UNIVERSITY OF GHANA

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COLLEGE OF HEALTH SCIENCES

FACTORS INFLUENCING NON-ADHERENCE TO TOPICAL ANTI-GLAUCOMA MEDICATIONS AMONG PATIENTS ATTENDING CRYSTAL EYE CLINIC, ADENTA

BY

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DECLARATION

I, Doreen Kontoh hereby declare that apart from the specific reference which have been acknowledged, this is my own work.

…….. ……..

Doreen Kontoh **Date**

(Student)

……. ……..

Dr Cillins Ahorlu **Date**

(Supervisor)

DEDICATION

I dedicate this piece of work my mother, Florence Amoa- Nkansah.You've been there from the onset, with your prayers, encouragement and any help I needed.

ACKNOWLEDGMENTS

How can I say thanks for all that you've done for me. Its been by your grace, my God that I've come this far. I acknowledge the great help received from the director of Crystal Eye Clinic, Adenta, Dr James Afful Clarke in the course of my work. I am also grateful for the inputs of my supervisor Dr Collins Ahorlu, for guiding the progress of this research with his rich knowledge. I appreciate immensely the support received from my family and all the glaucoma clients of the Crystal Eye Clinic who willingliy participated in this study.

ABSTRACT

Background: Non-adherence to topical anti-glaucoma medication is associated with worse clinical outcomes which can have negative impacts on therapeutic choices by clinicians. Additionally, variations in dosing patterns whether it is missed doses, mistimed doses, or overdosing can lead to less lowering of IOP (intraocular pressure) and/or an increase in side effects that diminish the tolerability of the therapy. This survey seeks to determine the factors that influence non-adherence to topical anti-glaucoma therapy among clients accessing the Crystal Eye Clinic at Adenta in order to help inform policies on appropriate treatment strategies.

General Aim: To determine the factors that influence non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta.

Methodology: This is a descriptive cross-sectional study using a quantitative method to determine the factors that influence non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta. The population of participants for the study was all patients accessing eye care services at the Crystal Eye Clinic, Adenta. Data was collected using a modified structured questionnaire in addition to Morisky Medication Adherence Scale – 8 (MMAS – 8). Simple Random Sampling was used to select the study participants. Microsoft Excel was used to collate the data from the questionnaires and then transferred to Stata Version 15 for analysis. Descriptive analysis, univariate and multivariate logistic regression analyses were carried out. A 95% confidence interval to establish significant relations between the dependent and the independent variables was applied.

Results: Overall, 62% of the respondents had low adherence to topical anti-glaucoma medication, 35% had medium adherence while only 3% had high adherence. The number of times the patient misses the eye drops and the expectations after using the eye drops

were significantly related to non-adherence. . However, how the medication was stored and correct names of drugs had significant relation with non-adherence to topical anti-glaucoma medication. Demographic factors such as age, sex, educational level etc. and Provider related factors such as whether instruction were given about medications, the freedom to ask questions about treatment were all statistically insignificant.

Conclusion: The study concluded that overall, there was high prevalence of non-adherence to topical anti- glaucoma medications among patients accessing glaucoma care at the crystal Eye Clinic. Innovative strategies such as use of scheduling charts and apps as well as guidelines or policies can help prompt patients to take their medications. Additionally, there is the need to include relatives of glaucoma patients in their care, particularly about their medications. More intense patient education about the disease and fear of blindness may be important factors for better prognosis of treatment.

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LIST OF ABBREVIATIONS

ACG	Angle Closure Glaucoma
CDRs	Cup to Disc Ratios
CHPS	Community Based Health Planning Services
DALY	Disability Adjusted Life Years
GHS	Ghana Health Service
GSS	Ghana Statistical Service
IOP	Intraocular Pressure
LILACS	Literature Latin American and Caribbean Health Sciences
MMAS – 8	Morisky Medication Adherence Scale – 8
NTG	Normal Tension Glaucoma
OAG	Open Angle Glaucoma
PFRH	Population Fertility and Reproductive Health
POAG	Primary Open Angle Glaucoma
SOBS	Social and Behavioural science
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to study

Glaucoma is a set of diseases with typical optic neuropathy in common, which is associated with structural (optic disc damage) and functional loss (visual field loss) (Quigley, 2011; Foster & Resnikoff, 2005). Among the causes of blindness that cannot be reversed, Glaucoma ranks the highest, and, globally the second cause of blindness (Baker, 2016; Alingham et al., 2011; Quigley, 2011; Ramalho et al., 2007). The primary contributing factor for glaucoma is the elevation in intraocular. pressure (The eye M.D. association, 2012). Primary and secondary glaucoma, are the main classification of the disease, common types of this classification is closed angle glaucoma (CAG) and open angle glaucoma (OAG) (Baker, 2016; Quigley, 2011; Foster & Resnikoff, 2005). The closed angle glaucoma is identified to be more widespread among East Asians (He et al., 2005) while the open angle glaucoma is more prevalent among people of African descent (Kyari et al., 2013; Cook, 2009).

Globally, over 60 million people suffered glaucoma from 2000 to 2013 (Tham et a.l, 2014). This number is further projected to rise as the world's population rises in both number and age (Cook & Foster, 2012). Additionally, it has been predicted that by the year 2020, between 76 to 80 million people will be diagnosed with the disease, this number will increase to 118.8 million people by the year 2040 (Tham et al., 2014; Quigley, 2011). Moreover, compared to Europe (2.93%) and Asia (3.40%), Africa has been identified to have recorded the highest glaucoma prevalence (4.79%) (Kyari et al., 2013; Cook, 2009). Further, people of African origin have been identified to be at least four times more prone to primary open angle glaucoma (POAG) than those not of African

origin (Kyari et al., 2013). Several studies have shown that the prevalence of glaucoma in West Africa is higher compared to East and Southern Africa (Kyari et al., 2013; Cook, 2009).

In Ghana, studies conducted across the various parts of the country have indicated high prevalence of glaucoma (De-Gaulle & Dako-Gyeke, 2016; Gyasi et al., 2014; Budenz et al., 2012; Bourne, 2006). For instance, high prevalence of glaucoma was noted in Tema (6.5%) (Budenz et al., 2012), Volta Region (7.6 %) (Guzek et al., 2006) and Akuapim South district (8.5%) (Ntim-Amponsah et al., 2004). Additionally, a clinic-based survey in Accra, found that 70% of the glaucoma cases were open angle.

However, researches have shown that topical medications are effective therapy against glaucoma (Sleath et al., 2011; Leske et al., 2007). Additionally, several clinical trials have indicated that, vision loss from glaucoma can mostly (if not totally) be prevented with effective medical therapy (Sleath et al., 2011). However, proper adherence to prescribed treatment requires taking the prescribed medication daily, with no breaks in therapy since non-adherence is associated with worse clinical outcomes (Mowatt, Nelson & Gordon, 2011). Non-Compliance to topical anti-glaucoma drugs has been reported in several studies (Sleath et al., 2011; Friedman et al., 2009; Friedman et al., 2007; Leske et al., 2007).

However, there is inadequate studies on the adherence to topical anti-glaucoma medication among glaucoma clients in Ghana despite increasing prevalence of the condition. Moreover, recent study in a Metropolis in Ghana confirmed that glaucoma patients prefer

other eye care services options such as native healers and local drug shops to the services of an ophthalmologist or optometrist in Ghana (Ocansey et al., 2014).

This study therefore seeks to identify the factors influencing non-adherence to topical anti-glaucoma medication among glaucoma patients attending Crystal Eye Clinic at the Adenta Municipality in order to help inform policy on appropriate strategies on glaucoma treatment.

1.2. Problem statement

Ghana has been identified as one of the countries in the world badly affected with glaucoma (Kosoko-Lasaki, 2006), with an estimated 600,000 people suffering from the disease. (GHS, 2013). Glaucoma is also the leading cause of blindness that cannot be reversed (Ntim-Amponsah et al., 2004). Some 8.5% of people older than 40years are affected by the open angle type of the disease. (Ntim-Amponsah et al., 2004). Additionally, it has been observed that glaucoma is affecting a lot more younger people in Ghana (Budenz et al., 2012; Bourne, 2006; Gyasi et al., 2006). Recent study has shown highly elevated IOP (33.5 mmHg) and grossly advanced optic neuropathy among glaucoma patients in the Greater Accra region (Gyasi et al, 2014). Similarly, considerable differences between high tension glaucoma and normal tension glaucoma (NTG) were observed (Gyasi et al., 2014). An earlier survey conducted in the North Eastern part of Ghana, found 98.4% of the patients suffering from primary open angle glaucoma (POAG) with 8.3% identified as NTG (Gyasi et al., 2010). Moreover, nearly 70.2% of the patients sampled had cup to disc ratios (CDRs) higher than 0.8 and with blindness sequelae twice in males compared to females (Gyasi et al., 2010).

However, research has shown that topical anti-glaucoma medications constitute effective therapy against glaucoma (Sleath et al., 2011; Leske et al., 2007). However, non-compliance to glaucoma treatment is related to poorer clinical outcomes which can also have negative impacts on therapeutic choices by clinicians, causing them to believe a therapy is not working and so unnecessarily switch course (Friedman et al., 2009). Additionally, variations in dosing patterns whether it is missed doses, mistimed doses, or overdosing can result in less lowering of IOP together with/or an increase in side effects that diminish the tolerability of the therapy (Sleath et al., 2011; Friedman et al., 2009; Friedman et al 2007; Leske et al., 2007). Several researches conducted have reported non-adherence to topical anti-glaucoma medication by patients in other jurisdictions (Sleath et al., 2011; Friedman et al., 2009; Friedman et al 2007; Leske et al., 2007). Further, causes of non-adherence related to service providers, situation/environment, medication, and glaucoma patients have been identified as significant barriers to medication compliance (Tadesse & Mulugeta, 2015; Sleath et al., 2011).

However, there is inadequate data on topical anti-glaucoma adherence among glaucoma clients despite the increasing prevalence of the disease. This study therefore seeks to identify the factors influencing non-adherence to topical anti-glaucoma medication among glaucoma patients attending Crystal Eye Clinic at the Adentan Municipality in order to help inform policy on glaucoma medication adherence.

1.3 Research Questions

Research questions are:

1. What is the level of non-adherence to topical anti-glaucoma medication among patients attending Crystal Eye Clinic?

2. What patient related factors influence non-adherence to topical anti-glaucoma therapy among patients attending Crystal Eye Clinic?
3. What provider-related factors influence non-adherent to topical anti-glaucoma therapy among patients attending Crystal Eye Clinic?
4. What medication-related factors influence non-adherence to topical anti-glaucoma medication among patients attending Crystal Eye Clinic?

1.4 Study Objective

1.4.1 General Objective

The broad objective is to determine the factors that influence non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta.

1.4.2 Specific Objectives

The specific objectives are:

1. To determine the prevalence of non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic
2. To identify patient factors that influence non-adherent to topical anti-glaucoma medication among patients attending Crystal Eye Clinic
3. To determine provider-related factors that influence non-adherent to topical anti-glaucoma medication among patients attending Crystal Eye Clinic
4. To identify medication-related factors that influence non-adherent to topical anti-glaucoma medication among patients attending Crystal Eye Clinic.

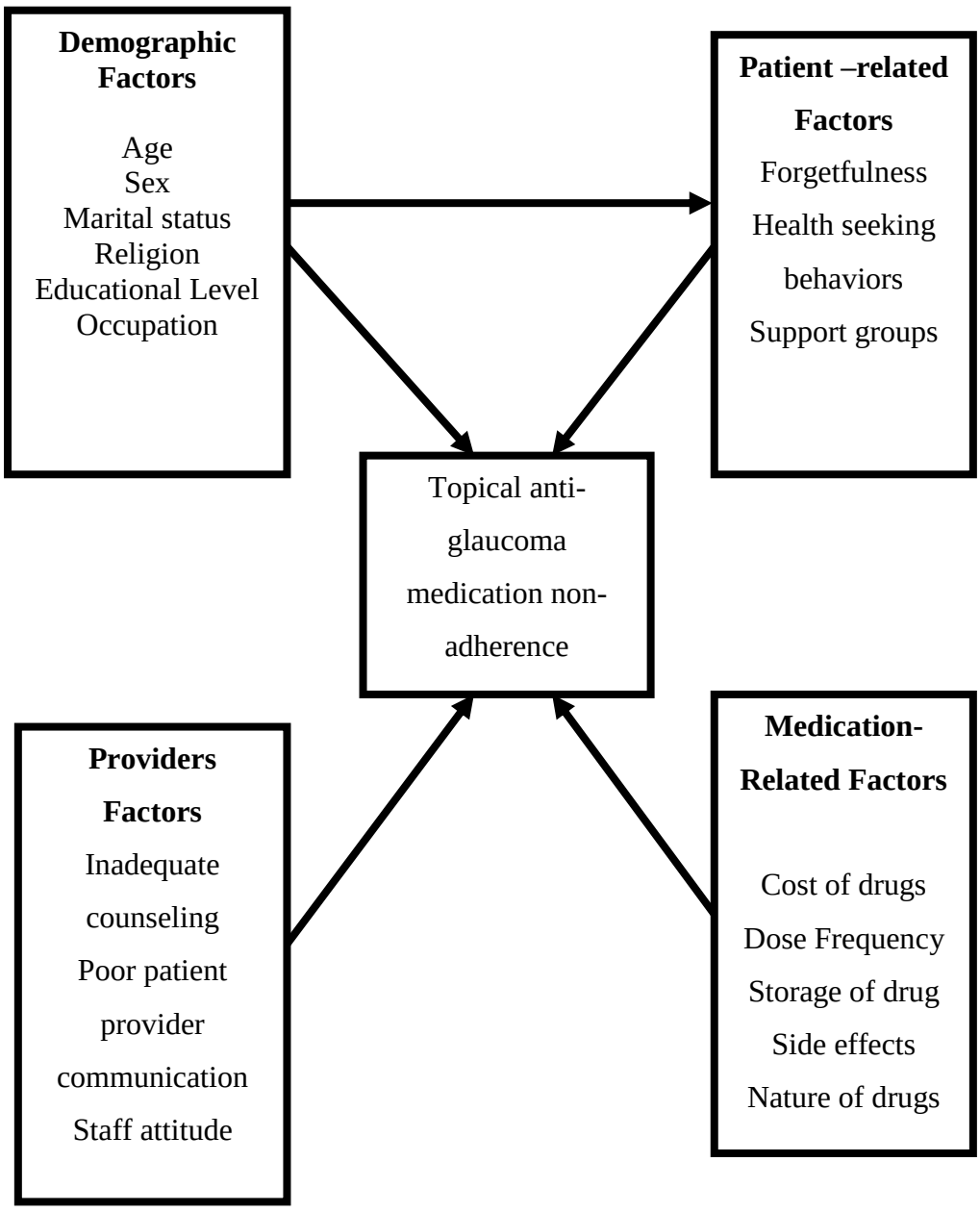

Figure 1.1: Conceptual Framework of factors that influence Non-Adherence to topical anti-glaucoma medication (Modified from Adherence to long - term therapies, World Health Organization Pg 26 (2003).

1.5 Significance of the Study

Determination of the prevalence of non-adherence to topical anti-glaucoma medications among the patients attending the Crystal Eye Clinic will help identify the true burden of the disease. When the true drain of the disease is known, preventive approaches would be device to control its menace.

Moreover, when the influencing factors from medication, patients and service providers are identified, this will help inform policy on the suitable strategies to control the factors, thereby reducing blindness from glaucoma. Lastly, lessons learnt will be applied to other health facilities with similar characteristics to serve as measures to reduce non-compliance to glaucoma treatment. The outcome of this research work will also add on to existing literature on glaucoma.

1.6 Outline of the Research/Study Report

The work is presented under six chapters. The first chapter presents the introduction to the study, background, problem statement, justification, general objective, specific objectives and research questions. The second chapter presents the literature in relation to the study. The third chapter contains the methods used for the study. The fourth, records the results of the study while the fifth chapter discusses the results. Chapter six contains conclusions and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Work done on glaucoma and important surveys that have been published by other researchers which are relevant to this study are acknowledged and discussed in this chapter. The objectives of this study and research methods are the main focus of this review of literature and is outlined as follows:

2.2 Global burden of glaucoma

Globally, the second ranked cause of blindness is glaucoma (Baker, 2016; Alingham et al, ,2011; Quigley, 2011; Ramalho et al., 2007). Moreover, it has been identified as the highest cause of irreversible blindness (Baker, 2016). Over 60 million persons had glaucoma between the year 2000 and 2013 (Tham et al., 2014) and it has been estimated that by the year 2020, about 76 to 80 million persons will suffer the disease. Additionally, it has been projected that about 118.8 million people will be affected by glaucoma by the year 2040 (Tham et al., 2014; Quigley, 2011). Contributing factors noted in literature to these escalating figures is the increasing global population and increasing age (Cook & Foster, 2012).

Africa is however noted as the region with the leading prevalence of Glaucoma (Kyari et al., 2013; Cook, 2009). A study conducted by Kyari et al., (2013) showed that in Europe and Asia, the prevalence of glaucoma were 2.93% and 3.40% respectively while Africa recorded 4.79%. Moreover, Africans have been identified to be at risk of primary open angle glaucoma (POAG) at least four times than non-Africans making open-angle glaucoma (OAG) to lead in the causes of blindness that is irreversible in Africa (Kyari et

al., 2013). As stated by the World Health Organization (2000), glaucoma has the second highest disability adjusted life years (DALY) score for sense organs after cataract.

2.3 Burden of glaucoma in Ghana

Ghana is noted to be one of the countries in Africa which have been affected most and ranks second worldwide with glaucoma (Melamed, Herndon & Shaarawy, 2010). Glaucoma is as well the leading cause of irreversible blindness in Ghana (Ntim-Amponsah et al., 2004). It has also been noted to affect about 8.5% of people more than 40yrs of age suffer open angle glaucoma (Ntim-Amponsah et al., 2004).

In a project carried out by Otabil et al., (2013), the prevalence of glaucoma found in an eye clinic in Ghana was determined. Prevalence of 9.5% was identified among female adults, while male adults and children recorded 8.77% and 1.41% respectively. It is therefore not surprising that several studies have concurred that glaucoma is affecting more younger people in Ghana (Budenz et al., 2012; Bourne, 2006; Gyasi et al., 2006). Moreover, in a recent study conducted by Gyasi et al., (2014), Intraocular pressure (IOP) was found to be highly elevated (33.5 mmHg) among glaucoma patients in the Greater Accra Region. Compounding this is the grossly advanced optic neuropathy (Gyasi et al., 2014).

Moreover, important variation between high tension glaucoma and normal tension glaucoma (NTG) has been noted in Ghana. For example, a study carried out in 2010 in the North Eastern part of Ghana in glaucoma patients, found 98.4% of the patients suffered from primary open angle glaucoma (POAG) of which 8.3% were classified as NTG (Gyasi et al., 2010). Moreover, nearly 70.2% of the patients sampled had cup to disc ratios

(CDRs) over 0.8 and with blindness sequelae twice in males compared to females (Gyasi et al., 2010). However, researches have shown that topical anti-glaucoma medications are effective therapy against glaucoma (Sleath et al, 2011; Leske et al., 2007).

2.4. Anti-glaucoma medication non-adherence

Adherence according to the European Glaucoma Society (2008) looks at compliance and persistence. Compliance means using a medication as instructed, with the right dose, method of administration and the interval between the doses while persistence is the ability to continue treatment, which may be determined by the frequency of prescription fill ups within a period.

The primary aim of glaucoma treatment is to avoid deterioration in vision and blindness. However studies have shown that the only way to prevent this is by lowering the intraocular pressure (IOP) (Heijl, Leske & Bengtsson, 2002; Kass, Heuer, Higginbotham, 2002). An eye drop that reduces intraocular pressure can prevent glaucoma advancement and hence maintain vision (Denis, 2011). This indicates the need for medication adherence. However compliance may be insufficient in as many as 59 % of clients (Denis, 2011). Increasing medication adherence is key for effective glaucoma management and this stands as a great struggle for physicians (Denis, 2011). Research has shown that topical anti-glaucoma medications are effective therapy against glaucoma (Sleath et al, 2011; Leske et al., 2007).

However, non-adherence to glaucoma medication results in worse clinical outcomes which can also have negative influence on therapeutic choices by clinicians (Friedman et al., 2009). Additionally, variations in dosing patterns whether it is missed doses, mistimed

doses, or overdosing can result in less lowering of IOP and/or an increase in side effects that diminish the tolerability of the therapy (Sleath et al, 2011; Friedman et al., 2009; Friedman et al 2007; Leske et al., 2007). Several researches done have reported non-adherence to topical anti-glaucoma medication by patients (Sleath et al, 2011; Friedman et al., 2009; Friedman et al., 2007; Leske et al., 2007).

2.5 Factors that influence non-adherence to topical anti-glaucoma medication

Proper medication adherence involves using the prescribed medication daily, with no breaks in treatment.(Mowatt, Nelson-Imoru and Gordon-Strachan 2011). Studies have identified several factors that can influence non-adherence to topical anti-glaucoma medication (Tadesse & Mulugeta, 2015; Sleath et al., 2011). However, this study considers the following factors and discusses them, as follows:

2.5.1. Demographic factors

Studies have shown significant connections between some demographic characteristics and non-adherence to topical anti-glaucoma therapy while others did not (Otabil et al., 2013; Tamrat, Gessesse, & Gelaw, 2015). The demographic factors considered in this study are discussed as follows:

2.5.1.1. Age

Several studies found non-adherence to topical anti-glaucoma therapy to be associated with the age of the sufferer (Dreer, Girkin, & Mansberger, 2012; Olthoff, Hoevenaars, Van Den Borne, Webers, & Schouten, 2008; Tamrat et al., 2015). For instance, a recent study conducted to assess the adherence level to topical anti-glaucoma medication in Ethiopian patients recorded 50% prevalence of non-adherence among adults from age 18-

40years while 72.5% prevalence was noted in those above age 55years (Tamrat, 2015). Similar studies done in Egypt found 53.6% noncompliance of which patients aged above 50 years were found to be significantly associated with the poor compliance (Hussein, 2015). The authors however argued that the higher noncompliance noted may be as a result of absence of family help, lowered vision, problems with manual dexterity, coordination, understanding, or recall as concluded in several other studies (Stryker et al., 2010).

Contrarily, Olthof et al., (2008) found that patients below age 55 were more prone to being non-adherent when the prevalence and determinants of non-adherence to topical hypotensive medication in Dutch glaucoma patients were explored. The authors explained that this observation may be due the working circumstances of these younger persons, which makes it almost impossible to regularly use eye drops, or undesirable effects like unclear sight that disturbs people whiles working.

2.5.1.2. Gender

Gender has been identified in several studies as a factor that has no significant influence on non-adherence to topical anti-glaucoma medication by patients (Tamrat, 2015; Tadesse, 2015; Olthof et al., 2008). For example, a study by Tamrat et al., (2015) found no association when the prevalence of non-adherence to topical anti-glaucoma medication was determined in Ethiopian patients. Additionally, gender was not found as a predictor of noncompliance when a cross sectional study was conducted to identify the extent of non-adherence to treatment among glaucoma clients at Menelik II Hospital in Ethiopia (Tadesse, 2015).

Moreover, a systematic review carried out by Castro et al., (2009) when articles were searched in the National Library of Medicine (PUBMED) and Literature Latin American and Caribbean Health Sciences (LILACS) found no association between gender and non-adherence. However though Meguid Latif, Shafik and Youssef (2014) found no significant association in their study on adherence to medical treatment in primary open-angle glaucoma in Egypt, they recorded that gender affects the level of compliance to anti-glaucoma medication. Several other studies found similar results (Khandekar, Shama & Mohammed, 2005; Kosoko-Lasaki, 2006).

However, earlier studies by Bloch et al., (1997) and Patel& Spaeth (1995) recorded significant associations. Additionally, Hussein et al., (2015) found in a recent study that females have tendency for higher compliance compared to their male counterparts.

2.5.1.3. Educational level

The level of education of the glaucoma patients has been found to be associated with their level of non-adherence to topical anti-glaucoma medication in several studies (Hussein et al, 2015; Meguid et al., 2014; Olthoff et al., 2008). Meguid et al., (2014) found illiterate had a higher adherence level of 71.9% compared to those with higher level of education when adherence to medical treatment in primary open-angle glaucoma in Egypt was determined. Additionally, they found that patients who had up to primary level of education recorded the highest level of adherence level (85.7%) while those with high school education recorded the poorest (53.3%).

However in a similar study in Jamaica where glaucoma medication adherence problems in an Eye Clinic in a Jamaican Hospital was assessed, the study found no relationship

between the patients' educational level and the non- adherence (Mowatt et al., 2011). Similar finding was obtained by Djafari et al (2009). However in another study, patients with secondary level education were found to show high level of compliance (Friedman et al., 2009).

2.5.1.4. Marital status

Several studies have recorded that non-adherence to topical anti-glaucoma medication has no association with the marital status of the individual (Omoti & Waziri-Erameh, 2003; Omoti & Ukponwan, 2005). Related outcomes were obtained by Mowatt et al (2011) in Jamaica. Additionally, a study done in Ethiopia patients found no significant association between non-adherence to anti-glaucoma medication and the marital status of the individual (Tamrat et al., 2015). However several other studies have reported living without help, or being a widow to be linked with poorer adherence level than being married (Djafari, 2008; Sleath et al., 2011)

2.5.1.5. Income

Researches have shown no association between medication non-adherence and income in Africa (Amira, 2007; Mathes, Jaschinski & Pieper, 2014). It was however argued that this may be because in many African studies, only a negligible number of people belong to high socioeconomic class, making it difficult to assess medication non-adherence in the high socioeconomic class (Amira, 2007; Isezuo, 2011). Further it has been noted that the lack of association between income and medication non-adherence may be a reflection of inter- play of other factors that contribute to medication adherence (Tamrat et al., (2015).

Contrarily, in a study by Tamrat et al., (2015) in Ethiopia patients, 74.4% of cases who mentioned financial hardship in obtaining medications were found to be non-adherent compared with 36.1% of those who cited no financial problem. Moreover, economic conditions of patient have been known to be a chief limiting factor for access to healthcare globally.

2.5.2. Patient–related factors

Proper medication adherence means using the prescribed medication daily, with no breaks in treatment (Mowatt et al., 2011). However it has been found that some factors related to the patient may hinder the success of medication (Tasi, 2006; Mowatt et al., 2011). These factors are described as follows:

2.5.2.1. Forgetfulness

Forgetfulness has been mentioned in several studies by patients as a major factor for non-adherence (Tasi, 2006; Mowatt et al., 2011; Tadesse, 2015). For instance a study to evaluate the prevalence and determinants of non-adherence to topical intraocular pressure reducing treatment in glaucoma patients in Denmark, identified forgetfulness as the most mentioned cause for non-adherence (Olthoff et al., 2008). Similar study conducted in Ethiopia patients recorded similar findings (Tadesse, 2015). However, studies have shown that variations in dosing patterns whether it is missed doses, mistimed doses, or overdosing can result in less reduction of IOP and/or an increase in side effects that diminish the tolerability of the therapy (Sleath et al., 2011; Friedman et al, 2009; Friedman et al 2007; Leske et al., 2007).

2.5.2.2. Social support

Glaucoma clients who have lower levels of treatment compliance are presumed to stand a higher chance of visual loss (Sleath et al., 2011). However, a study has indicated that social support helps with adherence to topical anti-glaucoma medication (Tadesse (2015). This may take the form of encouragement or motivation and reminders from family or friends. In the study by Tadesse et al., (2015), it was found that glaucoma patients find it helpful depending on others for instilling the drops.

Moreover, multiple obstacles including lack of motivation, drop application, and other practical issues have been identified to be associated with non-adherence (Lacey, 2008). Similarly, Hussein et al., (2015) found that negative family history of glaucoma affects patients' compliance to medication (Hussein et al., 2015).

2.5.3. Medication –related factors

Medication-related factors identified in literature considered for these studies include the following:

2.5.3.1. Cost of drug

Noncompliance with medical treatment has over the years been identified to be the key limiting factor in the medical care of any chronic disease (Eldaly, Hunter & Khafagy, 2007). However, financial coverage of cost of therapy has been recorded as one of the major factors that affects anti-glaucoma medication adherence (Hussein et al., 2015). Additionally, Hussein (2015) noted that patients whose costs were covered by insurance had higher level of compliance. Moreover similar studies carried out in Egypt revealed

that the inability to maintain IOP is mostly linked to the high cost involved in the management of glaucoma (Eldaly, Hunter & Khafagy, 2007).

Further, it has been recorded that patients living in developing countries have limited access to medication due to cost and unavailability (Tamrat, 2015). Tamrat (2015) found that 74.4% of patients who mentioned financial hardships in obtaining medications were non-adherent compared to 36.1% who cited no financial problem. Similar findings have been reported in the literature (Silva, 2010; Martin, 2009).

2.5.3.2. Dose frequency and regimen complexity

Researches have shown that topical anti-glaucoma medications constitute effective therapy against glaucoma (Sleath et al, 2011; Leske et al, 2007). However, it has been observed that the influence of the number of medications as well as the intricacy of treatment plan affects compliance rate among glaucoma patients (Tadesse, 2015). Similar findings have been obtained in other studies (Robin, 2007; Robin 2005).

Moreover, regimen complexity as well as existence of various other drugs in the patient's overall treatment has been found to be connected with non-adherence (Olthoff et al., 2008) Patients tend to be muddled by the different treatment plan for each drug and the number of drugs to be used associated with increased treatment complexity and higher rate of drug use (Olthoff et al., 2008). Stryker et al (2010) found that both adherent and non-adherent individuals had possibilities of taking other medications. A report from Hong Kong reported similar findings (Jeffery, 2009).

2.5.3.3. Side effects

Several studies have shown that adverse effects of the anti-glaucoma medication experienced by patients contribute to their inability to comply with treatment regimen (Castro & Mesquita, 2009; Olthoff et al., 2008). For instance undesirable effects of topical hypotensive glaucoma medication like as conjunctival redness, discomfort and rubbing of eyes have been noted as the leading cause of non-adherence (Adisa, Alutundu, & Fakeye, 2009; Alm, Grunden & Kwok, 2011) Moreover Stewart (2010) reported that withdrawals were largely due to adverse effects: 46 % of withdrawals compared with 10 % of withdrawals for inadequate IOP control when a randomized controlled trial was carried out. Stewart (2010) further pointed out that about one out of 20 patients (5.4 %) withdrew in total, reason being adverse effects. Similar findings were reported by Nordmann, Auzanneau & Ricard,(2003).

2.6 Chapter summary

The literature review explored the global burden of glaucoma, burden of glaucoma in Ghana, anti-glaucoma medication non-adherence, factors that influence non-adherence to topical anti-glaucoma medication particularly the demographic factors, patient-related and medication-related factors. The review has revealed that glaucoma remains the highest cause of irreversible blindness globally. In Africa, Ghana is most affected country with glaucoma and second worldwide with glaucoma burden. Although research have shown that topical anti-glaucoma medications are effective therapy against glaucoma, several studies have reported non-adherence to topical anti-glaucoma medication by patients in other jurisdictions (Sleath et al., 2011; Friedman et al, 2009; Friedman et al., 2007). Conversely, there is scanty information on the adherence to topical anti-glaucoma medication among glaucoma patients in Ghana despite the increasing prevalence of the

disease. Non adherence to anti-glaucoma medication is a factor for high glaucoma prevalence (Sleath et al., 2011; Friedman et al., 2009; Friedman et al 2007; Leske et al., 2007). Hence this study seeks to determine the factors influencing non-adherence to topical anti-glaucoma medication among glaucoma patients attending Crystal Eye Clinic at the Adenta Municipality in order to help inform policy on glaucoma medication adherence.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

In this chapter, the method and procedures used to conduct the study are described. Topics such as design, study site, population, sample size, sample and sampling procedure are explored. How data was collected and analyzed and ethical issues are also discussed. They are presented as follows

3.2. Research Design

This is a descriptive cross-sectional study using a quantitative approach to determine the factors that influence non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta. A cross-sectional is a study in which analysis of data was done at a specified point in time was used.

3.3. Study Site

The study was carried out at the Crystal Eye Clinic in the Adentan Municipal district. The clinic is located at Adenta housing down near the Adenta Market. Crystal Eye Clinic has a staff strength of 22 which include an Ophthalmologist, Optometrists, Ophthalmic Nurse, and other support staffs. Service provided by the clinic include eye consultation, refraction, surgeries, Optical service, Pharmacy and outreach services. The Adentan Municipality has a population of 78,215, as stated by Population and Housing Census conducted in 2010 (GSS, 2012). About 62.5 percent of the people in the Adenta Municipal are located in urban areas and 37.5 percent in rural areas. Currently, the Municipality has five Health centers, 22 CHIPS compound and 14 private health facilities.

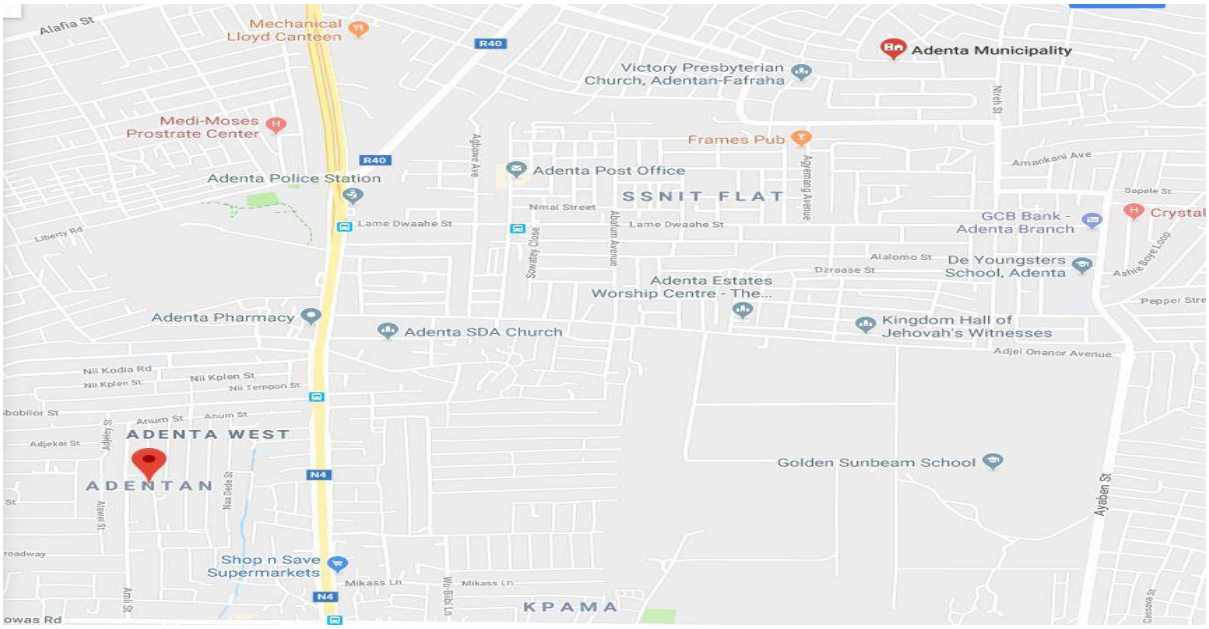

Figure 3.1: Map of Adentan Municipality

3.4 Study Population

The population used to conduct the study was all patients accessing eye care services at the Crystal Eye Clinic, Adenta

3.5 Inclusion criteria

All glaucoma patients of age 18 years and above, who have been on at least one topical anti-glaucoma medication in one or both eyes for the past 6 months and have been attending the Crystal Eye Clinic.

3.6 Exclusion Criteria

All glaucoma but was patients of age 18 years and above receiving glaucoma care who had been on at least one topical anti-glaucoma medication in one or both eyes for the past 6 months not be willing to participate. Additionally, patients who are unable to communicate as a result of deafness and whose relative were unwilling to participate was excluded.

3.7 Variables

TYPE OF VARIABLE	MEASUREMENT
Dependent Variable	Non-adherence to topical anti-glaucoma medication
Independent Variables	
Socio-demographic characteristics	Age, level of education, religion, marital status
Patient-related factors	Forgetfulness, Support groups, Travelling
Medication- Related Factors	Cost of drugs, dose frequency, storage of drug, side effects, nature of drugs
Providers Factors	Inadequate counseling, poor patient provider communication, staff attitude

3.8 Sample Size Determination

Using Cochran 1963 sample size formulae for cross-sectional study:

$$n = \frac{(Z_{\frac{\partial}{2}})^2 p(1-p)}{d^2} \ldots\ldots\ldots\ldots\ldots (1)$$

where:

n: sample size

p: the prevalence of glaucoma in Ghana p=9.2% (Otabil et al, 2013).

d: margin of error, 5%

Zα/2=1.96 since α=5% at 95% Confidence Level

Keying the above into equation (1), the least number of participants required to carry out the study is given by

$$n = \frac{(1.96)^2 0.0915(1-0.0915)}{0.05^2} = 127.741$$

Considering, expected loss ratio of 10%, the final sample size

$$127.741 \times 0.1 = 12.774$$

$$127.741 + 12.774 = 140.51 \approx 141$$

Therefore, the minimum sample size to determine the factors influencing non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta was 141.

3.9 Sampling Procedure

Using an average population of 200 glaucoma patients at the crystal eye clinic, a random number generator is used to generate 141 random numbers of 200. All these 200 glaucoma patients are assigned numbers 1-200 on their medical charts. On daily basis, the generated random numbers are used to select the participants to form the sample size of 141 in addition to satisfying the inclusion criteria.

3.10 Data collection Procedure and tools

Data was collected using a modified structured questionnaire (Mowatt et al., 2011) in addition to Morisky Medication Adherence Scale – 8 (MMAS – 8) through patient interview and chart review.

Patient's medical records were reviewed to abstract visual acuity, the type of glaucoma, and its severity. Topical anti-glaucoma medication adherence was measured using MMAS–8 which is a scale for medication-taking behavior. MMAS–8 is the newest version of the scale and has a good internal consistency (Cronbach's $\alpha = 0.83$) (Morisky,

Ang, Krousel-Wood, & Ward, 2008). A wide range of chronic medical diseases have employed the use of this scale (Pedersini & Vietri, 2014). According to Morisky et al., (2008), there are three categories 0f adherence to medication, high, medium and low. The study participants were considered to have high adherence when the MMAS-8 score was 8 0n the scale, medium adherence with a score of 6 to <8 and low adherence when score is < 6 (Morisky et al., 2008)

The modified questionnaire consisted of participants socio-demographic characteristics (age, education, religion, ethnicity, marital status, gender, income status), patient-related factors (forgetfulness, social supports), medication –related factors (cost of drugs, storage of drug, side effects).

Each questionnaire took 15-30 minutes on the average to be completed.

3.11 Quality Control

Quality control will involve the following:

1. Training of field staff: To ensure data quality, data collectors comprised of the Principal investigator and ophthalmic assistants at the Crystal Eye clinic were trained as research assistants. These individuals were trained on how to conduct interview and medical charts review and correct recording of data that was obtained from participants.

2. Pretesting of instrument for data collection: the data collection instrument was pre-tested at the Frafraha Health Centre. The purpose was to establish if the tools were clearly worded to reflect the context of our setting, if there were any word that could

be difficult for the respondents to understand and if the questionnaire would generated the type of information needed or required to answer the study objectives.

3. Review of the instruments: the data collection instrument was reviewed by the Principal researcher and the Ophthalmologist at Crystal eye clinic prior to the data collection after the pretesting.

4. Data entry approach: Data from the questionnaire was entered into Microsoft Excel before transferring to Stata version 15 for analysis. During the data entry, validation was done by setting limits to the various variables.

3.12 Data Processing

Data in Microsoft Excel was transferred to Stata Version 15 for cleaning, merging and analysis. Frequencies of the variables were run to clean the data and check data that was coded inconsistently. Raw data from the questionnaire was re- checked with any data that was found to be inconsistently coded.

3.13 Data Analysis

Descriptive analysis was carried out to determine the proportion for categorical variables: age, level of education, religion, marital status. To determine the prevalence of non-adherence, first each item on the Morisky scale answered correctly was scored as 1 and non-adherent was scored as 0. Composite score was then calculated for the eight individual questions of the Morisky scale, The study participants were considered to have high adherence when the MMAS-8 was 8 on the scale, medium adherence with score of 6 to<8 and low adherence when score is <6. To determine the patient-related factors, provider-related and medication-related factors that influence non-adherence, Pearson Chi

square analysis was carried out. Multivariate logistic regression analysis was done to ascertain the significant factors that affect the non-adherence controlling for other variables. A 95% confidence interval was employed to determine important relations that existed between the dependent and the independent variables.

3.14 Data Storage / Data Protection

A file in which the questionnaire was kept was locked in a cabinet. An electronic copy of coded questionnaire was stored on the computer with a password only principal researcher has knowledge of.

3.15 Study Limitations

Since the study focused on determining the factors that influence non-adherence to topical anti-glaucoma medication at the Crystal Eye Clinic, any conclusions made from the study may not be applicable to every eye clinic or hospital. However, for eye health facilities that have similar characteristic features as that of the study, conclusions might be extended to them. Secondly, data might be subjected to bias by the sincerity of respondents' answers. Aside all these limitations, the internal and external validity of the study will not be negatively affected.

3.16 Ethical Consideration

Introductory letter was obtained from the Department of Social and Behavioral Science (SOBS) of the School of Public Health (SPH) to the medical director, Crystal Eye Clinic for introduction. The proposal was submitted to the SOBS Department of the School of Public Health and then forwarded for ethical clearance from the Ghana Health Service Ethics Review Committee.

Clearance was obtained from the Ghana Health Service Ethics Review Committee prior to data collection. Clearance obtained from the Ghana Health Service Ethics Review Committee was submitted to the medical director, Crystal Eye Clinic. Approval from the clinic was obtained before data collection begun. A written informed consent was obtained from all participating clients. The participants included all glaucoma patients of age 18 years and above, who have been on at least one topical anti-glaucoma medication in one or both eyes at least for the past 6 months and had been attending the Crystal Eye Clinic.

CHAPTER FOUR

4.0 RESULTS

4.1. Introduction

This chapter presents the findings of the study in accordance with the outlined objectives and research questions. The chapter is in five sections. Section one presents demographic characteristics of the participants. Section two presents the assessment of the prevalence of non-adherence to topical anti-glaucoma medication. Section three presents the assessment on the patients- related factors that influence non-adherence to topical anti-glaucoma medication. Section four outlines the provider-related factors that influence non-adherence to topical anti-glaucoma medication. Section five presents the medication-related factors that influence non-adherence to topical anti-glaucoma medication and section six presents the chapter summary.

4.2. Demographic characteristics of respondents

Figure 4.1 presents the demographic characteristics of the 147 patients surveyed in the project. 51.7% of the respondents were mostly males. Most 67.4% of the respondents were above the age of 60 years while the least 6.1% were in the age group (18-40) years. (40.8%) of the respondents had received tertiary level of education. Majority, 57.8% of the respondents were married while, 28.6% were widows.

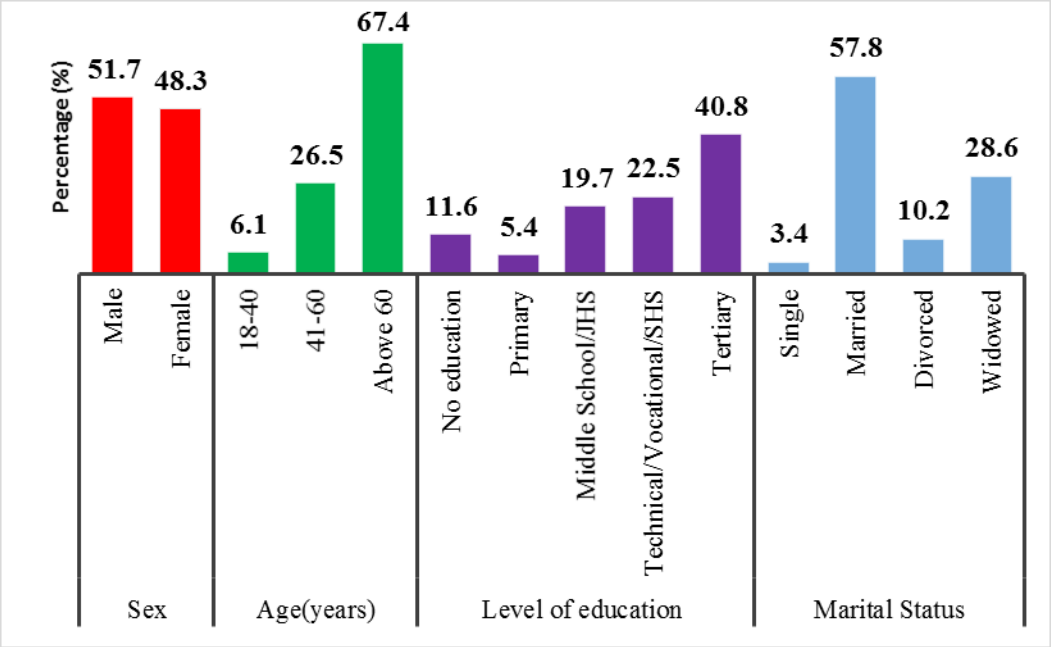

Figure 4.1: Socio-demographic characteristics of respondents

4.3. Prevalence of non-adherence to topical anti-glaucoma medication

Figure 4.2 shows the prevalence of non-adherence to topical anti-glaucoma medication using Morisky Medication Adherence Scale (MMAS-8). Overall, 62% of the respondents had low adherence to topical anti-glaucoma medication, 35% had medium adherence while only 3% had high adherence.

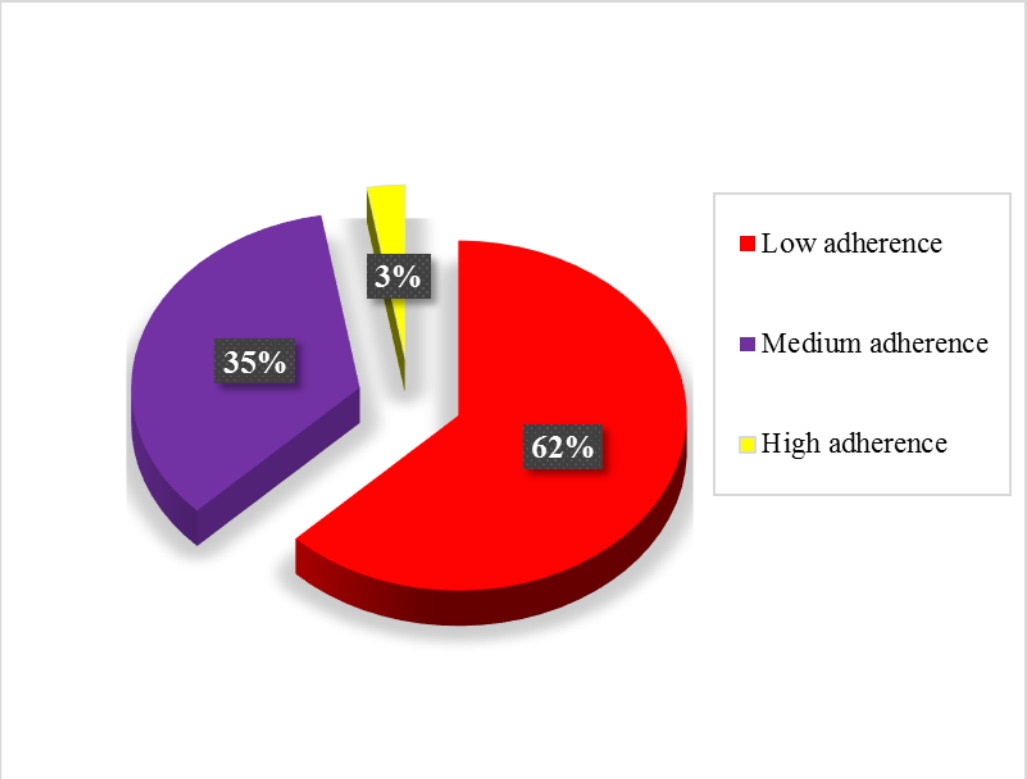

Figure 4.2: Overall prevalence of non-adherence to topical anti-glaucoma medication

4.4. Assessment of the prevalence of non-adherence to topical anti-glaucoma medication based on the domains of the Morisky Medication Adherence Scale (MMAS-8)

Table 4.1 presents the assessment of medication adherence using Morisky Medication Adherence Scale (MMAS-8). Overall, more than half 80 (54.4%) of the respondents agreed they do sometimes forget to instill their eye drops. Most 78 (53.1%) could therefore not instill their medications over the past two weeks. However, majority 106 (72.6%) stated they never stopped instilling their eye drops without informing their doctor. More than half 76 (52.0) of the respondents stated they don't forget to carry their medications along when they travel or leave home. However, most 82 (56.2%) of the respondents did not instill their medications the previous day. Majority 123 (84.3%) of the respondents stated they did not stop instilling the medication even when the symptoms

were under control. Moreover, more than half 97 (66.4%) agreed that it is not inconvenient having to stick to their medication plan while majority 84 (57.5%) did not have difficulty remembering to instill medications.

Table 4.1: Assessment of medication adherence

Morisky Medication Adherence Scale (MMAS-8)	Responses	
	Yes Frequency (%)	No Frequency (%)
Do you sometimes forget to instill your eye drops?	80(54.4)	67 (45.6)
Thinking over the past two weeks, were there any days when you did not instill your medications	78 (53.1)	69 (46.9)
Have you ever cut or stopped instilling your eye drops without telling your doctor because you felt worse when you instill it	40 (27.4)	106 (72.6)
When you travel or leave home do you sometimes forget to carry your medications along	70 (48.0)	76 (52.0)
Did you instill all your medicine yesterday?	82 (56.2)	64 (43.8)
When you feel your symptoms are under control do you sometimes stop instilling your medications?	23 (15.8)	123 (84.3)
Is it an inconvenience having to stick to your medication plan?	49 (33.6)	97 (66.4)
How often do you have difficulty remembering to instill your medications?		
Never rarely	84 (57.5)	
Sometimes	53 (36.3)	
Usually	4 (2.7)	
At all times	5 (3.4)	

4.4.1 Assessment of Patient-Related Factors that influence Non-Adherence to topical Anti-glaucoma medication

Figure 4.3a shows the patient-related factors that influence non-adherence to topical anti-glaucoma medication. Close to half 47.3% of the respondents never missed instilling eye drop in a week while more than one third, 36.3% missed it once. Overall, majority, 76.7% missed their drops because they forgot to do so. More than half, 52% of the respondents state\7d they never run out of medications. Additionally, most, 67.1% of the respondents mentioned they had someone who helps to either instill the medication or remind them to instill it. Further, most, 61.1% of the respondents stated they always get this help.

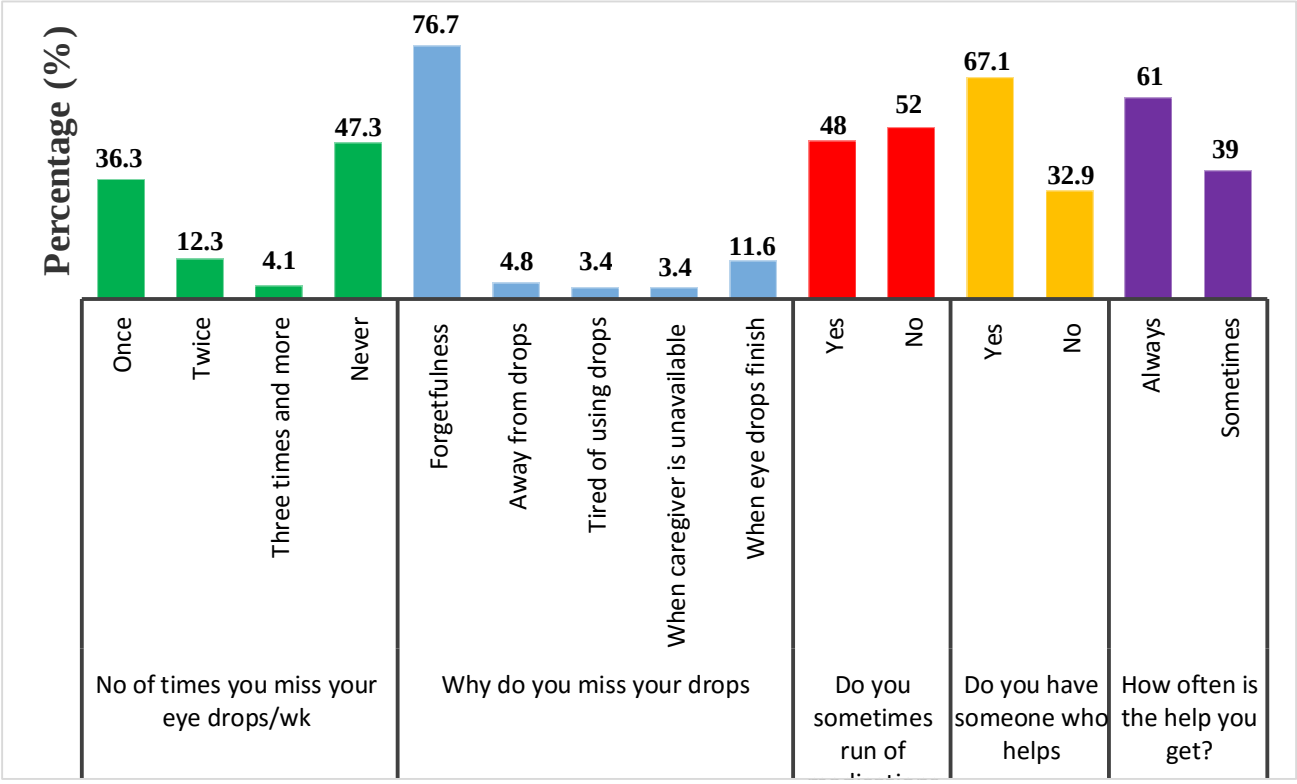

Figure 4.3A: Patients Related Factors to Non-Adherence to topical Anti-glaucoma medication

4.4.2 Assessment of Patient-Related Factors that influence Non-Adherence to topical Anti-glaucoma medication

Figure 4.3B shows the continuation of the assessment of the patient-related factors that influence non-adherence to topical anti-glaucoma medication. 43.8% of the respondents paid for their own medication. Additionally, 50.7% of the respondents agreed they know the names of their eye drops while 85.6% were able to get the names correct. Moreover, it is the expectation of 45.9% of the respondents to have their vision maintained while 33.7% wanted their vision to improve.

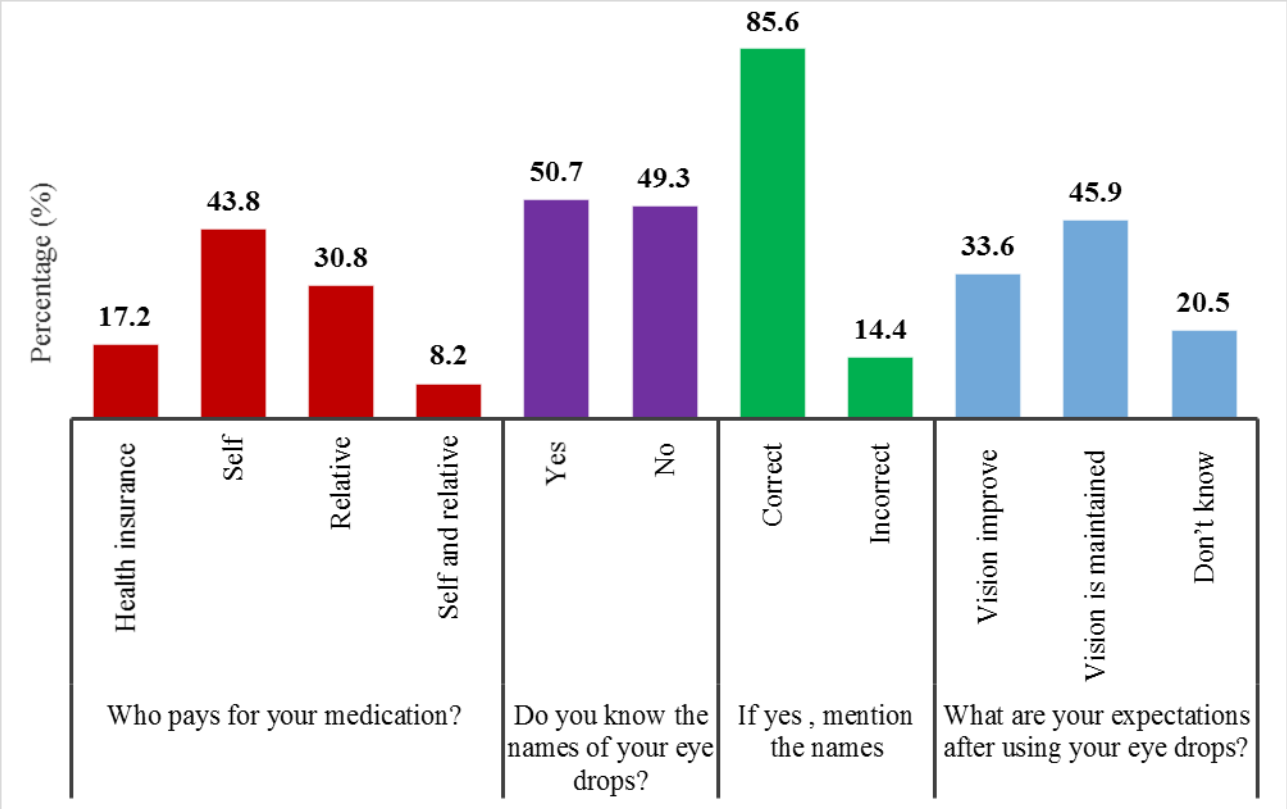

Figure 4.3B: Patients-related factors that influence non-adherence to topical anti-glaucoma medication

4.5. Provider-Related Factors that influence Non-Adherence to topical Anti-glaucoma medication

Figure 4.4 presents assessment on the provider-related factors that influence non-adherence to topical-anti-glaucoma medication. Overall, almost all, 95.2% of the respondents stated they were not given instructions on how to use the eye drops. Additionally, most 92.5%did not understand instructions when given. Further, more than half, 66.4% stated they were not provided any source for further clarification if needed while, 85.6% did not feel relaxed to ask questions about their eye drops during the care process.

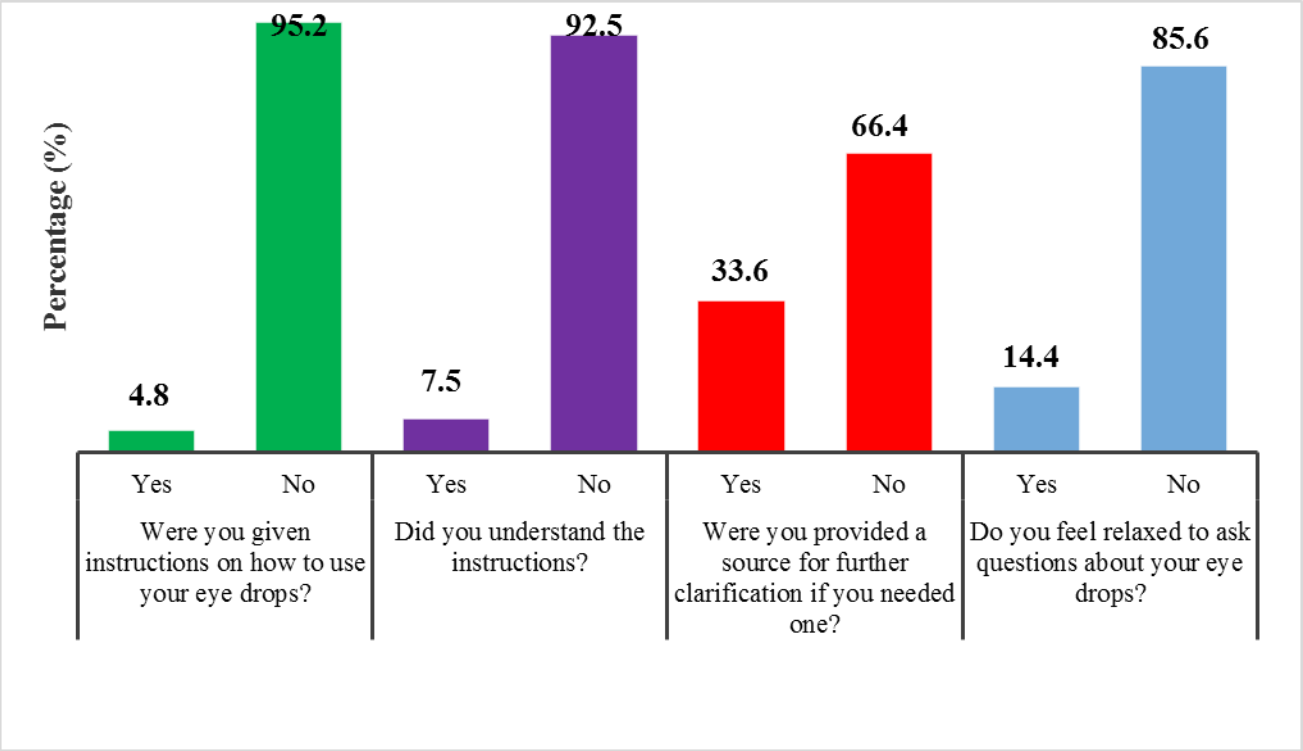

Figure 4.4: Provider-Related Factors that influence Non-Adherence to topical Anti-glaucoma medication

4.6 Medication-Related Factors that influence Non-Adherence to topical Anti-glaucoma medication

Figure 4.5 shows the medication-related factors that influence non-adherence to topical anti-glaucoma medication. Majority 82.2% of the respondents use two or more eye drops. More than half, 55.5% stated they instill their drops two times in a day. All (100%) of the respondents drop more than one medication at a time. However, more than half, 66.4% stated they instill them at an interval of 10 minutes in between each medication. More than two-thirds, 72.6% of the respondents stated they did experience side effects of the eye drop. Majority, 74% of the respondents did not store their medications in a fridge.

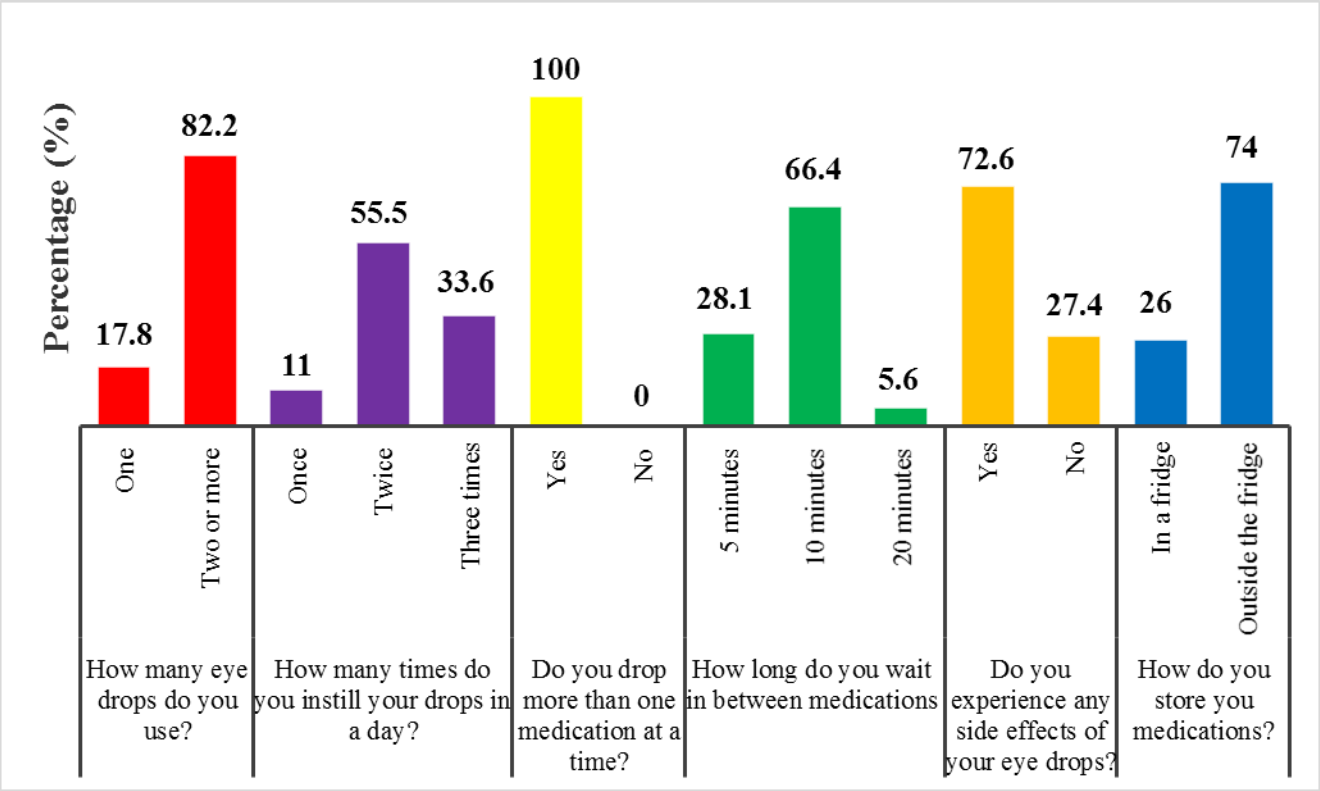

Figure 4.5: Medication-Related Factors that influence Non-Adherence to topical Anti-glaucoma medication

4.7. Relationship between demographic characteristics and prevalence of non-adherence to topical anti-glaucoma medication

Table 4.2 presents the relationship between the demographic characteristics of the respondents and the prevalence of non-adherence to topical anti-glaucoma medication. No significant relationship was observed between the demographic characteristics and the prevalence of non-adherence to topical anti-glaucoma medication ($p > 0.05$).

Table 4.2: Association between demographic characteristics and medication adherence using Chi square

Variable	Adherence level			χ^2	*p*-value
	Low N (%)	Moderate N (%)	High N (%)		
Gender				1.793	0.408
Male	46(50.0)	29(56.9)	1(25.0)		
Female	46(50.0)	22(43.1)	3(75.0)		
Age (years)				6.294	0.178
18-40	7(7.6)	2(3.9)	0(0.0)		
41-60	21(22.8)	15(29.4)	3(75.0)		
Above 60	64(69.6)	34(66.7)	1(25.0)		
Educational level					
No education	10(10.9)	6(11.8)	1(25.0)	7.075	0.529
Primary	5(5.4)	3(5.9)	0(0.00)		
Middle school /JHS	14(15.2)	14(27.5)	1(25.0)		
Technical/Voc /SHS	20(21.7)	13(25.5)	0(0.0)		
Tertiary	43(46.7)	15(29.4)	2(50.0)		
Marital status				3.123	0.793
Single	4(4.4)	1(2.0)	0(0.0)		
Married	52(56.5)	31(60.8)	2(50.0)		
Divorced	11(12.0)	3(5.9)	1(25.0)		
Widowed	25(27.2)	16(31.4)	1(25.0)		

4.8 Relationship between patient-related factors and prevalence of non-adherence to topical anti-glaucoma medication using Chi square

The relationship between the patient-related factors and the prevalence of non-adherence to topical anti-glaucoma medication is presented in Table 4.3. There was a significant relationship between the number of times the respondent misses eye drops in a week (χ^2 =20.10, $p < 0.05$) and the overall non-adherence to the medication. Additionally, a significant relationship (χ^2 =9.14, $p < 0.05$) was observed between the expectations of the respondents and the prevalence of non-adherence. Among those who expected their vision to improve, 29 (31.9%) had low adherence to anti-glaucoma medication compared to those who wanted their vision to be maintained, 49 (53.9%). There were no significant ($p > 0.05$) relationships between the other variables such as reasons for missing eye drops, financier of medication, help with instillation of eye drops etc. and the prevalence of non-adherence to topical anti-glaucoma medication.

Table 4.3: Association between patient-related factors and the prevalence of non-adherence to topical anti-glaucoma medication using Chi square

Variable	Adherence level			χ^2	*p*-value
	Low N (%)	Moderate N (%)	High N (%)		
Number of times missing eye drops in a week				20.101	0.003*
Once	41(45.1)	12(23.5)	0(0.0)		
Twice	13(14.3)	5(9.8)	0(0.0)		
Three times and more	6(6.6)	0(0.0)	0(0.0)		
Never	31(34.1)	34(66.7)	4(100.0)		
Reason for missing eye drops				4.259	0.833
Forgetfulness	69(75.8)	39(76.5)	4(100.0)		
Away from drops	6(6.6)	1(2.0)	0(0.0)		
Tired of using drops	4(4.4)	1(2.0)	0(0.0)		
When caregiver is unavailable	3(3.3)	2(3.9)	0(0.0)		
When eye drops finishes	9(9.9)	8(15.7)	0(0.0)		
Run out of medications				4.212	0.122
Yes	43(47.3)	27(52.9)	0(0.0)		
No	48(52.8)	24(47.1)	4(100.0)		
Help with instillation of eye drops				1.428	0.49
Yes	59(64.8)	37(72.6)	2(50.0)		
No	32(35.2)	14(27.5)	2(50.0)		
Frequency of help					
Always	51(56.0)	35(68.6)	3(75.0)	2.764	0.598
Sometimes	40(44.0)	16(31.4)	1(25.0)		
Financier of medication				1.455	0.962
Health insurance	16(17.6)	8(15.7)	1(25.0)		
Self	39(42.9)	23(45.1)	2(50.0)		
Relative	27(29.7)	17(33.3)	1(25.0)		
Self and relative	9(9.9)	3(5.9)	0(0.0)		
Expectations after eye drop usage				9.136	0.058*
Vision improve	29(31.9)	19(37.3)	1(25.0)		
Vision is maintained	49(53.9)	17(33.3)	1(25.0)		
Don't know	13(14.3)	15(29.4)	2(50.0)		

*Statistically significant difference between patient-related factors and the prevalence of non-adherence to topical anti-glaucoma medication ($p < 0.05$).

4.9 Relationship between provider-related factors and prevalence of non-adherence to topical anti-glaucoma medication using Chi square

Table 4.4 presents the relationship between provider-related factors and prevalence of non-adherence to topical anti-glaucoma medication using Chi square. There was no significant relationships observed between provider-related factors and the prevalence of non-adherence to topical anti-glaucoma medication (p> 0.05).

Table 4.4: Association between provider-related factors and prevalence of non-adherence to topical anti-glaucoma medication using Chi square

Variable	Adherence level			χ^2	*p*-value
	Low N (%)	Moderate N (%)	High N (%)		
Instructions provided on use your eye drops?				1.744	0.418
Yes	6(6.6)	1(2.0)	0(0.0)		
No	85(93.4)	50(98.0)	4(100.0)		
Understanding of instructions				0.336	0.845
Yes	7(7.7)	4(7.8)	0(0.0)		
No	84(92.3)	47(92.2)	4(100.0)		
Provision of source for further clarification if needed				0.823	0.663
Yes	33(36.3)	15(29.4)	1(25.0)		
No	58(63.7)	36(70.6)	3(75.0)		
Relaxed atmosphere to ask questions about your eye drops				1.561	0.458
Yes	15(16.5)	5(9.8)	1(25.0)		
No	76(83.5)	46(90.2)	3(75.0)		

4.10 Relationship between medication-related factors and prevalence of non-adherence to topical anti-glaucoma medication using Chi square

The relationship between the medication-related factors and the prevalence of non-adherence to topical anti-glaucoma medication is presented in Table 4.5. There was a significant relationship (χ^2 =6.52, p < 0.05) between where the medications were stored and the prevalence of non-adherence to medications. Among those who stored their drugs outside fridge, 84.3% and 100% had moderate and high adherence to medication respectively compared to 15.7% (moderate adherence) and 0.0% (high adherence) of those who stored their medications in a fridge. There was no significant relationships observed between the other stated factors like number of eye drop usage, frequency of instillation, side effects and the prevalence of non-adherence to topical anti-glaucoma medication (p> 0.05).

Table 4.5: Association between medication-related factors and prevalence of non-adherence to topical anti-glaucoma medication using Chi square

Variable	Adherence level			χ^2	*p*-value
	Low N (%)	Moderate N (%)	High N (%)		
Number of eye drops usage				0.964	0.618
Yes	18(19.8)	7(13.7)	1(25.0)		
No	73(80.2)	44(86.3)	3(75.0)		
Frequency of instillation in a day					
Once	10(11)	5(9.8)	1(25.0)	3.101	0.541
Twice	54(59.3)	26(51.0)	1(25.0)		
Three times	27(29.7)	20(39.2)	2(50.0)		
Experience of side effects of your eye drops				2.323	0.677
Yes	64(70.3)	38(74.5)	4(100.0)		
No	26(28.6)	13(25.5)	0(0.0)		
Storage of medications?				6.516	0.038*
In a fridge	30(33.0)	8(15.7)	0(0.0)		
Outside the fridge	61(67.0)	43(84.3)	4(100.0)		

*Statistically significant difference between medication-related factors and the prevalence of non-adherence to topical anti-glaucoma medication ($p < 0.05$).

4.11 Multiple logistic regression to establish overall relationship between the demographic characteristics, patient-, provider- and medication- related factors and non-adherence to topical anti-glaucoma medication.

Table 4.6 presents the multiple logistic regression of the relationships between the demographic characteristics, patient-, provider- and medication-related factors that influence non-adherence to topical anti-glaucoma medication. After adjusting for the confounding effects of the variables of the above factors, there was a strong evidence that the number of times the respondent misses eye drops in a week ($P < 0.05$), whether the respondent knows the correct name of the drop or not (adjusted OR = 0.87; 95 % CI = [0.05, 1.69]; $P < 0.05$) and how the medications are stored (adjusted OR = 0.99; 95 % CI = [0.03, 1.96]; $P < 0.05$) had significant influence on the prevalence of the overall non-adherence to anti-glaucoma medication.

Table 4.6: Multiple logistic regression to establish overall relationship between the demographic characteristics, patient-, provider- and medication- related factors and non-adherence to topical anti-glaucoma medication

Exposure Variable	AOR	(95% CI)	*p*-value
Age (years)			
18-40	Ref		0.262
41-60	0.56	(-1.36, 2.48)	
Above 60	-0.17	(-2.05, 1.72)	
Educational level			
No education	Ref		0.344
Primary	-0.23	(-3.10, 0.64)	
Middle school /JHS	-0.21	(-1.59, 1.18)	
Technical/Voc/SHS	-0.8	(-2.18, 0.58)	
Tertiary	-1.05	(-2.34, 0.24)	
Frequency of missing eye drops in a week			
Once	Ref		0.002*
Twice	0.34	(-0.96, 1.64)	
Three times and more	-15.33	(-0.23, 0.23)	
Never	1.64	(0.75, 2.53)	
Help in instillation of eye drops			
Yes	Ref		
No	-0.12	(-0.96, 1.64)	0.775
Names of eye drops.			
Correct	Ref		
Incorrect	0.87	(0.05, 1.69)	0.037*
Instructions on usage your eye drops			
Yes	Ref		
No	0.43	(-1.96, 2.84)	0.719
Storage of medications			
In a fridge	Ref		
Outside the fridge	0.99	(0.03, 1.96)	0.044*

AOR: adjusted odds ratio. CI: confidence interval. *: p-value<0.05

CHAPTER FIVE

5.0 DISCUSSION

5.1. Introduction

The findings identified in the study in relation to reviewed literature on the research topic is discussed in this chapter. The findings are discussed in accordance with the stated objectives and research questions. The study sought to determine the factors that influence the prevalence of non-adherence to anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta.

5.2. Prevalence of non-adherence to topical anti-glaucoma medication

Results showed that 62% of the respondents had low adherence to topical anti-glaucoma medication. The prevalence observed in this study is lower compared to 69% recorded among patients accessing care at the Eye Clinic of the Komfo Anokye Teaching Hospital, Ghana (Obuam-Sekyi, 2017). Similarly, Gupta et al., (2012) at Dr. Shroff Hospital in North India and Tamrat, Gessesse & Gelaw (2015) at Jimme University Special hospital in Ethiopia recorded higher non-adherence of 50%% and 67.5% respectively.

Similar study carried out in Nigeria recorded higher level of adherence (56%) compared to our findings (McVeigh and Vakros, 2015). Similarly, a cross sectional study that was carried out in Addis Ababa, Ethiopia to assess level of adherence to IOP reducing agents and to identify factors that influence adherence among glaucoma patients at a tertiary public eye clinic, found a higher adherence, 42.6% (Mehari, Giorgis & Shibeshi, 2016) compared to 3% observed in this current study.

The differences in prevalence with regards to the other studies may be as a result of many factors including differences in the socio-demographic characteristics such as ages, educational level and marital status, which have been reported in several studies to have influenced non-adherence to topical anti-glaucoma medication (Olthof et al., 2008; Dreer, Girkin & Mansberger, 2012; Tamrat et al., 2015). Other factors may include patient-related factors, medication related factors. For instance proper scheduling practices by health facilities have been identified to positively influence adherence since it helps patients in remembering when to take their medications (McVeigh & Vakros, 2015).

The results further showed that 54.4% of the respondents agreed that they sometimes forget to instill their eye drops. This is lower compared to an earlier study where 87.7% of the respondents reported that they sometimes do not remember to take their medication (Blondeau, Esper & Mazerolle, 2012). This difference may also be a contributing factor to the lower non-adherence recorded in this current study compared to others.

5.3. Relationship between demographic characteristics and prevalence of non-adherence to topical anti-glaucoma medication

The study did not prove any significant relation that existed between any of the demographic characteristics and the prevalence of non-adherence to topical anti-glaucoma medication. This agrees with an earlier study carried out in a Jamaican Hospital Eye Clinic (Mowatt, Nelson-Imoru, & Gordon-Strachan, 2011). A similar finding was obtained by Djafari et al., (2009). However this current finding is contrary to earlier studies where educational level of glaucoma patients was significantly associated with adherence (Hussein et al., 2015; Meguid et al., 2014; Olthof et al., 2008). The fair distribution of the participants across the educational level in this current study may be a contributing factor

to the no significant association observed in this study compared to previous studies. Moreover, patients in this current study may probably be well informed irrespective of the educational level compared to the previous studies.

However the current finding agrees with earlier findings where gender was found to have no significant influence on non-adherence to topical anti-glaucoma medication by patients (Olthoff, Hoevenaars, van den Borne, Webers, & Schouten, 2009; Tadesse, F & Mulugeta, 2015; Tamrat et al., 2015). For example, Tamrat et al (2015) found no association when the prevalence of non-adherence to topical anti-glaucoma medication was determined among Ethiopian patients.

Additionally, our results confirm those of previous studies where non-adherence to topical anti-glaucoma medication had no association with the marital status of the individuals (Omoti & Waziri-Erameh, 2003; Omoti & Ukponwan, 2005). Related outcomes were obtained by Mowatt et al (2011) in Jamaica. Additionally, a study done among Ethiopian patients found no significant association between non-adherence to anti-glaucoma medication and the marital status of the individual (Tamrat et al., 2015). However other studies recorded contrary findings. For instance Djafari (2008) and Sleath et al (2011) found that being a widow is significantly associated with lower level of adherence. This may be because of lack of family support which most widows normally face as argued in another study (Stryker et al., 2010).

Other studies found association between age of glaucoma patients and adherence to topical anti-glaucoma medication (Olthoff et al., 2008; Dreer, Girkin, & Mansberger, 2012; Tamrat et al., 2015). Younger age of patients (<55 years of age) has been found to be non-

adherent (Olthof et al., 2008). This may be as a result of the working circumstances of this younger age group, which makes it difficult to regularly use eye drops, or the inconvenient effects of using the medication such as unclear vision that may affect ability to work.

5.4 Relationship between patient-related factors and prevalence of non-adherence to topical anti-glaucoma medication

There was a significant relationship between the number of times respondents missed eye drop in a week and the overall non-adherence to medication. This agrees with an earlier study (Krousel-Wood, Thomas & Muntner, 2012). Additionally, a significant relationship was noticed between the expectations of respondents and the prevalence of non-adherence. However, there were no significant relationship between why the patient missed the drops such as forgetfulness, whether the patient runs out of medication, whether the patient has someone to help or not as well as whether the patient pays for the medication or not. However forgetfulness has been mentioned in several studies by patients as a major factor for non-adherence (Mowatt et al., 2011; Tadesse & Mulugeta, 2015). For instance a study to determine the prevalence and determinants of non-adherence to topical hypotensive treatment in Dutch glaucoma patients, forgetfulness was observed to be the most stated reason for non-adherence (Olthoff et al., 2008). Additionally, a study conducted among Ethiopian patients recorded similar findings (Tadesse & Mulugeta, 2015).

Financial coverage of cost of therapy has been recorded as one of the major factors that affect anti-glaucoma medication adherence (Hussein 2015) but no association was observed in this study. Additionally, Hussein (2015) noted that patients whose costs were covered by insurance had higher level of adherence. A similar finding was reported from Egypt, which showed that lack of IOP control is mostly related to the high cost of

treatment for glaucoma management (Eldaly, Hunter & Khafagy, 2007). Tamrat et al., (2015) found that 74.4% of patients who mentioned financial hardship in obtaining medications were non-adherent compared to 36.1% who cited no financial problem in their study. Similar findings have been reported in the literature (Silva, 2010; Martin, 2009).

5.5 Relationship between provider-related factors and prevalence of non-adherence to topical anti-glaucoma medication

No significant relationship was observed between provider-related factors and the prevalence of non-adherence to topical anti-glaucoma medication. This agrees with an earlier reports where no association was observed between instructions provided, understanding of instructions, sources for further clarification and whether the patient feel relaxed to ask questions about the eye drops and prevalence of non-adherence to topical anti glaucoma medication (Obuam-Sekyi, 2017). However Kyari, Bastawrous, Gilbert, Faal, & Abdull (2013), reported contrary findings. The lack of association observed in this study could be as a result of patients not understanding the instructions provided because the information material are usually written in technical languages (Weinreb et al., 2014).

5.6 Relationship between medication-related factors and non-adherence to topical anti-glaucoma medication

The study showed a significant relationship between where the medications were stored and non-adherence to medications. However, there was no significant relationship observed between number of times the patient instills the drops, the number of drops the patient has and whether the patient experiences any side effects or not and non-adherence to topical anti-glaucoma medication. However earlier studies showed that patients who

instill more than two medicines in a day are more likely not to comply with drug schedule (Sleath et al., 2011; Leske et al., 2007). Moreover, the effects of the number of medications as well as the complexity of regimen have been shown to affect compliance rate among glaucoma patients (Tadesse, 2015). Similar findings have been obtained in other studies (Robin, 2007; Robin 2005). Several studies have shown that adverse effects of anti-glaucoma medications experienced by patients contribute to their inability to comply with treatment regimen (Castro & Mesquita, 2009; Olthoff et al., 2008; GHS, 2014). For instance undesirable effects of topical hypotensive therapy for glaucoma, like conjunctival redness, discomfort and rubbing of eyes have been identified as the principal cause of non-adherence (Adisa, Alutundu, & Fakeye, 2009; Alm, Grunden & Kwok, 2011). Moreover, severe side effects such as reddening of the eyes and itching experienced from the use of glaucoma medication by patients have been identified as usually associated with break in medication regimen (GHS, 2014). However, severity of side effects of medication was not assessed in this study.

CHAPTER SIX

6.0 CONCLUSION AND RECOMENDATIONS

6.1. Overview

This chapter is in four sub headings. The first section summarizes the study. The second, shows the conclusion. The third identifies the limitations and the fourth looks at the recommendations of the study and future research.

6.2. Summary of the study

The study set out to determine the factors that influence non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adentan and to consequently establish the relationship between prevalence of non-adherence and demographic characteristics, patient related factors, provider-related factors and medication-related factors. To achieve this, a quantitative research procedure was employed to collect data. The data was analyzed with Stata V15. The key conclusions are presented in line with the main objectives of the study in mind.

6.3. Conclusions

There was a high level of non-adherence among patients accessing glaucoma care at the Crystal Eye Clinic. However no association was observed between the demographic characteristics and medication non-adherence. The number of times the patient misses the eye drops and the expectations after using the eye drops were significantly related to non-adherence. In relation to provider related factors that influence medication non-adherence, no significant relationship was recorded. However, how the medication was stored was significantly related with non-adherence to topical anti-glaucoma medication. Thus whether the medication is stored inside a fridge or outside it had significantly influenced

adherence. Moreover, correct naming of medication by patients is significantly related to their adherence to the topical anti-glaucoma medication.

6.4 Limitations to the study

The first limitation is recall bias. There could be recall bias on the part of respondents, since they were required to give information on factors that could influence their adherence based on their past experiences. Secondly, the focus of this study was on factors influencing non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic, the conclusions drawn from this study cannot be generalized. However, the conclusions can be extended to patients or health facilities that share similar characteristics. Finally, bias may arise from how the questionnaire was structured and the truth in the respondents' answers. In the midst of all these limitations, the internal and external validity of the study was not negatively affected as the tool has been validated through pre-testing before the actual data collection.

6.5 Recommendations and future research

Considering the findings of this research, the under listed recommendations are suggested:

1. The high prevalence of non-adherence to topical anti-glaucoma medication calls for innovative strategies and guidelines or policies by health care providers such as the use of scheduling charts and applications that can prompt patients to take their medication.
2. Health care providers need to educate glaucoma patients and relatives on the names of their medications so they can buy them when they forget to carry their medication along on trips. This will help in medication adherence.

3. Health facilities should have special clinics for glaucoma patient and caregivers to educate them on the disease condition so they can make informed decisions concerning their treatment.
4. Drug manufacturers should modify all the medication such that they can be stored at room temperature making it easier to carry along
5. This current study was a cross-sectional study that cannot provide evidence on temporal relationship or establish causal effects. Future study with an alternative design such as longitudinal study is recommended

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APPENDICES

Appendix A: Questionnaire

Factors influencing Non Adherence to topical Anti-glaucoma medication

Declaration by participant

By signing below, I agree to take part in a research study entitled **"Factors influencing non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta".**

I declare that I understand all that has been explained to me about the study- objectives and procedures and I voluntarily agree to participate in this study.

……. …….

Signature/Thumb print of participants Date

…… ……

Signature of Researcher Date

PART A: Socio-demographic Characteristics

1. Age…….
2. Sex: Male( ) Female ( )
3. Educational Level
   a. No formal Education( )
   b. Primary( )
   c. Middle Sch/JHS( )
   d. Technical/Vocational/SHS( )
   e. Tertiary( )
4. Marital Status
   a. Single ( )
   b. Married( )
   c. Divorced( )
   d. Widow/Widower( )

PART B: Prevalence of Non Adherence to topical Anti-glaucoma medication

5. Do you sometimes forget to instill your eye drops? ( ) Yes ( ) No
6. Thinking over the past two weeks, were there any days when you did not instill your medications. ( ) Yes ( )No
7. Have you ever cut or stopped instilling your eye drops without telling your doctor because you felt worse when you instill it.( ) Yes ( ) No.
8. When you travel or leave home do you sometimes forget to carry you medications along. ( ) Yes No( )
9. Did you instill all your medicine yesterday? Yes( ) No( )

10. When you feel your symptoms are under control do you sometimes stop instilling your medications? ( )Yes ( ) No
11. Is it an inconvenience having to stick to your medication plan? ( )Yes ( )No.
12. How often do you have difficulty remembering to instill your medications?
    a. Never Rarely ( )
    b. Sometimes ( )
    c. Usually ( )
    d. At all times ( )

PART C: Patients Related Factors to Non Adherence to topical Anti-glaucoma medication

13. How many times do you miss your eye drops in a week
    a. Once( )
    b. Twice( )
    c. Thrice and more( )
    d. Never( )
14. Why do you miss your drops?
    a. Forgetfulness( )
    b. Away from drops eg. Travelled( )
    c. Tired of using drops( )
    d. When caregiver is unavailable( )
    e. When eye drops finishes( )
15. Do you sometimes run of medications
    a. Yes( ) No( )
16. Do you have someone who either helps to instill your medication or remind you to instill.
    a. Yes( ) No( )
17. How often is the help you get?
    a. Always( )
    b. Sometimes( )
18. Who pays for your medication?
    a. Health Insurance( ), Private( ) NHIS( )
    b. Self Alone ( )
    c. Relatives Alone( )
    d. Self and relative ( )
19. Do you know the names of your eye drops?
    Yes ( ) No( )

20. If yes, mention the names……
    a. Correct ( ) b. Incorrect( )
21. What are your expectations after using your eye drops?
    a. Vision improves ( )
    b. Vision is maintained ( )
    c. Don't know ( )

PART D: Provider Related Factors to Non Adherence to topical Anti-glaucoma medication

22. Were you given instructions on how to use your eye drops?
    Yes ( ) No ( )
23. Did you understand the instructions?
    Yes ( ) No ( )
24. Were you provided a source for further clarification if you needed one?
    Yes ( ) No ( )
25. Do you feel relaxed to ask questions about your eye drops?
    a. Yes( ) No( )
    b. If no, why?

PART E: Medications related Factors to Non Adherence to topical Anti-glaucoma medication

26. How many eye drops do you use?
    a. One( )
    b. Two or more( )
27. How many times do you instill your drops in a day?
    a. Once ( )
    b. Twice( )
    c. Thrice( )
    d. Can't describe regimen properly( )
28. Do you drop more than one medication at a time?
    Yes ( ) No ( )
    If yes, how long do you wait between medications?
    a. 5mins( )
    b. 10mins( )
    c. 20mins( )
29. Do you experience any side effects of your eye drops?
    Yes ( ) No ( )
30. How do you store you medications?
    a. In a fridge
    b. Outside the fridge

Appendix B: Inform Consent

Information Sheet

Title: Factors influencing Non- Adherence to topical Anti Glaucoma Medication

Principal Investigator: Doreen Kontoh

Social and Behavioral science Department

School of Public health, University of Ghana, Legon

Tel: 0208635105; Email: efuadarkoa22@gmail.com

General Information about Research

The main aim was to determine the factors influencing non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic at Adenta. Specifically, it involves using questionnaire to elicit response on, factors that influences Non adherence to Topical Anti Glaucoma medications that may arise from patients, medications and service providers,

Potential Risks/ Benefits

This work is purposely academic and that no harm is intended. The study will not incur any major cost for participants except the participants' time that will be spent in answering the questionnaire and interviews. Some may also feel uncomfortable sharing some personal or confidential information with the researcher. We do not wish this to happen, but if it does, the respondent may be excused from answering any such questions. There will be no direct monetary benefit in this study. However their support will help add on to knowledge in the area of glaucoma and design strategies to improve adherence to medications.

Voluntary Involvement and Right to Leave the Research

Your decision to participate in the study is purely voluntary. That is you have the right not to take part in the study if you do not want to, and this will not affect you in anyway. Also, after accepting to participate, you are free to change your mind at any time in the course of the study.

Privacy/Confidentiality*:*

The responses and information provided during interview is strictly confidential and their names will not be linked to any responses. They will be identified only by a study number or code.

Data storage and Security:

All recorded questionnaires will be stored in a cabinet under lock and key, and destroyed after five years. Softcopy will be locked with a password accessible by only the principal investigator

Consenting Process

An information sheet containing all information the participant need to know about the study will be provided. The participant will be given enough time to read and understand. When participant is satisfied fully with the information, and want to participate, an interview with a structured questionnaire conducted. The interview will last about 10-15mins minutes.

Compensation

The study will also not provide compensation of any form to the participants

Declaration of Conflict of interest, Protocol and funding information:

The study has no conflict of interest and has no source of funding

Your rights as a Participant

This study has been reviewed and approved by the Ghana Health Service Ethics Review Committee. Please should you have any question, you may contact: Doreen Kontoh (principal investigator) on +233208635105 or via email: efuadarkoa22@gmail.com or Ms. Hannah Frimpong (Ghana Health Service Ethical Review Committee Administrator) on +233507041223.

Consent Form

The above document describing the benefits, risks and procedures for the research titled**, Factors influencing non-adherence to topical anti-glaucoma medication among patients attending the Crystal Eye Clinic** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Signature

If volunteer cannot read the form themselves, a witness must sign here: I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Signature of Researcher