THE ROLE OF PHARMACISTS IN DIABETES CARE. A CASE STUDY IN ZANZIBAR AND DAR ES SALAAM REGION, TANZANIA.

By

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A dissertation submitted in (partial) fulfilment of the requirements for the degree of Master of Pharmacy (Hospital Pharmacy) of the University of Dar es Salaam.

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CERTIFICATION

The undersigned certify that she has read and hereby recommend for acceptance by the University of Dar Es Salaam a dissertation entitled *The Role of Pharmacists in Diabetes Care. A Case Study in Zanzibar and Dar es Salaam Region, Tanzania,* in fulfilment of the requirements for the degree of Master of Pharmacy (Hospital Pharmacy) of the University of Dar es Salaam.

.....

Prof. Mary Justin-Temu
(Supervisor)

Date: 27 September 2004



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I, Lydia Zungufya, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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DEDICATION

This work is dedicated to my husband Dr. Ali Salum Ali and children Nasrat, Gheda and Raya for their immeasurable inspiration and support throughout my studies.

ABSTRACT

SETTINGS

The study was conducted in public diabetes clinics, hospital and community pharmacies closest to diabetes clinics in Dar es Salaam and Zanzibar.

OBJECTIVE

To investigate the role of pharmacists in diabetes care.

DESIGN

Cross sectional descriptive study.

METHODOLOGY

Face to face interviews were conducted with diabetic patients, health staff and pharmacists working in hospital and community pharmacies closest to the clinics.

RESULTS

Eighteen health workers were interviewed in seven diabetes clinics. No pharmacist was found to work in the diabetes clinics. Insulin (human and animal) and limited oral antidiabetics were found in four clinics. Drugs were dispensed by doctors and nurses, while pharmacists were found to manage drug ordering, preparing drug budgets and disposal of expired drugs. The sources of the drugs for people living with diabetes were hospital pharmacy, donations and procurement mainly from MSD.

Respondents were 115 patients aged between 10 and 80 years of whom 68 were females and 47 males. 31.3% of them were on insulin, 61.7% were on oral antidiabetics, 0.9% on both (insulin and oral antidiabetics) and 6.1% were on diet. Majority of patients on insulin (97.3%) and of those on oral antidiabetics (42%) knew the names of the drugs they used.

All patients knew how to use their medicines. Most patients (91.8%) on insulin stored it correctly, 83.7% knew the units of insulin they were using but only 21.6% were able to mention the type/source of insulin they were using. 40% of patients said drugs were available at the clinic, but only 17.4% of these said drugs were always available. Most patients(76%) knew the risks of not taking their medication and majority knew the symptoms of hypoglycaemia (63.5%) and hyperglycaemia (76%). The complications of diabetes were known to 64% of patients and 72% could tell what can improve their health as diabetic patients. Majority of patients mentioned doctors and nurses to be their source of health education about the disease while pharmacists were mentioned on storage and use of drugs.

A total of 51 pharmacies were visited, where 96% of the interviewees were pharmacists. A variety of oral antidiabetics were found in stock and 63% of the pharmacies stocked insulin (animal and human). 11.8% pharmacists had attended training in diabetes after graduating. Majority (99.6%) knew the major types of diabetes and the suggested treatment. They knew the primary system that is affected (61%), the gland (84%) and

the hormone (94%) that is affected. Pharmacists also knew the complications of diabetes, risks and the advice they can give a patient to reduce the risks.

CONCLUSION

There were no pharmacists working in any of the diabetes clinics that were visited. Most patients on oral antidiabetics did not know the names of the medicines while most of those on insulin knew the name, the units, how to store it correctly and a few knew the source of the insulin they were using. They all knew how to use their medication in terms of doses and frequency.

Pharmacists were found to be involved in educating patients about their medicines. Most patients obtained medicines from community pharmacies. Very few patients were found to have spoken to a pharmacist about their disease.

Most pharmacists had knowledge needed to educate patients about their medication and their disease.

There is a need to find a way of incorporating pharmacists in rendering holistic care to people living with diabetes.

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LIST OF ABBREVIATIONS

ATP	-	Adenosine Triphosphate
Ca^{2+}	-	Calcium ion
cAMP	-	Cyclic Adenosine Monophosphate
CDC	-	Centres for Disease Control and Prevention
CMS	-	Central Medical Store
DAZ	-	Diabetes Association of Zanzibar
DM	-	Diabetes Mellitus
DNA	-	Deoxyribonucleic Acid
EDL	-	Essential Drugs List
GLUT	-	Glucose Transporter
i.u	-	International Units
IDDM	-	Insulin Dependent Diabetes Mellitus
IDF	-	International Diabetes Foundation
K^+	-	Potassium ion
MMH	-	Mnazi Mmoja Hospital
MNH	-	Muhimbili National Hospital
MSD	-	Medical Stores Department
NIDDM	-	Non Insulin Dependent Diabetes Mellitus
NPH	-	Neutral Protamine Hagedon
TDA	-	Tanzania Diabetes Association
WHO	-	World Health Organisation

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1.0 INTRODUCTION AND LITERATURE REVIEW

1.1 Background information

The United Republic of Tanzania covers an area of 945,087 square kilometres [1] and an estimated population of over 35 million people to date [2]. Zanzibar comprises of two main islands (Unguja and Pemba) and covers an area of about 2328 square kilometres [3] with a population of about 985,000 people [2]. Dar es Salaam has an area of 1,350 square kilometres and an estimated population of over 2.5 million [2].

Diabetes care is provided through three clinics in Unguja, that is, Mnazi Mmoja Hospital (MMH), which is also a referral hospital, Makunduchi and Kivunge cottage hospitals. In Pemba there are five clinics; one at each district hospital (Chakechake, Wete and Mkoani) and one at each cottage hospital (Micheweni and Vitongoji). In Dar es Salaam there are four public clinics; one at each district hospital (Amana, Temeke and Mwananyamala) and at Muhimbili National Hospital (MNH) which is also a referral hospital.

Prevalence of diabetes in rural Tanzania was among the lowest in the world and so was the incidence rate of type 1. The prevalence, however in particular occupational groups of Tanzanians, is now higher than in Europeans. These groups have experienced changes in lifestyle marked by decreased physical activity, dietary changes and increase in

weight. Diabetes may also increase in the general population of Dar es Salaam and Zanzibar [4].

There are thirteen (13) pharmacists working in Zanzibar. Also there are sixty one (61) community pharmacies of which fifty five (55) are in Unguja and six (6) are in Pemba [Simai B, Pharmacy Board, Zanzibar, personal communication. November, 2003] while in Dar es Salaam; there are over two hundred and ninety (290) pharmacies and approximately the same number of pharmacists [Sitta A, Tanzania Food and Drugs Authority, personal communication. November, 2003].

Traditional diabetes care is rendered as a hospital based practice with doctors and nurses as front line managers. Most doctors and nurses lack in depth knowledge concerning management of drugs including antidiabetics.

1.1.1 The role of pharmacists

Pharmacists are "experts on medicines" and play an active role in the quality use of medicines in the society. They have skills in chemistry of the drugs, formulating medicines and the therapeutic use of drugs to treat diseases.

Pharmacists are trained as medicine specialists. They are educated in the various treatments of specific diseases. They advice and assist physicians to avoid drug

interactions and side effects, provide information about potentially useful therapies. They can be especially helpful to patients with multiple conditions, even identifying medications that may be helpful for more than one problem. With the many challenges in diabetes treatment, pharmacists are key resources for provision of quality diabetes health care.

The role of the pharmacist encompasses counselling patients on the best use of medications, providing advice on symptoms, management of common ailments, preparing and formulating medications and providing health education.

Pharmacists are the key point of contact in the pharmaceutical drug delivery chain, therefore they play an active role in providing information and advice on medications or potential drug interactions, they are also one of the most accessible health professionals and work closely with patients to assist them with managing their medicines and disease states as well as improving the quality of life. Many people with diabetes are unaware that they have the disease; so the pharmacist can play an important role by increasing public awareness of the risk factors of diabetes.

Also the management of diabetes has been made significantly easier for the patient with the advent of self-monitoring technology. Portable, lightweight glucose meters allow the patient to become directly involved in his or her own diabetes care. Self-monitoring of blood glucose requires the patient to obtain a capillary blood sample which is placed

on a test strip. Some of these test strips can be read visually. This can become a problem as many diabetics experience visual difficulties due to their disease. When used properly, glucose meters can provide highly accurate readings of blood glucose levels. A pharmacist is one among health care workers able to help the patient select a meter that meets their needs, as well as to give instructions on proper operation of the machine.

Pharmacists are also able to identify drug-related problems, and therefore they become the basis for team work in resolving these problems and also reinforce the knowledge about medication and diseases given to patients by other health care staff each time a prescription is dispensed. Therefore, by assuming the role of patient educator and counsellor, and drug information specialist to patients and physicians, the pharmacist, creates a niche in the health care delivery system in the management of patients with diabetes.

The Pharmacist's role in patient consultation is important because it is one of the easiest ways to prevent drug related problems such as compliance and to ensure that the patient is not ignorant about his or her disease state and drug regimen. Counselling can be the easiest way to ensure that the patient receives the full benefit from medication and can help the patient recover in the fastest time possible.

Apart from dispensing, which includes interpreting and evaluating prescriptions, consulting with prescribers regarding a patient or a prescription, pharmacists are also responsible for

- Drug quantification activities
- Drug selection
- Preparing drug budgets
- Storage of drugs
- Inventory control
- Disposal of expired drugs

1.2 Literature review

1.2.1 Diabetes mellitus

WHO defines diabetes mellitus as a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves [5]. Diabetes is also clinically defined as the state of persistent hyperglycaemia by measurement of fasting or random blood-glucose concentration (and occasionally by glucose tolerance test) [6].

1.2.2. Types of Diabetes Mellitus.

Most patients can be classified clinically as having either Type 1 diabetes [6-10], formerly known as insulin-dependent [5,9] which is due to a deficiency of insulin following autoimmune destruction of pancreatic beta cells [6-8]. This form develops most frequently in children and adolescents, but is being increasingly noted later in life[5] or Type 2 diabetes, formerly known as non-insulin-dependent[5] which is due to reduced secretion of insulin or to peripheral resistance to the action of insulin [6,7]. Patients with Type 1 diabetes require administration of insulin for their survival [6]. Type 2 diabetes mellitus (DM) is a heterogeneous disease with both genetic and environmental contributory factors [6-8]. Type 2 diabetes is much more common and accounts for around 90% of all diabetes cases worldwide. It occurs most frequently in adults, but is being noted increasingly in adolescents as well [5].

Certain genetic markers have been shown to increase the risk of developing Type 1 diabetes. Type 2 diabetes is strongly familial, but it is only recently noted that some genes have been consistently associated with increased risk for Type 2 diabetes in certain populations. Both types of diabetes are complex diseases caused by mutations in more than one gene, as well as by environmental factors [8].

Although patients may be controlled on diet alone, many require oral antidiabetic drugs or insulin to maintain satisfactory control. In overweight individuals, Type 2 diabetes may be prevented by losing weight and increasing physical activity. Use of drugs such

as orlistat, a pancreatic lipase inhibitor which reduces the absorption of dietary fat may be considered in obese patients [6].

Diabetes mellitus increases the risk of hypertension, myocardial infarction, cardiomyopathy, stroke and microvascular diseases underlying retinopathy, nephropathy and neuropathy [8-10], therefore diabetic patients are likely to be receiving multiple drug therapy for several medical problems and thus have complex pharmaceutical needs.

Reduced average life expectancy and an increase in morbidity due to diabetes associated cardiovascular disease; neuropathy, retinopathy, and nephropathy place a tremendous burden to the Government's resources in addition to the associated reduced quality of life for individuals with diabetes. The close correlation of disease duration with the incidence of diabetes complications and the associated increase in the ageing population further exacerbates the problems that are faced by those who suffer from this disease and for those who seek to care for them [12].

1.2.3. Global situation of diabetes mellitus.

Today, it is estimated that approximately 177 million people in all International Diabetes Federation (IDF) member nations, or about 5.2% in the age bracket 20-79, have diabetes mellitus. The South East Asian Region has the highest number of people with diabetes mellitus with some 49 million, and its prevalence of 7.5% is the second highest, behind

North American (7.8%), and ahead of the Eastern Mediterranean and Middle East Regions (6.4%) [11,14].

It is estimated that approximately 5.3 million people, or about 0.09% in all age groups have Type 1 diabetes in IDF member countries. The European Region with 1.6 million has the highest estimated number of people with Type 1 diabetes, followed by the North American Region with some 1 million, and the South-East Asian Region with 920,000. The estimated prevalence of Type 1 diabetes is highest in the North American Region with 0.25%, followed by the European Region, 0.20%.

The incidence of Type 1 diabetes in all IDF member countries is 82,000 persons per year in the 0-14 year age group and 130, 000 persons per year in the 15+ year age group.

Although Type 1 diabetes is acknowledged as an important problem, these figures are consistent with past reports in showing that the majority of people with diabetes have Type 2 diabetes.

The number of males and females with diabetes mellitus in those countries where data was separated by gender was approximately 76 million and 81 million male and female respectively [12].

For those low/middle income economies in which the number of people with diabetes mellitus was broken down into urban and rural areas, the number of people with diabetes in rural areas was about 50 million and the number in urban areas was some 58 million [12].

The prevalence of diabetes is higher in developed countries than in developing countries and is expected to remain so until 2025. However, the developing world will be hit the hardest by the escalating diabetes epidemic in the future. Urbanization, westernization and economic development in developing countries have already contributed to a substantial rise in diabetes. This is likely to continue and will affect significantly in the forthcoming global epidemic of diabetes [12].

The prevalence of adult diabetes in developing countries is expected to increase by 170% between 1995 and 2025, as compared to a rise of 41% over the same period in the developed world [12,15,16]. It is projected to rise in both developed and developing countries. While diabetes is most common among the elderly in many populations, prevalence rates are rising particularly quickly among comparatively young and productive populations in the developing world.

The alarming increase of diabetes prevalence is projected to occur because of population ageing, unhealthy diet, obesity, sedentary lifestyle and migration of people from rural to urban. All over the world, traditional lifestyles and dietary patterns that have sustained

people over generations are disappearing. Socio-economic realities mean that families are urbanized as they seek employment. Rapid industrialization is taking its toll. Diabetes will increasingly concentrate in urban areas in the future. An important contributing factor to the projected increase in diabetes is the situation in developing countries [12].

1.2.4. Situation of diabetes mellitus in Africa.

The overall prevalence of diabetes in African countries vary considerably between urban and rural and diabetes Type 1 and Type 2 but it is estimated to be in the overall dimension of 0.01% to 1% whereby the variation could possibly be explained by the lack of standardization of diagnostic criteria [17].

1.2.5. Situation of diabetes mellitus in Zanzibar.

Few data exist on the impact of diabetes mellitus, particularly the insulin dependent subtype, in many parts of Africa [18]. The importance of diabetes as a public health problem in the East African Islands of Zanzibar was assessed through prospective registration of all newly diagnosed diabetic individuals who attended the diabetic clinic at MMH from January, 1986 to December, 1989. In this study, 78.3% of newly registered patients had Type 2 diabetes while 18.9% had Type 1 diabetes and 2.8% had diabetes of uncertain type [18].

In the year 2000, four thousand five hundred and twenty eight (4528) patients were registered in the diabetes registry, which, is updated every five years (last updated 2000). In 2001, two hundred and seventy six (276) new cases were registered at Mnazi Mmoja referral hospital diabetes clinic, out of which 2% were Type 1 while the remaining 98% had Type 2 diabetes [Dr Salim A, MMH, personal communication. November, 2003].

1.2.6. Situation of diabetes mellitus in Dar es Salaam.

Before implementation of the diabetes project in Dar es Salaam in 1994 the prevalence of diabetes Type 1 was estimated at 0.2% of the general population (approximately 1,800,000 inhabitants) of Dar es Salaam [4] and a study over a six year period showed a distribution of 21.8% Type 1, 66% Type 2 and 12.2% of diabetes of an unclassified type among 1250 newly diagnosed patients [19]. The number of people with diabetes is expected to increase alarmingly in the coming decades.

1.2.7. Cost of diabetes mellitus.

There are many costs involved in the care and management of diabetes for both the individual and the health care system. The WHO estimates that 4 to 5% of health budgets are spent on diabetes-related illnesses. A person with diabetes incurs medical costs that are two to five times higher than those of a person without diabetes. This is due to more frequent medical visits, purchase of supplies and medication, and the higher likelihood of being admitted to a hospital [12].

In a study to estimate the costs of diagnosis and treatment of diabetes in Tanzania, it was found that the average annual direct cost of diabetes care in 1989-90 was $287 for a patient requiring insulin and $103 for a patient not requiring insulin. Purchase of insulin accounted for 68.2 %($156) of the average annual outpatient costs for patients requiring insulin. For patients not requiring insulin the cost of oral hypoglycaemic drugs and treatment of chronic complications and infections accounted for 42.5% ($29.3) and 48.8% (33.7) of costs respectively [20].

1.2.8. General principle of management of diabetes mellitus.

Treatment is aimed at alleviating symptoms and minimizing the risk of long-term complications by appropriate control of diabetes. Other risk factors for cardiovascular disease (smoking, hypertension, obesity and hyperlipidaemia) should be addressed [6].

Optimal glycaemic control in both Type 1 diabetes and Type 2 diabetes reduces, in the long term, the risk of microvascular complications including retinopathy with the potential loss of vision, nephropathy leading to renal failure and to some extent neuropathy [6,8,10]. However, a temporary deterioration in established diabetic retinopathy may occur when normalizing blood-glucose concentration [6].

A measure of the total glycated (or glycosylated) haemoglobin (HbA_1) or a specific fraction (HbA_{1c}) provides a good indication of long-term glycaemic control. The ideal HbA_{1c} concentration is between 6.5 and 7.5% but this cannot always be achieved, and

for those on insulin there are significantly increased risks of severe hypoglycaemia. Tight control of blood pressure in hypertensive patients with Type 2 diabetes reduces mortality significantly and protects visual acuity (by reducing considerably the risks of maculopathy and retinal photocoagulation) [6].

1.2.9Antidiabetic agents

1.2.9.1 Insulin

Insulin is a polypeptide hormone of complex structure and plays a key role in the regulation of carbohydrate, fat, and protein metabolism [6,7,9,21]. There are differences in the amino-acid sequence of animal insulin, human insulin and the human insulin analogues [8,9,21]. Insulin may be extracted from pork pancreas and purified by crystallisation; it may also be extracted from beef pancreas (now rarely used) [6]. Human sequence insulin may be produced semi synthetically by enzymatic modification of porcine insulin or biosynthetically by recombinant Deoxyribonucleic Acid (DNA) technology using bacteria or yeast. All insulin preparations are to a greater or lesser extent immunogenic in man but immunological resistance to insulin action is uncommon. Preparations of human sequence insulin should theoretically be less immunogenic, but no real advantage has been shown in trials [6].

Insulin is inactivated by gastro-intestinal enzymes, and must therefore be given by injection. The subcutaneous route of administration is the primary treatment for patients with Type 1, for those with Type 2 that is not adequately controlled by diet

and/or oral hypoglycaemic agents, and for patients with postpancreatectomy diabetes or gestational diabetes [6,8,21]. Insulin is also critical for the management of diabetic ketoacidosis, and it has an important role in the treatment of hyperglycaemic, nonketotic coma and temporarily in the presence of intercurrent illness or perioperative management of both Type1 and Type 2 patients. Almost all children with diabetes require insulin. It is also likely to be needed by most patients with rapid onset of symptoms, substantial loss of weight, weakness and ketonuria [9,7,6,22]. Pregnant women with Type 2 diabetes should be treated with insulin when diet alone fails. Mixtures of insulin preparations may be required and appropriate combinations have to be determined for the individual patient.

Insulin preparations can be classified according to their duration of action into short-, intermediate-, and long acting, and by their species of origin into human, porcine, bovine or a mixture of bovine and porcine [6].

a) **Short-acting insulin** e.g. soluble insulin, insulin lispro and insulin aspart. Have a relatively rapid onset of action (30 to 60 minutes) and short duration of action of up to 8 hours, the peak action occurring between 2 and 4 hours. Soluble insulin is the most appropriate form for use in diabetic emergencies and at the time of surgery.
b) **Intermediate- acting insulin** e.g. neutral protamine Hagedorn (NPH) insulin (isophane insulin suspension) and lente insulin (insulin zinc suspension). The

onset of action is within 1.5 hours, the peak of action is between 4 and 12 hours and a duration of up to 24 hours.

c) **Long acting insulin** e.g. ultralente insulin (extended insulin suspension) and protamine zinc insulin suspension.

These have a very slow onset and a prolonged, relatively "flat" peak of action [6] and duration of up to 35 hours [7].

Some of intermediate- and long acting insulin are given twice daily in conjunction with short-acting (soluble) insulin, and others are given once daily, particularly in elderly patients. They can be mixed with soluble insulin in the syringe, essentially retaining the properties of the two components, although there may be some blunting of the initial effect of the soluble insulin component especially on mixing with protamine zinc insulin [7].

Human insulin has a more rapid onset and shorter duration of action than porcine insulin] [8]. When given by subcutaneous injection, the effect appears within 15 minutes and generally lasts 5-7 hours [6].

The duration of action of a particular type of insulin varies considerably from one patient to another, and needs to be assessed individually [6].

Insulin requirements may be increased by infection, stress, trauma, puberty, and during the second and third trimesters of pregnancy. Requirements may be decreased in patients with renal or hepatic impairment and in those with some endocrine disorders (e.g. Addison's disease, hypopituitarism) or coeliac disease.

Insulin is generally given by subcutaneous injection. Injection devices ('pens'), which hold the insulin in a cartridge and meter the required dose, are convenient to use or by the conventional syringe and needle. Short-acting insulin can also be given by continuous subcutaneous infusion using a portable infusion pump that delivers a continuous basal insulin infusion and patient-activated bolus doses at meal times.

1.2.2.2 Oral antidiabetic drugs.

These are agents used in the management of patients with Type 2 diabetes mellitus. There are different classes with different modes of action.

a) Sulphonylureas

Are divided traditionally into two groups or generations of agents [8]. The first generation (tolbutamide, acetohexamide, tolazamide, and chlorpropamide) and the second generation (glibenclamide, glipizide, gliclazide, and glimepiride).

Sulphonylureas cause hypoglycaemia by stimulating insulin release from pancreatic β-cells. The acute administration of sulphonylureas to Type 2 diabetes patients increases insulin levels by reducing hepatic clearance of the hormone.

The mode of action of sulphonylurea compounds could be chiefly explained by inhibition of Adenosine Triphosphate (ATP) sensitive potassium (K^+) channels initiating insulin secretion. Thus these drugs could be applied only in patients with Type 2 diabetes having some endogenous insulin production. However, there are other mechanisms contributing to the hypoglycaemic action of these compounds, thus a direct exocytosis promoting effect mediated by protein kinase C, increase in cyclic Adenosine monophosphate (cAMP) level and calcium (Ca) ionophore-like activity should also be taken into account.

Insulin secretion mechanism

Glucose is transported through the glucose transporter GLUT 2, and the subsequent metabolism of glucose produces ATP in the pancreatic beta cells. The increase in the ATP level closes the ATP sensitive K^+ channels, which depolarizes the membrane and results in the opening of the voltage-dependent Ca^{2+} channels. The subsequent Ca^{2+} influx leads to an increase in intracellular Ca^{2+} concentration, which triggers insulin granule exocytosis in the beta cells. Sulphonylureas binding to the special part of K_{ATP} channels close the channels and subsequently stimulate insulin secretion [8,17].

The main effect of the sulphonylureas is the improvement of metabolism, decrease of blood glucose level both by pancreatic and extrapancreatic mechanisms. In the beta cell both insulin and C-peptide secretions are enhanced, whereas the peripheral effects of insulin are also more expressed by them.

Selection of hypoglycaemic sulphonylurea in the therapy of diabetic patients may be influenced by the cardiovascular side effects.

b) Biguanides

Metformin is the only member of this class that is used; other members (phenformin and buformin) were withdrawn in many countries because they caused lactic acidosis. Metformin has been shown to be equally efficacious in lowering serum glucose and HbA_{1c} levels.

Metformin is antihyperglycaemic, not hypoglycaemic and acts by reducing hepatic glucose output through inhibition of gluconeogenesis and by increasing glucose uptake in skeletal muscle [8,21]. Metformin also increases the insulin sensitivity in peripheral tissues and it may reduce the absorption of glucose from the intestine.

Patients with renal impairment, hepatic disease, cardiac failure, or chronic hypoxic lung disease should avoid metformin. These conditions all predispose to increased lactate production and hence to the fatal complication of lactic acidosis.

c) Thiazolidinediones

Are a new class of drugs for the treatment of Type 2 diabetes e.g. Rosiglitazone (Avandia) and Pioglitazone (Actos) and they act by both reducing glucose production in the liver, and increasing insulin dependent glucose uptake in muscle cells. They do not

increase insulin production. These drugs may be used in combination with metformin or a sulphonylurea.

d) Other oral antidiabetic agents

i. Glinides e.g. Repaglinide

Its insulinotropic action is mediated via the inhibition of ATP-dependent K^+channels in the pancreatic β-cell membrane. Repaglinide having an advantageous pharmacokinetic characteristic (rapid absorption, short duration of action) offers a good long-term glycaemic control combined with a low risk of severe hypoglycaemia.

ii. Drugs preventing carbohydrate absorption (α-glucosidase inhibitors) e.g. Acarbose (Glucobay^R)

Reduce intestinal absorption of starch, dextrin and disaccharides by inhibiting the action of intestinal brush border α-glucosidase. Acarbose (Glucobay^R) is a competitive inhibitor of this enzyme; it delays the digestion of complex carbohydrates and retards or prevents the absorption of meal derived glucose into the circulation. Thus the postprandial rise in plasma glucose is blunted in both normal and diabetic subjects. Acarbose also competitively inhibits glucoamylase and sucrase but has weak effects on pancreatic α-amylase.

1.3 Previous studies on the role of pharmacists in diabetes care.

A preliminary study was undertaken in Britain to investigate whether patients with diabetes attending a hospital outpatient clinic felt that it would be useful to talk to a pharmacist about their medication. Few patients thought that they had ever spoken to a pharmacist about their medication, but many went on to request information in areas which could be dealt with by a pharmacist. The results of this survey highlighted several areas for concern regarding the education of patients with diabetes and the possible role of a pharmacist [23]. Also in this study only half of patients with Type 2 diabetes could name their medication and dose correctly. This reflects lack of knowledge in these patients which needs to be reinforced by pharmacists and other health care staff each time a prescription is dispensed [23].

A Group Health Cooperative of Puget Sound, a Health Management Organisation (HMO) based in Renton, Wash., uses multispecialty "teams" to document and coordinate each member's contribution to the care of each diabetes patient. Pharmacists take on various roles, including that of focusing on correcting any drug-related problems for these patients.

In this exercise it was found that when pharmacists were first in line (in the care of a patient), they were able to identify drug-related problems, and that then became the basis for some of the work that the teams did in resolving those problems. Structurally, that worked out much better for the team and for the patient [24].

A study conducted at South Durham Health Care on hospital pharmacists' role in Type 2 diabetes management showed that pharmacist's educational programmes for diabetic patients are effective and have a significant impact in better glycaemic control and improved patients understanding and the quality of life. The pharmacist-led diabetic clinic provided new evidence that patient education and counselling in diabetes management appear to be essential elements in glycaemic control [25].



2.0 STATEMENT OF THE PROBLEM

Diabetes affects almost every aspect of a patient's life and without proper treatment; complications of the disease can be as devastating as the disease itself. The incidence of heart disease, stroke, high blood pressure, blindness, kidney disease, amputations, and dental diseases are two to four times higher in diabetes patients than in the general population [26].

Community pharmacies continue to be the outlet of choice for most patients (including diabetic patients) especially when drugs are not available in public health facilities. Also public health facilities stock limited types of drugs including antidiabetic drugs as indicated in the essential drug list (EDL) compared to community pharmacies which stock a variety of medicines, therefore; pharmacists have an excellent opportunity to improve the well-being of diabetic patients by providing consultative services such as education, diabetes care guidelines, blood glucose monitoring instructions and nutrition counselling. In addition, pharmacists can be instrumental in identifying those who face a high risk of developing the disease, thereby helping them prevent its onset.

The law of the market dictates types of antidiabetic medications available in community pharmacies, that is, what is available in the pharmacies is determined by what is being prescribed. At the same time, diabetes services are rendered without direct involvement of pharmacists particularly in public health facilities, that is, there is no common forum where pharmacists and physicians exchange ideas concerning a patient directly. They

communicate through a prescription brought in by a patient. The poor communication between physicians and pharmacists deprive people living with diabetes of pharmacists' expert advice on their medication.

Also, diabetic patients are likely to be receiving multiple drug therapy for several medical problems from complications associated with the disease and thus have complex pharmaceutical needs, which require pharmacists' expertise. Services provided by a pharmacist during the dispensing process have the potential to provide a valuable contribution to health care. The dispensing process does include a check on the safety and efficacy of each prescribed medication.

Diabetes mellitus can now be found in almost every population in the world and epidemiological evidence suggests that without effective prevention and control programmes, diabetes will most likely continue to increase globally [15,16].

For this reason it is justifiable to look into the role of pharmacists in general in consolidating holistic diabetes care.

2.1 Significance of the study

This study will enable the Ministries of Health in Zanzibar and that of Tanzania Mainland and the community to understand how pharmacists are involved in provision of diabetes care. Diabetes is a disease characterized by multiple complications where proper use of drugs and health education can help reduce the complications associated with the disease and hence deaths. It will also help to find out types of drugs that are stocked in diabetes clinics and community/retail pharmacies as well as problems that are encountered by patients and health staff in diabetes clinics when pharmacists are not involved in the provision of diabetes care.

The findings of this study will also enable the Ministries of Health to plan a better way of empowering pharmacists to be a part and parcel of holistic diabetic care for the people living with diabetes.

3.0 STUDY OBJECTIVES AND RESEARCH QUESTIONS

3.1 Broad objective.

To investigate the role of pharmacists in diabetes care.

3.2 Specific objectives

- To investigate who manages drugs and other medical supplies for diabetes clinics.
- To investigate if patients know how to use their medication.
- To investigate if patients find it useful talking to pharmacists about their medication.
- To describe the knowledge of pharmacists on antidiabetic agents.
- To investigate the level of knowledge of pharmacists on diabetes.

3.3 Research questions

- Are there any pharmacists working in diabetic clinics?
- Who manages drugs in a diabetic clinic if there are drugs kept and dispensed at the clinic?
- Do patients talk to pharmacists about their medication?
- Do patients talk to pharmacists about their disease?

4.0 METHODOLOGY

4.1 Study area

The study was conducted in Zanzibar and Dar es Salaam.

Zanzibar and Dar es Salaam were chosen because of their well organized diabetes services and they are the capital cities of Tanzania Islands and Mainland respectively. They also have referral hospitals and established diabetes centres of excellence. Zanzibar has at least one diabetic clinic per region and a diabetes centre at Mnazi Mmoja referral hospital. Dar es Salaam has one diabetes clinic per district and an established centre at Muhimbili National Hospital(MNH), which is also a referral hospital.

Most of the diabetic patients collect their medications from the nearby community pharmacies due to insufficiency and sometimes unavailability of antidiabetics in the hospital pharmacies. It has been observed that, pharmacists are not part of the health workers who provide comprehensive diabetes care in diabetes clinics [Mlavwasi G, MNH. Personal communication, November 2003].

4.2 Study design

A cross sectional descriptive study was carried out for a period of three months.

4.3 Study population.

The following subjects were studied:

- Health workers working at MMH, Kivunge, and Makunduchi diabetic clinics in Zanzibar.
- Health workers at MNH diabetes clinic, and the districts diabetes clinics in Dar es Salaam; Ilala (Amana), Temeke and Kinondoni (Mwananyamala).
- Community pharmacies closest to the clinics above and hospital pharmacies where the clinics were situated.
- People living with diabetes mellitus.

4.4 Sampling procedure.

Convenience sampling method was used.

4.5 Sample size

Sample sizes were chosen depending on the available time and resources. The face-to-face interviews using questionnaires with all subjects were conducted in two cities (Zanzibar and Dar es Salaam) where a total of seven clinics were studied. The clinics were located away from each other and sometimes up to sixty (60) kilometres from town e.g. Makunduchi in Zanzibar.

The formula; $n = \frac{4p(100-p)}{\varepsilon^2}$ was used.

Where,

n = minimum number of patients to be interviewed

ε = margin of error

p = proportion of diabetes patients who know about their medication

a) Patient's sample size.

The proportion of diabetes patients who know about their disease or about their medication in Dar es Salaam and Zanzibar is not known, therefore it was assumed that 50% of patients know about their disease and medication and therefore p was set at 50%(that is p = 50%)

n = minimum number of patients to be interviewed

ε = margin of error = 0.1 = 10%

p = proportion of diabetes patients who know about their medication

Therefore; $n = \frac{4 \times 50(100-50)}{10^2}$

$= 100$

b) Pharmacies sample size

n = minimum number of pharmacies to be studied

ε = margin of error = 0.15 = 15%

p = proportion of pharmacies that stock different types of antidiabetics

Therefore; $n = \frac{4 \times 50(100-50)}{15^2}$

$= 44.4$

Therefore sample sizes were as follows:

- 18 health workers at the above mentioned diabetes clinics. (All those who were willing to be interviewed).

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- 59 patients in Dar es Salaam diabetes clinics.
- 56 patients in Zanzibar diabetes clinics.
- 28 pharmacies in Dar es Salaam.
- 23 pharmacies in Zanzibar.

Therefore a total of 18 health workers, 115 diabetic patients and 51 pharmacists in community (44) and hospital (7) pharmacies were interviewed.

4.6 Inclusion criteria:

- All willing health staff working in diabetes clinics.
- Diabetes patients attending clinics during the period of the study.
- Hospital and community pharmacies closest to the clinics.

4.7 Exclusion criteria

All those who were not willing to participate were excluded from the study.

4.8 Study instrument

Three questionnaires were used and a different questionnaire was used for each group. Questionnaires consisted mostly of close-ended questions so as to enable asking specific questions of interest and save time. Pre-testing with 10 patients, 5 pharmacies and 2 health staff was carried out and a few changes were made accordingly.

4.9 Data handling

Computer was used for the immediate transfer of data from the questionnaire form to computer file Epi Info version 6, a soft ware package developed by the WHO and Centres for disease Control and Prevention (CDC). The software was later used for data analysis.

4.10 Ethical aspects

This study was not expected to raise any ethical questions, however;

- Verbal consent was obtained from all respondents.
- Details of the research were explained and sufficient time was allocated to subjects to decide whether or not to participate in the study.

4.11 Definition of terms

For the purpose of this study;

Community pharmacy refers to retail pharmacy.

Diabetes refers to diabetes mellitus.

Cottage hospital refers to a district hospital in Zanzibar.

5.0 RESULTLS

5.1 Target groups

5.1.1 Health workers

Member of staffs were interviewed face to face. 18 questionneires were filled, 4 in MNH, 3 in Temeke, 2 in Mwananytamala, 3 in Amana, 4 in MMH, 1 in Kivunge, 1 in Makunduchi. In MNH diabetes clinic were 1 medical doctor, 2 nurses and 1 Laboratory technician. In Temeke were 3 nurses. In Mwananyamala were 1 nurse and 1 Assistant medical officer. In Amana there were 2 nurses and 1 Asssisstant medical officer. In MMH were 1 medical doctor and 3 nurses. In Kivunge was 1 Clinical officer. In Makunduchi was 1 nurse.

A total of 51 pharmacies were visited, 7 of which were hospital pharmacies (one from each hospital) and the rest community pharmacies. The pharmacies were located in 6 districts; 3 in Dar es Salaam and 3 in Zanzibar. The number of pharmacies in each district is as shown in the table below:

Table 1. Number of pharmacies visited per district

	District					
	Ilala	**Kinondoni**	**Temeke**	**North A**	**South**	**Urban West**
Number	14	7	7	3	2	18
Percentage	27.5	13.7	13.7	5.9	3.9	35.3

5.1.2 Patients.

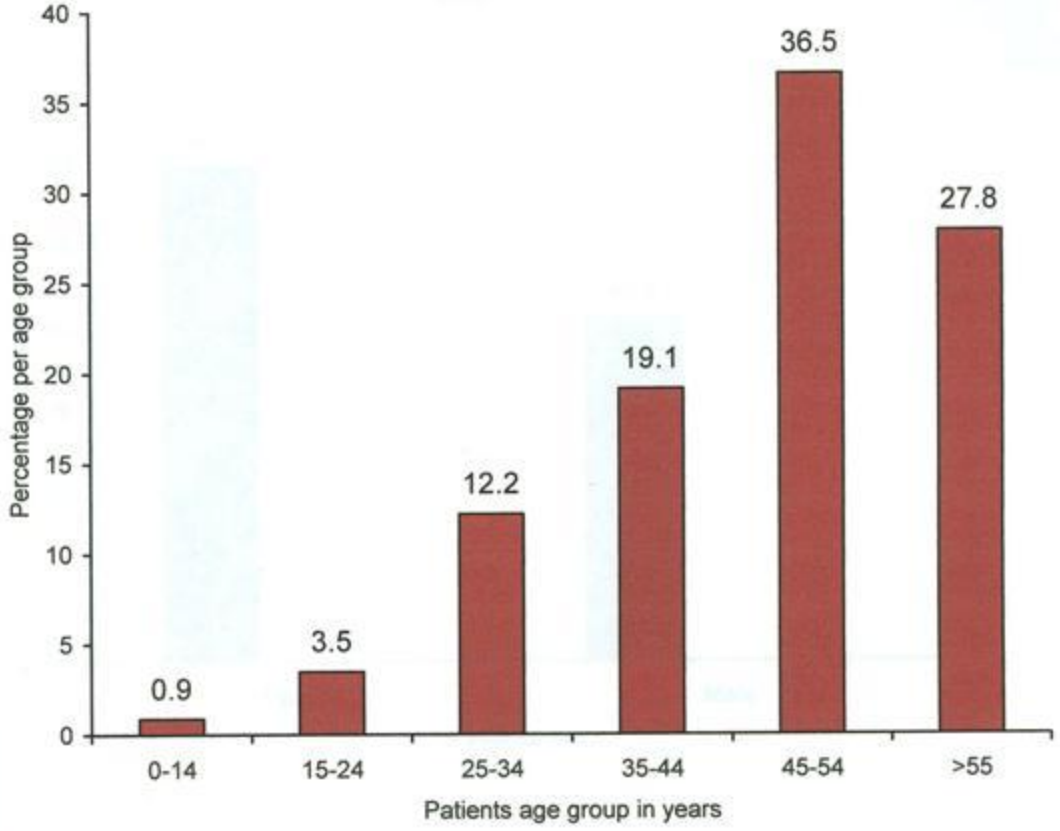
The target of covering at least 14 patients per clinic was reached. A total of 115 patients were interviewed. The number of patients that were interviewed from each clinic is shown in Table 2.

Table 2. Number of patients interviewed for each clinic.

Clinic	Number (%)
Kivunge	14 (12.2)
Makunduchi	16 (13.9)
MMH	26 (22.6)
MNH	17 (14.8)
Mwananyamala	14 (12.2)
Temeke	14 (12.2)
Amana	14 (12.2)
Total	**115(100%)**

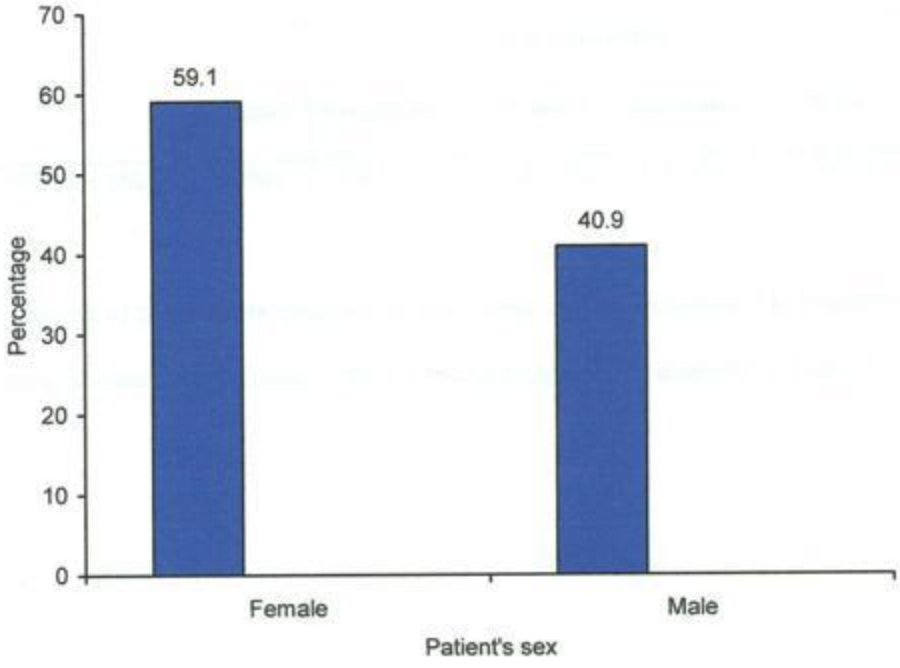
The age distribution of patients was between 10 and 80 years. Majority of the patients interviewed were aged between 45 and 54. The age group below 34 years was small. The age structure of patients interviewed is shown in Figure 1.

Figure 1. Distribution of the patients interviewed per age group



ajority of the patients interviewed were females, sex distribution was found to be 68 9.1%) females and 47(40.9%) males as shown in Figure 2.

Figure 2. Distribution of the patients' interviewed by sex.



Out of 115 patients interviewed, it was found that 4 (3.5%) completed higher, 43 (37.4%) secondary and 52 (45.2%) primary education. 1 (0.9%) received informal education and 15 (13%) did not receive any kind of education.

Table 3. Level of education of the patients interviewed

	Level of education				
	Higher	**Secondary**	**Primary**	**Informal**	**None**
Number (%)	4(%)	43(37.4)	52(45.2%)	1(0.9%)	15(%)

Majority of the patients interviewed were using oral antidiabetics (71) followed by those using insulin. Type of drugs used according to age group is shown in Table 4.

Table 4. Proportion of patients by age category who use specific diabetes therapy

Age group (Years)	Type of antidiabetic				
	Insulin	**Oral antidiabetics**	**Insulin plus oral antidiabetics**	**Diet**	**Total**
0-19	2	1	0	0	3
20-39	13	9	0	1	23
40-59	17	42	0	4	63
≥60	4	19	1	2	26
Total	**36**	**71**	**1**	**7**	**115**

5.1.2.1 Patients' knowledge on diabetes mellitus.

Patients were asked several questions about diabetes mellitus and manifestation of acute and chronic complications and their responses were as follows:

Majority of them 73 (63.5%) knew the symptoms of hypoglycaemia while 42 (36.5%) did not know. The signs of hypoglycaemia that were mentioned by patients are shown in Table 5.

Table 5. Signs of hypoglycaemia mentioned by patients

Symptoms	Yes	No
Sweating	45(61.6%)	28(38.4%)
Hunger	32(43.8%)	41(56.2%)
Concentration problems	7(9.6%)	66(90.4%)
Tremor	11(15.1%)	62(84.9%)
Confusion	25(34.2%)	48(65.8%)

When patients were asked about their experience of hypoglycaemia, 44 (38.3%) of the patients answered positively, but it is interesting to note that they differed on their first aids' actions. 7 (15.9%) gave wrong responses.

Table 6. Actions taken by patients when they experienced hypoglycaemia

Action	Number (%)
Took some sugar	6 (13.6)
Had something to eat	15 (34.1)
Drunk something with sugar	16 (36.4)
Consulted the pharmacist	1 (02.3)
Others	6 (13.6)
Total	**44 (100)**

Most of the patients (76%) knew that not taking their medication would lead to hyperglycaemia. Symptoms of hyperglycaemia which were mentioned are shown in Table 7.

Table 7. Symptoms of hyperglycaemia mentioned by patients

Symptom	Yes	No
Hyperventilation	15 (17.2%)	72 (82.8%)
Smell of acetone	4 (4.6%)	83 (95.4%)
Dehydration	73 (83.9%)	14 (16.1%)
High pulse rate	20 (23%)	67 (77.0%)
Blood pressure decreases	2 (2.3%)	85 (97.7%)
Warm dry skin	9 (10.3%)	78 (89.7%)
Chills	6 (6.9%)	81 (93.1%)
Frequent urination	30 (34.5%)	57 (65.5%)

The complications of diabetes were known to 74 (64.3%) patients and they could also mention them as shown in Table 8.

Table 8. Diabetes complications mentioned by patients

Complication	Yes	No
Eyes	25 (60.8%)	29 (39.2%)
Heart	22 (29.7%)	52 (70.3%)
Kidney	22 (29.7%)	52 (70.3%)
Circulation	25 (33.8%)	49 (66.2%)
Infections	33 (44.6%)	41 (55.4%)
Disturbances in sensitivity	32 (43.2%)	42 (56.8%)
Impotence	6 (8.1%)	68 (91.9%)

Majority (72%) were able to tell what could improve their health as diabetic patients; and their responses are shown in Table 9.

Table 9. Management of diabetes as percieved by patients themselves

Action	Yes	No
Diet	65 (78.3%)	18 (21.7%)
Loose weight	33 (39.8%)	50 (60.2%)
Physical activity	53 (63.9%)	30 (36.1%)
Stop smoking	20 (24.1%)	63 (75.9%)
Control hypertension	12 (14.5%)	71 (85.5%)

5.1.2.2 Patients' knowledge on the use of antidiabetics

Knowledge is an important tool in the management of diabetic patients. Out come of the treatment of diabetes depends on the knowledge of the patients on how to live with diabetes. Patients were assessed on the knowledge of antidiabetics. Majority of the patients on insulin had good knowledge on their treatment as shown in Table 10.

Table 10. Questions about the name(s) of the drug(s) they used

Oral antidiabetics		Insulin	
Yes	No	Yes	No
30 (42.3%)	41 (57.7%)	36 (97.3%)	01 (2.7%)

Patients on insulin were asked if they knew the source and the units of insulin they were using. Majority knew the units which they were using; their responses are summarized in Table 11.

Table 11. Questions about the source and units of insulin used

Source of insulin		Units of insulin	
Yes	No	Yes	No
08 (21.6%)	29 (78.6%)	31 (83.7%)	06 (16.3%)

Almost all respondents (84.8%) knew how to store insulin; the remainder gave wrong answers like cupboard (8.3%), table (2.7%) and other places (5.4%) as portrayed in Table12.

Table 12. Patients knowledge on how to store insulin

	Place				
	Fridge	Cupboard	Pot with water	Table	Other places
Number	16	3	15	1	2
Percentage	43.2	8.1	40.5	2.7	5.4

5.1.3. Pharmacists

5.1.3.1 Pharmacists' knowledge of diabetes mellitus.

Knowledge of diabetes mellitus on the part of pharmacists is very important as they are supposed to educate patients and other health personnel on antidiabetics and diabetes mellitus as a whole. Several questions were asked to investigate pharmacists' level of diabetes education.

Pharmacists were asked to rate themselves on the knowledge of diabetes mellitus. About half thought they had good to very good knowledge as shown in Table 13.

Table 13. Knowledge of interviewed pharmacists on diabetes mellitus

	Knowledge level		
	Very good	Good	Moderate
Number	3	24	24
Percentage (%)	5.9	47.1	47.1

Pharmacists were asked if they had any post training on diabetes mellitus after qualifying as pharmacists. Few 6 (11.8%) admitted to have attended training on diabetes and mentioned areas that were covered as listed in Table 14. All of them had attended the training for less than one month.

Table 14. Areas of training that were covered as mentioned by pharmacists

Area/Field of training	Number (%)
Drugs used in diabetes	1 (16.7)
Management of diabetic patients	3 (50)
Diabetes complications	1 (16.7)
Others	1 (16.7)

When asked which field they would like to have more training on, 83.3% preferred training on current information on diabetes, diagnosis and management of diabetic patients and rational use of antidiabetics. Only one wanted to have more training on drugs used in diabetes.

Pharmacists were asked about major types of diabetes mellitus and 49 of them (96.1%) were able to mention two major types of diabetes (Type 1 and 2) while 4 of them (7.8%) went further to mention the other types e.g. gestational diabetes (3 pharmacists) and Maturity Onset Diabetes of the Young (MODY) (1 pharmacist)

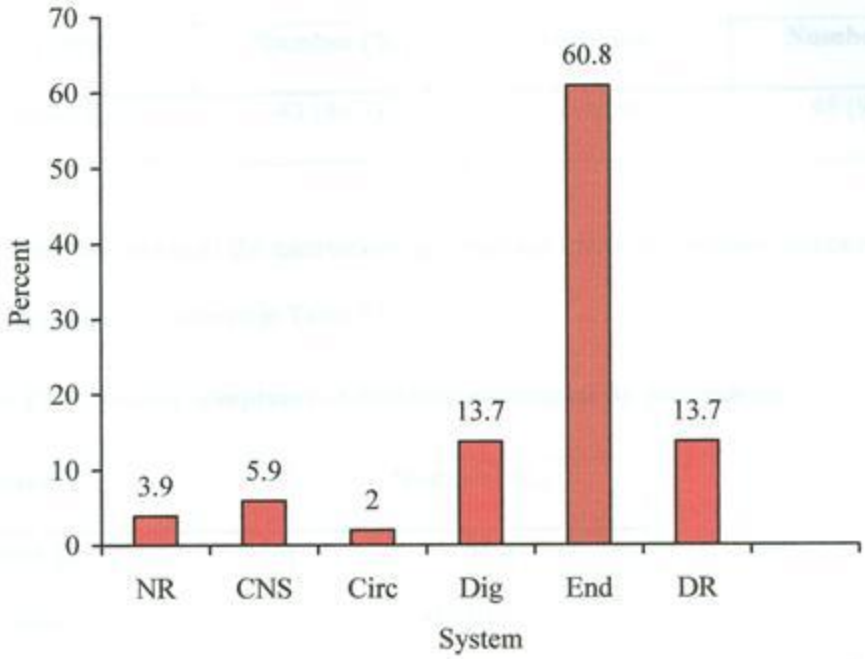
Pharmacists were asked to suggest treatment for the major types of diabetes mellitus. Their suggestions are shown in Table 15.

Table 15. Suggested treatment for the major types of diabetes

	Type 1	Type 2
Oral antidiabetics	1 (2.0%)	41 (80.4%)
Insulin	47 (92.2%)	2 (3.9%)
Diet	2 (3.9%)	15 (29.4%)
Advised to see a doctor	1 (1.96%)	1 (1.96%)

On the question about the primary system that is affected in diabetes mellitus, most pharmacists (60.8%) were able to mention the system that is affected to cause diabetes correctly, a few of them (13.7%) did not remember while the remainder (25.5%) gave a variety of answers as summarized in Figure 3.

Figure 3. Responses on the primary system that is affected in a diabetic patient



NR= No response, CNS = central nervous system, Circ = circulatory system, Dig = digestive system End = endocrine system, DR = Don't Remember.

Majority of the pharmacists interviewed knew which gland (84.3%) and hormone (94.1%) that is affected in diabetes mellitus as shown in Table 16.

Table 16. Responses on the gland and the hormone that is affected in a diabetic patient

Gland	Number (%)	Hormone	Number (%)
Pancreas	43 (84.3)	Insulin	48 (94.1)

More than two thirds of the interviewed pharmacists knew the common symptoms of diabetes mellitus as shown in Table 17.

Table 17. Common symptoms of diabetes mentioned by pharmacists

Symptom	Number (%)
Polyphargia	30 (58.8)
Polydipsia	43 (84.3)
Polyuria	42 (82.4)
Weakness	23 (45.1)
Blurred vision	2 (3.9)

More than half of the respondents knew complications of diabetes mellitus as shown in Table 18.

Table 18. Complications of diabetes as mentioned by pharmacists

Complication	Number (%)
Neuropathy	24 (47.1)
Retinopathy	29 (56.9)
Nephropathy	16 (31.4)
Cardiovascular	36 (70.6)
Infections	31 (60.8)
Impotence	14 (27.5)

When asked about the common risk factors of diabetes, majority of the respondents were able to mention them as indicated in Table 19.

Table 19. Common risk factors as mentioned by pharmacists

Risk	Number (%)
Obesity	49 (96.1)
Sedentary life style	29 (56.9)
Age greater than 45years	6 (11.8)
Family history	33 (64.7)
High blood pressure	14 (27.5)

When asked what advice they would give to reduce the risks of developing diabetes complications, the responses were as shown in Table 20.

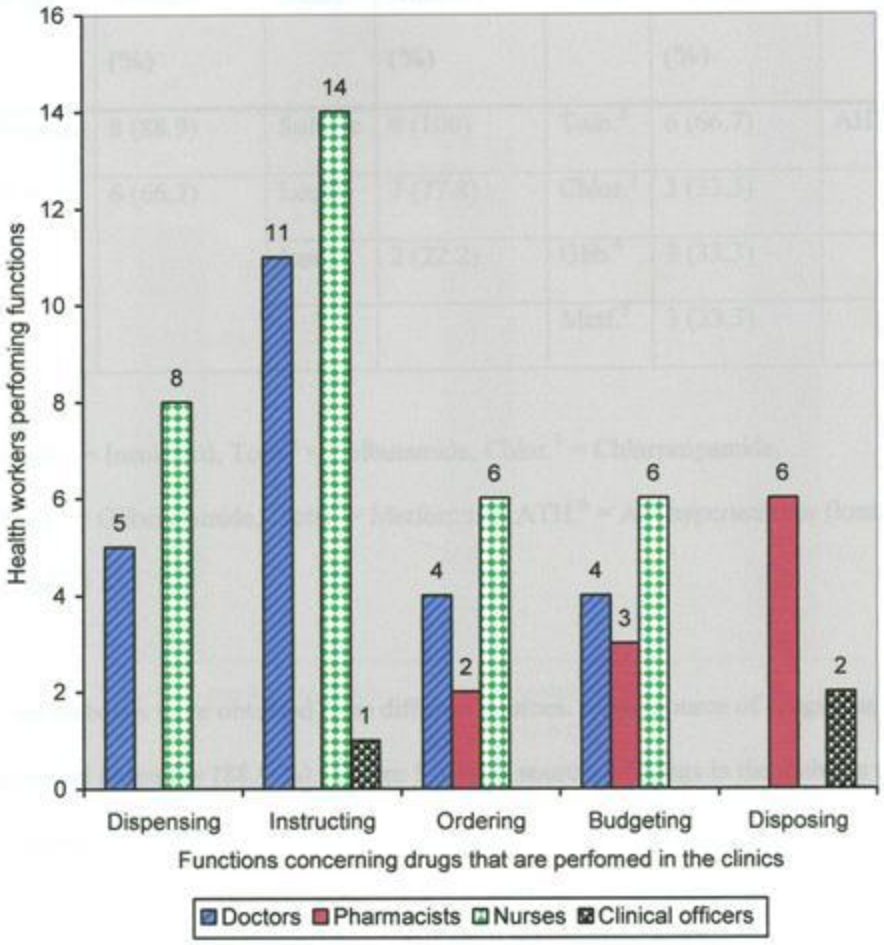
Table 20. Responses on the advice to reduce the risk factors of developing diabetes

Advice	Number (%)
Diet	45 (88.2)
Loose weight	37 (72.5)
Physical activity	46 (90.2)
Stop smoking	22 (43.1)
Control hypertension	7 (13.7)

5.2. Antidiabetics in diabetes clinics.

Antidiabetics are managed by different cadres in the diabetes clinics. The process of drug management involves budgeting, procurement and dispensing of drugs. Figure 4 shows the different health cadres and how they manage drugs in the diabetes clinics.

Figure 4. Different health cadres and how they perform different functions concerning drugs in diabetes clinics.



Several types of insulin and oral hypoglycemic drugs were dispensed in diabetes clinics in Zanzibar and Dar es Salaam as shown in Table 21.

Table 21.Drugs dispensed in diabetes clinics

Insulin				Oral antidiabetics		Others	
Type	**Number (%)**	**Name**	**Number (%)**	**Name**	**Number (%)**	**Name**	**Number (%)**
Human	8 (88.9)	Soluble	9 (100)	Tolb.[2]	6 (66.7)	AHT[6]	1 (11)
Animal	6 (66.7)	Lente	7 (77.8)	Chlor.[3]	3 (33.3)		
		Insul.[1]	2 (22.2)	Glib.[4]	3 (33.3)		
				Metf.[5]	3 (33.3)		

Insul.[1] = Insulatard, Tolb.[2] = Tolbutamide, Chlor.[3] = Chlorpropamide, Glib.[4] = Glibenclamide, Metf.[5] = Metformine, ATH.[6] = Antihypertensives (losatarn and cipril®.)

Antidiabetics were obtained from different sources. Major source of drugs was from hospital pharmacy (88.9 %). Figure 5 reveals sources of drugs in the diabetes clinics studied.

Figure 5. Sources of drugs in diabetes clinics

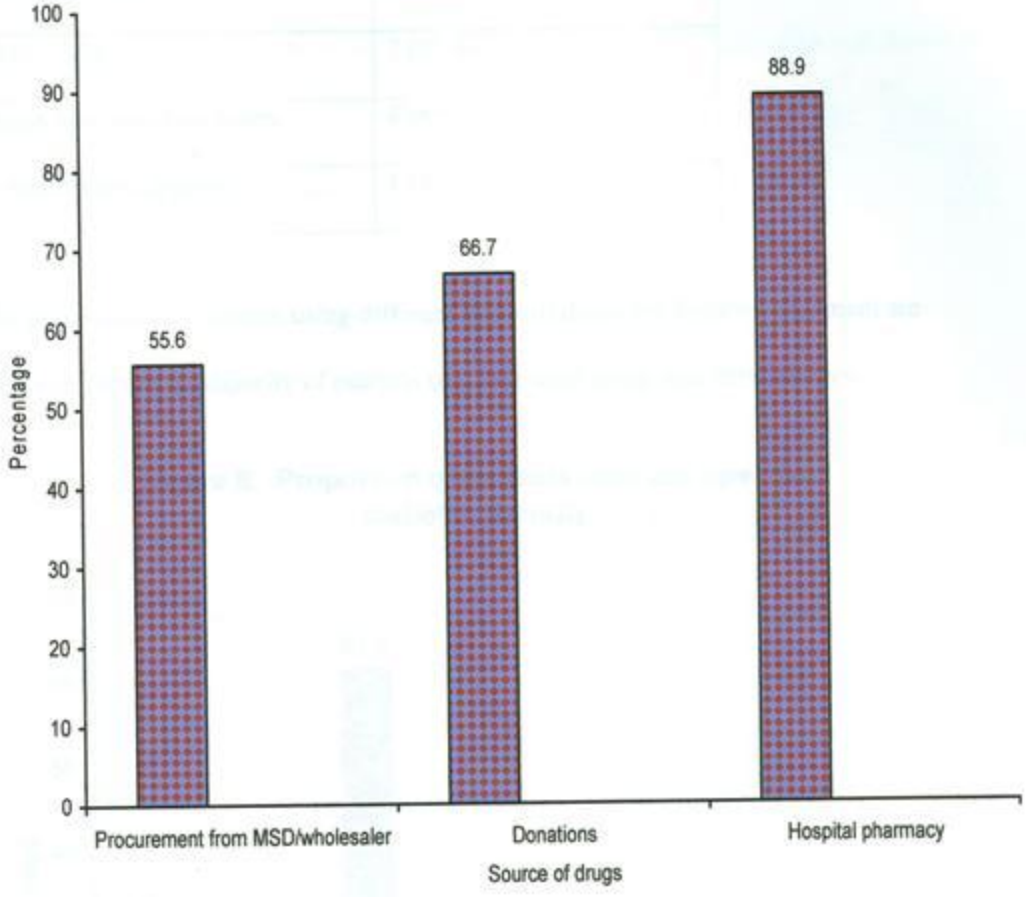


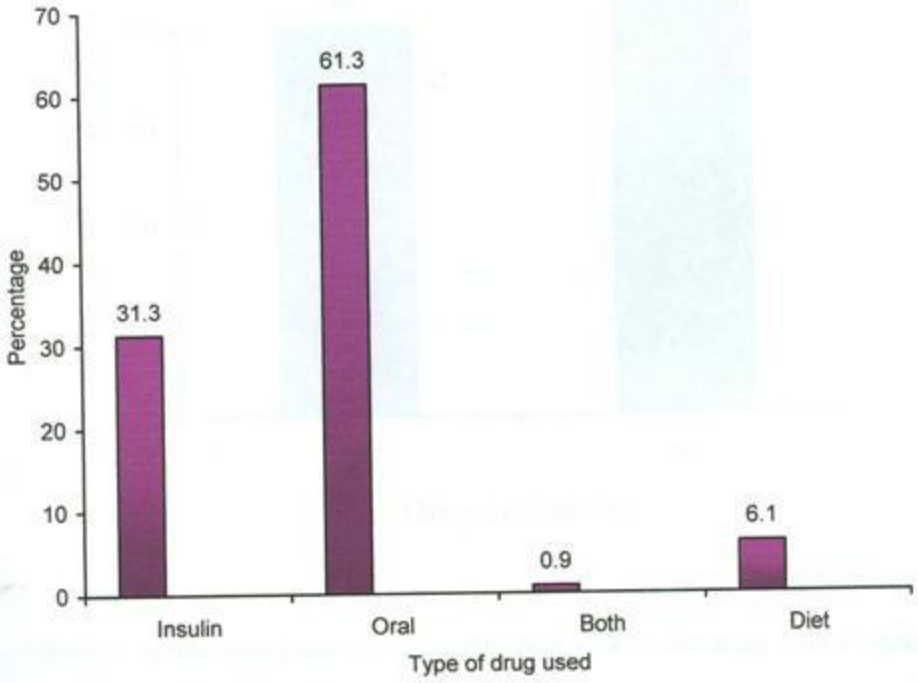
Table 22 shows the pharmaceutical reference books which were found in the diabetes clinics. At least each clinic had a reference book.

Table 1. Pharmaceutical reference books in diabetes clinics.

Reference book	Number (%)
MIMS Africa	7 (77.8)
British National Formulary	8 (88.9)
British Pharmacopoeia	1 (11.1)

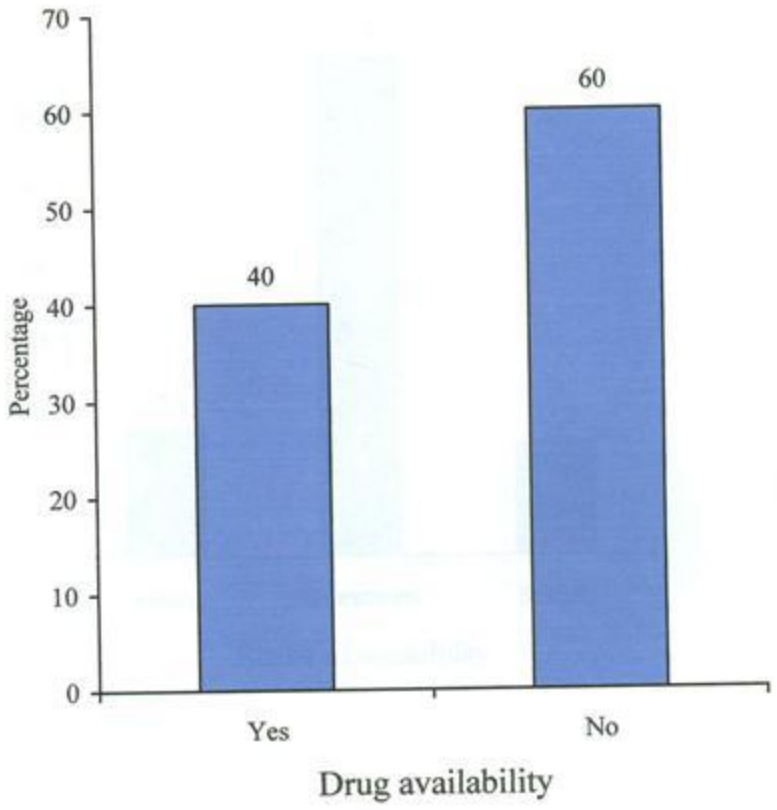
The proportions of patients using different types of drugs for diabetes treatment are shown in Figure 6. Majority of patients (61.3%) were using oral antidiabetics.

Figure 6. Proportion of patients who use specific diabetes therapy



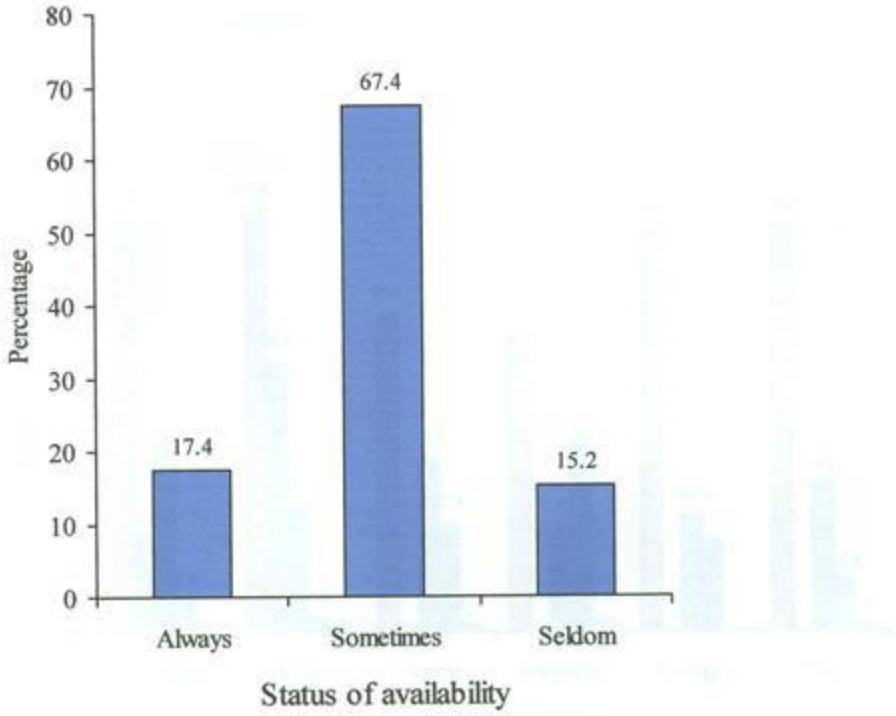
More than half of the patients that were interviewed had to visit community pharmacies to purchase antidiabetics as they were unavailable in the diabetes clinics as shown in Figure 7.

Figure 7. Drug availability in the diabetes clinics



Of the 40 % who said drugs were available, only 17.4 % said drugs were always available as shown in Figure 8.

Figure 8. Availability status of drugs in diabetes clinics.

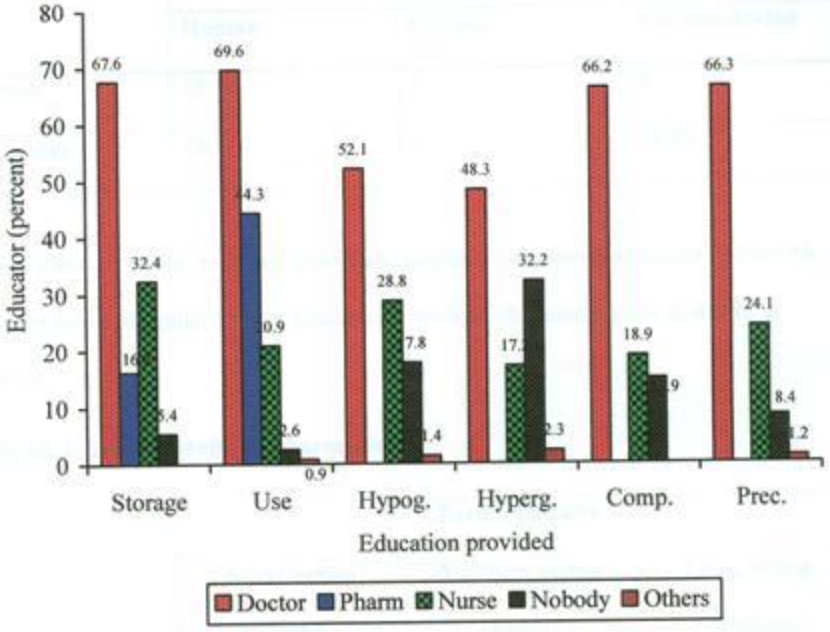


5.3 Patients'source of diabetes education

Patients were asked where they were taught about diabetes. They were also asked who was impacting them the knowledge about how to use and store (insulin), oral antidiabetics and drugs for other ailments. Majority of the patients mentioned nurses as

the source of their knowledge. They listed a number of medical professionals as summarized in Figure 9.

Figure 9. Educators of diabetic patients



Others = Media, laboratory technician, visiting specialist.

Hypog. = Hypoglycaemia, Hyperg. = Hyperglycaemia, Comp. = Complications, Prec. = Precautions.

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5.4 Antidiabetic drugs in community pharmacies.

All community pharmacies stocked oral antidiabetics (100%) but insulin was stocked in 32 pharmacies (63%) where majority (78.1%) stocked Human insulin as shown in Table 23.

Table 23. Types of insulin in pharmacies.

	Type of insulin		
	Human	**Porcine**	**Porcine/Bovine**
Number	25	2	6
Percentage	78.1	6.3	18.75

Several forms of insulin exist and almost all pharmacies that stocked insulin had soluble and lente forms of insulin. Only 4 pharmacies stocked ultralente insulin as shown in Table 24.

Table 24. Forms of insulin in pharmacies

	Form of insulin		
	Short acting (Soluble)	**Medium acting (Lente)**	**Long acting (Ultralente)**
Number	29	32	4
Percentage	90.6	100	12.5

All pharmacies stocked oral antidiabetic agents. Most popular oral antidiabetics were Glibenclamide (84.3%) and Metformin (80.4%). Relatively new oral antidiabetic drugs Glimepiride (2.0%) and Glitazones (2.0%) were rarely stocked.

Table 25. Types of oral antidiabetic agents stocked in pharmacies.

Drug name	Number (%)
Tolbutamide	8 (15.7)
Chlorpropamide	32 (62.7)
Glibenclamide	43 (84.3)
Glipizide	17 (33.3)
Gliclazide	8 (15.7)
Glimepiride	1 (2.0)
Metformin	41 (80.4)
Glitazones	1 (2.0)
Others	1 (2.0)

6.0 DISCUSSION

6.1 The role of a pharmacist as an expert on medicine.

In Tanzania, all types of out-patient clinics are normally conducted by doctors and nurses and patients are directed to the pharmacy to collect their medicines. Nurses were majority of the staff that were interviewed at the diabetes clinics (Table1). It was also found that, none of these clinics had pharmaceutical personnel. Doctors and nurses were found to dispense medicines. This is similar to earlier findings by Ewald who found that in the diabetes clinics there were no pharmacists and antidiabetics were dispensed by nurses [27].

Of the 18 non pharmaceutical staff who were interviewed, 9 (50%) dispensed medicines in the clinics where they worked. It was found that 5 clinics namely Mwananyamala and MNH in Dar es Salaam and Kivunge, Makunduchi and MMH in Zanzibar dispensed drugs at their clinics. In these centres, the role of pharmacists remains to be the acquisition of medicines and making sure that they are available at all times in the clinic for the clinic staff to dispense. In this situation, patient-pharmacist interaction in the clinic which is important in health education is missing.

The patient-pharmacist interaction involves interpreting and evaluating prescriptions, consulting with prescribers regarding a patient and/or a prescription in case of any problems and the actual dispensing. Instructions given to patients by pharmacists during

dispensing help to reinforce the instructions given to patients earlier by doctors or nurses.

6.2. Situation of antidiabetic drugs in the clinics.

At MNH in Dar es Salaam and MMH in Zanzibar, Diabetes Association offices situated within the clinics' premises facilitate procurement, storage and dispensing of the medicines that are stocked, however, the medicine stocks found were small.

In Zanzibar, insulin (human and animal) and tolbutamide were available at the clinics while at MNH a number of oral antidiabetics, human insulin and a few antihypertensive medicines (lisinopril, losartan) were found. The Diabetes Association of Zanzibar (DAZ) is also responsible for distribution of insulin to Kivunge and Makunduchi diabetes clinics. In these clinics medicines were not managed by pharmacists, therefore, dispensing medicines and giving necessary instructions to patients concerning their medications was done by doctors and nurses.

6.3. Cost of insulin in the clinics and community pharmacies.

In Zanzibar and at MNH hospital pharmacy, medicines were issued free of charge while at the district diabetes clinics in Dar es Salaam, medicines were sold at a cheaper price compared to that in the community pharmacies for example, human insulin was sold at Tsh. 3500/= at district diabetes clinics, the Tanzania Diabetes Association (TDA) at MNH sold human insulin at Tsh. 7000/= while in community pharmacies the price was observed to range from Tsh. 12,000/= to Tsh. 15,000/=. The price in district hospitals is

subsidized due to cost sharing which explains why it was found to be very low. These observations are different from those of Ramadhani who reported in 2003, that no public clinic had human insulin. He also found that the prices of human insulin varied from Tsh. 25,000/= to Tsh. 36,000/= [28]. The differences in these observations can be explained by the fact that during that time human insulin was being introduced into the market in Tanzania, therefore it was scarce and it was found in few community pharmacies. In Ramadhani's study, human insulin was found in 43% of the private health facilities that were visited [28], but human insulin is now found at Medical Stores Department (MSD) which is the supplier of medicines and medical equipments to the approved government and non-government agencies throughout Tanzania. This explains why human insulin is now found in public health facilities because they obtain their supplies from MSD. The availability of human insulin in public clinics and community pharmacies explains the change of the high price reported earlier.

6.4. Management of antidiabetic drugs in the clinics.

It was observed that, the diabetes clinics in Zanzibar communicate with the hospital pharmacies and Central Medical Store (CMS) in matters concerning medicines including shortages, types of medicines that are available, distribution and ordering. Also the diabetes clinic through the DA at MMH consults CMS during procurement of medicines which is mostly done through MSD. The DAZ obtains authorization from CMS to purchase the medicines they need from MSD. At MNH there was no communication between the hospital pharmacy and medicine handlers at the diabetes clinic, but recently

diabetic patients have been directed to collect medicines from the hospital pharmacy where they are collected free of charge. This means that all patients attending diabetes clinic at MNH will then pass through the hospital pharmacy and interact with pharmacists.

Pharmacists were found to be involved in ordering (22.2%), preparing the budgets (33.3%) and disposal of expired medicines (66.6%) (Fig. 4). This indicates that although pharmacists were not dispensing medicines to patients, they were responsible for making sure the right medicines, right quantities and quality, right information of the medicines collected by the clinics and given to patients are available in good time.

For clinics that stocked medicines, sources were hospital pharmacy (88.9%), procurement mostly from MSD (55.6%) and donations (66%). In all these areas, pharmacists are in charge of all the procedures involved. From these results it is observed that the main source of medicines for the clinics is the hospital pharmacy, where a pharmacist plays a major role serving the patients indirectly. The Diabetes Associations in Zanzibar and MNH, procure medicine through MSD where pharmacists are in-charge. In Zanzibar all medicines bought from MSD by any project, programme, association etc. have to be authorized by CMS. They are then checked at the CMS and recorded before being issued for use and if the stock is big, CMS assists in storage. Donations are also channelled through CMS. It is therefore observed that, as far as medicine management is concerned in diabetes clinics, pharmacists in hospital

pharmacies play an indirect role. That is, they may not come in contact with patients but at some stage medicines will pass through their hands.

Only MMH clinic had a separate store for medicines. The absence of stores in diabetes clinics is explained by the fact that they stocked small amounts of medicines and if they had large stocks then the hospital pharmacy or CMS was involved.

All clinics except Mwananyamala had ledger books for medicine record keeping. These findings do not collaborate with those of Ewald who found that documentation was not done [27]. This may be explained by the fact that at the time of this study, diabetes centres of excellence were already established in more than 50% of the clinics visited (MMH, MNH, Temeke, Amana and Mwananyamala) and these may have provided sufficient room to bring about the improvement and possibly dissemination of Ewald results brought up a change.

In some of the clinics, staff members were found to hold regular meetings but pharmacists were not involved. This may be explained by the fact that pharmacists are not identified as part of the team participating in the care of diabetic patients in the clinics and therefore other health personnel fail to understand their role in diabetes management. Their role is left at ensuring availability of medicines and therefore, they were only contacted when medicines were not available.

The clinics had a number of pharmaceutical references including MIMS Africa (77.8%), British National Formulary (88.9%) and British Pharmacopoeia (11.1%), which health personnel refer to whenever needs arise, but this is not the best alternative to having a pharmacist.

6.5. Types of diabetes.

The sex distribution was found to be 47 male and 68 female and the age range was between 10 and 80 years with the mean of 48 years and the median of 49 years. The results indicate that there are fewer patients below the age of 40 suffering from diabetes which is in line with earlier studies [23,29-32] where prevalence tends to be lowest among persons less than 45 years of age.

The types of medicines used may indicate patients with Type 1 or Type 2 diabetes. In this study it was observed that 31.3% had Type 1 and 69.7% had Type 2 which indicates that more patients have Type 2 diabetes. This is consistent with previous reports that majority of people have Type 2 diabetes [12,18,19,31].

Results on the type of medicine used according to age group showed that most people under the age of 34 years use insulin for treatment of diabetes while patients above this age use oral antidiabetics. This is in line with other findings that more Type 2 diabetic patients are at ages above 45 years [29].

6.6. Knowledge of the patients on diabetes mellitus.

Most patients on insulin (97.3%) knew the names of insulin they were using while those on oral antidiabetics only 42.3% were able to mention the names of the medicines that they were using. This supports Booth findings who found that around half of the patients with Type 2 diabetes could name their medication and dose correctly [23]. However, most names were mentioned using brand names as most of them are easy and brief and therefore easier to be remembered by patients. Some of those on insulin were not able to mention the name but they were able to mention whether the insulin was clear (soluble) or cloudy (lente) meaning short or intermediate acting insulin respectively. 21.6 % of patients on insulin were also able to mention the source of the insulin (animal or human). Most of those on insulin (91.8%) stored the insulin correctly and 83.7% were able to mention the units of insulin they were using. This may be due to the reinforcement of the instructions given to patients by pharmacists every time insulin was dispensed in either hospital or community pharmacy. This is one area where pharmacists were observed to contribute in patients' education.

All patients knew how much and the frequency with which to use their medications. This is probably due to the reinforcement of the instructions by pharmacists during dispensing.

40 % of patients said medicines were available in the clinics but most of these (83%) said they were not available all the time (Fig. 8). It was also observed that, the quantity

of medicine that was dispensed could not last patients to their next clinic appointment. Therefore most patients purchase their extra medication from community pharmacies before their next visit. This happens during scarcity of antidiabetics in public hospitals. Similar observations were made by Simpson who found that in Dar es Salaam and Zanzibar a large proportion of patients relied on obtaining insulin from the community pharmacy [32]. This indicates that majority of patients talk to pharmacists and therefore there is pharmacist/patient interaction, an opportunity to reinforce what patients have learned in diabetes clinics.

Most patients (63.5%) knew the symptoms of hypoglycaemia, and the most frequently mentioned were sweating, hunger and confusion. Only 38.3% said they knew what to do when they experienced hypoglycaemia. They mentioned drinking something with sugar (36.4%), eating something (34.1%) and taking sugar (13.6%). Only one (2.7%) had consulted a pharmacist. This could be due to the fact that patients feel more confident talking to a doctor than a pharmacist [23] which explains why only one patient sought assistance from a pharmacist.

75.7% of the patients knew the risks of not taking their medication and they were able to mention the symptoms with the most frequently mentioned symptoms being dehydration (thirst) and frequent urination.



Majority (64.3%) of the patients knew the complications of diabetes as retinopathy, infections (poor wound healing) and neuropathy.

They were also able to mention the things they should do to improve their health which were diet control, physical activity and loosing weight. All these affect the most common risk factors of diabetes i.e. obesity and sedentary life style.

The responses above indicate that most patients are aware of their disease condition, its complications and risk factors. Diabetes is known to affect many parts of the body leading to serious complications such as blindness, kidney damage, and lower-limb amputations. Working together, people with diabetes and their health care providers can reduce the occurrence of these and other diabetes complications by controlling the levels of blood glucose, blood pressure, and blood lipids and by receiving other preventive care practices in a timely manner.

6.7. Role of the pharmacists as diabetics educators.

It was observed that patients' education about their disease was provided by doctors and nurses while pharmacists were observed to play a role in medicine use (44.3%) and storage (16.2%) only.

Pharmacists were not found to be involved in patient education concerning their disease. It was observed that only one patient consulted a pharmacist on hypoglycaemia. This

may be explained by the fact that diabetes education about the disease is provided in diabetes clinic where pharmacists are not found.

This study found out that pharmacists are involved in diabetes care mostly where medicines are concerned, which may be due to the fact that patients look at a pharmacist as only a medicine specialist and hence consulting them in matters related to their medicines. Similarly Booth found that patients claimed that their doctor provided the most useful advice on both diabetes and its treatment and that no patient thought that a pharmacist gave the most useful information [23]. This may be the same reason why patients did not consider seeking advice from a pharmacist could be useful.

The results further indicates that most patients come in contact with pharmacists at some stage mostly when collecting their medication and that is why pharmacists were mentioned by patients on patients' education about medicines (giving instructions on the use and storage of medication).

6.8. Role of community pharmacies.

Of the 51 pharmacies which were visited, 96.1% had a pharmacist (Fig. 10). Different types of antidiabetics were found in community pharmacies, most of which were not available in public hospital pharmacies (Table 18), an indication that patients obtain most of their medicines from community pharmacies. It was also observed that

hospital pharmacies had insufficient and limited types of medicines stocks (Table 2). This can be explained by the fact that the public hospital pharmacy obtain medicines from MSD which supply only essential medicines listed in the essential medicines list and they also have a limited budget allocated for medicines, while the community pharmacies obtain their medicines from different sources and have no limit to what they can stock in their pharmacies as long as the medicine is registered in the country. Generally, it is observed that pharmacists are not directly involved in the provision of diabetes care and education of patients in the clinics but are directly involved in the care and education of patients in community pharmacies where patients obtain most of their medicines most of the time.

6.9. Limitation experienced by pharmacists in delivering services to people living with diabetes.

The main problems that were mentioned by pharmacists included the following;

- Drugs are inhibitively expensive for the majority of ordinary patients.
- Lack of continuing medical education.
- Patients preferring self medication, as they acquire basic knowledge on drugs along the course of their ailment.
- Pharmacists playing passive role in provision of health care.
- Prescribers using brand names and patients demanding the same brands.
- Counterfeighting of oral drugs leading to poor patient response.

- Scarcity/shortage of drugs due to inadequate drug budgets in public diabetic clinics and dispensaries.
- Congestion of patients during clinic's days makes it very difficult to discuss with patients about their ailments and treatment at the public pharmacies.

7.0 CONCLUSION.

There were no pharmacists working in any of the diabetes clinics that were visited; however, most of the clinics did not keep any medicines. In those clinics which were found to keep medicines, they had small stocks which were managed by doctors and nurses. The main source of medicines was hospital pharmacy and for those which ordered medicines, most of them procure from MSD. Procurement of antidiabetics always involved a pharmacist except at MNH.

Most patients that were interviewed were using oral antidiabetics indicating they were Type 2 diabetics and most of them did not know the names of the medicines they were using, a reflection of the basic lack of knowledge about their medication. Most of those on insulin knew the name and the units of the insulin they were using, how to store it correctly and a few were able to mention the source of the insulin they were using. All patients knew how to use their medications.

Pharmacists were found to be involved in instructing patients on how to store and use their medicines and most patients obtained medicines from community pharmacies indicating that patients talk to pharmacists about their medication. Very few patients were found to have talked to pharmacists about their disease.

Most pharmacists had not attended any training in diabetes after graduating; however they had the basic knowledge needed to educate patients about their medication and their

8.0 RECOMMENDATIONS

- Pharmacists should be involved actively in the management of diabetic patients so as to make patients aware of the knowledge that they have about diabetes.
- Pharmacists in hospitals should take part in diabetes care in the clinics by visiting the clinics regularly and spending some time with patients and health care providers.
- Educational and promotional materials like posters should be available in pharmacies. These can help to reinforce the education that patients have. They can also be useful to other people visiting the pharmacy.
- Pharmacists should organise regular fresher meetings so as to update themselves with current knowledge about diseases and their management.
- Pharmacists should not be satisfied with what they learnt in school, they should keep reading journals, through internet, attending conferences, scientific meetings etc.
- Patient education should be conducted as team work involving different health personnel.

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