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FACTORS ASSOCIATED WITH NON-ADHERENCE TO ANTI DIABETIC MEDICATIONS AMONG DIABETIC PATIENTS IN SOME SELECTED POLYCLINICS IN THE ABLEKUMA SUB METROPOLITAN, ACCRA, GHANA.

BY

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DECLARATION

Azumah Abdul-Tawab, proclaim that this research is as a result of my original work under supervision and all works used for this research has been duly acknowledged.

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Date

DEDICATION

This work is dedicated to my family, friends, colleagues and bosses at work for the support and sacrifice they put in place to make this work a success.

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ABSTRACT

Non- adherence to anti diabetic medication amongst diabetic patients has become a global issue. This has led to so many co-morbidities associated with diabetes hence increasing the morbidity and death related to it. Despites these issues studies examining non-adherence to anti-diabetic medications amongst type 2 diabetes mellitus (DM) patients is rare. This study sought to examine non-adherence to anti-diabetic medications amongst type 2 DM patients in some selected polyclinic in the Ablekuma Sub-Metropolitan namely Mamprobi and Dansoman polyclinics. Using a structured questionnaire 179 type 2 diabetics were interviewed. Non-adherence to medications was measured using the morisky medication adherence scale. The results showed that about 70.4 % had poor glycaemic control with their fasting blood sugar (FBS) above 7.0mmol with prevalence of non-adherence being 66.5 % which means that most of the patients had poor adherence and this has negative implications on the management of patients with diabetes. There was significant association between non adherence to medical regimen and religion ($p=0.002$), educational level ($p<0.001$), occupation ($p<0.001$) and monthly income ($p<0.001$) but there was no significant linkage with age, sex and marital status. In addition, religion, occupation, educational background and income had significant association with non-adherence to medication but there was no significant association between marital status, age, sex. This study showed that non-adherent patients had a 1.26 increased chance of having poor glycemic control (i.e. FBS of more than 7. 0mmol.) due to non-adherence. Finally, the study showed that non adherence increased the chance of having poor glycemic control.

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ADA	-	American Diabetes Association
DM	-	Diabetes Mellitus
IDF	-	International Diabetes Federation
IDDM	-	Insulin Dependent Diabetes Mellitus
MMAS8	-	Morisky Medication Adherence Scale 8
NIDDM	-	Non Insulin Dependent Diabetes Mellitus
OPD	-	Out Patient Department
T2D	-	Type 2 Diabetes
WHO	-	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Diabetes mellitus (DM) is a disease of metabolic origin and has become a global concern owing to the increase in morbidity and mortality associated with the disease (WHO, 2016). Despite this adherence to anti-diabetic medication is still low especially in developing countries like Ghana (Oputa & Chineye, 2012).

In Ghana there are "interventions" like the running of special diabetes clinic, the formation of diabetes groups and improved diabetes (Arifulla, John, Sreedharan, Muttappallymyalil, & Basha, 2014). The aim of every management instituted by a health provider is to achieve desired outcome and also to minimize complication as part of the whole spectrum of the disease management.(Jing et al 2008).

The main aim of diabetes management is to provide individuals with self-care skills to manage their condition and to help them live an independent lifestyle. (Abioye-Akanji, 2013).

To enable an individual to achieve this goal a set of coordinated activities must be instituted which include: education on self-management, regular monitoring of blood glucose level, exercise, administration of medication, appropriate diet, and regular visit to the health facility (Evert *et al*., 2014).

Other terminology used interchangeably in medical practice is compliance which according to Khan et al., 2012 can be defined as the extent to which a patient's behavior in terms of taking medication, executing the lifestyle changes, undergoing medical test or keeping appointment with the physician coincides with the healthcare provider's recommendations for health and medical advice.Noncompliance to medical therapy in patients with chronic illness is an ever

present and complex issue in management. Non- compliance is a fast growing trend which has the ability of negatively affects benefits of treatment and intervention. (Haynes et al, 1997, Hornes R. 1997).According to The World Health Organization (2003) non-adherence to medications is a major problem and is on the rise resulting in serious consequences and complications associated with disease.

Delamater 2006 defined adherence as an active, voluntary and collaborative involvement of a patient in a mutually acceptable behavior to produce a certain therapeutic desire outcome.

Adherence to anti diabetic agents has shown to improve good glycemic control and also results in improved long term prognosis of the disease.(Wens et al., 2005).

Research conducted by Vermeire et al 2009 showed that there is low compliance to therapy amongst type 2 diabetics.

According to Shama and Barakat, 2010, despite the availability of therapy compliance is still low amongst diabetics.

The problem of non-compliance in diabetics is multifactorial and it can be those related to the patients, the health provider, therapy related, disease related and socioeconomic status related (David, 2012).

However reports still show that adherence is low amongst type 2 diabetes patients (IDF, 2014). According to Glasgow (1991) most of the previous studies on adherence to anti diabetic medication showed low adherence pattern to both pharmacotherapy and other aspects of diabetic care. Thirty to fifty percent of the patients do not adhere to medication resulting in sub-optimal treatment (Adisa, Alutundu B. M., & T., 2009). Patient-centered factors include socio-demographic (age, gender and educational level) factors, psychological factors including

motivation towards therapy taking, patient-prescriber relationship and patient knowledge (Glasgow, 1991).

Therapy-related factors include route, type and duration of treatment, complexity of treatment especially as patients may be on multiple medicines, cost of medication especially if co-payment is an issue and adverse effects (Rwegerera, 2014). Healthcare system factors include availability and accessibility of health care, and the health provider-patient interactions (Hutchins, 2011).Non adherence accounts for majority of the cases of poor glycemic control with other factors like treatment failure accounting for a minority in developing countries and these results in high morbidity and mortality associated with diabetes (IDF, 2014). Thus, studies that investigate non-adherence to therapy is of paramount importance to provide information needed by health managers in revising or introducing new interventions to help curb the increasing numbers of non-adherent diabetic patients. Thus, studies that investigate non-adherence to diabetic medications is of paramount importance to the Health sector of the country. Such studies will inform management decisions aimed at revising or introducing new interventions to help curb the increasing numbers of non-adherence diabetic patients, complications like cardiovascular problems, loss of nerve sensation, renal failure, problems with vision, sexual problems, and diabetic foot ulcer results in high morbidity and mortality associated with diabetes mellitus (Jackson, Adibe, Okonta, and Ukwe (2015).

1.2 Problem Statement

In 2014, there were 422 million adults (8.5% of adult population) living with diabetes mellitus (DM) (WHO, 2014). Interestingly, global projections points to a rise in the cases of DM with over 65% of the cases occurring in developing countries (e.g. countries in sub-Saharan Africa), a continent which also has high level of communicable diseases and non-communicable diseases

Ogbera and Kuku (2012). Diabetes was said to have caused about 1.5 million deaths in 2012 and mortality is still increasing (WHO, 2016). It is a chronic condition that needs long-term medical management both to control its problems and reduce its development of complications. According to the International Diabetes Federation, 2013 Ghana has a national prevalence of 3.35%. In Ghana the cases of diabetes is gradually rising with an estimated 266,200 adults having diabetes with about 4790 deaths associated with diabetes and its complication as at 2015.(WHO 2016).

Patient adherence to therapy is poor, mostly in cases of chronic disease. Low adherence is an emerging problem, and greatly undermines the positive effect of medical therapy. Following treatment plan is likely to optimize care and substantially enhance benefit (Whiting, Hayes, & Unwin, 2003). Medical non-adherence has been cited as a big public health issue which puts enormous monetary pressure on health system budget. About 40–50% of patients in the USA are non-adherent and that costs about 100 billion dollars, resulting in 10% of hospitalization and 23% nursing home clients (Donovan, 1992) . The medical and financial problems of non-adherence tend to move together, but are specific to the therapeutic field and drug concerned. Non-adherence to a medication which is vital to the stability of important physiological functions results in serious complication as compared to medications used for symptomatic relief (Vermeire et al 2005). Oputa and Chineye (2012) found out there is a higher risk of dying from diabetes and its complications in middle age people in poor countries as compared to rich countries due to non-adherence to therapy. Non-adherence accounts for majority of the cases of poor glycaemic control with other factors like treatment failure accounting for a minority in developing countries and these results in high morbidity and mortality associated with diabetes

(IDF, 2014).Strict adherence to therapy results in better outcomes according to studies done by Whiting et al. (2003).

Non-adherence to diabetes medication can results in failure leading to poor treatment outcomes and complications such as cardiovascular problems, loss of nerve sensation, eye problems, renal failure, sexual problems and diabetic foot ulcer leading to amputation.(Jackson et al. 2015) due to poor sugar control as a result of non-compliance to medications IDF (2015) showed that development of complication is faster in patients who are non-compliant and this leads to increased hospital stay and mortality. Medication adherence is therefore crucial as an integral component in diabetes management hence it is important to identify the factors that affect non-adherence to anti diabetic medication.

The main aim of this study was to examine factors associated with non-adherence to anti diabetic medical regimen among type 2 DM patients at Mamprobi and Dansoman polyclinics.

1.3 Justification

The issue of non-adherence has always been the headache of researchers and health providers and hence a lot of time and energy has been invested to under the underlying cause of it but to no avail. Researchers are having a hard-time tackling this issue because; patient's attitude to treatment is quite challenging to deal with. Ample attention should be given to this non-adherence issue to understand the patient's attitudes and why they do not follow their treatment regimen (Emslie-Smith , Dowall , & A, 2003).

With regards to management of chronic disease conditions, non-adherence to therapy is a big issue worldwide where adherence is about 50% of the of the treatment regimen whiles that of life style modification is lower (Barber, 2004). Devotion of time and energy is mostly needed in the

management of chronic condition and the management of diabetes is one of the demanding group (Trostle , 1988).Management of diabetes involves routine measurement of one's blood glucose, lifestyle modification and the timely administration of prescribed medicines (Trostle, 1988). Research have showed that good sugar control is achieved by adhering to medications, diet, and exercise minimizes the chances of developing chronic problems (Coleman 2005).

Diabetes, needs long term treatment otherwise this may lead to many complications which can be acute like hypoglycaemia, diabetic ketoacidosis, or non-kenotic hyperosmolar coma or chronic like heart disease, kidney diseases, and eye problems hence optimal management of diabetes, as well as modification of lifestyle like cessation of smoking, drinking of alcohol and good body weight is important. These problems influence the well-being of the patient, raise the chance of death among patients and bring a greater burden on the economic cost (Peyrot, Mark, Rubin, & .K, 2010). To reduce or decrease the health burden of the disease on the health system, diabetic patients are advised to be disciplined with their treatment regimen (Coleman 2005).The purpose of this study is identifying the factors that lead to non-adherence to medication in diabetic patients at Mamprobi and Dansoman polyclinic with the purpose of discovering the loopholes of management in order to aid stakeholders to provide excellent care to patients, ensuring they are adhering to the treatment regimen and to also investigate how non-compliance affects glycaemic control in diabetics.

1.4 Conceptual Framework

This framework (Fig. 1) illustrates the relationship between patient-centred factors, health delivery system factors, management-associated factors, disease-associated factors and adherence , as well as the inter-relations between patient factors and disease factors, socio economic factors and disease factors, socioeconomic factors and health system factors and

patient factors and health system factors. The framework shows how patient centred factors like age or higher educational level can influence adherence positively or even negatively as shown from other studies. Similarly, therapy associated factors like treatment complexity and the period of treatment has been shown to have a linkage to medication adherence, as it is noted that the longer the duration the reduced odds of adherence, and also large pill burden might negatively affect compliance as patients will get fed up of taking many pills for a long time. The relationship between health system factors like waiting for long at the clinics can turn to affect compliance negatively. Furthermore the framework shows us the effects that socio-economic variables like cost and social support have on patient compliance. For instance, elderly patients with good social support turn to have good compliance and likewise patients who acquire medication or who have their treatment cost absorbed by any form of insurance turn to have good compliance than those who pay from their pockets. Last but not the least, the effects of diseases factors like the severity and symptoms are noted to affect compliance, for instance, severe and symptomatic stages of a disease should be determining factor for patients to comply on therapy. However, the reverse could be true as some patients might just abandon the treatment if symptoms are worse with the thinking that the therapy is not working for them all together.

It is also stated in the framework how patient factors like age, educational background and patient beliefs can affect the disease factors like symptoms and severity. For instance, younger diabetic patients only appreciate the disease when it presents them with symptoms that are deemed severe and that can equally be due to the educational level of those patients to apprehend the disease and its symptoms. Also, a relationship can exist between patient socio-economic factors like income and social support and other factors such as disease factors, for instance good social support has a positive effect on disease severity and likewise improves symptoms.

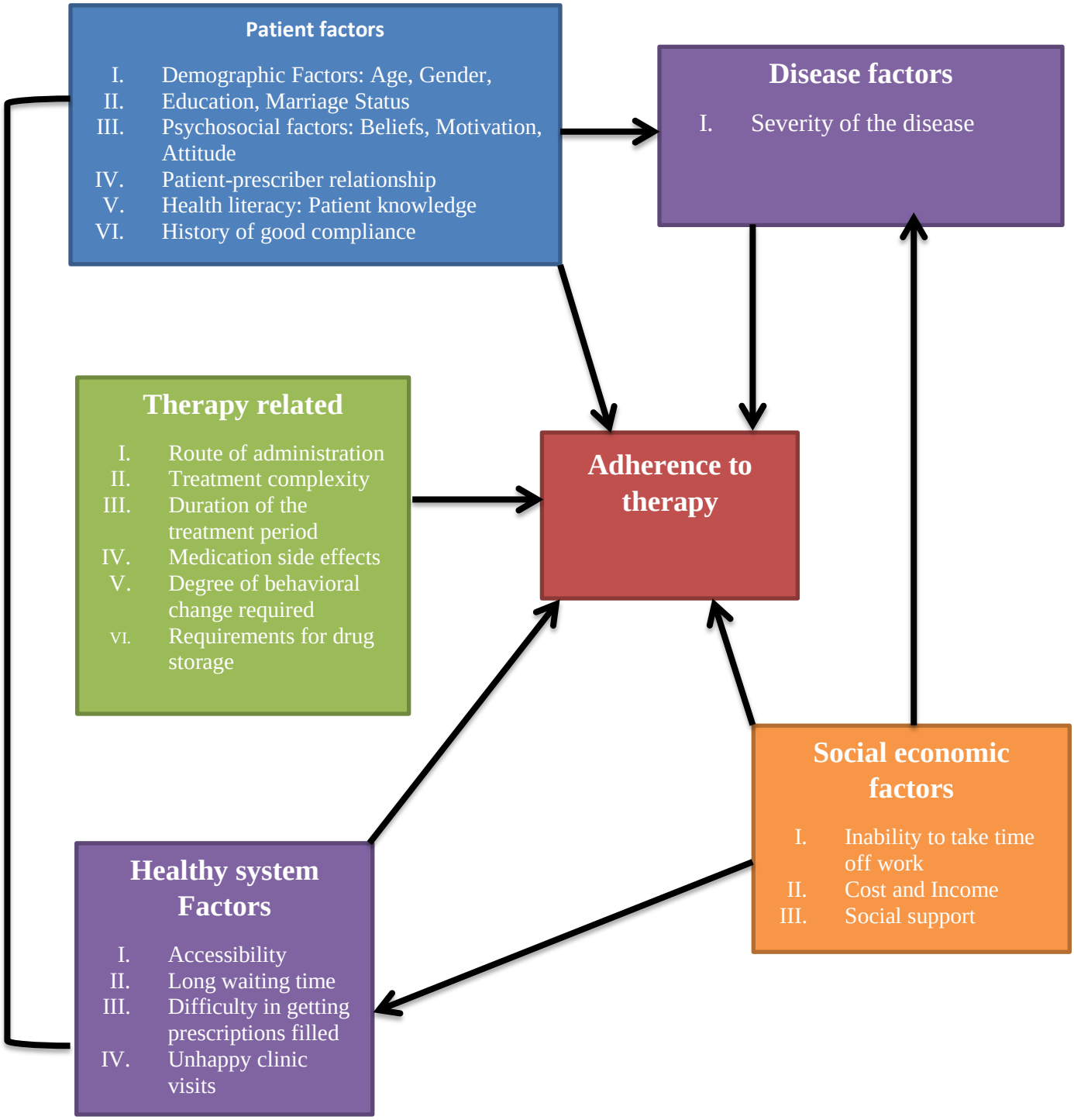

Figure 1: Conceptual framework showing how the various factors affect adherence to anti diabetic medications amongst type 2 diabetics

1.5 Research Questions

1) What is the prevalence of non-adherence to anti diabetic medication regimen among type 2 DM patients who attends Mamprobi polyclinic and Dansoman polyclinic?

2) What are the factors that influence non-adherence to medication among type 2 DM patients?

3) What is the relationship between the factors that affect non-adherence to therapy and glycemic control?

1.6 Objectives

1.6.1 General Objective

To examine factors associated with non-adherence to medication regimen among type 2 diabetes mellitus patients at Mamprobi polyclinic and Dansoman polyclinic.

1.6.2 Specific Objectives

1. To estimate the prevalence of non-adherent type 2 diabetics
2. To determine the factors that influences non-adherence to medication amongst type 2 diabetes mellitus patients.
3. To determine the relationship between non-adherence to therapy and poor glycemic control

CHAPTER TWO

LITERATURE REVIEW

According to WHO, diabetes is defined as "a metabolic disorder of multiple etiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in the insulin secretion, insulin action, or both".

Insulin is made by the pancreas whose function is carrying sugar from the blood stream to the cells to be used as energy. The problem associated with insulin release leads to increase glucose accumulation in the body leading to hyperglycaemia.

Diabetes usually present with symptoms like polydipsia (excessive thirst), nocturia (excessive urination at night more than 4 times), frequent urination, impaired vision, unexplained loss of weight. They can also present as emergencies like diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemic state (HHS). Longstanding hyperglycemic state can lead to complications like blindness, chronic renal failure, and/or reduced peripheral nerve sensation leading to increased risk of foot sores, cutting of the body parts, charcot joints and sexual problems (Holt, 2004). Complications from diabetes leads to loss of vision, renal failure and amputations and these can lead to poor health of the client (Peyrot et al., 2010).

Two main types of DM exist namely a. type 1 also called the insulin dependent diabetes mellitus (IDDM) and the type 2 also known as non- insulin dependent diabetes mellitus (NIDDM) (Thent, 2013). IDDM is due to lack of insulin as a result of the pancreas not making insulin and NIDDM results from a resistant to insulin at the receptor sites, insulin is produced but is unable to work (Parving et al., 1992). According to Buse (2011), NIDDM is the commonest type.

According to Turk and Rudy (1991) the diagnosis of diabetes can be made using either the fasting blood sugar or 2 hours post prandial glucose:

1. Fasting plasma sugar level ≥ 7.0 mmol/l (126 mg/dl)

2. Plasma sugar ≥ 11.1 mmol/l (200 mg/dl) two hours after a 75 g oral glucose load as in a glucose tolerance test.

Another way of diagnosing is the use of symptoms of increased glucose in the body and random blood sugar ≥ 11.1 mmol/l (200 mg/dl) and glycated hemoglobin (Hb A1C) ≥ 6.5% (Bron, Wilson, & Fleck, 2014). Glycated hemoglobin (HbA1c) according to Spraul, Sonnenberg, and Berger (1987) is the gold standard for assessing long-term glycemic control. This should be assessed every 3 months.

2.1 Global burden of diabetes

According to (WHO, 2016), about 422 million people worldwide have diabetes and about 90 % have diabetes type 2. Leone, Coast, Narayanan, and De Graft Aikins (2012) 8.2% of global deaths were directly associated with diabetes and its complications. Hyperglycaemia which is one of the complications of DM is ranked high as risk factor for premature death with other risk factors like cardiac diseases and tobacco usage, and a common cause of death in both sexes with about 1.5 million deaths linked to diabetes in 2012 (IDF, 2015). According to the WHO by 2030 DM will be in the top ten (10) causes of mortality in the world. Also according to WHO it is estimated that about 80% of DM patients stay in poor countries and developing countries like Ghana. The cases of DM have been on the rise in Africa with an estimated rate of 6% with about 25 million adults having the disease WHO (2016) with about 80% of the death associated with diabetes occurred in Africa (WHO, 2013) .According to the IDF (2015) Ghana has a national

prevalence of 3.35%. In Ghana the cases of diabetes is gradually rising with an estimated 266,200 adults having diabetes with about 4790 deaths associated with diabetes and its complication as at 2015 (WHO, 2016).

2.2 Management of type 2 diabetes

Type 2 diabetes (T2DM) is a major cause of premature morbidity and mortality particularly from cardiovascular disease (CVD), blindness, amputations and renal failure (ADA, 2012).Therefore, one of the major aims in the management of type 2 DM is to produce near to normal glucose levels in order to avert the development of diabetic complications (Robert et al., 2013). Alsoworth noting is the contribution of heart disease to the premature mortality among diabetes. Ozougwu (2013) stated that DM can be managed using pharmacological agents like oral hypoglycemic agents (OHAs) or insulin and non-pharmacological agents such as dietary changes and lifestyle modifications.

2.2.1 Pharmacological treatment of DM

Pharmacological treatment of DM is based on two principal abnormalities namely impaired insulin secretion and insulin resistance (Moulin et al., 2007).Hence according to Dworkin et al. (2010) any medication given should target one or both abnormalities hence combination of different hypoglycemic agents is required in some cases. As result, prescribed hypoglycemic drugs aim at one of the abnormalities above and to effectively address both abnormalities, combination of different hypoglycemic agents is required (Dworkin et al., 2010). Hypoglycemic agents used in the management of hyperglycemia include sulphonylureas andglinides which stimulate the secretion of insulin directly.

2.2.1.1 Insulin therapy

Good glycemic control help reduce the possibility of developing complications. Insulin stimulates synthesis of glucokinase and moderates gluconeogenesis. Socioeconomic status of an individual contributes to availability or in accessibility of insulin in health facilities according to Hall, Thomsen, Henriksen, and Lohse (2011).Some notable side effects of insulin include weight gain, allergy, skin changes due to injection site (lipodystrophy), hypoglycemia etc. According to Rosenstock et al. (2005) insulin is mostly administered when targeted glycemic control is difficult to achieve on oral hypoglycemic agents only. There is progress damage of beta cells in

type 2 DM thus insulin will have to be given to get good sugar control and hence must be given in patients on hypoglycemic agent who have poor glycemic control (Horvath et al., 2007)

Horne and Weinman (1999) showed that non-adherence was high in patients on insulin compared to those on oral hypoglycemic agents.

2.2.1.2 Oral Hypoglycemic Agents

Oral hypoglycemic agent are used in the management of diabetes mellitus by reducing the glucose levels in the blood and also used in cases where there is resistance or defect in insulin secretion by the pancreatic beta cells. OHA's commonly used include sulphonylureas and gliberclamide which stimulate the secretion of insulin directly, others like thiazolidinedione and metformin improve the sensitivity of insulin and glycosidase inhibitors reduce the rate of carbohydrate absorption. Robert et al, 2010 states that the first drug of choice is metformin for all patients of type 2 DM worldwide. Some adverse effects of metformin according to Richard (2005) include weakness, easy fatigability, shortness of breath, nausea etc.

2.2.2 Non-Pharmacological Management of type 2 DM

According to the ADA (2012) the essentials non pharmacological therapy of diabetes include individual-care program involving team based care and patient education, monitoring of glycemic control, dietary management (food planning), physical activity.

2.2.2.1. Dietary Management

A conventional dietary plan should be made up of 60 – 65% carbohydrate, 25- 35% fat, and 10-20% protein with little or no alcohol (IDF, 2015) .

Therefore, a dietary plan for such patients should include the intake of unfortified foods e.g. vegetables, whole grain cereals, root tubers like yam and fruits in place of fibre supplements. Tuomilehto et al. (2001) type 2 diabetics should take mono and polyunsaturated fats as replacement for saturated fats. In addition, Tuomilehto et al. (2001) recommends that little amount of sugar can be a part of a healthy eating plan and non-nutritive sweeteners can be used in place of high sugar drinks and diets like soft drinks.

Protein sources like seafood, lean meat, low-fat dairy products, legumes and nuts are suitable for diabetes (Norris, Engelgau, & Narayan, 2001).According to Peterson and Karen (1999) diabetes are advised to avoid foods that contain a lot of salt like soy, oyster and fish sauces.

2.2.2.2 Physical Activity and Exercise

Physical activity helps makes insulin more sensitive and hence improving glycemic control and also weight management (Boulé, Haddad, Kenny, Wells, & Sigal, 2001). Hu et al. (2001) concluded that there is a reduction in complications and death in diabetic patients who have engaged in regular exercise for duration of 12-14 years.

A health goal of 150 minutes of moderate exercise a week is recommended in diabetes according to Boulé et al. (2001).These exercise include brisk walking, tai-chi, cycling, aerobics, jogging, lap-swimming, cycling uphill (Reid et al., 2010).However Reid et al. (2010) also said exercise should be tailored to suit patients age, gender, social, physical and economic status.

2.3 Adherence to anti diabetic medication

Adherence according to Khan AR et al. (2012.) can be defined as the limit to which a patient's behaviour in terms of following prescribed medication, modifying lifestyle, undergoing medical investigations or keeping appointment with the health provider in line with what the health care provider gives.

Several forms of non-adherence or non-compliance exist namely primary, non-persistence, non-conforming. Primary non-adherence is the type where the provider gives prescription to the patient and the medication is either bought or started (Gellad, Grenard, & Mcglynn, 2009).

Non-Persistence is the case where the patient stops the medication without the knowledge of the provider or medical advice. This usual occurs because of unwanted effects of the drugs or patient feeling the sugar is well controlled and doesn't see the need to take medication. Other factors like miscommunication between provider and patient, accessibility to medication, price of medication can lead to non-persistence non-adherence. Non-conforming non-adherence happens when the client takes the medication the way he or she wants different from what is prescribed by the provider. That includes skipping medication, taking medications at an inappropriate times or wrong dosage, using wrong route of administration (Osterberg & Blaschke, 2005).

According to WHO (2003) patient's knowledge on condition and also encouragement from health workers and guardians impacts the positive outcome of management and helps improve

adherence. Harris, Cowie C.C., and Howie (1993) showed that defaulting treatment of chronic disease condition management have a bad impact on the management outcome and this is a big concern. Patients with chronic conditions do not comply with management regimen as compared to those with acute conditions because in acute cases effects of the treatment regimen is felt fast but in chronic illness it takes a while before improvement is seen hence most patients with chronic illness are likely to stop their medication after six (6) months from start of treatment (Haynes, Taylor D.W., & Sackett, 1979).Morris, Voight, and Teslovich (2012) showed that poor adherence to treatment results in serious health outcome and death.

Non-compliance to medical regimen results in poor glycemic control that leads to vascular problems like heart attack, cerebrovascular accidents, chronic kidney diseases and retinopathy as showed by (Munger, Van Tassell, & LaFleur, 2007). Fedrick and Justin-Temu (2012) found that non-adherence is the commonest reason for developing complications of diabetes in all age groups and race and that adherence is very low in a lot of people regardless of their disease stage, age or race.

According to Luyster and Dunbar-Jacob (2011)non-compliance to medication place a very heavy burden on health care usage .Also Munger et al. (2007)found out that one third to two third of all hospitals admission were a result of non-compliance.Morisky et al. (1986) showed that non-compliance can be measured using medication organizations such as pill usage, and history of refills ie crosschecking history refill date and amount of drugs given out as shown on the printed labels.

Some of the reasons why people don't adhere to medication include forgetfulness, dose omission, price of medicines, and side effects of medicines (Munger et al., 2007).WHO

identified some factors that affect compliance and has categorized them into social/economic factors, medical condition related factors, therapy-related factors, and patient behaviours.

2.4 Some factors that influence adherence to anti diabetic medications in diabetic patients.

2.4.1 Demographic factors and non-adherence

There is enough documentation linking non-adherence with demographic features like age, gender, educational background, marital status, occupation amongst diabetes according to Naranjo, Fisher, Arean, Hessler, and Mullan (2011) showed that it was less likely for African and Mexican diabetic patients to check their sugars regularly.

2.4.1.1. Age

Mandewo, Dodge, Chideme-munodawafa, and Mandewo (2014) showed that most older diabetics are likely not adhere to medical regimen because they have problems with injecting themselves with the insulin or because they stay alone and most often have problems with vision are likely to take over or under dose of medication and this results in non-adherence. Increasing age has been liked with non-adherence and is usually due to poor or reduction in reasoning or cognition (Borges, Ferraz, & Chacra, 2014). Kalyango. J, Owino E, and A. (2008)study concluded that non-compliance is high between people between ages 36-50 years.

2.4.1.2 Sex

Lindberg, Ekstrom, Moller, and Ahlner (2001)stated there are several studies to show that gender has a strong link with adherence. Adisa et al. (2009) said, there is a higher chance of males not complying to medications in relation to the female diabetic patients as the males are likely to forget about their medications and this was backed by studies by Balbay, Annakkya, and Arbak (2005) and Choi-Kwon, Kwon, and Kim (2005). Other studies have shown otherwise and these

include Kalyango. J et al. (2008) and Caspard, Chan, and Walker (2005). Spikmans et al. (2003); Senior, Marteau, and Weinman (2004) also found no link between sex and non-compliance.

2.4.1.3. Religion

Mandewo et al. (2014) said that most religious patients believe that God will cure their diabetes and hence didn't take their medication. Some patient resort to herbal preparation to cure their ailments.

2.4.1 4. Educational status

Education either high or low has a bearing on compliance in type 2 DM (Jin J et al., 2008). Lack of education makes it difficult for client to understand their condition and also the reason why they should take medication. Martin L, Williams , Haskard , and DiMatteo (2005) reported that people with little or no education find it difficult to appreciate their condition and these results in low levels of compliance. Gimenes, Zanetti, and Haas (2009) proved that adherence was very high in people who are educated and this was confirmed by other studies like Ghods and Nasrollahzadeh (2003) and Jin J et al. (2008).

2.4.1.5. Marital Status

Single usually have poor glycemic control due to no adherence compared to married people (Ali, Bullard, & Barker L., 2012). Cooper, Carpenter, and Katona (2005) concluded that marriage has a good influence on adherence due spousal support and constant reminder by spouse. Kaona, Tuba, Siziya, and Sikaona (2004) showed that marital status and non-adherence has no association.

2.4.1.6. Occupation

Office workers and traders are more likely to be complying with medication and unemployed patients are not likely to take medication (Adisa et al., 2009).

2.4.2 Social factors and non-adherence

Mandewo et al. (2014) found out clients who receive social support from their children and family members in monetary, material and emotional terms are more likely to be compliant on medication however clients who rely on governmental support do not adhere to medication. Several studies confirmed this statement including Seo and Min (2005), Kyngas H and M. (2001) and Thomas LK, Sargent RG, and PC. (2001).

2.4.3 Health facility based factors and non-adherence

According to WHO (2013) the following health facility factors can influence adherence and these include lack of access, longer waiting time, attitude of staff, inability to secure prescribed drugs etc. According to Saboor Aftab, Kumar, and Barber (2013) availability of essential drugs is low in middle and low income countries.

2.4.3.1. Distance

Travelling long distance to attend clinic or to buy medication is will be a problem for patients who live in the rural areas as studies by Mandewo et al. (2014) showed. Mandewo et al. (2014) also showed that lack of standardized syringes lead to wrong dosage. Shortages of standardized syringes in the villages pose a challenge to them and they have to travel long distance to secure them and this makes adherence an issue.

2.4.3.2. Long waiting time

Mandewo et al. (2014) showed that there was no linkage between waiting time at the hospital and compliance. It was also noted that patients who spend shorter time at private facilities didn't have any influence on compliance.

2.4.3.3. Attitude of Staff

The way staff treats patients has a role in adherence. Kalyango. J et al. (2008) showed that speaking rudely to patients and other rude behaviours have a negative influence on adherence. Martin L et al. (2005) showed that good rapport between patient and health provider improves compliance.

2.4.4 Individual factors and non-adherence

A lot of individual factors plays a role in patients being non-compliant to medication and this include forgetfulness, pill burden, financial constraints and travelling away from home.Garber et al. (2013) showed that the following individual factors have a bad impact on adherence and these are lack of responsibility, lack of motivation, loss of hope in the diabetes therapy and negative effect of side effects. Patient's knowledge on condition and he various regimen and side effects of medication plays a greater role in influencing adherence.

Non-adherence can be due to patients thinking that most chronic illness can be cured using herbal medication and they tend to use them instead of following their prescribed drugs till they develop complication (King, 2008). Wabe, Angamo, and Hussein (2011) showed that diabetes who take alcohol may refuse to take their medication or may forget to take their medication due to the influence of alcohol .Most patients get depressed after being diagnose with chronic illness and this leads to forgetfulness due to impaired memory (Saboor Aftab et al., 2013).

2.4.5 Drug related factors and non-adherence

2.4.5.1. Cost of drugs

Anti-diabetic agents are expensive especially insulin and make it difficult for patients to buy and this leads to non-adherence. The good is that patients on NHIS are able to enjoy free supply of some of the medications but most patients do not have NHIS (Kalyango. J et al., 2008).Financial constraints still play a critical role in adherence to medication as a study by Wabe et al. (2011) showed that about 37% of clients who are non-compliant have financial issues. According to Mandewo et al. (2014) most patient are unable to afford medical services and prescribed drugs and this leads to non-adherence.

Chapman et al. (2005) found out that patients on multiple drugs for multiple conditions which is common in diabetes decide to purchase the less expensive drugs which is usually the anti-diabetic agents and this leads to non-compliance.

Studies done by Álvarez, Estrada, Goez, Carreño, and Mancilla (2013) and Trivedi, Gaurav, and Saxena (2016); concluded that the cost of managing diabetes pose a big financial impact on the budget of individuals and the country since it involves continuous monitoring of sugar and taking medication, in the Ghana an average of $123 is spent monthly on diabetic patients.

2.4.5.2 Side Effects of Drugs

Fischer et al. (2010) noted that the most common side effects experienced by patients taking anti diabetics are those related to the gastrointestinal tract like nausea, vomiting, and diarrhoea and this often leads to non-adherence. It has been noted that patients who have adverse effects from medications are unlikely to take them again. Richard (2005) showed that patients who were not compliant on medication were mainly due to side effects of the medications. Some studies found

no association between adherence and side effects of medication as studies by Kalyango. J et al. (2008) showed.

2.5 Glycemic control and non-adherence

Glycemic control is measured using glycated hemoglobin which gives a picture of the sugar control over 3 months. Egede, Gebregziabher M, Echols C, and CP. (2015) found out that patients who are compliant on medication have low glycated hemoglobin. Studies have showed that non-adherence is associated with poor sugar control and subsequent high glycated haemoglobin. Poor glycemic control can be defined as gylcated hemoglobin greater than 7.5% (Pladevall et al., 2004). A study done by Imad et al. (2015), concluded that 37% of males and 19% of females who had poor glycemic control where found to be non-compliant.

In summary several factors including patient factors, disease factors, socio economic factors, health system factors and therapy related factors play a significant role in adherence to anti diabetic medication and also non-adherence has been shown to have a negative influence on sugar control.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This study was a cross sectional survey and this was done by administering 179 structured closed ended questionnaires to all type 2 diabetes patients who had met the inclusion criteria.

3.2 Study Area

This study was conducted across 2 polyclinics that run special diabetes clinics (Mamprobi and Dansoman polyclinics) in Ablekuma-South sub metro of the Accra Metropolitan Area. These polyclinics have on average of 20-30 diabetic patients attending the facility every week. The Ablekuma–south Sub-Metro is one of the 10 sub-districts of the Accra metropolitan Area – mainly made of Korle-bu, Mamprobi and Dansoman.

3.3 Study Population

The targeted populations was diabetic patients' aged 18 years or more who attended the diabetes clinic at Mamprobi polyclinic and Dansoman polyclinic.

3.3.1 Inclusion criteria

The inclusion criteria included patients (both sexes) who were greater than 18 years, having been diagnosed of diabetes over a period of 6 months and have clinical records (is a known patient at the facility) at the facilities to be studied and also on anti-diabetes medications for glycemic control.

3.3.2 Exclusion criteria

These include patient (both sexes) less than 18 years, who were on admission, type 1 diabetes pregnant or diagnosed less than 6 months and finally those who have no clinical records and not medication.

3.4 Study Variables

3.4.1 Dependent Variable

The dependent variable or outcome variable of this study was adherence to anti diabetic medication which was measured using the morisky 8 medication adherence scale.

3.4.2 Independent variables

The independent variables to be measured include: age, sex, marital status, religion, educational background, marital status, side effects of medication, duration of disease, accessibility, attitude of health workers, cost, work schedule and social support system.

3.5 Sampling Technique

The total sample size was calculated and shared in equal proportions for ease of distribution and to enable fast collection of data required for the study. Finally, samples were collected on clinic days from clients who met the criteria till all required samples were collected.

3.6 Sample Size

Adopting sample size indicated by Cochran (1963) for cross-sectional study using 12% proportion of non-adherence to medication from previous studies (Tiv Michel et al., 2012).

$N = [Z2\ p\ (1-p)]/d2$ …….. (1)

Where:

N: Estimated minimum sample size

Z: Standard deviation of 1.96 at 95% confidence interval.

p: the proportion of unknown prevalence of non-adherence to medication among diabetes mellitus at Mamprobi and Dansoman polyclinics, estimated to be p= 12% (Tiv Michel et al., 2012).

d = margin of error at 5%

Inputting the above into equation (1), the minimum sample size required for this study is given by $n= [(1.96)^2 \times 0.12 (1- 0.12)] / (0.05)^2$ n= [3.842 x 0.12(0.88)]/0.0025 = 163

A non-respondent rate of 10% was used for this study and therefore the total sample size was 180.

3.7 Data Collection

Data was collected using 179 structured questionnaires which was administered to diabetic clients who met the inclusion criteria. The tool contained demographic variables like age, sex, occupation, marital status etc. which are some of the independent variables measured in this study. Other independent variables were pill burden, the health system variables and socioeconomic variables.

Morisky scale of measurement

The Morisky 8-item Medication Adherence Scale (Morisky et al., 1986) was administered to measure therapeutic adherence. The scale (which is a questionnaire) is a self-reporting tool often used for screening medication adherence in patients. It is made up of a total of eight questions. The first 7 questions have dichotomous answers: YES or NO. A question with an answer “YES”

gets a score of "1" and a "NO" gets a score of zero. The eight question has 5 options (answers) where option "A" gets a score of "1" and options "B" to "E" get scores of zero each (Appendix A). A composite score of < 4 means patient is adherent to his/ her diabetic medication while a score between 4 and 8 means non-adherence.

3.8 Measurement of Glycemic Control

This was assessed by taking the fasting blood sugar of the patients during their recent clinic visit or on the day of visit. A normal fasting blood sugar is between 4.0 and 7.0 mmol/. Patients with poor glycemic control will be those who had fasting blood glucose >7.0 mmol/l (IDF, 2015). Patients who have fasting blood sugar less than 4 mmol/l were considered to be having low sugars hence anti-diabetic medications were adjusted so patients have a fasting blood sugar between 4-7 mmol/l.

3.9 Quality Control

The data collection tool was designed to fit the objective of the study. Pretesting of the tool was done using 18 questionnaires which is 10% of the total sample size who met the criteria at the Dansoman polyclinic diabetes clinic to ascertain the validity and reliability of the tool. Pretesting was done with the aim of removing irrelevant questions so as to make the results of the study reliable and accurate. Respondents' personal information was kept private and treated with confidentiality during the data collection process and analysis. Data was stored electronically with a strong password protection.

All completed data were validated daily before entry and uncompleted questionnaires were completed before entry. After data entry, database was cleaned before running the analysis. Training of research assistants was done before the start of the study to assist with the study.

3.10 Data Analysis

3.10.1 Prevalence of non-adherence to DM

Prevalence was calculated by dividing the number of non-adherent diabetics by the total number of diabetics attending the two polyclinics within the study period.

3.10.2 Factors associated with non-adherence

Factors associated with non-adherence were examined using a Chi-square test. This was done to test the relationships of the predictor variables with the dichotomous outcome (adherence and non-adherence) of the morisky scale.

3.10.3 Relationship between non-adherence and poor glycemic control

The relationship between poor glycemic control and non-adherence was assessed using logistic regression.

3.11 Ethical Consideration

Ethical clearance was gotten from the Ethics Review Committee of the Ghana Health Service (GHS). Approval to use the two facilities was sought from the medical director or chief medical Superintendent of respective facilities and OPD in charges through the regional health directorate.

Consent of the participants was sought before data was collected. A written informed consent was signed or thumb printed by each study participant. The aim of the study, the benefits and rights of clients and procedure involved was explained to all participants. They were promised of confidentiality. Voluntary participation was indicated by signing a consent form. All information provided by the respondents was confidential and data was kept in a safe place and softcopy stored on computers protected by passwords. Questionnaires and other data collection tools would be destroyed after one year of the study. The identity of the respondent was not be used

for the study. The information provided was identified by a code number and treated with strict confidentiality. Respondents' names did not appear or was not mentioned in any part of the report of this study. This research has no risks to the participants apart from feeling uncomfortable about answering some questions.

Electronic data files were secured by a code known by principal investigator and supervisor. All hard copies of data sheets were locked cabinet that can only be accessed by the principal investigator and supervisor. Research assistants had accessed to data only when they were given permission. Data files will be discarded after five years.

Participants had the right to refuse to answer questions that makes them uncomfortable. Clients also had the right to withdrawal from the study anytime they felt uncomfortable. They were assured of confidentiality with regard to all information they provide and will be encouraged to fully participate.

This study is funded by the principal investigator only.

3.12 Potential risk and benefits

Patients who agreed to take part in the study were educated more on the condition and also on the reasons why they should adhere strictly to their diabetic regimens. Also, the patients were taught how to identify and manage diabetic emergencies before seeking help at major facilities. In addition patients who had poor glycemic control or have complications were taken note of and their conditions discussed with the attending physician. At the national level, this study will help spot loopholes in the management of diabetic conditions which will be beneficial to stakeholders to provide excellent care to patients and ensure they are adhering to the treatment regimen. There is no potential risk associated with this study.

CHAPTER FOUR

4.0 RESULTS

4.1 Demographic characteristics of Patients

A total of 179 type 2 DM patients were sampled with a mean age of 56 ± 11.7 years. Most (41.3%) of the patients were in the age group ≥ 60 years followed by 40-49 (27.4%) years and then 50-59 years (24.0%). More than half (52.5%) of the patients were males. Most (62.2%) of the patents were Christians, 27.9% were Muslims and 9.5% were traditional worshippers. Majority (63.7%) of the patients were married and 15.1% were widowed. Concerning educational level, one fourth of the patients had attained tertiary education, 19.6% had secondary education and 13.4% had no formal education. Regarding occupation, 29.1% were businessmen, 20.7% were civil servants, 7.3% were farmers, 15.6% had retired and 27.4% were unemployed. Most of the patients earned less than thousand Ghana Cedis as their monthly income. The blood glucose of the patients were measured of which 70.4% of the patients had their fasting glucose ≥ 7.0 mmol and the rest <6.99 mmol.

Table 1: Demographic characteristics of Patients

Variable	Frequency [N=179]	Percentage (%)
Age		
<40	13	7.3
40-49	49	27.4
50-59	43	24.0
≥60	74	41.3
Mean ± SD	**56 ± 11.75**	
Sex		
Female	85	47.5
Male	94	52.5
Religion		
Christian	112	62.6
Muslims	50	27.9
Traditionalist	17	9.5
Marital status		
Single	15	8.4
Married	114	63.7
Divorced	23	12.9
Widowed	27	15.1
Educational level		
Informal education	24	13.4
JHS	23	12.9
No formal education	37	20.7
Primary	15	8.4
SHS	35	19.6
Tertiary	45	25.1
Occupation		
Businessman	52	29.1
Civil servant	37	20.7
Farmer	13	7.3
Retired	28	15.6
Unemployed	49	27.4
Monthly Income (GHS)		
>1000	108	60.3
1000-1999	50	27.9
2000-2999	18	10.1
≥3000	3	1.7
Fasting glucose		
< 6.99 mmol	53	29.6
≥ 7.0 mmol	126	70.4

4.2 Prevalence of non-adherent diabetics to medication

Out of the 179 type 2 diabteic patients sampled, 66.5% of the patients were not adhering to the mediation regimen.

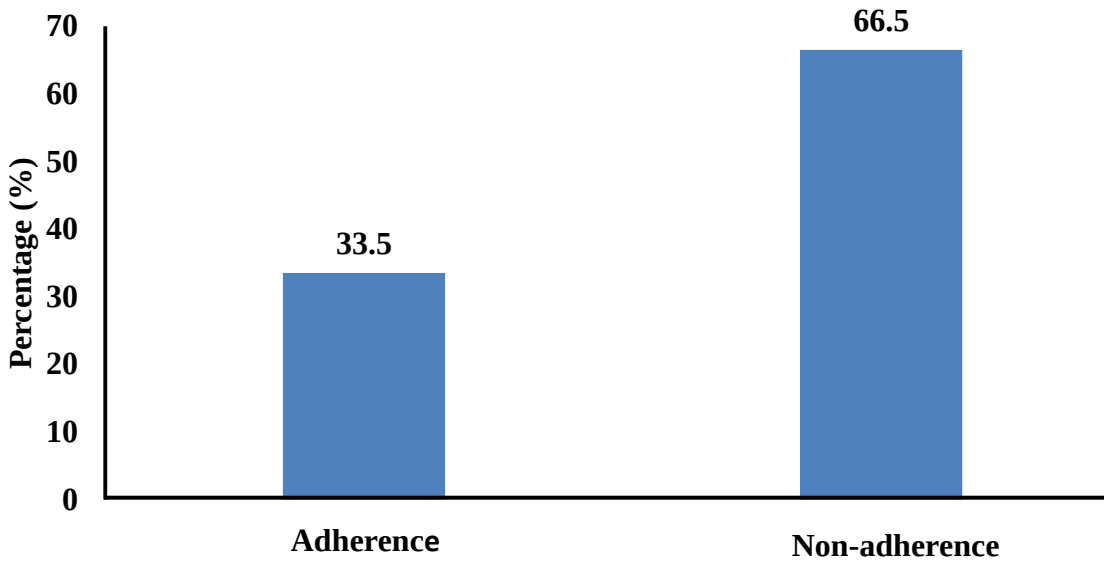

Figure 2: Prevalence of non-Adherence to Type 2 diabetes

4.3 Association between non-adherence and socio-demographic characteristics

A bivariate analysis was performed to examine the relationship between socio-demographic and non-adherence the results showed that there was significant association between non-adherence and religion (χ^2 =12.07, p=0.002, α=0.05), educational level attained (χ^2 =24.44, p<0.001, α=0.05), occupation (χ^2 =22.74, p<0.001, α=0.05), monthly income (χ^2 =25.18, p<0.001,

α=0.05), fasting glucose (χ^2 =8.15, p=0.004, α=0.05) and non-adherence to medication among type 2 diabetic patients. There was however no significant association between age, sex, marital status and non-adherence to medication regimen among type 2 diabetic patients (Table 2).

4.4. Factors influencing non-adherence to medication regimen among type 2 diabetics

Patients with tertiary education, SHS, primary, no formal education and JHS were 69%, 45%, 48%, 52% and 18% less likely not to adhere to the medication regimen as compared to those with informal education and were not statistically significant. Civil servants, farmers, retirees and unemployed patients were 2.01, 5.49, 1.08 and 8.47 times more likely not to adhere to the medication regimen as compared to the businessmen. Patients whose monthly income was 1000-1999, 2000-2999 and ≥3000 Ghana Cedis were 53%, 68% and 88% less likely not to adhere to the medication regimen as compared to those who earn less than 1000 Ghana Cedis.

Using logistic regression to find the relationship between non-adherence and glycemic control the results showed that, patients whose fasting blood glucose was ≥ 7.0 mmol were 1.26 times more likely not to adhere to the medication regimen [AOR=1.26 (95% CI: 1.13-6.04); p= 0.024] and this was statistically significant as shown in Table 3.

Table 2: Factors influencing non-Adherence to medication regimen among T2D

Variable	Adherent n(%)	Non-adherent n(%)	COR (95% CI)	P-Value	AOR (95% CI)	P Value
Age						
<40.	7(11.6)	6(5.0)	1.0			
40-49	13(21.7)	36(30.3)	**3.23 (0.91-11.4)**	**0.068**		
50-59	19(31.7)	24(20.2)	1.47 (0.42-5.11)	0.542		
≤60	21(35.0)	53(44.5)	**2.99 (0.88-9.79)**	**0.078**		
Sex						
Female	25(41.7)	60(50.4)	1.0			
Male	35(58.3)	59(49.6)	0.70 (0.37-1.31)	0.269		
Religion						
Christian	37(61.7)	75(63.0)	1.0			
Muslims	23(38.3)	27(22.7)	0.57 (0.29-1.14)	0.116		
Traditionalist	0(0.0)	17(14.3)	1.23 (0.12-2.22)	0.123		
Marital status						
Single	6(10.0)	9(7.6)	1.0			
Married	42(70.0)	72(60.5)	1.14 (0.38-3.43)	0.812		
Divorced	6(10)	17(14.3)	1.89 (0.47-7.58)	0.370		
Widowed	6(10)	21(17.7)	2.33 (0.59-9.23)	0.227		
Educational level						
Informal education	4(6.7)	20(16.8)	1.0		1.0	
JHS	4(6.7)	19(16.0)	0.95 (0.20-4.35)	0.947	0.82 (0.15-4.44)	0.826
No formal education	9(15.0)	28(23.5)	0.62 (0.16-2.30)	0.478	0.48 (0.11-2.01)	0.316
Primary	3(5.0)	12(10.1)	0.80 (015-4.20)	0.792	0.52 (0.08-3.12)	0.474
SHS	13(21.7)	22(18.5)	**0.33 (0.09-1.21)**	**0.096**	0.55 (0.13-2.23)	0.408
Tertiary	27(45.0)	18(15.1)	**0.13 (0.03-0.45)**	**0.001**	0.31 (0.07-1.38)	0.127
Occupation						
Business	25(41.7)	27(22.7)	1.0		1.0	
Civil servant	17(28.3)	20(16.8)	1.09 (0.47-2.53)	0.843	2.01 (0.73-5.53)	0.172
Farmer	1(1.7)	12(10.1)	**11.11 (1.34-91.76)**	**0.025**	5.49 (0.59-51.15)	0.135
Retired	12(20.0)	16(13.5)	1.23 (0.49-3.11)	0.655	1.08 (0.35-3.33)	0.886
Unemployed	5(8.3)	44(37.0)	**8.14 (2.78-23.82)**	**<0.001**	8.47 (2.41-29.80)	
Monthly Income (GHS)						
>1000	22(36.7)	86(72.3)			1.0	
1000-1999	24(40.0)	26(21.9)	**0.27 (0.13-0.57)**	**0.001**	0.47 (0.18-1.16) 0.104	
2000-2999	11(18.3)	7(5.9)	**0.16 (0.05-0.47)**	**0.001**	0.32 (0.08-1.27) 0.107	
≥3000	3(5.0)	0(0.0)	0.23 (0.01-	0.435	0.12 (0.12-	

			1.23)		1.23) 0.201	

n(%) represents frequency(percentage), COR represents Crude odds ratio And AOR represents Adjusted odds ratio and CI represents confidence interval

Table 3: Association between adherence and glycemic control

Fasting glucose	**Adherent n(%)**	**Non-adherent**	**COR (95% CI)**	**P-Value**	**AOR (95% CI)**	**P-Value**
<6.99 mmol/l	26(43.3)	27(22.7)	1.0		1.0	
>7.0 mmol/l	34(56.7)	92(77.3)	**2.60 (1.33-5.07)**	**0.005**	**1.26 (1.13-6.04)**	**0.024**

n(%) represents frequency(percentage), COR represents Crude odds ratio And AOR represents Adjusted odds ratio and CI represents confidence interval

CHAPTER FIVE

5.0 DISCUSSION

Non-adherence to diabetes medication is the commonest cause for developing diabetes complications in all age groups and race and that adherence is very poor among lots of people regardless of their disease stage, age or race (Fedrick & Justin-Temu, 2012). This study sought to examine factors associated with non-adherence to medication regimen among type 2 diabetes mellitus patients.

5.1 Prevalence of non-adherence to anti diabetes medication

The findings of this study showed that the prevalence of non-adherence to diabetic regimens among diabetic patients was 66.5%. A similar study conducted among diabetics in Limbe and Bamenda Regional Hospitals in Cameroon, showed that 54.5% of diabetic patients were not adhering to the anti-diabetic medications (Aminde et al., 2019). A cross sectional study conducted in Saudi Arabia (Almaghaslah et al., 2018), Sudan (EI-Hadiyah, Madani, Abdelrahim, & Yousif, 2016). Uganda(Kalyango et al., 2008) showed prevalence of 38%, 55%, and 28.9% respectively. The prevalence of non-adherence as obtained in this study varied from what was obtained in other studies. The differences could be as a result of the differences in study location, sample size, study design and diabetic patients' exposure to health care resources.

5.2 Factors influencing non-adherence to anti-diabetes medications amongst type 2 DM

Regarding the factors associated with medication non-adherence among the DM patients, this study found that patients who had tertiary education, SHS, primary, no formal education and JHS were less likely not to adhere to the medication regimen as compared to those with informal education and was not statistically significant. The finding of this study was similar to the results of a study carried out by Awodele and Osuolale (2015) in Nigeria which also found that there

was no significant association between diabetes medication non-adherence and educational level Another cross sectional study carried out in Ethiopia was inconsistent to the findings of this study, the findings from their study showed that there was a negative relationship between adherence to medication and level of education. Therefore, diabetic patients with low educational level were significantly associated with non-adherence to medication inferably those with low education had higher rates of non-adherence (Kassahun, Gashe, Mulisa, & Rike, 2016) . Those with low educational level tend not to adhere to medication since illiteracy can result in the poor outcome of diabetes due to poor accessibility to healthcare services and self-care of diabetes. However, more educated patients were non-adherent to the therapy. Being less educated makes learning about diabetes management very difficult; as diabetes drug therapy becomes more complex, patients are required to have more complex cognitive skills to be able to understand the prescribed drug therapy and to adhere to treatment for good glucose control. The results as obtained in this study could be due to the reason that even though the patients have some form of education, education related to diabetes care and management may be inadequate and hence cannot practice good diabetes care.

The present study found that civil servants, farmers, retirees and unemployed patients were not to adhere to the medication regimen as compared to the businessmen and was however not statistically significant. The non-adherence could be due to work schedule and inadequate time for health care services. Financial difficulties have great impact on self-care and management of health conditions since it tends to affect the quality of health services obtained. In this study, even though was not statistically significant, patients whose monthly income was 1000-1999, 2000-2999 and ≥3000 Ghana Cedis were less likely not to adhere to the medication regimen as compared to those who earn less than 1000 Ghana Cedis. A cross sectional study was conducted

in Ethiopia and the findings from their study showed that diabetic patients with income were significantly associated with non-adherence to medication. Those with low income had higher rates of non-adherence (Kassahun et al., 2016). Consequently, low income affects the accessibility of health care services and people who tend to earn less were more likely not to adhere to their medication regimen. The results of this study can be attributed to the fact that even though some income was earned at the month, the patients do not have adequate knowledge to practice adherence.

5.3 Relationship between non-adherence and glycemic control

The results of this present study showed that, patients whose fasting blood glucose was ≥ 7.0 mmol were 1.26 times more likely not to adhere to the medication regimen. The findings of the study has similar results where one of the main contributing reasons for poor glycemic control was non-adherence to medication (Polonsky, 2016). The results of a longitudinal study carried out in order to determine the influence of poor adherence to medication to glycemic control in veterans with T2D who were followed up for at least 5 years, showed that poor medication adherence (MPR <80%) was significantly (P<0.001) associated with poor glycemic control (HbA1c >8%) (Egede et al., 2015). Another cross sectional study done in Saudi on diabetes patients indicated that glycated hemoglobin of <7.0 was statistically associated with adherence of diabetes medication (Alqarni, Alrahbeni, Qarni, & Qarni, 2018). Indeed, diabetes medication adherence and glycated hemoglobin appear to be inversely related (Egede et al., 2015) . Poor medication adherence in T2D is a well known common factor and is associated with inadequate glycemic control, increased morbidity and mortality, and increased costs of outpatient care, emergency room visits, hospitalization, and managing complications of diabetes. Diabetes can be managed well by following the prescribed oral hypoglycemic agents (OHAs) and/or insulin. The

glycated hemoglobin test measures the average blood glucose of patients over a period of 2-3 months and has strong predictive value for diabetes complications. The diabetes medication helps in the regulation of the blood glucose (Alqarni et al., 2018). The regulation of the glycated haemoglobin helps to prevent complication of condition such ad organ failure and weakness of the body.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Non-compliance to diabetes therapy among type 2 DM patients at Mamprobi polyclinic and Dansoman polyclinic was high (54.5%). Five out of every 10 diabetic patients was not adhering to their medication regimens which can lead to diabetes complications. Glycemic control was linked with non-adherence but educational level, occupation and incomes were not significantly associated with non-adherence. Patients with tertiary education, SHS, primary, no formal education and JHS were less likely not to adhere to the management regimen as compared to those with informal education. Civil servants, farmers, retirees and unemployed patients were more likely not to adhere to the medication regimen as compared to the businessmen.Patients whose fasting blood glucose was ≥ 7.0 mmol were 1.26 times more likely not to adhere to the medication regimen.

6.2. Recommendations

The district/municipal health directorate, doctors and nurses should intensify education on diabetes care and management among diabetic patients.

The district/municipal health directorate and non-governmental organization should design targeted health program related to diabetes care and management.

Diabetic patients should regularly measure their blood glucose level, adapt to healthy eating habits by eating fruits and vegetables and healthy lifestyle than includes exercises.

The hospitals should encourage the formation of more diabetic social groups within locality to help diabetic patients understand their condition.

Government and researchers should study the economic and financial burden of diabetes on the individuals in the country and also the economy's health budget.

Finally, a study should be conducted on health workers views pertaining to the factors that influence adherence to medication amongst diabetic patients.

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APPENDIX A: QUESTIONAIRE

NON-ADHERENCE TO ANTI DIABETIC MEDICATIONS IN DIABETIC PATIENTS IN SOME SELECTED POLYCLINICS IN THE ABLEKUMA SUB METROPOLITAN NAMELY MAMPROBI POLYCLINIC AND DANSOMAN POLYCLINIC.

FASTING BLOOD SUGAR ……..MMOL/L

SECTION A (DEMOGRAPHIC CHARACTERISTICS)

1. AGE ……IN YEARS

2. GENDER 1. MALE [ ] 2. FEMALE [ ]

3. RELIGION 1. MUSLIM [ ] 2. CHRISTIAN [ ] 3.TRADITIONALIST [ ] 4. ATHEIST [ ]

4. MARITAL STATUS 1. SINGLE [ ] 2.MARRIED [ ] 3. DIVORCED [ ] 4.WIDOW/ER [ ]

5. EDUCATIONAL LEVEL 1.NO FORMAL EDUCATION [ ] 2.PRIMARY [ ] 3.JHS [ ] 4.SHS [ ] 5.UNIVERSITY [ ] 6.INFORMAL EDUCATION [ ]

6. OCCUPATION 1.UNEMPLOYED [ ] 2.CIVIL SERVANT [ ] 3. BUSINESS MAN/WOMAN [ ] 4.FARMER [ ] 5.RETIRED [ ] 6.OTHERS……

7. AVERAGE MONTHLY INCOME ……

8. DO YOU DRINK ALCOHOL 1. YES [ ] 2. [ ]

IF YES PROCEED TO 9,IF NO PROCEED TO 10

9. IF YES HOW MANY UNITS 1. LESS THAN 14 UNITS FOR FEMALE AND 21 UNITS FOR MEN [ ] 2. MORE THAN 14 UNITS FOR FEMALE AND 21 UNITS FOR MALE [ ]

10. DO YOU SMOKE 1.YES [ ] 2. NO [ ]

11. HOW OFTEN DO YOU EXERCISE 1. DAILY [ ] 2. MORE THAN TWICE A WEEK [ ] 3. WEEKLY [ ] 4. NEVER [ ]

SECTION B (KNOWLEDGE OF DIABETES AND FACTORS AFFECTING ADHERENCE)

12. HOW LONG HAVE YOU BEEN DIAGNOSED OF DIABETES…….. IN YEARS

13. WHAT DO YOU THINK CAUSES DIABETES 1. SPIRITUAL [ ] 2.MEDICAL CONDITION [ ] 3.I DON'T KNOW [ ]

14. HAVE YOU HEARD OF GLYCATED HEMOGLOBIN BEFORE 1.YES [ ] 2.NO [ ]

15. DO YOU HAVE ANY DIABETIC IN YOUR FAMILY 1.YES [ ] 2.NO [ ]

16. HOW DO YOU CONTROL YOUR SUGAR LEVEL 1.MEDICATION [ ] 2.EXERCISE [ ] 3.PRAYERS [ ] 4. DIET [ ] 5. OTHERS……

17. WHICH MEDICATIONS ARE YOU TAKING 1.METFORMIN 2.INSULIN 3.GLIBERCLAMIDE 4.HERBAL MEDICATION [ ] 5. OTHERS……..

18. HOW OFTEN DO YOU VISIT THE HEALTH FACILITY 1.WEEKLY [ ] 2.TWICE A WEEK [ ] 3. MONTHLY [ ] 4. QUARTERLY [ ]

19. DO YOU SOMETIMES MISS YOU APPOINTMENT 1.YES[ ] 2.NO [ ]

20. WHY DID YOU MISS 1.I FORGOT [ ] 2.DECIDED NOT TO COME [ ] 3. WAS BUSY WITH OTHER THINGS[ ] 4. NO REASON [ ] 5. TIRED OF VISITING HOSPITAL [ ]

6. OTHERS……..

21. HOW LONG DO YOU STAY WHEN YOU VISIT THE HOSPITAL 1. LESS TTHAN 1 HOUR [ ] 2. 1-2 HOURS [ ] 3 . MORE THAN 2 HOURS [ ]

22. DOES YOUR HEALTH PROVIDER EXPLAIN YOUR CONDITION IN DETAIL TO YOU 1.YES [ ] 2.NO [ ]

23. ARE YOU ABLE TO DISCUSS YOUR CONDITION FREELY WITH YOUR DOCTOR 1.YES [ ] 2.NO [ ]

24. ARE YOU THOROUGHLY EXAMINED BY YOUR DOCTOR ON EVERY VISIT 1.YES [ ] 2.NO [ ]

25. HOW WILL YOU GRADE YOUR HEALTH PROVIDER 1.EXCELLENT [ ] 2.VERY GOOD [ ] 3.GOOD [ ] 4.AVERAGE [ ] 5.POOR [ ]

26. HOW CLOSE IS YOUR HOME FROM THE HEALTH FACILITY 1.VERY CLOSE [ ] 2.CLOSE [ ] 3.FAR [ ]

27. ARE YOU ABLE TO BUY ALL THE MEDICATION PRESCRIBED BY YOUR PROVIDER 1.YES [ ] 2.NO[ ]

28. IF NO WHY 1.EXPENSIVE [ ] 2. DIFFICULT TO FIND [ ] 3.NOT AVAILABLE [ ] 4.OTHERS [ ]

29. WHO IS SUPPORTING YOU FINANCIALLY 1.FRIENDS [ ] 2. FAMILY [ ]

3.ORGANIZATION [ ] 4 .SELF [ ] 5.OTHERS[ ]

30. HOW MANY TIMES ARE SUPPOSE TO TAKE YOUR MEDICATION 1.ONCE [ ]

2.TWICE [ ] 3.THREE TIMES [ ] 4.MORE THAN THREE [ ]

31. DO YOU FOLLOW THE PRECRIBED REGIMEN 1.YES [ ] 2. NO [ ]

32. DO YOU HAVE ANY SIDE EFFECTS WHEN YOU TAKE THE MEDICATION 1. YES

[ ]2.NO [ ]

33.WHICH OF THE FOLLOWING GROUPS PROVIDE YOU SUPPORT SINCE YOU

WERE DIAGNOSED OF DM 1. FAMILY [ ] 2.FRIENDS [ ] 3.COMMUNITY [ ]

4.DIABETIC GROUPS [ ]

34. HOW OFTEN DO YOU CHECK YOUR SUGAR 1.DAILY [ ] 2.WEEKLY [ ]

3.MONTHLY [ ]

35. HOW DO YOU CHECK YOUR SUGAR 1.SELF [ ] 2. PHARMACY [ ]

3.LABORATORY [ ]

SECTION C (ADHERENCE)

MORISKY 8-ITEM MEDICATION ADHERENCE QUESTIONAIRE

QUESTION	**ANSWER (YES/NO)**	**SCORE (Y=1, N=0)**
1.DO YOU SOMETIMES		

FORGET TO TAKE YOUR MEDICINE		
2. PEOPLE SOMETIMES MISS TAKING THEIR MEDICINE FOR REASONS OTHER THAN FORGETTING.THINKING OVER THE PAST 2 WEEKS WERE THERE ANY DAYS WHEN YOU DIDN'T TAKE YOUR MEDICINE?		
3. HAVE YOU EVER CUT BACK OR STOPPED TAKING YOUR MEDICINE WITHOUT TELLING YOUR DOCTOR BECAUSE YOU FELT WORSE WHEN YOU TOOK IT.		

4. WHEN YOU TRAVEL OR LEAVE HOME DO YOU SOMETIMES FORGET TO BRING ALONG YOUR MEDICINE?		
5. DID YOU TAKE ALL YOUR MEDICINES YESTERDAY?		
6. WHEN YOU FEEL LIKE YOUR SYMPTOMS ARE UNDER CONTROL DO YOU SOMETIMES STOP TAKING YOUR MEDICINE?		
7. TAKING MEDICINE EVERYDAY IS A REAL INCONVENIENCE FOR		

SOME PEOPLE.DO YOU EVER FEEL HASSLED ABOUT STICKING TO YOUR TREATMENT PLAN?		
8. HOW OFTEN DO YOU HAVE DIFFICULTY REMEMBERING TO TAKE ALL YOUR MEDICINE? (A = 0 B-E = 1)	A. NEVER/RARELY B. ONCE IN A WHILE C. SOMETIMES D. USUALLY E. ALL THE TIME	
Score less than or equal to 4 = GOOD ADHERENCE ABOVE 4 = POOR ADHERENCE		

APPENDIX B: CONSENT FORM

STUDY TITLE: NON-ADHERENCE TO ANTI DIABETIC MEDICATIONS IN DIABETIC PATIENTS IN SOME SELECTED POLYCLINICS IN THE ABLEKUMA SUB METROPOLITAN NAMELY MAMPROBI POLYCLINIC AND DANSOMAN POLYCLINIC.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (.. ENGLISH, HAUSA , GA, TWI..). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant…….. ID Code ……..

Participants' Signature ……...OR Thumb Print……

Date:…….

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (,,TWI, GA. HAUSA..) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter……

Signature of Interpreter…….. Date:……

Contact Details …….

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (…TWI, GA, HAUSA AND ENGLISH…)

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:……

Signature…….... OR Thumb Print …….....

Date:……

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name…….

Signature …….

Date…….

APPENDIX C: PARTICIPANTS INFORMATION SHEET

TITLE: NON-ADHERENCE TO ANTI DIABETIC MEDICATIONS IN DIABETIC PATIENTS IN SOME SELECTED POLYCLINICS IN THE ABLEKUMA SUB METROPOLITAN NAMELY MAMPROBI POLYCLINIC AND DANSOMAN POLYCLINIC.

INTRODUCTION

Dear Participant

My name is Azumah Abdul-Tawab,a student of the School of Public Health ,University of Ghana ,undertaking a study on the above topic in partial fulfillment of my master's in public health.

BACKGROUND

The purpose of this to identify the factors that lead non-adherence in diabetic patients at mamprobi and dansoman polyclinic with the aim of identifying the loopholes in the management in order to aid stakeholders, health professionals, and health facilities provide effective and efficient care to patients and ensure their adherence to the treatment regimen and also how non-compliance affects glycemic control in diabetics.

NATURE OF RESEARCH

This study will employ descriptive cross sectional type of design in assessing the factors that affect adherence amongst diabetics to therapy, this method is chosen because it spontaneously measure the exposure (independent) variables and that of the outcome (dependent) variables.

PARTICIPANTS INVOLVEMENT

The study will involve taking of participants' clinical information and answering questions on socio-demographic factors, and treatment adherence. Filling each questionnaire will take about 30mins of the participants time. The information you provide will add to knowledge about the treatment behaviors among patients of diabetes.

POTENTIAL RISKS AND BENEFITS

Patients that agree to partake in the study will be educated more on the condition and also the reasons they should adhere strictly to their diabetic regimens. Also patient will be taught how to identify and manage diabetic emergencies before seeking helping at major facilities. In addition patients who have poor glycemic control or have complication will identified and discusses with attending physician so that special attention will be paid to them. At the national level his study will help identify loopholes in the management in order to aid stakeholders, health professionals, and health facilities to provide effective and efficient care to patients and ensure their adherence to the treatment regimen.

There is no potential risk associated with this study

COST

There is no cost involvement

COMPENSATION

There will be no compensation given to participants

CONFIDENTIALITY

All information provided by the respondents will be kept confidential and data will be locked in a safer place and softcopy stored on computers protected by passwords. Questionnaires and other data collection tools will be destroyed after one year of the study. The name and identity of the respondent will not be used for the study. The information provided will only be identified by a code number and treated with strict confidentiality. Respondents' names will not appear or will not be mentioned in any part of the report of this study. Electronic data files would be secured by a password known by only principal investigator and Supervisor. All hard copies of data sheets would be kept in a locked file cabinet that can only be accessed by the principal investigator and supervisor. Research assistants will access them only when they have been given permission. Data files will be kept for five years after which they will be destroyed.

VOLUNTARILY PARTICIPATION AND WITHDRAWAL

Participation in this study is voluntary. You are free to answer part or the entire questionnaire. You can choose to withdraw from the study or stop the interview at any time you want. You can also choose not to answer any question(s) you find uncomfortable about. No one will be coerced to obtain response from participants, and you are at liberty to withdraw from the study at any time and it will not affect you in any way. Taking part in the study would not affect the quality of care you receive in any way.

OUTCOME AND FEEDBACK

Feedback will be given to the various hospitals after the study for onwards passage to participants to help improve the quality of care given to patients.

FUNDING INFORMATION

This study is solely funded by the principal investigator

CONFLICT OF INTEREST

There is conflict of interest

A copy of the Information sheet will be given to you after it has been signed or thumb-printed to take home.

CONTACTS

If you have any question(s) or further clarification concerning this study and/or the conduct of the researcher and research assistants, please do not hesitate to contact the following;

1. Azumah Abdul-Tawab (Principal Investiagtor)

DTD E2/6

Sakumono Estate.

Tel: 0248538589

Email: azumahabdultawab@gmail.com

2. Dr Paul K Botwe (Supervisor)

University of Ghana School of Public Health, legon.

Tel:0205944689

Email:pkbotwe@gmail.com

If you have any concerns or need clarifications regarding ethical issues, please contact

Mrs. Hannah Frimpong (Administrator)

Ghana Health Service, Ethical Review Committee Secretariat, Accra

Tel: 0507041223/02432352

ETHICAL CLEARANCE

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

MyRef. GHS/RDD/ERC/Admin/App/19/315
Your Ref. No.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com
11th July, 2019

Abdul-Tawab Azumah
University of Ghana
School of Public Health
Legon

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC 032/05/19**
Project Title	Adherence to Anti Diabetic Medications in Diabetic Patients in Some Selected Polyclinics in the Ablekuma Sub Metropolitan, Accra
Approval Date	11th July, 2019
Expiry Date	10th July, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.
- Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. Cynthia Bannerman
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra