment at Kenyatta National Hospital.

b) Regimen compliance of the diabetics at KNH is not good.

1. 5 OBJECTIVES OF THE STUDY

1.5.1 GENERAL OBJECTIVES

a) To investigate the prevalence and to determine the major complications of Diabetes Mellitus among patients seeking treatment at Kenyatta National Hospital.

b) To evaluate patient compliance to their prescribed regimen.

1.5.2: SPECIFIC OBJECTIVES OF THE SURVEY:

a) To identify patient demographic and socio-economic profiles in the study area.

b) To investigate the prevalence of diabetes mellitus in Kenyatta National Hospital.

c) To identify complications of the disorder that diabetic patients present at KNH.

d) Establish the ways the diabetics come to learn that they have diabetes and to establish the methods used to diagnose diabetes.

e) To determine the methods of control and treatment commonly employed in the management of the condition.

f) To determine patient compliance with the prescribed regimens and identify factors that lead to non-compliance of patients to the prescribed regimens.

CHAPTER 2: MATERIALS AND METHODS

2.1 THE STUDY AREA

The study was carried out at **Kenyatta National Hospital,** which is a National referral hospital located in Nairobi City (see map next page). This hospital was selected because it is a National referral Hospital; therefore assumed to have diabetic patients from regions in and around Nairobi and all over the country. This minimised bias when assessing the ethnic and social economic backgrounds of the patients.

2.2 THE STUDY SUBJECTS

2.2.1 INCLUSION CRITERIA

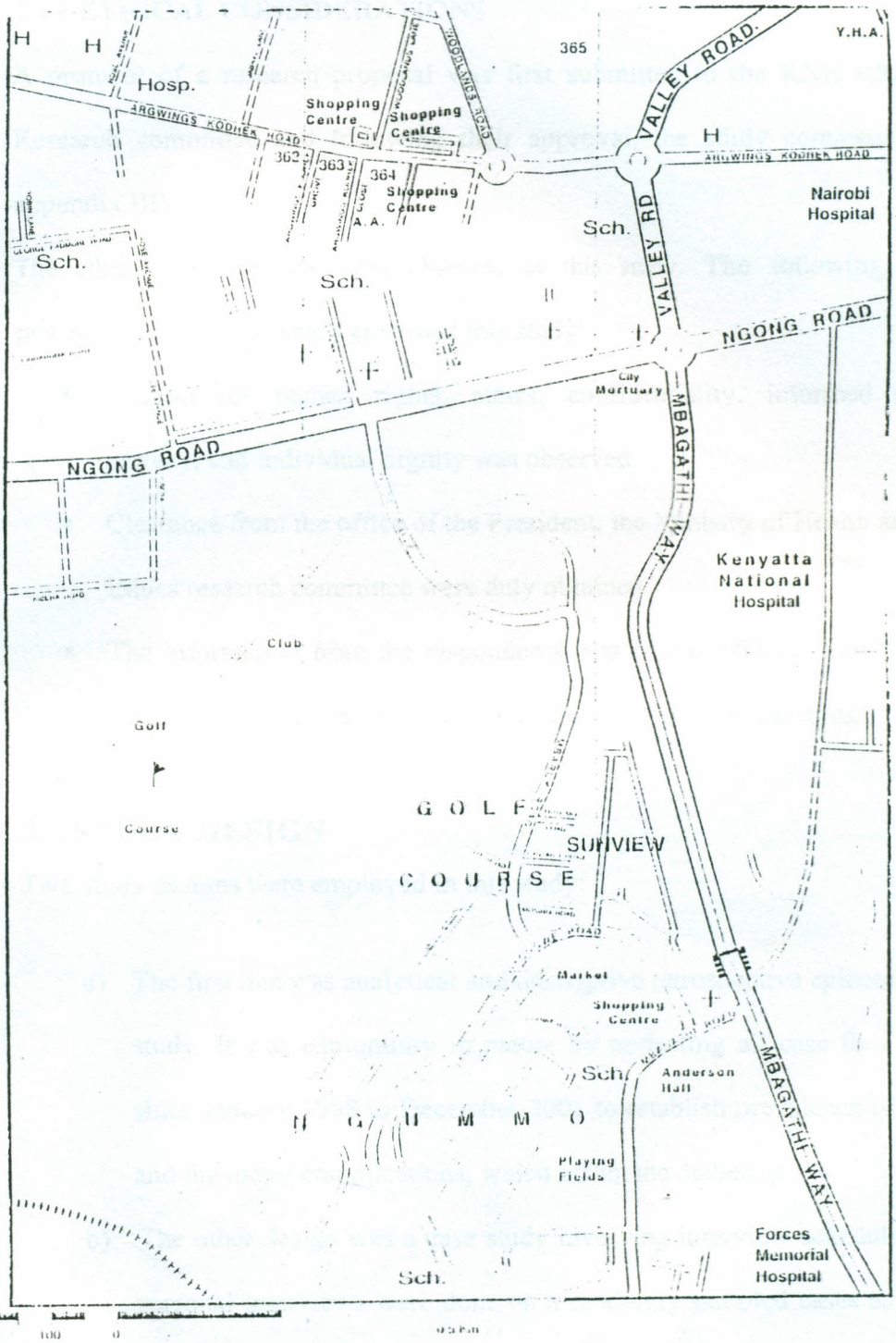
a) All case files from 1998 – 2001 and sampled cases that present with diabetes at the hospital.

b) The cases that were interviewed were as from age 12- 80 and were sampled irrespective of age sex or socio-economic status.

2.2.2 EXCLUSION CRITERIA

All case files which did not fall in the selected years, that is 1998 to 2001. All cases that could not be able to respond to the interview questions and children below 12 years and those of age above 80 years. Those who were too weak to answer the questions were excluded from the study. Those whom could not communicate well in English or Kiswahili were also not interviewed.

Figure I: Map of Nairobi and Location Study Area



2.2.3 ETHICAL CONSIDERATIONS

A protocol of a research proposal was first submitted to the KNH ethical and Research committee and following their approval, the study commenced (See appendix III).

The ethical considerations were observed in this study. The following, values, principals and ethical issues governed this study:

- Respect for human rights, ethics, confidentiality, informed consent, privacy, and individual dignity was observed.
- Clearance from the office of the President, the Ministry of Health and KNH Ethics research committee were duly obtained.
- The information from the respondents was kept confidential and numbers instead of names were used in the data collection questionnaires.

2.3 STUDY DESIGN

Two study designs were employed in this study:

a) The first one was analytical and descriptive retrospective epidemiological study. It was exploratory in nature by reviewing all case files at KNH since January 1998 to December 2001 to establish prevalence of diabetes and the major complications, which afflict the diabetics.

b) The other design was a case study involving interview schedules, where personal interviews were done on a randomly sampled cases as a follow up to explore factors that influence poor control and development of

complications in diabetes. This design was able to provide quantitative data, which detailed on information to establish prevalence trends, relationships and enabled the researcher to meaningfully describe distribution of variables using standard statistical methods.

2.3.1 SAMPLING PROCEDURE

The purposive or convenient sampling procedure was employed in this study in the extraction of secondary data. All the case files from the year 1998 to 2001 were reviewed and random simple sampling was employed to get the cases for exploratory follow-up interview in this study. To qualify for the interview, the patients who were expected to attend clinic which is run once weekly on Fridays during the period of study, were drawn up each week from the diabetic clinic records and using simple random sampling seven patients were selected for interview each week for eleven weeks and three patients interviewed during the last week of study. This sample represented 5% of the patients scheduled to attend clinic every week during the study period.

11x7

2.3.2 SAMPLE SIZE

Since the point of interest in this study was to unearth prevalence of the condition, then the sample size included the review of all the case files from 1998 to 2001.Total of 3,996 diabetic case files were reviewed. The sample of the follow-up cases that were interviewed was determined using Fisher's exact formula as below:

$$n = \frac{Z^2pqD}{d^2}$$

$$N = \frac{1.96^2 \times 0.1 \times 0.5}{0.05^2}$$

$$= 76.8$$

Therefore 80 cases were interviewed.

Where: n= the desired sample size when estimated population is over 10,000

P = Proportion of target population estimated to have Diabetes

q = 1-p

Z = Standard normal deviate at the required confidence level

d=the level of statistical significance

D=design effect

(Adapted from Kothari, 2000).

2.4: METHODS OF DATA COLLECTION

Data was collected from both primary and secondary sources. Secondary data was mainly obtained form the institution's annual records using diabetes prevalence survey form (appendix II). Primary data was obtained through personal interviews as well as a semi-structured questionnaire (Appendix I).

The study employed quantitative techniques of data collection. The instruments used in data collection were: -

a) The prevalence survey form, which was used to collect data from the review of case files.

b) The closed-ended questionnaire was used to collate information from the patients through interview schedules. The interview schedule was pre-tested prior to the period of research (Borg and Gall, 1989).

This method permitted only certain depth responses with clarity to meet the objectives of the study. The patient questionnaire was pre-tested on 8 patients (10% of the desired respondents) and was determined to be reliable (Mugenda and Mugenda, 1999). The interview schedules were conducted each Friday during the research period. Individual interviews were carried out in English or Kiswahili given that the patients have varied educational backgrounds. Personal hospital records reviewed for each case interviewed. Data collection from the patients and the case files took a total of three months.

2.5 DATA MANAGEMENT

Descriptive and analytical statistics have been used to present the results of this study. Data was coded and entered into the computer using statistical package for social sciences was used in both data entry and analysis. Frequencies and percentages were calculated and presented in tabular form. T-test was used to compare the means. Cross tabulations were used to establish relationships between variables. One-way ANOVA was employed to relate late diagnosis and development of complications. Linear regression was used to evaluate risks for diabetes.

CHAPTER 3: RESULTS

This study was done in two parts which are: The survey which involved the review of all case records from January 1998 to December 2001 so as to determine prevalence trends in diabetes at Kenyatta National Hospital. A total of 3996 case files were reviewed and interview schedule were also done to be able to asses level of compliance and management of the condition as a matter of follow up. A total of 80 patients were interviewed.

3.1 SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SUBJECTS

3.1.1 AGE DISTRIBUTION

Table 2 shows a summary of patients' age distribution in years for all the cases reviewed. From the review of records, the youngest patient to be recorded in the period under study was a neonate. The oldest patient was 108 years. The age bracket affected most is between ages 30-59.

Table 2: Patients Age Distribution of all Case Records Reviewed

Age (Years)	Frequency (n)	Proportion (%)
0-9	16	0.4
10-19	85	2.1
20-29	290	7.3
30-39	808	20.3
40-49	1219	30.6
50-59	1121	28.1
60-69	278	7.0
70-79	137	3.4
80 and above	33	0.8
Total	**3996**	**100**

Figure 2: Ages of Interviewed cases.

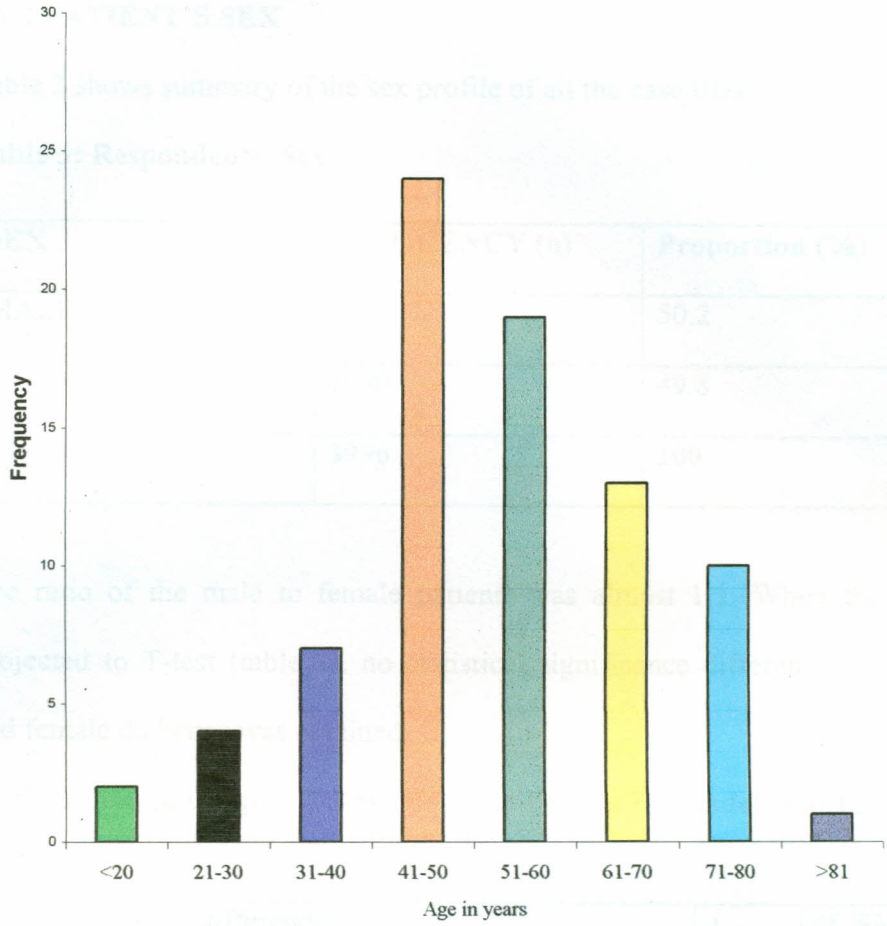


Figure 2 shows summary of the ages of those interviewed. The age bracket affected most is between ages 30-59. This further explains that we have more type two diabetics than type one. Those above 40 are more at risk.

3.1.2 PATIENT'S SEX

Table 3 shows summary of the sex profile of all the case files.

Table 3: Respondents' Sex

SEX	FREQUENCY (n)	Proportion (%)
MALE	2006	50.2
FEMALE	1990	49.8
TOTAL	**3996**	**100**

The ratio of the male to female patients was almost 1:1. When the data were subjected to T-test (table 4), no statistical significance difference between male and female diabetics was obtained.

Table 4: paired samples T-Test for Male-Female respondents at KNH

	Paired Differences					t	df	Sign(2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95%Confidence Interval of the Difference				
				Lower	Upper			
MALE-FEMALE	.25	6.15	1.78	-4.16	3.66	-.141	80	0.891

3.1.3 OCCUPATION

To make the analysis meaningful, the term occupation was defined to mean that economic activity the patient was engaged in. Majority of the patients were self-employed (28.2%) while the least were students.

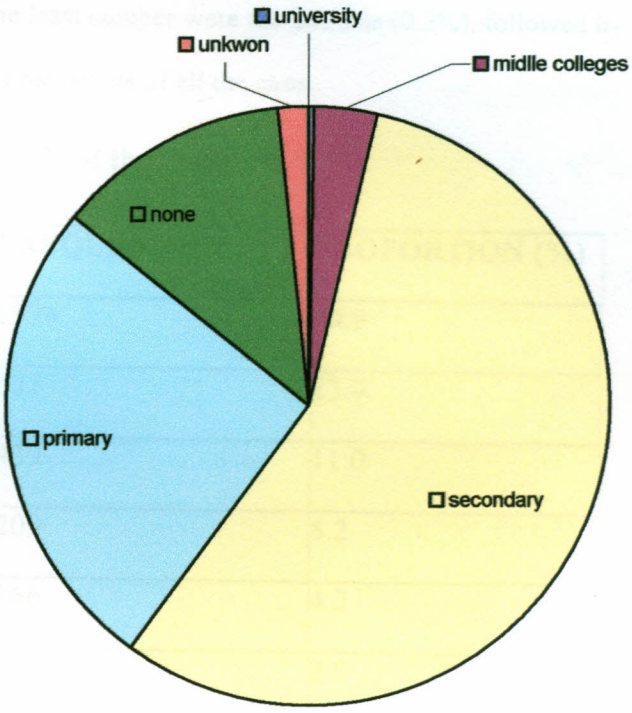
Majority of the respondents, that is, 1448 (36.2%) were self-employed. 530 (28.8%) were in formal employment in civil service or private sector. 339(8.5%) were unemployed and 76 (1.9) were students. Table 5 gives summary of the patients' occupation.

Table 5: Patient's Occupation

Occupation	Frequency (n)	Proportion (%)
Employed	1126	28.2
Retired	530	13.3
Self employed	1448	36.2
Unemployed	339	8.5
Housewife	468	11.7
Student	76	1.9
Unknown	9	0.2
TOTAL	**3996**	**100**

3.1.4: LEVEL OF FORMAL EDUCATION

Figure 3: Patients' level of education



The level of education was the highest formal educational qualification that the patient had attained at the time he/she came for treatment at KNH. From the case files, majority of the respondents (57.5%) were of secondary education level while the least were university graduates (7.5%). It is therefore evident that most people who seek treatment at KNH are of low academic class and therefore probably of low-income class.

3.1.5 ETHNIC DISTRIBUTION

The great majority of patients with this condition were Kikuyu (49.9%), followed by the Akamba (13.9%). The least number were the Somalis (0.3%), followed by the Swahili (0.5 %). Table 6 shows ethnic profile of all the cases.

Table 6: Ethnic Profile of the Patients

TRIBE	FREQUENCY (n)	PROPORTION (%)
Kikuyu	1996	49.9
Kamba	557	13.9
Luhya	439	11.0
Luo	209	5.2
Meru	166	4.2
Kisii	157	3.9
Embu	126	3.2
Masaai	87	2.2
Kalenjin	78	2.0
Taita	60	1.5
Swahili	20	0.5
Somali	11	0.3
Others	90	2.2
TOTAL	**3996**	**100**

3.1.6 INCOME LEVELS

Most of the patients were low-income earners. 24 (30%) of the respondents earned an income of less than Kenya Shillings 4000. Only 5 (6.25%) patients were of high-income bracket, which is above 20,000 Kenya Shillings, while 29 were of medium income earners, (Ksh 9000 to 2000). Table 7 below summarises the income levels of the patients.

Table 7: Patient's Income

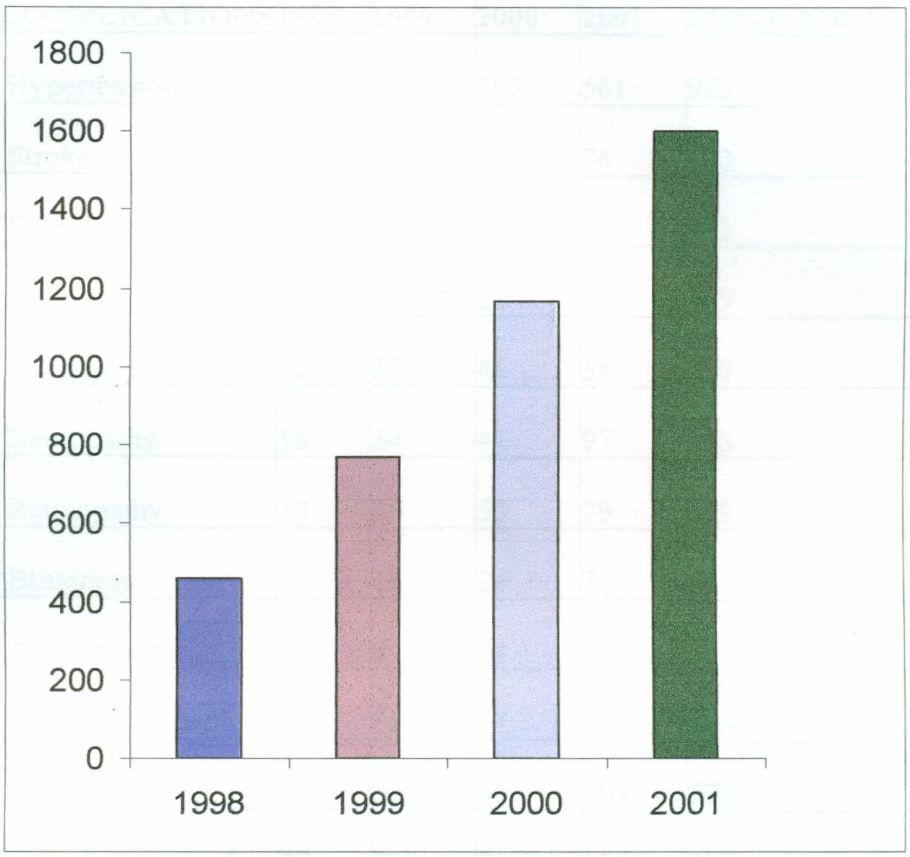
MONTHLY INCOME IN KSHS	FREQUENCY (n)	PROPORTION (%)
Less than 4,000	**24**	**30**
4,001 – 9,000	**22**	**27.5**
9,001 – 15,000	**16**	**20**
15,001 – 20,000	**13**	**16.3**
20,001 – 25,000	**2**	**2.5**
25,001 and above	**3**	**3.8**
TOTAL	**80**	**100**

3.2: PREVALENCE OF DIABETES

From the review of the case files from year 1998-2001, it was noted that diabetes Mellitus was on an upward trend. The number of cases seems to increase gradually every year, however, there was a tremendous increase of cases between the year 1999 and year 2000, where 416 new cases were recorded. The noted increase in cases throughout the period under study could be as a result of increased awareness

and hence many people are being screened of diabetes and being diagnosed. Figure 4 shows the summary of prevalence of cases recorded from 1998-2001.

Figure 4: Prevalence of Diabetes mellitus at KNH



3.3: MAJOR DIABETES COMPLICATIONS AT KNH

From the case files, when the frequency of complications was evaluated, it was found that a patient could have more than one complication. About 50% of the patients with resultant diabetes complications had more than two diabetes resultant complications. Table 8 below gives a summary of the frequency of complications.

Table 8: Frequencies of Complications

COMPLICATIONS	1998	1999	2000	2001	FREQUENCY
Hypertension	71	88	203	561	923
Stroke	23	37	57	76	193
Diabetic coma	11	19	29	52	111
Nephropathy	26	18	31	44	119
Heart diseases	12	33	46	58	149
Neuropathy	16	34	41	97	188
Retinopathy	19	26	55	79	179
Blindness	10	16	24	31	81
Amputations	6	9	24	29	68
Sexual dysfunction	4	15	27	48	94
Ketoacidosis	13	65	89	109	276
Other/unspecified	47	94	76	122	339
Totals	**258**	**454**	**702**	**1306**	**2720**

The cases of major complications noted at KNH were increasing at an enormous rate. For example, blindness due to diabetes effect on the retina was only 10 in 1998 as opposed to 81 in the year 2002.

Majority of the cases had complications. Out of the 3996 cases that were reviewed, 2720 of the cases, accounting for about 68% had complications.

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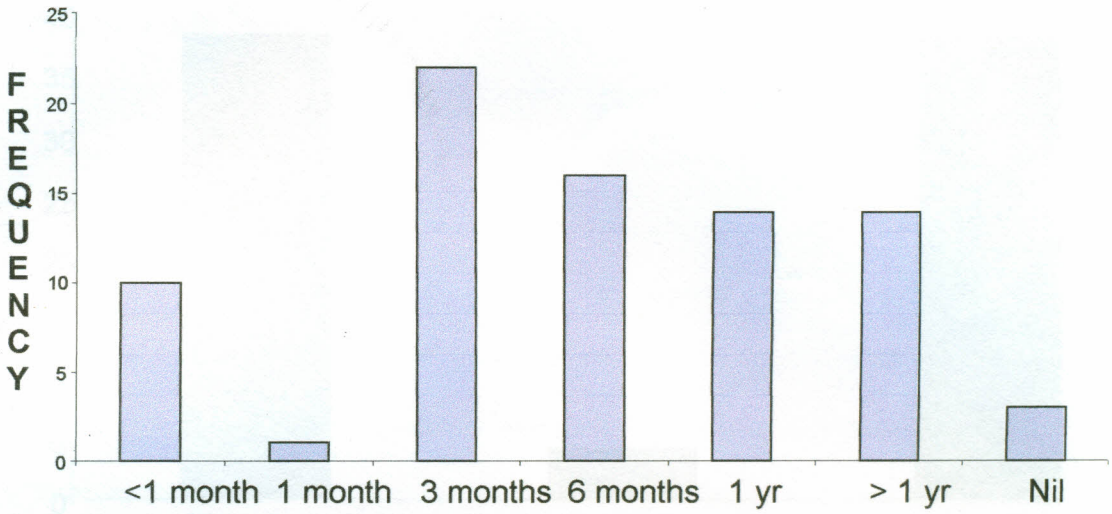
Hypertension was the most frequent complication. 923 cases were having hypertension out of the 2720 cases with complications. The least of the complications was the resultant amputations with total cases of 68 in the period of study.

3.4 DIAGNOSIS

3.4.1 DURATION OF SYMPTOMS BEFORE DIAGNOSIS

This referred to the number of months the patient had suffered the diabetic symptoms before diagnosis due to ignorance or confusing the symptoms with another disease. This finally leads to development of complications or poorly controlled diabetes. Of the 80 respondents, only 3 patients did not suffer the symptoms before they were diagnosed, meaning that these patients discovered their condition before its onset. All the three patients eventually had good control of their diabetes. Figure 5 shows the duration the diabetics suffered before the respondents were diagnosed to be diabetic.

Figure 5: Duration of symptoms before diagnosis

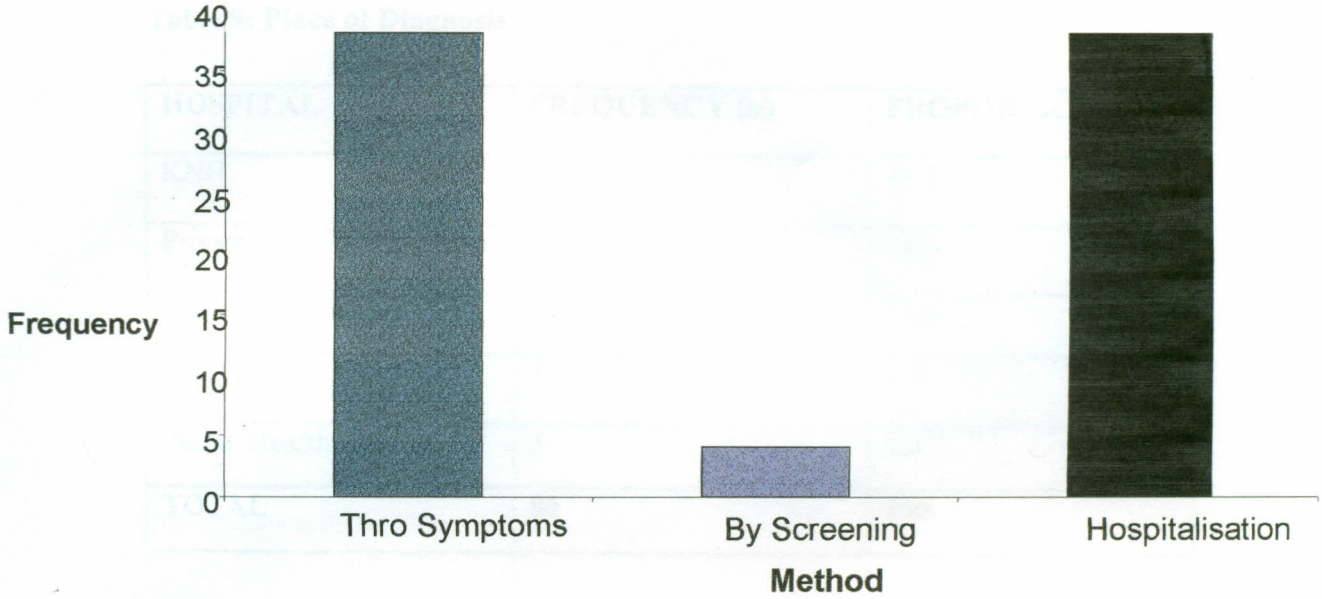


Duration of symptoms

3.4.2 WAYS BY WHICH DIABETICS LEARN OF THEIR CONDITION

This meant the way the diabetic patient first come to know his/ her condition. There were three ways identified that is, through symptoms, by screening, and through hospitalisation. Figure 6 gives a summary of the way patients first learnt of their condition.

Figure 6: ways diabetics come to know that they are diabetic



Out of the 80 patients interviewed only 5 patients learnt of their condition through screening. 39 patients learnt of their condition through observing symptoms and going for diagnosis in hospital while the remaining 38 learnt of their condition through hospitalization, meaning that they did not know of their underlying diabetic problems until they were hospitalized and diagnosed to be diabetic.

3.4.3 PLACE WHERE FIRST DIAGNOSED AS DIABETIC

Table 9: Place of Diagnosis

HOSPITAL	FREQUENCY (n)	PROPORTION (%)
KNH	29	36.3
Private Facility	27	33.8
District/Provincial	14	17.5
NGO	7	8.9
Public Health Centre	3	3.8
TOTAL	**80**	**100**

Majority of the respondents (36.3%) stated that they were first diagnosed to be diabetic at KNH. Only 3 i.e. 3.8% of the respondents were diagnosed at the public health centres. This shows that there is lack of proper diagnostic techniques in the lower levels of the referral system. This delays diagnosis giving a leeway to the development of complications.

3.5 MANAGEMENT AND CONTROL

3.5.1 SPECIFICATION OF TYPE OF DIABETES MELLITUS

Of the total case files reviewed, only 1844 (47.26%) cases had their diabetes specified, that is, the specific type of diabetes was identified and labelled while 52.4% cases were of unspecified diabetes mellitus. Table 10 gives a summary of the specificity of diagnosed diabetes.

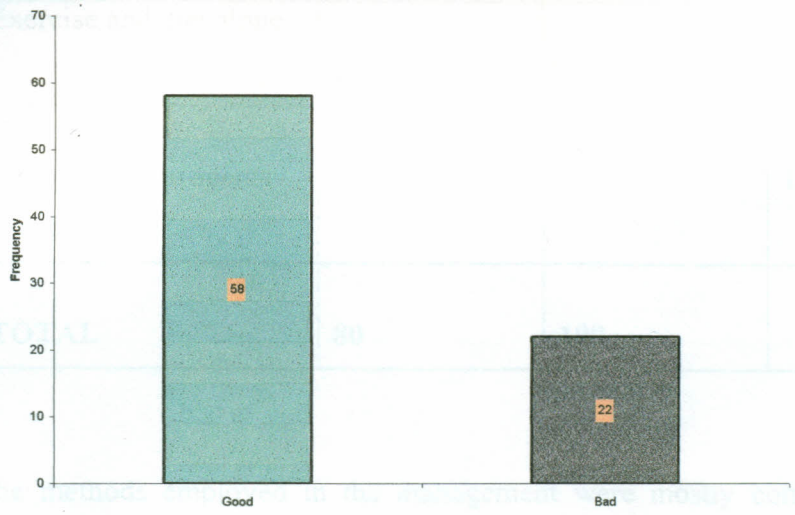
Table 10: Type of Diabetes mellitus

TYPE	FREQUENCY	PROPORTION (%)
IDDM	1390	34.79
NIDDM	454	11.36
Unspecified Diabetes mellitus	2112	52.85
TOTAL	**3996**	**100**

3.5.2 LEVEL OF GLUCOSE CONTROL

Figure 7 shows the summary of level of glucose control

Figure 7: Level of blood glucose control



Out of the 80 patients that were interviewed, 58 (72.5%) of the respondents had good control of their diabetes, while 22 (27.5%) had poor blood glucose control.

3.5.3 METHODS USED TO MANAGE THE CONDITION AT KNH

Table 11: Common Methods of Management at KNH

METHOD	FREQUENCY	Proportion (%)	CUMULATIVE
Insulin	5	6.3	6.3
Oral Hypoglycaemic drugs/agents	6	7.5	13.8
Insulin diet and exercise	29	31.3	45.1
Diet and oral hypoglycaemic agents	25	36.3	81.4
Exercise and diet alone	2	2.5	83.9
Insulin oral hypoglycaemic agents and diet	13	16.1	100.0
TOTAL	**80**	**100**	

The methods employed in the management were mostly combined. The study findings show that majority of the patients at KNH (36.3%) are managed by insulin supplements and diet regulation. 25 (31.3%) of the patients that were interviewed were managed on diet and oral hypoglycaemic agents. 6 patients (7.5%) are managed by oral hypoglycaemic agents. Those managed on exercise

and diet alone were 2 (2.5%). Most patients (29) were managed by insulin, diet and exercise, followed by those under management of diet and oral hypoglycaemic agents (25). The least method used in the management is that which involves exercise and diet alone (2). 6.3 % of the patients were on insulin treatment alone without diet restrictions.

3.5.4 SATISFACTION TO HOW CONDITION IS BEING MANAGED

When the respondents were asked on what their view was about the way their condition was being managed, 71.3% of the patients were satisfied with how their condition was being managed, while 23 (28.7%) were not satisfied. This information is summarised in table 12

Table 12: Satisfaction with Management of the Disease

Satisfied with management	Frequency (n)	Proportion (%)
YES	57	71.3
NO	23	28.7
Total	**80**	**100**

3.5.5 ADVICE, EDUCATION AND INFORMATION

9 respondents said that they were not given any advice at first diagnosis and this could result into mismanagement of their condition. Table 13 gives a summary of the various advices given during the first visit to the patients by the health care providers.

Table 13: Advices Given at Diagnosis

ADVICE	FREQUENCY	%	CUM %
Diet counselling	9	11.3	11.3
Insulin use	1	1.3	12.5
More information	3	3.8	16.3
Exercise and diet	13	16.3	32.5
Insulin diet and exercise	14	17.5	50.0
Hypoglycaemic agents and diet	4	5.0	55.0
Information on injection use	11	13.8	68.8
All of the above	6	20.0	88.8
No advice given	9	11.2	100.0
TOTAL	**80**	**100**	

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3.5.6 KNOWLEDGE OF COMPLICATIONS

The knowledge acquired by the patient about their diabetic condition is important in the control the patient is able to exert on their diabetes. The amount of diabetic education, knowledge and information acquired by the patient all have a positive effect upon compliance and have an overall effect of reducing the chances of overt complications (Schatz, 1988). 78%, that is 63 patients knew the complications of Diabetes while 17 of them did not have any idea of the complications. The table 14 below gives a summary of the patients' knowledge of the complications.

Table 14: Knowledge of Complications

KNOWLEDGE OF COMPLICATIONS	FREQUENCY	%
YES	63	78.8
NO	17	21.2
TOTAL	80	100

3.6.5 DURATION OF DISEASE IN YEARS

The term duration referred to the number years a patient had been suffering form the condition. The Duration ranged from one month to 25-years .34.11% of the total patients had duration of one year, followed by patients with duration of less than one year (26.73%). The least duration was that of nine years where a total of 10 that is, (0.25%). Table 15 gives summary of this result.

Table 15: Duration of Disease in Years

DURATION	Frequency	Percentage
Less than a year	1039	26
1	1326	33.18
2	903	22.6
3	370	9.25
4	97	2.4
5	39	0.98
6	14	0.35
7	18	0.45
8	16	0.4
9	12	0.3
10	10	0.25
Over 10	43	1.07
Unknown	09	2.73
TOTALS	**3996**	**100**

3.6: COMPLIANCE

3.6.1 STRICT COMPLIANCE TO DIABETIC REGIMEN

43 patients (53.8%) complied strictly to the advice given to them while 37 patients (46.2%) failed to comply with the advice. Table 16 gives a summary of this result.

Table 16: Compliance to Advice

COMPLIANCE TO DIABETIC REGIMEN	FREQUENCY (n)	PROPORTION (%)
YES	43	53.8
NO	37	46.2
TOTAL	80	100

3.6.2: REASONS FOR NON COMPLIANCE

Out of the 37 patients who did not comply strictly with their treatment plan, 25 of them said they were unable to comply because they were unable to afford the cost involved in the purchase of medication. One patient had no reason for not complying, hence negligence on his part. But on examination, this patient had no formal education. Table 17 Shows reasons for non-Compliance.

Table 17: Reasons for non-Compliance

REASON	FREQUENCY	%
Cannot afford medicine	25	67.6
Not able to use drugs as required	3	8.1
No reason	1	2.7
Both 1 and 2	8	21.6
TOTAL	37	100

3.6.3: RELATIONSHIP BETWEEN EXTRA EDUCATION ON DIABETES AND COMPLIANCE

The extra knowledge/Education acquired by the patient about their diabetic condition is important in the control the patient is able to exert on their diabetes. The amount of diabetic education, knowledge and information acquired by the patient all have a positive effect upon compliance and have an overall effect of reducing the chances of overt complications (Schatz, 1988).

Of the 63 patients who had been given more information about their condition, 33 (52.4%) were strict compliers of their diabetic regimen. Table 18 gives a cross tabulation of the relationship between extra education and compliance to the regimen.

Table 18: Relationship between extra Education on diabetes and compliance

	COMPLIANCE		
EXTRA EDUCATION	**YES**	**NO**	**TOTAL**
YES	33 (52.4%)	30 (47.6%)	63(78.8%)
NO	10 (58.8%)	7(51.2%)	17(21.3%)
TOTAL	**43 (53.8%)**	**37 (46.3%)**	**80 (100%)**

3.7: HISTORY AND RISK FACTORS ASSESSMENT.

3.7.1 CIGARETTE SMOKING

Cigarette smoking has been attributed as a risk factor to Diabetes complication of stroke and hearty attack. 9 (11.3%) of the respondents still engaged themselves in cigarette smoking even after they were informed that this behaviour increases the risk of not achieving good control. 71 of the respondents were not active smokers. Tale 19 gives a summary of the result.

Table 19: Cigarette Smoking

CIGARETTE SMOKING	FREQUENCY	Proportion (%)
YES	9	11.3
NO	71	88.7
TOTAL	**80**	**100**

3.7.2: ALCOHOL CONSUMPTION

35 patients (43.8%) were still engaged in alcohol drinking while 65 patients did not take alcohol (56.2%). A summary of this is shown in the table 20 below.

Table 20: Alcohol Consumption

ALCOHOL CONSUMPTION	FREQUENCY	Proportion (%)
YES	35	43.8
NO	65	56.2
TOTAL	**80**	**100**

3.7.3: LACK OF EXERCISE AS A RISK FACTOR

Lack of regular exercise has been attributed to Diabetes and attainment of poor blood glucose control. 39 of the respondents were actively engaged in physical exercise; while 41 (51.3) were not engaged in physical activity to enable them achieve good control. Table 21 shows a summary of the results.

Table 21: Regular Exercise

REGULAR EXERCISE	FREQUENCY	Proportion (%)
YES	39	48.7
NO	41	51.3
TOTAL	**80**	**100**

3.7. 4: FAMILY HISTORY.

59 of patients interviewed had a positive family history. This shows that family history is significant in relation to diabetes prevalence at Kenyatta National Hospital. Table 22 below gives a summary of family history of respondents.

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Table 22: Family History

HISTORY	FREQUENCY (n)
FATHER/MOTHER	37
SISTER/ BROTHER	8
GRAND PARENTS	11
SON/ DAUGHTER	3
NO HISTORY	21
TOTAL	**80**

Of all patients interviewed, 73.8 % had a positive family connection. 60 % of those with family history had a close family diabetic tie (that is Father/ mother; sister/ brother categories).

When linear regression analysis was done on the three risk factors, family history was found to be the highly significant single risk factor among the study subjects.

Table 23: Linear Regression Analysis between Risk factors and diabetes at KNH

		Alcohol	Physical Inactivity	Family history
Diabetic Cases	R	0.567*	0.530*	0.971**
	R^2	0.535	0.56	0.942
	p	0.000	0.000	0.000
	N	80	80	80

* Correlation is significant at the 0.01 level (2-tailed).

3.8: CONTROL OF THE DISEASE

3.8.1 OF BLOOD SUGAR LEVEL

On the objective assessment of the blood sugar levels as indicated by the nurse in the previous three visits, the following results were obtained in table 24.

Table 24: Level of blood glucose control

CONTROL	YES	NO	TOTAL
Good	48	10	58 (72.5%)
Bad	9	13	22 (27.5%)
TOTAL	**57 (71.3%)**	**13 (28.8%)**	**80 (100%)**

3.8.2: RELATIONSHIP BETWEEN DIAGNOSIS AND LEVEL OF BLOOD GLUCOSE CONTROL

When one-way ANOVA was subjected to the variables of year of diagnosis versus control, the following table 25 gives the outcome of the analysis of variance.

Table 25: Relationship between Diagnosis and level of blood glucose control

SOURCE	d.f	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROBABILITY
Between groups	1	3.387	3.3870	1.0849	0.3008
Within groups	78	150.163	1.9252		
TOTAL	**79**	**153.550**			

N=80
F (0.3008)

When one-way ANOVA was subjected to the variables of year of diagnosis versus control, it was found that there is statistical significance (F=3.008 at 0.001 confidence level) between the duration of symptoms before diagnosis and level of blood glucose control. This indicated that those people who were diagnosed early enough had good control of their diabetes over those who were diagnosed after some long duration of time.

CHAPTER 4: DISCUSSION

This study aimed at investigating the prevalence of diabetes mellitus and its complications at KNH and further investigated the effect of socio-economic, cultural and demographic factors on the patient's degree to comply with the prescribed diabetic regimens. The study further aimed at investigating whether information and education about diabetes is given to patients early enough so as to avoid mismanagement and development of diabetes complications. To be able to meet the above objectives, This study was done in two parts which are: The review of case records to determine prevalence and interview schedule to be able to asses level of information and education the patient has been given and relate this to the development of complications.

4.1: PATIENT SOCIO-ECONOMIC CHARACTERISTICS

This further explains that we have more type two diabetics than type one. Those above 40 are more at risk. The ratio of the male to female patients was almost 1:1, although male patients were slightly more than. This result compared well with the findings of West (1978) who showed that the disease affects more men than the women. When the data were subjected to T-test, no statistical significance difference between male and female diabetics was obtained (Table 4). These results compared well with an early survey done at Kenyatta National Referral Hospital showed equal male and female prevalence rates (Sakwa, 1996) and

supports existing scientific knowledge (West, 1978; Leslie and Robins, 1995; Mc Carty and Zimmet, 1997; Zimmet, 1979; Kaplan *et al.,* 1993).

It is therefore evident that most people who seek treatment at KNH are of low academic class and therefore probably of low-income class. This compared well with studies done earlier at the same institution by other scholars (Sakwa, 1996; Njenga, 1986; Hakim, 1983; Gicheru, 1978; Abdullah, 1976).

On ethnicity is concerned, the Kikuyu community topped the list. This could be caused by the fact that they are the majority of all the Kenyan Tribes as from the census of 1999 or simply because KNH is near to them than the rest of the Kenyan tribes. This compared well with studies done earlier by Sakwa (1996); Njenga, (1986); Hakim (1983); Abdullah (1976). The other possible reason floated by Gicheru (1978) is that this community is highly susceptible to diabetes than all other communities in Kenya.

Most of the patients were low-income earners. This affected their levels of compliance; there was poor compliance of the patients to their prescribed regimen. This result was in line with the findings of Onyango (1982); and Schatz (1988), who found that low income and low level of formal education affects the way the patient will manage his/her condition. Therefore prescribed diabetic regimens should be tailored to patients' income. This will enable the patient to comply to the

prescribed regimens, as they can be able to afford (Huskisson, 1981). Financial problems make more patients not to comply with the recommended methods of management and control of blood glucose levels. The cost of medication for example insulin and the cost of prescribed more protein diet which are relatively expensive lead to patients' non compliance to the proper general management of their condition (Sakwa, 1996).

The knowledge acquired by the patient about their diabetic condition is important in the control the patient is able to exert on their diabetes. The amount of diabetic education, knowledge and information acquired by the patient all have a positive effect upon compliance and have an overall effect of reducing the chances of overt complications (Schatz, 1988).

4.2: PREVALENCE OF DIABETES AT KENYATTA NATIONAL HOSPITAL

From the review of the records since January 1998 to December 2001, it was noted that there has a marked increase of Diabetes mellitus. This increase can probably be attributed to the increase in awareness on the general population due to increased awareness campaigns which could have resulted in raising index of suspicion and improved methods of diagnosis and improved level of formal education has resulted in more people going to hospital on the earliest signal of the perceived symptoms of the condition. These results compare well with the works

of Onyango (1982) who stated in his work " the prevalence of diabetes at K.N.H is increasing at an alarming rate and this calls for an all out National effort to combat this disease as there could be many more cases that have not sought treatment in the country". This result was also inline with the works of Sakwa (1996); Mungola et al (1982); Awan and Mungola (1976) all of whom showed that there is a surge in diabetes among the Kenyan population . Since, almost half of people with diabetes remain undiagnosed, the prevalence that was shown by this study can only give a rough idea of how worse things could be on the ground. For this reason, it is hoped that the results of this study will help raise awareness, promote the need for education and curb the financial burden of the illness. Changes in lifestyle are to blame for the increasing incidence of Type 2 diabetes. New technologies and timesaving devices are replacing traditional active lifestyles and modifying dietary patterns, thereby increasing the risk of developing Type 2 diabetes.

4.3 MAJOR COMPLICATIONS OF DIABETES MELLITUS AT KNH

The results of this study showed that Diabetes complications as seen among the patients seeking treatment at KNH during the study period is increasing tremendously. The reason for this is that KNH is a national referral Hospital where complicated cases if all diseases are referred to from District and Provincial Hospitals. By the time people are diagnosed as having diabetes, 70% of them

already have complications like high blood pressure, importance and tissue damage because the disease has gone undiagnosed up to ten years. The onset of diabetes may be slow or dramatic but the effects can be disastrous and even tragic (WHO, 1980). A person with diabetes is more likely than other people to develop; heart attack, stroke, eye problems which can lead to blindness, kidney disease which can lead to kidney failure, foot or leg amputations, frequent infections and sexual dysfunction among other complications (Hukisson 1981;Nathan and Meigs 1997; Feener and King 1993). Complications of Diabetes in K.N.H are mainly due to patient's failure to comply with their prescribed diabetic regimens (Sakwa, 1996).

Most of the patients who suffered for quite some time before they were diagnosed as being diabetic ended up developing diabetes complications. This compliments the work done earlier by Mungola (1980) who showed that a much higher incidence of diabetic complications occurs in patients who are diagnosed after the disease has long established in the system for quit some time.

Substantial epidemiological data suggest that prolonged elevated blood glucose levels are correlated with complications in a variety of organ systems (Ross *et al;* 1983). This study found out that patients who had poor control of their diabetes ended up developing resultant complications. These findings also were in agreement with the findings of (Sakwa, 1996), who found out that complications

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as a result of diabetes at KNH are mainly due to patient's failure to comply with their prescribed diabetic regimens.

Majority of the patients were diagnosed at KNH followed by those diagnosed at Provincial and District Public Hospitals and later referred to KNH for treatment and management. This shows that health centres and clinics miss to diagnose diabetes correctly. This in turn leads to a person staying for long with undiagnosed diabetes and by the time the case shows up at KNH, complications of this disorder would have already set in.

4.4: MANAGEMENT OF DIABETES

The most common methods used in the management of the condition at KNH were by use of diet, oral hypoglycaemic and diet (36.3 %), this suggests that most of the patients seeking treatment at KNH are of type II diabetes. This concurs with the generally held scientific fact that the most common type of diabetes is that of type II that is 90 % (West, 1978; Martin, 2000; WHO, 1980).

It has been shown that proper management of this condition is achieved if the distinction is made between the major two types of diabetes (Leslie and Robins, 1995). But from this study results show that 52.74% of the total cases in review had their diabetes not specified. This in itself is a major source of mismanagement

and something needs to be done to check on this serious omission on the part of the physician.

4. 5: DIABETES EDUCATION/ INFORMATION

Most of the patients who did not comply with diabetic regimen (80%) had not received any advice or extra education ever since they were first diagnosed. Most patients with limited education and knowledge about diabetes are unable to follow their regimens. Many diabetic patients may not understand the condition they are suffering from and therefore may not know how to take care of themselves adequately. Any regimen plan given to such patients may not benefit them, as they do not make sense out of it. Lack of necessary education to the diabetics is therefore the primary cause of poorly controlled blood sugars in most diabetics seeking treatment at KNH. This result was in agreement with the findings of Kaplan and Davis (1986) who showed that Diabetes Education empowers the patient to make his or her own decisions as part of the Health –care team. The knowledge acquired by the patient about their diabetic condition is important in the control the patient is able to exert on their diabetes. The amount of diabetic education, knowledge and information acquired by the patient all have a positive effect upon compliance and have an overall effect of reducing the chances of overt complications (Schatz, 1988; Kaplan and Davis, 1986).

The results of this study reveal that much still needs to be done to increase awareness of people with diabetes about their condition, the need to maintain stable blood glucose levels and the effective regimes that are available to help them achieve this aim. Empowerment, through education, will always prove cost effective (Davidson, 1986; Feener and King, 1993; Nathan, 1997; West 1978; Zimmet, 1982; 1979; Ochi *et al*, 1985).

Majority of the respondents got more information and extra education about Diabetes from KNH. The rest sought it from Private, District/Provincial Hospitals or NGOs before they ended up at the National referral Hospital. It was established that the main source of diabetes education and information in Nairobi is K.N.H The NGOs that are concerned with Diabetes and other awareness lobby groups were rarely cited as sources of Diabetes information. This clearly showed that at low levels of referral system, patient education is not adequately given and thus results in mismanagement of the condition eventually resulting into development of complications.

4.6 COMPLIANCE

The results of this study demonstrated that those patients who followed their physicians advise and prescribed regimen, achieved better control of their diabetes than those who did not adhere to the health care professional recommendations. Income levels influenced compliance to advice given by health care professionals. The patients in high-income bracket all complied to advise while some of those in the low income bracket did not comply and cited unaffordability of the drugs and the required diets as a major reason for their non-compliance with their regimens. These findings were in agreement with work done else where by Schatz (1988) but were contrary to those done at the same place by Sakwa (1996), who indicated that low income did not affect patient compliance to their prescribed regimen.

Formal Education had an influence on compliance with the regimen prescribed for the diabetics. Those patients who were of post primary education complied readily to their regimens probably because they understood their treatment regimens and new the repercussions of not following their regimens.

Those with secondary levels of education have relatively higher awareness; the level of awareness seems to increase with the level of education. There is a higher awareness of diabetes among males than females. The level of formal education seems to go hand in hand with level of proper management. The lower the formal education the poor the management of the condition. This study disagrees with the

earlier works done by Sakwa (1996) who concluded that: "Education, occupation and income did not seem to play a major role in compliance to regimens. The same applied to age and marital status" (Sakwa 1996)

Compliance to the diabetic regimens was not related to duration of illness.

This was contrary to the results from the works done earlier on by Sakwa (1996) and Gicheru (1978) at the same institution which suggested that the longer one had suffered diabetes the better the compliance to his/ her regimen.

Sex, tribe and occupation did not affect adherence to the instructions of the health care professional by the patient. These results were in agreement with work done earlier by Sakwa (1996). The results indicated that those who had been given information immediately after diagnosis achieved better control than those who received education later or never did.

When one-way ANOVA was subjected to the variables of year of diagnosis versus control (table 26), it was found that there is statistical significance between the duration of symptoms before diagnosis and level of blood glucose control. This indicated that those people who were diagnosed early enough had good control of their diabetes over those who were diagnosed after some long duration of time. This result was in line with the findings of Sakwa (1996) who argued that: "With the passage of time the patient is expected to be familiar with the disease, accept

the situation and appreciate the role he/she has to play in his/her management and this should lead to better management" (Sakwa, 1996).

4.7: REASONS FOR NON COMPLIANCE

The major reason for non-compliance was lack of money to purchase the required drugs and diet for most of the patients who did not comply with their regimens. This result was in agreement with the work done earlier by Sakwa in 1996 at the same institution where she argues that: "Unavailability of money to purchase drugs could have resulted in poor disease control in some patients" (Sakwa, 1996).

Behavioural interventions are important in the treatment of both Type I and Type II diabetes. Patients with Type I diabetes must follow a complex regimen of diet, exercise, and insulin injections. Failure to follow this complicated set of prescriptions can result in increased risk of complications, symptoms and in severe cases, even death (Kaplan *et al*; 1993).

4.8: HISTORY AND RISK FACTORS ASSESSMENT.

The regression analysis performed identified positive Family history, increased Alcohol consumption and physical inactivity as significant risk factors associated with diabetics in Kenyatta National Hospital (Table 24). This was consistent with

other studies done elsewhere (Zimmet, 1978, 1982; WHO, 1978; World Bank, 1975; Leslie and Robins, 1995; Schatz, 1988).

The risk factors reported above were extremely significant and indicate that unless something is done, the problem of diabetes and its resultant complications at KNH will continue to escalate at an alarming rate. As earlier reported the prevalence rate has increased from less than 1% in 1982 (Awan and Mungola, 1982) to 6% in 1996 (Sakwa, 1996) and 12.97% in 2002 (Current Study).

The level of blood glucose control at KNH can be termed as good since 76 % of the patients had averagely good blood glucose control. This shows that good control can be achieved by good compliance. Level of compliance of the diabetics to their prescribed diabetic regimen at KNH can generally be documented as good. This result compares well with previous work done by Sakwa (1996) at the same institution.

complications if the adhere to their prescribed regimens. This was consistent with the works done earlier at the same institution (Sakwa, 1996).

e) The results of this study show that there is a misnomer in the management of this disorder, which should not be ignored. This was both attributed to the health care professionals not giving the information and education to their patients and the patient's failure to comply with the prescribed diabetic regimen. Lack of specification of the type of diabetes at KNH between the type I and type II by the physicians and some consiltants is a source of error in the proper management of diabetes in the hospital. Majority of the patients learn of their condition after they are hospitalised. This means that most patients come to know of the condition long after it has established in the system causing the resultant complications due to uncontrolled sugar.

f) Patient adherence and compliance to the advise given can be termed generally as good even though much still needs to be done to improve on the few areas suggested above so as to have the best results in the management of the diabetics at KNH and in Kenya as a whole. Level of compliance of the diabetics to their prescribed diabetic regimen at KNH can generally be documented as good. It was observed that knowledge of

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diabetic complications is quite widespread among the patients seeking treatment at KNH

g) Physical inactivity, alcoholism are catalysts for the onset of complications in diabetes. It was further observed that family history is significant in relation to diabetes prevalence at Kenyatta National Hospital. This was consistent with other studies done elsewhere (Zimmet, 1978, 1982; WHO, 1978; World Bank, 1975; Leslie and Robins, 1995; Schatz, 1988).

In conclusion from the results of this study, it was clear that for proper management of this life threatening condition to be achieved, then the following conditions must be fulfilled before satisfactory standard of management can be achieved:

1) The patient must have a moderate degree of knowledge and information/ education so that he /she can understand the disease he suffers and of the reasons for the treatment recommended so as to comply with it.
2) The patients must be willing to cooperate and follow the recommended regimen carefully and accurately
3) The doctor and other health professionals must be interested in diabetes and create time so as to discuss, instruct and supervise his/ her patients, appropriately.
4) Health care professions should aim at identifying and specifying the type of diabetes, that is, type and type diabetes for better management.

5) Because so many patients that were involved in this study already experienced diabetes-associated complications, the need for further education about the importance of improving blood glucose levels is urgent. Traditionally, educating people with diabetes has been the primary responsibility of health care professionals.

Once all the above are achieved, the level of development of complications shall be reduced.

CHAPTER 6: RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE RESEARCH WORK

6.1 : RECOMMENDATIONS

- **The Government should: -**

  a. Recognize diabetes as a serious public health problem.

  b. Develop and implement a National diabetes programme, which shall be involved in the education and awareness campaigns to educate the general public on Diabetes and be involved in the management of the condition by coordinating research, prevention, treatment and control programmes.

  c. Be proactive on diabetes and give it as a serious condition affecting its people and form a secretariat for Non-communicable diseases where diabetes is included so as to reduce the negative impact these conditions will be exerting on the economy. The government should develop and implement a National Diabetes Programme.

  d. Allocate resources to prevent and manage diabetes. Provide resources for research.

e. Develop and implement an integrated health care model; implement clinical care guidelines.

f. Make available and affordable insulin and other medications and supplies needed for managing Diabetes. Insulin is a life saving drug for most diabetics, and hence should be included among the essential drugs list. Human insulin, which is currently used in the management of this condition, is expensive for majority of the Kenyan population. Struggling families in Kenya are sometimes forced to have to make hard choices between food and medication and therefore the cost of insulin should be subsided for the common man to afford.

g. Make Blood sugar testing a routine test in public institutions starting from hospitals, schools, colleges etc should be done. This will help identify those people at high risk of developing diabetes, who can then be given intensive education on Healthful living in adjusting their diet, life style, etc. These measures will enable such individuals prevent/ postpone or completely avoid Diabetes

h. Develop a national database for diabetes. There is no current data on the numbers that are affected by diabetes in the ministry of health to be able to appropriate resources for proper management of this condition. Hence the ministry of Health should come up with an Epidemiological research on diabetes to be able to come up with the number of people affected by this condition.

i. Empower the patient and educate the health care team. There should be an adjustment to improve the curriculum on diabetes and endocrinology in the medical institutions, especially in the Medical Training Centres so as to equip the personnel with sufficient information and knowledge to be able to improve care and management of the patient suffering from the condition. There should be refresher courses for the Health care professionals dealing with diabetes so as to equip them with current information aimed at achieving better management of this condition.

j. Design an educational program to create awareness to the general public. This will lead to availability of information on diabetes and hence enhance management, which will in turn lead to, decreased development of diabetes complications which are expensive to manage and lead to poor quality of life. Many alert patients and

families can be counted on to ask the doctor questions, secure literature, and keep working until they find satisfactory regimen. Hence, the health care professional must take an initiative in calling a client's need so as to come up with an acceptable management plan. Therefore, patient education should be a primary responsibility of health care professionals to empower patients with skill and information to enhance their adherence to the prescribed regimens.

k) Promote partnerships among major stakeholders. Partnerships involving National organizations, communities, the media, the private sector and other stakeholders need to be established, while those existing be strengthened.

6.2: SUGGESTIONS FOR FUTURE RESEARCH WORK

Since this work was an informant research on the magnitude of diabetes in Kenya and hence serving as an eye opener into diabetes research which will assist our country in aiming to prevent the development of complications which afflict the diabetics and design new intervention programs to minimise the condition in the general population. Therefore, I recommended that further research be carried out in the following areas: -

1) A similar survey should be done country wide involving major Hospitals so as to come up with a proper estimate of prevalence and incidence of the condition in our country.

2) Community epidemiological surveys should be done around the country to determine prevalence in such communities, as there could be many cases in the community, which are not yet diagnosed.

3) A follow up study to evaluate patient compliance to the prescribed regimen.

4) A study to evaluate adequacy, relevance and reliability of the information given to diabetics by health care professionals.

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APPENDICES

Appendix 1: PATIENT QUESTIONNAIRE FORM

PART A: PATIENT DEMOGRAPHIC CHARACTERISTICS (To be filled from medical records)

SECTION I (Tick the appropriate box)

Respondents Number: AGE: ☐ **SEX:** ☐ **FEMALE** ☐

MALE ☐

HOME DISTRICT: _____

OCCUPATION: _____

INCOME IN KSHS PER MONTH_____

LEVEL OF EDUCATION_____

PART B: HISTORY AND DIAGNOSIS

1. How did you come to know that you are diabetic?

- Through symptoms ☐
- By screening ☐
- By Hospitalization ☐
- Other_____

2.a) Is there any member of your family who is (also) suffering from diabetes?

YES ☐ NO ☐

2b) If Yes, who?

Father/Mother [ ]

Brother/sister [ ]

Uncle/aunt [ ]

Grand parents [ ]

Other relative [ ]

3. Do you – Smoke cigarette YES [ ] NO [ ]

- Drink alcohol YES [ ] NO [ ]

- Exercises regularly YES [ ] NO [ ]

4. How long did you observe diabetic symptoms?

Like increased thirst, increased eating, weight loss or weight gain, Blurred vision, increased urination before you were diagnosed as being diabetic?

Less a month [ ]

a month [ ]

3 months [ ]

6 months [ ]

A year [ ]

More than a year [ ]

Other_____

5. Which year were you first diagnosed as diabetic? _____

6. Where you were first diagnosed as diabetic? _____

PART C: EDUCATION/ADVISE AND COMPLIANCE

7. Were you given any information concerning diabetes, e.g., the causes, complications and what you could do to achieve good treatment etc, at first diagnosis?

Yes ☐ NO ☐

8. What advise were you given by clinician/nurse/Doctor at diagnosis?

☐ Exercise

☐ Diet counseling

☐ Insulin use

☐ Tablets use

☐ More information on diabetes

8.b) Have you ever received any extra education/ information on diabetes during subsequent visits to the hospital after diagnosis?

Yes ☐ NO ☐

9. If yes, Where? _____

10. (a). Have you followed the advice strictly? 1.Yes ☐ 2. NO ☐

10 (b) If yes, are you satisfied by the way your condition is being managed now?

Yes 1 ☐ NO 2 ☐

11. If no to question 10, do you have any reasons for not complying with clinician/nurses/Doctor's advice?

-Can not afford Medicine 1[]

-Cannot get the required food. 2 [ ]

-Not able to use the drugs as required. 3 [ ]

-Not able to do exercise. 4 [ ]

-N0 reason 5 [ ]

-Other 6 _____

PART D: KNOWLEDGE OF COMPLICATIONS AND CONTROL

14. Do you know the complications that arise as a result of diabetes?

YES [1] NO [2]

15.If yes, which of the following complications are you experiencing now? (*More than one answer allowed)*

- Eye problems 1 [ ]
- Diabetic foot/amputation 2 [ ]
- Heart disease/stroke 3 [ ]
- Kidney failure 4 [ ]
- Gangrene/Neuropathy 5 [ ]
- Sexual dysfunction 6 [ ]
- Other_____

16. If no, list some of the symptoms you experience, which you think, are as result of diabetes?

- Eye problems 1 [ ]

- Diabetic foot/amputation 2 [ ]
- Heart disease/stroke 3 [ ]
- Kidney failure 4 [ ]
- Gangrene/Neuropathy 5 [ ]
- Sexual dysfunction 6 [ ]
- Hypertension 7 [ ]
- Other_8_____

17. Which method(s) are you using to manage your condition?

- Insulin use 1 [ ]
- Oral hypoglycemic drugs 2 [ ]
- Diet 3 [ ]
- Exercise 4 [ ]
- Herbal Medicine 5 [ ]
- Other 6_____

18. Assessment of level of control by looking at average blood sugar level (*from patient's file records).*

Excellent control 1 ☐

Good 2 ☐

Average 3 ☐

Poor Control 4

Very poor control 5 ☐

APPENDIX II: Diabetes Prevalence Survey Form

KENYA DIABETES MANAGEMENT & INFORMATION CENTRE
(DMI CENTRE)
DIABETES PREVALENCE SURVEY FORM

Institutional data.

Name: _____

Address: _____

Government: Referral Provincial District Others____

Others: Private Mission

Province: _____ District: _____

Patient Data

Name: _____

Date of Birth: _____ Sex: Male Female Age____

Occupation: _____ Tribe: _____ Residence _____

Type: (1) (2) Year of Diagnosis:_____ Duration:_____

Method of Diagnosis:
By screening By Hospitalisation Through Symptoms

Others_____

Complications

- Eye
- Kidney
- Gangrene
- Heart attack
- Sexual dysfunction
- Amputations
- Stroke

Method of Treatment:

- Insulin
- Oral agents
- Diet/ Exercise

Control: Good (<10mmols/180mg/dls) Bad (>10mmols/ 180mg/dls)

Blood Pressure: Present Not present

Other Disease(s)_____

Deceased_____

APPENDIX II: Diabetes Prevalence Survey Form

KENYA DIABETES MANAGEMENT & INFORMATION CENTRE
(DMI CENTRE)
DIABETES PREVALENCE SURVEY FORM

Institutional data.

Name: _____

Address: _____

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Province: _____ District: _____

Patient Data

Name: _____

Date of Birth: _____ Sex: Male Female Age____

Occupation: _____ Tribe: _____ Residence _____

Type: (1) (2) Year of Diagnosis:_____ Duration:_____

Method of Diagnosis:

By screening By Hospitalisation Through Symptoms

Others_____

Complications

- Eye
- Kidney
- Gangrene
- Heart attack
- Sexual dysfunction
- Amputations
- Stroke

Method of Treatment:

- Insulin
- Oral agents
- Diet/ Exercise

Control: Good (<10mmols/180mg/dls) Bad (>10mmols/ 180mg/dls)

Blood Pressure: Present Not present

Other Disease(s)_____

Deceased_____

APPENDIX IV: Abstract for Conference and Seminar Publications

1.ABSTRACT

Frequency of Occurrence and Risk Factors of Diabetes Mellitus in Nairobi City, Kenya.

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Abstract

This was a pilot study, which aimed at determining the prevalence of diabetes mellitus and associated risk factors in Kenya. Data on diabetes prevalence is lacking in Kenya, even though cases seem to be on the increase. Being a community survey, the study was carried out in the entire five Divisions of Nairobi city using a cross sectional study design. The survey estimated the point prevalence rates as well as the expected number of Diabetics in the population of Nairobi City and came up with data to update the National Diabetic Demographic data in the Ministry of Health. The prevalence rates for diabetes mellitus were found to be on a tremendous increase in comparison to early studies. The common risk factors associated with the high increase of this condition were found to be physical inactivity and increased alcohol consumption alongside cigarette smoking, positive family history and obesity. The prevalence of Diabetes mellitus to the Nairobi city population for all persons aged 15 years and over was determined at 12.97 %. If the younger age group (15-34) is ignored, the prevalence of diabetes to the population aged 35 years and over rises to 14.92%.

This study involved a community survey to estimate the point prevalence rates as well as the expected number of Diabetics in the population and elucidate the risk

factors of diabetes mellitus in Nairobi City, Kenya. The study was carried out in the five Divisions of Nairobi city. A cross sectional study design was employed in this study. A team of 10 nurses were identified and trained in diagnosing diabetes using the criteria recommended by the WHO. Five (5) of these nurses were posted to clinics in each division, while 5 others visited homes and places of work in their respective divisions. Blood samples were taken from all respondents and screened for diabetes and the results scored into a record sheet. The follow up data to determine the associated risk factors from all positive cases were collected using pre-tested questionnaire forms and were entered and analysed using appropriate statistical tools. Both descriptive and inferential statistics were used to determine the prevalence and the associated risk factors. The minimum sample size was determined using Fisher et al (1998) formulae:
A total of 4964 persons aged 15 and over were randomly selected, stratified by age to form the sample for the study.

The screening program identified a total of 631 cases of diabetes using the blood testing biosensor technology. Out of the total cases of diabetes that were identified (631), 105 (16.64%)were under 35 years of age. Twelve (12) new cases were detected from the Juvenile sample of persons in this group. The detection of previously undiagnosed cases of diabetes to person's aged 15-34 was an indicator that there is Juvenile onset diabetes in Nairobi. This result corrected the notion commonly held that diabetes is a problem of the aged population. However, the number of diabetic cases aged 15-34 was found to be significantly lower than to those aged above 35 years ($t=12.875$; $p<0.05$). This shows that man induced diabetes is more than the hereditary acquired diabetes mellitus in Nairobi City, Kenya agreeing with existing research (Mc Carty and Zimmet, 1997; Tursan, 1983; Awan and Mungola, 1976).

The prevalence rate of Diabetes in Nairobi City was found to be 12.97%. However, if the age category of 15-34 is ignored, then the prevalence rate of person's aged 35 and over increases to 14.92% while that of persons aged 15 and 34 decreases to 7.3% . This shows that mature onset diabetes mellitus (type II), which is induced by sedentary life style, is rampant in Nairobi City than the Juvenile onset Diabetes mellitus (Type I).

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