SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCE

UNIVERSITY OF GHANA, LEGON

MEDICATION ADHERENCE AMONG GLAUCOMA PATIENTS ATTENDING KOMFO ANOKYE TEACHING HOSPITAL IN THE ASANTE REGION

BY

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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENTOF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

JULY, 2017

DECLARATION

I, Comfort Obuam – Sekyi the author of this dissertation, do hereby declare that with the exception of references to the literature and work of other researchers which have been duly cited and referenced, this dissertation is the result of my original work.

I hereby declare that this work in its fullness or part has not been submitted for any degree presently or being submitted in candidature for another degree.

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(SUPERVISOR)

DEDICATION

I devote the bit of work to the Almighty God (Jehovah) for the fortification, strength and knowledge given to me to write up this piece of work.

ACKNOWLEDGEMENT

This work would not have been completed without the help and support of some individuals and institutions.

My appreciation goes to my academic supervisor Dr. Justice Nonvignon for his corrections and guidance.

My heartfelt gratitude goes to Professor. Sekyi- Aikins for his selfless contribution to my work especially in the corrections and to Dr. Genevieve Aryeetey I say thank you for your motherly advices.

My profound gratitude goes to the Head of Department of the Eye Cinic of the Komfo Anokye Teaching Hospital, Dr. Seth Lartey and the Biostatistician of the clinic, Mr. Edgard Afour for their guidance and support in the collection of my data and all the staff at the clinic for their moral support.

I am also grateful to Dr. Judith Stephens, Dr. David Nana Adjei and Professor Bamela Goka for reading through my work and giving me guidelines in writing of this dissertation

Finally to the Principal and staff of the Ophthalmic Nursing School, I say thank you and God bless you.

ABSTRACT

Introduction

Glaucoma affects more than three million people in Africa. Glaucoma is a chronic disease with no symptoms initially. This study sought to assess adherence to medication among glaucoma patients.

Methods: A cross sectional study design was used to systematically interview one-hundred and thirty respondents from the Eye Clinic of Komfo Anokye Teaching Hospital. The Morisky 8 questionnaire was used as the data collection tool. Data was analyzed using STATA version 14.0. Summary statistics such as frequencies, percentages, means and standard deviations were computed. Pearson's chi-square test and ordinal logistic regression were used to determine associations and effect of factors on medication adherence respectively.

Results

This study showed an overall level of adherence of 31% among respondents of the study. Glaucoma medication adherence was significantly influenced by presence of primary care giver (p=0.041); no instructions on how to instill medication (p=0.001); not understanding instructions for instilling medication (p=0.001); not providing alternative source of clarification on instructions (p=0.001). Also, having access to monthly salary of respondents (p=0.001) and salary (p=0.001) were significant.

Conclusion

Level of adherence of glaucoma medication among respondents was low in this study. Factors such as lack of clear and detailed instructions on instilling glaucoma medication influenced level of medication adherence. More eye health care practitioners must be trained by the government as a policy especially ophthalmic nurse to educate the general population on the importance of medication adherence in glaucoma.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVATIONS

ABREVIATIONS	MEANING
E U	European Union
GHS	Ghana health service
I O P	Intra ocular Pressure
KATH	Komfo Anokye Teaching Hospital
OHTS	Ocular Hypertension Treatment Centre
OR	Odds Radio
POAG	Primary Open Angle Glaucoma
WHO	World Health Organization

DEFINITION OF TERMS

TERMS	DEFINITION
ADHERENCE	Is the way a patient behave towards the taking of his drug according to recommended guidelines
CATARACT	Opacification of the human lens in the eye
INTRA OCULAR PRESSURE	It is the pressure of the fluid inside the eyeball and it is use to evaluate patients at risk from glaucoma
INSTILLATION OF EYE MEDICATION	Is the dispensation of a sterile ophthalmic or eye drop into a patient's eye.
MYOPIA	It is also called near sightedness or short sightedness. It is an eye condition where close objects appear clearer and distant objects appear blurry.
PRIMARY OPEN ANGLE GLAUCOMA	It is a progressive eye condition caused by rise in Intra Ocular Pressure leading to irreversible blindness if not treated.

CHAPTER ONE

INTRODUCTION

1.1 Background

Glaucoma is a chronic optic nerve diseases, often asymptomatic, associated with distraction of the retinal nerve fibres which presently is the main determining factor for permanent blindness globally (Katherine and Georgios, 2015). It is a chronic disease with no symptoms initially, and is therefore susceptible to patient's non-adherence to prescribed therapy (Quigley, 2010). Glaucoma affects more than three million people in Africa (Tham et al., 2014). Affected Africans usually do not present to the hospital early and about half of the patient report with permanent visual loss. (Cook, 2009). Glaucoma now accounts for about 12.3% of global blindness, (Weinreb et al., 2014) and it is projected that about 80 million individuals will have permanent visual loss by the year 2020 in the world, with 11.2 million of the cases from Primary Open Angle Glaucoma and Closed Angle Glaucoma variants alone (Katherine and Georgios, 2015).

Early treatment may prevent further vision loss and preserve patient's quality of life (Gasch, Wang & Pasquale 2000). Cook (2009); Grant and Burke (1982) revealed that many glaucoma clients report to the hospital with some partial blindness.

Grant and Burke (1982), again identified about 33.3% of clients lost their vision out of glaucoma before they go to the hospital for treatment. The problem is more pronounced in people of African descent. According to Fraser, Bunce & Wormald (1999), an African-American client is 4 ½ times expected to report with total blindness than a client of white origin of similar age, gender, and pressure in the eye.

Studies have shown that glaucoma is an important cause of blindness in Ghana and it is

estimated that Primary Open Angle Glaucoma mostly affects people 40 years or more. Surgery is considered as the most effective method of management, however the patronage among Ghanaians is low because it is expensive and patients have negative beliefs among them (GHS, 2012). Data available at the Komfo Anokye teaching hospital shows that the prevalence of glaucoma cases is approximately 8.5% of the entire population of clients that attend the outpatient department of the Eye Center or facility (KATH, 2015).

The prevalence of the disease and its capacity to cause blindness usually have been attributed to non- compliance of medication by patients (Salomao, 2000). Glaucoma management therefore requires good adherence and appropriate administration technique of the drugs in addition to hospital reviews to prevent complications associated with the disease (Katherine & Georgios, 2015). To safeguard the health of the individuals with glaucoma and to reduce blindness medication adherence of people with the condition needs to be investigated.

1.2 Problem statement

A significant cause of achievement in drug management of glaucoma treatment is the compliance of clients to their drugs regiment. Medical therapies are used for a temporary measure prior to surgery and to maximize pressure control after surgery. Early recognition and appropriate therapy of glaucoma can significantly improve the patient's vision in the future. Medication to manage the condition is the available option adopted in Ghana; however, there are several factors that may influence patient's adherence to medication leading to worsened consequences and blindness (GHS, 2014). Medication non-adherence is a growing concern to healthcare systems, physicians and other stakeholders because of mounting evidence that it is prevalent and associated with adverse outcomes and higher

costs of eye care (Tham et al., 2014). One significant component of medical management of glaucoma is good adherence to medication. However, health workers sometimes do not give instructions on adherence and target the causes of the disease condition. They rarely ask patients about their adherence behavior and how patients actually apply their prescribed medications on their eye. These issues may lead to success or failure of medical therapy regime for glaucoma management (Tony et al., 2007). Studies showed that adherence to glaucoma medication is a significant challenge among glaucoma patients (Schwartz, 2013). This is an indication that, to achieve a favorable outcome in the management of glaucoma, clients need to comply with treatment (Weinreb et al., 2014). Studies conducted by the Ghana Health Service reported that about 45% of glaucoma patients do not adhere to their medication instructions (GHS, 2012). Literature on medication adherence among glaucoma patients is scanty and limited to specific populations. There is therefore the need to assess medication adherence among glaucoma patient and explore challenges they experience in Ghana.

1.3. Objectives of the study

1.3.1 General objective

The general objective of the study was to assess adherence to medication among glaucoma patients.

1.3.2 Specific objectives

1. To determine the proportion of medication adherence in glaucoma patients attending KATH.
2. To assess the factors influencing medication adherence in glaucoma patients attending KATH.

1.4 Research questions

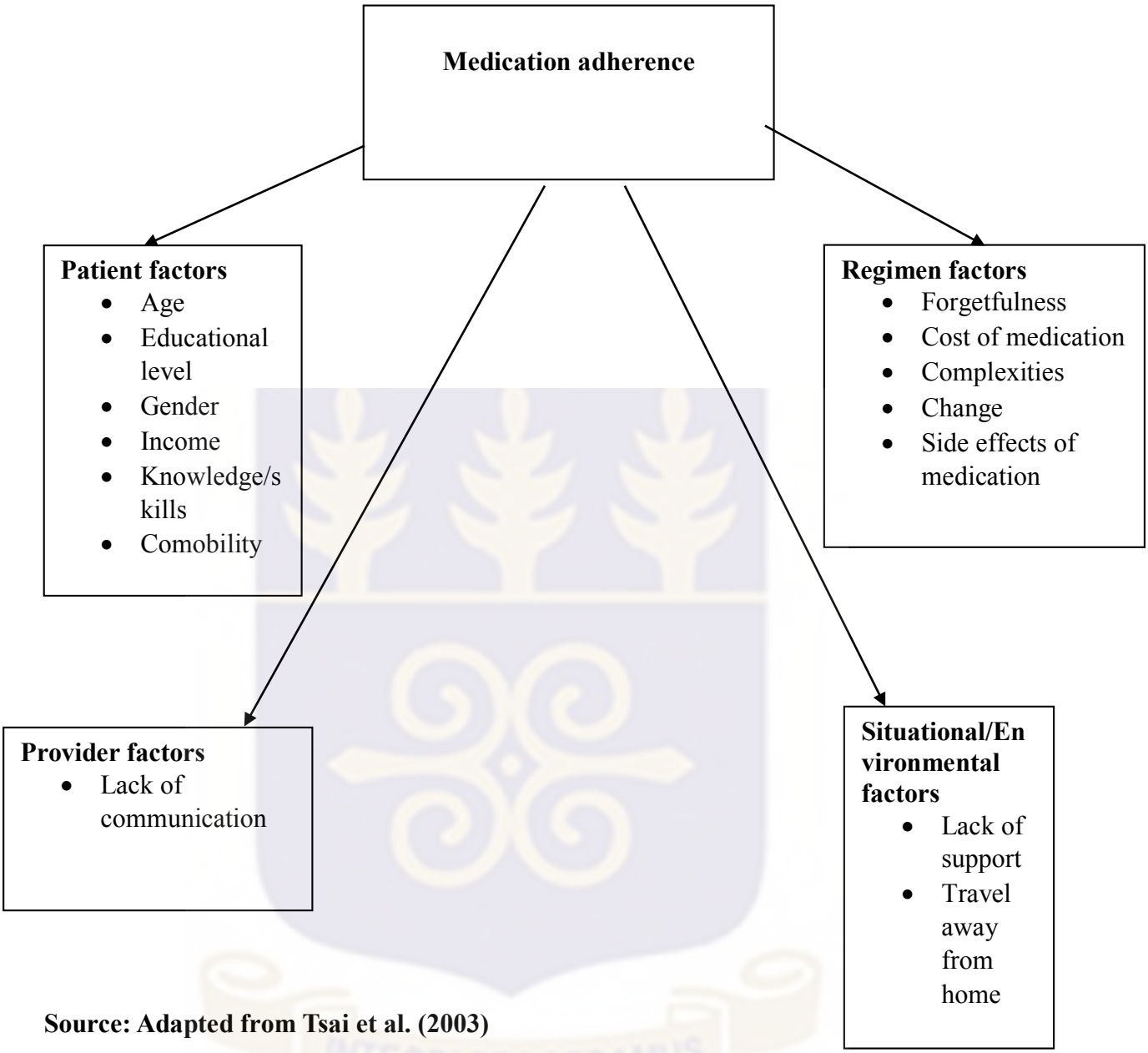
1. What proportion of glaucoma patients attending KATH adhere to glaucoma medication?

2. What are the factors influencing medication adherence in glaucoma patients attending KATH?

1.5 Justification and significance of study

There is the need to strengthen human health and reduce eye related diseases leading to blindness in Ghana. Studies on genetic, environmental and lifestyle causes of glaucoma have been conducted in Ghana. Studies on medication adherence also need to be conducted to compliment the genetic, environment and lifestyle causes for effective management of glaucoma. The research is necessary to provide adequate data and information on the factors that influence the decision of medication adherence. These will provide additional guidelines regarding the need to continuously monitor glaucoma patients and create awareness and services that will significantly reduce the level of blindness caused by the condition. This could help monitor with the view to finding solutions to health problems associated with glaucoma. The need therefore to ascertain drug compliance among glaucoma clients who attend clinic at the ophthalmology department of the Komfo Anokye teaching hospital is very important to the significant numbers of individuals with the eye condition. The study will also assist in the development and implementation of appropriate guidelines by the Government of Ghana to enhance eye care services.

Figure 1: Conceptual framework



Source: Adapted from Tsai et al. (2003)

1.6 Conceptual framework

1.6.1 Patient-related Factors

These factors are related to the awareness of the patient have and education regarding their disease and medication. Patients with inadequate health literacy will have difficulty in understanding and interpreting most written health texts and instructions. Such patients are

also more likely to take medications incorrectly (Kyari et al., 2013). Research have shown that aging and ocular hypertension are a predisposing causes of getting glaucoma. (EDPRG, 2012).

1.6.2 Provider-related Factors

Adherence is better achieved where physician take proactive role in discussing with patient regarding their disease and use of medication. An open discussion regarding dosing, side effects, cost of medication, early and more frequent follow ups in the beginning usually help in developing a better understanding between patient and the physician (Edward, 2012).

1.6.3 Situations/Environmental Factors

Socio-cultural, racial and ethnic factors may influence medication adherence. Insufficient family support is a known reason for non-compliance (Quigley, 2010). Distance to source of medication and distance to health facility has also been reported to affect medication adherence (Nordstrom, 2012). Support from family especially partners influences medication adherence.

1.6.4 Regimen-related Factors

The cost of medication, complexity of taking multiple medications for multiple diseases, change in dosing schedules are all well-known reasons for non -adherence. Co-morbidities like poor vision and arthritis in glaucoma patients affect their ability to instill their eye drops. Once-a day dosing with prostaglandin and beta-blockers have a better persistency (Nordstrom, 2012).

CHAPTER TWO

LITERATURE REVIEW

This chapter deals with pertinent literature on prevalence of glaucoma and the burden of glaucoma on the global context, Africa and Ghana. The section also discusses the epidemiology or effects and causes of glaucoma, empirical studies conducted on glaucoma, factors influencing medication adherence in glaucoma patients.

2.1 Epidemiology of glaucoma

Glaucoma is a group of eye diseases characterized by progressive loss of visual field due to damage to the optic nerve fibers (Blondeau et al., 2012). Globally, it is estimated that 285 million people are visually impaired; 39 million people are blind and another 246 million have low vision (WHO, 2010). By the year 2010, visual loss associated with glaucoma is estimated to affect 8.4 million people globally and by 2020, may go beyond 11 million. Glaucoma is an important factor for blindness worldwide and majority of these people are blind due to treatable and/or preventable causes (WHO, 2010). Glaucoma is the second leading cause of blindness worldwide as reported by the World Health Organization (Bourne, 2006).

In 2002, 37 million individuals were blind worldwide, with glaucoma accounting for 12.3% of these individuals (Sleath, 2014). By the year 2020 it is estimated that there will be almost 80 million people in the world with open angle glaucoma and angle-closure glaucoma. Glaucoma had been found to contribute to blindness at a rate of 8% in Africa (Sleath, 2014). It is estimated that by the year 2020, about three million Americans will suffer from glaucoma in the United States. Blindness from glaucoma in Black- Americans is about one-third greater than white Americans. Primary Open Angle Glaucoma is the

leading cause of blindness in African Americans.

2.2 Pathophysiology of Glaucoma

Primary open-angle glaucoma results from overproduction or obstruction of the outflow of aqueous humour through the trabecular meshwork or sclemnis canal, causing increased intraocular pressure and damage to the optic nerve. Glaucoma is a chronic, slowly progressive, usually bilateral neuropathy of the optic nerve(Chin & Regine, 2008). Untreated glaucoma eventually leads to complete loss of vision. About 10% of patients with glaucoma become unilaterally or bilaterally blind. The pathophysiology of glaucoma is a progressive loss of ganglion cells resulting in visual field damages related to the intraocular pressure (Chin & Regine, 2008).

Everyone is at risk for glaucoma from babies to the aged. Older people are at a higher risk for glaucoma but babies can be born with glaucoma. Young adults can get glaucoma, too. There are several known risk factors for glaucoma; these include increasing age, family history of glaucoma, race and ethnicity, nearsightedness, high blood pressure, diabetes mellitus and elevated intraocular pressure.

2.2.1 Risk factors of Glaucoma

A connection between age and primary open-angle glaucoma (POAG) has been described in most studies. Evidence from research revealed that people between the ages of 40 and 80 years are at higher risk of developing glaucoma (De Voogd, Ikram, Wolfs, Jansonius, Hofman & De Jong, 2005; Leske, Wu, Hennis, Honkanen & Nemesure, 2008). These findings are in line with the Meiktila Eye Study (Franzco, MBBS, Franzco, Franzco, Franzco & MD, 2007).

Kawase, Tomidokoro, Araie, Lwase &Yamamoto (2008), in a Taijim study found a positive correlation between IOP and myopia. Family history is another risk factor for glaucoma. There is evidence that family history of POAG is a risk factor (Kwon, Fingert, Kuehn & Alward, 2009). Risk indicators of open-angle glaucoma correlate highly in families, and the patterns are consistent with the hypothesis of genetic determinants of these factors (Klein, Klein & Lee, 2004). A number of genes have been identified as possible factors in many cases of glaucoma. Typically, early-onset forms of glaucoma are inherited as Mendelian-dominant or Mendelian-receiver traits, including early-onset open-angle glaucoma, congenital glaucoma, and glaucoma associated with pigment dispersion syndrome (Wiggs, 2007).

The prevalence of POAG relating to race and ethnicity is worth mentioning. Rudnicka et al., (2006) found that black populations had the highest POAG prevalence in all ages, but the proportional increase in prevalence of POAG with age was highest in the white population. This is supported in the Barbados Eye Study by Leske, Wu, Hennis, Honkanen and Nemesure, (2008) undertaken among Africans. It was revealed that there was an increased number of glaucoma cases in the people of black origin. Increased intra ocular pressure, aging and a relative suffering from glaucoma was identified as a predisposing factor to the disease.

Several factor associated to blood vessels were studied with much concentration on perfusion pressure and pressure of the blood (Hulsman, Vingerling, Hofman, Witterman & de Jong, 2007; Leske et al., 2008). Predisposing factors associated with the cardiovascular system were identify as possible causes for POAG development. Similarly, an increased

blood pressure have the potential of destroying arterioles of the retina. Also there is an indication that intra ocular pressure and blood pressure values are associated.

Systemic conditions such as hypertension and diabetes mellitus have been studied as possible risk factors for POAG. Mitchell, Lee, Lochtchina and Wang (2009) reported that hypertension, particularly if poorly controlled, appears to be related to a modest, increased risk of POAG. Prevalence of POAG in patients who suffer from diabetes mellitus is slightly increased (De Voogd et al., 2006). According to Sanspree, Daum, Arthur, Schmidt and Pillion (2005) diabetes mellitus, hypertension and obesity increase the likelihood of glaucoma.

Bonovas, Peponis and Filioussi (2004) study on diabetes being a predisposing cause of POAG found a positive relationship with diabetes mellitus and POAG. The study showed a positive connection between diabetes and the possibility of getting POAG. Clinicians should beware of this possibility. Omoti, Enock, Okeigbemen, Akpe and Fuh (2009), in their studies, concluded that an increased BP and pressure of the pulse was identified in client with black origin with POAG in Africa.

In contrast, in a Rotterdam Study, no association between diabetes and POAG was detected. This is in line with the findings of Hulsman, Vingerling, Hofman, Witterman and De Jong (2007), who stated that the relationship between risk factors, such as systemic hypertension, systolic or diastolic blood pressure, or perfusion pressures and POAG, remain controversial. And in the Beijing Eye study done on Western societies by Xu, Wang and Jonas (2009) neither identified systemic blood pressure in addition to the pressure in the blood supplied to the eye as positively related to developing POAG. However, it would be more understandable if glaucomas are grouped as a high-tension and

normal-tension glaucomas. Published evidence indicates that diagnosis and presentation of glaucoma is an important factor for subsequent blindness and is associated with poor knowledge about glaucoma (Kooner, Albdoor, Chao & Adams-Huet, 2006; Sathyamangalam, 2009).

Professionals in health and social welfare are concerned that lack of knowledge of risk factors of POAG could remain a major cause of why patients present late to eye facilities (Cross, Shah, Batival & Spurgeon, 2005). Studies have shown that, only 4% of the population are likely to get glaucoma in 5 years should intra ocular pressure be reduce to one-fifth. However, if the intra ocular pressure is not controlled, a total of 9% of the population are more likely to get the disease. That is in two fold more than if the condition were treated. People with elevated IOP have an increased risk of developing glaucoma. Elevated IOP is usually defined as greater than 21 mercury (Hg). However, even people with normal eye pressure can develop glaucoma. All people who are at risk of developing glaucoma should have their eyes examined annually for early detection. Patients who are diagnosed with glaucoma should also inform blood relatives of their condition to alert them to their own potential for developing the disease. Blood relatives should be encouraged to undergo a comprehensive eye examination.

2.3 Effects and causes of Glaucoma

Glaucoma is second to cataract as a leading cause of global blindness and is the leading cause of irreversible visual loss. Common symptoms of the disease include buphthalmos which is enlarged corneal diameters breaks in descemet membrane and optic disc cupping (Kanski and Bowling, 2011). Reduced density of the cornea, high pressure in the eye, short sightedness, aging and hereditary are the risk factors for open-angle glaucoma. Risk

factors for angle closure glaucoma include shallow anterior chamber, short axial length, small corneal diameter, steep corneal curvature, shallow limbal chamber depth and thick, relatively anteriorly positioned lens (Kardas et al., 2012).

2.4 Medication adherence in Glaucoma patients

Adherence is defined as the degree to which a client's sticks to instructions given to him concerning a particular drug prescribed by a health care giver (Blondeau, 2012). A number of studies on clients adherence to medications revealed that a larger portion of clients do not adhere to medication regiment. This ranges from 6.3% to 87% globally (Burnier, 2006). In a study conducted in Germany, glaucoma clients were grouped into non-compliance and compliance to medication by client reporting themselves, tallies from medical records, and clients honoring hospital review schedules. Respondents were said to be non-compliance to drugs when it is written in their folders by their care givers as well as the client reporting for not instilling a dosage of drug within seven days. Client not going for their glaucoma drugs as scheduled was termed review non-compliance, which is indicated by medical data showing four weeks and more defaulter period and client reporting of shortage of drugs ahead of the review date. Despite the availability of effective pharmacologic therapies, adherence to medication in patients with glaucoma was reported to vary from 24% to 59% (Nordstrom et al., 2005). In a large retrospective cohort study that used health insurance claims, data from 5300 patients showed that nearly 50% of patients discontinued glaucoma medications within 6 months and only 37% of all patients got all their prescription filled at three years after the initial dispensing period (Nordstrom et al., 2005).

Tsai et al., (2003) developed taxonomy (systematic classification) of barriers to adherence

in glaucoma patients. They described 71 unique situational obstacles to medication adherence and grouped them into four separate categories: situational/ environmental factors (49 %), regimen factors (32%), patient factors (16%) and provider factors (3%) was reported by respondents. Such taxonomies have guided development of individual treatment algorithms to optimize patient education and problem solving regarding the prescribed therapeutic.

Many reasons have been associated with low compliance to prescribed medication, significant among them are, the clients, health care system elements, the treatment of the illness, the socio-economic status of the client and the nature of the disease (AlGhurair et al, 2012). Kardas et al. identified in the 2012 European report that the particular elements related to poor non-adherence are individual not believing that they can follow prescriptions, perception of obstacles militating the administration of the medicines, price of the drugs, side effects of drugs and regular instillation.

2.5 Empirical studies on glaucoma medication adherence

A study conducted within twelve weeks period on two topical anti-glaucoma (beta-blocker) revealed that almost all the respondents (98% & 96%) always instill their medications. Again 44 out 48 clients of a school specialized in glaucoma management revealed that, clients always instill their anti-glaucoma medication preceding the 14 days period whiles 196 out of 230 clients seen in glaucoma subspecialty practices also revealed always instilling their medicines. Contrary, a focus group discussion involving 21 clients, seeing two ophthalmologists at least, at the same time and not less than two anti-glaucoma drugs indicated some degree of non-compliance (Taylor et al., 2010).

Other studies have found substantial but widespread rates of non-adherence. For example, almost half of the client's suffering from glaucoma disclosed of omitting two or more dosage of their medicines in seven days period (Konstas et al., 2000) whiles almost quarter of clients given anti-glaucoma drops usually forget to instil their drugs. (Krousel-Wood et al., 2012).

Research has revealed that it takes two minutes for eye drops to be absorbed by the ocular surface. This prolongs the duration for which the drug stays on the eye and its potency. This also reduces absorption into the general circulation thereby reducing possible side effects of the drugs. Five minute interval should elapse between instillation of different eye drops, and drops should be instilled before the application of ointment. Problems such as touching of the eyes or lids, instilling the drops at the wrong place and instillation of more than one drop into the suck have been reported as problems associated with instillation of eye drops. (McVeigh and Vakros, 2015).

Medications are mainly absorbed in the eye through the cornea and non-cornea routes. Majority of the drugs are absorbed through the cornea, into the aqueous humor in the anterior chamber. A multicenter study from ten centers across Canada shows that more than half of the clients studied were either non-adherent or exhibited inaccurate way of instilling medication (Kholdebarin et al., 2008). Not instilling drugs are usually as a result of drug non-compliance; notwithstanding, sometimes client with high compliance might not be getting the required dosage due to poor instillation procedure.

Sleath et al. (2012), found out in their research that almost half (44%) of clients told the researchers of frequently missing the eye whiles trying to instil eye drop. Another research conducted by Stone et al. (2011) identified that about 33.3% of the clients were able to

instil their drops correctly, whiles about one-fourth of the respondents were not able to instil the drops correctly as prescribed.

Research conducted by Lacey et al. (2009) on glaucoma adherence again revealed that few respondents had been instructed as how to effectively instil eye drops and afterwards depended on the drug manual guide for which they found cumbersome to read, or misleading as it clashes with other advices gotten from other sources like internet, pharmacists and other clients (McVeigh and Vakros, 2015). Incorrect administration procedures may include contamination of tip of bottle, not dropping into the eye and stilling more than required. (Gupta et al., 2012; Sleath et al., 2011).

A four-item Morisky Medication scale was used in a study in Europe to find out obstacles to medication adherence. Two thousand six-hundred and thirty (2630) respondents who were glaucoma clients from 11 EU countries were used. Almost half of the respondents (42%) did not adhere to drug regiment at the same time while 18% of the respondents decided not to instil their medication (Kardas, 2012). There were different adherent rates among countries. For instance, in Austria 34% of glaucoma clients did not adhere to their medication regiment whiles in Hungary 70% did not adhere (Morrison et al., 2012).

Various researches carried out in Greece to measure adherence to medication with glaucoma client's revealed contrary outcome. Research conducted by (Sotirios et al., 2016) using a 4-item Morisky Medication Adherence Scale also indicated that three-fourth of glaucoma clients were medication adherent. In another study on glaucoma medication adherence, (Stavropoulou, 2012) reported that majority of the respondents confirmed that they use their drugs in accordance with the doctors instructions. Further studies estimating

level of adherence based on numerous questions on frequent medication use, only 15% of glaucoma patients were adherent.

Sotirios et al. (2016) in a study on glaucoma medication adherence reported that most participants stated that they deliberately did not adhere to their medication because it was cumbersome. Almost all the participants with low adherent level felt that it is not convenient to follow the medication regiment, 77.6% decided not to take their medication whiles 79.1% do not remember to take their medication. Similarly, almost all the medium adherers think that it is difficult to adhere to medication schedules, whiles 4.2% intentionally do not take their medication. He concluded that participants said it was cumbersome to adhere to their medication regiment.

2.6 Factors influencing medication adherence

Medication adherence is one of the main obstacles in management of glaucoma because it is asymptomatic in the early stages of the disease (Although et al., 2010). Clients reporting themselves through interviews are usually the basic tool for measuring drug compliance among glaucoma clients (Taylor et al., 2013).

There are several factors that can influencing medication adherence and this include; Lack of family or social support, homelessness, poor accessibility to health, not having insurance policy on health, high price of drugs and beliefs about the illness (Weinreb et al., 2014). Provider-patient relationship, provider communication skills and differences in the understanding of the health professional in addition to the client are also significant factors known to influence medication adherence. In adequate motivation giving by health professionals and lack of health education to the clients, lack of home visits, lack of

inadequate knowledge on compliance and effective interventions for improving it, Patient information materials written normally are technical, poor access or missed appointments and long waiting times have also been reported to influence medication adherence (Weinreb et al., 2014).

Medication adherence has lasting effect on the vision of the client (Konstas et al., 2000). It is also related to misuse of recommended drugs, thereby increasing the expenditure on the health care (Reeder et al., 2008). In glaucoma, non-adherence to medication instillation is a known burden, at the rate of 80% among the clients which was measured using various techniques and methods (Gupta et al., 2012). Non-adherence and inappropriate administration of hypotensive agents can potentially result in treatment been unsuccessful and because glaucoma has no symptoms, lasting adherence are important for the control of the disease (McVeigh and Vakros, 2015).

Stewart et al. (2004) reported that memory of patients with glaucoma was importantly connected with taking of their medicine and going for hospital review by their health care providers. McVeigh and Vakros (2015) reported in a study conducted on medication adherence among glaucoma patients in Nigeria that, 56% of non-adherent participants cited scheduling issues such as remembering when to take their medications to be a major significant barrier to medication-taking compared with only 18.8% of adherent participants ($P<0.001$). The study further revealed that almost half of the respondents who did not adhere stated forgetfulness, having the inaccurate date, or clashing schedule as a reason for not coming to see their ophthalmologists ($P<0.05$).

Taylor et al. (2013) reported that obstacle to adherence to medication was the dilemma with the appropriate instillation of eye medications by patients due to lack of requisite

knowledge about the diseases. Issues reported in relations to barriers of instillation were under or over instillation as well as trouble of pressing the bottle.

Stewart et al. (2004) asserted that obstacle to adherence were grouped into factors relating to patient, the disease and the medication.

Another study identified significant correlation between non-adherence and low educational level and one significant reason attributed to the positive correlation in their study was attributed to differences in client's groups. They found out that their participants have had glaucoma for a long period of time, therefore they had some information on the condition. This indicated that, demographic factors had less influence on the adherence behavior in the specific study group used for the study (Kholdebarin et al. (2013)

Blondeau (2012) reported that forgetfulness is the commonest prevalent intellectual element affecting compliance. Most patients usually forget and miss their recommended doses for the day therefore increasing the duration of time for the drugs to be refilled. Attitudes, beliefs, personal strength, help from the family were identified as social and psychological factors affecting compliance to glaucoma management. In ability of the individual to recognize the importance of the treatment or satisfy with the treatment has been persistently related to lower self-reported compliance. (Konstas et al., 2012).

2.6.1 Patient factors

These factors are related to the knowledge the patient have and education regarding their disease and medication. Patients with inadequate health literacy will have difficulty in understanding and interpreting most written health texts and instructions compared to those with good knowledge. This indicates that such patients are more likely to take medications incorrectly (Kyari et al., 2013).

Konstas et al. (2012) observed in a study conducted in Pakistan among glaucoma patients that patients administer their eye drops less often due to inadequate knowledge about glaucoma. However the study of Konstas et al. (2012) on medication adherence in India showed that almost all the respondents studied showed positive understanding of the disease. They asserted that the high level of knowledge was partly attributed to the type of study population the patients represented were well-informed groups. This indicates that further education on the condition will not have any positive impact on compliance habit.

Hoevenaars et al (2008) again could not identify any positive association among medication adherence and knowledge on glaucoma. The findings also showed that, knowledge on the chronic nature of glaucoma contributed to decrease drug compliance. Studies have shown that there exist a relationship between glaucoma and attitude towards drug compliance as patients with good knowledge of the diseases are more likely to adhere to medication compared to those without adequate or poor knowledge. Several studies have shown that several clients with glaucoma do not have adequate insight into their condition. A study by Konstas et al., (2010) in Greece among glaucoma patients reported that 50% of the clients have an idea of the meaning of glaucoma whiles about one-fourth of the clients have an idea that glaucoma can cause loss of vision.

Facts concerning the association among demographic variables like sex, age, family background, socio economic state, literacy, hereditary between medication compliance are mostly documented. Background differences in glaucoma medication compliance or knowledge are sometimes related and may be confounded with education (Taylor et al., 2013). The age of an individual is one of the significant determinants of the development of glaucoma (Taylor et al., 2013). Research frequently confirm that aging is a predisposing

element for the development of Open Angle glaucoma (OAG). Research carried out in Wisconsin among white individuals revealed that, OAG occurrence among the people aged 43-54 were reported to be 0.9% while it was 4.7% between 75 years of age or older indicating significantly higher percentage points (Klein et al., 2007). In a Barbados Eye Studies, the incidence of Primary Open Angle Glaucoma was 2.2% for those aged between 40 to 49 years at baseline and 7.9% for those greater than 70 years of age with a relative risk of developing glaucoma projected to be 3.8 for the older age group (Leske et al., 2007). The results of a recent meta-analysis to forecast the occurrence of Open Angle Glaucoma in elderly shows that the occurrence of Open Angle Glaucoma rises in relation to age. Increasing age is considered to be a surrogate risk factor for currently unknown factors such as increased deterioration of tissue or ganglion cells, increased duration of exposure to other risk factors, or poorer adherence to therapy or decreased ability to afford therapy (Boland and Quigley, 2007).

Aged clients showed low medication compliance related to trouble in reading, understanding and recalling medication labels and prescriptions. Stewart et al. (2004), however in his study on association between glaucoma medication adherence and demographic characteristics of the individual could not identify a positive association between level of education, sex, or age of the client and level of adherence. The findings also show that young people are expected to comply with prescribed medication than older people (Stewart et al. 2004).

The result of a study conducted in Melbourne and Rotterdam indicated that more males were getting Open Angle Glaucoma compared to females but the differences obtained was not statistically significant at an alpha level of 0.05. This was probably attributed to the

small sample sizes of the population used for the study (De voogd et al., 2005, Mukesh et al., 2002).A research group on prevalence of eye diseases has also indicated no statistical significant disparity in the glaucoma occurrence among males and females in hispanic, blacks and white people. (Eye Diseases Prevalence Research Group, 2004).

Investigations and findings of studies conducted in most countries in Sub-Saharan Africa did not identify a significant difference in incidence by gender; however other hospital based studies previously conducted in the North Eastern region of Ghana, Nigeria and Ethiopia have reported nearly a 2:1 male to female ratio. This may reflect an under reporting of women affected by the disease in these studies. The largest population study in Ghana to date reported no statistical difference in gender prevalence of Primary Open Angle Glaucoma at any age (Ntim-Amponsah et al., 2010). In a study by Sotirios et al. (2016), Gender didn't also seem to influence medication adherence.

Marital status is one of the factors that is more likely to influence medication adherence. Some studies conducted have shown statistically significant disparity in different marital status groups among the respondents. They observed there were higher scores in adherence among married respondents compared to the unmarried using Morisky medication adherence scale ($p = 0.009$)

The level of educational background of patients with glaucoma has being reported to play a very significant role in medication adherence**.** Low level of education may hinder the patient's ability to comprehend with the medication instructions. In a study conducted by Sotirios et al. (2016) in glaucoma patients in Greece on medication adherence, the results showed that, individuals with lower levels of education were less likely to adhere to medication instructions compared to their counterparts with higher education. The research

associates inadequate compliance rate to the greater proportion of illiteracy. Illiteracy can influence the reading and understanding of prescription which may in turn affect client awareness concerning the probability of not adhering to prescription schedule. (Taylor et al., 2013).

2.6.2 Factors Relating to Medication

Advice given for particular medication, the number of drugs and doses for each drug administration are used to measure prescription management schedule. Clients who instill more two medicines in a day are more likely not to comply with drug schedule. Severe side effects such as reddening of the eye and itching experienced from the use of glaucoma medication by patients may be a significant factor and usually associated with break in medication regimen (GHS, 2014).

Barrier to medication adherence is often associated to the price of glaucoma drugs as cited in studies conducted among patients. Patients who can afford glaucoma medication or in high income groups are more likely to go for constant refilling compared to those with low income groups (GHS, 2014).

2.7 Conclusion

The papers reviewed shows non-adherence to glaucoma drugs is wide spread and a common barrier to effective management of glaucoma. Most studies were conducted in developed countries with a few in sub-Saharan Africa. The studies were generally quantitative with a few qualitative designs. Morisky 4 and 8 were the preferred data measurement for medication adherence in glaucoma patients. The gap in this literature review is the lack of information on glaucoma medication adherence among patients in Ghana.

CHAPTER THREE

METHODS

3.1 Study site

The study was undertaken at Komfo Anokye Teaching Hospital (KATH) Eye Clinic in the Ashanti Region. The KATH is the second largest hospital in Ghana, receiving referrals from the Northern half of the country. The hospital was founded in 1954. It is affiliated to Kwame Nkrumah University of Science and Technology, School of Medical Sciences. The Hospital has a bed capacity of 1,000. The hospital is also accredited for post graduate training by the West African College of Surgeons in surgery, obstetrics and gynaecology, otorhinolaryingology, radiology and ophthalmology. The eye center is located near the Accident and Emergency Centre. The eye clinic sees about 31, 294 patients a year. The glaucoma clinic is run twice in a week on Tuesdays and Thursdays (GHS, 2014). The eye center comprises of 16 rooms and is divided into outpatients department, wards and theatres. There are 7 ophthalmic nurses, three general nurses, 7 ophthalmologists and 10 residents doctors. There are 14 slit lamps, three auto refractors, A and B scan machines, biometry machine, visual field analysis machine. The clinic runs specialist clinic. Namely, paediatric, cornea, glaucoma, retina and occluoplastic clinics. The OPD has 8 consulting rooms, one general room, one screening room, one procedure room, three rooms for refraction with three optometrists and a pharmacy shop. The ward is made up of two rooms (male and female) wards. The female ward consists of 10 beds and four cots and the male has 7 beds. Theatre consist of the recovery room and three operating rooms. There are four microscopes, four operations tables and three anaesthetic machines. The recovery room has five beds with one anaethestic machine and three pulsometers (GHS, 2014).

3.2 Study Design

This study adopted a facility based cross- sectional design.

3.3 Study population

The population for this study consisted of patients screened to have glaucoma at KATH from January to April, 2017.

3.3.1 Inclusion criteria

All patients who are above the age of 18 years with a specialized confirmed diagnosis or screened to have glaucoma who gave consent were included in the study. Glaucoma patients must have been on medication for at least a month.

3.3.2 Exclusion criteria

All glaucoma patients who refused to consent to the study were excluded.

3.4 Sample size determination

A minimum sample size was obtained using the Cochran's formula;

$$n= \frac{Z \times Z \times PQ}{D \times D}$$

Where: n= desired sample size

Z= standardized z-score for 95% confidence level usually set at 1.96

P= the proportion in a target outpatient population estimated to have glaucoma at the KATH eye clinic is estimated to be 8% of the number of cases reported.

Q=1-p

d=degree of accuracy desired set at 0.05 probability level.

$$n = \frac{1.96 \times 1.96 \times P0.08X0.92}{0.05 \times .05}$$

Using the formula above a total sample size of 113 participants was targeted to be used for the study. A 10% error margin was allowed for non-responses bringing the total sample size to 124 participants.

3.5 Sampling technique

Patients diagnosed to have glaucoma that attended the eye clinic were selected using systematic random sampling technique. Numbers were written on pieces of papers and put in a box. Using the population size and sample size calculated above, a Kth value of 4 was obtained. The first number was randomly selected and used as the starting point for the selection of patients. Each fourth patient who met the inclusion criteria and consented to the study was recruited for the study. This technique was used to select 130 participants to constitute the required sample size.

3.6 Data collection technique and tools

An interviewer-administered questionnaire was used in the study. An 8-item Morisky Medication Adherence scale comprising of closed and open ended questions was used to estimate medication adherence. The questionnaire contained three parts: demographic characteristics, medication adherence and factors influencing medication adherence. The questionnaire was administered with the assistance of two trained research assistants with public health background. After obtaining approval from the participants through informed consent, the research assistants administered the questionnaires to the respondents in their preferred language. The researcher then collected the completed questionnaires and sealed them in an envelope.

3.7 Study variables

3.7.1 Outcome variable

Medication Adherence: measured using Morisky Medication Adherence Scale (MMAS-8). According to Morisky et al. (2008), there are three categories of adherent patients: high adherence with a score of 8 on the scale, medium adherence with a score of 6 to < 8, and low adherence with a score of <6.

3.7.2 Independent variables

Demographic data (Age, education, marital status, income), knowledge, provider factors (Dissatisfaction with service, communication between patients and service provider); Situational and environmental factor (social support).

Description of domains making up outcome and independent variables

Variables	**Factors**
Dependent variable	Medication adherence Morisky 8 was employed in measuring medication adherence.
Independent variables	Provider factors, patient factors, regimen factors, situational and environmental factors.
Demographic factors	Age, education, marital status, income
Provider factors	Communication between patients and service provider
Regiment factors	Forgetfulness, cost of medication, complexities, change and sideeffects
Situation and environment factor	Lack of support, distance from health facility, Social support

3.8 Quality assurance and control

Proper quality assurance procedures and precautions were taken to ensure the reliability and validity of the data. The researcher selected three research assistants that have public health related background and can speak at least more than two local languages and gave them adequate training to assist in the data collection. The content of the training involved; the purpose and objectives of the study, data collection techniques and tools to use, translation of questionnaires into various local languages; and data collection ethical guidelines. The principal researcher was part of the team during the interviews to ensure that relevant information in line with the objectives of the study is collected**.** The questionnaire was pre-tested at Korle-Bu Teaching Hospital for the identification of errors before the study. Concerns such as wording of some portions (question 3 and 5) of the questionnaire raised during the pretesting was corrected to standardize and finalize the questionnaire for the study. A response rate of 86% was achieved. Analysis of the non-response rate did not show any significant differences.

3.9 Data processing and Analysis

Initial data collected was cleaned and entered in Microsoft Office Excel spreadsheet (2010). Descriptive statistics such as means ± SD, cross-tabulations, tables, frequency and percentages were used to describe demographic characteristics of the study population. Data was analyzed using STATA version 14.0. Adherence was computed by using eight individual questions into a composite one. Each item on the Morisky scale answered correctly was scored as 1 and a non-adherence was scored as 0. The eight scores were added and converted into percentages. Those who scored 50% or less were categorized as low adherence, 51-70% as medium adherence and 76-100% as high adherence. Finally, those classified as high and moderate adherent were categorized as adherent and those who

had low adherence were classified as non-adherent. For establishing associations between categorical independent and dependent variables, Pearson's Chi square was used and statistical significance was accepted at a 5 % probability level ($P \leq 0.05$). In cases of sparse data in some cells, the Fischer's exact test was computed.

3.10 Ethical considerations

Ethical clearance was obtained from School of Medical Sciences Komfo Anokye Teaching Hospital Committee on Human Research, Publication and Ethics Review Board. Consent was sought from all the study participants. An introductory letter was obtained from the School of Public Health and administration of the Hospital for the purpose of seeking permission to gain entrance into the research setting. The researcher explained the nature and purpose of the research to each participant and questions raised were duly answered, after which the "informed consent/assent form" was signed. To ensure that the participants have understood the information, they were made to complete the "Volunteer Agreement form. Respondents were informed that they had the right to withdraw from the study at any point of the study without giving reasons. The study participants were made to understand that participation in the study will be entirely voluntary. Their decision to decline to enter the study, failure to answer any question or termination of the interview was highly respected and considered by the principal researcher. To maintain anonymity, individual participants were given identity numbers and to ensure confidentiality as well. All documented information given by participants were stored under lock and key and passwords were used for soft copies. The data was made available only to supervisor and possibly authorities from the KATH Ethical Review Committee if required. Copies of the research was made available to the School of Public Health library and KATH.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics of respondents

The study surveyed one hundred and thirty (130) respondents. About 44.6% (58) were above 65 years, 18.5% (24) were 35-44 years while the least 12.3% (16) were found in the remaining age groups. Approximately 44.6% (72) were males. About 13.8% (18) had no formal education. About 43.8% (57) had JHS level of education, 27.7% (36) (tertiary level education. About 55.4% (72) were married while 27.7% (36) were single. About half of the respondents 46.2% (60) were retired while 24.6% (32) were employed and 13.8% (18) were unemployed. About half of the respondents 48.5% (63) did not have any source of income. About a quarter of the respondents 24.6% (32) are on salary while 1.5% (2) were students. About 62.3% (81) in the study depended on family assistance while 33.8% (44) did not have any financial assistance. About 94.6% (123) had valid health insurance. Shown in Table 1

Table 1: Demographic characteristics of respondents (n=130)

Characteristics	Number (n)	Percent (%)
Age group (years)		
25-34	16	12.3
35-44	24	18.5
45-54	16	12.3
55-64	16	12.3
65 and above	58	44.6
Sex		
Females	72	55.4
Males	58	44.6
Educational level		
No formal education	18	13.8
Primary	2	1.5
JHS	57	43.8
SHS	17	13.1
Tertiary	36	27.7
Marital Status		
Single	58	44.6
Married	72	55.4
Divorced		
Widowed		
Employment status		
Employed	32	24.6
Unemployed	18	13.8
Student	20	15.4
Retired	60	46.2
Sources of income		
Allowance	3	2.3
Salary	62	47.7
Unemployed	64	50.0
Financial Assistance		
Family	81	62.3
Friends	5	3.8
No	44	33.8
Valid health insurance		
Insured	123	94.6
Uninsured	7	5.4
Total	130	100

4.2 Glaucoma medication and diagnosis

Table 2 presents responses to questions about glaucoma medication and diagnosis. Information on clinical factors of respondents. About 96.2% (125) did not have a primary care giver. About 62.3% (81) have been diagnosed of glaucoma for less than 5 years, while 16.2% (21) have been diagnosed for more than nine years. About 98.5% (128), reported that they were given instruction on how to take medications. Also, majority of the

respondents 97.7% (127) reported that they understood the instructions given to them. About 79.2% (103) reported that they were provided with source of further clarification. About 40.0% (52) of the respondents reported that they experience side effects.

Table 2: Responses to factors affecting adherence to glaucoma medication

Factors	Number n	Percentage %
Primary care giver present		
Present	5	3.8
Absent	125	96.2
Length of diagnosis (years)		
< 5	81	62.3
5-9	28	21.5
≥ 10	21	16.2
Number of medications		
1	74	56.9
2	54	41.5
3	2	1.5
Instructions given		
Not given	2	1.5
Given	128	98.5
Understood instructions provided		
Not understood	3	2.3
Understood	127	97.7
Availability of source of information		
Not available	27	20.8
Available	103	79.2
Side effect from medication		
No side effects	78	60
Side effects	52	40
Total	130	100

4.3 Proportion of adherers to glaucoma medication

Figure 1 presents the rate of medication adherence among respondents in the study. Adherence was computed by using eight individual questions into a composite score. Each item a respondent answer “yes” was scored as one and “no” was scored as 0. The eight

scores were added and converted into percentages. Those who scored 50% or less were categorized as low adherence, 51-70% as medium adherence and 76-100% as high adherence. Overall adherence for respondents in this study was 31% (40). About 69.2% (90) showed non-adherence, with 21% (27) showing moderate adherence while 10% (13) showed high adherence rate.

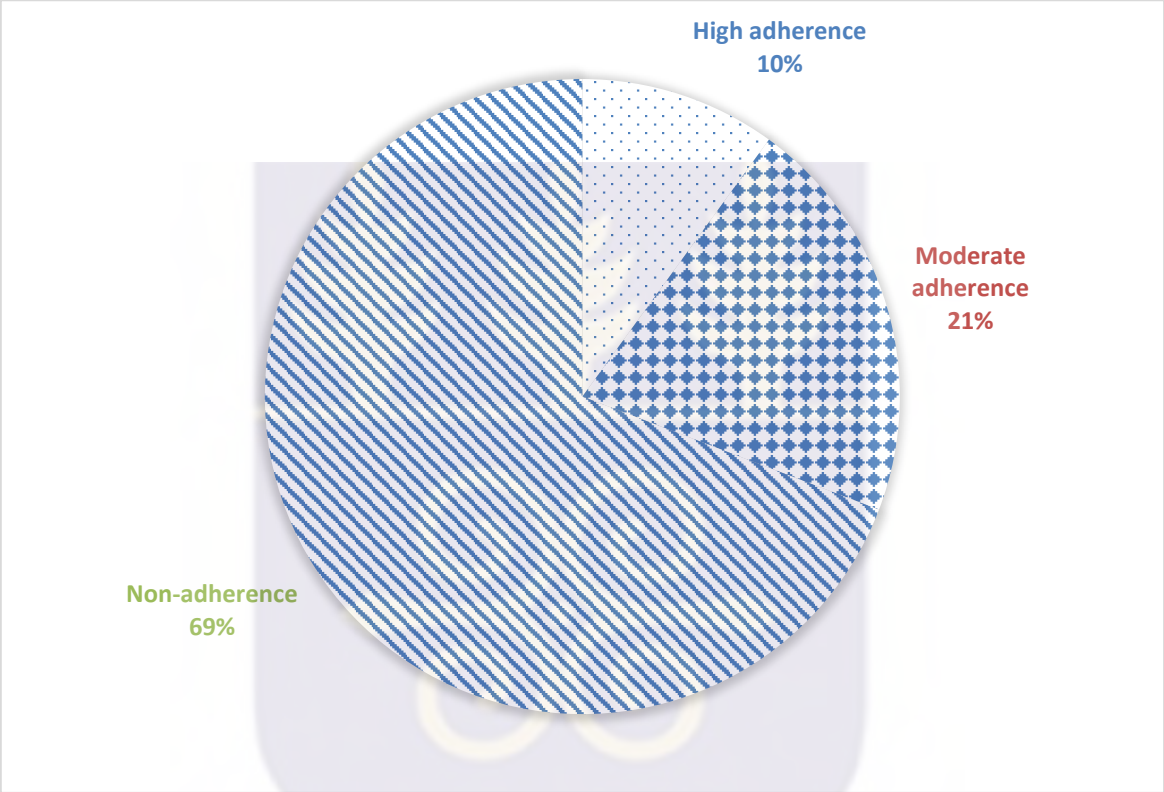


Figure 2: Proportion of adherers to glaucoma medication

4.4 Factors influencing Adherence to glaucoma medication

Table 3 presents factors which influence respondents' adherence to glaucoma medication. About 64.6% (84) reported that they sometimes forget to take their medication. About 93.8% (122) reported that they sometimes stop instilling their medicines when they feel their condition is better. About 75.4% (98) reported that over the past two weeks there were days they did not instill their medication. About 88.5% (115) in the study reported

that they have ever cut back or stopped instilling their medications without telling their physician. Almost all the respondents 114 (87.7%) reported that when they travel, they sometimes forget to bring along their medication. Similarly, a large proportion of the respondents 90.8% (118) reported that when they feel their condition is under control they sometimes stop instilling their medication.

Table 3: Respondents adherence to medication

Factors	Number n	Percentage %
Forgot to instill medication		
Forgot	84	64.6
Did not forget	46	35.4
Total43	130	100
Stopped instillation after condition improved		
Stopped	122	93.8
Did not stop	8	6.2
Total	130	100
No instillation for the last two weeks		
Instilled	98	75.4
Did not instill	32	24.6
Total	130	100
Ever cutback on instilling medication		
Cutback	115	88.5
Did not cutback	15	11.5
Total	130	100
Forget medication when outside the home		
Forgot	114	87.7
Did not forget	16	12.3
Total	130	100
Sometimes stop when condition is under control		
Stopped	118	90.8
Did not stop	12	9.2
Total	130	100

4.5 Association between demographic variables and adherence rate

This section presents associations between selected demographic characteristics and medication adherence rate. Insurance status was significantly association with adherence rate in this study (p=0.037). There was no significant association between age group of respondents, sex, educational level, marital status, and employment status, source of income, financial assistance and adherence rate. Despite these, there were a few trends worth reporting. Specifically, most respondents with low adherence rate were 65 years and above, had JHS level of education, were married, retired and unemployed.

Table 4: Demographic variables and adherence rate

Characteristics	High	Medium	Low	χ^2	p-value
Age group (years)					
25-34	2 (15.4)	3 (11.1)	11 (12.2)		
35-44	3 (23.1)	7 (25.9)	14 (15.6)		
45-54	2 (15.4)	4 (14.8)	10 (11.1)	3.46	0.903
55-64	2 (15.4)	2 (7.4)	12 (13.3)		
65 and above	4 (30.8)	11 (40.7)	43 (47.8)		
Sex					
Males	7 (53.8)	17 (63.0)	48 (53.3)	0.793	0.673
Females	6 (46.2)	10 (37.0)	42 (46.7)		
Educational level					
No formal education	1 (7.7)	2 (7.4)	15 (16.7)		
Primary	0 (0.0)	0 (0.0)	2 (2.2)		
JHS	6 (46.2)	10 (37.0)	41 (45.6)	12.879	0.116
SHS	2 (15.4)	1 (3.7)	14 (15.6)		
Tertiary	4 (30.8)	14 (51.9)	18 (20.0)		
Marital Status					
Single	7 (53.8)	7 (25.9)	22 (24.4)		
Married	5 (38.5)	16 (59.3)	51 (56.7)	6.288	0.392
Divorced	0 (0.0)	3 (11.1)	11 (12.2)		
Widowed	1 (7.7)	1 (3.7)	6 (6.7)		
Employment status					
Employed	2 (15.4)	4 (14.8)	26 (28.9)		
Unemployed	2 (15.4)	7 (25.9)	9 (10.0)	8.22	0.202
Student	1 (7.7)	6 (22.2)	13 (14.4)		
Retired	8 (61.5)	10 (37.0)	42 (46.7)		
Your sources of income					
Allowance	1 (7.7)	1 (3.7)	1 (1.1)		
Salary	3 (23.1)	15 (55.2)	44 (48.9)	12.57	0.126
Unemployed	9 (69.2)	11 (47.8)	43 (47.8)		
Student	0 (0.0)	0 (0.0)	2 (2.2)		
Financial Assistance					
Family	8 (61.5)	13 (48.1)	60 (66.7)		
Friends	0 (0.0)	0 (0.0)	5 (5.6)	7.014	0.135
No	5 (38.5)	14 (51.9)	25 (27.8)		
Valid health insurance					
Insured	12 (92.3)	23 (85.2)	88 (97.8)	6.615	0.037*
Uninsured	1 (7.7)	4 (14.8)	2 92.2)		

4.6 Influence of demographic characteristics on adherence rate to glaucoma medication

Ordinal logistic regression showed significant influence of access to allowances, proceeds from business and salary on glaucoma medication adherence rate.

Table 5: Influence of demographic characteristics on medication adherence rate

Characteristics	Estimate	p-value	95% C.I.	
Age group (years)				
25-34	0.678	0.485	-1.225	2.581
35-44	-0.606	0.485	-2.308	1.096
45-54	-1.383	0.116	-3.108	0.343
55-64	-0.207	0.786	-1.701	1.288
65 and above	Reference	.	.	.
Sex				
Male	-0.344	0.491	-1.323	0.635
Female	Reference	.	.	.
Educational level				
No formal education	0.502	0.576	-1.258	2.262
Primary	17.551	0.997	-81.785	82.887
JHS	0.128	0.848	-1.173	1.428
SHS	0.653	0.439	-1.001	2.307
Tertiary	Reference	.	.	.
Marital status				
Single	-0.247	0.798	-2.142	1.648
Married	Reference	.	.	.
Employment status				
Employed	-0.031	0.981	-2.581	2.518
Unemployed	-0.305	0.791	-2.557	1.947
Student	1.001	0.477	-1.759	3.760
Retired	Reference	.	.	.
Your source of income				
Allowance	-17.594	0.001*	-20.619	-14.569
Salary	-19.567	0.001*	-18.672	-21.1456
Unemployed	Reference	.	.	.
Financial assistance				
Family	2.363	0.018	0.398	4.328
Friends	18.239	0.994	-48.300	49.779
Valid Health insurance				
Insured	1.550	0.069	-0.121	3.222
Uninsured	Reference	.	.	.

Significant at 5%

4.7 Association between clinical/provider factors and adherence rate

This section presents associations between selected clinical factors and medication adherence rate of respondents. The was no statistically significant association between presence of primary care giver, length of diagnosis, length on glaucoma medication, number of medications, instructions provided, understanding instructions, source for further clarification, presence of side effect and medication adherence rate ($p>0.05$)

Table 6: Clinical/provider factors and adherence rate

Factors	High	Medium	Low	X^2	p-value
Primary care giver					
Present	1 (7.7)	1 (3.7)	3 (3.3)	0.585	0.746
Absent	12 (92.3)	26 (96.3)	87 (96.7)		
Length of diagnosis of Glaucoma					
< 5 years	8 61.5)	22 (81.5)	51 (56.7)		
5-9 years	3 (23.1)	2 (7.4)	23 (25.6)	5.822	0.213
≥ 10 years	2 (15.4)	3 (11.1)	16 (17.7)		
Number of medications					
1	8 (61.5)	15 (55.6)	51 (56.7)	1.036	0.904
2	5 (38.5)	12 (44.4)	37 (41.1)		
3	0 (0.0)	0 (0.0)	2 (2.2)		
Instructions					
Instruction not given	0 (0.0)	1 (3.7)	1 (1.1)	1.147	0.563
Instruction given	13 (100.0)	26 (96.3)	89 (98.9)		
Understood instructions given					
Did not understand	0 (0.0)	1 (3.7)	2 (2.2)	0.543	0.762
Understood	3 (100.0)	26 (96.3)	88 (97.8)		
Source for further clarification given					
No source of clarification	4 (30.8)	5 (18.5)	18 (20.0)	0.905	0.636
Source of clarification available	9 (69.2)	22 (81.5)	72 (80.0)		
Side effect					
No side effect	6 (46.2)	20 (74.1)	52 (57.8)	3.452	0.178
Side effect present	7 (53.8)	7 (25.9)	38 (42.2)		

4.8 Influence of medication factors on adherence rate

Ordinal logistic regression showed significance influence of respondents having a primary care giver, understanding medication, no source of clarification given and not experiencing side effect on adherence rate ($p<0.05$).

Table 7: Ordinal logistic regression showing influence of clinical/provider factors on adherence rate

	Estimate	Std. Error	p-value	95% C.I.	
Primary care giver					
Present	-2.595	1.268	0.041	-5.080	-0.111
Absent	Reference	.	.	.	.
Length of diagnosis of Glaucoma					
< 5 years	-1.234	0.976	0.110	-3.414	1.466
5-9 years	-1.013	0.994	0.231	-2.163	1.439
≥ 10 years	Reference	.	.	.	.
Instructions given					
No	2.493	4.517	0.581	-6.359	11.346
Yes	Reference	.	.	.	.
Understood instructions given					
Did not understand	3.639	0.621	0.001*	2.422	4.856
Understood	Reference	.	.	.	.
Further clarification given					
No	2.971	0.981	0.002*	1.047	4.894
Yes	Reference	.	.	.	.
Side effect					
No side effect	3.851	0.883	0.000*	2.121	5.581
Side effect	Reference	.	.	.	.
Significant at 5%					

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This study sought to assess the level of glaucoma medication adherence among glaucoma patients as well as determine factors which may influence adherence rate. One-hundred and thirty (130) respondents were surveyed using a cross sectional design.

5.2 Demographic characteristics of respondents

In this study, most respondents 50.7% were above 65 years with a fair distribution among 35-44 years. This age distribution is to be expected as glaucoma is age related and occurs in the later ages of individuals. Similarly, research revealed that people between the age of 40 and 80 years are at higher risk of developing glaucoma (De Voogd, Ikram, Wolfs, Jansonius, Hofman & De Jong, 2005; De Voogd et al., 2006; Rudnicka et al., 2006; Leske, et al., Wu et al., 2008). More than half of the respondents were females. This distribution seems to reflect existing findings that glaucoma is skewed towards females and, more females turn to come for treatment compared to females (Katherine and Georgios, 2015). Contrary to this study, the Barbados Eye Studies and the Beaver Dam Eye Study, showed there was no statistically significant increased risk of glaucoma with the sex of the individual (Leske et al., 2007). In the Melbourne and Rotterdam studies, there was a trend towards increased risk for Open Angle Glaucoma in males compared to females; however, the differences obtained was not statistical significant at 95% confidence level. This was probably attributed to the small sample size of the population used for the study (De voogd et al., 2005, Mukesh et al., 2002). About 55.4% of the respondents were married while a quarter were single. This distribution reflects in the age distribution of respondents in this

study. This is also shown in the employment status as most respondents were retired. However, only 13.8% were employed. The retired status of most of the respondents reflected a high prevalence of unemployment among respondents. Due to this, half of the respondents unemployed. However, the study observed that more than half of the respondents received remittances from family members. This could help them in defraying some of the cost of medications used for glaucoma treatments. About a quarter of the respondents were on salary and this reflects in the level of education of respondents. Worth noting is the fact that, almost all the respondents had valid health insurance. This may influence their level of adherence as some studies have reported cost of medication as a barrier to medication adherence. Similar findings were reported by (Kooner, Albdoor, Chao & Adams-Huet, 2006; Sathyamangalam, 2009) who showed that cost of mediation was a barrier to medication adherence among glaucoma patients.

5.3 Glaucoma medication and diagnosis

The study revealed that majority of the respondents had a primary caregiver. Access to primary health care giver has been shown to improve medication adherence in some studies, Weinreb et al., (2014) in their study reported on several factors that can influence medication adherence. Absence of or limited access to health care facilities and caregivers. The added that lack of positive reinforcement from the health care provider and weak capacity of the system to educate patients influence medication adherence.

Length of diagnosis was sparingly distributed across all the year groups though most have had glaucoma for 4-6 years. A small proportion reported having had glaucoma for more than 9 years. More than half of the respondents reported that they instill only one medication while close to half instill 2 medications. According to (GHS, 2014), the

number of medications, the number of doses of each medication and the specific instructions for medication administration have all been used to represent medication therapy regimen. Higher daily dose frequency especially of more than two administrations per day is usually associated with increased glaucoma medication non-adherence. Severe side effects experienced from the use of glaucoma medication by patients may be a significant factor and often related to discontinuation of medication therapy.

Almost all respondents in the study reported that they were provided with instructions on how to instill medication. Also, majority of the respondents reported that they understood the instructions given to them. These findings did not reflect in the level of glaucoma medication adherence observed in this study. This may be due to a disconnection between the knowledge on instructions and practice of instruction. This is supported by Taylor et al. (2013) who stated that a barrier to medication adherence was the difficulty with proper administration of drops by patients due to lack of requisite knowledge about the diseases. Administration issues included getting the proper number of drops into the eye and difficulty squeezing the bottle was also reported as major barriers. Konstas et al. (2012) observed in a study conducted in Pakistan among glaucoma patients that patients administer their eye drops less often due to inadequate knowledge about glaucoma. However, the study of Konstas et al. (2012) on medication adherence in India showed that more than 90% of the study participants had good knowledge about glaucoma. They asserted that the high level of knowledge was partly attributed to the type of study population the patients represented were well-informed groups. Majority of the respondents reported that they were provided with source of further clarification. However, about 40.0% of the respondents reported that they experienced side effects.

5.4 Level of adherence

Level of adherence was low among most of the respondents 69%, while 10% showed high level of glaucoma medication adherence. Similar, to the findings of this study, a higher non-adherence rate 80% of glaucoma medication was reported by Gupta et al., (2012). Contrary to the findings of this study, McVeigh and Vakros (2015) reported a lower non-adherence rate 56% among glaucoma patients in Nigeria this was attributed to scheduling issues such as remembering when to take their medications to be a major significant barrier to medication-taking compared with only 18.8% of adherent participants.

About 87.7% of the respondents reported that they sometimes forget to take their medication. Supporting this finding, Blondeau (2012) reported that the most pervasive cognitive factor influencing adherence is forgetfulness. Most patients usually forget and miss their recommended doses for the day therefore increasing the duration of time for the drugs to be refilled. Majority of the respondents reported that they sometimes stop instilling their medicines when they feel their condition is better. About 75% reported that over the past two weeks there were days they did not instill their medication. About 88.5% in the study reported that they have ever cut back or stopped instilling their medications without telling their physician. Close to all the respondents 87.7% reported that when they travel, they sometimes forget to bring along their medication. Similarly, a large proportion of the respondent reported that when they feel their condition is under control they sometimes stop instilling their medication. In a 12-week, randomized, observer-masked crossover study of two formulations of a topical beta-blocker, 98% and 96% of patients responded that they never or rarely forgot their medications. Contrary to the findings of this study, Taylor et al., (2010) 92% of 48 patients from an academic-based glaucoma specialty practice reported never missing a dose of their ocular hypotensive therapy during

the preceding two weeks and 85% of 230 patients seen in glaucoma subspecialty practices reported never or almost never missing a dose. Other studies have found substantial but widespread rates of non-adherence. For example, 44% of patients with chronic glaucoma reported missing more than two doses per week (Konstas et al., 2000) and 24% of patients who were prescribed a topical beta-blocker reported frequently or occasionally missing doses (Krousel-Wood et al., 2012).

In this study, having a valid health insurance was significantly associated with glaucoma medication adherence. There was no association between demographic characteristics and level of medication adherence. Contrary to the findings of this study, other studies found significant association between sex, educational level source of income, financial assistance and adherence rate. Specifically, Kholdebarin et al. (2013) found a positive association between low educational level and non- adherent behavior. One significant reason attributed to the positive correlation in their study was attributed to differences in patient population. They asserted that the patients in their study had a long history of glaucoma and were relatively well informed. This indicated that, demographic factors had less influence on the adherence behavior in the specific study group used for the study. The age of an individual is one of the significant determinants of the development of glaucoma (Taylor et al., 2013). Also, was observed that married participants had higher adherence scores compared to widowers or singles using Morisky medication adherence scale (McVeigh and Vakros, 2015). In a study conducted by Sotirios et al. (2016) in glaucoma patients in Greece on medication adherence, the results showed that, individuals with lower levels of education were less likely to adhere to medication instructions compared to the higher education.

In the present study, there was no significant association between presence of primary care giver, length of diagnosis, length on glaucoma medication, number of medications, instructions provided, understanding instructions, source for further clarification, presence of side effect and medication adherence rate. Contrary to the findings of this study, Kyari et al., (2013), reported that patients with inadequate health literacy have difficulty in understanding and interpreting most written health texts and instructions compared to those with good knowledge. This indicates that such patients are more likely to take medications incorrectly (Kyari et al., 2013).

The study was underpowered and the use of cross section design may have introduced some level of information bias.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Level of adherence of glaucoma medication among respondents was 31% in this study. Factors such as lack of clear and detailed instructions on instilling glaucoma medication influenced level of medication adherence. The inability of health facility to provide further source of clarification on medication adherence also affected adherence rate. Finally, having health insurance also improved adherence rate among respondents. Providing detailed and clear instruction on instilling medication may improve glaucoma medication adherence.

6.2 Recommendations

i. The study revealed that respondents did not understand instructions provided to them on how to instill medication. Pharmacists must provide clear and detailed instructions on how glaucoma medication must be effectively instilled.

ii. Respondents reported lack of reliable alternative source of information on instructions to instillation of drugs. There must be reliable alternative source of information on further clarification of instructions provided on glaucoma medication.

iii. More eye health care practitioners must be trained by the government as a policy especially ophthalmic nurse to educate the general public on the importance of medication adherence in glaucoma.

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APPENDICES

Appendix I: Questionnaire

QUESTIONAIRE: MEDICATION ADHERENCE AMONG GLAUCOMA PATIENTS ATTENDING OKOMFO ANOKYE TEACHING HOSPITAL, GHANA

PARTICIPANT CONSENT

I am Comfort Obuam -Sekyi, a student of the School of Public Health, University of Ghana**.** I am conducting a study on medication adherence among glaucoma Patients at Komfo Anokye Teaching Hospital. The response you give will assist in the establishment of facts relating to medication adherence among glaucoma Patients. All the information is strictly for academic purposes and will be highly treated with the greatest level of confidentiality. Kindly tick (√) the most appropriate response in all three sections.
Thank you.

Participants consent: Yes[ ] No[ ], If No, end of interview

Questions	CODE	Questions	Code
Questionnaire ID	QID	Interview code	ICODE
Question number	QN		
Date	DATE		

Q NO.	**Sociodemographic Characteristics**	Coding categories	Skip to	CODES
Section A: Demographic characteristics of respondents				
1	Age of respondents	……. years		
2	Sex	Male……..1 Female…….. 2		

3	Educational level of respondents	No formal education……..1 Primary……..2 Middle School/ JHS…….....3 Technical/Vocation/SHS……...4 Tertiary……..... 5		
4	Marital status	Single…….1 Married……..2 Divorced……3 Widowed……...4		
		Occupation		
5	What your employment status?	Self- employed……1 Private sector ……2 Public sector …….3 Unemployed …….4 Students/ apprentice ……5		
		Income		
6	Income from all sources including salary	……		
7	Do you get financial assistance from other people in support of your eye care? Example; friends, family members, etc.	……		
8	Do you have a valid health insurance care?	Insured……..1 Not insured……2		
9	If Yes, what type?	Public ……..1 Private …….2		

	Other Factors			
10	Do you have a primary care giver?	Has caregiver ……1 Does not have caregiver..……..2		
11	If Yes, What is the; Age Sex Educational level of the person	…….		

Section B: Clinical factors

Q NO.	**Clinical factors**	Coding categories	Skip to	CODES
		Section B: Clinical factors		
1	For how long have you been diagnosed of glaucoma?	…….. years		
2	For how long have been on medication for glaucoma?	…….. years		
3	Number of medications	1-2……..……..1 3-5……..……..2 ≥ 5……3		
4	Were you given instructions on how to take medication?	Instructions given……1 Instructions not given……..2		
5	Did you understand the instructions given?	Understood……1 Did not understand ……..2		

6	Were you provided with a source for further clarification if you needed one?	Source provided……1 No source provided……..2		
7	Do you experience any side effects from the medication	Side effects……1 No side effects……..2		

Section C: This section presents 8-items on medication adherence using the Morisky Medication Adherence Scale (MMAS-8). You indicated that you are taking medication for your condition. Individuals have identified several issues regarding their medication taking behavior and we are interested in your experiences. There is no right or wrong answer. Please answer each question based on your personal experience with your glaucoma medication.

	Self-reported 8-item Morisky Medication Adherence Scale (MMAS-8)			
1	Do you sometimes forget to instill your medications?	Forgot……1 Did not forget…..……..0		
2	When you feel like your condition is under control, do you sometimes stop instilling your medicines?	Stop instilling……1 Did not stop instilling....0		
3	Thinking over the past two weeks, were there any days when you did not instill your medicines?	Stop instilling……1 Did not stop instilling....0		
4	Have you ever cut back or stopped instilling your medication without telling your doctor, because you felt worse when you took it?	Cut back …...……..1 Did not cut back...……..0		
5	When you travel or leave home, do you sometimes forget to	Forgot……1 Did not forget…..……..0		

	bring along your medications?			
6	When you feel like your condition is under control, do you sometimes stop instilling your medicines?	Stop instilling……1 Did not stop instilling....0		☐
7	Instilling medication every day is a real inconvenience for you?	Inconvenient……..1 Not inconvenient…..……...0		☐
8	Do you ever feel hassled about sticking to your treatment plan?	Hassled……..1 Not hassled……..0		☐

Thank you

Appendix II: Consent Form

Committee on Human Research Publication and Ethics
School of Medical Sciences, Kwame Nkrumah University of Science and Technology
Kumasi, Ghana. Tel: 233 3220 63248 or 233 20 5453785. Email: chrpe.knust.kath@gmail.com

CONSENT FORM

Statement of person obtaining informed consent:
I have fully explained this research to _____ and have given sufficient information about the study, including that on procedures, risks and benefits, to enable the prospective participant make an informed decision to or not to participate.

DATE: _____ NAME: _____

Statement of person giving consent:
I have read the information on this study/research or have had it translated into a language I understand. I have also talked it over with the interviewer to my satisfaction.

I understand that my participation is voluntary (not compulsory).

I know enough about the purpose, methods, risks and benefits of the research study to decide that I want to take part in it.

I understand that I may freely stop being part of this study at any time without having to explain myself.

I have received a copy of this information leaflet and consent form to keep for myself.

NAME:_____

DATE: _____ SIGNATURE/THUMB PRINT: _____

Statement of person witnessing consent (Process for Non-Literate Participants):

I _____ (Name of Witness) certify that information given to

_____ (Name of Participant), in the local language, is a true reflection of what I have read from the study Participant Information Leaflet, attached.

WITNESS' SIGNATURE (maintain if participant is non-literate): _____

MOTHER'S SIGNATURE (maintain if participant is under 18 years): _____

MOTHER'S NAME: _____

FATHER'S SIGNATURE (maintain if participant is under 18 years): _____

FATHER'S NAME: _____

Appendix III: Ethical Clearance

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

Ref: CHRPE/AP/097/17

21st February, 201

Ms Comfort Obuam-Sekyi
School of Public Health
University of Ghana
ACCRA

Dear Madam,

LETTER OF APPROVAL

Protocol Title: ***"Meditation Adherence among Glaucoma Patients at Komfo Anokye Teaching Hospital, Ghana."***

Proposed sites: ***The Eye Directorate, Komfo Anokye Teaching Hospital.***

Sponsor: ***Principal Investigator.***

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

The Committee reviewed the following documents:

- A notification letter of 10th January, 2017 from the Komfo Anokye Teaching Hospital (study sites) indicating approval for the conduct of the study in the Hospital
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Protocol.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, beginning 21st February, 2017 to 20th February, 2018 renewable thereafter. The Committee may however, suspend or withdraw ethical approval at any time if your study is found to contravene the approved protocol.

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

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

Thank you Madam, for your application.

Yours faithfully,

Rev. Prof. John Appiah-Poku.
Honorary Secretary
FOR: CHAIRMAN

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