FACTORS CONTRIBUTING TO NON-ADHERENCE TO DIABETES TREATMENT AMONG PATIENTS ATTENDING CLINICS IN MWANZA CITY, TANZANIA

BY

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2010

CERTIFICATION

The undersigned certifies that he has read and hereby recommends this dissertation for acceptance by Muhimbili University of Health and Allied Sciences a dissertation tittled "Factors contributing to non-adherence to diabetes treatment among diabetic patients attending clinics in Mwanza city".

This dissertation is presented in partial fulfillment of the degree of Masters of Public Health.

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DEDICATION

This dissertation is dedicated to my beloved wife, Leonia and my sister Dr. Aurelia Bundala , whose prayers and encouraging words inspired me to successfully produce this dissertation.

ABSTRACT

Background: Non-adherence in chronic diseases has been described earlier as taking less than 80% of the prescribed treatment. Non-adherence to the diabetes treatment regimen is possibly the most common reason for poor health outcomes among people with diabetes. The rates of non-adherence to diabetes regimen tasks are highly variable, but have significant consequences on diabetes outcomes and the effectiveness of treatments. Non-adherence is a problem that has many contributing factors and the responsibility for adherence must be shared by health professionals, the health care system, the community and the patients.

Objective: The aim of this study was to determine the proportion (magnitude) of non-adherence and its contributing factors among diabetic patients attending clinics in Mwanza city. Specifically the study determined the relationship between non-adherence and various variables which are; alcohol use, knowledge on diabetes, its treatment and complication, travel distance to reach the clinic by patients and medication side effects.

Results: A total of 272 diabetic patients attending two diabetes clinics in Mwanza city were interviewed. Of the respondents, 118(43.4%) were males. Their mean age was 51.22 (14.97 standard deviation).

Among all respondents, 255 (93.8%) scored High level of knowledge on Diabetes and its treatment as compared with those with low knowledge making it not a significant contributor to non-adherence. Of the 272 patients, 77(28.3%) reported non-adherent.

Alcohol use, medication side effects and distance travelled to reach the clinic were the significant contributors to non-adherence (p=0.001).

Conclusion: Factors which were found contributing to non-adherence to diabetes treatment include: alcohol use, medication side effects and few clinics located far from most of patient. Quality improvement efforts should focus on these modifiable factors.

It is therefore recommended that, patients should be educated on the possible side effects that can occur during treatment and that they should not stop taking the drugs against medical advice. Alcohol use should be discouraged among diabetic patients as it is the cause of non-adherence probably due to forgetfulness. This should be done at all levels from the doctors, nurses and drug dispensers in all clinics. Also more diabetes clinics should be established at least in each district hospital in order to improve accessibility to clinics and reduce long waiting time.

For improving adherence, availability of information with patients' perspectives about patients' expectations, needs and experiences in taking medication and about what might help them to become and remain adherent should be maintained.

Key terms: - Diabetes; type 1 diabetes; type 2 diabetes; Medication; Non-adherence

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ABBREVIATIONS/ACRONYMS

AIDS.....Acquired Immune Deficiency Syndrome

BMC.....Bugando Medical Centre

HIV.....Human Immunodeficiency Virus

NHIF.....National Health Insurance Fund

TDA.....Tanzania Diabetes Association

UN.....United Nations

UK.....United Kingdom

US.....United States of America

WHO.....World Health Organization

DEFINITION OF OPERATIONAL TERM

Medication non-adherence means failure to take medications as prescribed by the health care provider. Medication non-adherence can either be willful or unintentional, which includes: (1) Failing to initially fill or refill a prescription, (2) discontinuing a medication before the course of therapy is complete (3) taking more or less of a medication than prescribed and (4) taking a dose at the wrong time *(Sarah Wamala et al., 2007)*. In this study Medication non-adherence means taking less than 80 % of the prescribed medication.

CHAPTER ONE

1. INTRODUCTION

1.1. Background

Diabetes mellitus (DM) is a group of diseases characterized by high levels of blood glucose resulting from defects in insulin secretion, insulin action or both. Usually the body use and store glucose produced during the digestion of food by the help of insulin, a pancreatic hormone. People with DM experiences frequent urination, increased thirst, dehydration, weight loss, blurred vision, fatigue, and, occasionally coma. Uncontrolled high levels of glucose (hyperglycemia) over time damages the eyes, nerves, blood vessels, kidneys, and heart, causing organ dysfunction and failure. *(Pladevall et all, 2004).*

By the year 2025, the number of adults with diabetes in the world is estimated to rise to 300 million, whilst the major part of this numerical increase will occur in developing countries. The number of people with diabetes in Africa remains uncertain, although in 2000 International Diabetes Federation (IDF) estimated at 7.5 million diabetic adults. This figure is now thought to be much larger *(IDF, 2005).* In Tanzania according to Tanzania Diabetes Association (TDA), it is estimated that, 300,000-350,000 people has diabetes *(TDA, 2005).* In December21, 2006, the United Nations General Assembly resolution declared DM as an international public health issue, only second to HIV-AIDS *(WHO, 2006).*

Treatment of diabetes is complex and involves lifestyle modification to optimize nutrition and physical activity as well as the addition of medication therapy to provide needed physiologic support for insulin deficiency or for insulin resistance. In type 1 diabetes, the use of insulin is essential for physiologic insulin replacement. In type 2 diabetes there are a number of pharmacological options including oral agents (metformin, chlorpropamide and glibenclamide), injected insulin, and, more recently, the incretin mimetic agents, amylin analogs, and inhaled insulin*(Meece .,2006)* and *(Siminerio .. 2006).*

Non-adherence to the diabetes treatment regimen is possibly the most common reason for poor health outcomes among people with diabetes. The rates of non-adherence to diabetes regimen tasks are highly variable, but have significant consequences on diabetes outcomes and the effectiveness of treatments *(Harris., 2006).* Studies show that medication adherence for chronic diseases averages about 50% *(Blanca et al., 2001).* Diabetes is one of the most psychologically and behaviorally demanding of the chronic diseases, which requires frequent self monitoring of blood glucose, dietary modifications, exercise, and administration of medication on schedule *(Ciechanowski et al., 2001) & (Rubin et al., 1999).* For patients with either type 1 or type 2 diabetes, studies have emphasized the importance of controlling blood glucose to optimal level through strict adherence to medications in order to minimize deleterious long-term complications *(DCCT Research Group 1996 & Lance.,t 1999).*

Failure to take medication as prescribed is termed non-adherence. Medication non-adherence can either be willful or unintentional, which include: (1) failing to initially fill or refill a prescription, (2) discontinuing a medication before the course of therapy is complete (3) taking more or less of a medication than prescribed and (4) taking a dose at the wrong time (Sarah et al., 2007). Non-adherence in this study means that patients fail to comply with the advice of their health care providers in taking drugs.

Non-adherence in chronic diseases has been described earlier as taking less than 80% of the prescribed treatment *(Sackett et al 1991).* A recent meta-analysis has showed that the average adherence in patients with diabetes is 67.5%, which is suboptimal *(Shobhana et al, 1999).* Also, recently, a specific systematic review on adherence to medications for diabetes showed that average adherence to oral hypoglycemic agents ranged from 36 to 93% (Diabetes Care 1996). In general, poor adherence to medications has been shown to end up with the development of complications, disease progression, avoidable hospitalizations, premature disability, and even death *(Pladevall et al 2004).*

Non-adherence is a concern which is growing in all aspects of treatment, seriously affecting the benefits of current medical care. However, ensuring that patients take diabetes medications as prescribed and achieve normal or near normal blood glucose control is among the most common challenges encountered by physicians and other health care providers involved in the treatment of patients with diabetes *(Adisa et al, 2009).*

Non-adherence is a problem that has many contributing factors and the responsibility for adherence must be shared by health professionals, the health care system, the community and the patients. A substantial literature has documented a number of factors related to diabetes regimen adherence problems, which includes demographic, psychological, and social factors, as well as health care provider, medical system, disease and treatment related factors *(Delamater 2001).*

For improving adherence, collaborative effort in the development of simple interventions including patients' input, appears most promising. Availability of information with patients' perspectives about patients' expectations, needs and experiences in taking medication and about what might help them to become and remain adherent needs to be addressed during all phases of diabetes treatment *(Lutfey et al; 1999 & Van Dulmen et al; 2008)* .This study examined the magnitude (proportion) of non-adherence to diabetes treatment and its contributing factors in order to identify the areas upon which counseling should be focused as well as assisting in the development of future interventions to improve adherence and outcomes of diabetes treatment.

1.2 Problem statement

Patient non-adherence is both costly and deleterious to health. Medications that are prescribed following consultation with a medical professional are usually dispensed with an expectation of close to perfect adherence. Patient non-adherence may therefore have severe implications for the control of symptoms, recovery time, quality of life and mortality. Treatment complications may also result from non-adherence. Yet non-adherence may account for a poor treatment outcome and in these circumstances, overdosing may constitute a serious health hazard. In terms of financial implications there is likely to be considerable wastage when resources are directed at medical consultations, medication, transport to appointments and other aspects surrounding medical care if non-adherence to treatment remains high.

Non adherence situation need to be rectified, otherwise there will be a huge economic burden on Tanzania both from direct health care costs plus indirect costs from a decline in workplace productivity. In addition there will be losses from premature morbidity and mortality.

Studies have found that, the introduction of non-adherence information into clinical practice has the potential to improve both adherence and clinical outcomes. Also suggests that in order to improve adherence, it is helpful to consider demographic, psychological, and social factors, as well as health care provider, medical system, disease, and treatment related factors *(Delamater., 2001)* and alcohol use *(Chris et al; 2008).*

These studies have generated mixed results of the factors associated with non-adherence to diabetes treatment. However, most of the studies were carried out in developed countries, leaving a gap in knowledge about the proportion and factors that may be associated with non-adherence to diabetic treatment in developing countries like Tanzania, where non-adherence is assumed to be higher than developed countries owing to inadequate health resources and inequities in access to health care *(WHO; 2003).* Therefore, it is for the above reasons that it was thought to be utmost importance this study to be carried out.

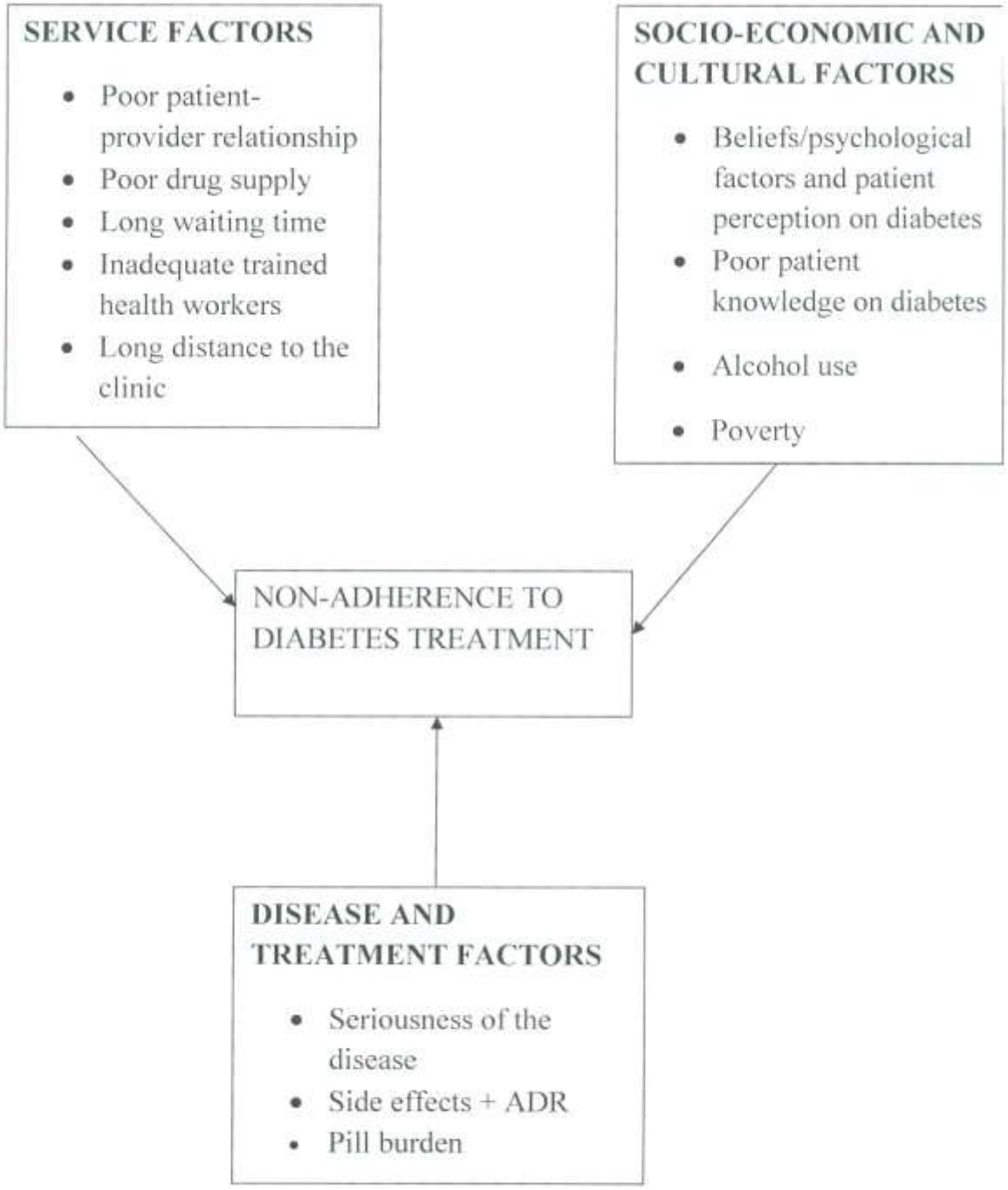


Figure 1: Conceptual framework on factors contributing to non-adherence - described on Literature review.

1.3 Rationale

Diabetes care is complex and requires that many issues, beyond glycemic control, be addressed. To improve patient adherence, it is important to understand why non-adherence occurs.

The ultimate goal of this strategy was to determine the factors contributing to non-adherence among diabetic patients, the results which will be shared among health professionals, the health care system, the community and the patients.

Recommendations of this study will assist in developing strategies and interventions that will take into consideration the factors contributing to non-adherence so as to lower the impact of a disease that is on the increase, on the health system which is already overburdened with communicable diseases.

Results of this study will also target policy-makers and health managers who can have an impact on national and local policies in ways that will benefit patients, health systems and societies with better health outcomes and economic efficiency.

This study is also a partial fulfillment of the requirements for the degree of Masters of Public Health of the Muhimbili Universty of Health and Allied Sciences.

1.4 Objectives

1.4.1 Broad objective

To determine the factors contributing to non-adherence to diabetes treatment among diabetic patients attending clinic in Mwanza city, Tanzania

1.4.2 Specific objectives

1. To determine the proportion of non-adherence to diabetes treatment among diabetic patients attending clinic in Mwanza city.
2. To determine the relationship between patient's knowledge on diabetes, its treatment, and complications and non-adherence to diabetes treatment.
3. To determine the relationship between alcohol use and non-adherence to diabetes treatment.
4. To determine the relationship between medication side effects and non-adherence to diabetes treatment.
5. To determine the relationship between travel distance to clinic and non-adherence to diabetes treatment.

1.4.3 Research questions

1. Is there relationship between patients' socio-demographic characteristics and non-adherence to diabetes treatment?
2. Is there relationship between patients' knowledge on diabetes, its treatment, and complications and non-adherence to diabetes treatment?
3. Is there relationship between alcohol use and non-adherence to diabetes treatment?
4. Is there relationship between medication side effects and non-adherence to diabetes treatment?
5. Is there relationship between travel distance to clinic and non-adherence to diabetes treatment?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Non-adherence to diabetes treatment

2.1.1 Medication non-adherence

Non-adherence to medication has become a worldwide problem. The magnitude and impact is assumed to be higher in developing countries owing to inadequate health resources and inequities in access to health care *(WHO; 2003).*

In the context of disease, literatures have termed medication non-adherence as an "epidemic." Different studies have shown that more than 10% of older adult hospital admissions were due to non-adherence with medication regimens. Another study done to persons admitted to the hospital showed that, one-third had a history of non-adherence *(Miller et al., 1997).* In Finland, a study reported only 15% of the respondents adhering to medication as scheduled *(WHO; 2003).*

Dailey et al., 2007 studied 37 431 Medicaid-funded patients in the United States, reported that, only 15% of the patients prescribed a single oral medication adhered taking it regularly. In Europe, it is even worse because just 28% patients with diabetes are able to achieve optimal adherence for diabetes *(WHO 2003).*

However, Paes et al., 1997 has found that most deviations in medication taking by patients are a result of omission of doses rather than additions or delays in the timing of

doses. Patients have a tendance to skip doses of prescribed medications probably to reduce the inconveniences/fear of daily ingestion of drugs and daily insulin injection.

2.1.2 Consequences of non-adherence

Diabetes Mellitus if is not controlled, ultimately lead to high blood sugar levels, a condition called hyperglycemia. Hyperglycemia overtime cause damages to the retina of the eye, the kidneys, the nerves, and the blood vessels *(Bethesda., 2008).* Studies show that, Medication non-adherence consequences in adults are more serious, less easily detected, and less easily resolved than in younger age groups (WHO, 2006).

Diabetes can lead to different complications. In type 2 diabetes patients, they are more at risk to suffer from cardiovascular disease, while type 1 diabetes patients are more likely to suffer kidney failure. About 40 percent of people with type 1 diabetes develop severe kidney disease and kidney failure by the age of fifty *(Novelguide.com, 14th April 2010 & Jayant et al., 2000).* The estimate done in the US, found that medication non-adherence results in 125,000 deaths annually, and costs the US health care system $100 billion per year *(Wamala et al., 2007).*

Since Diabetes Mellitus develops complications if remain uncontrolled, the cost for treating complications is also a burden to individuals, health care system and the country as a whole. The study known as Cost for Diabetes in Europe, showed that the total cost of treating more than 10 million patients with type 2 diabetes in the countries studied was approximately US 29 billion, an average of 5% of the total health care expenditure

in each country. Furthermore, that cost increases 2 to 3.5 fold once patients develop microvascular and macrovascular complications which are preventable. Hospitalization costs, which include the treatment of long- term complications such as heart disease, account for 30-65% of the overall costs of the disease. It also shows that, the direct costs of complications attributable to poor control of diabetes are 3-4 times higher than those of good control. The indirect costs (production losses due to sick leave, early retirement and premature death) are of approximately the same magnitude as these direct costs *(WHO, 2003).*

Diabetes in Tanzania is introducing an increasing economic burden on the population and on the national budget for health care. One study in Tanzania found that the treatment of complications was the second highest outpatient cost, representing 30.8% of total costs *(WHO, 2003)*. A study in the Kilimanjaro region showed that the total direct costs relating to the treatment of diabetes accounted for a quarter of the minimum wage, resulting in about 46% of the patients having permanent financial difficulties. Research from Dar es Salaam reported that only 1 in 5 of people with diabetes was receiving government funded treatment for the disease *(Ramaiya., 2005).*

Interventions addressing non-adherence can therefore help to reduce this economic burden to the individual, community and health system.

2.2 Factors contributing to non-adherence to diabetes treatment

2.2.1 Demographic factors

Studies done on demographic factors have reported that, ethnic minority, low socioeconomic status, and low levels of education are associated with lower regimen adherence and greater diabetes-related morbidity *(Delamater., 2001). Linda., 2004* also found that, demographic variables such as age and gender appear to influence adherence to medication. Another study done in 6 US states (Alabama, California, Florida, Mississippi, New York and Ohio) found that, among diabetic patients enrolled, patients younger than 65 years and women patients were more likely to be non-adherent to medications *(Yang et al 2009).* Similarly, a study done in Philippine shows that, adherence was found to be strongly associated with age, non-adherence decreased as age increased, reaching a peak at age 74 *(Lee et al 2005).*

2.2.2 Psychological/belief factors

Psychological/belief factors are also linked with regimen adherence. Appropriate health beliefs, such as perceived seriousness of diabetes, vulnerability to complications, and the efficacy of treatment, can predict better adherence. Patients adhere well when the treatment regimen makes sense to them, when it seems effective, when they believe the benefits exceed the costs, when they feel they have the ability to succeed at the regimen, and when their environment supports regimen-related behaviors *(Delamater. 2006).* A study done in US reports that, psychological/belief factors seem to be important determinants of medication non-adherence *(Daniel et al., 2009).* Report from a study

done by *Steven,* reveals that depression symptomatology are associated with non-adherence to important aspects of diabetes self-care.

Negative attitudes toward medication is also found to be very common, particularly in patients with less education and poorer diabetes-related knowledge, even when they received precise recommendations. It also found that, patients who did not adhere to therapy were most commonly women and were depressed *(Lerman et al., 2009)*. Therefore it is necessary to improve patient perception and acceptance of medication regimens with the help of diabetes educators, to facilitate earlier and more aggressive intervention and thus optimize glycemic control *(Lerman et al., 2009)*.

Interventions aimed at alleviating beliefs not related to health, which are quite common, could result in significant improvements in diabetes self-care.

2.2.3 Socio - economic factors

Family relationships play an important role in diabetes management. Studies have shown that low levels of conflict, high levels of cohesion and organization, and good communication patterns are associated with better regimen adherence. Greater levels of social support, particularly diabetes-related support from spouses and other family members are associated with better regimen adherence. Social support also serves to buffer the adverse effect of stress on diabetes management *(Delamater. (2006). Botelho et al., 1992* and *Anderson et al., 1982* have shown that socioeconomic factors play a vital role in adherence, as patients who are poor or live on fixed income may be non-adherent because of their inability to afford the cost of prescribed medications. Anderson

et al., 1982 also showed that patients who have limited access to transportation, live far away from clinics may not likely to adhere to treatment regimens.

2.2.4 Health care provider and medical system factors

Relatively little research has been conducted on the effects of health care team and system-related factors on non-adherence. It is increasingly being recognized that a collaborative relationship between patient and provider may improve patient adherence and outcomes in chronic medical illnesses *(Von Korff et al., 1997 & Linda., 2004).* A study done to 17 patients with type 1 diabetes mellitus and 121 patients with type 2 diabetes mellitus shows that, social support provided by nurse case managers promote adherence of diabetic patients to medications, (*Aubert et al ., 1998).* It was observed in the Diabetes Control and Complications Trial that one of the key elements to success in achieving good glycemic control was the availability of support provided to patients by the health care team *(Delamater., 2001).*

2.2.5 Disease- and treatment-related factors

Delamater., 2001 has generally shown that lower regimen adherence can be expected when a health condition is chronic, when the course of symptoms varies or when symptoms are not apparent, when a regimen is more complex, and when a treatment regimen requires lifestyle changes. Dailey et al. showed that patients prescribed a single medication had better short-term and long-term adherence rates than patients prescribed two or more medications

(WHO, 2003). Several studies investigating adherence to chronic disease treatment have evidenced that patients often discontinue their medications or even do not take them at all because they consider them ineffective or experience side effects. Among diabetes patients, many believe they do not need any drug therapies as they have no symptoms *(Bethesda, 2008).* A study of type 2 diabetic patients reported that, for the majority (58%), side effects were a main factor limiting adherence *(Grant et al., 2003).* A survey done in UK and US to patients with Type 2 diabetes shows that, medication side effects and risks influence patients' treatment choices *(Hauber et al., 2009).*

2.2.6 Alcohol use

Alcohol misuse is common and has been associated with medication non-adherence, and it is a behavior that is modifiable; however, research on alcohol misuse and medication non-adherence has been largely limited to patients with HIV and a few studies on diabetes *(Bryson., 2008).* In two studies from the UK, Singh and Press found that poor glycemic control in people with diabetes was associated with alcohol use *(Samsone et al., 2008).*

Two landmark studies, the Diabetes Control and Complications Trial and the United Kingdom Prospective Diabetes Study (UKPDS), have clearly established that tight blood glucose control in both type 1 and type 2 diabetes can decrease the risk of developing secondary microvascular complications *(Lancet, 1999).* Other studies have demonstrated the economic and quality-of-life benefits of improved glycemic control among this

patient population *(DCCT Research Group., 1996)*. However in actual practice settings, the management of diabetes lies predominantly in the hands of the patient, in part patients have autonomy in determining whether, or to what extent, adherence to the prescribed regimen is acceptable *(Jayant et al., 2000)*. Most of the studies on diabetes treatment non-adherence have been done in developed countries, that's why a study in Tanzanian context was thought to be utmost importance to be carried out to investigate the probable factors contributing to non-adherence to diabetes treatment among diabetic patients, in order to assist in developing needed interventions to increase medication adherence so that patients can realize the full benefit of prescribed therapies.

CHAPTER THREE

3. METHODOLOGY

3.1 Study design

Descriptive cross-sectional study design was employed to determine the proportion and factors contributing to non-adherence to diabetes treatment among diabetic patients attending clinic in Mwanza City, Tanzania. This design is simple and inexpensive (Olsen & Diane., 2004).

3.2 Area of the study

This study was conducted at Bugando Medical Centre and Sekou Toure Hospital in Mwanza City, Tanzania. The two diabetes clinic centers were chosen by convenience because they are the only established diabetes clinics in Mwanza City.

Bugando Medical Centre is a consultant and teaching hospital for the Lake and Western zones of the United Republic of Tanzania. It is a referral centre for tertiary specialist care for six regions, including Mwanza, Mara, Kagera, Shinyanga, Tabora and Kigoma. It serves catchment population of approximately 13 million people. Bugando Medical Centre is a referral hospital under Government and Church Partnership, which exists to provide tertiary specialist quality health care, consultancy, research and training in health. It operates out-patients diabetic clinic once per week serving approximately 50 patients per week. Sekou Toure hospital is a regional hospital for Mwanza City with a catchment population of nearly 3 million. It has an established diabetes clinic which

operates twice per week and according to the clinic registers, it serves 40-80 patients per week.

3.3 Study population

Individuals that were included in this study were adult diabetic patients aged between 18 years and above who are on diabetes treatment with oral hypoglycemic agents or insulin injection for three consecutive months or more and attending clinic at Bugando Medical Centre or Sekou Toure Hospital in Mwanza City, Tanzania.

3.4 Sample and sampling methods

3.4.1 Sample size

Sample size (n) was calculated, by the following formula of a single proportion,

$$n = \frac{z^2 p\,(100-p)}{\varepsilon^2}$$

z= level of confidence (1.96 for 95% confidence level)

p = expected proportion. In this study 23% used as expected proportion. This was chosen because many studies using self report has found non-adherence to diabetes treatment ranging from 20-30 percent. ε = margin of error. In this study the degree of precision is set at 5%

The substitution of the above formula shows that;

$$n = \frac{1.96^2 23\,(100-23)}{5^2}$$

= 272 diabetic patients

The sample included both Type 1 and Type 2 diabetic patients.

Inclusion criteria

1. Having diabetes and on diabetes treatment
2. Attending clinic for three consecutive months or more
3. Diabetic patients with age between 18 years and above
4. Giving written informed consent

Exclusion criteria

1. Very ill diabetic patients
2. Nearly diagnosed diabetic patients (less than 3 months)
3. Diabetic patients aged below 18 years
4. Those who will refuse to sign the written consent

3.4.2 Sampling technique

Respondents were selected from the two clinics by using systematic random sampling method. On each clinic day, the total attendance was obtained through the attendance registers and the total number reported on that day was used as a sample size (n) for calculating K-interval from total sample size (N=272). The initial patient on each clinic day was selected by writing down the names of the first two patients each on a separate piece of paper and randomly selecting one. Thereafter, patients who met a selection criterion were interviewed. A total of 272 diabetic patients were interviewed from 7th to 30th June 2010. 154 patients obtained from Sekou Toure Hospital and 118 from Bugando Medical Centre. The difference of sampled patients was due to number of clinics

operated per week, twice per week at Sekou Toure Hospital, while once per week at Bugando Medical Center. The sample included both Type 1 and Type 2 diabetic patients.

3.5 Data collection methods

Data was collected through questionnaires with both closed and open ended questions developed in English, then translated in Kiswahili. Questions developed basing on literature review with the aim to find important information that could characterize non-adherence. Data collection tool, authors was validated by colleagues, experts, and outsiders, and all their great advice was implemented. All the professionals who were consulted to validate it answered that the tool helped in the identification of the factors contributing to non-adherence and that the data or questions were reliable/enough to identify variation in contributing factors.

The information obtained was on patient's demographic characteristics and contributing factors to non-adherence to diabetes treatment which includes knowledge on diabetes, alcohol use, medication side effects and travel distance to reach the clinic. Non-adherence was determined by using the pill count method. Clinic card was used to determine the number of drugs taken by the patients. Patients were asked to recall if they missed any doses of medication on a day by day basis over a period of one week. The number of tablets missed was calculated basing on the prescribed dose. Patients who reported taking less than 80% of their prescribed diabetes medicines was considered non-adherent to treatment. Patients who did not come with the remaining medicines and

those using insulin injections were asked to remember how many times they missed to use their medication per week, if they were taking less than 80% of the course per week, they were considered non-adhering.

3.5.1 Study variable

Dependent variables

- Non-adherence to medication treatment.

Independent variables

- Social demographic characteristics: Age, sex, marital status, occupation, education level, religion, waiting time, income and other patient's characteristics
- Knowledge on diabetes
- Alcohol use
- Side effects of drugs
- Travel distance to clinic

3.6 Pre-testing of the questionnaire

Prior to data collection, a pretest of the data collection tool was done to 20 diabetic patients from Sekou Toure Hospital diabetes clinic. This allowed modification of the questionnaire especially those questions which generated the same answers. This testing process also helped to adjust any final confusion or problem areas and adjusting language so that it is better suited to the audience.

These patients were included in this study because they were of the same age as the study population and attending one of the studied clinics.

3.7 Data management

Two research assistants with medical background (nurses) were recruited and trained. Training of research assistants was done for two days by the principle investigator; it involved familiarization with the questionnaire and how to record the required information correctly. Research ethics and administrative issues were also part of the training. Research assistants were closely supervised daily to ensure that the procedures and schedules followed. The filled questionnaires were checked for completeness daily, and entered into a computer using SPSS computer software.

3.8 Data analysis plan

Data were analyzed using Statistical Package for Social Scientist (SPSS software version 15.0). Data was analyzed differently according to the objectives.

Univariate analysis used to describe social demographic variables using frequencies for categorical variables. In bivariate analysis the difference between proportions examined using Chi-squire test and where $p<0.05$, the difference was considered to be significant.

Non-adherence to diabetes treatment was considered as any person who was taking the prescribed medication for less than 80% within a week.

There were 9 questions, which measured knowledge. Constructed-response questions related to the knowledge on diabetes, its management and complications. Closed and open

response format was used to test if the questions were measuring knowledge where different ideas related to diabetes, its management and complications were generated and used to form questions so that for scores on similar items to be related (internally consistent), but for each to contribute some unique information as well.

For each question, a correct response was assigned a score of one and a wrong response a score of zero. Another variable with the sum of all 9 questions was generated. Two cut off points were made, 0-4 for low knowledge and 5-9 for moderate/high knowledge. Level of education was categorized into two groups, those with formal education and those with no formal education. Those who never attended school were categorized as no formal education while adult education, primary school and above were considered with formal education.

Patients who were married and cohabiting were categorized as married and the singles, widowed, separated or divorced were categorized as unmarried.

Occupations also were categorized into two groups, informal occupation (students, peasants, house wives, self employed and petty traders), while those who were employed were considered having formal occupation. Income was classified into two groups which are low income and high income. Low income was for those earning less than 40,000 Tanzania Shillings per month which is approximately less than one dollar per day.

Time spent at the clinic (waiting time) was categorized as those who are staying up to two hours and those who were staying for more than two hours. Distance to clinic was

also categorized into two groups, those who are staying as far as 10 kilometer and those who are staying more than 10 kilometer from the clinic.

In bivariate analysis the Chi squire test was used to examine relationship between dependent variable and independent variables. Non-adherence to diabetes treatment as a dichotomous dependent variable, was also associated with other independent variable (age, sex, alcohol use, level of knowledge, distance to clinic and medication side effects) while adjusting each other for confounding effects by using logistic regression model.

3.9 Ethical consideration

Ethical approval for this research was obtained from the research and publication committee of Muhimbili University of Health and Allied Sciences before the study commence. Permission to do this research was also obtained from the Director of Bugando Medical Centre and the Medical Officer in charge of Sekou Toure hospital in Mwanza, Tanzania. The patients were interviewed only after getting their written informed consent after an adequate explanation of the purpose of the study, expected outcomes and benefits of the study. They were also told on the confidentiality of the information they provide, freedom to participate and that their responses would be used only for academic purposes, or helping to improve the services being provided by those clinics.

3.10 Study limitations

1. Cross-sectional study design is the design in which information on the health problem and exposure collected simultaneously, therefore difficulty establishing that cause (factors contributing to non-adherence especially medication side effects, alcohol use and distance to clinic) antedated effect (non-adherence).

2. Recall bias; patients were not able to remember well the number of doses they missed. This could have resulted in miss classification, assigning wrong exposure or outcome category, hence over or under estimation of non-adherence but it was minimized by asking them to remember just for a period of one week.

3. Some of the patients were not bringing their remaining pills making difficult to establish non-adherence by pill count method. This was counted for by asking patients how many times they did not take their medication in the previous one week. For example if the patient is taking 1 tablet per day, it means 7 tablets per week, missing taking the tablets for 2 days and above means non-adhering (5/7 x 100 =78% which is less than 80% of recommend adherence).

4. Selection bias occurred in this study using clinic setting only, leaving the serious offenders in the community who are not coming to the clinic; this is a systematic error in this study that could have resulted in an incorrect estimate of the association between contributing factors and non-adherence. Further studies should consider surveys involving patients in community who are not coming to the clinic.

5. Desirability biases due to due to collection of reported information could have occurred leading to over estimation of the proportion of non-adherence and association between contributing factors and non-adherence as many patients tend to please their health care providers by not telling the truth of their faults. This was minimized by structuring and standardizing questions to reduce biases. For example, questions were ordered in such a way that a question does not influence the response to subsequent questions, also every respondent was presented with the same questions and in the same order as other respondents in order to ensure reliability, generalizability and validity.

CHAPTER FOUR

4.0 RESULTS

4.1 Distribution of respondents by clinic and social demographic characteristics

Social demographic characteristics of the respondents are summarized in Table 1. A total of 272 diabetic patients attending two diabetes clinics in Mwanza city were interviewed; of which 56.6% (n=154) were from Sekou Toure hospital and 43.4% (n=118) from Bugando Medical Centre. Of the respondents, 43.4% (n=118) were males and 56.6% were females. The mean age of the respondents was 51.22 years (standard deviation=14.97, range 18 to 100 years).

Marital status of the respondents was 76% (n=177), married or cohabiting, 11% (n=30) were single, 18.0% (n=49) widowed, and 5.5% (n=16) were separated/divorced. Occupation of the respondents were 28.7% (n=78), were peasants while 21.7% were formally employed, 21.3% self employed and 28.3% not employed.

In terms of education level, majority of respondents (53.7% n=146) had primary education. The rest were educated higher than primary level i.e. secondary and college education. Christians were the majority (73.9% n=201), while 25% (n=68) were Muslims.

Table 1: Distribution of respondents by clinic and social demographic characteristics

Characteristics	Total N=272	Percent (%)
Clinic		
Bugando	118	(43.4)
Sekou Toure	154	(56.6)
Age group		
18-29	24	(8.8)
30-39	29	(10.7)
40-49	64	(23.5)
50+	155	(57.0)
Marital status		
Single	30	(11)
Married/cohabiting	177	(76.1)
Widowed	49	(18.0)
Separated/Divorced	16	(5.9)
Occupation		
Student	15	(5.5)
Peasant	78	(28.7)
Housewife	62	(22.8)
Self employed	19	(7.0)
Petty business	39	(14.3)
Employed	59	(21.7)
Education level		
No formal education	38	(14.0)
Adult education	5	(1.8)
Primary school	146	(53.7)
Secondary school	57	(21.0)
Post secondary	19	(7.0)
Others e.g. Madras	7	(2.6)
Monthly income		
None/low	161	(59.2)
Moderate/High	111	(40.8)
Religion		
Christian	201	(73.9)
Muslim	68	(25.0)
Others	3	(1.1)

4.2 Distribution of level of knowledge in percentages

On assessing the level of knowledge of respondents if they knew diabetes, how is acquired, whether it is communicable and treatable and its complications, most of them (93.8% n=255) showed high level of knowledge as shown in Figure 1.

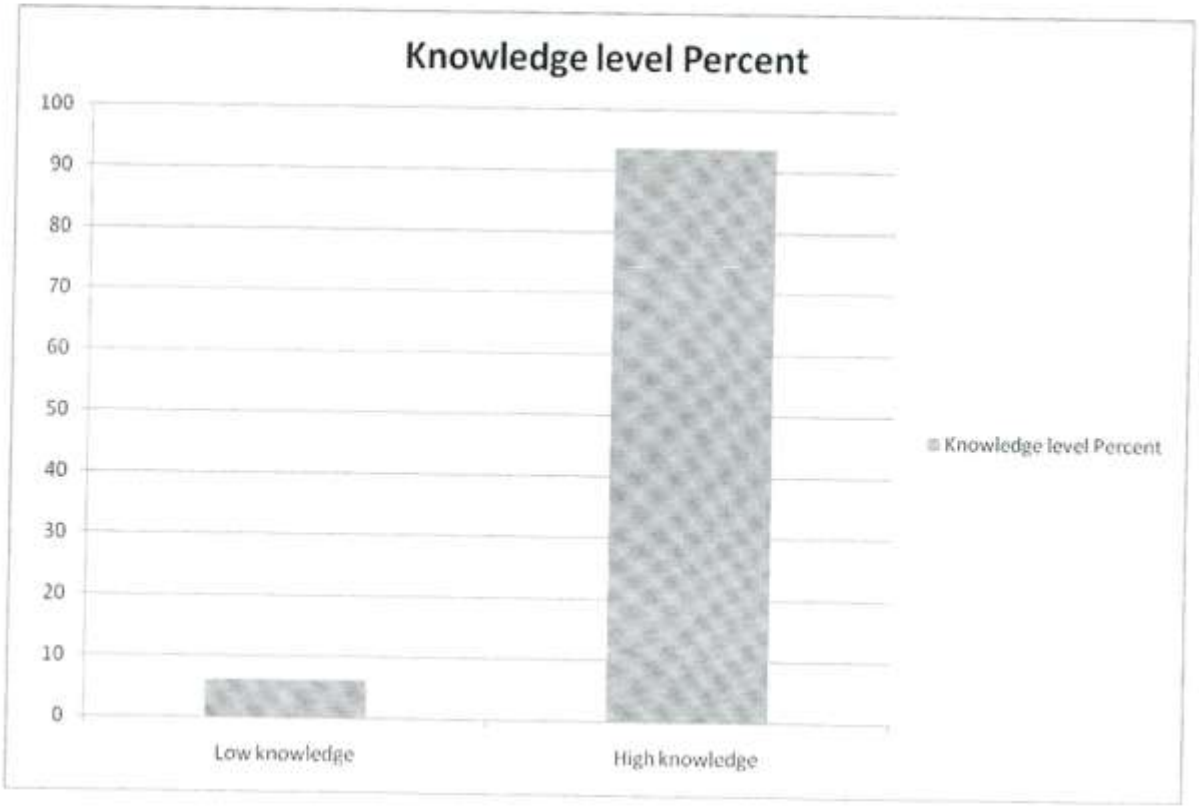


Figure 2: Distribution of level of knowledge in percentages

4.3 Distribution of the factors contributing to non-adherence to diabetes treatment by sex

Out of 118 males, 93.2% (n=110) had high level of knowledge. Among females, 94.2% (n=145) had high level of knowledge compared to those with low level of knowledge (p=0.752). Of 272 respondents, only 7.4% (n=20) reported to be taking alcohol even after starting diabetes treatment. Majority of these were females (60% n=12). The difference between females and males in taking alcohol was not statistically significant (P=0.751). It was also found that, 16.5% (n=45) of the respondents were experiencing some side effects of whom females were more (60% n=27) compared to males (40.6% n=18) (P=0.616). The side effects reported included: raised heart beats, stomach upsets, hypoglycemia and boils at the site of injection.

The patients at the clinic reported to spend some hours to get services at the clinic. Sometimes the patients had to wait for two hours or more. The mean time spent at the clinic was 3.81 hours (standard deviation1.727). More than half of the respondents (77.6% n=211) had to wait for more than two hours before getting services and the rest had to spend up to two hours. However the difference in time spent at the clinic was not statistically significant between males and females (P=0.875). Also patients had to travel long distance to reach diabetes clinic, the mean travel distance was 19.5 km (41.8 standard deviation) where 33.8% (n=92) of the respondents had to travel more than 10 kilometer with no significant difference between males and females (p=0.2). (See table 2)

Table 2: Distribution of the factors contributing to non-adherence to diabetes treatment by sex

Characteristics	Sex		Total
	Males N= 118 (%)	Females N=154 (%)	N=272 (%)
Level of knowledge			
Low	8(47.1)	9(52.9)	17(6.3)
high	110(43.1)	145(56.9)	255 (93.8)
Use of alcohol			
Yes	8(40.0)	12(60.0)	20(7.4)
No	110 (43.7)	142 (56.2)	252 (92.6)
Side effects of Drugs			
Yes	18(40.0)	27(60.0)	45(16.5)
No	100 (44.1)	127 (55.9)	227 (83.5)
Time spent (hours)			
Up to 2	27(44.3)	34(55.7)	61(22.4)
More than 2	91(43.1)	120 (56.9)	211(77.6)
Travel Distance km)			
Up to 10	73(40.6)	107(59.4)	180(66.2)
More than 10	45 (48.9)	47(51.1)	92(33.8)

4.4 Proportion of Non-adherence to diabetes treatment according to type of diabetes, drug type, route of administration and clinic

The overall proportion of non-adherence of all the respondents in this study was 28.3% (n=77). At Bugando Medical Centre clinic, 25.4% (n=30) reported taking less than 80% of their prescribed medication doses, while at Sekou Toure Hospital clinic it was 30.5% (n=47) of respondents which showed no significant difference between the two clinics (P=0.355).

Among type 1 diabetic patients, 31.4% (n=11) missed their doses, while only 27.8% (n=66) of those with type 2 diabetes. Furthermore there was no significant relationship between the type of medication taken, route of administration of drugs and non-adherence to treatment (p=0.228). (See table 3).

Table 3: Non-adherence to diabetes treatment according to type of diabetes, drug type, route of administration and clinic (n=272)

Characteristics	Non-adherence (n=77)	Adhering (n=195)	Total	P value
	N (%)	N (%)	N (%)	
Type of diabetes				
Type 1	11(31.4)	24 (68.6)	35(12.9)	0.661
Type 2	66(27.8)	171(72.2)	237(87.1)	
Clinic				
Bugando	30(25.4)	88(74.6)	118 (43.4)	0.137
Sekou Toure	47(30.5)	107(69.5)	154(56.6)	
Type of medication				
Diabenese tables	34 (25.6)	99 (74.4)	133(48.9)	0.228
Metformin & Glibenclamide	12(24.5)	37(75.5)	49(18.0)	
Insulin injection	31(35.6)	56(64.4)	87(32.0)	
Other brands (Glimepiride & Rotaglitazone)	0(0.0)	3(100)	3(1.1)	
Route of administration				
Oral	46(24.9)	139(75.1)	185(68.0)	0.228
Insulin	31(35.6)	56(64.4)	87(32.0)	

Overall proportion of non-adherence= 28.3%

4.5 Non-adherence to diabetes treatment by socio-demographic characteristics

Bivariate analysis of social demographic characteristics, on contributing factors for non-adherence yielded the following results. With regard to age patients with more than 40 years had the highest number of patients who reported not adhering to treatment (29.2%, n=62) as compared to those aged less than 40 years (25% n=15), (p=0.519). 50.6% (n=39) females reported non-adherent compared to males. However the difference was not statistically significant (P=0.212).

More married patients 31.1% (n=55) than unmarried patients appear taking their prescribed doses for less than 80% (p=1.167). Most of the patients in this study had low income 59.2% (n=161). Among those who reported non-adherent, similar percentage of patients obtained between those with low income (28.0) and those with high income (28.8), (P=0.813).

This study also found that, level of education was significantly associated with non-adherence to drugs (p=0.025). Proportionally Christian who reported taking their prescribed doses for less than 80% appeared to be more (28.4% n=201) than Muslims (27.9% n=68), (P=0.979).

(See table 4).

Table 4: Non-adherence to diabetes treatment by socio-demographic characteristics (n=272)

Characteristics	Non-adhering (n=77)	Adhering (n=195)	Total	P value
	N (%)	N (%)	N (%)	
Age Group				
Less than 40	15 (25.0)	45 (75.0)	60(22.1)	0.517
More than 40	62(29.2)	150(70.8)	212(77.9)	
Sex				
Male	38 (32.2)	80 (67.8)	118 (43.4)	0.212
Female	39(25.3)	115(74.7)	154(56.6)	
Marital status				
Married	55(31.1)	122(68.9)	177(65.1)	1.167
Un married	22(23.2)	73(76.8)	95(34.9)	
Occupation				
Informal occupation	61(28.6)	152(71.4)	213(78.3)	0.749
Formal occupation	16(27.1)	43(72.9)	59(21.7)	
Monthly income				
None/low	45(28.0)	116(72)	161(59.2)	0.813
High	32(28.8)	79(71.2)	111(40.8)	
Level of education				
No formal education	5(13.2)	33(86.8)	38(14.0)	0.025*
Formal education	72(30.8)	162(69.2)	234(86.0)	
Religion				
Christian	57(28.4)	144(71.6)	201(73.9)	0.979
Muslim	19(27.9)	49 (72.1)	68 (25.0)	
Others	1(33.3)	2(66.7)	3(1.1)	

Key: * Statistically significant difference (p<0.05)

4.6 Association between level of knowledge, alcohol use, medication side effects and distance to clinic, and non-adherence.

Bivariate analysis of other patient variables namely level of knowledge, alcohol use, medication side effects and distance to clinic, on contributing factors for non-adherence yielded the following results. Those with low knowledge levels (41.2% n=7) were more non-adherent to diabetes treatment as compared to those with high knowledge levels (27.5% n=70), (p=0.224). Seventy five percent 75% (n=15) of the diabetic patients taking alcohol while on medication, were found non-adhering to diabetes treatment, while 24.6% (n=62) were not taking alcohol, (p<0.001).

With regard to side effects, 51.1% (n=23) patients who experienced side effects were more likely non adherent than those who were not experiencing side effects (23.8%), (p<0.001). The waiting time spent at the clinic showed to be related to non-adherence as 76.6% (n=59) of those who missed their doses were spending more than 2 hours to see the clinician than to those who spent less or equal to 2 hours, (p=0.813). Overall travel distance was significantly associated with non-adherence. Forty five percent (45.7% n=42) of those who reported living more than 10 km missed their doses compared to those who reported living less than 10 km (19.4%), (p<0.001).

Among these variables, alcohol use, medication side effects and distance to clinic were significantly associated with respondents' non-adherence (p< 0.001). Knowledge on diabetes, time spent at the clinic was not significantly associated with respondents' non-adherence. (See table 5)

Table 5: Association between level of knowledge, alcohol use, medication side effects and distance to clinic, and non-adherence among diabetic patients attending clinic in Mwanza city

Characteristics	Non-adherence		Adhering		Total		P value
	N=	(%)	N=	(%)	N=	(%)	
Type of diabetes		11(31.4)					
Type 1	62(26.2)		24(68.6)		35(12.9)		0.511
Type 2			175(73.8)		237(87.1)		
Level of knowledge		7(41.2)					
Low	7(27.5)		10(58.8)		17(6.3)		0.224
High			185(72.5)		25(93.8)		
Use of alcohol							
Yes	15(75.0)		5(25.0)		20(7.4)		<0.001
No	62(24.0)		190(75.0)		252(92.6)		
Side effects of Drugs							
Yes	23(51.1)		22(48.9)		45(16.5)		<0.001
No	54(23.8)		173(76.2)		227(83.5)		
Time spent (hours)							
Up to 2	18(29.5)	59	43(70.5)		61(22.4)		0.813
More than 2	(28.0)		152(72.0)		211(77.6)		
Travel Distance km)							
Lowest through 10	35(19.4)	42(45.7)	145(80.6)		180(66.2)		<0.001
More than 10			50(54.3)		92(33.8)		

Key: * statistically significant difference (p<0.001)

4.7 Logistic Regression Predicting Likelihood of reporting non-adherence to diabetes treatment

Table 6 shows that, only three of the independent variables made a unique statistically significant contribution to the model, which includes medication side effects, alcohol taking and distance travelled to reach the clinic in kilometers. The strongest contributing factor in this model of reporting missing doses was alcohol taking with odds ratio of 10.66. This means respondents who were taking alcohol were over 10 times more likely to report non-adhering to diabetes treatment than those who are not taking alcohol, controlling for all other factors in the model. Medication side effect was positively related to missing doses with odds ratio greater than 1, indicating that for those respondents who are experiencing medication side effect, were 3.71 times more likely to report non-adherence as compared with those without side effects, controlling for all other factors. Also distance travelled to reach the clinic was significantly associated with non adherence, respondents who are staying below 10 kilometers, were 0.3 times less likely to report non-adherence, controlling for all other factors. Level of education had no significant relationship with non adherence to diabetes treatment, controlling for all other factors, ($p=0.05$).

Table 6: Logistic Regression Predicting Likelihood of reporting non-adherence to diabetes treatment

Predictors of non-adherence	Exp(B)	95% CI for EXP(B)	P-value
Age	1.00	0.99-1.02	0.78
Sex	1.26	0.68-2.32	0.46
Medication side effects	3.71	1.78-7.72	<0.001*
Alcohol taking	10.66	3.40	<0.001*
Distance to clinic in kilometer	0.30	0.16-0.55	<0.001*
Level of education	0.31	0.10-0.99	0.05*

Key: * Statistically significant difference (p<0.001)

4.8 Reasons for missing doses for the previous one week

Those who were not adhering to treatment during the previous week were asked to give reasons. The commonest reason given was because the medication finished before the next clinic (26.6% n=20) followed by the reason that they had no money to purchase the drugs after getting prescription (22.1% n=17) which could be explaining for the reason of drugs finishing before clinic for those who had little money, probably bought few drugs not enough to reach next clinic. There are those who stopped taking drugs after feeling better and forgetfulness combined contributed 31.2% (n=24) of the reasons of missing the treatment. Some (7.8% n=6) of all respondents opted for traditional medicine and stopped taking diabetes medication. (See table 7)

Table 7: Reasons for missing doses for the previous one week

Reasons for missing doses	Frequency	Valid Percent
Forgetting	12	15.6
Emergency	3	3.9
Travelling	7	9.1
Opting for traditional medicine	6	7.8
Don't have money for drug purchasing(economic factors)	17	22.1
Drugs finished before next clinic(drug supply)	20	26.0
Feeling better	12	15.6
Total	**77**	**100**

4.9 Missing clinic appointments by social demographic characteristics

Table 8 shows that, among 272 respondents, 25.7% (70) missed to attend clinic as per schedule once or more. There was a difference in proportion of missing clinic among of those attending clinic at Bugando Medical Centre (17.8% n=21) compared to those attending at Sekou Toure hospital clinic. (Table 8).

Table 8: Missing clinic appointments by social demographic characteristics

Characteristics	Non-attending (n=70)	Attending (n=202)	Total (n=272)	P value
	N (%)	N (%)	N (%)	
Age Group				
Less than 40	13 (21.7)	47(78.3)	60 (22.1)	0.414
More than 40	57(26.9)	155(73.1)	212(77.9)	
Sex				
Male	29(24.6)	89(75.4)	118 (43.4)	0.702
Female	41(26.6)	113(73.4)	154(56.6)	
Marital status				
Married	51(28.8)	126(71.2)	177(65.1)	0.113
Un married	19(20.0)	76(80.0)	95(34.9)	
Occupation				
Informal occupation	54(25.5)	158(74.5)	212(77.9)	0.852
Formal occupation	16(26.7)	44(73.3)	60(22.1)	
Monthly income				
None/low	38 (23.6)	123(76.4)	161(59.2)	0.333
High	32(28.8)	79(71.2)	111(40.8)	
Level of education				
No formal education	9(23.7)	29(76.3)	38(14.0)	0.755
Formal education	61(26.1)	173(73.9)	234(86.0)	
Religion				
Christian	56(27.9)	145(72.1)	201(73.9)	0.293
Muslim	14(20.620)	54(79.4)	68(25.0)	
Others	0(0)	3(100)	3(1.1)	

4.10 Reasons for missing clinic appointment for the previous three months

Respondents missing clinic appointments was mainly due to travelling (42.9% n=30) for activities such as attending funeral ceremony, farming, business and office related issues, followed by different emergencies such as being sick, care of relatives and those which could not be mentioned. 21.4% (n=15) also did not have money for fare to attend clinic. (See table 9).

Table 9: Reasons for missing clinic appointment for the previous three months

	Frequency	Valid Percent
Emergency	18	25.7
Travelling	30	42.9
Don't have fare	15	21.4
Forgetting	4	5.7
Feeling better	3	4.3
Total	**70**	**100.0**

CHAPTER FIVE

5.0: DISCUSSION

The objective of this study was to assess the proportion of non-adherence and the extent to which social demographic data and other factors, contributes to non-adherence to diabetes treatment among diabetic patients. The proportion of patient's non-adherent to treatment was found to be 28.3% (suggesting sub-optimal adherence to diabetes treatment). This proportion of non-adherence is high considering the severity of the disease when complications develop. This imply that, there are still some obstacles influencing patient adherence to treatment which needs to be addressed, otherwise there will be a huge economic burden on Tanzania both from direct health care costs plus indirect costs from a decline in workplace productivity. In addition there will be losses from premature morbidity and mortality.

The proportion of patient non-adherence to medications found in this study is similar to those found in other recent studies which range from 20% to 30% (Kalyango., 2008, Ho., 2006, Lau et al., 2004, Julie A et al., 2008 & Blanca *et al. 2001*). Factors contributing to this include having the medication finished before next visit to the clinic, inability to purchase the prescribed drugs that are absent from the clinic, feeling better from sign and symptoms of the disease, forgetfulness and some opted for traditional medicine.

Knowledge level on diabetes, its treatment and complications was not significantly associated with non-adherence although patients with low knowledge appear more likely

to be non-adhering as compared to those with high knowledge. This result is not in consistent with other studies *(Delamater. 2006)* which have shown that, appropriate health knowledge/belief such as perceived seriousness of diabetes, vulnerability to complications, and the efficacy of treatment can predict better adherence this could be attributed to health education provided to patients at the clinic before the start of other clinic services. Almost all patients (non-adhering or adhering) are aware of diabetes, its treatment and complications.

The likelihood of reporting non-adherence was strongly associated with alcohol use, controlling for all other factors. This study also found a myth that says, taking strong alcohols (spirits like Konyagi) can help to burn the excess sugar in the blood and hence no need of using medication. This was observed during the patients' interview. Association between alcohol use and non-adherence is consistent with other studies which have reported strong association between alcohol use and non-adherence (Randy el al., 2008 & *Samsone et al., 2008 & Bryson., 2008).* This strong association could be attributed by the fact that, patients who take alcohol easily forget/neglect to take drugs or fear to take drugs while on alcohol.

Medication side effects were also found to contribute significantly (Figure 1) to non-adherence to diabetes treatment. Common side effects mentioned were rashes associated with itching, stomach upsets like nausea and loss of appetite, fainting associated with hypoglycemia and boils at the site of injection. Patients are more likely to miss their doses to avoid problems or stay away from complications associated with the use of

drugs. The observed significant effect of medication side effects to non-adherence is also observed with other studies *(Grant et al., 2003)*.

Distance traveled to reach diabetes clinic was also a factor found to contribute significantly to non-adherence. This can be due to poor social economic status which makes patients leaving far from the clinic unable to pay fare or due to poor infrastructure resulting in absence or poor transport which may result in patients opting for traditional medicine to avoid this type of problem incurred during clinic visit. This result is supported by *Anderson et al., 1982* that showed that patients who have limited access to transportation, live far away from clinics are not likely to adhere to treatment regimens.

Although, time spent at the clinic did not predict significantly to non-adherence in multivariate analysis but in bivariate analysis showed that, most of those who reported non-adhering were spending more than 2 hours to see a clinician as compared to those who spent less than 2 hours. This observation can be explained by the fact that some patients were not reporting to the clinic to refill their drugs because they were avoiding the long waiting time to see the doctor or nurse. Another reason may be the long time spent before seeing a pharmacist for drug refilling as in all the two clinics studied drugs are not stored in the same building where diabetic patients are seen by doctors or nurses. Normally all drugs are stored in the hospital pharmacy where all patients get their drugs.

The number of drug types taken, route of administration and non-adherence showed no association. This implies that these factors do not predict non-adherence among these

respondents. This finding is similar to that found in other studies, *(Horne et al, 1999 & Grant., 2003).*

Among the clinics studied Sekou Toure hospital had larger proportion of patients with non-adherence to treatment compared to Bugando Medical Centre. This difference may be attributed to the difference in the number of sampled patients attending in each clinic.

Educational level was the only socio-demographic variable associated with non-adherence to diabetes treatment at bivariate analysis and multivariate analysis. This association is consistent with other studies which suggest that diabetic patients with higher education level had characteristics that may promote strong knowledge and positive attitude about treatment adherence (Ranchor et al., 1996 & Varghesea et al., 2007).

Other social demographic characteristics like age, sex, marital status, occupation, income, and religion were not significantly associated with non-adherence. This is similar to the results reported by other studies (*Horne et al, 1999 & Blanca et al, 2001*). However these results are not in line with studies whose findings associated these demographic characteristics with non-adherence. *Lee et al 2000 & Yang et al 2009,* reported that patients with young age are non-adherent than old ages, an indication that, non-adherence decreased with age.

Marital status has been shown to influence patient's regimen adherence. This is due to that, those who are married have greater levels of social support, particularly diabetes-related support from spouses and other family members. Social support also serves to

buffer the adverse effect of stress on diabetes management *(Delamater., 2006).* Various studies have reported that, patients with low or fixed income are more non-adherent *(Anderson et al., 1982 & Botelho et al., 1992)* which was also observed in our study.

More than fifty percent of the respondents were found adhering to treatment. Reasons given by these respondents included, fear for the effects of the disease (such as frequent urination, eye problems) to progress, avoiding blood sugar to rise, consequently hospitalization, and that these drugs were helping them.

Clinic attendance was another factor which was assessed independently as part of diabetes treatment. About a quarter of all respondents did not attend clinic as per schedule. Those respondents who were attending clinic at Sekou Toure were found significantly likely to miss clinic as compared to those who were attending clinic at Bugando Medical Centre. The main reasons given by the respondents on why they were missing clinics included travelling for activities such as attending funeral ceremony, farming, business and office related issues, attending different emergencies such as being sick, care of relatives and others did not have money for fare to attend clinics. This means patients need close follow up and counseling to make sure that they adhere to scheduled clinics. Another reason for missing clinics could probably because of having only two established diabetes clinic in Mwanza City, Sekou Toure Hospital and Bugando Medical Centre which are not far from each other, given that-more patients are coming far from the city.

CHAPTER SIX

6.1: CONCLUSION

This study revealed that 28.3% of the patients attending clinics in Mwanza City were not adhering to diabetes treatment. Several factors ranging from alcohol use, forgetfulness, distance to clinic and fear of side effects were found to contribute to non-adherence to diabetes treatment. Thus, alcohol use, side effects, distance to clinic and cost should always be considered by health care providers when caring for these patients. Health care providers should also try to find to achieve blood glucose control with agents that does not interfere the life style, personal and professional activities and individual preferences. To avoid the serious complications that may occur as a result of chronic hyperglycemia, a comprehensive team (Nurses, prescribers and drug dispensers) effort is required to address non-adherence in all phases of treatment.

The ongoing pre-clinic health education should put emphases on factors contributing to non-adherence which are modifiable; patients can be more adhering to treatment if they are trained on the value of their individualized therapy. This will prevent the complications of diabetes mellitus which are cost full and can lead to immature mortality of the productive force. Future studies should consider the use of larger sample sizes, so as to get more representation of diverse population of patients' characteristics and utilizing more objective measures, and less reliance on self-report to determine non-adherence.

6.2: RECOMMENDATIONS

- Patients should be educated on the possible side effects that can occur during treatment and that they should not stop taking the drugs against medical advice. This should be done at all levels from the doctors, nurses and drug dispensers.
- The travel distance to clinic should be considered, other diabetes clinics should be established in all the districts of Mwanza region to reduce the economic burden the patients incur to reach these two only estabiliched diabetes clinics in Mwanza region.

- Counseling has been shown to improve adherence and therefore this should be emphasized and maintained in all clinics.

- This study didn't explore the health care factors that might contribute to non-adherence to diabetes treatment. Other researchers are encouraged to conduct researches which include linking adherence and availability of infrastructure, drug supply, and availability of adequate staff and motivation of staff.

- It is important to continuously monitor adherence and evaluate the factors which contribute to non-adherence in order to reduce morbidity and mortality from diabetes and hence increase productivity in our communities and the nation as the whole.

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