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MEDICATION ADHERENCE AND PREDICTORS OF ADHERENCE WITH TYPE-2 DIABETES MELLITUS PATIENTS IN GHANA- A SYSTEMATIC REVIEW

BY

BARBARA ADJOA CONNEL

(10805757)

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DECLARATION

I, hereby declare that except for references to other people's work, which I have duly acknowledged, this thesis is the result of my own research work, and that it has neither in part nor wholly been presented elsewhere for another degree.

Sign: 

BARBARA ADJOA CONNEL

(CANDIDATE)

Sign:……  ……November 12, 2020…….

DR. BISMARK SARFO

(Supervisor)

DEDICATION

This thesis is dedicated to my parents, my siblings, and also to all my friends, for their love, support, and sacrifices that have enabled me to complete this work.

ACKNOWLEDGEMENTS

I thank the Lord my God for the opportunity to pursue this course and also for bringing me this far.

My special thanks also go to my supervisor, Dr. Bismark Sarfo, for his guidance and patience.

My special sincere thanks also go to all my heroes and friends for their immense supports in diverse ways.

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LIST OF ABBREVIATIONS

ADA – American Diabetes Association

DBP – Diastolic Blood Pressure

DM – Diabetes Mellitus

FBG – Fasting Blood Glucose

GHS – Ghana Health Service

GNA – Ghana News Agency

IDDM – Insulin-Dependent Diabetes Mellitus

IDF – International Diabetes Federation

MMAS – Morisky-Medication Adherence Scale

NIDDM – Non-insulin dependent diabetes mellitus

NHIS – National Health Insurance Scheme

OPD – Out Patients Department

SBP – systolic blood pressure

T2DM – Type-2 Diabetes Mellitus

WHO – World Health Organization

ABSTRACT

Background: The study reviewed peer reviewed published works on adherence to medication by Type-2 Diabetes Mellitus (T2DM) patients in Ghana. Diabetes is a condition associated with hormonal disorders and is a chronic condition in nature. T2DM is the most occurring type of diabetes and is non-insulin dependent. Adherence to medication is very necessary to avoid complications such as nephropathy, neuropathy, retinopathy, cardiovascular complications, erectile dysfunction and diabetic foot.

Objective: Adherence to medication is of great importance in treating diseases. It is therefore expedient that researchers make appreciable efforts into adherence. This systematic review determined the level of adherence to medication by T2DM patients and its associated factors.

Method: PubMed Central, Gale OneFile: Health & Medicine and Google Scholar were searched to retrieve research works for the review. There were 1,448 participants from six research works with research specifically conducted in Ghana. An average participant population of 241 patients were reviewed.

Results: The study revealed a low level of adherence to T2DM medication with an average adherence of 54.69%. There was however, a gradual increase in the level of adherence taking into consideration a period of ten years studies on diabetes medication. Education; [aOR = 3.68 (95%CI: 1.02–12.43)], Age; [aOR = 0.351 (95%CI: 0.178-0.775)] and Self- management practices; [aOR = 0.334(95%CI: 0.101-0.615)] were related to the study and were found to be positive predictors of T2DM medication adherence. Highly educated, older persons and patients with good attitudes in terms of self-care were found to be more adherent to medication.

Conclusion: This review concludes that the level of adherence to T2DM in Ghana is low despite a gradual increase in the period of ten years. Also, Education is a major contributing factor to adherence. More education should therefore be resorted to as an effort to increase adherence to T2DM medication.

Keywords: Diabetes mellitus, Type-2, adherence, Ghana

CHAPTER ONE

1.0 INTRODUCTION

Diabetes is a condition associated with hormonal disorders and is a chronic condition in nature. It is a condition very much associated with the elite regions of the world in years past but recently has become a burden of the third world, including sub Saharan Africa. Diabetes, a high burden chronic condition had an estimated prevalence of 2.8% worldwide for all age groups. This estimated percentage is also expected to increase by 2030 to 4.4%. (Wild S. et al, 2004.)

The World Health Organisation in 2013 estimated that Africa has 80% mortality of the 387 million diabetes cases worldwide. Additionally, 2.58% of the total deaths in Ghana is caused by diabetes. (Sarfo-Kantanka et al, 2016). Two major forms of diabetes mellitus are widely known. These are Type 1 which is Insulin-Dependent Diabetes Mellitus (IDDM) and Type 2 which is Non-Insulin Dependent Diabetes Mellitus (NIDDM). Type 1 is caused by failure for the beta cells of the islets of Langerhans in the pancreas and Type 2 is caused by insulin resistance due to few insulin receptors (Parving et al., 1992).

In type 1 DM, there is complete insufficient production of insulin. The cause of this type of DM is as a result of damage to the pancreatic beta cells (Kawasaki et al., 2014). There is high emergence of type 1 DM among people. The thought behind this remains uncertain but maybe as a result of changes in components that affects the environment, prior occurrences in the womb or advance dietary habit in life (Jarosz-Chobot et al., 2011). This situation normally happens in children or young adults, though it can develop in people of any age. It is controlled via the administration of daily insulin therapy, direct supervision, nutritious food, and frequent body exercise (American Diabetes Association, 2017).

The most occurring type of diabetes mellitus is the Type 2 Diabetes Mellitus: T2DM. Though very prudent in adults, it is observed as well in children and adolescents (Reinehr, 2013). It occurs later in life as a result of factors such as peripheral resistance to insulin, minimal secretion of insulin by the pancreatic beta cells and increased glucagon secretion from alpha cells of pancreas (Ozougwu et al., 2013). T2DM, a common endocrine disease has been burdensome throughout the world. People with diabetes mellitus suffer premature mortalities (Butt et al., 2015). Patients are normally diagnosed when complications of diabetes mellitus have matured. It is normally controlled with healthy and nutritious diets and more intense physical exercises or oral medications (American Diabetes Association, 2016).

Gestational diabetes mellitus develops in some non-diabetic expectant mothers normally from 24 weeks of gestation. It is mostly due to insulin resistance leading to higher level of blood glucose. (Ashwal & Hod, 2015).

Diabetes is a lifelong and its management can be costly to both the patient and the nation at large. Diabetic patients are expected to follow accurate treatment administered to them to accomplish sufficient glycemic objectives. This is further improved by self-care management or behaviour encompassing adequate nutrition, physical activities, foot care, self-blood glucose monitoring and medications adherence (Chatterjeee, 2006: Poskipartar et al., 2006: Xu et al., 2010). Self-care is also paramount as a study by Lindström et al., (2006) indicates that the risk of diabetes mellitus complications decreases by about 43% by doing recommended physical activities, eating a proper diet, and maintaining the right weight

Management of chronic conditions is marked with challenges such as non-adherence. Adherence to prescribed medications is very necessary to attaining quality healthcare. The World Health

Organization (WHO, 2003) reported that, “adherence is the extent to which a person’s behaviour including taking medication, following a prescribed diet, and/or executing lifestyle changes corresponds with agreed recommendations from the health care provider.” Not adhering to medication is costly just as the management of any condition itself. It contributes to the economic burden of the individual, the society and the nation at large. A study by Haynes et al, (1976) revealed that an increase in maximising adherence to interventions as compared to improving specified medical treatments tends to be more beneficial to the population than the latter.

Suboptimal blood sugar control among patients can be caused by lack of adherence to anti diabetic medication. This can also result in treatment failures, increased complications and high death rates. Although treatment is available for management of diabetes mellitus control and adherence remain inadequate (Sham and Barakat, 2010).

1.2 Problem Statement

Several studies have shown that adherence can effectively improve glycemic levels and help decrease the cost of health care services as well (Lawrence et al., 2006; Lee et al., 2006; (American Diabetes Association, 2013).

Non- adherence to medication among diabetes patients has increased as well as its associated adverse health outcomes. This is as a result of inadequate knowledge and education about the need to adhere to medication when managing diabetes. Optimal treatment of diabetes mellitus is influenced by several factors and not only individual factors according to (Brown et al, 2004), hence all factors and also institutions are to be considered in alleviating adverse outcomes that come with poor management of diabetes mellitus.

Studies by Egede et al., (2013) and Kalyango et al., (2018) indicated that suboptimal treatment is observed among diabetes mellitus patients. This is estimated as 23% to 77%. The factors contributing to this include non-adherence to diabetic medication. Globally non-adherence to medications among diabetes mellitus patients is a challenge (Ngo et al., 2013) and Hugtenburg et al., (2013) characterize non-adherence to medication as inability to administer more than 80% of an administered treatment for chronic conditions. More so, it is known that patients with chronic conditions such as diabetes and are on long term therapies tend not to adhere to their medications (WHO 2003).

Adherence in the treatment of diabetes mellitus can improve and prevent diabetic complications such as nephropathy and subsequent kidney failure, neuropathy, retinopathy, cardiovascular complications, erectile dysfunction, diabetic foot which can lead to amputation of the limb and the like not to mention the financial cost on patient, community and nation at large. (WHO, 2015 and Jackson et al., 2015).

1.3 Justification

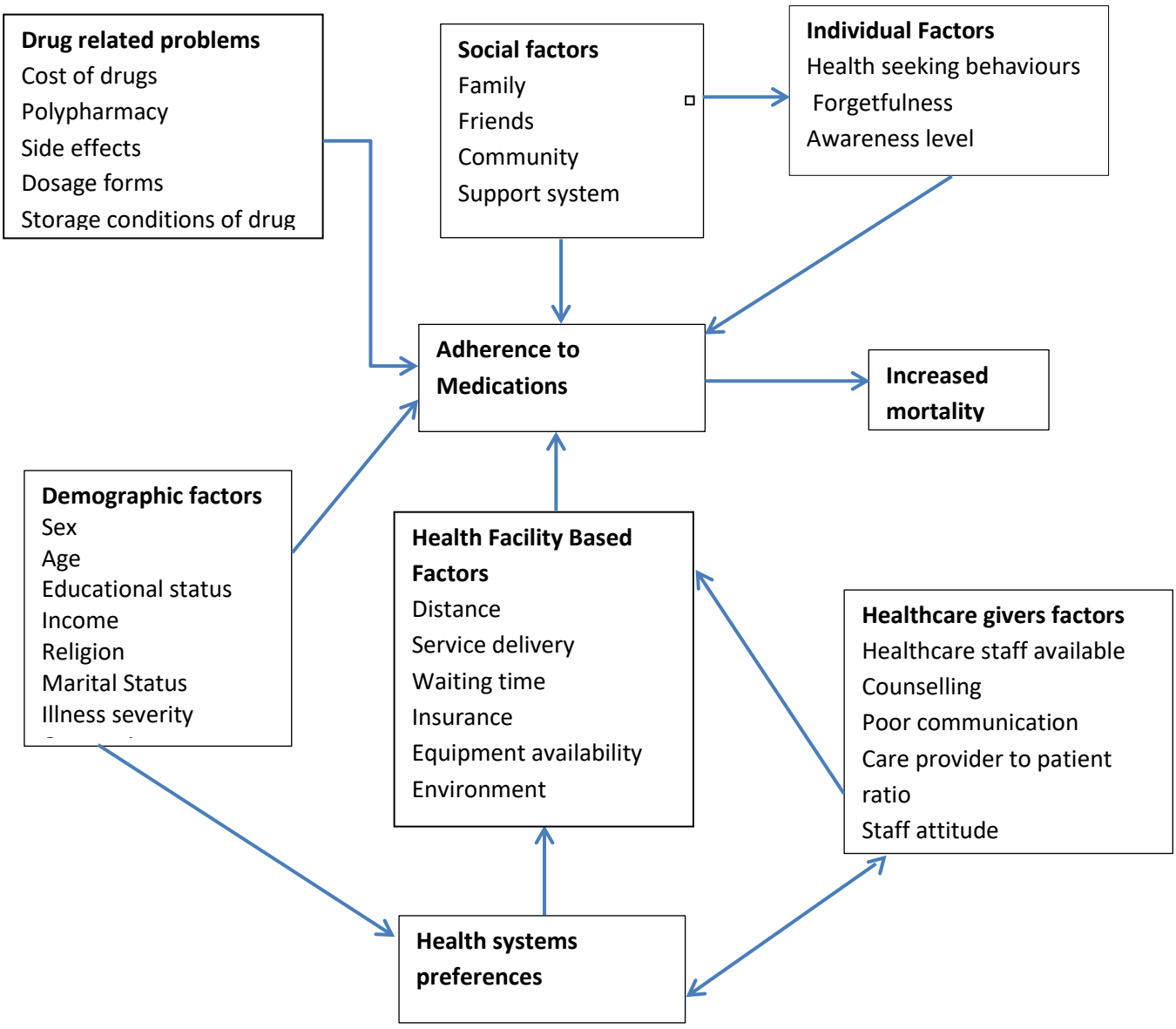
Diabetes mellitus, management is severely retarded by non-adherence to medication. This leads to several health complications.

The findings of a study by Divya et al., (2015) indicated that patient education plays a major role in improving medication adherence among diabetic patients. Though several reasons can be attributed to this menace, the findings from this study would help provide necessary information for policy makers on the burden and factors that influence medication adherence.

The findings of this study will help the patient, the community, health institutions, non-governmental organizations, and the government as a whole. Patients would be empowered to

improve upon their treatment goals by increasing their understanding of medication regimen and the benefits of adherence, and government can formulate policies and plan accordingly in order to strengthen them to efficiently work to tackle the problem of non-adherence to medication among diabetic patients.

1.4 Conceptual Framework



1.5 Narrative on the conceptual framework

The figure above shows a pictorial view of the relation between the dependent variables and the independent variables that contribute to non-adherence to medications among diabetes patients. The factors include six main categories. They are: drug related problems, social factors, individual factors, demographic factors, health facility based factor and healthcare givers factors.

The demographic factors include gender, age, educational status, income, religion, marital status and illness severity. Age and gender much affect adherence to medication among diabetes patients. Increasing age results in lesser adherence to medication whereas adherence also decreases among female gender as compared to the male gender. This was reported by Bebar et al., (2013) and Thayer et al., (2010). Patients with higher education that is those who could read and write tend to have basic understanding of their medication regimen and disease condition and hence influentially adhere to their medications. Hence low educational level increases non-adherence (Divya & Nadig (2015)

According to Adisa et al., (2009), adherence to medication is influenced by the cost the patient incurs. Health givers factors such poor communication and absenteeism on behalf of the care givers affects patients urge to adhere to the medications which can lead to diabetic complications and mortality. Poor communication results in less understanding of the patient's to the treatment and the medication regimen implemented. The closer the patient is to the facility, the less financial burden it becomes on him/her. Distance is a contributing factor to non-adherence as it increases the cost of assessing healthcare.

Also health facility based factors such as long waiting time, according to Kalyango et al., (2008b) negatively affects adherence whereas great service provision improves relationship and

confidence between the provider and the patient resulting in an improved adherence to medication.

The importance of medication and awareness level play an important role in adherence to medications (Freeman et al, 2012). Some diabetic patients attribute their condition and its complication to many lifestyle factors such as diet, psychological stress, family history and supernatural factors. (De-Graft Aikins et al, 2014)

Another influence on adherence is availability of social support. When patients have friends and families who offer support in diverse ways and, it encourages them to adherence to medication regimen (Adisa et al., 2009).

1.6 Research Questions

The research questions for this study are as follows:

1. What is the level of adherence to medication regimen among diabetes mellitus patients in Ghana?
2. What are the factors associated with adherence to medication among diabetic patients?

1.7 Objectives

1.7.1 General Objectives

The general objective of this study is to assess the prevalence of adherence to medication among diabetes mellitus patients in Ghana.

1.7.2 Specific Objectives

1. To determine the prevalence of adherence to medication regimen among diabetes patients in Ghana.
2. To assess the factors associated with adherence to medication among diabetic patients in Ghana.

CHAPTER TWO

2.0 LITERATURE REVIEW

The World Health Organization defines Medication adherence as "the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (WHO, 2003). The failure to medication adherence leads to complications of the diabetes mellitus disease, high cost of health care and increasing proportions of mortality (Chatterjee et al, 2017).

2.1 Adherence to Diabetes Mellitus Medication

Non-adherence is described as not taking more than 80% of the administered treatment in chronic diseases (Sackett et al, 1991). Adherence to diabetes mellitus treatment has been found in previous studies to be suboptimal ranging from 23% to 77% (Schectman, Nadkarni and Voss, 2002; Kalyango et al., 2018). Attempts to expound and enhance adherence in patients mostly seem not to be effectual. 50% of interventions seem to fail although successful adherence interventions are in existence according to Arifulla et al., (2014). Non-adherence to diabetes mellitus medical treatments remains an issue of concern to medical practitioners (Ahola & Groop, 2013). The management of diabetes mellitus most at times look simple and direct. The challenge that comes with it and its results are likely to pose a weighty predicament for diabetic patients, their families, the systems of the health care and higher authorities at large (IDF, 2006).

2.2 Individual's factors influencing adherence to diabetic medication

2.2.1 Age

Ahmad, Ramli, Islahudin, & Paraidathathu, (2013) sampled 557 patients with T2DM in Primary Health Clinics in Malaysia to assess and ascertain factors that are related with non-adherence to medication. The study used logistic regression analysis to predict that age has an influence on non-adherence. That is, a unit rise in age increases non-adherence to medication. However, participants who have had diabetes mellitus for long have now become more conscious of the disease and therefore, were in a better state to adhere to their medications. It was recommended that there is a necessity for educating younger generations. This is opposed by Sweileh et al. (2014), in a study done in Palestine which identified that age has no relationship with medication non-adherence among T2DM patients.

2.2.2 Sex

A study conducted by Kalyango, Owino & Nambuya (2008) to assess the prevalence and factors responsible for medication non-adherence among 402 patients with T2DM in Mulago Hospital, Uganda revealed that sex was significantly related with medication non-adherence among the type 2 diabetic patients. This is in agreement with a study done by Elsous et al., (2017) who established that non-adherence to diabetes mellitus medication was associated with females seeking medical care in Gaza Strip, Palestine. According to Elsous et al. (2017), women were found to be more active in chasing after preventive and protective healthcare and pursuing medical services to attain treatments or cures for medical conditions than men. This is because, adherence to diabetes mellitus medication is defied with difficult regimens particularly when there are comorbidities present, and so men tend to forget to take their treatments as they might be drained with work. A study that was done in Palestine by Sweileh et al. (2014), and in Malaysia by Ahmad et al. (2013) on the contrary, identified no relationship between sex and non-adherence to diabetes medication.

2.2.3 Marital Status

A study conducted by Sweileh et al. (2014) on 405 patients at Al-Makhfia governmental diabetes mellitus clinic in Nablus, Palestine found that marital status was significantly associated with adherence to T2DM medication. That is, patients who are married are less probable to be non-adherent compared with patients who are single. Marital status was insignificant during multivariate analysis. This meant that family or marital factors when measured as a single factor are significant for medication adherence but become irrelevant when measured amid other robust factors like beliefs and disease-related information.

2.2.4 Educational Level

Ali, Alemu, and Sada (2017) studied 146 patients having diabetes mellitus getting care at the Zewditu Memorial Hospital in Ethiopia to measure factors influencing non-adherence to diabetic medications. They employed logistic regression and found that educational level had a statistical significant relationship with non-adherence to diabetic medications. Similar outcomes were detected from a study conducted among patients living with diabetes mellitus in Uganda by Kalyango, Owino, & Nambuya, (2008) and in Iran by Farsaei (2011) which showed that patients' educational level has an association with adherence to diabetes mellitus medication. Higher rates of non-adherence have been linked with low educational level. That is according to Ali, Alemu, and Sada (2017), being an illiterate makes the understanding of diabetes mellitus drug therapy difficult. As it becomes more complex, higher cognitive skills in patients are essential to be able to comprehend the recommended treatment therapy to adhere to medication. In contrast, two studies one performed in Palestine by Sweileh et al. (2014), and the other in Malaysia by Ahmad

et al., (2013) identified no relationship between educational level and DM medication non-adherence.

2.2.5 Religion

A study by Mandewo et al., (2014) which examined factors that are related with medication non-adherence in adults with T2DM showed that some patients do not take their medication because they believe that God can cure them. Others asserted that their adherence or nonadherence to medication had nothing to do with religion but some others are hindered by cultural practices especially in taking some particular drugs. On the contrary, a study by Rwegerera (2014) in Tanzania found no association between religion and non-adherence to diabetic mediation.

2.2.6 Monthly Income

A study conducted in Malaysian reported that income has an association with adherence to diabetes mellitus medication (Chew, Hassan, & Sherina 2015). According to the report, higher income is likely to influence a patient's adherence to recommended medication. That is, patients who earn higher income are enabled to be more capable in the events of seeking health. This is in line with a study conducted by Kassahun et al., (2016) who identified that low income was significantly related with non-adherence to DM medication.

2.2.7 Duration of Diabetes Mellitus

Abebaw et al. (2016) studied 288 patients to assess factors influencing adherence among T2DM patients at the University of Gondar Hospital, Diabetic Clinic in Gondar, and Northwest Ethiopia. They found that the duration of diabetes mellitus has a significant association with adherence to the disease. In a similar study conducted in Uganda by Bagonza et al. (2015), in

Iran by Yekta et al. (2011) and in Nigeria by Pascal et al. (2012), they found that duration of diabetes had an association with non-adherence to diabetes medication.

According to Bagonza et al., (2015), patients who have had the disease for a short period and are on treatment may perhaps have a reduced conscious of the disease and consequently are highly probable to have increased non-adherence proportion and vice versa. Elsous et al. (2017) also stated that participants were more probable to adhere to the prescribed medication if they have a long history of diabetes. This is because, during the early years of disease, patients might not have been fully exposed to the threat of the disease and the complications it comes with. When they begin to experience the complications, attitude and approach toward the disease and associated therapies also receive adjustment heading towards better adherence to medication. Also, patients tend to have better cooperation with their providers of health care, appreciate their plans for treatment, and turn out to be more mindful of their diseases because of the gained experiences with the longer duration of the disease. In contrast, Sweilah et al., (2014) and Ahmad et al., (2013) conducted research in Palestine and Malaysia respectively which identified no association concerning duration of diabetes and non-adherence to medication among diabetic patients.

2.2.8 Presence of Co-morbidities

The complexity normally increases with chronic nature as the disease progresses in most patients. A study revealed that patients with other co-morbidities can take as many as ten tablets a day (Gaede et al., 2003). The complexity of the dosage regimen directly affects adherence (Thayer et al., 2010). This is consistent with studies conducted in Palestine by Sweileh et al., (2014), and in Malaysia by Ahmad, Ramli, Islahudin and Paraidathathu (2013) which identified

the existence of co-morbidities having an association with non-adherence to diabetes mellitus medication. According to Ahmad et al., (2013), T2DM patients with comorbid conditions largely have additional medications of diverse classes of pharmacology like hypertensive medicines, lipid-lowering agents, and antiplatelet medicines. This makes it a complex treatment regimen which possibly will contribute to non-adherence.

2.2.9 Physical Activity

Castaneda (2003) conducted a study which showed that about 23% of chronic situations and deaths linked to cardiovascular diseases and diabetes mellitus are connected with physical inactivity. Similarly, a study conducted by Nyenwe et al., (2011), revealed that sedentary lifestyles are a contributing factor to the risk of developing T2DM. Physical activity, when done habitually, has been recognized to improve insulin action by enhancing blood glucose levels. It also decreases blood lipids, blood pressure and other deaths related to the heart (Colberg et al., 2010). Frequent physical activity contributes to weight loss and advances the quality of life of type 2 diabetics (Castaneda, 2003; ADA, 2014a). 2.3 Health-Related Factors and non-adherence

2.3 Health Related Factors and Adherence

2.3.0 Patient-provider communication

When there are effective communication and interaction between patients and providers with respect to collective decision-making, health manners, course and consequences of care for diabetic patients are influenced, meta-analysis showed that there was a positive significant relationship between patient-provider communication and adherence. (Greenfield et al., 1998; Kaplan & Greenfield, 1989; Berger & Muhlhauser, 1999; Dimmatteo et al., (2000) There was an increased risk of non-adherence among patients whose communication with providers were poor

as compared to patients who had better communication with providers (Martin et al., 2005). Patients who are unable to comprehend their medication regimen were at a higher risk of being non- adherent compared to patients who understood their medication regimen (Richard, 2005; Vermeire et al., 2009).

2.3.1 Availability of Drugs

Bagonza, Rutebemberwa, and Bazeyo (2015) studied 521 diabetes mellitus patients in Iganga and Bugiri hospitals to assess factors related to adherence to antidiabetic medication in rural eastern Uganda. The study found that the availability of diabetic medicines was independently related with adherence to diabetic medication. This is in line with studies done by Ali et al. (2015) in Uganda who found an association between availability of diabetic medicines and adherence to medication among diabetic patients. According to Ali, Alemu, and Sada (2017), the absence of medicines in the health organization harms patient's adherence, particularly when it is accompanied by low socio-economic status. This is because patients usually do not have enough money to pay for medication from the reserved sectors, where medicines are typically expensive.

2.3.2 Cost of Medicine

Rwegerera (2014) studied 215 patients to assess adherence to antidiabetic medication and accompanying factors among patients with T2DM at Diabetic clinic of Muhimbili National Hospital in Tanzania. The study found a statistical significant relationship between the cost of medicine and adherence to anti-diabetic medication.

2.3.13 Side effects

Gastrointestinal disorders (nausea, vomiting, and diarrhea), are some of the side effects following medication, that have been revealed to significantly influence non-adherence (Fischer et al., 2010). A patient who experiences an adverse reaction from medication is more likely to discontinue the medication than those who do not. Kalyango et al., (2008) however, demonstrated that there was no association between side effects and medication non-adherence. Freemark and Bursey, (2001) observed temporal abdominal distress or diarrhea ensued in 40% of treated patients with no events of nausea or lactic acidosis. Richard, (2005) reported that several patients not adhering to medication was as a result of the side effect of the anti-diabetic medication.

2.3.4 Knowledge of Disease

A study conducted in Islamabad identified a significant relationship between knowledge of disease and non-adherence to diabetes mellitus medication Shams et al., 2016). Similarly, according to a study conducted by Divya and Nadig (2015), 64.63% of non-adherent patients of known T2DM patients in South India lacked information about the recommended medication. This is consistent with a study in Uganda by Bagonza, Rutebemberwa, and Bazeyo (2015), in Malaysia by Ahmad et al., (2013) who identified that knowledge of the disease has a significant association with adherence to medication. Ahmad et al., (2013) stated that the direct relationship between adherence and medication knowledge proposes that health care experts are in the greatest and appropriate spot to broadcast suitable information for improved management outcome. Furthermore, a study conducted by Venkatesan et al. (2018) among T2DM patients in rural Tamil Nadu revealed a significant relationship between perceived lacks of knowledge about diabetes mellitus with low adherence to medication. It was recorded that information about the problems of diabetes mellitus such as foot complications, stroke, eye, and heart attack was far

less than fifty percent (Adil et al., 2010). Education on diabetes mellitus can be on disease awareness, expertise essential for management and ability to incorporate therapy in daily life. Individual factors, both psychological and environmental must be considered since it has been shown to largely influence patients' drive to learn and adhere to treatment (Hansotia, 2013).

2.4 Community Factors and non-adherence

2.4.1 Social Support

Studies by Mandewo et al., (2014) revealed that patients regularly receive social care and support either from their children in terms of material, moral or emotional, from spouses or some distant relatives. Whereas some patients are assisted by Governmental agencies, others are assisted by their friends. The absence of such supports will therefore affect adherence to medication.

2.4.2 Distance to Health Facility

Kassahun, Gashe, Mulisa, & Rike, (2016) studied 384 diabetic patients to assess factors affecting adherence to anti-diabetic medication at the Assela General Hospital (AGH), Oromia Region, in Ethiopia. The study found a significant association between distance from home to the hospital and adherence to diabetic medication. According to Kassahun et al. (2016), patients from distant areas, particularly when it was accompanied by deprived substructure like lack of transportation, were less expected to be adherent than patients who were nearer. That is, if patients need to cover a long distance to come to the clinic, it will possibly affect their interest in collecting medicines from the health institution when they refill the medications.

2.4.3 Financial support

Medi, Mateti, Kanduri, & Konda (2015) studied 140 diabetic patients to assess medication adherence and determinants in south Indian. The study revealed that financial support has a significant relationship with and medication non-adherence. Another study conducted by Santhosh &Naveen, (2011) showed that lack of finance had an influence on medication non-adherence. According to a study done by Isomaa et al., (2011), financial support has an influence on non-adherence to medication.

2.4.4 Diabetes Mellitus Complications

Diverse ways have been used to manage diabetes mellitus, yet the tendency of complications still exist (Public Health Agency of Canada, 2011). The short-term complications associated with diabetes mellitus include; diabetic ketoacidosis (Public Health Agency of Canada, 2011); slow healing of bruises and cuts (Argenta & Morykwas, 2004); recurrent bladder and skin infections (Argenta & Morykwas, 2004). Poor medication adherence is often recorded, leading to considerable deteriorating of the disease, death and high health-care expenses (Jimmy & Jose, 2011).

With this, consultants are encouraged to look out for low or non-adherence and improve them by highlighting the importance of the regimen of a patient, making it simple and modifying the patient's regimen to their lifestyle (Gelaw et al, 2014). One common and significant risk factor that has increased T2DM is Obesity. (Hramiak, Leiter, Paul, & Ur, 2007; Morrison & Chanoine, 2007). Diabetic patients are two to four times more probable to have cardiovascular diseases compared to non-diabetic persons (Booth, Kapral, Fung, & Tu, 2006). Cardiovascular diseases are the principal cause of death among persons with T2DM and also the main reason for the high

healthcare for persons living with diabetes mellitus (Simpson, Corabian, Jacobs, & Johnson, 2003)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

A systematic review of literature was done with regards to medication adherence which was scaled down to medication adherence with diabetic patients in Ghana.

3.2 Study area

The research articles reviewed were researches conducted in Ghana. Hence the study area for this work is specifically, Ghana.

3.3 Study population

This study sampled 8607 research works all over the world and finally reviewed 6 peer reviewed published works. A total study population of 1,448 participants was realized altogether (from the five works).

3.4.1 Inclusion criteria for the selection of articles

1. Research conducted in Ghana
2. Research on Diabetes Mellitus
3. Reported percentage of adherence
4. Factors associated with level of adherence

3.4.2 Exclusion criteria

The following criteria were used to exclude research articles from the review.

1. Research work conducted outside Ghana
2. Study on males or females only
3. Research older than 10 years
4. Research work not reporting percentage of adherence
5. Research work not published in English language
6. Research work not published

3.5 Study variables

The dependent variable of the study is adherence to diabetic medication.

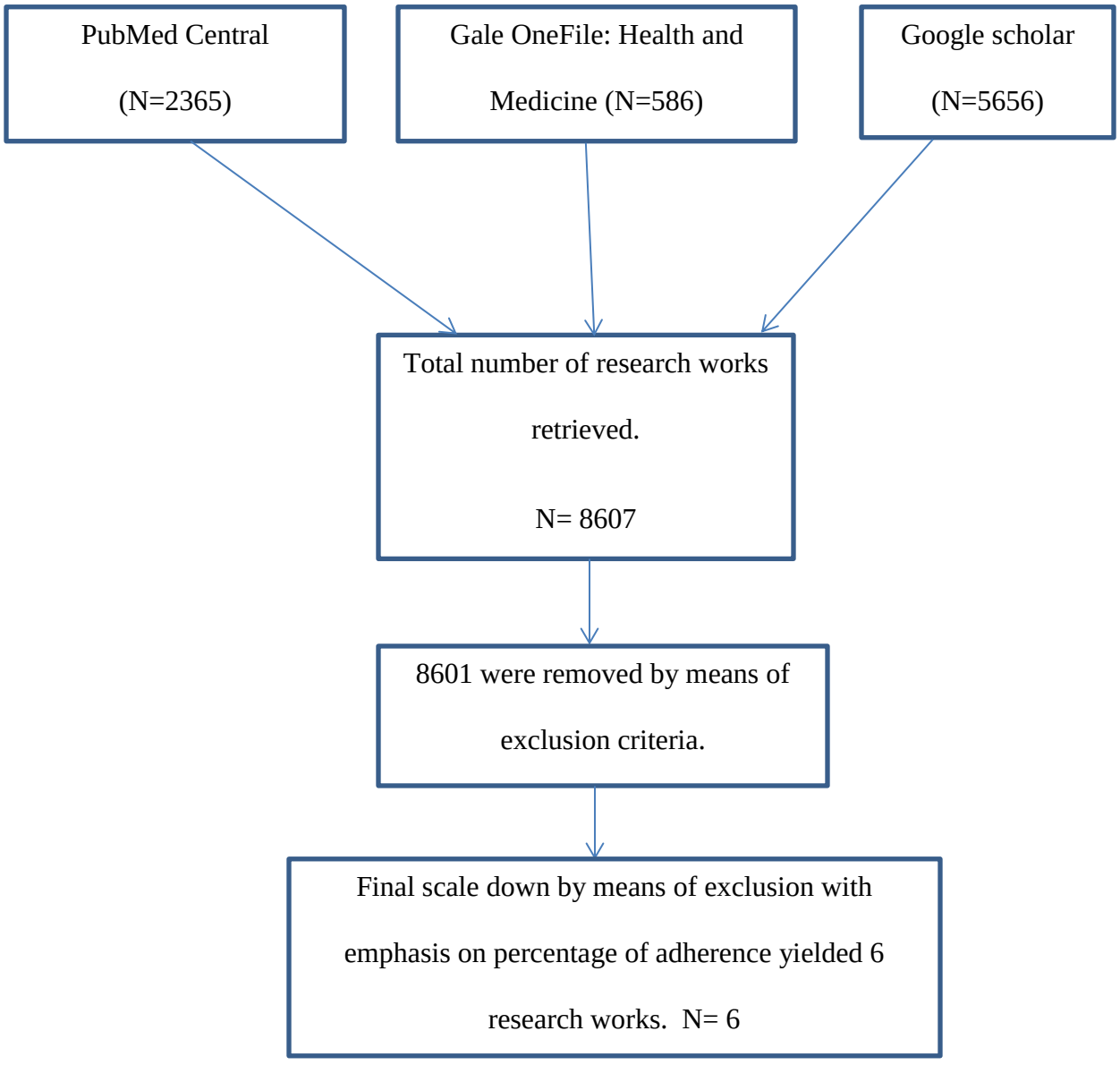
The independent variables are as follows:

Demographic factors	**Health Care Givers Factors**	**Health Facility Based Factors**	**Drug Related Factors**	**Individual Factors**
Age	Staff attitude	Waiting time	Cost of drugs	Forgetfulness
Sex	Patient-provider Communication	Distance	Side Effects	Awareness level
Educational level			Polypharmacy	Health seeking behaviours
Religion				
Income				
Severity of illness				

Table 3.1. Independent variables of the study.

3.6 Search strategy

Flow diagram of search strategy (N = number of research works)



3.7 Sampling method

The sampling was based on the inclusion and exclusion criteria. Titles and abstracts of published works were reviewed. Medication Adherence of Diabetes and other health related issues were selected. The country where research was done was finally scaled down to by means of the inclusion and exclusion criteria of this study.

3.8 Data collection and management

The researchers abstracted data from the medical records of participants. A survey approach was used to collect relevant information for the study. The eight-item Morisky Medication Adherence Scale (MMAS-8) was used to measure adherence.

3.9 Data Analysis

Data gathered by the authors were analysed using SPSS. Frequency distribution tables and percentages were the statistical tools used in describing the data. Chi-square test and multiple logistic regressions were also used by the authors to determine the association between the dependent variable and various independent variables. Both bivariate and multiple logistic regression analysis were used to evaluate the relationship between the independent, health and community-related factors and adherence to diabetic medication. All variables that were identified were related to adherence in bivariate analysis using Crude Odds Ratio with 95% CI at significant level of ≤ 0.05 and entered into the multiple logistic regression models in order to control for confounders. Adjusted Odds Ratio with 95% CI were used to assess the degree of relationship between explanatory variables and adherence to diabetes mellitus medication. The statistical relationship between dependent and independent variables were declared significant at a p-value of ≤ 0.05.

CHAPTER FOUR

1.0 RESULTS AND DISCUSSION

1.1 Results

This review was based on five research articles that had quantitative information on the rate of T2DM adherence and had also reported on factors that related to the adherence levels. An observational study of the levels of adherence reported in the five studies was conducted and a mean of the rates was also calculated. Table 2 shows the various research articles in this review and their respective reported rates of adherence.

Study and year	**Location in Ghana**	**Study Population**	**Adherence**	**Major Findings**
Kretchy et al (2020)	Accra, Greater Accra Region	188	33.3%	Poor adherence to medications was recorded. Four areas of T2DM distress were revealed as negative emotions about diabetes: dietary concerns, diabetes care, dissatisfaction with external support and diabetes management helplessness.
Afaya et al (2020)	Tamale, Northern Region	330	84.5%	Adherence to anti-diabetes medication formed the majority and was influenced by Participant's age, educational level and

				practice of self-care behaviours.
Addo et al (2017)	Offinso South, Ashanti Region	200	55.6%	Medication noncompliance was high with patients living with HIV/AIDS and those with psychological disorders. The cost of medication did not influence noncompliance.
Sefah et al (2020)	Ho, Volta region	400	47.75%	Adherence was low. The main self-reported reason for non-adherence was forgetfulness.
Bruce et al (2015)	Accra, Greater Accra Region	200	38.5%	Adherence in diabetic patients was low with educational level being a major factor.
Amaltinga (2017)	Dormaa, Brong Ahafo Region	130	68.5%	Adherence to diabetic treatment was satisfactory. Finances, forgetfulness, busy schedules and poor family support contributed to nonadherence. Patients called for a government subsidy to the drugs as well as continuous health education on the diseases and family support.
AVERAGE		**241**	**54.69%**	

Table 4.1. References reviewed and rates of adherence.

The findings from the results indicate that the level of adherence to Type-2 diabetes mellitus (T2DM) medication in Ghana has seen no trend of increase or decrease in the past ten years. The range is 33.3% to 84.5%. Averagely, this review estimates the level of adherence in Ghana to be 54.69% with an average population of 241 patients. The highest which is 84.5% was reported by Afaya et al (2020). Three studies have adherence rates below this average; 33.3%, 47.75% and 38.5% (Kretchy et al, Sefah et al and Bruce et al) respectively.

Study	**Age**	**Independent Variables**			
		Demographic factors	**Healthcare givers factors**	**Individual factors**	**Drug related factors**
Kretchy et al (2020)	18 and above	Age: 50+	No. of Medication: 1 – 16.58% 2 – 36.9% 3 – 28.88% 4 + - 17.65%	Low distress	Cost of drug: NHIS support

Afaya et al (2020)	25 - 90	Age: 70+ more adherent (p-value: 0.016) Education: 40% formal education. Tertiary education increased knowledge score.		Forgetfulness	Cost of drugs: NHIS support
Addo et al (2017)	<40 to >60 (18 and above)	Age: old people are more compliant. (P-value: 0.006) Education : Educated (p-value: 0.018)	No. of Medication: 1 – 12.5% 2 – 38.0% 3 – 21.5% 4+ – 28.0%	Forgetfulness (impacted negatively)	Cost of drug: NHIS support
Sefah et al (2020)	18 and above	Education: Tertiary level was more adherent		Forgetfulness (impacted negatively)	

Bruce et al (2015)	18 to 75	Education: High level of education significantly affected adherence.			Mode of payment affected adherence.
Amaltinga et al (2017)	18+	Age: 50+		Forgetfulness (impacted negatively) Busy schedules (impacted negatively)	Finances (impacted negatively)

Table 4.2. Independent variables predicting adherence. $P \leq 0.05$ is significant.

The factors that contribute to adherence to T2DM medication in Ghana as observed from the five studies are shown in Table 3. These factors were more of demographic factors and individual factors. Kretchy et al (2020) however had a strong base of diabetes distress as a key factor.

4.2 DISCUSSION

The level of adherence to Type-2 diabetes mellitus (T2DM) medication in Ghana has seen no particular trend of increase in the past ten years. The findings show an adherence range from 33.3% to 84.5% with an average of 54.69% among an average population of 241 patients in Ghana. Although there is no reported standard rate of adherence, studies have come up with estimated ranges. In a study conducted by Wabe et al (2011) on adherence to diabetes medication in Ethiopia, the worldwide rate of adherence was reported to be from 36% to 93%. Also Alqarni et al (2018) reported 65% - 85% for OHAs with suggested cut off point of 80%. The range of adherence in this review is seen to be close to that reported by Wabe and colleagues in 2011. A relation to the report by Alqarni et al suggests that adherence to T2DM medication in Ghana has exceeded the threshold of 80%. However, this is seen in one out of the six research works reviewed and specifically in Tamale, the northern part of Ghana (one part of Ghana). On the average, the rate of adherence is below the threshold. This study therefore suggests that the level of adherence to T2DM is on the lower rate.

Age and education were the key demographic factors across the research works reviewed. Age as a predictor of adherence was observed in three out of the five articles studied while education was observed in four. Afaya et al (2020) reported the highest level of adherence at 84.5%. Old age had a positive relation with patients' adherence. This is as a result of the high level of adherence that was related to old people. The age factor affecting medication adherence was also reported by Addo et al (2017). In a research on social demographic variables on adherence, Galveia et al (2015) similarly had age as a factor affecting adherence. Higher age was said to be significant to adherence. It is therefore relevant to note in this study that in Ghana, older people with diabetes adhere to medications than the young ones.

Another demographic factor that has a positive impact on adherence is level of education. Whereas being educated or not is not a factor to dwell much on, level of education positively affect prevalence of adherence. Bruce et al (2015) reported a significant correlation between the prevalence of adherence and the level of education. A positive relation is associated with patients who adhered to medication because they had high level of education. There is also a similarity with the study by Sefah et al (2020) in this regard. Rike et al (2015) on non-adherence and factors affecting adherence, reported that level of education was significant to medication adherence. Galveia et al (2014) similarly reported that level of education is associated with adherence. Galveia and colleagues realised that lower level of education contributed to non-adherence to diabetes medication.

Abebaw et al. (2016) in a study in Ethiopia on factors influencing adherence found that the duration of diabetes mellitus has a significant association with adherence to the disease. Similar studies were conducted in Uganda by Bagonza et al (2015) and in Iran by Yekta et al (2011). Duration of diagnosis and difficulty in remembering medication instructions are also predictors of adherence to medication. These individual factors were also seen to be associated with adherence and had positive influences on adherence. The difficulty in remembering medication instructions may be due to the long duration of diagnosis which can also result in forgetfulness of instructions. This review further indicates that, less cost of medications predicts adherence. This is realised in the support by the NHIS of Ghana taking some of the cost of medicines (Addo et al, 2017). Amaltinga (2017) also mentioned that finances affected adherence. Rwegerera (2014) studied 215 patients to assess adherence to antidiabetic medication and accompanying factors among patients with T2DM at Diabetic clinic of Muhimbili National Hospital in Tanzania. The study found a statistical significant relationship between the cost of medicine and adherence to

anti-diabetic medication. Patients who cannot afford medications because of high costs are sure to be non-adherent. Therefore the National Health Insurance Scheme of Ghana supporting cost of medication is a positive significant to medication adherence.

CHAPTER FIVE

4.0 CONCLUSION AND RECOMMENDATION

4.1 CONCLUSION

This study concludes that the level of adherence to Type-2 Diabetes Mellitus medication in Ghana is low (average of 54.69%).

Formal education and high level of education positively affected medication adherence. Other factors that predicted the adherence to T2DM were age (old age), low distress and self-care behaviour.

5.2 RECOMMENDATION

The findings in this review, suggests that more research should be conducted to check the prevalence of diabetes medication adherence in Ghana. Also, more education about adherence to medication should be done. The education should include managing diabetes distress and medication instructions.

It further suggests that young patients should be targeted in regards to improving T2DM medication adherence.

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