KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF HEALTH POLICY MANAGEMENT AND ECONOMICS

FACTORS THAT CONTRIBUTE TO NON-ADHERENCE TO ORAL HYPOGLYCAEMIC THERAPY AMONG TYPE II DIABETIC PATIENTS AT SOUTH SUNTRESO HOSPITAL

A DISSERTATION SUBMITTED TO THE SCHOOL OF GRADUATES STUDIES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI IN PARTIAL FULFILMENT FOR THE AWARD OF MPH IN HEALTH SERVICES PLANNING AND MANAGEMENT.

BY

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SEPTEMBER, 2019

DECLARATION

I hereby declare that this submission is my own work towards the Master of Public Health in Health Services Planning and Management. To the best of my knowledge, it contains no material previously published by another person or material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ACKNOWLEDGEMENT

DEDICATION

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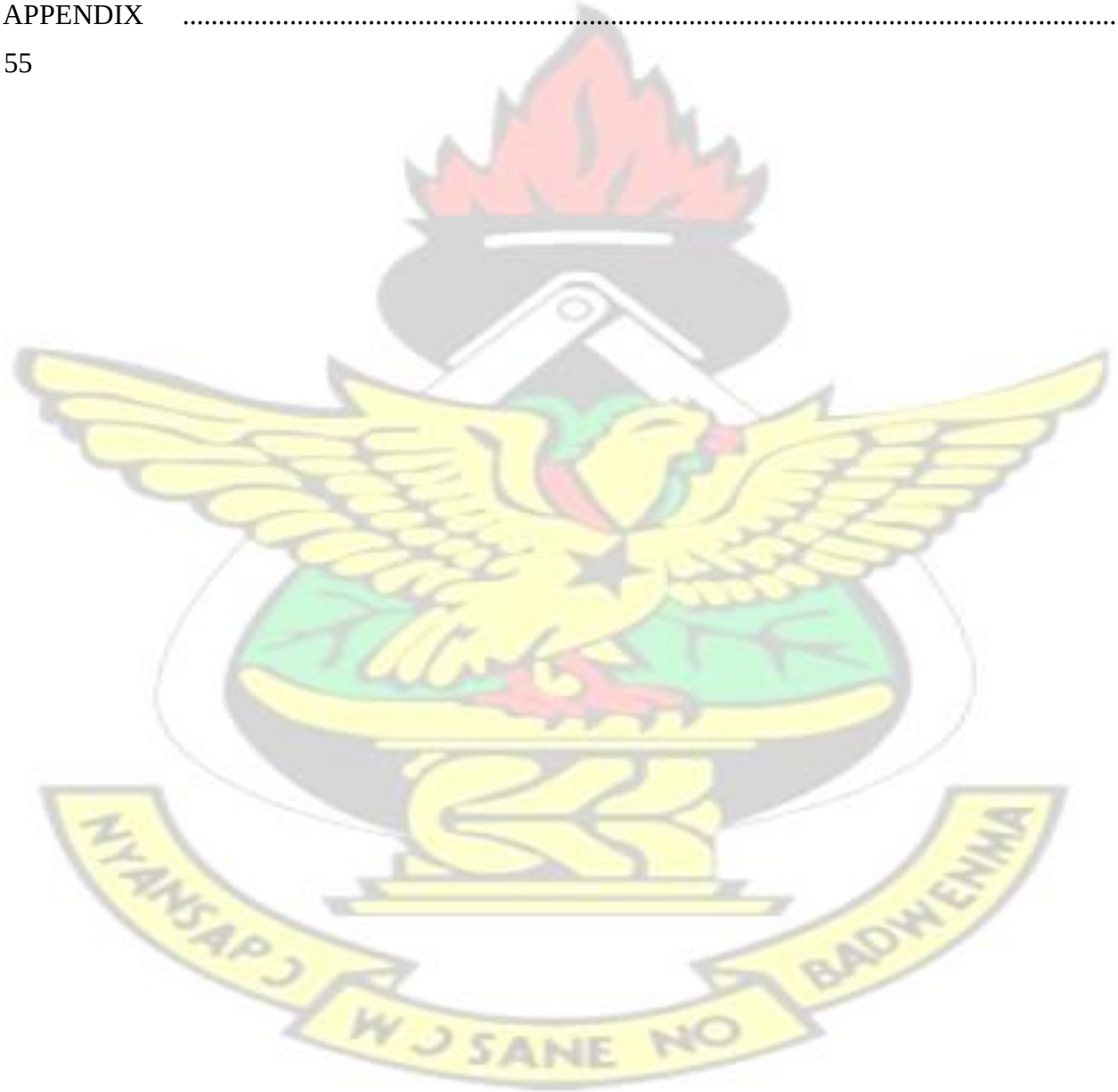

ABSTRACT

Background

Diabetes is a non-communicable and chronic disease that currently contributes to a large and significant proportion of all global mortalities regardless of levels of economic achievement. The adherence of medication for the diabetes has become a problem for many patients. Therefore, this study was to evaluate adherence to oral hypoglycaemic agents (OHAs) among patients attending the diabetes centre at the Suntreso Government Hospital in Kumasi.

Methods

A cross sectional study where descriptive research method was adopted. Both quantitative and qualitative methods were used to obtain data from the participants. The study population were diabetic patients seeking for treatment at the Suntreso Government Hospital. A sample size of 200 diabetic patients were simple randomly selected. Data was obtained through the use of questionnaires and measurement of the fasting blood glucose of diabetic patients. Data was analysed using a STATA v 16.

Results

It is identified in the study that the mean age of the diabetic patients was 58.75 ± 0.75 years and also the female patients made up the larger proportion of patients in this current study. Moreover, it was realized that the average fasting blood glucose levels of participants was 8.84 ± 0.29 mmol/l where most of them have been diagnosed of the disease for 1-3 years. The medication predominantly used by participants (71%) was Metformin, however, their rate of adherence to the medications was suboptimal (61%). Irrespective of their quiet impressive rate of adherence to medication, most of the participants have been diagnosed of other chronic conditions such as hypertension and depression. The major barriers toward adherence to OHAs by diabetic patients

are drug-related and provider, social, and individuals factors. Conclusively, it is identified in this study that a significant relationship at 5% significance level exist between non-adherence to OHAs medication and gender, education, marital status, religion, and monthly income of the diabetic patients.

Conclusion

The adherence rate of OHAs medication among type 2 diabetic patients was good, however, much improvement is required to help derail the barriers confronting the adherence of medication among type 2 diabetic patients.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Globally, approximately 415 million people live with diabetes, with a majority who reside in low- and middle-income countries (Jaacks *et al.*, 2016). Diabetes is a non-communicable and chronic disease that currently contributes to a large and significant proportion of all global mortalities regardless of levels of economic achievement (Lozano *et al.*, 2013). Although Type 1 diabetes has a high global occurrence, the prevalence of Type 2 diabetes mellitus (T2DM) is on the increase, notably in developing countries (Dall *et al.*, 2010). In 2010 alone, diabetes contributed to a 75% loss of global gross domestic product (GDP), which amounted to an estimated USD 63 trillion in healthcare costs (Lozano *et al.*, 2013). Given that diabetes is a major cause of mortality, morbidity, and health care expenditure, addressing this chronic disease represents a global health challenge (Seuring, Archangelidi and Suhrcke, 2015; Jaacks *et al.*, 2016).

Genetic, environmental, and metabolic risk factors contribute to type 2 diabetes (Wu *et al.*, 2014). These include a strong family history of diabetes mellitus, age, obesity, physical inactivity, and poor dietary habits (Fletcher, Gulanick and Lamendola, 2002). Women with histories of gestational diabetes and their children are at increased risks of acquiring type 2 diabetes, and insulin resistance and impaired glucose tolerance also increase a person's risk for developing type 2 diabetes (Fletcher, Gulanick and Lamendola, 2002). Other risk factors for

T2DM include hyperinsulinemia, atherogenic dyslipidemia, glucose intolerance, hypertension, prothrombic states, hyperuricemia, and polycystic ovary syndrome (Fletcher, Gulanick and Lamendola, 2002).

The Clinical Guidelines Task Force of the International Diabetes Federation has created an evidence-based Global Guideline for the care of people with Type 2 diabetes around the world with recommendations developed for three levels of care (standard, comprehensive, and minimal) which can be applied in settings with different resources (Aschner *et al.*, 2014). Recommendations for the care and management of type 2 diabetes in adults typically focus on patient education, dietary advice, managing cardiovascular risk, managing blood glucose levels, and identifying and managing long-term complications (National Institute for Health and Care Excellence (NICE), 2015). The most popular approach to care and management of T2DM has been a combination of lifestyle modifications such as nutritional therapy and physical activity, and pharmacotherapy (Ganz, 2005; Bonora, 2018). Currently, there are five distinct classes (sulfonylureas, meglitinides, biguanides, thiazolidinediones and alpha-glucosidase inhibitors) of oral hypoglycaemic agents (OHAs) which are used in varied combinations to correct one or more of metabolic abnormalities and to treat type 2 diabetes (Luna and Feinglos, 2001).

In spite of current therapeutic benefits, a large proportion of T2DM patients do not achieve recommended glycaemic targets (García-Pérez *et al.*, 2013), and this poses an immense challenge to the management of T2DM. Non-adherence to therapies for T2DM have generally been associated with age, ethnicity, social support, lack of education or information, perception and duration of disease, complexity of dosing regimen, polytherapy, psychological factors, safety, tolerability, clinical inertia and cost (Rubin, 2005; Bailey and Kodack, 2011; GarcíaPérez *et al.*,

2013). Stark differences between patients and health providers, with respect to opinions and perceptions on non-adherence, may also be a contributing factor to exacerbating this challenge (Brundisini *et al.*, 2015).

Adherence to therapy by T2DM patients depends primarily on a number of variables, including those specific to patients, healthcare providers, and treatment (Nau, 2012). Increased patient knowledge of oral hypoglycaemic issues and reinforcement of the importance of medication adherence have been suggested to be useful in promoting adherence to therapies among T2DM patients (Lun Gan, Brammer and Creedy, 2016). Continuous education may provide T2DM patients the opportunity to reinforce information and additionally help educators to identify barriers to medication adherence. It has been suggested that diabetes educators must be aware of the common barriers to adherence, such as regimen complexity of ≥1 OHA or ≥1 dose daily, depression, remembering doses and refills, and to subsequently provide screening and support to their patients to resolve those barriers if they exist (Odegard and Capoccia, 2007). Diabetesrelated emotional distress may be associated with non-adherence and poor glycaemic control among adults (Gonzalez *et al.*, 2015). This suggests that depression screening and treatment may be included in protocols for management of patients with type 2 diabetes (Kalsekar *et al.*, 2006). Perceptions of experiencing medication-related side effects are also barriers that have been associated with nonadherence to OHAs (Chao, Nau and Aikens, 2007). There is evidence that demonstrates that some T2DM patients understand the need for medications, but adjust dosages and timing of medication-taking in their daily lives (McSharry *et al.*, 2016). Potential benefits of pharmacists playing major roles in interventions to improve medication adherence in diabetes, especially in providing patient education (Lindenmeyer *et al.*, 2006) have also been suggested. Adherence rates may additionally be influenced by the class of OHAs that are administered to

T2DM patients (McGovern *et al.*, 2016).

Although there have been suggestions that educational interventions that focus on selfmanagement strategies appear more likely to achieve positive outcomes (Lun Gan, Brammer and Creedy, 2016), there is no consistency in methodologies for diabetes therapy adherence research, and that an effective intervention that can be generalised to all T2DM patients is currently nonexistent (Sapkota *et al.*, 2015). Because a perfect measure does not exist, a multimeasure approach seems to be the best solution (Lam and Fresco, 2015).

1.2 Problem Statement

Different treatment modalities for diabetes are practiced in Ghana, although the most common approach to clinical management of the condition among most diagnosed diabetics is a combination of education about protective lifestyle factors and oral drug therapy or OHAs, with or without insulin. Monitoring of adherence to therapies against diabetes in Ghana is not a common practice among healthcare providers. Since there is practically no proper monitoring of adherence to treatment, the management of diabetes towards positive outcomes of enhanced glycaemic control among Ghanaian diabetics remains unresolved. Adherence to diet, and other self-care guidelines such as checking of feet are relatively low (Mogre *et al.*, 2017). Healershopping between medical systems is also very common (Aikins, Owusu-dabo and Agyemang, 2012). There are indications that diabetic patients employ both orthodox and local or herbal remedies in the management of the condition (Tabong *et al.*, 2018). Other major challenges that have been identified with diabetes management include poor education about diabetes, erratic supply of essential OHAs at health facilities and poorly trained health care professionals to manage diabetes

including doctors, nurses and dieticians (Aikins, Owusu-dabo and Agyemang, 2012). People living with diabetes experience complex psychosocial challenges but have limited social support which may be highly essential to enhance coping with the condition (Tabong *et al*., 2018). In support of these efforts, some diabetics have called for government subsidies for OHAs, continuous health education on the disease and intensified family support (Prosper Mandela Amaltinga, 2017).

In Ghana, diabetes is one of the top ten causes of morbidity and mortality among adults (GHS, 2017) but there are wide variations in reported prevalence estimates because of self-reporting and a high rate of undiagnosed diabetes (Gatimu, Milimo and Sebastian, 2016). These variations are a result of rural/urban and clinical sub-group differences in the studies from which these estimates have been garnered. Additionally, nationally representative diabetes prevalence estimates do not include community studies, are clinically biased, and potentially reflect a misrepresentation of the burden of diabetes and under-reporting of diabetes in Ghana. In 2014, national prevalence estimates for diabetes were 0.8 and 1.4 for Ghanaian women and men respectively (15-49 years) who were provided outpatient care in selected health facilities (GSS, 2015). Although available evidence is weak, inadequate, and lacks consistency, there is evidence of an increase in the trend of prevalence estimates for diabetes in Ghana (Abubakari and Bhopal, 2008; Aikins, Owusu-dabo and Agyemang, 2012; Sarfo-Kantanka *et al.*, 2016). The prevalence of diabetes in Ghana has ostensibly risen from 0.2% in the late 1950s, to 6.0% in 2009 (Aikins, Owusu-dabo and Agyemang, 2012). In the late 1990s, a prevalence of 6.4% was recorded in a mixed community in Accra, and 9.1% among civil servants in 2006 (Aikins, Owusu-dabo and Agyemang, 2012). Currently, the prevalence of diabetes in Ghana has been reported to be 9 %

(GHS, 2017), although this estimate may require additional validation for consistency.

In Ghana, the risks of becoming diabetic include a family history of diabetes, physical inactivity, and age, with an increase in the likelihood of acquiring the disease as age increases beyond 40 (Asamoah-Boaheng *et al.*, 2018). Other risk factors for T2DM among Ghanaians include early on onset of obesity (Obirikorang *et al.*, 2016; Asamoah-Boaheng, Tenkorang and SarfoKantanka, 2019) and central obesity in particular (Frank *et al.*, 2013), socioeconomic position (Beune *et al.*, 2017), and dietary patterns (Frank *et al.*, 2014). Evidence of risk factors related to gender are not conclusive.

The high prevalence of diabetes in Ghana continues to account for elevated costs of treatment, which are further increased when its complications occur (Amon, Kweku and Aikins, 2017; Mutyambizi *et al.*, 2018). The costs of drug therapies majorly contribute to high and increased total direct costs of treatment (Kirigia *et al.*, 2009; Amissah and Dunyah, 2016). Ineffective screening as a preventive measure, accounts for late presentation and diagnosis of diabetes and its associated complications and comorbidities in Ghana, further increasing related treatment costs (Quaye *et al.*, 2015). Examples of its many associated complications and comorbidities include impaired kidney function (Agyenim-Boateng *et al.*, 2016), crystalluria (Ephraim *et al.*, 2017), metabolic syndrome (Nsiah *et al.*, 2015), diabetic retinopathy and cataracts (Rotimi *et al.*, 2003), hypertension (M. *et al.*, 2012), oral health problems (Broder *et al.*, 2014), vitamin D deficiency (Fondjo *et al.*, 2017), altered immunity and pro-inflammatory states (Darko *et al.*, 2015; Asare-anane *et al.*, 2018), coagulopathy (Panford *et al.*, 2017), and other haematological and lipid profile abnormalities (Antwi-Baffour *et al.*, 2018). It has even been suggested that increases in the

prevalence of diabetes mellitus in Ghana may put more persons at risk for malaria infections (Danquah, Bedu-Addo and Mockenhaupt, 2010).

1.3 Justification

Under the Health Needs Assessment for Kumasi, diabetes, has been identified as a preventable common disease in Kumasi (Pehr and Akuamoa-Boateng, 2010). Urban centres in Sub-Saharan Africa, such as Kumasi, Ghana, are especially impacted by the dual burden of infectious and non-communicable disease (NCD), including a rise in type 2 diabetes mellitus (T2DM) prevalence (Doherty *et al.*, 2014). In Ghana, there is an urgent need to accelerate attainment of Sustainable Development Goal (SDG) indicator 3.4.1 related to the reduction of mortality attributable to non-communicable diseases, including diabetes, by 2030 (Ministry of Finance and Economic Planning, 2018), and a reduction in healthcare costs attributable to non-communicable diseases such as diabetes. As part of efforts to meet this objective, the Ministry of Health in Ghana has established a collaboration with Novo Nordisk, a Danish global healthcare company with extensive years of experience in diabetes care. This partnership has led to the implementation of the Base of the Pyramid (BoP) project which began in 2011 (GHS, 2017), ultimately seeking to identify solutions that can lead to an integrated approach to diagnosis, treatment and diabetes control for poor diabetic patients. The purpose of the BoP project is to develop scalable, sustainable and profitable solutions that increase access to diabetes care in low- and middle-income countries. The ultimate aim is that more Ghanaian diabetics live healthier lives. In line with this objective, the Diabetes Support Centre at the Suntreso Government

Hospital is the eighth (8^{th}) and most recent of such centres to be built in Ghana and the 2^{nd} in the Ashanti Region after the establishment of the first of its kind at the Manhyia District Hospital

(GHS, 2017). The establishment of this centre at the Suntreso Government Hospital in December 2018 is pivotal to improving care of diabetes in the district and region. However, there is a need to evaluate adherence to oral medications as a strategy to closely monitor the sustainability of healthcare efforts by the new facility. The issue of medication adherence to oral hyperglycaemic agents is of important value in assessing the effectiveness of the newly opened centre in improving care for diabetics. This evaluation will assist clinicians and other healthcare providers to identify at-risk groups and to better equip and inform screening and healthcare efforts for diabetics in the district.

1.4 Aims and Objectives

The goal of the study is to evaluate adherence to oral hypoglycaemic agents (OHAs) among patients attending the diabetes centre at the Suntreso Government Hospital in Kumasi. Specifically, the study aims to:

i. To evaluate the adherence rate of OHAs medication among type 2 diabetic patients who report to the diabetes centre of the Suntreso Government Hospital.
ii. To assess the barriers associated with the adherence of OHAs medication among type 2 diabetic patients who report to the diabetes centre of the Suntreso Government Hospital. iii. To identify the socio-demographic predictors of adherence of OHAs medication among type 2 diabetic patients who report to the diabetes centre of the Suntreso Government Hospital

1.5 Research Questions

This study addresses these questions:

i. What is the adherence rate of OHAs medication among type 2 diabetic patients who report to the diabetes centre of the Suntreso Government Hospital?

ii. What are the barriers associated with the adherence of OHAs medication among type 2 diabetic patients who report to the diabetes centre of the Suntreso Government Hospital? iii. What are the socio-demographic predictors of adherence of OHAs medication among type 2 diabetic patients who report to the diabetes centre of the Suntreso Government Hospital?

1.6 Significance of the Study

Findings of this study is capable of enabling the decisions of policy makers in ensuring proper management of diabetic patients with respect to their adherence to OHAs medication. Consequently, this will aid in reducing the frequent incidents, hospitalizations, and mortalities associated with poor adherence to medications within the shortest possible time which later will help to build a robust and effective economy of the country. Moreover, findings of this study provides information for other studies in related field to be carried out with ease.

1.7 Limitations of the Study

This study largely depends on self-reported data and is thus subject to recall bias. This study is also quantitative in nature and not entirely comprehensive because of time limitations for additional qualitative exploration of any reasons for non-adherence to OHAs among diabetics who attend the support centre. Moreover, the research encountered some level of reluctance on the part of the respondents in responding to the questionnaire.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter analytically reviews literature and knowledge on the specific subject and variables under study. The purpose of this review is to establish a link or disconnection between previous findings and this current study establishing a justification for the necessity for future studies in this field. Hence, this section has been considered under the following sub-headings below:

2.1 Diabetes Mellitus

Diabetes Mellitus is a metabolic disorder in which the hormone insulin produced by the pancreatic beta cells are either inadequate or is totally absent (Goldenberg & Punthakee, 2013). The amount of sugar in the blood increases to dangerous levels in the absence of insulin to push sugar into the body cells (Goldenberg & Punthakee, 2013). This will result in diabetic complications such as renal failure, peripheral vascular disease, cerebrovascular accidents

(Goldenberg & Punthakee, 2013; Levitan, Song, Ford, & Liu, 2004). According to the American Diabetes Association, 2012, there are three types of diabetes mellitus namely Types 1 and 2 and gestational diabetes. Type 1 Diabetes is insulin dependent where the body cannot produce any of the hormone insulin whereas Type 2 diabetes is one in which there is inadequate production of the

hormone. Type 1 is more prevalent than Type 2 (Dall, Mann, *et al*.,2009) and type 2 patients tend to be overweight (World Health Organisation, 2015). Gestational Diabetes is glucose intolerance that occurs in pregnancy (American Diabetes Association, 2012; Goldenberg & Punthakee, 2013).

2.2 Diabetes Management

Proper self-management of diabetes is central to blood glucose control and prevention of complications (Canadian Diabetes Association, 2013; Watkins & Connell, 2004). Adhering to recommended physical activities, proper diet and weight management decreases ones risk of developing diabetic complications by 43% (Lindstrom *et al*., 2006). Regardless of such benefits, many patients fail to adhere to self-management (Jordan & Jordan, 2010). In Finland, only 19% of patients are self-compliant (Toljamo & Hentimen, 2001).

Generally, patients find difficulty adhering to long term medication especially when they involve lifestyle changes. Diabetics tend to be more adherent to medication especially simpler regimen than to dietary and lifestyle changes (Paes, 2007). Diabetic medication adherence can be improved through collaborative efforts between the sufferer and the health care giver. The burden of responsibility should be redirected from the patient to a more comprehensive approach. There should be proper assessment and understanding of the reasons why patients are not compliant in order to address those reasons head on. Patients may not have the appropriate knowledge and skills regarding the disease or may have inappropriate attitudes towards caring for themselves (Claxton, 2009). Environmental and Social barriers including poor family relations will hamper disease management as patients may feel socially isolated. There may be specific psychological or

psychiatric disorders, such as depression, anxiety, or eating disorders that impair effective diabetes management (Anderson *et al*., 2008).

Understanding behavioural change is essential for effective management of Diabetes. Health care providers must understand behaviour change as part of an interpersonal process. Patient outcomes are ultimately impacted by the influence of health care workers. To be most effective at health behaviour change, health care providers should have a patient-centred approach, cultivate a collaborative relationship, communicate clearly, and provide directives (advice) when patients are ready to hear and learn more about the new recommendations (Rollnick et al., 2013). Many specific strategies enable patients to change their behaviour (Haynes, 2012). Health care providers should assess the importance patients place on specific behaviours and the confidence they have in such behaviours improving their lot. Specific health goals should be set and targeted. It is critical to build the confidence of patients in the dose regimen. Providers should give enough reasons why patients should adhere to medication to promote behavioural change as merely providing information to increase knowledge will not guarantee results. Collaborating and negotiating are integral to these encounters, but patients assume control over decision making (Glasgow & Toober, 2009).

2.2.1 Diabetes and Physical Activities

Physical activities aid individuals have proper weight and blood pressure control, good glycaemic control and reduced dependence on anti-diabetic medication (Chudyk & Petrella, 2011; Sigal et al., 2013). Regular exercises improve HbA1C levels as well as reduces body fat

(Church, Blair, & Cocreham , 2010;Signal et al.,2013).It is recommended that diabetics partake in moderate to vigorous physical activities for about two and halve hours every week(Sigal et al.,2013). Despite this enormous benefits only about one third (37.7%) of patients engage in such activities (Safford et al., 2005)

2.2.2 Pharmacotherapy

Appropriate therapy adherence improve disease outcomes. (Fredrick & Justin-Temu, 2012; McGibbon, Richardson, Hernandez, & Dornan, 2013; Sweileh *et al*., 2004). Diabetics who are regular on their medications have fewer complications (Granger *et al*.,2005; Horwitz *et al*.,1990; Simpson, Eurich, *et al*.,2006).Insulin is the main stay of treatment for type I Diabetes and may be either administered continuously or at interval (McGibbon *et al*., 2013). Treatment of Type II Diabetes is however tailored towards individual needs. Several medications are used in managing diabetes. The Canadian Diabetes Association published a guideline for managing Type II diabetes which states that management begins with lifestyle modifications with or without pharmacotherapy. This is pursued for about two months and then an oral hypoglycaemic (metformin) is introduced (Harper *et al*., 2013).

2.3 Non-Adherence to Anti-Diabetics

Globally, adherence to antidiabetic medications varies between 36 and 93 % (Wabe, 2011).Proper medication adherence is critical for metabolic function as non-adherence leads to higher HbAIc (Ramphal et al., 2008). The Netherlands has a mean adherence to oral glucose lowering drugs of between 61 and 85% amongst Type II Diabetics according to a study conducted on refill adherence and polypharmacy. An increase in the number of medications and dosing regimens reduces compliance to therapy amongst type 2 Diabetics (Horne, 2008). More than two thirds of diabetics

are first diagnosed after the age of 50 years (CDC, 2011).Globally, poor therapy adherence amongst patients with chronic diseases is reaching alarming proportions. According to the World Health Organization about half of chronic disease sufferers are fully compliant on their medications. It is commonly known that many patients have difficult following treatment regime (Wabe, 2011).

Adherence to anti-diabetic drug therapy and self-management practise amongst Type 2 Diabetics in Nigeria is about 33% according to a study conducted in southwestern Nigeria (Kolawole *et al*., 2008). A significant knowledge gap on the factors responsible for non-adherence amongst Diabetics in Uganda was determined in another study (Kalyango *et al*., 2008). One third of Type 2 Diabetics attending Extension II Clinic in Botswana had difficulty adhering to recommended lifestyle modifications (Adewale *et al*. 2008).Poor adherence leads to complications resulting from poor control.

According to The World Health Organization, adherence to long-term therapy is the extent to which a person's behaviour taking a medicine, following a diet, and or executing lifestyle changes-corresponds with agreed recommendations from a healthcare provider (WHO, 2008). About half of diabetics are non-adherent to diabetes-related medications (Heisler, 2008).There are a variety of ways of assessing medication adherence. Some of these include the use of selfreports or patient diaries, the use of physician reports , pill counts , medical records , pharmacy records ,blood and or urine assays , electronic measures et cetera. Directly observed treatment is another means for such assessment (Volmink *et al*., 2010).

2.4 Knowledge on Diabetes Medication Regimen

Diabetes has been considered as a public health issue, hence, education is essential in combating this condition. Irrespective of the literacy rate of individuals within a country, education is essential in helping to reduce the prevalence rate in the country and world at large. According to Albano *et al*. (2008), deficient knowledge on medication has the likelihood of affecting adherence to the medication. A patient is likely to take more or less than prescribed if the patient does not apprehend the instructions given by the health practitioner. Moreover, a patient with no or little knowledge on the side effects of the medication will not adhere to the medication until he/she starts experiencing the consequences in an aggravated manner (Lindenmeyer *et al*., 2006).

A study carried out by Al-Qazaz *et al*. (2011) showed a positive influence of patient's knowledge about diabetes on adherence to medication and glycaemic control. In an opposing manner, some studies have identified no positive relationship between patients' knowledge on disease and adherence (Gazmararian *et al*., 2006; Loke *et al*., 2012).

Central to the management of Type 2 Diabetes, is appropriate patient education and counselling. The World Health Organisation emphasises the promulgation of effective educative programing on diabetes to improve knowledge of the disease. Such educational programs improve awareness of the disease and prevent morbidity and mortality associated with the disease (Adil *et al*., 2010). Some of the objectives of such educational campaigns is to enhance integration of diabetes therapy with daily living by improving the availability of the knowledge and skills required for treatment. Factors such as individual, psychological and environmental considerations greatly impact on the level of adherence (Hansotia, 2013).

2.5 Causes of Non-adherence to Diabetes Medication

Many factors such as social, demographic, psychological, medical system, and disease related issues help to improve patient adherence.

2.5.1 Demographic Factors

Demographic factors such as ethnicity, low levels of education and socioeconomic status have an influence on anti-diabetic regimen compliance and related morbidity (Andersen et al., 2008).Blood Glucose control is generally poor amongst ethnic minorities as a result of poor medication adherence. There is also lower self-monitoring of blood glucose amongst AfricanAmerican and Mexican-American patients. Patients with lower educational levels have higher diabetes related morbidity due to poor regimen adherence. Patients from lower socioeconomic backgrounds have lower adherence levels mainly due to inadequate medication supply. Financial difficulties limit access to diabetic medications. Variables such as direct and indirect costs associated with the medication regimen and limited access to medications have an impact on patient adherence to therapy in developing countries (Boabeng et al., 2012). There is lower adherence amongst patients of lower socioeconomic conditions as poor patients or those who live on fixed salary may not have the capability to afford the medications. Due to lack of funds, older patients fail to get prescriptions filled, skip doses and or reduce doses (Madden et al., 2013). Such patients who may live far from hospitals and have limited access to transportation , also have lower adherence rates. A study by Madden et al. (2013) revealed that older adults skip doses or reduce doses.

Substantial evidences have been established between the non-adherence of diabetes medication and demographic factors such as age, gender, religion, educational status, marital status and occupation (Naranjo *et al*., 2011).

Age has been related to the adherence of diabetes medication. A study conducted by Mandewo *et al*. (2014) identified that most elderly diabetic patients possibly do not adhere to medication regimen as prescribed. This was associated to the fact that possibly they find it difficult in injecting themselves with the insulin since they usually live alone and as a result take under dose or overdose of the medication which results to non-adherence to medication. Therefore, old age has a direct connection with non-adherence to medication due to poor reasoning or cognition (Borges *et al*., 2014). Contrarily, a study carried out by Kalyango *et al*. (2008a) showed that diabetic patients within 36 to 50 years show higher non-adherence to diabetes medication.

Adherence of diabetes medication has been related to gender. The work of Adisa *et al*. (2009) revealed that male diabetic patients have higher inclinations to non-adherence of medications as likened to female diabetic patients. This was attributed to the fact that males are likely to forget as compared to females. However, women are three times at risk of not adhering to medication as compared to men (Kalyango *et al*. 2008b).

With respect to religion and adherence of diabetes medication, a study conducted by Mandewo e*t al*. (2014) disclosed that patients who are Christians usually do not adhere to medications due to their believe in total healing from God. However, some patients are likely not to allow religious affiliation to influence their level of adherence to diabetes medication. Some patients believe that their culture prevented them from adhering to treatment recommendations particularly to drugs. They also admitted to have consulted apostolic faith healers to deliver them from diabetes. Again, some also acknowledged to have accessed traditional healers for treatment of their predicaments.

Illiteracy renders a serious challenge to the understanding of the nature of the disease and its associated medications. A study carried out by Martin *et al*. (2005) described that adherence to

medication is very high when patients have basic knowledge in reading and writing. In another vein, the work of Gimenes *et al*., (2009) showed that medication adherence was enhanced among individuals with higher educational qualification. Therefore, education is required to enhance patient management outcomes of the disease (Umpierre *et al*., 2011; Funnel *et al*., 2012; Marrero *et al*., 2013).

Some studies have ascertained the influence of occupation and marital status on diabetes medication adherence. According to Adisa *et al*. (2009), office workers and traders who contract the diabetic disease seem to adhere most to their medication regimen as compared to unemployed individuals. On the other hand, unmarried individuals stand a chance of having poor glycemic control due to their non-adherence to medication as compared to married individuals (Ali *et al*., 2012).

2.5.2 Psychological Factors

Adherence to medication is influenced by psychological factors such as perception of disease seriousness and complications, and treatment efficacy. According to Delamater, 2008, the chances of adherence is increased when regimen are effective, benefits outweigh costs, there is a supportive social environment and when treatments makes sense to patients. Stress and poor coping strategies inhibit adherence. Major Depressive Disorders, Anxiety Neurosis and eating disorders such as Bulimia Nervosa worsen outcomes in diabetic management amongst the youth and adults. Health care providers feel inadequate to provide psychological support for such patients (Peyrot, 2010) and this worsens the state.

2.5.3 Social Factors

Critical in the management of diabetes is the importance of the role of family relationships. Therapy adherence is improved by good interpersonal communication patterns, improved interpersonal cohesion and organisation and low levels of interpersonal conflicts. Improved social support from spouses and significant others is critical for medication adherence. Such support services serve to limit the adverse effect of the stress of diabetes management on the patient (Al-Qazaz, 2011). These support services maybe informational, instrumental or emotional.

2.5.4 Health System

Adherence to medications, diet, and weight loss is promoted by social support provided by nurse care managers. Regular frequent contacts with patients through routine visits help to improve blood glucose control. The use of phone calls to remind patients of clinic appointments improve adherence (Harris, 2003) .Support and encouragement from the health care team is critical to improving good glycaemic control (Anderson *et al*., 2008). Quality patient- doctor relationship and interaction enhances dose adherence. Satisfied patients are more adherent.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The chapter seeks to provide information on the research method adopted for the collection and analysis of data. Moreover, the limitations associated with the study was also captured in this section.

3.1 Study Design

This study is a cross sectional study where descriptive research method was adopted since the study was carried out to observe an area with limited information. The researcher adopted this research design in order to enable him assess detailed and specific questions that have the potential of being useful for the analysis of prospective studies (Neuman, 2007). The methods for research study can be done in three ways, thus, qualitative, quantitative, and mixed methods (Davis, 2000). Qualitative research design is focused on addressing words and observations without the use of numbers due to its main aim of identifying views of individuals concerning a particular subject matter (Schmidt and Hollensen, 2006). Nevertheless, this design is flexible throughout the entire research and usually done in an unstructured approach with an in-depth analysis. On the contrary, the work of Davis (2000) showed that quantitative research design encompasses arithmetical and numerical analysis of a structured survey from samples of large populations. Since this study focuses on evaluating the adherence to oral hypoglycaemic agents

(OHAs) among patients attending the diabetes centre at the Suntreso Government Hospital in Kumasi, the suitable approach selected for this study is both quantitative and qualitative designs.

3.1.1 Study Variables

Variables used in a study can either be dependent or independent. For the purpose of this study, the dependent variable was the adherence level of diabetic patients as against the independent variable of the socio-demographic characteristics of participants.

3.2 Data Collection Techniques

The major source of data for this study was a primary data in the sense that data was collected by the investigator for the first time, right from the beginning to the end. The essence of using primary data is that it renders the data more reliable, authentic and also very objective. The researcher used a structured open and close-ended questionnaire in which participants (i.e. diabetic patients) were allowed to respond to the questionnaire without any compulsion. The questionnaire was directly linked to the objectives of the study. The administration of the questionnaire was done manually by the researcher and some research assistants by handing the questionnaire over to the respondents to solicit their responses. This method of data collection gave respondents the privacy and confidence in addressing their individualistic experiences with adherence to OHAs medication. Moreover, a qualitative data was collected by measuring the anthropometrics of the patients.

3.2.1 Measurement of Fasting Blood Glucose

A drop of capillary blood (Xul) will be collected using lancet, test strips and glucose meter. The thumb of participants in the study will be swiped with alcohol swabs and allowed to dry before pricking with prescribed lancets. A small drop of capillary blood was obtained by gently applying pressure intermittently and allowing the blood to completely fill the blood slot of the test strip, and the resulting measurement recorded off the glucometer.

3.3 Study Population

The target population for this study was diabetic patients visiting the Suntreso Government Hospital Diabetic Center between June and July 2019. The researcher chose the target population due to the massive frequent visits of clients into this facility, proximity and convenience issues.

3.4 Sample Size Estimation

A simple random sampling technique was used for this study where diabetic patients were selected onto the study with recourse to the convenience. This was a probabilistic sampling technique which gave every diabetic patient attending to treatment within the study site the equal opportunity of been selected onto the study. Subsequently, a sample size of 200 diabetic patients was used for the study. Medical record folders of participants was reviewed to identify those who meet the inclusion criteria. The sample size for the study was fairly distributed among gender, race, age category etc. to ensure no bias towards any patient. The sampling size of this study was determined using the Cochrane's sample size determination for proportions.

$$n =$$

Where n is the sample size

Z^2 is the abscissa of the normal curve that cuts off an area at the tails (1 - a equals the desired confidence level, e.g., 95%), which is constant as 1.96.

e is the desired level of precision at a significance level of 95%, which is 0.05 p is

the estimated prevalence of type 2 diabetes – 14%, and q is 1-p (1-0.14 = 0.86).

Therefore,

$$n =$$

n = 185 diabetic patients

A 10% adjustment was made to make the sample size 200 participants in order to cater for any error.

3.4.1 Inclusion Criteria

This includes:

1. All adult type 2 diabetes patients
2. 30 years and above
3. Diagnosed with diabetes for a year and above, and
4. Visiting the diabetes clinic as an outpatient for their scheduled follow-up appointments.

3.4.2 Exclusion Criteria

This includes:

1. All T2DM patients < 30 years
2. Diagnosed less than a year ago, and
3. All pregnant women with diabetes

3.5 Statistical Analyses

The questionnaires was coded, cleaned, and entered into the statistical software, STATA version 12.0. Data was quantitatively analysed using descriptive statistics such as frequency, means, and standard deviations. Moreover, a chi-square test and logistic regression analysis were carried out to ascertain the relationship between the dependent and independent variables within the study.

For all statistical tests, a p -value < 0.05 was considered significant. Subsequently, statistically generated results were represented with tables and charts for a clear understanding of the analysis.

3.6 Ethical Approval

This study sought for ethical clearance from the Committee on Human Research, Publications and Ethics (CHRPE) of the Kwame University of Science and Technology. Moreover, permission was sought for from the management of the selected health facility in order to be given permission to carry out the study in the facility. The consent of the participants was sought for and in the questionnaire, names of participants were not captured and the main objective of the study were made known to the participants before they started answering the questions.

3.7 Study Area

The Kumasi Metropolitan is one of the several administrative districts in the Ashanti Region with Kumasi as the central business district. It is located between Latitude 6.35^{o}N and 6.40^{o}S and Longitude 1.30^{o}W and 1.35^{o}E and elevated 250 to 300 meters above sea level. The Kumasi Metropolitan Assembly (KMA) was established by Legislative Instrument 1614 of 1995 under Local Government Law 1988, NDPC law 207, which replaced the Local Government Act 462, 1993. It accommodates about 36.2 percent of the region's population. Currently, Kumasi Metropolis has about 50 health facilities (including both public and private institutions) providing healthcare services to its residents. Among the existing health facilities within the metropolis, the ones where inhabitants frequently visit for health care are the public ones. For the purpose of Health Administration, it is divided into three sub metros namely Bantama, Manhyia and Subin.

Under the Bantam sub-metro is located the Suntreso government Hospital. Currently, the Suntreso Government Hospital has 119 beds, 359 staff, 25 specialist, and 18 medical doctors (www.suntresohospital.org). The hospital has a vibrant unit dedicated in handling and managing diabetic cases and clients. This unit within the hospital has been very effective in the delivery of quality health care to patients.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.0 Introduction

This chapter seeks to present the results from the data obtained from respondents concerning their adherence to oral hypoglycemic agents.

4.1 Demographic Information

The demographic characteristics of diabetic patients undergoing treatments within the health facilities are demonstrated in Table 4.1 below. It is evident from Table 4.1 that the mean age of the study participants was 58.75 ± 0.75 years. Majority of the participants representing 80.50% were females where 19.50% were males. With respect to the ethnicity of the study participants, 81.50% were Akans while 6.00% were Frafras, 5.00% were Ewes, 3.00% were Gonja's, 2.50% were Dagomba's, and 2.00% were Ga's. In terms of the level of education of the participants of the study, 28.50% had some High school education whereas 24.50% have completed high school, 22.00% have had no formal education, 10.00% had bachelor's degree, 8.50% had primary school education, 6.00% had vocational education, and 0.50% had graduate or advanced professional education. For the marital status of the participants, most of them representing 63.00% were married while 37.0% were living without a partner. With recourse to the religion of the study participants, 92.50% are Christians and 7.50% are Muslims. With respect to the monthly income of the participants, 59.00% have no idea of their monthly salary while 19.50% receives a monthly salary ≤ GH₵ 500, 12.00% obtains a monthly salary of GH₵ 500 – 1,000, 6.50% receives a monthly salary within GH₵ 1,000 and GH₵1,500, 2.50% receives between GH ₵ 1,500 and 2,000 on a monthly basis, and 0.50% receives more than GH₵ 2,000 on monthly basis.

Table 4.1 Demographic Characteristics of Participants

Variable	**Frequency**	**Percentage (%)**
Age (Mean ± S.D)	58.75 ± 0.75	
Gender		
Male	39	19.50
Female	161	80.50
Ethnicity		
Akan	163	81.50
Ga	4	2.00

Ewe	10	5.00
Dagomba	5	2.50
Gonja	6	3.00
Frafra	12	6.00
Education		
No formal education	44	22.00
Primary School	17	8.50
Some High School	57	28.50
Completed High School	49	24.50
Vocational Degree	12	6.00
Bachelors' Degree	20	10.00
Graduate or Advanced Professional Degree	1	0.50
Marital Status		
Married	126	63.00
Living without a partner	74	37.00
Religion Christian		
	185	92.50
Islam	15	7.50
Monthly Income		
≤ GH₵ 500	39	19.50
GH₵ 500 – 1,000	24	12.00
GH₵ 1,000 – 1,500	13	6.50
GH₵ 1,500 – 2,000	5	2.50
More than GH₵ 2,000	1	0.50
Don't know	118	59.00

4.2 Anthropometrics

The anthropometrics of participants were ascertained and results shown in Table 4.2 below. It is evident in the Table that the mean weight of the participants was 69.30 ± 0.78 kg whereas the mean height of participants was 169.61 ± 1.79 cm, and the average fasting blood glucose levels of participants was 8.84 ± 0.29 mmol/l.

Table 4.2 Anthropometric Characteristics of Participants

Variable	Mean ± Standard Deviation
Weight (kg)	69.30 ± 0.78
Height (cm)	169.61 ± 1.79
Fasting Blood Glucose (mmol/l)	8.84 ± 0.29

4.3 Adherence to OHAs

The years of being diagnosed of Type 2 diabetes, medication taken, adherence levels of participants toward OHAs, and their being diagnosed of any other chronic condition were determined and results are expressed in Table 4.3 below. It was identified that 36.50% of the participants have been diagnosed of Type 2 diabetes for 1-3 years whereas 35.50% for 4-6 years,

14.00% each for both 7-9 years and ≥ 10 years. In terms of the medication used by participants, 71.00% uses Metformin while 12.00% uses Metformin + Glibenclamide, 6.50% uses insulin, 5.50% takes in Glibenclamide, 3.00% uses herbal medication, and 2.00% uses Insulin + OHA. In terms of the adherence to medication, most of the respondents representing 61.00% adheres to their medications where the remaining 39.00% do not adhere to their medication regimens. A high percentage of 80.50% of the study participants have been diagnosed of other chronic condition while 19.50% have not.

Table 4.3 Years of Diagnose, medication usage, adherence to medication, and chronic disease diagnose of participants

	Frequency	Percentage (%)
Years of being diagnosed of Type 2 Diabetes		
1-3 years	73	36.50
4-6 years	71	35.50
7-9 years	28	14.00
≥ 10 years	28	14.00

Medication taken		
Metformin	142	71.00
Glibenclamide	11	5.50
Metformin + Glibenclamide	24	12.00
Insulin	13	6.50
Insulin + OHA	4	2.00
Herbal Medication	6	3.00
Adhere to Medication		
Yes	122	61.00
No	78	39.00
Diagnosed of any other chronic condition		
Yes	161	80.50
No	39	19.50

4.4 Barriers to Adherence to OHAs

With the findings in the previous section that some of the study participants do not adhere to their medications, the barriers confronting their adherence to the medications were ascertained. It is clear from Table 4.4 that for barriers to adherence to OHAs associated with individual factors, majority of the participants representing 80.77% do not adhere to their medications since they do not earn enough whereas 66.67% agree that they forget to take their medications. In terms of the social factors, 87.18%, 73.08%, and 37.18% agree that they do not adhere to medication due to less help from family/friends, stigmatization of diabetes, and poor road network facility to health facility, respectively. For provider and drug related factors, 96.15%, 92.31%, 82.05%, and 79.49% do not adhere to OHAs medications due to high compliance to OHAs dose regimen, side effects of medication, high cost of medication, and poor attitudes of staff providers, respectively. Table 4.4 Barriers toward the adherence of OHAs among participants

Variable	Frequency	Percentage (%)
Individual Factors		
Forget to take medicine	52	66.67
Believe not in support of diabetes medication	12	15.38
Not earning enough	63	80.77
Social Factors		
Stigmatization of diabetes	57	73.08
Less help from family/friends	68	87.18
Poor road network to health facility	29	37.18
Provider and Drug Related Factors		
High cost of medication	64	82.05
Side effects of medication	72	92.31
Poor attitudes of staff providers	62	79.49
Dose regimen of OHAs are high to comply	75	96.15

4.5 Relationship between Non-adherence to Medication and Socio-Demographics

In evaluating the relationship existing within the non-adherence of OHAs medication and the socio-demographic characteristics of participants, a chi-square test was carried out. It is evident in Table 4.5 that a significant relationship at 5% significance level exist between non-adherence to OHAs medication and gender, education, marital status, religion, and monthly income. It is clear that females (41.61%) had poor adherence to medication than males (28.21%). For the education of participants, 90.91% of the participants who have no formal education do not adhere to medication whereas none of the participants with graduate or advanced professional degree do not adhere to medications. In terms of the marital status of participants, those who are married (16.67%) reported of least poor adherence whereas participants not living with a partner (36.49%) have the highest poor adherence levels to medications. 41.08% of the participants who are Christians do not adhere to medication as compared to 13.33% of those belonging to the Islamic fraternity. Majority of the respondents, representing 61.54% who receive a monthly salary between GH₵1,000 and 1,500 have poor adherence toward medication whereas none of the participants obtaining a monthly salary more than GH₵ 2,000 reported of poor adherence to medications.

Table 4.5 Socio-demographic Characteristics and medication non-adherence

Socio-demographics	Adherence of Medication			
	Good, N = 122 (%)	Poor, N = 78 (%)	Total	p-value
Gender				0.00
Male	28 (71.79)	11 (28.21)	39	
Female	94 (58.39)	67 (41.61)	161	
Ethnicity				0.09
Akan	106 (65.03)	57 (34.97)	163	
Ga	3 (75.00)	1 (25.00)	4	
Ewe	3 (30.00)	7 (70.00)	10	
Dagomba	2 (40.00)	3 (60.00)	5	
Gonja	4 (66.67)	2 (33.33)	6	
Frafra	4 (33.33)	8 (66.67)	12	
Education				0.00
No formal education	4 (9.09)	40 (90.91)	44	
Primary School	7 (41.18)	10 (58.82)	17	
Some High School	46 (80.70)	11 (19.30)	57	
Completed High School	37 (75.51)	12 (24.49)	49	
Vocational Degree	9 (75.00)	3 (25.00)	12	
Bachelors' Degree	18 (90.00)	2 (10.00)	20	
Graduate or Advanced Professional Degree	1 (100.00)	0 (0.00)	1	
Marital Status				0.01
Married	105 (83.33)	21 (16.67)	126	
Living without a partner	47 (63.51)	27 (36.49)	74	
Religion				0.04

Christian	109 (58.92)	76 (41.08)	185	
Islam	13 (86.67)	2 (13.33)	15	
Monthly Income				0.00
≤ GH₵ 500	26 (66.67)	13 (33.33)	39	
GH₵ 500 – 1,000	15 (62.50)	9 (37.50)	24	
GH₵ 1,000 – 1,500	5 (38.46)	8 (61.54)	13	
GH₵ 1,500 – 2,000	3 (60.00)	2 (40.00)	5	
More than GH₵ 2,000	1 (100.00)	0 (0.00)	1	
Don't know	72 (61.02)	46 (38.98)	118	

4.7 Socio-demographic Predictors of Non-adherence to OHAs

A logistic regression was carried out between the socio-demographic characteristics of participants and their non-adherence levels toward OHAs medications. The independent variable was socio-demographic characteristics (including gender, level of education, ethnic group, marital status, monthly income, and religion) whereas the dependent variable was the nonadherence toward medications. Results are shown in Table 4.6

Table 4.7 below shows a significant relationship ($p < 0.05$) between the odds of participants' non-adherence toward OHAs medication across gender, level of education, ethnic group, marital status, monthly income, and religion. In terms of the gender of participants, the odds of male participants being non-adherent to medication is 1 times the odds of non-adherence to medication among females (OR = 1.12, CI. 0.69 – 1.82).

The odds of participants' non-adherence to OHAs medication among those with no formal education (OR = 2.86, CI. 0.60 – 3.38), bachelor's degree (OR = 0.19, CI. 0.01 – 0.56) and graduate or advanced professional degree (OR = 0.15, CI. 0.04 – 0.38) education are 2.86 times, 0.19 times,

and 0.15 times, respectively, the odds of non-adherence in medication among those with some high school education.

With respect to the marital status of participants, the odds of participants living without a partner being non-adherent to medication is 2 times the odds of non-adherence to medication among those married (OR = 2.02, CI. 0.68 – 3.73). Participants belonging to the Islamic religion are 79% of the odds of non-adherence among those belonging to the Christian religion (OR = 0.79, CI. 0.31 – 1.65).

The odds of participants' non-adherence to OHAs medication among those receiving monthly salary of ≤ GH₵ 500 (OR = 4.02, CI. 2.11 – 5.19), GH₵ 1,500 – 2,000 (OR = 0.83 CI. 0.28 – 1.13) and more than GH₵ 2,000 (OR = 0.54, CI. 0.31 – 1.09) are 4.02 times, 0.83 times, and 0.54 times, respectively, the odds of non-adherence in medication among those unknown monthly salary.

Table 4.6 Socio-demographic predictors of non-adherence to medication **Adjusted Odd Ratio** **p-value**

Variable	Crude OR (95% CI)	p-value		
Gender		[0.00]		[0.00]
Male	1.12 (0.69 – 1.82)	0.03*	1.01 (0.97 – 1.05)	0.02*
Female	Reference			
Ethnicity		[0.29]		[0.03]
Akan	Reference			
Ga	1.66 (0.42 – 2.85)	0.09	1.72 (0.52 – 2.91)	0.15
Ewe	0.48 (0.12 – 1.05)	0.87	0.51 (0.17 – 1.25)	0.95
Dagomba	0.23 (0.04 – 1.09)	0.21	0.29 (0.04 – 1.09)	0.38
Gonja	0.98 (0.02 – 1.95)	0.45	0.93 (0.02 – 1.72)	0.58
Frafra	1.85 (0.81 – 2.32)	0.00*	1.97 (0.84 – 2.47)	0.02*
Education		[0.02]		[0.04]
No formal education	2.86 (0.60 – 3.38)	0.02*	3.02 (0.67 – 3.42)	0.00*
Primary School	0.96 (0.41 – 1.37)	0.29	0.99 (0.41 – 1.37)	0.98
Some High School	Reference			
Completed High School	1.65 (1.02 – 3.19)	0.46	1.71 (1.02 – 3.22)	0.84
Vocational Degree	0.28 (0.03 – 1.01)	0.37	0.45 (0.03 – 1.05)	0.75
Bachelors' Degree	0.19 (0.01 – 0.56)	0.02*	0.17 (0.01 – 0.43)	0.01*
Graduate or Advanced	0.15 (0.04 – 0.38)	0.01*	0.12 (0.04 – 0.28)	0.03*
Professional Degree				
Marital Status		[0.00]		
Married	Reference			

Living without a partner	2.02 (0.68 – 3.73)	0.02*	2.19 (0.65 – 3.59)	0.01*
Religion		[0.03]		
Christian	Reference			
Islam	0.79 (0.31 – 1.65)	0.03*	0.82 (0.35 – 1.50)	0.05
Monthly Income		[0.04]		
≤ GH₵ 500	4.02 (2.11 – 5.19)	0.01*	4.14 (2.09 – 5.26)	0.04*
GH₵ 500 – 1,000	2.75 (1.15 – 3.06)	0.21	2.77 (1.10 – 3.19)	0.48
GH₵ 1,000 – 1,500	0.79 (0.31 – 1.22)	0.86	0.85 (0.35 – 1.27)	1.29
GH₵ 1,500 – 2,000	0.83 (0.28 – 1.13)	0.04*	0.78 (0.29 – 1.08)	0.01*
More than GH₵ 2,000	0.54 (0.31 – 1.09)	0.01*	0.51 (0.31 – 1.09)	0.04*
Don't know	Reference			

CHAPTER FIVE

DISCUSSIONS

5.0 Introduction

This chapter provides detailed discussion on results obtained from the field study relating to the specific objectives of this study. The study results were compared to past findings on nonadherence toward OHAs medications to establish linkages between this current study and existing literature. It also relates the findings to the study's conceptual framework and research hypothesis.

5.1 Socio-demographic Characteristics of Participants

The mean age of 58.75 ± 0.75 years found in this study is similar to the 58.15 ± 9 .16 years and 61 ± 12.3 years recorded in work from Malaysia and the USA, respectively (Al-Qazaz *et al*., 2011; Ahia *et al*., 2014). Age has been related to the adherence of diabetes medication. A study conducted by Mandewo *et al*. (2014) identified that most elderly diabetic patients possibly do not adhere to medication regimen as prescribed. This was associated to the fact that possibly they find it difficult in injecting themselves with the insulin since they usually live alone and as a result take under dose or overdose of the medication which results to non-adherence to medication. Therefore, old age has a direct connection with non-adherence to medication due to poor reasoning or cognition (Borges *et al*., 2014). Contrarily, a study carried out by Kalyango *et al*. (2008a) showed that diabetic patients within 36 to 50 years show higher non-adherence to diabetes medication.

Female patients made up the larger proportion of patients in this current study; this reflects the general trend from similar studies among diabetes patients worldwide (Rhee *et al*., 2005; Mafauzy,

2006; Sweileh *et al*., 2014). Although there is no sex bias for the contraction of diabetes; genetic effects and epigenetic mechanisms, nutritional factors and sedentary lifestyle affect risk and complications differently in both sexes. This finding clearly suggests that the women are likely to transmit the Type II diabetes to their offspring. The work of Dabelea *et al*. (2000) identified that individuals born after their mothers contracted the disease stand a higher chance of being affected with the disease than those born before mother contracted the disease. However, no difference was observed in the risk of developing type 2 diabetes whether an individual born before or after his father developed diabetes. Contrarily, Lindsay *et al*. (2000) reported an association between paternal but not maternal type 2 diabetes. Therefore, it can be concluded that individuals with family history of type 2 diabetes are at risk of contracting the disease. The Akans predominated throughout the entire study since the study site was an Akan state, hence, it was highly expected. Majority of the respondents have some level of formal education which clearly shows that they can clearly have some knowledge about the disease and also be able to read to some extent the prescriptions medical officers give them. Most of the participants were married and there is the likelihood of obtaining support from their partners throughout the management care periods of the disease. The trend of high percentage of Christians as compared to Islams in this study was expected since the country and region of the study is noted of being predominated with Christians. Majority of the participants had no idea of their monthly salary which signifies that most of them were involved in non-formal occupations where it becomes difficult to quantify their monthly wages or remittances.

5.2 Anthropometrics

The average fasting blood glucose levels of participants was 8.84 ± 0.29 mmol/l. The average fasting blood glucose levels of the participant is lower as compared to 11.29 ± 0.75 mmol/l

identified in the study carried out by Arthur *et al*. (2005) in Ghana. This indicates that the diabetic patients under this current study have impaired glucose tolerance and are managing their glucose levels well since most of them had glucose levels lower than the >7 mmol/l threshold. This can be attributed to good dietary and adherence to medication habits exhibited by the patients. Diabetes can be associated to diet consumption since food seem to have an influence on body weight which can result in type 2 diabetes (Meyer *et al*., 2000).

5.3 Adherence to OHAs

Majority of the participants have been diagnosed of the Type 2 diabetes for 1-3 years. The medication predominantly used by participants (71%) was Metformin. Similar finding was identified by Fadare *et al*. (2015) that Metformin is the predominantly used medication by diabetic patients in Nigeria, however, the rate of usage (58.7%) was less than the rate of usage in this current study. Oral agents from the Metformin are usually used by patients due to the associated lower cost of these drugs, their availability and potential safety issues as compared to other drugs.

It is evident from the findings that the adherence of participants toward medication was suboptimal (61%). Interestingly, evidence suggests that adherence to medication in Type 2 diabetes is less than optimal (Ruben, 2005; Krass *et al*., 2014). Finding is consistent with 63% and 60% as identified by Ahmad *et al*. (2013) as carried out in Malaysia and Adu-Mintaah (2015) as carried out in Ghana, respectively. Although the locations are different but a common trend of adherence toward medication among diabetes patients are observed. On the contrary, some studies carried out in Nigeria revealed a much lower adherence rate of 40 - 55% among Type 2 diabetic patients (Pascal *et al*., 2012; Adisa and Fakeye, 2013; Fadare *et al*., 2015).

Moreover, another study identified an adherence rate of 57.7% among diabetic patients in India (Mukherjee *et al*., 2013). An Ethiopian studies revealed an adherence rate of 74.6% among diabetic patients (Abebe *et al*., 2014). Similarly, Boccuzzi *et al*. (2001) carried out a study in the United States and identified that the rate at which type 2 diabetic patients adhere to medications was within 70% to 80%. The disparity identified within these findings although Ghana, Nigeria and Ethiopia are within the same continent can be associated with the issues of different data collection instruments, educational levels, health care infrastructure and system, medication, and individual differences. Medication adherence to anti-diabetic agents is more cost-effective, as it may reduce hospitalization frequency and costs associated with both short- and long-term complications (Breitscheidel *et al*., 2010; Wild, 2012). According to Adisa and Fakaye (2014) and World Health Organisation (2018) non-adherence is especially high among patients with chronic diseases (including diabetes mellitus) that typically require long-term and sometimes complex treatment regimen to control symptoms and prevent complications, with adherence rate dropping most dramatically after the first six months of therapy. As diabetes treatment is multidimensional, adherence in one aspect of the regimen does not necessarily translate to adherence to another aspects of the regimen (i.e. medication use and lifestyle changes. If patients do not take medications as prescribed, serious health consequences can result, with acute and chronic complications, more hospitalizations and higher costs of healthcare (Delamater, 2006). Adherence to medication for diabetes leads to a good glycaemic control. Good glycaemic control can prevent complications and improve the quality of life of the patient.

A high percentage of 80.50% of the study participants have been diagnosed of other chronic conditions such as hypertension and depression. Although the trend of conditions are similar with

other findings but a less percentage of 60.5% was recorded for diabetic patients who have been diagnosed with other conditions in Nigeria (Fadare *et al*., 2015). The impact of depression on adherence to medication in a wide range of diseases strongly highlights the need for healthcare professionals to effectively manage depression and recognize its influence on medication-taking behaviour.

5.4 Barriers toward Adherence to OHAs

The major barriers toward adherence to OHAs by diabetic patients are drug-related and provider, social, and individuals factors. For drug-related and provider factors most of the participants do not adhere to medication due to high compliance to OHAs dose regimen, side effects of medication, high cost of medication, and poor attitudes of staff providers. The complexity usually upsurges with the chronic nature as the disease progresses in most patients. A study conducted by Gaede *et al*. (2003) revealed that patients with other co-morbidities can consume as many as ten tablets within a day. According to Thayer *et al*. (2010), the complexity of the dosage regimen directly affects adherence. Therefore, producers of the various regimens of medications for diabetes and health practitioners can find possible solutions in helping patients manage with the regimens and not see it of a complex nature. Moreover, patients should report to their health practitioners as early as possible at the juvenile stage of the disease in order not to experience the complexity of dose regimens at the deteriorating stages of the disease condition.

The management of the diabetes disease is considered as expensive. The cost is usually associated with medications, reactive stripes, hospitalization procedures, biomedical analysis and image examinations (Borges *et al*., 2014). Therefore, patients tend to be non-adherent to medications due

to the high cost associated to medication (Rwegerera, 2014). Interestingly, diabetic patients are usually low or middle income earners.

For social factors, most of the participants do not adhere to medication due to less help from family/friends and stigmatization of diabetes. For the individual factors, majority of the participants do not adhere to their medications since they do not earn enough and also forget to take their medications. Forgetfulness can be considered as a perpetual failure to remember something. Depression has been connected with the development of diabetes. As diabetic patients get depressed their ability to remember decreases which renders a greater impairment to their adherence of medication (Jannuzzi *et al*., 2014). The management of the diabetes disease is considered as expensive and interestingly, diabetic patients are usually low or middle income earners.

5.5 Relationship between Non-adherence to Medication and Socio-Demographics

It is identified in this study that a significant relationship at 5% significance level exist between non-adherence to OHAs medication and gender, education, marital status, religion, and monthly income. Findings were similar with that identified by Adisa and Fakaye (2014), Fadaye *et al*. (2015), Martin *et al*. (2005) in other jurisdictions across the globe. Adherence of diabetes medication has been related to gender. The work of Adisa *et al*. (2009) revealed that male diabetic patients have higher inclinations to non-adherence of medications as likened to female diabetic patients. This is attributed to the fact that males are likely to forget their medications as compared to females. However, women are three times in risk of not adhering to medication as compared to men (Kalyango *et al*. 2008b).

With respect to religion and adherence of diabetes medication, a study conducted by Mandewo e*t al*. (2014) disclosed that patients who are Christians usually do not adhere to medications due to their believe in total healing from God. However, some patients are likely not to allow religious affiliation to influence their level of adherence to diabetes medication. Some patients believe that their culture prevented them from adhering to treatment recommendations particularly to drugs. They also admitted to have consulted apostolic faith healers to deliver them from diabetes. Again, some also acknowledged to have accessed traditional healers for treatment of their predicaments.

Illiteracy renders a serious challenge to the understanding of the nature of the diabetes disease and its associated medications. A study carried out by Martin *et al*. (2005) described that adherence to medication is very high when patients have basic knowledge in reading and writing. In another vein, the work of Gimenes *et al*., (2009) showed that medication adherence was enhanced among individuals with higher educational qualification. Therefore, education is required enhance patient management outcomes of the disease (Umpierre *et al*., 2011; Funnel *et al*., 2012; Marrero *et al*., 2013). Unmarried individuals stand a chance of having poor glycemic control due to their non-adherence to medication as compared to married individuals (Ali *et al*.,

2012). This is due to the fact that they don't have partners who will help them take their medications and also support them financially with the cost of medication.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter considers an extensive conclusion made based on the findings with recourse to the specific objectives of this study. Moreover, based on the findings, some recommendations are outlined in the chapter as well to help provide a holistic approach in managing diabetes among patients.

6.1 Conclusion

It is identified in the study that the mean age of the diabetic patients was 58.75 ± 0.75 years and also the female patients made up the larger proportion of patients in this current study. This finding clearly suggests that the women are likely to transmit the Type II diabetes to their offspring. The Akans predominated throughout the entire study since the study site was an Akan state, hence, it was highly expected. Majority of the respondents have some level of formal education which clearly shows that they have some knowledge about the diabetes disease and can also be able to read to some extent the prescriptions medical officers give them. Most of the participants were married and there is the likelihood of obtaining support from their partners throughout the management care periods of the disease. The trend of high percentage of Christians as compared to Islams in this study was expected since the country and region of the study is noted of being predominated with Christians. Majority of the participants had no idea of their monthly salary which signifies that most of them were involved in non-formal occupations where it becomes difficult to quantify their monthly wages or remittances.

It was realized that the average fasting blood glucose levels of participants was 8.84 ± 0.29 mmol/l where most of them have been diagnosed of the disease for 1-3 years. The medication predominantly used by participants (71%) was Metformin, however, their rate of adherence to the medications was suboptimal (61%). Irrespective of their quiet impressive rate of adherence to medication, most of the participants have been diagnosed of other chronic conditions such as hypertension and depression.

The major barriers toward adherence to OHAs by diabetic patients are drug-related and provider, social, and individuals factors. For drug-related and provider factors most of the participants do not adhere to medication due to high compliance to OHAs dose regimen, side effects of medication, high cost of medication, and poor attitudes of staff providers. For social factors, most of the participants do not adhere to medication due to less help from family/friends and stigmatization of diabetes. For the individual factors, majority of the participants do not adhere to their medications since they do not earn enough and also forget to take their medications. Conclusively, it is identified in this study that a significant relationship at 5% significance level exist between non-adherence to OHAs medication and gender, education, marital status, religion, and monthly income of the diabetic patients.

6.2 Recommendations

Based on the finding that provider and drug related factors is a major contributor towards the non-adherence of medications among diabetic patients, it is highly recommended that the Ministry of Health through its staff at the respective health facilities should create a conducive environment for patients so they can visit the hospital regularly for check-ups and assessments. Moreover, the

Ministry of Finance should find possible ways of further subsidizing the cost of diabetes drugs or medications so many who do not earn enough can also seek proper care and attention.

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APPENDIX