KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

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DEPARTMENT OF PHARMACY PRACTICE

RESEARCH TOPIC

ADHERENCE TO ANTI-DIABETICS A CASE STUDY OF OUT-PATIENTS ATTENDING THE DIABETIC CLINIC OF THE KOMFO ANOKYE TEACHING HOSPITAL, KUMASI.

PRESENTED BY

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AUGUST 2016

ADHERENCE TO ANTI-DIABETICS A CASE STUDY OF OUT-PATIENTS ATTENDING THE DIABETIC CLINIC OF THE KOMFO ANOKYE TEACHING HOSPITAL, KUMASI

By

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DECLARATION

This submission contains no material that has been earlier put out by another person, neither does it have materials which have been accepted for the award of any other degree at the University, except where due references have been made in the text.

I hereby affirm that this submission is my own work towards the Master of Science (MSc) in Clinical Pharmacy.

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(HEAD OF DEPARTMENT) Signature Date

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DEDICATION

This study is dedicated to my husband Mr. Patrick Owusu-Danso, my children Gadiel, Stephanie and Ruby. I also dedicate this study to my parents Mr. and Mrs Amoh for their continuous love and support.

ABSTRACT

BACKGROUND: Non-adherence to diabetes treatment leads to poor glucose control and increases the risk of disease complications. The prevalence and factors associated with nonadherence in resource limited settings should be determined so as to lower the impact of diabetes that is on the increase, on the health systems which are already overburdened with communicable diseases.

OBJECTIVE: The purpose of this study is to assess the level of adherence to antidiabetic medicines among patients attending the diabetic clinic and factors contributing to non-adherence at Komfo Anokye Teaching Hospital

METHODS: A cross-sectional study was conducted at the diabetic clinic of the KATH. A list of all patients attending the diabetic clinic for at least the past two years was obtained. A simple random method of sampling was used to select the desired sample size from the patient list. Data was collected via personal interviews using a structured questionnaire and also from the patient medical records. The structured questionnaire was administered to each patient after consenting to participate in the study. The questionnaire was in the form of exit interviews. Information provided by the respondents was counter checked with their medical records.

RESULTS: The level of adherence to anti-diabetic medication among the respondents revealed that majority of them; constituting 64.2% had a high adherence level. The correlation between patients' socio-demographic and adherence rate to anti diabetic therapy indicated that adherence among women was high represented by 69.6%.

Adherence was high among participants less than 55 years (54.9%), among participants living with their family (90.1%), among participants who were knowledgeable about their disease condition and the effect of defaulting their anti-diabetic medication (64.5%) and high among participants who have been diagnosed of diabetes for less than 3 years (47.04%).

Conclusion: This study revealed a high level of adherence among the participants. Also patients with knowledge of default consequences are more likely to adhere to their antidiabetic medications (p=0.046).

Keywords: adherence, non-adherence, anti-diabetic medication, diabetes, Komfo Anokye Teaching hospital, Ghana.

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DEENT	Dental Eye Ear Nose and Throat
DM	Diabetes Mellitus
ER	Emergency room
IGT	Impaired Glucose Tolerance
IDDM	Insulin Dependent Diabetes Mellitus
ICU	Intensive Care Unit
KATH	Komfo Anokye Teaching Hospital
MMAS	Morisky Medication Adherence Scale
NIDDM	Non-Insulin-Dependent Diabetes Mellitus
SPSS	Statistical Package for Social Sciences
WHO	World Health Organisation

CHAPTER 1

1.0 INTRODUCTION

1.1 BACKGROUND

Diabetes is among the most difficult disease conditions to manage well. The management of this disease condition is quite a challenge for the diabetic patient. Good glycemic control can be attained if a diagnosed patient follows strict instructions given to him or her. The World Health Organization have stated that non-adherence with long-term antidiabetic medication coupled with comorbid disease states including dyslipidemia, hypertension and diabetes are deemed a common issues that results in serious health challenges coupled with loss of time, money, poorly managed disease condition and enhanced economic burden (World Health Organization,2003).

Adherence is a major challenge patient with diabetes faces and this has a detrimental effect on blood glucose control. Good adherence practices to prescribed treatment regimen reduce diabetic complications from occurring. It is quite a challenge for the health care provider when patient are non-adherent to their treatment recommendation(Fischer, *et al*. 2010). As a result of patient's nonadherence to treatment regimen, complications set in and this affects the quality of life of the patient. Patients can easily avoid diabetic complications if they follow instructions and advice on adherence given by their care givers.(Coleman, *et al*. 2005).

Diabetes complications, death and serious health care losses also occur when patients decide not to adhere to their treatment regimen. (Mateo, *et al*. 2006; Shaw and Baker 2004). Attention should be given to patients with chronic disease conditions such as hypertension, diabetes etc. on their adherence to their medications.(Armour, *et al*. 2004; Fischer, *et al*. 2010).The World Health Organization (2003) has stated that non-adherence to medications is a challenge and is on the increase resulting in serious consequences. Finding lasting solutions to this issue is of importance worldwide than the introduction and development of new medicines for the management of diabetes. (Winkler *et al*., 2002). Even though series of studies have proved that taking prescribed medicines for the treatment of diseases improves one's health status and prevents unavoidable deaths, patients with chronic diseases in advance countries have adherence rates ranging from 50%-60% (Fischer et al, 2010 ;Harris et al 1993). In the third world countries, access to health care is a problem, there is

lack of proper diagnosis and limited drug availability; all these factors are considered when adherence becomes a problem during the management of chronic conditions like as diabetes, depression, and HIV/AIDS(Friedman, *et al*. 2010).

In the management of chronic diseases, the rate at which patients adhere to their medicines drops after 6 months into the management of the disease.(Klatt, *et al*. 2013; Sabaté 2003; Vermeire, et al. 2005) Studies conducted comparing the rates of adherence of chronic conditions such as diabetes and HIV shows that the adherence rates are 80% and 95% respectively, it concluded that the adherence rates for HIV is impressive.(Vermeire, *et al*. 2005). Past studies conducted between the years 1997 and 1999 showed that diabetic patients who were not religiously adhering to their medicines were 30% at risk of being hospitalized every year whiles those who were adherent to their medicines had a lower risk of 13% of hospitalization yearly.(Yusuff, *et al*. 2008). This same study showed that the total health cost burden on patients with poor adherence was double that of those who had good adherence rates.

It was approximated in the year 2001 that more than 89,000 cardiovascular deaths would have occurred in hypertensive patients who were 40 years and older and not on any antihypertensive medicines.(Morisky, *et al*. 1986). Patients who are diagnosed of both diabetes and hypertension as comorbid disease conditions and take their medicines as advised by their health provider are 48% less likely to die before their time from the disease.(Jackevicius, *et al*. 2008).Asthmatic patients who have good regimen adherence, have 11% less visits to the emergency wards or hospitals. (Delamater 2006).

In the process of counseling or advising patients on their treatment regimen in relation to serious disease conditions like hypertension, diabetes and others, importance should be placed on the implications of not treating the diseases well or appropriately and how it can lead to cardiovascular attacks, paralysis and possibly permanently affecting the patients quality of life. As pharmacists, we are encouraged to educate and advise our patients on proper medication adherence and the consequences the disease have on them when they do not adhere.

Clinical practices have shown that it is quite difficult for most patients to strictly adhere to their medicines after life style modifications have been prescribed for them by their health providers.

It have been observed that only a third of patients diagnosed with chronic diseases conditions like diabetes, hypertension etc. are adherent to their regimen.(Shaw and Baker 2004).

Findings from several studies have proved that most patients with chronic disease conditions normally stop taking their medicines for the mere fact that they have a feeling the medicines cannot cure them and are also worried about the side effects of the medicines they are taking.(Coleman, *et al*. 2005; Heissam, *et al*. 2015; Shi, et al. 2010). It is a common believe among patients with diabetes that as far as they do not experience any symptom of diabetes, there is no need to take treatment.

Various meanings have been assigned to adherence but it is simply taking less than 80% of prescribed medicines and following other prescribed treatment regimen given. Adherence is the representative of the final step of rational drug use.(Choudhry, *et al*. 2009; Trostle 1988).

Adherence may be influenced by many factors but there is no statistics on which one of it has the greatest effect. Care givers should initially find out whether their patients have access to their prescribed medicines. Patients adherence to drug therapy can be categorized into four main groups provided there is the availability of medicines, these categorizations are as follows, patient-related factors; factors related to patient-provider relationship, treatment regimen and factors related to the disease itself(Barber, *et al*. 2004; Trostle 1988).

One of the factors mostly used to determine patients adherence behaviors is the patient related factors(Organization 2003). Patients' adherence to drug therapy is solely dependent on that patient and it usually paints a true picture of how difficult it is to understand how the other factors too affect a patient medication taking behavior and to adhere to the prescribed regimen. It is known that certain factors have strong effects on adherence and these factors are the environment where the patient resides in, the type of care the provider gives and the practice of the care giver.

Adherence is all about how informed and how knowledgeable the patient concerned is aware about the disease , being motivated to get involved in the management of the condition, how expectant the results of the management would be and how poor adherence to the regimen would affect the whole treatment outcome.(World Health Organization, 2003). It should be noted that a patient's non-adherence to medication is influenced by a lot of factors.

Factors that affect a patient's attitude to adhering to medication regimen changes over a period of time. Continues evaluation of the patient's attitude to treatment adherence is of great importance. There is no specific or single approach in solving the problem of non-adherence in a patient.

Several approaches used to solve or manage the problem of non-adherence highlights on the importance of increasing the patients knowledge on the disease condition, reducing the amount of medicine to be taken at a specified time and how frequent is should be taken. Even though this approach is theoretically practicable, it does not necessarily mean it will improve the adherence attitude or behavior of a patient who have made up his or her own mind about how well the disease condition should be managed. (World Health Organization, 2003).

Studies conducted have proved that a one way approach to solving the adherence problem does not yield any good results as compared to using more than one or multiple approaches. It have been cited in studies that the main reason for non-adherence can be identified when the provider continually make follow-ups during the period of treatment.(Krueger, *et al*. 2003). A detailed approach is needed to be used in solving this non-adherence problem, various issues such as providing information about the disease condition, encouraging the patient to be adherent and specific regimen should be based on individual needs, all these are to be addressed.(Krueger, *et al*. 2003; McDonald, *et al*. 2002). The appropriate time to start adherence interventions is when the patient starts or begins his or her initial treatment regimen. When interventions are started earlier during the course of treatment it gives older patients the opportunity to ask questions, especially questions on the disease condition, the medicine they have been put on and their side effects.(McDonald, *et al*. 2002)

Multiple factors come together to affect a patient's adherence to a prescribed treatment regimen and also contribute to non-adherence of other patients diagnosed with chronic disease conditions like diabetes. (Barber, *et al*. 2004)

Non adherence to antidiabetic has been a major health issue for researchers and health providers and all resources are being channeled in that directions to solve this issue and to better understand why these patients do not adhere. Researchers are having problems in tackling this issue because patient's attitude to treatment is quite difficult to deal with. Attention should be given to this non adherence issue to understand the patient's attitudes to why they do not adhere to their treatment regimen. (Emslie-Smith, *et al*. 2003; Trostle 1988)

The importance of regimen adherence does not only include patients religiously taking their medicines but it also includes positive life style changes or modifications.(Murray, *et al*. 2007). The most important aspect of every treatment regimen is to achieve success at the end of the day and to see your patient fulfilled and satisfied with the prescribed treatment outcome. Efforts on the part of the health care provider to give the best care to patient might not yield any results when the patient is not adhering to the various therapies prescribed. Shortfalls like these might go a long way to have a negative effect on the management of the disease.(Jin, *et al*. 2008).

When it comes to the management of chronic disease conditions, non-adherence to medication regimen is a major problem worldwide. In the management of chronic disease conditions like diabetes, medication adherence is about 50% of the of the treatment regimen whiles that of life style modification is lower as cited by a study.(Barber, *et al*. 2004; Coleman, *et al*. 2005). Devoted time and energy is mostly needed in the management of chronic disease conditions but the management of diabetes is among the most demanding among the group.(Trostle 1988). Management of diabetes involves routine measurement of one's blood glucose, life style modification and the timely administration of prescribed medicines.(Trostle 1988). Studies have reiterated the importance of achieving optimal glucose control through strict adherence to medications, diet, and exercise in order to minimize serious long term complications (Coleman, *et al*. 2005; Emslie-Smith, *et al*. 2003; Trostle 1988).

Chronic disease condition like diabetes, without the necessary treatments can cause many complications. Acute complications include hypoglycemia, diabetic ketoacidosis, or non-ketotic hyperosmolar coma. Serious long term complications include cardiovascular disease, chronic renal failure, and retinal damage. Thus, adequate treatment of diabetes is important, as well as blood pressure control and lifestyle factors such as smoking cessation and maintaining a healthy body weight.

These complications affect the well-being of the patient, increases death among patients and bring a greater burden on the economic cost.(Coleman, *et al*. 2005; Peyrot, *et al*. 2010; Trostle 1988). To reduce or decrease the health burden of the disease on the system diabetic patients are advised to adhere strictly to their treatment regimen.(Coleman, *et al*. 2005; Peyrot, *et al*. 2010).A patient diagnosed with a chronic disease condition adhering to less than 80% of any prescribed treatment regimen is described as being non-adherent. (Barber, *et al*. 2004)

Factors considered to be important such as services provided and issues related to medicines have been stated in literature, these factors are the number of tablets to be ingested at a sitting and the troubling side effects, bad relationships among the patient and the care giver and the delay observed when it comes to educating the patients on the disease condition.

Knowledge they say is power, it is the greatest tool in the fight against diabetes. Providing information can help people assess their risk of diabetes, motivate them to seek proper treatment and care, and inspire them to take charge of their disease for their lifetime. Due to increasing incidence of complications associated with diabetes, it would be prudent to assess the perception the patient have about the disease. Proper management requires life style changes and adequate diabetes knowledge of which is considered a key component of diabetes management. Differences in the level of knowledge have been described depending on level of education, gender and social status of the patient. Measuring how well diabetic patients are knowledgeable about diabetes can help in targeting public health efforts to reduce diabetes related complications (Choudhry, *et al.* 2009; Coleman, *et al*. 2005; Delamater, *et al*. 2001).

1.2PROBLEM STATEMENT

Non-adherence to the treatment regimen for diabetes results in avoidable suffering for the patients and excess costs to the health system as a whole. Managing diabetes requires more than just taking

medicine, other aspects of self-management such as self-monitoring of blood glucose, dietary restrictions, regular foot care and eye examinations have all been shown to markedly reduce the incidence and progression of complications of diabetes. Not adhering to recognized standards of care is the principal cause of the development of complications of diabetes and their associated individual, societal and economic costs. On-adherence has been defined in the literature as a patient's passive failure to follow a prescribed therapeutic regimen. This principle also applies to dietary regimens, screening tests, and lifestyle modifications. Non-adherence to appropriate treatment regimen has profound implications on the patient as well as on doctor-patient relationships and interactions, plans of care, and the healthcare system as a whole.

Deliberately not taking medications as prescribed, the patient will not benefit from the medication, adequate drug serum levels will not be achieved, and the medication will not have an effective therapeutic intervention as required to. For example, if a patient with diabetes mellitus is prescribed an oral agent but is not consistently adhering to the regimen, only suboptimal intermittent glucose control will be achieved instead of the continuous control which is required for optimal prevention of the long-term consequences of diabetes. In addition, physicians may erroneously interpret the inadequate glucose control as indicating a need for more medication and thus potentially over-prescribe, putting the patient at risk for hypoglycemia.

Finally, non-adherence leads to increased healthcare utilization through under treatment of chronic and acute problems. Chronic disease conditions like diabetes, without proper treatments can cause many complications. Acute complications include hypoglycemia, diabetic ketoacidosis, or nonketotic hyperosmolar coma. Serious long term complications include cardiovascular disease, chronic renal failure, and retinal damage. Thus, adequate treatment of diabetes is important, as well as blood pressure control and lifestyle modifications such as smoking cessation and maintaining a healthy body weight.

At the Komfo Anokye Teaching hospital there have not been any studies conducted to determine the level of adherence to antidiabetic medications among diabetic patients so this study aims at determining the level of adherence among these patients who attends the diabetic clinic at KATH.

1.3RESEARCH QUESTIONS

- What is the level of adherence to antidiabetic medicines among patients attending the clinic at KATH?

- What are the contributing factors to the non-adherence to antidiabetic medicines among patients attending The Diabetic Clinic at KATH?

1.4MAIN OBJECTIVE

To assess the adherence levels of antidiabetic medicines among patients attending the diabetic clinic and factors contributing to non-adherence at Komfo Anokye Teaching Hospital.

1.4.1 SPECIFIC OBJECTIVES

- To assess the level of adherence to antidiabetic medicines among patients attending the clinic at KATH

- To assess how contributing factors affect non-adherence to antidiabetic medicines among patients attending clinic at KATH.

1.5RATIONALE

The purpose of this research is to assess how diabetic patients attending the Diabetic Clinic at KATH strictly adhere to their antidiabetic medicines and to find ways of improving adherence. The findings of this research will be used to increase scientific knowledge base to the scientific world and to inform the practice and policy makers (Ministry of Health and the Board of the KATH).This is aimed at planning interventions to improve patient adherence to antidiabetic therapy to reduce the impact of diabetes and its complications and also improve upon the quality of life of the patients and the health cost burden in general.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 WHAT IS DIABETES

Diabetes mellitus has been described as a group of disease conditions marked by high levels of serum glucose as a result of defects in insulin secretion, insulin action or both(Barber, *et al*. 2004; Shaw and Baker 2004).Diabetes can be grouped into three main types and they are:

Type 1 diabetes is an autoimmune condition. It is caused by the body attacking its own pancreas with antibodies. In people with type 1 diabetes, the damaged pancreas does not make insulin. This type of diabetes may be caused by a genetic predisposition. It could also be the result of faulty beta cells in the pancreas that normally produce insulin. It was previously referred to as "insulindependent diabetes mellitus" (IDDM) or "juvenile diabetes"(Choudhry, *et al*. 2009).

With type 2 diabetes mellitus, insulin is produced, but the insulin produced does not function properly and this leads to a condition called insulin resistance. Decreased insulin production is a characteristic of patients who have been diagnosed with type 2 diabetes mellitus. The primary cause is excessive body weight and not enough exercise(Choudhry, *et al*. 2009).As the disease progresses, lack of insulin eventually develops. This form was previously referred to as noninsulin-dependent diabetes mellitus (NIDDM) or "adult-onset diabetes".

Gestational diabetes, is the third main form and occurs when pregnant women without a previous history of diabetes develop a high blood glucose level(Choudhry, *et al*. 2009).This type of diabetes is mostly diagnosed in the middle or later stage in pregnancy. Because high blood sugar levels in a mother are circulated through the placenta to the baby, gestational diabetes have to be controlled to protect the baby's growth and development.

Common signs and symptoms include the following:

Frequent urination

Excessive thirst

Unexplained weight loss
Extreme hunger

Sudden vision changes

Tingling or numbness in the hands or feet

Feeling very tired much of the time

Very dry skin

Sores that is slow to heal

More infections than usual

Diabetes mellitus is identified by recurrent or persistent high blood glucose levels, and is diagnosed by showing any one of the following (Turk and Rudy.v1991),

- Fasting plasma glucose level ≥ 7.0 mmol/l (126 mg/dl)
- Plasma glucose ≥ 11.1 mmol/l (200 mg/dl) two hours after a 75 g oral glucose load as in a glucose tolerance test

Symptoms of hyperglycemia and casual plasma glucose ≥ 11.1 mmol/l (200 mg/dl) and glycated hemoglobin (Hb A1C) ≥ 6.5% (Bron, Wilson and Fleck, 2014).

A positive result, in the absence of unequivocal hyperglycemia should be done repeatedly to confirm any of the above methods on different days. It is preferable to measure a fasting glucose level because of the ease of measurement and the considerable time commitment of formal glucose tolerance testing, which takes two hours to complete and it offers no prognostic advantage over the fasting test(Fischer, *et al*. 2010). According to the current definition, two fasting glucose measurements above 126 mg/dl (7.0 mmol/l) are considered to be diagnostic for diabetes mellitus.

Most common effects of untreated diabetes include the gradual damage, collapse and failure of various organs including the kidneys, nerves, heart, eyes and blood vessels. The limbs or feet of most diabetic patients who do not adhere to their treatment regimen are affected. Patients diagnosed with diabetes also have other disease conditions like heart related diseases like hypertension; the disease also comes along with other conditions such as retinopathy, nephropathy, peripheral vascular disease and peripheral neuropathy. Addition to these serious complications, diabetes can mostly cause life-threatening events such as diabetic ketoacidosis and hyperosmolar (non-ketotic) coma resulting from biochemical imbalances. Diabetic patients who contract infectious disease like pneumonia or influenza risk dying from the contracted disease as compared with other patients who are not diabetic and this is of great concern to care givers.(Peyrot, *et al*.

2010).

Diabetes is linked with increasing complications such as cardiovascular attacks like stroke. In 2004 diabetic related deaths which was certified among the elderly was as a result of heart diseases. In that same age group stroke was implicated to be the cause of 16% deaths, this implies that when a diabetic patient does not properly adhere to prescribed treatment regimen, cardiovascular disease can also set in over a period of time. Averagely heart related deaths are three times higher in elderly patients who are diabetic also diabetic patients are 2 to 4 times at risk of being attacked by a stroke. Majority of deaths recorded in diabetics are linked to hypertension and approximately 75% of the elderly with diabetes usually have high blood pressure or are on antihypertensive medications and this was reported in the years 2003-2004. Complications from diabetes leads to blindness, kidney failure and limb amputations and these affect the quality of health of the patient.(Peyrot, *et al*. 2010).

2.2 PREVALENCE OF DIABETES

Various statistics have shown that as of 1995, there were 135 million diabetic patients worldwide, 285 million in 2010, 366 million in the year 2011, and this is expected to reach 552 million in 2030, with 80% of diabetic patients living in low and middle income countries.

It has been reported that majority of diabetic patients are within the ages of 40 – 59 years, whereas about 183 million (50%) patients living with diabetes are undiagnosed, with 4.6 million deaths occurring worldwide in the year 2011(Peyrot, *et al*. 2010).

In Africa 14.7 million adults are estimated to have diabetes, with a regional prevalence of 3.8%, and the highest prevalence of diabetes is highest in the Island Reunion, with 16% out of a population of 800,000, 12.4% in Seychelles out of a population of 84,000, 11.1% in Botswana out of a population of two million, and 10.6% in Gabon, with a population of 1.4 million(Jackevicius, *et al*. 2008). In very populated African countries, Nigeria tops with a total of three million diabetic patients, followed by South Africa with 1.9 million, Ethiopia with 1.4 million and Kenya with 769,000(Mateo, *et al*. 2006).

Records from Ghana indicate that the prevalence rate of diabetes has been 0.2 – 0.4% between the years 1958 and 1960 respectively. In the years 2002 and 2008 the rates of people diagnosed with

diabetes was 6.4% and 9% respectively with the rapid rise in diabetes being attributed to an increasing aging population, increasing unhealthy lifestyles, poor dieting and drop in the level of physical activities. There were 440,000 cases of diabetes in Ghana in 2013(Jackevicius, *et al*. 2008).

2.3 ADHERENCE

Adherence is described as the active, voluntary participation of the patient in the management of his or her disease, by following a mutually agreed course of treatment and sharing responsibility between the patient and health care providers(Peyrot, *et al*. 2010).The concept of adherence involves the following steps: the type of goal you want to set, how to plan for the treatment and how to execute the treatment regimen. Recommended individualized treatment plan improves patient's adherence level or behaviors to specified regimen.

Adherence is all about having knowledge about a disease condition, being encouraged to get involve in its management and knowing the positive aspect of following instructions concerning a prescribed treatment regimen and the consequences of not adhering to treatment.(World Health Organization, 2003).

Adherence to life style modification has been described by Hentinen as the management of one's health by eating healthy, exercising as often and living healthy and establishing a close relationship and working closely with the provider and not necessarily strictly following any laid down rules as to how to live. It is a fact that patients experiences difficulty following treatment recommendations. Defaulting treatment of chronic disease condition regimen have a detrimental effect on the treatment outcome and this is a major concern in the implementation of health policies and economics of the population.(Harris 2001)

Non adherence to treatment regimen for patient diagnosed of chronic diseases is a worldwide issue generating great concerns. The WHO stated recently in its report that only 50% of patient diagnosed with chronic diseases were fully compliant with their treatment regimen, in the developing countries, the rates are even lower. It is an undeniable fact that many patients experiences difficulty in following treatment regimen. Treatment regimen adherence problems are common in individuals with diabetes, making glycemic control difficult to attain. It is frustrating for diabetic health care professionals

when patients do not adhere to their treatment regimen because adhering to their treatment regimen reduces the risk of developing complications of diabetes mellitus. (Delamater, 2006). One of the difficult chronic diseases to treat successfully is diabetes. Maintaining excellent blood glucose control can easily be achieved by patients who are adherent to prescribed treatment regimen. Many patients are not able to maintain excellent blood glucose levels and as a result a complication of diabetes sets in affecting the patient's quality of life. Complications resulting in deaths from diabetes can easily be prevented or avoided provided patients are adherent to their prescribed treatment regimen, and this is of great concern to diabetic health providers. It is frustrating when majority of diabetic patients still default prescribed treatment regimen. Understanding why patients default treatment and finding ways to improve adherence is a very important aspect of diabetes management.

Patients with chronic disease conditions are less adherent to their treatment regimen as compared to those diagnosed with acute disease; it is very common among patients with chronic disease conditions to default their treatment regimen after the first six months into therapy. (Haynes *et al*, 2002). The World Health Organization has identified factors that affect adherence and these have been categorized into five and main types, they are social/economic factors, medical conditionrelated factors, therapy-related factors, and patient behaviors. Identifying strategies for improving medication adherence are the responsibility of all.

Majority of factors come into play to affect a patient's risk of non-adherence. Identifiable factors that have an influence on a patient's adherence to treatment changes with time. During treatment, it is very important for a patient's medication adherence behavior to be assessed continuously. There are majority of reasons explaining why non adherence occur among patients diagnosed with chronic disease conditions and therefore there is no single solution in solving this problem of nonadherence.

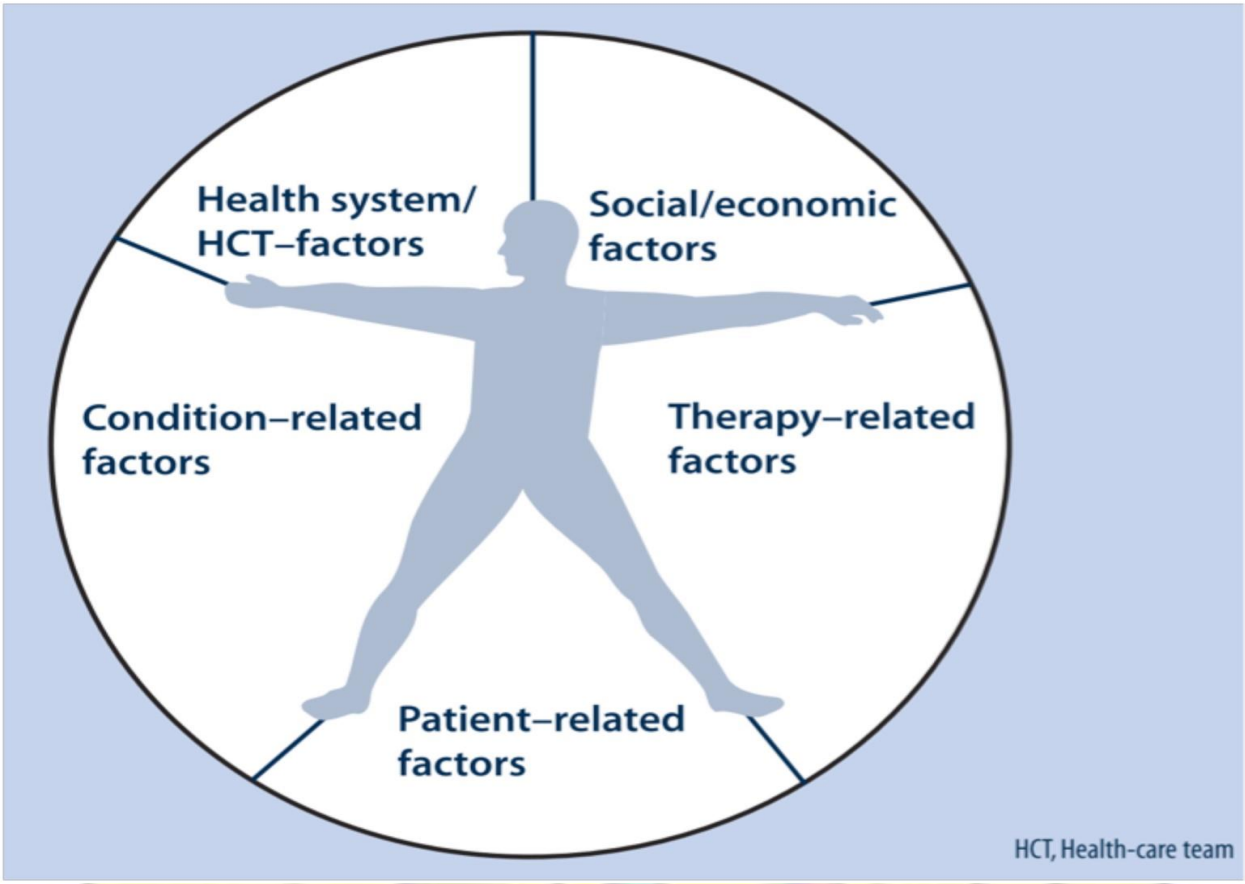

Figure 2.3.1: Factors Reported to Affect Adherence (Adapted from Steiner and Prochazka, 1997).

1. SOCIAL AND ECONOMIC DIMENSION
Limited English language proficiency
Low health literacy
Lack of family or social support network
Unstable living conditions; homelessness
Burdensome schedule
Limited access to health care facilities
Lack of health care insurance
Inability or difficulty accessing pharmacy
Medication cost
Cultural and lay beliefs about illness and treatment
Elder abuse

2. HEALTH CARE SYSTEM DIMENSION
Provider-patient relationship
Provider communication skills (contributing to lack of patient knowledge or understanding of the treatment regimen)
Disparity between the health beliefs of the health care provider and those of the patient
Lack of positive reinforcement from the health care provider
Weak capacity of the system to educate patients and provide follow-up
Lack of knowledge on adherence and of effective interventions for improving it
Patient information materials written at too high literacy level
Restricted formularies; changing medications covered on formularies
High drug costs, copayments, or both
Poor access or missed appointments
Long wait times
Lack of continuity of care

3. CONDITION-RELATED DIMENSION
Chronic conditions
Lack of symptoms
Severity of symptoms
Depression
Psychotic disorders
Mental retardation/developmental disability

4. THERAPY-RELATED DIMENSION
Complexity of medication regimen (number of daily doses; number of concurrent medications)
Treatment requires mastery of certain techniques (injections, inhalers)
Duration of therapy
Frequent changes in medication regimen
Lack of immediate benefit of therapy
Medications with social stigma attached to use
Actual or perceived unpleasant side effects
Treatment interferes with lifestyle or requires significant behavioral changes

5. PATIENT-RELATED DIMENSION
Physical Factors
Visual impairment
Hearing impairment
Cognitive impairment
Impaired mobility or dexterity
Swallowing problems
Psychological/Behavioral Factors
Knowledge about disease
Perceived risk/susceptibility to disease
Understanding reason medication is needed
Expectations or attitudes toward treatment
Perceived benefit of treatment
Confidence in ability to follow treatment regimen
Motivation
Fear of possible adverse effects
Fear of dependence
Feeling stigmatized by the disease
Frustration with health care providers
Psychosocial stress, anxiety, anger
Alcohol or substance abuse

Table 2.3.1:Table representing factors affecting adherence (Adapted from Miller *et al*., 1997)

The World Health Organization stated in its 2003 report that one of the determinants of adherence behavior is patient-related factors. It is believed that a person is responsible for administering his or her medication; this shows how factors affecting a person's medication taking attitude are being confused with the ability of the person to adhere to treatment regimen. Associated factors to these dimensions are listed in table 2.3.1 above.

2.4 HOW TO IDENTIFY MEDICATION NON-ADHERENCE

It is important to be able to identify patients who need interventions on medication adherence, this helps to improve adherence. Warning signs of medication non-adherence includes:

•refusing to obtain medicines for a new prescription
• Frequent refilling of medications taken on a chronic basis
•Persistently refilling of prescriptions of medicines for chronic disease conditions
• completing the whole course of treatment within the shortest possible time.

Krueger *et al*., 2005 and Osterberg and Blaschke, 2005 identified indicators of medication nonadherence as follows;

• Language and educational barrier
• Lack of accommodation
• Being depressed
• Mentally challenged
• Drug abuse
• Cognitive impairment
• Memory impairment
• Mood swings
• Ignorant about the disease condition
• Not believing in the benefit of the therapy
• Wrong beliefs about medication regimen

• Difficulty in understanding the medication regimen
• Lack of motivation to take medication
• Cumbersomeness of the medication regimen
• Unwanted effects of the medication
• High cost of medication
• Unavailability of proper care and medicines
• Lack of appropriate discharge planning or follow-up
• Defaulting clinic appointments

2.5FACTORS AFFECTING ADHERENCE IN DIABETES MANAGEMENT

2.5.1 Demographic factors

In the management of diabetes certain factors have greater influence on the patient's ability to adhere to a prescribed treatment regimen. These factors are the age of the patient, the gender, the level of education of the patient and the economic status of the patients, all these affects the treatment outcome either positively or negatively. It is very common to find lower rates of selfmonitoring of serum glucose among African and Mexican Americans. (Harris, Cowie et al. 1993)

2.5.2 Psychological factors

Psychological factors also play an important role in regimen adherence. There are certain health beliefs that influence the patient's medication taking and life style modification treatment regimen. The type of diabetes being diagnosed, how serious the patient sees the disease, the risk of complications, how long the patient have been diagnosed with the disease and how effective a prescribed treatment regimen can be, all of these factors can easily tell whether the patient would adhere to treatment or not.(Brownlee-Duffeck et al.1987). Patients adhere better when they are involved in the selection of their treatment regimen this encourages them to feel at ease to ask their provider any questions during the course of treatment. Also the environment where the patient finds him or herself also encourages adherence. Problems with adherence are often associated with coping with high levels of stress. (Peyrot, etal.1999)

The management of diabetes in the youth and adults becomes worse when psychological problems such as anxiety, depression etc. are involved. The DAWN study shows that majority of diabetic patients have poor psychological well-being and that health care providers reports that these psychological problems adversely affects adherence. Health care providers have demonstrated in the study above that they have lost confidence in the provision of psychological support their patients may need and their ability to specifically identify the patient's psychological problems.(Peyrot, et al.2005)

2.5.3 Family history and relationships

Family support has an effect in the management of diabetes. Various studies have identified that there is the need to reduce the levels of conflict among patients with chronic conditions, increase the level of togetherness and improve how frequent the patient interact with family members, all these factors will lead to increased and improved adherence to treatment regimen among patients. In the management of diabetes, the relationship and support exhibited by spouses and family members to the patient leads to an improvement in regimen adherence. (Makaryus & Friedman, 2005)

2.5.4Adequatesupport provided by the health care team

Patients adherence to treatment regimen is improved when adequate care and support is provided by the care providers involved in the management of the disease. Another study has shown that glycemic control, lipid profile and blood pressure levels are maintained at the appropriate levels when prescribed treatment regimen is adhered and the provider play a major role in this by continuously calling the patient on phone to remind them on the importance of adherence. It has being observed in the Diabetes Control and Complications Trial (DCCT Research GROUP) that the provision of support to patients by the health care team is one of the most important components to succeed in attaining good glycaemic control. In addition, the relationship that exists between the patient and the doctor and the rapport that exist between the health care team and the patient goes a long way in attaining good regimen adherence. (Choo, *et al*, 2001)

Studies have cited that when patients appreciate the relationship that exists between them and their care providers, it helps improve on adherence to their treatment regimen. (Choo, *et al,* 2001).In addition to this finding, when patients have a negative view of others and have greater self-esteem

towards their doctor and rates their patient provider communication as poor, this negatively affects adherence to their medication regimen. There are certain important factors that turn to improve adherence and these are calling the patient on phone to remind them of their next clinic appointment and sending patients' post cards to remind of their clinic appointments.(Haynes et al. 1979)

2.5.5 Factors that are disease and treatment related

Various studies conducted have shown that usually adherence to treatment regimen among patients with chronic disease conditions is low. These studies also indicated that factors such as the complexity of the treatment regimen, changes in life style modifications and variations of symptoms of the disease normally affects the rates of adherence among these patients. Other research conducted among diabetic patients have also shown that patients adherence rate to changes in life style modifications is low as compared to adherence to medication regimen that are simpler in nature. It is a common practice to see diabetic outpatients administer treatments on their own and these treatment regimens are usually developed with the assistants of their physician and other care givers. The involvement of the patient in the development of their regimen affects their willingness and belief in the treatment and this strongly influence how effective the regimen will be**.** For type 2 diabetic patients with high Glycated hemoglobin, there is the need to improve upon the patients' blood glucose levels and their life style modifications, and this reduces the risk of diabetes complications and deaths. There are some important factors that adversely affects patients adherence behaviors and these are the fear of getting into hypoglycemic or hyperglycemic state, putting on weight, injecting oneself with insulin ,the difficulty with dietary adherence and how complex the medication regimen can be. (Dey *et al*, 2000).

A successful diabetic treatment outcome is achieved when the patient adhere to the prescribed treatment regimen. In view of this fact it has been observed in several studies that there is a difficulty in maintaining the highest level of adherence in the entire treatment regimen. One of the most common challenges observed by most physicians at the primary health care facilities when managing type 2 diabetic patients is making sure that the patient takes his or her prescribed oral medications. Some identifiable reasons why patients do not adhere to their oral medicines include forgetfulness and spontaneous activities (Dey *et al*, 2000).

However these patients adherence to life style modification is often suboptimal. Adherence to dietary regimen was found to be a basic problem in type 2 diabetic patients; this was observed by 85% of primary care givers as cited in a random study. A diabetic patient's long term adherence can be influenced by how complex or difficult the medication regimen would be. The aspects of the medication regimen that influences adherence are undesirable effects of the medication, the hypoglycemic effects of the medicine and how frequent the patient has to administer the medicine.(Cramer et al. 2004).

Increasing the number of doses per day affects adherence negatively (Richter et al. 2003). The success of a diabetes therapy is achieved when the patient is adherent to the regimen and the prescribed regimen is not complicated or difficult for the patient to follow. How easy or convenient a medication regimen can be plays an important role in determining whether the patient will be able to effectively adhere to the regimen and this affect the efficacy of the treatment regimen. Certain medicines lookalike, therefore they are easily missed up by patients.

The association that exists between weight gain and maintaining good glycemic levels is an important hindrance in achieving optimal serum glucose control in type 2 diabetic patients. Also among Type 1 and 2 diabetic patients adherence to medication treatment regimen is affected negatively due to the fear of weight gain which is the side effect of some of the medicines they are prescribed. Educating the patient's increases awareness about the disease, making sure the medication regimen given are simplified and easier to remember, all these factors increases the patients level of adherence. (Feldstein AC et al. 2002). Certain patients are difficult to manage, ensuring that the dosage regimen and treatment is simplified does not have an effect on their level of adherence, and this is so because they do not believe in the treatment regimen. The World Health Organization cited in its 2003 report that, having knowledge on a chronic disease does not guarantee improves adherence levels among diabetic patients.

Published studies have identified that single interventions alone are not successful as compared to those that are multiple and these affect adherence positively. For non-adherent patients, the health provider needs to continuously follow up on the patient and addresses the reasons why the patient is being non adherent.(Krueger *et al*., 2003). Extensive interventions are needed to solve some important issues that bother on adherence, these include educating the patients, encouraging them to be adherent to their treatment regimen, provision of support from spouses and family members and

the need to provide regimen based on the patient's needs.(Krueger *et al*., 2003; McDonald *et al*., 2002).

2.6IMPROVING PATIENT BEHAVIOUR

There is no need for health care professionals to adapt the strategy of trying to get their patients to adhere better to their regimen but rather they have to improve upon or encourage them to adhere. Improving upon the patients' adherence behavior requires an attitudinal change in appreciating the effort the patient put in the management of the disease condition. The approach to clinical management of diabetes can be affected by certain attitudes that may be encountered during the management process by health care providers. (Hess *et a*l, 2006).

2.6.1 Traditional method of improving patients' health behaviors

Here the patients have so much confidence in the health care provider to the extent that they do whatever the health provider tells them to do in relation to the management of their condition. Knowledge is impacted to the patient by advising the patient on the disease condition. The patient is supposed to change his or her behavior, be willing to change and that the prescribed treatment regimen should be of importance to them. (Rollick et al. 1999)

Patients become resistant or rebellious when they are told what to do concerning the management of their disease condition, this approach takes away their independence and usually this approach is not successful. (Hess *et a*l, 2006).

Procedures mostly used in the prevention of behavioral change from occurring are, not creating a relationship with the patient, instructing the patients on what to do concerning their therapy, taking away the patients independence. You should also be able to misinterpret the patient's ability to judge behavior change as important and these patients urge in changing; misjudge the patient's willingness in changing; provoke the patient; accuse them for not being responsible for their own wellbeing and put fear in them.(Rollick et al. 1999)

2.6.2 Evaluation of diabetes management difficulties

In the assessment of patients' behavioral involvements, it is important to first understand the main reason why patients do not get themselves involved in optimum diabetes self-management activities. It is very necessary to estimate lack of self-care before setting up plans which will not be successful if the main reasons for not adhering to a prescribed regimen are not first dealt with and this should be part of the plan. Some patients may be lacking knowledge in the disease, also some health beliefs and attitudes may contribute to non-adherence on the part of the patient. Some well noted environmental factors are likely to have a negative effect on the patients will to conduct proper self-care processes. The management of diabetes is challenged when the patient feels dejected by the society and also when there is a conflicted family relationship. Effective diabetes management is mostly affected by psychological disorders such as anxiety and depression.
(Funnell et al.2004)
There is the need for other members of the team like the psychiatrists, specialists in behavioral management and diabetes educators etc. to properly conduct extensive assessment to find diabetes management problems. Appropriate medicines are provided as prescribed for mental, psychotropic and stress managements.

2.6.3 Adequate behavioral involvements

Appreciating behavioral alterations of the diabetic patient is a must for the health care provider and this forms part of an interactive process. Even though it is the responsibility of the patient to make decisions on the management of their own disease condition the health providers also play a role in the management process. A patient-centered approach should be employed in the management of the patient's behavioral changes by the care providers. They also need to encourage a collaborative relationship between the patient and themselves to aid in effective communication. The health provider needs to give advice to the patients when the need arises. (Funnell et al.2004)

Specific approaches should assist the patients with behavior changes. Initially, a relationship should be established between the health provider and the patient, taking sincere interest in the patient's wellbeing. During the management of the patient by the care givers, it is necessary to evaluate how

significant the patient see the prescribed regimen and how they are willing or motivated to follow the therapy. The patient need to be encouraged during the clinical encounter and also the importance of regimen-related behavior should be noted. Exchanging information plays an important role in behavioral-change process during instances where the patients are proving difficult and do not want to take instructions from the provider. The care givers are to provide reasons to why a specific regimen is prescribed to the patient. Giving information to the patient will increase his or her knowledge about the disease condition but this does not give assurance that it will affect their behavioral changes. (Anderson et al 2002)

Health care givers face series of difficulties in terms of patient adherence to their treatment regimen. Initially, the health providers need to listen to their patients and find out what is important to them. This exercise will not yield any results if it is conducted at a noisy environment, communication between the provider and the patient creates a good relationship between the two.

The patient's unwillingness to change and reducing the resistance to change are some of the challenges care givers encounters. (Rollick et al 1999)

There are several ways to deal with this resistance issue but effective ways are to decrease the resistance to specified treatment regimen and this includes stressing on the patients personal choices and abilities; reconsidering their willingness, setting priorities; most often actively participating in the patients decisions on their preferred regimen. (Anderson et al 2002)

For behavioral consultation to be effective, the care givers need to motivate the patient to express their views on the regimen and in these instances active communication techniques are recommended to be used.(Anderson et al 2002)

These techniques include questions that are mostly open-ended in nature, summarizing and clarifying statements made to make it more understandable to the patients. The patient should be assisted to participate fully in the decision making process concerning their health, they should be given the options to choose which aspect of the therapeutic approach that will either affect them positively or negatively. Even though the patient can collaborate and negotiate with the care giver on which regimen he or she chooses, the patient still have an upper hand on the final decision. Provided the patient has agreed to follow specific goals, their self-care management can be improved by adopting interventions such as behavioral actions and psychosocial processes.(Choudhry, *et al,* 2009). Self-

monitoring is a fundamental element of behavioral change, this helps improves the patients sense of awareness; the determinants are well understood and progress can be followed over a specified time period. For complicated treatments regimen, there is the need to gradually introduce newer regimen-related behaviors to avoid resistance from the patient. Setting specific and measurable goals plays an important role in attaining success at behavioral change.

During the clinical encounter phase with the patient, it is important the health provider evaluate and design social acceptance and assistance for newer behaviors, this should not only be specific for the environment in which the patient resides in but also for the consulting rooms as well.(Brown et al 1999).Formal behavioral contracts should be employed to spell out the goals of treatment and design positive outcomes that will help the patients in achieving their goals. In the process of helping the patient tackle problems that they are likely to encounter during the therapy, they should be thought how to identify the problem, suggest possible ways in solving them, making a firm decision on how to go about it and then assessing the positive outcomes of the choice. During the clinical encounter with the patient, it is important to give a written and clarified instructions to the patient especially for prescriptions with newer regimen, this helps the patient remember the details of what you discussed with him or her. During the process of managing the patients, it is necessary to take into account the limits of your ability to the patient's behavioral change. (Delamater et al.2001)In the management of patients with complex behavioral changes, there is the need to pass on such cases to the appropriate specialists who would intervene more effectively. (Meichalenbaum, Turk et al.1987)

2.7 Adherence and percentages

Diabetes mellitus was reported to be the cause of deaths among the elderly in Tanzania, the death rates was comparable to that of elderly diabetic patients in the United States of America; this study was conducted by McCarty et el in 1996.

So much have been invested in the management of diabetes in terms of care and this have brought substantial health benefits to the management of other chronic conditions like coronary artery diseases and hypertension. The use of non-pharmacological management of diabetes like regular physical exercise and life style modifications and pharmacological management in terms of adhering

to prescribed medication regimen have shown to reduce complications of diabetes and other comorbid disease conditions. (Brown *et al*, 1999, Harris, Cowrie& Howie, 1993)

The increasing rates of non-adherence among diabetic patients have a detrimental effect on the outcomes of diabetes management. Currently, diabetes management centers on patient self-care or self-management. The goal of an effective diabetes management is to ensure that serum glucose levels are near the standard levels whiles avoiding acute and chronic complications associated with it. These goals can be achieved if patients on pharmacotherapy among other things administer or take their antidiuretic drugs as prescribed by the physicians. When medication adherence becomes an issue of concern to the health care provider and the nation as a whole, poor clinical outcomes will be the end results. (Whiting et al 2011)

Enough documented evidence from literature has been found on factors that are related to diabetes regimen adherence problems. Diabetes regimen adherence problems cited in literature are psychological, social and demographic factors; available medical system, disease and treatment related factors and the relationship between the patient and the health provider. All these factors need special attention during management of the diabetic patient. During the years 1999 and 2002 respectively, studies conducted found adherence rates to diabetes regimen management to be suboptimal ranging from 23% to 77 %in countries such as United States of America, India and Mexico. (Brown *et al*, 1999, Harris et al, 1993).Other studies conducted found adherence rates to antidiuretic medications to be 65% to 85% and that of insulin use to be 60% to 80% among type 2 diabetic patients. (Brownlee-Duffeck *et al*, 2006).

In the management of chronic disease conditions, effective use of medicine or adherence to medication regimen have been identified to be effective as cited in various studies, yet adherence rates among patients with such conditions keeps rising and this is of major concern to stake holders and majority of these patients become non adherent after six month into a prescribed treatment regimen. Depending on the nature of the disease condition the patient have been diagnosed with, the treatment given, the attitude of the patient to treatment and the condition of the treatment setting, the non-adherence rates varies between 17% and 60% respectively. It is very important to note that non adherence rates increases when patients are not experiencing any symptoms. (Peas, Bakker,& Soe-Agnie, 1997).

Regimen complexity related factors such as the cost of the medicine, the side effects of the medicine and the number or doses per day that the patient may have to ingest during therapy have been shown to affect adherence as cited by Vermeireet.al in a study they conducted. (Vermeire et al 2005)

Being knowledgeable about the benefits of the drug regimen helps patients to adhere better to the prescribed regimen. There was no significant association existing between non-adherences as a results of the complexity of the prescribed regimen, this was cited in other studies.(Grant et al 2003, Horne et al 1999).Advancing in age have been linked to medication non-adherence and this is backed with the fact that as one ages that persons cognition or ability to reason reduces and also there may be comorbid conditions that also comes with its own medication regimen and this overwhelms the elderly patient, hence being non adherent to the regimen. Nearly one third of respondents, between the ages of 36 to 50 years recruited for a study in Mulago Hospital in Uganda, were found not to be adherent to their treatment regimen but this study concluded that age did not have any significant association with adherence. (Whiting *et al*, 2011).

There is an increased in risk of non-adherence among women as compared to men. Gender was cited to be significantly associated with drug non-adherence in the study conducted in Uganda. (Kalyango et al. 2008). Anti-diabetic medication adherence was improved with an increase in the level of education among respondents who were part of a study conducted in Brazil; however, there was no significant association. (Gimenes et al 2009)

Various studies have concluded that as advance in age comes with comorbid disease conditions, patients who have been diagnosed with these disease conditions usually decide which of the treatment regimen they want to forfeit when the need be, especially when pressure cost problem arises. (Caetano *et al*, 2006).

59% of respondents from a study conducted in Nigeria Ibadan state were found not to be adherent to their former anti-diabetic given due to financial challenges. Side effects from previous antidiabetic medicines were the main reason for not adhering to their treatment regimen; this was further revealed in the study among 34.5% of the respondents. In another study, side effect was the main reason noted for non-adherence to the regimen. (Brownlee-Duffeck, *et al*, 2005; Heidenreich, 2004).

Another factor that has a negative effect on patient's adherence to therapy in diabetes management is depression. The effects of depression on diabetes management have indicated an increased in medication non adherent rate of 24.5% in depressed patients as against 18.8% in patients with no major depression; this was noted in another study.

Patients who frequently default their clinic appointment were likely to be non- adherent to their treatment regimen, this was further revealed by the Uganda study. (Kalyango et al. 2008)

Socio-demographic factors like occupation, marital status and religious background of respondents were found not to be significantly associated with on-adherence. (Kalyango et al. 2008, Horne et al 1999)

Other studies revealed other factors like the route of administration of the medicines, the total number of antidiuretic prescribed and how long the respondents have been diagnosed with the disease condition were not significantly associated with non-adherence. (Kalyango et al. 2008- Horne et al 1999)

In a current study conducted in Europe, called the ENTRED study where majority of type 2 diabetic patients were recruited, all medications prescribed to the patients including anti-diabetic drugs, factors including the age, financial status of the respondent and existing diabetes complications were associated with poor medication adherence (Tiv , Viel et al 2012)

Evidence from cross-sectional and prospective studies demonstrates the role of obesity and a sedentary lifestyle as major risk factors for the development of type 2 diabetes (Tuomilehto, 1989; Perry, 1995; Harris *et al*, 1998). A press release by the International Diabetes Federation 2006 stated that changing diet and/or exercise behaviors will reduce the risk of developing diabetes in individuals with impaired glucose tolerance (IGT). Eriksson and Lindgarde (1991) found that lifestyle interventions including diet plus exercise decreased the risk of diabetes by 50%. Similarly, a study conducted in China (Pan *et al*, 1997) reported a 25% risk reduction from either diet, exercise, or the combination, compared with a control group. This link with behavioral and environmental factors has further been confirmed by the recent randomized controlled clinical trial of prevention of type 2 diabetes (Tuomilehto *et al*, 2001). This study was conducted to determine the feasibility and effects of a programme of changes in lifestyle designed to prevent or delay the onset of type 2 diabetes in subjects with IGT (Tuomilehto *et al*, 2001). Long term complications of diabetes will reduce and the health of the population will improve if patients are adherent to their medication regimen this was recommended in a WHO report. Lifestyle variables include meal habits, how frequent the patient exercises, whether the patient smokes or drinks alcohol.

Adherence to anti-diabetic medications would improve when patients adopt life style modifications that suit the prescribed regimen. (Pan *et al*, 1997)

Ahmed et al conducted a study on the relationship between alcohol consumption and maintaining a good control among diabetic patients, they concluded that the relationship is inversely proportional hence reducing alcohol consumption minimizes the risk of diabetes complications.(Tuomilehto *et al*, 2001).

2.8METHODS OF MEASURING MEDICATION ADHERENCE

Medication adherence can be assessed using different methods. Osterberg *et al* classified the methods of assessing medication adherence as either direct or indirect methods.

The direct method of measuring adherence involve directly observing a patient take his or her medicine or therapy, measuring the amount of medicine ingested or serum metabolite of the medicine in the patient and measuring the levels of biological markers in the blood are all classified as direct method of assessing medication adherence. (Osterberg et al 2005). Even though the direct method of measuring adherence are said to be more vigorous than the indirect methods, these direct methods also have their limitations. There are instances where patients may hide the tablet in their mouth and throw it away later. Differences in the metabolism of the medicines may affect the serum levels of the medicines. (Rudd et al.1998; Pullar et al. 1989)

The indirect method of assessing medication adherence is not preferable for routine clinical use because it is not feasible. Methods used to assess patients medication adherence includes the use of questionnaires, self-reports, pill counts, how frequent the patient refills his or her prescription , evaluation of how patients responds clinically, monitoring the use of medicines by the patients electronically, assessment of physiological indicators and patient diaries. Patient self-report, tablet counts and refilling of prescriptions the frequently used methods employed by the indirect method in assessing patients medication adherence.

The Morisky scale is a commonly used, validated; 4-item self-reported adherence measure that has been shown to be predictive of adherence to chronic conditions like diabetes and hypertension.
Self-report which is one of the indirect methods of assessing patience adherence is easily influenced by patient inaccurate recalls or by social involvement, here the patient's involved report a very encouraging adherence to their care givers. It is easy to count tablets and it has been associated with electronic medication monitors, and they are usually used in randomized, controlled clinical trials to

evaluate medication adherence. Pill count or counting of tablets are easier to measure, it does not completely take into account the right timing of when the medicine was administered, due to this the data collected can easily be influenced by the patient. Both of the methods mentioned above have advantages and disadvantages and the decision to use any one of them will depend on the type of clinical and the data available at that particular instance. (Morisky, *et al*, 1986)

The electronic pharmacy data is generally available. This method of measuring medication adherence is the commonly used method in literature. How frequent the patient fills his or her prescription and how these refills are obtained shows how the patient manages their adherence behavior and pharmacy refill data based on medication adherence are mostly associated with a variety of patient's outcomes.(Morisky, *et al*, 1986).

Medication adherence based on data from the pharmacy is the most frequently used method in measuring the medication possession ratio and the number of days covered. Principally these methods are usually defined by the total number of doses of medicines dispensed in relation to the dispensing time. The main difference between these two measures is that the maximum number of days covered is 1.0, which indicates full adherence, whereas the medication possession ratio represents oversupplies and can have a value >1.0.With the pharmacy prescription refill data, patients are to take their prescribed medicines at an enclosed pharmacy.

The amount of doses of the medicine administered associates well with the medication control or possession ratio. The medication control also associates well with the period covered, where the patient is adherent to his or her medication regimen but not with the time periods at which the doses of the medicine are supposed to be taken. (Andrade et al.2006)

These methods of measuring patient's medication adherence to regimen become more difficult when there are differences between the periods of follow ups among patients (Yusuff, *et al*, 2008).
The Morisky Medication Adherence Scale (MMAS) was used in measuring the level of adherence for this study. The Morisky Medication Adherence Scale is one of the indirect methods of assessing patient's medication adherence; it uses a 4-item or 8-item question in assessing both unintentional and intentional non-adherence behaviors. Adherence in this study was defined as a
"NO" response (or a score of 1) to each of the 4-item question on the Morisky scale making a score of 4 as the excellent adherence score (Morisky, Green & Levune, 1986).

CHAPTER 3

3.0 METHODOLOGY

3.1 STUDY AREA

The study was conducted at the Diabetic clinic of the Directorate of medicine, KATH. Komfo Anokye Teaching hospital is located in Kumasi, Ghana and is the second largest hospital in the country and the only tertiary health institution in the Ashanti Region. It is the main referral hospital for the Ashanti, Brong Ahafo, Northern, Upper East and Upper West Regions. The hospital was built in 1954 as the Kumasi Central Hospital. It was affiliated to the medical school of the Kwame Nkrumah University of Science and Technology. The hospital currently has about 1000 beds, up from the initial500 when first built. The hospital is made up of clinical and nonclinical directorates and they are:

Clinical directorates

- Anaesthesia and intensive care unit (ICU)
- Child health
- Dental, Eye, Ear, Nose and Throat (DEENT)
- Diagnostics
- Medicine
- Obstetrics and Gynaecology
- Oncology
- Polyclinic
- Surgery
- Accident and Emergency department
- Pharmacy
- Non-clinical directorates
- Domestic services
- Security
- Supply chain management
- Technical services

The internal medicine directorate runs both general and specialist clinics and the diabetic clinic is one of the specialist clinics. The diabetic clinic organizes three clinic days in a week on an outpatient basis and the average patient attendance on a clinic day is about 250.There are about 1500 registered members who visit the clinic on appointment basis every 6 month. On each clinic day patients are

educated on the need for strict adherence and to take their prescribed medications religiously and advised on life style modifications by pharmacists, nurses, dieticians and dentists.

3. 2 STUDY DESIGN

The study was a cross-sectional study and involved diabetic patients who attended the diabetic clinic of KATH.

3.3ELIGIBILITY

Patients with diabetes were considered for this study.

3.3.1 INCLUSION CRITERIA

1. Patients who have been diagnosed of having diabetes for at least two years and who attend the diabetic clinic at KATH.
2. Patients of age 18 years or above were selected.
3. Diabetic outpatients were interviewed.

3.3.2 EXCLUSION CRITERIA

1. Patients who were unwell or had psychiatric complications were not recruited.
2. Patients who take herbal or alternative medicines for their diabetes management were not recruited.
3. Diabetic inpatients were not interviewed.
4. Co morbid patients were not recruited for the study.

3.4 SAMPLE SIZE

The sample size for the study was calculated using a proportion of 38.5% of adherence to oral anti-diabetic among patients attending a teaching hospital in Ghana in a study conducted by Bruce et al (2011) and assuming a 95% confidence limit and an estimated delta of 0.078, a minimum of 253 patients were recruited for the study.

Formula

$n = z^2pq/d^z$

Where

n = the desired sample size z = the standard deviation (1.96 corresponding to the 95 % confidence level) p = the proportion of the respondents who are adherent to their anti-diabetic (38.5 or 0.385) q = 1-p the proportion of respondents who are adherent to their anti-diabetic medication.

(1- 0.385) d = degree of accuracy (0.05)

3.5 SAMPLING METHOD

Systematic random sampling was used to sample respondents for the study. The first respondent was conveniently sampled after agreeing to participate in the study then every third respondent was sampled afterwards

3.5.1 DATA COLLECTION

Data was collected via personal interviews using a structured questionnaire and also from the patient medical records. The structured questionnaire was based on The Morisky Medication Adherence Scale (MMAS) and it was administered to each respondent after consenting to participate in the study. The questionnaire was in the form of exit interviews. Information provided by the respondents was counter checked with their medical records.

3.6 DATA ENTRY AND ANALYSIS

The data collected was entered into SPSS statistical software (version 19) for descriptive statistics. Student's t-test and Anova were used to compare means of different variables.

Categorical variables were compared using chi-square test. Correlation analysis was carried out to determine the associations between continuous and ordinal variables.

Various hypothesis testing was done to assess the level of significance among any two variables. A cut off level of 0.05 was used to assess the level of significance.

3.7 ETHICALCONSIDERATIONS

Patients were reassured that information obtained from them would be kept confidential. Patients consent was sought before the questionnaires were administered. No patient identity was revealed. A coding system was used to identify each patient in order to protect clinical information of patients. The confidentiality of patients was reassured.

The proposal for the study was submitted to the Directorate of Medicine for approval and ethical approval was obtained from the committee for Human Research Publication and Ethics of the Kwame Nkrumah University of Science and Technology.

3.8 DESSEMINATION OF RESULTS

After the study, a stake holders meeting was organized and the results were disseminated.

3.9 LIMITATIONS

Interviewer bias was a potential limitation due to fact that those who had no formal education filled the questionnaire with the help of interpreters, though I believe that this effect should be minimal as all of them were trained before the commencement of the study and that they were highly experienced in this regard.

Another important limitation is that respondents could be overestimating their adherence levels when using a self-reporting method. Also the number of factors contributing to adherence explored in this study might not have been comprehensive.

CHAPTER 4

4.0 RESULTS

4.1 Socio-demographic characteristics of respondents

Table4.1.1: Socio-demographic characteristics of respondents

Age of respondents (years)	n/N	(%)
<55	139/253	54.9
55 and above	114/253	45.1
Gender of respondents		
Male	77/253	30.4
Female	176/253	69.6
Level of Educational		
No Formal	69/253	27.3
Primary	69/253	27.3
Secondary	70/253	27.7
Tertiary	45/253	17.8
Occupation of respondents		
Civil Servant	30/253	11.9
Retired Worker	35/253	13.8
Business Man/Woman	95/253	37.5
Unemployed	70/253	27.7
Others	23/253	9.1
Religion of respondents		
Christian	219/253	86.6
Moslem	32/219	12.6
Traditionalist	2/253	0.8
Marital status of respondents		
Single	91/253	36.0
Married	162/253	64.0
Widowed	47/320	14.7
Where You Live		
Alone	18/253	7.1
With Family	228/253	90.1
With Friends	7/253	2.8

*n = number of patients observed N = Total number of the sample

A total of 253 diabetic patients were recruited for this study, 30.4% were males and 69.6% were females. Majority of the respondents belonged to the middle age group of 38-55 years (54.9%) followed by the elderly group > 55 years (45.1%).

27.3% of the respondents had basic education and the occupational section of the respondents indicates that 27.7% of the respondents were unemployed the median duration with diabetes was 3 years. Socio-demographic characteristics of the participants are summarized in table 4.1.1 above.

4.2 Adherence Level of Participants

4.2.1 The level of adherence of diabetic patients attending clinic at KATH.

Using the Morisky Medication Adherence scale to determine adherence level among respondents, it was observed that majority of the respondents constituting 64.2% had high adherence level. This was followed by medium and low adherence level with proportions of 22.8% and 13% respectively. This is illustrated in figure 1 below.

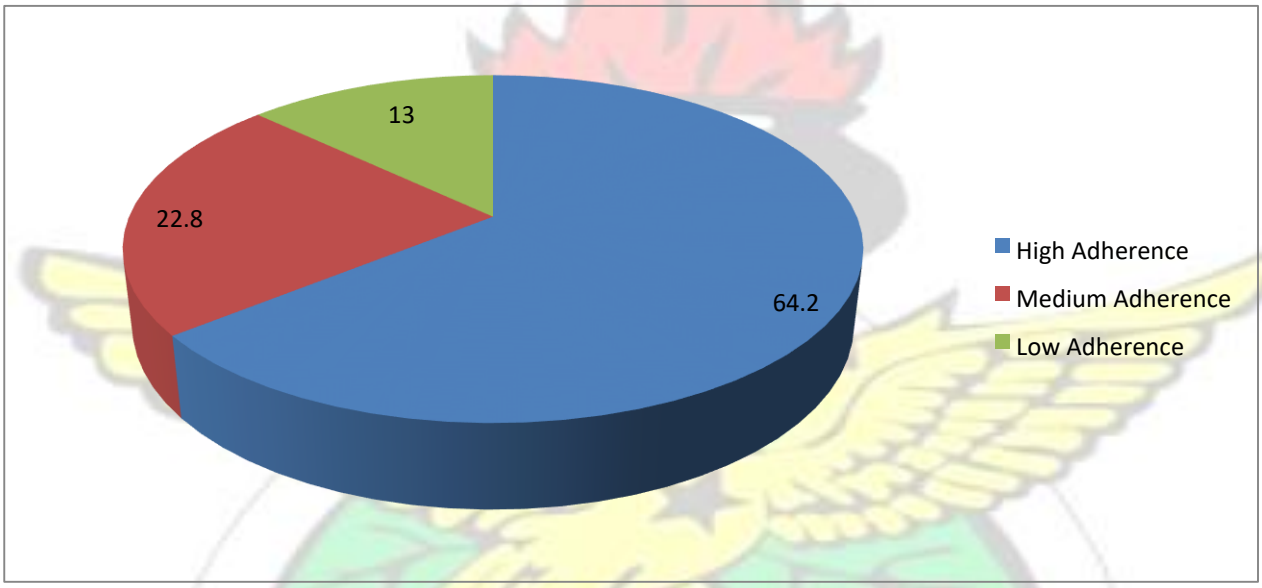

Figure 4.2.1: Level of adherence to anti-diabetic agents among participants.

4.3 Effect of gender on adherence

Table 4.3.1.: Summary description of cross tabulation between patients' gender and level of adherence

Gender	Adherence Level Scale			Total	P value
	High Adherence	Medium Adherence	Low Adherence		
males	50	18	9	77	0.784
% within Gender	64.9%	23.4%	11.7%	100.0%	
% within Adherence Level Scale	30.7%	31.6%	27.3%	30.4%	
females	113	39	24	176	
% within Gender	64.2%	22.2%	13.6%	100.0%	
% within Adherence Level Scale	69.3%	68.4%	72.7%	69.6%	
Count	163	57	33	253	
% within Gender	64.4%	22.5%	13.0%	100.0%	
% within Adherence Level Scale	100.0%	100.0%	100.0%	100.0%	

The results of the cross tabulation, 69.3% of females compared with 30.7% males had high adherence level. 72.7% females as against 27.3% males had low adherence level. Among the male patients 64.9% had high adherence compared with 23.4% and 11.7% with medium and low adherence levels respectively. Among the female patients 64.2% had high adherence level compared with 22.2% and 13.6% with medium and low adherence levels respectively.

The Chi-squared test (Linear by linear) result p=0.784, we fail to reject the null hypothesis. Therefore there is no evidence of association between gender and level of adherence. The difference of 38.4% between females and males with high adherence is statistically insignificant. Hence in the wider population it could be that there are differences in adherence level among males and females and although females are more likely to adhere to their anti-diabetic medications the difference in adherence levels are not significant.

4.4 EFFECT OF WHOM THE PATIENT STAYS WITH ON ADHERENCE

Table4.4.1: A cross tabulation describing the relationship between where the respondents stay and how it affects their level of adherence.

Adherence Level			Whom Do You Live With			Total	P value
			Alone	With Family	With Friends		
	High Adherence	Count	12	148	3 1.8%	163	0.131
		% within Adherence Level	7.4%	90.8%		100%	
		% within Where You Live	66.7%	64.9%	42.9%	64.4%	
	Medium Adherence	Count	4 7.0%	53 93.0%	0 .0%	57 100%	
		% within Adherence Level					
		% within Where You Live	22.2%	23.2%	.0%	22.5%	
	Low Adherence	Count	2 6.1%	27 81.8%	4 12.1%	33 100%	
		% within Adherence Level					
		% within Where You Live	11.1%	11.8%	57.1%	13.0%	
Total		Count	18	228	7	253	
		% within Adherence Level	7.1%	90.1%	2.8%	100%	
		% within Where You Live	100.0%	100.0%	100.0%	100%	

A cross tabulation of adherence level and whom do you live with indicates that 7.4%, 90.8% and 1.8% of patients lived alone, with family and with friends respectively compared with 11.1%, 11.8% and 57.1% within the low adherence group. Also among the patients who lived alone 66.7% had high adherence compared with 22.2% and 11.1% with medium and low adherence respectively.
Also the Chi-squared test result p=0.131 the null hypothesis is not rejected. Therefore there is no evidence of association between whom the patient lives with and level of adherence. The difference of 5.6% between living alone and living with friends as well as difference of 83.4% between living alone and living with family within the high adherence group is not statistically significant. However in the wider population it could be that there are differences in adherence level among whom patients stays with and although those living with family are more likely to adhere to their anti-diabetic medications compared to those living alone and those living with friends, the difference in adherence levels are not statistically significant.

4.5 **EFFECT OF PATIENTS KNOWLEDGE ON ADHERENCE Table4.5.1: Summary description of cross tabulation between patients' knowledge of default and level of adherence**

			Adherence Level Scale			**Total**
			High Adherence	**Medium Adherence**	**Low Adherence**	
Knowledge of Default Consequences	Yes	Count	120	37	29	186
		% within Knowledge of Default Consequences	64.5%	19.9%	15.6%	100.0%
		% within Adherence Level	73.6%	64.9%	87.9%	73.5%
	No	Count	43	20	4	67
		% within Knowledge of Default Consequences	64.2%	29.9%	6.0%	100.0%
		% within Adherence Level	26.4%	35.1%	12.1%	26.5%
Total		Count	163	57	33	253
		% within Knowledge of Default Consequences	64.4%	22.5%	13.0%	100.0%
		% within Adherence Level	100.0%	100.0%	100.0%	100.0%

The results in the table above shows that, among the patients with high adherence level, 73.6% had knowledge of default consequences compared to 26.4% without knowledge of default consequences. Also among those with knowledge of default consequences, 64.5% had high adherence level compared to 19.9% and 15.6% who had medium and low adherence level respectively.

From the Chi-squared test result p=0.046the null hypothesis is rejected. This indicates that there is an evidence of association between patients' knowledge of default consequences and level of adherence. The difference of 47.2% between patients with knowledge of default consequences and those without knowledge of default consequences among the high adherence group is statistically

significant. Again the difference of 48.9% between high adherence and low adherence among the patients who have knowledge of default consequences group is also statistically significant. Hence in the wider population it could be that there are big differences in adherence level depending on the knowledge of default consequences and those patients with knowledge of default consequences are more likely to adhere to their anti-diabetic medications.

4.6 EFFECT OF THE DURATION OF DISEASE ON ADHERENCE

Table 4.6.1: Summary description of cross tabulation between patients' duration of disease and level of adherence. (Kruskal-Wallis Test)

Kruskal-Wallis Test

		Adherence Level Scale			P-value
		High Adherence	Medium Adherence	Low Adherence	
Duration of Disease (years)	> Median	44	14	4	0.05
	<= Median	119	43	29	

Majority of the patients within the high adherence group n= 119 had a median duration of diabetes for 3 years or less compared with n=44 who have had the disease for more than 3 years as shown in table 4. Within the medium adherence group, 43 and 14 patients had 3 years or less and more than 3 years respectively compared with 29 and 4 within the low adherence group who have 3 years or less and more than 3 years respectively.
Also from the Kruskal-Wallis Test p=0.05 indicates there is association between duration of disease and adherence and that patients with less than 3 years median duration of disease are more likely to adhere to their anti-diabetic medications.

4.7 EFFECT OF AGE ON ADHERENCE

Table 4.7.1: The relationship between age of patients and adherence level (One way ANOVA)

One way ANOVA

	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum	P-value
				Lower Bound	Upper Bound			
High Adherence	160	58.37	12.675	56.39	60.35	20	86	0.145
Medium Adherence	54	54.76	9.695	52.11	57.41	26	80	
Low Adherence	33	56.12	13.257	51.42	60.82	28	82	
Total	247	57.28	12.218	55.75	58.81	20	86	

The One way ANOVA results revealed that the mean ages of the participants with high, medium and low adherence levels were 58.37, 54.76 and 56.12 years respectively. The results further show that patients with high adherence were older than those with medium and low adherence by 3.6 and 2.3 years respectively.

The p-value of 0.145 indicates that although on the average older patients are more likely to adhere to their anti-diabetic medication, the association between mean age and adherence level is not statistically significant.

Table 4.7.2:The relationship between age category and adherence level (Chi Squared Test [Linear by linear]) Chi Squared Test (Linear by linear)

			Adherence Level Scale			Total	P value
			High Adherence	Medium Adherence	Low Adherence		
Age Categories	<55	Count	84	37	18	139	0.339
		% within Age Categories	60.4%	26.6%	12.9%	100.0%	
		% within Adherence Level Scale	51.5%	64.9%	54.5%	54.9%	
	>55	Count	79	20	15	114	
		% within Age Categories	69.3%	17.5%	13.2%	100.0%	
		% within Adherence Level Scale	48.5%	35.1%	45.5%	45.1%	
Total		Count	163	57	33	253	
		% within Age Categories	64.4%	22.5%	13.0%	100.0%	
		% within Adherence Level Scale	100.0%	100.0%	100.0%	100.0%	

The results of cross tabulation between age category and adherence level from the above table indicates that among the high adherence group, 84 participants constituting 51.5% were <55 years compared with 79 (48.5%) who were >/=55 years. Also among the low adherence group, 18 (54.5%) were <55 years as against 15 (45.5%) who were >/=55 years.

Also from the Chi Squared result p=0.339, the null hypothesis is rejected. Therefore, there is no evidence of association between age category and adherence level. Hence although there are differences between age category and the level of adherence, there is no statistically significant association between age and the level of adherence.

CHAPTER 5

5.0 DISCUSSION

Poor medication adherence is a significant barrier to attainment of positive clinical outcome among diabetic patients. The inconvenience of daily ingestion of too many drugs has been observed to constitute a hindrance to medication adherence among patients with chronic diseases in general and diabetes patients in particular(Mateo, *et al*. 2006).Results from the study revealed that sociodemographic factors of the respondents like marital status, occupation, educational level and religious background of the respondents didn't have any significantly association with adherence.

Majority of the respondents, constituting 64.2% had high adherence level. This was followed by medium and low adherence level with proportions of 22.8% and 13% respectively. The prevalence of adherence in this study is consistent with similar studies conducted at Southwestern Nigeria and Brazil were the prevalence were 60%, 59.7%and 78.3% respectively (Whiting *et al*, 2011). The poor adherence in this current study is also in line with the findings of a study carried out in France where poor adherence was 12% (Whiting *et al*, 2011, Mateo, *et al*. 2006).The rate of adherence found in this study was higher compared to a similar study conducted at the Korle Bu Teaching hospital in Ghana, where the prevalence was 38.5%(Mateo, *et al*. 2006). The adherence level found in this study was also greater than other studies conducted in Egypt where the adherence rate was 38.9%(Delamater, *et al*. 2001) and in Mexico the adherence rate was 41 % (Harris 2001).

However a study conducted in India found the incidence of non-adherence to diabetes management to be 75% but in this current study, the prevalence was found to be lower than that found in India. (Brownlee-Duffeck, *et al*, 2005), this study also used self-reports. This difference observed in the two studies might be due to the fact that respondents in the current study obtained free medical care and anti-diabetic medicines through the health insurance scheme and this could have influenced their good adherence behavior. The National Health Insurance Scheme (NHIS) in Ghana ensures that patients who are subscribers to the scheme have improved access to medical care and essential drugs.

Also in the studies reported by Delamater, et al.(2001) and Harris,(2001), non-adherence to a treatment regimen was significantly associated to the socio-economic position of the respondent and

a barrier to adherence may be due to the high cost of treatment. Also in this current study, the cost of treatment is minimized because diabetic patients recruited for this study were registered with the NHIS hence there was a reduced risk of the respondents not adhering to their treatment regimen. Previous studies conducted, identified prevalence of non-adherence to diabetes treatment to be 23%-77% using other methods of assessing adherence(Coleman, et al. 2005). The risk of getting diabetes complications is due to non-adherence to treatment regimen. Increase in the cost of health care occurs due to managing diabetes complications that occurs during periods of treatment and this decreases productivity and increases deaths from these complications.

Majority of patients enrolled in this study were females representing 176 (69.6 %) and the rest 77 (30.4%) were males. Out of this number 69.3% of the females had high adherence whiles 30.7% males had high adherence. This high adherence level among the female participants could be due to their high enrollment for this study. The difference of 38.4% between females and males with high adherence is statistically insignificant however poor adherence to anti-diabetic medication was found to be associated with the female gender as was cited in other studies. In a similar study conducted in India males predominated in that study population (Glasgow, 1991).

Majority of participants who had high adherence level, representing 139 (54.9 %) were less than 55 years and the remaining number of participants who had low adherence level representing 114 (45.1%) were more than 55 years old. At Mulago hospital in Uganda, a study conducted found almost one third of respondents (31.3%) between the ages of 36 to 50 years not adherent to their prescribed treatment regimens, this finding is not consistent with the result with this current study.

The results of this study also indicate that there is no evidence of association between age category and adherence level. Hence although there are differences between age category and the level of adherence, there is no significant association between age and the level of adherence.

Majority of the participants for this study representing 90.1% live with their family, 2.8 % live with their friends and 7.1% live alone. From the results participants living with their family had the highest adherence level (90.8%). In diabetes management, the role relatives of the patient play and the relationship that exist between them have a positive impact on the patient's treatment outcomes. It have been identified from numerous studies that patients adhere better to their treatment regimen when there exist improvement in the levels of unity and organization, reduced levels of misunderstanding and a good communication between them and their families.(Paes, Bakker &Soe-

Agnie, 1997). Also there is improvement in regimen adherence when there are increased levels of social support especially diabetes related support from the spouses and other members of the extended family (Makaryus& Friedman, 2005). Social support also serves to buffer the adverse effect of stress on diabetes management (Vermeire *et al*, 2005).

However in this study, there is no evidence of association between whom the patient stays with and level of adherence. The difference of 5.6% between living alone and living with friends as well as difference of 83.4% between living alone and living with family within the high adherence group is not statistically significant.

Results of this study also showed that 64.5% of the participants who were knowledgeable about their disease condition and the effects of defaulting their anti-diabetic medication were more adhering than those who knew nothing about their disease condition. In Brazil, a study conducted found that increase in the level of education of respondent to be associated to improve in antidiabetic medication adherence, and this finding is consistent to this current study.

There was a positive significant association between the level of education and adherence. This was consistent with other studies. Educated patients are more knowledgeable about the consequences of diabetes and the complications associated with diabetes and as such tend to adhere to their medications better.(Delamater, *et al*. 2001, Paes, Bakker &Soe-Agnie, 1997).

In addition, illiterates were unable to read effectively or understand the instruction provided by the health professionals and as such were not able to take their medications optimally. In this era of increase in the complexity of diabetes drug therapy, patients need to be educated to understand the condition diabetes and its management. Educating the patient on the disease condition helps improve adherence to therapy and health outcomes.

The duration that a patient has been diagnosed of diabetes plays an important role in medication adherence. The findings from this current study are consistent with a report by the World Health Organization (WHO), that points to the fact that respondents medication adherence is inversely proportional to the duration of being diagnosed with diabetes. Those patients with longer disease duration tend to be less adherent to treatment (WHO, 2003).

Diabetes is a progressive silent disease, and due to this fact lower rates of medication adherence is a matter of concern to health providers and worldwide and complications due to poor glucose control are likely to increase with time (Osterberg & Blaschke, 2005).

There was a significant association between how long the participant have been diagnosed with diabetes and adherence levels. From the results of this study, participants who had been diagnosed of diabetes for 3 years or less were found to adhere better to their antidiabetic medications than those who had been diagnosed for more than 3 years, hence adherence decreased with increased duration of disease diagnosis.

This finding is consistent with findings of a study by Whiting *et al*, 2011, which reported that patients were less likely to adhere to their medication with time, but inconsistent with the findings of some studies on chronic diseases which revealed that longer duration of the diseases resulted in good adherence(Delamater 2006; Morisky, *et al*. 1986). The finding of this study indicates that adherence is compromised with increased duration of diabetes because patient's attitude coping with the disease is reduced and their beliefs about medication effectiveness is also reduced, so they get tired of daily ingestion/ administration of anti-diabetic medications after years of suffering from the disease.(Whiting *et al*, 2011)

Educational level and the economic status can impact positively or negatively on the quality of life of the diabetic patient, as a result, on the level of metabolic control. Contentment with treatment and quality of life are positively associated with employment and a higher income. People with lower education level and the unemployed, have, in general, a lower satisfaction with life and are less appreciative with diabetes treatment, as well as having worse metabolic control (Makaryus& Friedman, 2005). In this study few participants were unemployed (70, 27.7%) with majority of the participants gainfully employed (183, 72.3%) [Table 4.1.1]. The high employment rate among the participants in this study may have impacted on the high adherence rate observed.

The 4-item modified Morisky adherence scale used to assess medication adherence might be linked with some limitations since it is a self-report method; however, there is no gold standard method for assessing adherence. The assessment of the patients' answers to the 4-item modified Morisky adherence predictor scale revealed that 64.2 % of the patients had high adherence with prescribed medications, whereas 22.8% had medium adherence and 13 % had poor adherence. The finding is

inconsistent with the outcomes of a study carried out in France, which revealed the following adherence levels: good adherence 39%, medium adherence 49%, and poor adherence 12%. (Tiv, Viel et al 2012)

CHAPTER 6

6.0 CONCLUSION AND RECOMMENDATIONS

6.1CONCLUSION

Majority of the participants recruited at the Diabetic Clinic of the Komfo Anokye Teaching Hospital for the study had high adherence level to their anti-diabetic medications. Sociodemographic factors like marital status of the respondents, occupation, educational level and religion of the respondents had no significant effect on their adherence to their anti-diabetic medication. Patients with knowledge of default consequences are more likely to adhere to their antidiabetic medications ($p=0.046$).

6.2 RECOMMENDATIONS

1. Strategies should be designed to help patients understand their drug regimens in order to improve on their adherence. These strategies will help prevent the complications of diabetes mellitus which are debilitating and if not prevented can increase the burden of the disease that is already on the increase.

2. Physicians and pharmacists should improve upon the areas of patient education, adherence counseling, communication between them and the patients, and medication selection bearing in mind cost.

3. Additional studies are needed to study the complications that exist between the rate of adherence, how frequent the patient visits the clinic and whether they are able to afford their prescribed drugs. These studies should involve large number of respondents so that the numbers in the various strata can be sufficient.

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APPENDICES

APPENDIX I SAMPLE OF STUDY QUESTIONNAIRE

A SURVEY ON ADHERENCE TO ANTI-DIABETICS, A CASE STUDY OF OUTPATIENTS ATTENDING THE DIABETES CLINIC OF THE KOMFO ANOKYE TEACHING HOSPITAL, KUMASI.

Dear Participant,

My name is Henrietta Owusu-Danso. I am conducting this survey as part of my MSc in Clinical and Social Pharmacy at the Kwame Nkrumah University of Science and Technology. This study seeks to find out how diabetics strictly adhere to prescribed medicines. Your completion of this questionnaire would contribute to the success of this research and would be highly appreciated. The information given in this survey will be treated with strict confidence. As you will notice you are not asked to include your name and address.

The questionnaire takes a few minutes to complete. Thank you for your time and participation.

SECTION A

Demographic Information

Please answer the following questions by ticking the box with the most appropriate option. Q1.

Gender: (a) Male (b) Female

Q2.Age: .....years

a)< 55 years b) 55 – 64 years c) ≥ 65 years

Q3.Marital status

(a) Married [ ] (b) Single [ ]

Q4. Religious status

(a) Christian (b) Moslem (c) Traditionalist

Q5. Occupation

(a) Civil servant [ ] (b) Retired worker (c) Businessman / woman [ ] (d) Unemployed[ ]

(e) Others specify.....

Q6. Whom do you live with? .....

(a) Alone (b) with family (c) with friends (d) other

Q7. Level of education

(a) No Formal Education (b) Primary (c) Secondary (d) Tertiary

SECTION B

Please tick the appropriate option (s)

Q8.Who told you that you were suffering from diabetes mellitus?

(a) Medical doctor (b) Pharmacist (c) Lab scientist (d) Others

Q9. How long have you been diagnosed of diabetes?

(a) Less than a year (b) 2 - 6years (c) more than 6 years

SECTION C

Q10. Can you please tell me the number of antidiabetic medications you are currently taking?

(1.) 1 (ii.) 2 (iii) 3 (iv) 4

Q11. How do you take your antidiabetic medications?_____

Q12. If you feel better, do you stop taking your medications?

(a) Yes (b) No

Q13. If you feel worse while taking your medication, do you stop taking your medications?

(a) Yes (b) No

Q14. Do you ever have problems remembering to take your antidiabetic medication?

(a) Yes (b) No.

Q15. Are there days that you forget to take your antidiabetic medicines?

(a) Yes (b) No

Q16. If yes, what do you do when you miss taking a dose of your anti- diabetic medication at the appropriate time?

(a) Take it as soon as remembered and if it is almost time for the next dose, take only that dose

(b) Forget the missed dose completely

(c) Take double or extra dose during the time of taking the next dose

(d) Others specify

Q17. Do you fast?

a) Yes b) No

Q 18.During periods of fast, what do you do?

(a)Take the medicine early in the morning with food like the way Muslims fast

(b) Abstain from food

(c)Take the medicine without food

(d) Don't take the medicine at all

Q19.How often do you fill your prescriptions?

(a)Every month

(b)Every two months

(c) Every three months

(d) Every four months

Q20. Do you sometimes fail to keep your clinic appointments?

(a) Yes (b) No

Q20. If yes, why? _____

Q22.When you come to the clinic and don't get medicine, what do you do?

(a) Buy from the pharmacy

(b) Forget about the medication

(c) Wait till the next clinic day

(d) Take the medication from an accredited pharmacy with a pharmacy card

Q23. Do you know the effects of not taking your medications?

(a) Yes (b) No

Q24.When you forget to take your medication, what happens or how do you feel during the period you forget

SECTION D

Q. 25. Do you eat oily or fatty foods?

(a) Yes (b) No (c) Sometimes

Q.26. Do you eat salty foods?

(a) Yes (b) No (c) Sometimes

Q. 27. Do you exercise?

(a) Yes (b) No (c) Sometimes

APPENDIX II ETHICAL CLEARANCE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICAL SCIENCES / KOMFO ANOKYE TEACHING HOSPITAL
COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

Our Ref: CHRPE/AP/110/14

10th April, 2014.

Mrs. Henrietta Owusu-Danso
Medicine Pharmacy
Komfo Anokye Teaching Hospital
Post Office Box 1934
KUMASI.

Dear Madam,

LETTER OF APPROVAL

Protocol Title *"Adherence to Anti-Diabetics a Case Study of Out-Patients Attending the Diabetic Clinic at the Komfo Anokye Teaching Hospital, Kumasi."*

Proposed Site: *Diabetic Clinic, Medicine Directorate, Komfo Anokye Teaching Hospital, Kumasi.*

Sponsor: *Principal Investigator.*

Your submission to the Committee on Human Research, Publications and Ethics on the above named protocol refers.

The Committee reviewed the following documents:

- A notification letter of 6th February, 2014 from the Komfo Anokye Teaching Hospital (study site) indicating approval for the conduct of the study in the Hospital.
- A completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Proposal.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, renewable annually thereafter. The Committee may however, suspend or withdraw ethical approval at anytime if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you Madam, for your application.

Yours faithfully,

Osomfuor Prof. Sir J. W. Acheampong MD, FWACP
Chairman

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