SCHOOL OF PUBLIC HEALTH
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ECONOMIC BURDEN OF GLAUCOMA ON PATIENTS IN THE TEMA METROPOLIS

BY

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DECLARATION

I declare that except for other people's investigations which have been duly acknowledged, this work is the result of my own original research, and that no part of this dissertation has been presented elsewhere for another degree.

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(Student)	(Supervisor)
Signature: ……..	Signature: ……
Date…….……..	Date …..……...

DEDICATION

This dissertation is dedicated to my wonderful children, Francis, Helena and Paul. You are my inspiration.

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Thank you Lord for seeing me through my pursuit of this degree and for bringing me this far. I will forever remain indebted to you. My sincerest appreciation goes to my supervisor, Dr. Genevieve Cecilia Aryeetey for the guidance she provided me in ensuring that this dissertation was successfully completed. I am also very grateful to Professor Moses Aikins and Dr Justice Nonvignon for all the assistance they gave me. To all the staff of HPPM department in the School of Public Health, especially Mr Samuel Amon, I cannot thank you enough. I am very grateful for your kindness. I would also like to express my appreciation to the teaching and non-teaching staff of the School of Public Health for their diverse roles in ensuring the successful completion of this degree. Special thanks goes to Dr Emmanuel Asampong for encouraging me during my period of study. I am also very grateful to the management, staff and patients of Tema General Hospital Eye Clinic and Tema Christian Eye Centre who consented to participate in this study. My sincerest appreciation goes to Olivia Kushitor for her help during the data collection stage of this study. My mum merits special thanks for her constant support and encouragement. To my siblings, especially my brother, Wilfred Webakwaba Adda, I am very grateful for the support you offered me throughout my period of study. To my colleagues in the School of Public, thank you so much for the gift of friendship. It was a privilege meeting you all.

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ABSTRACT

Introduction: Glaucoma is the leading cause of irreversible blindness worldwide. Ghana ranks second in the prevalence of glaucoma globally. Glaucoma poses a considerable economic burden on its patients since victims have to be on treatment for the rest of their lives. The cost of managing glaucoma increases as the disease progresses. Only few studies have been conducted to estimate the cost of managing glaucoma. This study therefore aims to determine the economic burden of glaucoma on patients.

Methods: Cross sectional Cost Of Illness (COI) study from the perspective of patient was used. The study sample (n=180) was drawn using a proportional quota sampling approach from a public and private eye care facility in the Tema Metropolis. A simple random sampling method was then used to select study glaucoma patients from the two facilities. Direct cost was a summation of all costs related to the treatment of glaucoma. Indirect cost was estimated using the Human Capital Approach to estimate patients and caregivers time lost due to seeking glaucoma care. Intangible cost was determined using tertile statistic approach to assess fear, emotional pain, social isolation and depression.

Results: The total cost of seeking glaucoma care from the perspective of the patient was estimated to be GHS45,889.28 (USD10,525.06) with an average cost of GHS254.94(USD 58.47) per patient per month. The direct cost constituted 93.7% of the cost profile whilst the indirect cost represented 6.3% of the cost profile. Overall, more than a quarter (25.6%) of patients suffer moderate intangible burden, and less than three times the patients attending private hospital (2.0%) endured lesser burden compared to those attending public hospital (6.1%).

Conclusion: Glaucoma poses a significant economic burden on patients which increases as the disease progresses. The direct costs of glaucoma are high and constitute more than two-thirds of the total cost of glaucoma with the main cost driver being medicines.

Keywords: Direct cost, indirect cost, intangible cost, glaucoma

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DEFINITION OF TERMS

Glaucoma- Glaucoma is a group of optic neuropathies which can lead to progressive and irreversible visual field damage, and is currently the leading cause of irreversible blindness in the world

Direct cost- The value of health care resources that are consumed with respect to the prevention, diagnosis and treatment of disease or injury, as well as with respect to the provision of an intervention, including costs related to side effects or other current and future consequences.

Indirect Cost- Indirect costs represent the value of output lost due to illness or premature death.

Intangible Cost- Intangible costs are defined as sufferings and discomfort borne by a patient because of a disease

LIST OF ABBREVIATIONS

AACG : Acute Angle Closure Glaucoma

CEC :Christian Eye Centre

COAG : Close Open Angle Glaucoma

COI : Cost of Illness

GOG : Government of Ghana

HCA : Human Capital approach

NFL :Nerve fiber layer analysis

NHIS : National health Insurance scheme

OCT :Optical coherence tomography

POAG : Primary Open Angle Glaucoma

TGH : Tema General Hospital

VFD :Visual field defect

VFT :Visual field Test

WHO : World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Glaucoma is the leading cause of irreversible blindness globally, second only to cataract. In 2010, About 8.4 million individuals went blind globally due to glaucoma (Quigley & Broman, 2006). The disease affects an estimated 67 million people globally (Adio & Onua, 2012). It is estimated that, there are 285 million visually impaired people globally out of which 249 million have low vision while the rest are blind (WHO, 2010). Majority of such cases are in the developing economies and if interventions are not implemented to ameliorate the situation, it could get much worse (Apio-Adih, 2014). Glaucoma accounts for about 15% of blindness in Africa, and Africa is the region with the highest prevalence of blindness resulting from glaucoma as compared to other regions in the world (Adio & Onua, 2012). In Ghana, about 8.5 % of the population aged 40 years and above are reported to have glaucoma (Ntim-Amponsah et al., 2004). Ghana is reported to have the highest prevalence of glaucoma in Africa (Ocansey et al., 2016). This worsening health phenomenon informed the creation of a global health initiative known as "The Vision 2020: The Right to Sight" in 1999. The aim of vision 2020 is to eliminate avoidable blindness by the year 2020. The responsibility of implementing such an agenda rested with national governments with assistance from Non-Governmental Organizations (NGOs) and the World Health Organization (WHO).

In its Vision 2020 agenda, the International Community for Eye Care set the year 2020 for the complete elimination of preventable blindness as a public health problem. However, glaucoma was not considered by this initiative and for that same target year. Quigley and Broman predicted that glaucoma cases could reach 79.5 million globally(Quigley &

Broman, 2006). Glaucoma is a group of diseases that damages the optic nerves of the eye and leads to progressive and irreversible blindness (Khurana, 2007). The most common form of Glaucoma is the Open – Angle type which more often associated with a rise in intraocular pressure (IOP) (Khurana, 2007). Extensive steroids usage, age, race, genetics and intraocular pressure (IOP) are some of the risk factors that lead to glaucoma. The risk of Primary Open Angle Glaucoma (POAG) increases with age, and with the group of those over 40 years of age constituting more than 25 % of Africa's population, more people could be living with the condition than reported (Ocansey et al., 2016). Glaucoma is often referred to as the "silent thief of sight" (Kyari, 2013). This is because glaucoma does not elicit any signs and symptoms in its early stage. Thus, the only way to ensure early detection is through regular eye checkups. It must be noted that early detection is very crucial in the management of glaucoma since any damage caused to the eye by glaucoma is irreversible. Although Glaucoma cannot be cured or prevented, it can be controlled. However, once the visual field is lost, it cannot be regained thus making the early detection of glaucoma highly crucial. In the developing world in general and Ghana in particular, eye healthcare seeking behavior is not encouraging and many factors combine to exacerbate the situation (Apio-Adih, 2014). Poor knowledge and awareness among individuals contribute greatly to their eye healthcare seeking behavior and more often some individuals do not even know they have glaucoma thus starting treatment late when they are partially blind or totally blind in some cases (Awiah, 2015).

POAG accounts for 70% of the cases of Glaucoma in Ghana (Ocansey et al., 2016).The required method of treatment for POAG is surgery but the uptake of surgery for POAG in Ghana is not encouraging. Patients usually prefer medical treatment to surgery. Some studies have attributed this to superstition which may further be reinforced by cultural beliefs, high cost and inadequate access (Adio & Onua, 2012).

1.2 Problem Statement

Ghana has the highest prevalence of glaucoma in Africa (Ocansey et al., 2016), however there are a number of challenges in the management of glaucoma in the Country.

A major challenge in the fight against Glaucoma in Ghana is the cost of treatment. Stakeholders have complained severally about the high cost of treatment, particularly drugs which are reported to be very expensive due to taxes. Further most of the drugs required for the treatment of Glaucoma are not covered by the NHIS, further burdening patients economically (Liu, Y., Simavli, H., Que, C. J., Rizzo, J. L., Tsikata, E., Maurer, R., & Chen, 2015).

Even though the Government of Ghana (GOG) introduced the National Health Insurance Scheme (NHIS) in 2003 with the primary aim of expanding access to healthcare via the removal of financial barriers, the glaucoma patient still bears a significant financial burden. This is because the list of medications relating to the treatment of glaucoma under the scheme is limited. The list excludes more effective and potent drugs such as latanoprost (Porter et al., 2013). Most effective glaucoma medications are not covered by the NHIS (Koffuor & Amoateng, 2012). In addition, the cost of tests such as Visual Field Tests (VFT) and Nerve Fiber Layer Assessment (NFLA) are not covered under the scheme (Kymes et al., 2010). This implies that the glaucoma patient in Ghana is faced with an enormous financial burden even if the patient is an NHIS beneficiary.

Some studies have concluded that, glaucoma patients are very likely to suffer the psychological pain of anxiety and depression (Tastan et al, 2010; Zhou et al., 2013). The heavy economic cost combined with the fear of blindness and permanent visual impairment exacerbate the psychological problems glaucoma patients go through (Zhou et al., 2013)

Due to the fact that, Ghana ranks second worldwide in terms of the prevalence of glaucoma after Barbados (Wittenborn & Rein, 2011) and yet studies relating to the cost of managing glaucoma in Ghana is very scanty, It is critical to conduct studies to assess the cost of managing Glaucoma in Ghana.

1.3 Objectives

1.3.1 General objectives

To determine the economic burden of glaucoma on patients in the Tema Metropolis.

1.3.2 Specific objectives

1. To estimate and compare direct cost of glaucoma treatment in public and private hospitals
2. To estimate and compare indirect cost of glaucoma treatment in public and private hospitals
3. To describe and compare intangible cost of glaucoma treatment in public and private hospitals
4. To analyse the relationship between direct, indirect and intangible cost of glaucoma and patients' characteristics.

1.4 Research questions

1. What are the direct costs associated with glaucoma in public compared to private hospitals?

2. What are the indirect costs associated with glaucoma in public compared to private hospitals?

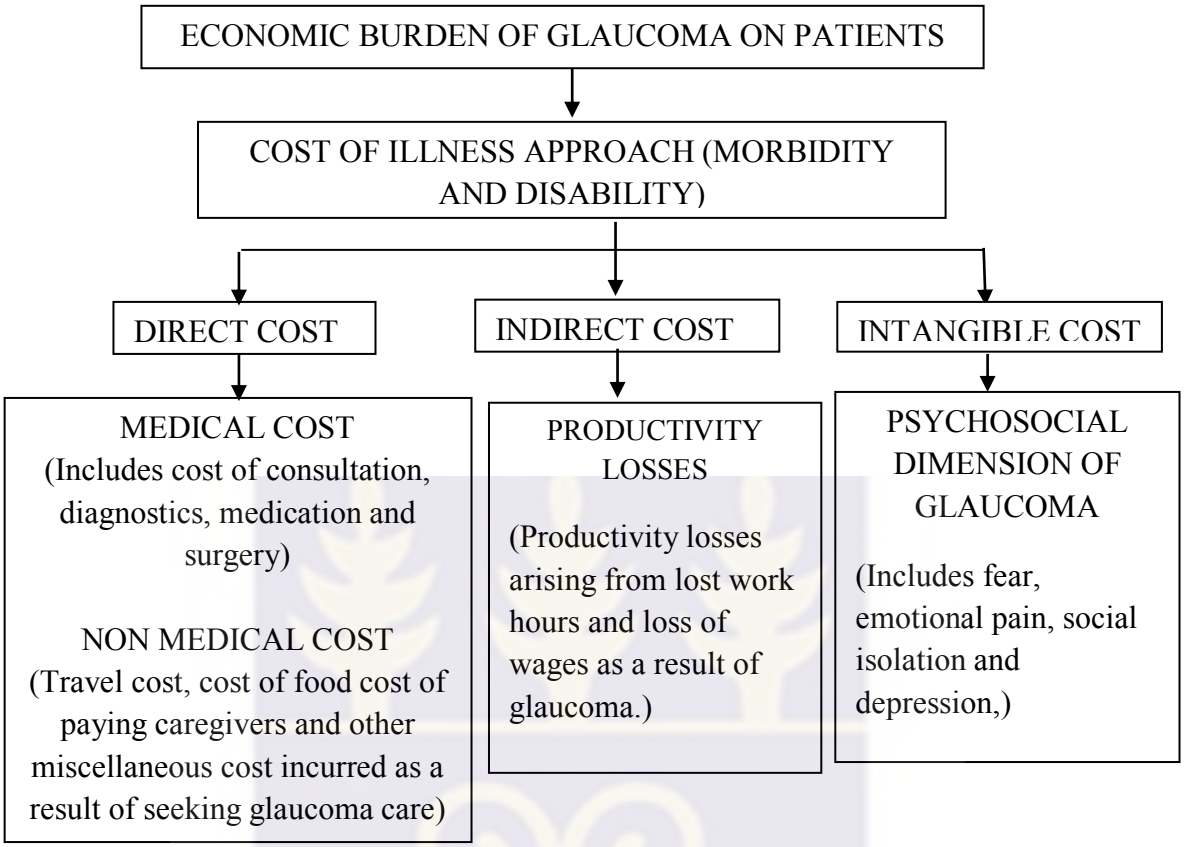
3. What are the intangible costs associated with glaucoma in public compared to private hospitals?

4. What is the relationship between direct, indirect and intangible cost of glaucoma and patients' characteristics.

1.5 Conceptual Framework

The economic burden of a disease refers to the total cost borne by the individual as a result of that particular disease. Economic burden of a disease manifests in three ways: direct cost, indirect cost and intangible cost. The direct cost comprises of two components – medical cost and non-medical cost. The medical cost includes cost of consultation, diagnostics, medication and surgery while the non-medical cost refers to costs such as travel cost, cost of food and other miscellaneous cost incurred as a result of seeking glaucoma care. The second component of the economic burden is the indirect cost which refers to productivity losses as a result of lost working hours and subsequently lost wages. The third and final component is that of intangible costs which refers to those costs associated with the psychosocial effects of glaucoma on patients. These psychosocial effects include but not limited to depression, fear, anxiety, stress and reduced self-confidence.

Figure 1: Conceptual Framework for the economic burden of glaucoma on patients



1.6 Justification of the Study

The negative consequences of glaucoma go beyond the victim. Glaucoma has consequences for the healthcare system and society in general. Accurate knowledge about economic burden of glaucoma is essential as it would help formulate and prioritize health care policies and interventions and eventually allocate health care resources in accordance with budget constraints in order to achieve policy efficiency.

However, despite the gravity of glaucoma in Ghana, very few studies have focused on the economic cost of the disease on its victims. This study aims to fill this gap in literature. The research study also aims to provide valuable empirical information that would inform health policy in relation to glaucoma management in Ghana.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literature in relation to the phenomenon under investigation. It begins with a description of the glaucoma disease. The chapter also contains literature on health seeking behavior for eye care services. The economic burden of disease approach or model that informs the study is also explained. The chapter ends with literature on the direct cost, indirect cost and intangible cost of glaucoma.

2.2 Glaucoma

Glaucoma is a group of optic neuropathies which can lead to progressive and irreversible visual field damage, and is currently the leading cause of irreversible blindness in the world .Risk factors that can predispose one to glaucoma include sustained intraocular pressure (IOP), age, genetics, race, and prolonged use of steroids. Other risk factors are concomitant systemic and ocular conditions such as diabetes and high myopia (Ocansey et al., 2016).

There are different classifications of glaucoma. Glaucoma is mainly classified into the angle closure type and the open angle type. Studies reveal that the black populations of the Caribbean, Africa and the United States have the highest prevalence of open-angle glaucoma (Wittenborn & Rein, 2011). In West Africa, the most prevalent type of glaucoma is POAG with 4 % of the population said to be suffering from it (Cook, 2009). In Africa, glaucoma accounts for 15% of blindness and it is the region with the highest prevalence of blindness relative to other regions in the world (Adio & Onua, 2012).Ghana is reported to have the highest prevalence of glaucoma in Africa (Ocansey et al., 2016) with 8.5 % of the population aged 40 and above reported to have glaucoma (Ntim-

Amponsah et al.,2004). Blindness resulting from glaucoma is influenced by the age of onset of glaucoma and the natural history as well as access to services the quality of care provided and adherence to treatment and follow-up. There is some evidence that glaucoma has an earlier age of onset in blacks and has a more aggressive clinical course. In Africa, there are the additional factors of poor awareness and poor access to care. Socio-economic deprivation exacerbates the problem. (Kyari, 2013)

Zhou et al., (2013) reports that the heavy economic cost combined with the fear of blindness and permanent visual impairment worsen the psychological problems glaucoma patients go through.

Medical therapy for glaucoma is an economic burden to many patients and should be individualized, according to the socioeconomic status, availability of drugs and the required distance to travel to reach the specialist clinics (Varma, Lee, Goldberg, & Kotak, 2011).

In West Africa and Ghana in particular, some local and international initiatives have ignored glaucoma all together. In 1995, the Government of Ghana (GOG) launched the vision 2020 with the "right to sight" as one of its components. This initiative aimed at the elimination of blindness but stop short of giving consideration to glaucoma. Even though Glaucoma is a very important cause of blindness in Ghana, NGOs such as Sight savers International commit huge financial resources to the elimination of Cataract but almost ignore Glaucoma which is second in Cataract in causing blindness (Egbert, 2002).

2.3 Eye health seeking behavior

Health seeking behavior simply refers to all the overt and covert actions an individual undertakes in the prevention and detection of eye diseases and illness in the asymptomatic stage. In both developing and the developed world, it is established that, knowledge and

awareness creation at the individual level is not sufficient to invoke a behavioral change towards eye care. There is the need for a collective effort so to reduce delays to diagnosis and improve compliance to treatments among individuals (McKain, 2009; Awiah, 2015).

Poor knowledge of various eye diseases on the part of patients coupled with inadequate information from health managers and policymakers combine to exacerbate the already precarious situation (Alexander et al., 2008). Laitinen et al. (2008) opined that, lack of information about rehabilitation facilities leads to reluctance among individuals especially the elderly to seek regular eye care. Cano (2007) and (Frazier & Kleinstein, 2009) added that, poor understanding of the severity and impact of certain eye conditions as well as the inadequate eye care officials coupled with inadequate assessments of the vision needs of individuals all work against the uptake of eye care services. Furtherance to the aforementioned, Baker and Murdoch (2008) reported that, there was no difference in the eye care seeking behavior among both the educated and uneducated about glaucoma. Thus the authors concluded that, though some individuals are aware of certain eye conditions, they do not feel the need to seek eye care or do not perceive themselves are attracting such conditions. In 2015, it was reported that an estimated 700, 000 Ghanaians were affected with Glaucoma with a sizeable number going blind if untreated. About 40% of those affected with Glaucoma were not aware they had the disease. A very disturbing phenomenon of Glaucoma in Ghana is that, diagnosis of the disease starts late when most victims are already partially blind (Awiah, 2015).

The inadequacy of eye screening exercises and low media attention to eye diseases coupled with poor information services contributes greatly to poor knowledge and inadequate awareness among individuals (Adriono, Wang, Octavianus, & Congdon, 2011).

2.4 Economic burden of disease / Cost of illness approach

The cost of illness approach represents the earliest attempts to apply economic concepts to healthcare. The main aim of the Economic Burden of Disease (EDB) or Cost of Illness (COI), is the assessment of the economic burden or cost of a disease or illness on society or the individual (Jo, 2014). The analysis of the cost of illness presents useful insights that would inform health managers and policy makers as to the relative importance of diseases and illnesses (Clabaugh & Ward, 2008).The economic cost of illness presents policy makers with the potential benefits of an intervention, if it eradicates a problem (Jo, 2014).

The economic cost of a disease or illness is computed by identifying all the components of an illness or disease that generate cost during healthcare delivery and assigning monetary value to each of the components listed. The monetary value then becomes the opportunity cost, that is the value of what the money spent on healthcare could have been expended on but is lost due to a disease or illness (Tarricone, 2006).

Segel (2006) and (Jo, 2014) argued that, an all-encompassing economic cost of illness analysis involves three cost components – direct costs, indirect costs and intangible costs. The direct costs refer to all healthcare and non-healthcare related costs. The healthcare costs comprises of all medical expenses related to a disease or illness such as surgery, diagnosis and rehabilitation among others while the non-healthcare costs refers to costs such as transportation, feeding, informal cares inter alia (Adio & Onua, 2012; Ocansey et al., 2016; Tarricone, 2006). It also estimated that, if the most effective and efficient methods of treatment are adopted, chronic diseases are associated with higher direct costs relative to acute or communicable diseases (Segel, 2006).

(Jo, 2014) argued that, though sometimes considered together indirect and intangible cost must be analyzed separately. Indirect costs reflects cost related to absenteeism and lost

wages (productivity loss) while intangible costs refers to losses in healthy time resulting in pain, depression, grief and anxiety (Clabaugh & Ward, 2008; Jo, 2014).

2.5 Determination of the economic burden of glaucoma

The prevalence of glaucoma contributes greatly to direct, indirect and intangible costs associated with the treatment of the disease. Darba and Kaskens reported that, as a consequence of aging population and the development of new drugs, the economic burden of eye care shall rise. (Darba & Kaskens, 2010). Olsen and Berdeaux (2009) concluded that, 62% of the cost of treating Glaucoma could be attributed to drugs. Ocansey et al. added that, the cost of glaucoma surgery is a significant cost burden (Ocansey et al., 2016).

2.5.1 Direct cost of glaucoma

According to Taylor et al., (2006), the direct cost of all Australians who underwent treatment for Glaucoma stood at U$144. Out of that, the cost of glaucoma medication was the highest of all the direct cost components.

Keffe et al. (2009) also in Austrailia reported that, the biggest cost component of the direct non-medical cost of glaucoma was transportation since almost all participants owned cars. The authors added that, the cost of hiring the services of caregivers was also enormous as about 38% of indirect cost of glaucoma treatment covered Caregivers. Caregivers are crucial especially for services that require good vision such as driving and reading.

In Nigeria, the cost of glaucoma medication stood around an average of US$54 for an individual on a monthly basis while the cost of surgery was about U$200 (Adio & Onua, 2012).These authors further put forth that, the economic burden of surgery meant that, many victims of glaucoma chose treatment as a cheaper alternative.

In Ghana, Ocansey et al., also made similar findings, where the cost of medications formed the biggest component of the direct cost of treating glaucoma.(Ocansey et al., 2016) Furthermore, the cost of transportation for each visit averaged around U$17.

2.5.2 Indirect cost of glaucoma

In Japan, productivity losses from glaucoma have been reported to be primarily high at the national level due to the low levels of employment in the country. It is estimated that worker absenteeism leads productivity losses of up to U$384 million (Roberts et al., 2010). Keffe et al. (2009) also reported that, in cases where caregivers to victims of glaucoma are relatives, productivity losses due to absenteeism and lost wages on the part of the patient and caregivers are quite substantial. Similar studies in Nigeria revealed that, productivity losses are further compounded by long waiting hours where some victims of glaucoma lose up to U$200 per visit (Adio & Onua, 2012).

2.5.3 Intangible cost of glaucoma

Glaucoma has negative effects on the Quality of Life (QoL) of its victims (Zhou et al., 2013). The psychological burden of glaucoma on its victims increase as vision impairment intensifies. Victims of glaucoma suffer pain, grief, depression and anxiety and social withdrawal (Kymes et al., 2010; Agorastos et al., 2013).

Roberts et al. (2010) reported that, loss of wellbeing in Japan due to Glaucoma was given a monetary value amount to over 50USD million. Visual impairment among individuals was responsible for many injuries and falls (Cruess et al, 2011) while Zhou et al., (2013) concluded that, depression and anxiety suffered by victims of glaucoma reduces their quality of life.

2.6 Conclusion of Reviewed Literature

The literature reviewed indicates that the black populations of the Caribbean, Africa and the United States have the highest prevalence of open-angle glaucoma (Wittenborn & Rein, 2011). The literature also revealed that 15% of blindness in Africa can be attributed to glaucoma (Adio & Onua, 2012). Ghana is reported to have the highest prevalence of glaucoma in Africa (Ocansey et al., 2016) with 8.5 % of the population aged 40 and above in Ghana reported to have glaucoma (Ntim-Amponsah et al., 2004).The literature confirms that glaucoma places considerable economic burden on its victims (Ocansey et al., 2016) with associated productivity losses (Adio & Onua, 2012) which in turn has negative consequences on the quality of life of victims either physically or psychology (Kymes et al., 2010; Agorastos et al., 2013).

In spite of the public health implications of glaucoma, the literature review revealed that very few studies have investigated the economic consequences of the disease on its victims. In Ghana and Africa in general, there have also been limited studies on the economic costs of glaucoma on its victims as well as the psychological problems victims encounter.

The cost of illness approach of this study conducted from the patient's perspective will be very relevant since it aims to bridge the knowledge gap in this field. The research study will also provide useful information to policy makers in the health sector on the economic burden of glaucoma on patients.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents detailed information of the study area and the methods and techniques used for the study.it also describes study area, study population, sampling procedure and techniques, sample size, data collection tools and techniques. The ethical considerations and assumptions for the study are also described in this chapter

3.2 Study design

This study employed a descriptive cross-sectional study using quantitative approach to collect data.

3.3 Study Area

The study was conducted at the Tema General Hospital Eye Clinic and the Tema Christian Eye Centre. The Tema General Hospital Eye Clinic serves as the main government hospital which offers specialist eye services and the Tema Christian Eye Centre is the only private eye specialist hospital in the Tema Metropolis. The burden of glaucoma was therefore measured from both the perspectives of patients attending private and public healthcare facilities. The location of both facilities in the Metropolis makes them easily accessible to patients in and around the Metropolis.

The Tema Metropolis is one of the ten (10) districts in the greater Accra Region. It has a population of about 403,934 (Ghana Statistical Service, 2014), making it the second largest populated district in the Greater Accra Region. Tema General Hospital is the only public health facility in the Tema Metropolis that offers primary, secondary and tertiary specialist services in Eye Care. It is located in community nine (9). The geographical

location of the Tema General Hospital makes it a major referral point for all other public and private health facilities in and around the Metropolis. The catchment area for Tema General Hospital includes the whole of the Tema Metropolis including its satellite towns and villages. It caters for patients from the Ashaiman municipal due to its proximity to the hospital. It also provides services to patients outside the metropolis including Prampram, Dowuenya, Afienya and Sogakope. Tema General Hospital is a 280 bed capacity hospital that provides a 24 hour out-patient and in-patient services. The hospital also provides specialist services including eye care services to its clients. The Eye Clinic attends to an average number of 940 patients a month of which about 140 (14.9%) are glaucoma patients.

The Christian Eye Centre is a Christian based private specialist eye facility located in Community one of the Tema Metropolis. It also serves patients in and around the metropolis. The Eye center offers medical, surgical and optical eye services. Christian Eye Centre attends to an average of number of 946 patients a month of which 165 (17.4%) are glaucoma patients.

Conducting the research at the two facilities offered the researcher the opportunity to measure the economic burden of Glaucoma from both the perspectives of patients attending public and private healthcare facilities. This ensured that the study sample was representative of the study population.

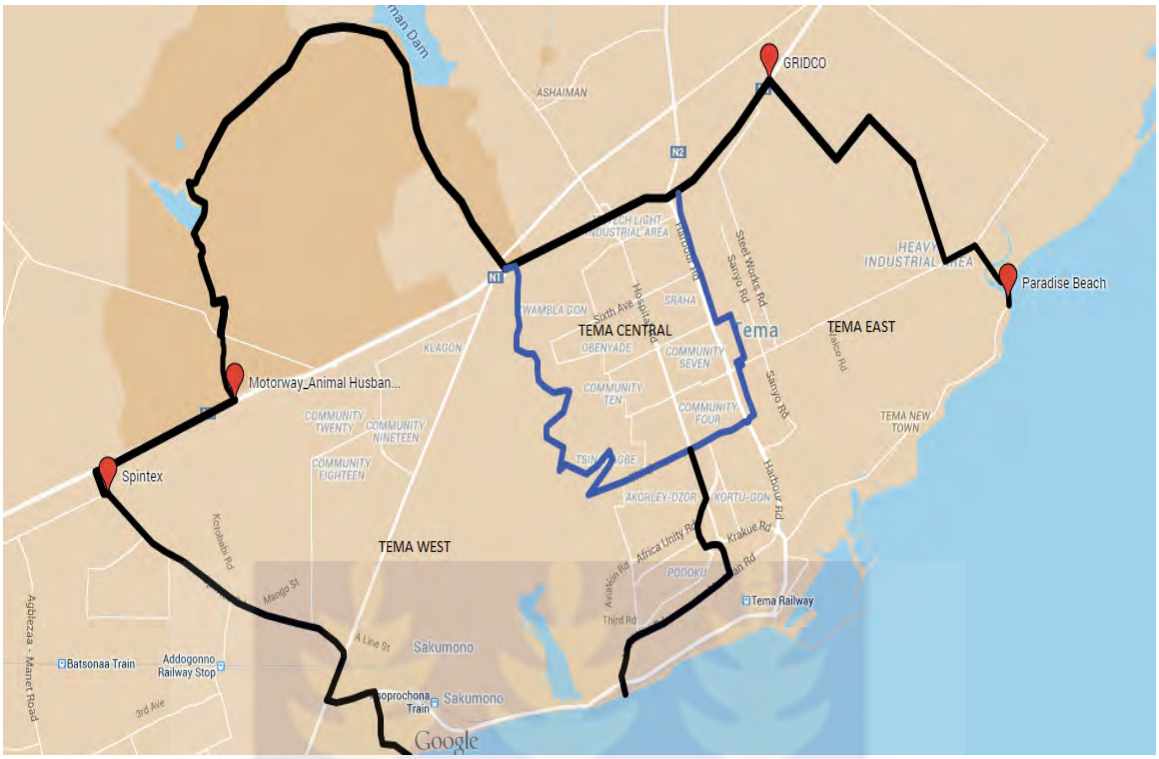


Figure 2: Map of Tema Metropolis

3.4 Study variables

The variables for the study included the following:

1. **Socio-demographic characteristics** -Age, occupation, marital status, educational level, employment status and monthly income. These variables were measured with a structured questionnaire through interviews.
2. **Direct cost (medical and non-medical)-** Medical costs included cost of consultation, diagnostics, treatment and medication while non-medical costs consisted of travel cost, cost of food and other miscellaneous cost incurred as a result of seeking glaucoma care.
3. **Indirect cost (productivity losses) -** Productivity losses arising from lost work hours and lost wages.
4. **Intangible cost (psychosocial dimension of illness) –** fear, emotional pain, depression and social isolation.

3.5 Study population

The study population was made up of glaucoma patients who attended the Tema General Hospital Eye Clinic and the Tema Christian Eye Center in the Tema Metropolis during the study period.

3.6 Sample size calculation

The Cochran's sample size determination of means was used to calculate the sample size. The sample size obtained for the study is 180. The detail of how it was calculated is shown below:

In determining the sample size for this research work, three factors were needed to be specified so as to obtain the appropriate sample size: the level of precision (sampling error), the level of confidence, and the degree of variability in the attributes being measured (Miaoulis and Michener, 1976).

For the purpose of this study with a continuous outcome variable, a 95% confidence level was used with sampling error of 0.05 or 5% (Varma et al, 2011) and an estimated standard deviation of 0.327 (Ocansey et al, 2012)

Considering,

$$n = \frac{z_{\alpha/2}{}^2 \sigma^2}{\varepsilon^2}$$

where

n represents the sample size (selected patients with history of glaucoma)

$Z_{\alpha/2}$ denotes the critical value

σ represents the estimated standard deviation from previous literature.

ε represents the level of precision or sampling error

Considering $\alpha = 0.05, \sigma = 0.327$ $\varepsilon = 5\%$ and $Z_{0.025} = 1.96$

Implies,

$$n = \frac{1.96^2 \times 0.327^2}{0.05^2} = 164.31 \approx 165$$

Adjusting for 10% non - response rate

$$= 164 \times \frac{10}{100}$$

= 16.4 approximately 16

Sample size n = adjusted sample size + 10% non-response rate

164 + 16 = 180

Therefore, the sample of 180 was considered with 95 percent level of significance, 7% sampling error and a standard deviation of 0.327.

Assumptions

- The medication costs on glaucoma ranges from 42% to 56% of direct costs at each disease stage (Varma et al, 2011).
- The average cost on glaucoma medication was estimated as GH₵967 ($484) per year considering a sample of 84 patients (Ocansey et al, 2012).

3.7 Sampling method

The study employed a proportional quota sampling approach to draw sample from a public (Tema General Hospital) and private (Christian Eye Centre) eye care facilities. A simple random sampling method was used to select study glaucoma patients from the two facilities.

Since the study was conducted in two different facilities, the total number of participants from each facility was determined based on proportion to size of glaucoma patients attending the two health facilities. The Tema General Hospital attends to an average of 140 glaucoma patients a month whilst Tema Christian Eye Centre attends to an average of 165 glaucoma patients a month. Thus, based on proportions, about 45.6% (n=82) of the study patients were sampled from Tema General Hospital and 54.4% (n=98) participants from Tema Christian Eye Centre making a total of 180 which was the sample size estimated for the study.

The principal investigator administered the questionnaires to the research participants at Tema General Hospital whilst a trained research assistant did same for the participants at Tema Christian Eye Center. This was done concurrently. The patient's attendance records served as the sampling frame. The selection of research participants was done using a simple random sampling technique. This was done separately for Tema General Hospital and Tema Christian Eye Centre. A simple random sampling technique was used bearing in mind the number of glaucoma patients who were estimated to visit the facility within the study period of three weeks. If a selected participant refused to participate in the study, the next patient was recruited until the sample size was achieved. By the last day of data collection in Tema General Hospital, 82 participants were recruited for the study.

An average of 12 glaucoma patients are seen on each clinic day (and clinics ran three times in a week) at the Tema General Hospital. The study was conducted in three weeks and the average number of glaucoma patients who were expected to attend the clinic during the period of the study was 105. A simple random sampling technique was used to select study patients. The patients were recruited to participate in the study after they were registered by the receptionist at the eye clinic and they satisfied the inclusion criteria.

Once they consented to the study, a questionnaire was administered to them by the principal investigator. This procedure was repeated every day until the last day of data collection.

Thus a minimum of 9 questionnaires were administered on each clinic day during the study period at Tema General Hospital.

The same procedure indicated above was used to select the study participants in Tema Christian Eye Centre. The average number of glaucoma patients who visited the Tema Christian Eye Centre in a month was is 165. This implied that about 124 patients were expected to visit the facility in the three (3) week period of the study (clinic days were Monday through Saturdays). Thus an average number of 7 glaucoma patients were expected to visit the facility daily. Since the sample space was 98 and a simple random sampling was used. Every sampled glaucoma patient who visited the facility during the study duration and consented to the study was recruited to participate in the study. Study participants were recruited after they had been seen. Thus, exit interviews were conducted where a research assistant administered questionnaires to the participants. If a selected participant refused to participate in the study, the next sampled patient was recruited. This procedure was repeated each day during the study period until the desired sample size of 98 was obtained. The 98 glaucoma patients were recruited over the study period of three (3) weeks. Thus a minimum of 6 questionnaires were administered on each clinic day during the study period at Tema Christian Eye Centre.

Inclusion criteria

All randomly sampled adults diagnosed with primary open glaucoma who sought eye care at the Tema General Hospital Eye Clinic or the Tema Christian Eye Centre during the period of the study formed part of the research study.

Exclusion criteria

Persons diagnosed with pediatric glaucoma or angle closure glaucoma were excluded from the study.

3.8 Data collection techniques and tools

The data collection tool for the research study was a structured closed-ended questionnaire. The questionnaire was made up of four main parts that measured the four cost variables of the research study namely: socio–demographic variables, direct costs associated with glaucoma treatment, indirect costs associated with glaucoma treatment and the intangible costs associated with glaucoma treatment.

The questionnaire was interviewer administered. This approach afforded the researcher the opportunity to clarify concepts and any misunderstandings. This approach was helpful in dealing with participants who were not literate. Data was collected with the help of two trained research assistants. The data collection exercise lasted no more than four weeks. Daily meetings were held by Principal Investigator with the Research Assistants to discuss challenges and way forward and also examine completed questionnaires.

3.9 Quality control

Some measures were put in place to ensure complete and accurate data during the pre-data collection stage, the data collection stage and the data entry and data processing stages.

3.9.1 Training of research assistants

For the purpose of the research study, there was a training session for the research assistant who was recruited for the study. The research assistant was a fourth year medical student who had some basic knowledge about the issues under interrogation and was fluent in some of the most common local languages such as Twi, Ga, Fante and Ewe. The

Research Assistant was briefed on all ethical protocols that guided the study and the purpose of the questionnaire.

3.9.2 Pretesting of questionnaire

The questionnaire was pre-tested on glaucoma patients attending the Eye Clinic of the Ridge Hospital in Accra. This was performed by the principal investigator and the trained research assistant. The questionnaire was pretested to prevent ambiguity and other difficulties that the participants may have encountered during the study. The pretesting also assessed the Research Assistant's understanding of the questionnaire to prevent interviewer bias. The questionnaire was revised and modified accordingly.

3.9.3 Data collection stage

Research guidelines were adhered to strictly by the principal investigator and the research assistant. All questionnaires were given special codes which indicated the specific day and the particular facility where the questionnaire was administered. Measures were also put in place to ensure that no study participant as interviewed twice. At the end of every day, meetings were held between the principal investigator and the research assistant to examine completed questionnaires and also to discuss and address challenges encountered. This was to help improve the process of data collection.

3.10 Data entry and processing

Every completed questionnaire was given a unique code and arranged systematically in a file. The coded forms were entered into Epi Info version 7 by the principal investigator promptly as they were received from the field. Double data entry was done to ensure consistency and accuracy of data. The data was cross checked for errors, cleaned and imported into STATA version 13 for analysis.

3.11 Data Analysis

3.11.1 Background characteristics of participants

The background characteristics of the study participants were analyzed using MS Excel 2013 STATA version 13 and the results were presented in a table. The socio-economic status (SES) of study patients was determined using wealth quintile.

3.11.2 Estimation of direct costs

The direct cost was estimated as cost incurred by the study patients in direct relation to glaucoma. It included both medical and non-medical cost as depicted in Tables 1 and 2.

The medical cost consisted of registration fee, consultation fee, cost of medicines/drugs, cost of laboratory/diagnostic tests and cost of surgery. This was computed separately for patients with and without access to the National Health Insurance Scheme (NHIS). Average cost was estimated and reported. The estimation approach is shown in table 1.

Table 1: Estimation of direct medical cost

Type of Costs	Cost estimation approach
Consultation	This was a summation of the cost of registration and consultation of the patients during the study period
Diagnostics	This was a summation of the cost of diagnostics test requested for the patients during the study period
Medication	This was a summation of the cost of medication prescribed for the patients during the study period.
Surgery	This was a summation of the cost of surgery that the patient underwent during the study period.
Total medical	This was a summation of the total cost of consultation, diagnostics, medication and surgery that the patients will incur during the study period.

3.11.3 Estimation of direct non-medical costs

Direct non-medical cost was estimated by summing up travel cost, cost of food and other miscellaneous cost incurred such as cost of phone calls/phone credits as a result of seeking glaucoma care. The estimation approach is shown in Table 2.

Table 2: Estimation of direct non-medical costs

Type of Costs	Cost estimation approach
Travel	This was a summation of all transportation cost that will be incurred by the patient and his/her caregiver for travelling to and from the eye clinic during the study period.
Food	This was a summation of cost that will be incurred by the patient and his/her caregiver on food items including beverages and water during the study period.
Miscellaneous	This was a summation of all cost that will be incurred by the patient on items such as telephone calls, phone credits and other items purchased because of the patient's eye condition during the study period.
Total medical	This was a summation of the total cost of travel, food and miscellaneous expenses that will be incurred by the patient during the study period.

The total direct cost was determined by a summation of all components of medical and non-medical related expenses that was incurred by the patient during the study period.

3.11.4 Total direct cost

This was a summation of estimated direct medical and non-medical cost incurred due to the diabetes illness and its related complications due to comorbidities.

3.11.5 Estimation of indirect costs

Indirect cost was calculated using the human capital approach (HCA), which determines the value of human capital as the present value of the patient's future earnings. This was obtained by multiplying the daily minimum wage rate by the number of workdays lost for the patient, and his/her care giver(s) where applicable. Productivity loss was valued using the 2017 national minimum wage of Ghana (that is GHS8.80 per day).

Table 3: Estimation indirect cost on patient

Category	Cost estimation approach
Productivity loss due to traveling time	This was the total number of hours that was spent by the patient and caregivers who travelled to the facility to seek treatment and from facility to their homes during the study period
Valued productivity loss due to traveling time	This was estimated by multiplying total number of work hours lost by the patient and caregivers travelled to the facility to seek treatment and from facility to their homes during the study period, and the daily minimum wage.
Productivity loss due to waiting times and seeking treatment	This was the total number of hours spent by the patient and caregivers waiting and seeking treatment at the glaucoma clinic during the study period
Valued productivity loss due to waiting times	This was estimated by multiplying total number of work hours lost by the patient and caregivers waiting and seeking treatment at the glaucoma clinic during the study period.
Total Indirect cost	This was the overall aggregation of the total valued productivity loss due to traveling time, waiting times and seeking treatment.

3.11.6 Economic Cost

The economic burden of glaucoma on the patient was estimated by adding the total direct cost and total indirect cost. The average cost per patient was determined by dividing the overall cost by the number of glaucoma patients sampled.

3.11.7 Determination of intangible costs

A five dimension Likert scale was used, in which glaucoma patients were asked to rate statements under each dimension as (1) 'Not at all' (2) 'A little' (3) 'Moderately' (4) 'Quite a bit' (5) 'Extremely' in respect of fear, emotional suffering, social isolation and depression. The Likert scale responses were scored under each domain of intangible cost. A mean score of the responses for each dimension was estimated for the patients.

An intangible score boundary was obtained by adding all the minimum scores and the maximum scores in the domains giving a score range of 16-80. This range was reclassified into low, moderate and high intangible cost with the corresponding ranges using tertile statistic approach as shown in Table 4. Chi-square test or Fisher's Exact test was used to test for statistical association between intangible cost and sex, educational levels and age. Further statistical analysis was done to test relationships between intangible scores for each domains and patients demographics using Kruskal-Walis test and Wilcoxon Rank Sum test. The results were presented in charts, tables and figures.

Table 4: Composite intangible score ranges

Score	Dimension	Range limits
Composite Scores	Low	16 – 37
	Moderate	38 – 58
	High	59 - 80

3.11.8 Sensitivity Analysis

To determine the robustness of the cost estimates, sensitivity analysis was performed on cost components which lacked certainty. This was done by varying the medication cost and the wage rate by 3%, 5% and 10% respectively. The result was presented in a summary table.

3.12 Assumptions

The assumption that was made in this study is that the national minimum wage for the Country is reflective of the average income earned per day by the respondent.

3.13 Ethical considerations

The following procedures were observed during the study.

3.13.1 Ethical clearance

Ethical clearance for the study was obtained from Ghana Health Service Ethical Review Committee of the research department of the Ghana Health Service (ERC Approval No 130/02/2017).

3.13.2 Permission

Permission was obtained from the Medical Superintendent of the Tema General Hospital and Director of the Tema Christian Eye Centre before the research was conducted.

3.13.3 Informed consent

All study participants were required to provide informed consent before they were included in the study. The information required for the participants consent were duly read and explained to them. Participants gave their informed consent either by signing or thumb printing printed consent forms. Participants in the study were informed that their

participation was entirely voluntary. All participants were made aware of the right to withdraw from the study at any time without it affecting their ability to access eye care at the facility in the future. A written consent was sought from all participants prior to data collection.

3.13.4 Confidentiality / Privacy

All information provided by the research participants during the entire study shall remain confidential. The study was conducted in a manner that ensured the privacy of all participants.

3.13.5 Anonymity

All participants who give consent were assured of anonymity. No name was be written on the questionnaire ensuring that the privacy of the participants were respected. The data obtained was analyzed solely for the objective of the study. The data was be analyzed in such a manner that the anonymity of all respondents were ensured.

3.13.6 Voluntary withdrawal

All research participants were duly informed about their right to decline participation in the study and also withdraw from the study anytime they so wished. Participants were assured that their decision to refuse to be part of the study or to withdraw from the study shall in no way affect healthcare delivered to them at the facility nor have any future consequences.

3.13.7 Potential risk and benefits of the study

The research study posed no foreseeable risks or harm to the research participants. The study did not harm participants either physically or psychologically. Study participants

were not threatened. The research study when complete may positive consequences for healthcare delivery in Ghana and glaucoma patients in particular.

3.13.8 Conflict of Interest

I have no competing interest in the study.

3.13.9 Compensation

There was no form of compensation for study participants

3.13.10 Funding Information

There was no external funding for the research study. The entire cost of the research study was borne by the researcher.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the results of the study. Data from a total of 180 respondents were analyzed. Results were presented based on the responses of the participants and are illustrated in tables and figures.

4.2 Socio-demographic ccharacteristics of rrespondents

The study response rate was 100%. A total of 92 male and 88 female respondents participated in the study representing 51.1% and 48.9% respectively (see Table 5). Respondents from the private facility constituted 50 males and 48 females representing 51.0% and 49.0% respectively. Out of the 82 respondents from the public facility, male respondents were 42 whereas female respondents were 40 representing 51.2% and 49.8% respectively.

The highest age of the respondents was 93 years whilst the youngest age was 18 years. About 8.9% of the respondents were below 40 years, 35 % were between 40 years and 60 years whereas the remaining 71.7% of the respondents were above 60 years. The mean age of the respondents was 59(SD:16.2). At the private facility, 7.1% of the respondents were below 40 years, 13.3% were between 40 and 60 years whilst the 79.6% of the 98 respondents were above 60 years. Out of the 82 participants from the public facility, 11% were below 40 years, 26.8% were between 40 and 60 years and the remaining 62.2% were above 60 years. About 71.1% of the total respondents of 192 were above 60 years. This represents more than two thirds of the respondents.

The employment status of the respondents showed that about 75% of the respondents in all the facilities were employed, 14% were unemployed, 8% were students/apprentices whilst 46.1% were retired. About 36% of the respondents from the private facility were employed, 6.1% were unemployed, 3.1% were students or apprentices whilst 55.1% were retired. At the public facility, employed respondents represented 48.8%, unemployed respondents were 9.7%, students/apprentice represented 6.1% percent whilst retirees represented 35.4% of the respondents.

About 68.3% of the respondents from all the facilities were married, 6.1% were single, 20.6% were widowed, and divorced/separated persons represented 5.0% of the respondents. At the private facility, 67.3% of the respondents were married, 3.1% were single, 24.5% were widowed, whilst 5.1% were divorced or separated. 69.5% of respondents from the public facility were married, 9.7% were single. Widowed respondents represented 15.9%, whereas divorced or separated respondents represented 4.9%.

About 60% of all the respondents from both facilities' had monthly incomes that were less than GHC 500. About 25.6% of the respondents had a monthly income between GHS500 and GHS 1000 and 11.7% of the respondents has a monthly income of more than GHS 1000. The mean income for all the respondents in both facilities was GHS 496.89. From the private facility, 63.2% of the respondents received an income less than GHS 500 monthly,24.5% received between GHS 500 and GHS 1000 whilst , 9.2% received a monthly income more than GHS1000 whereas. The monthly income for respondents from the public facility are as follows, 56.1% of the respondents received less than GHS 500, 26.8% received between GHS500 and GHS 1000 and 14.6% received more than GHS1000. Non response rate at the public facility was 2.4%. The mean income for the

respondents in all facilities was GHS 496.89. Out of the total number of 180 respondents, 90.6% of them were registered under the NHIS.

Table 5: Socio-demographic Characteristics of Respondents

Characteristics	Private HF N (%)	Public HF N (%)	All facilities N (%)
Sex			
Male	50 (51.0)	42 (51.2)	92 (51.1)
Female	48 (49.0)	40 (49.8)	88 (48.9)
Age			
<40	7(7.1)	9(11.0)	16(8.9)
40-60	13(13.3)	22(26.8)	35(19.4)
>60	78(79.6)	51(62.2%)	129(71.7)
Mean (SD)			58.8(16.2)
Marital status			
Married	66(67.3)	57(69.5)	123(68.3)
Single	3(3.1)	8(9.7)	11(6.1)
Widowed	24(24.5)	13(15.9)	37(20.6)
Divorced/Separated	5(5.1)	4(4.9)	9(5.0)
Educational Level			
No Education	15(15.3)	14(17.1)	29(16.1)
Primary/JSS	23(23.5)	27(32.9)	50(27.8)
Secondary	35(35.7)	15(18.3)	50(27.8)
Tertiary	25(25.5)	26(31.7)	51(28.3)
Employment status			
Employed	35(35.7)	40(48.8)	75(41.7)
Unemployed	6(6.1)	8(9.7)	14(7.8)
Student/apprentice	3(3.1)	5(6.1)	8(4.4)
Retired	54(55.1)	29(35.4)	83(46.1)
Income(GHS)			
<500	62(63.2)	46(56.1)	108(60.0)
500-1000	24(24.5)	22(26.8)	46(25.6)
>1000	9(9.2)	12(14.6)	21(11.7)
Non Response	3(3.1)	2(2.4)	5(2.7)
Mean (SD)			496.89(737.80)
NHIS Beneficiary			
Yes	88(89.8)	75(91.5)	163(90.6)
No	10(10.2)	7(8.5)	17(9.4)

4.3 Direct Cost

The total direct cost was GHS 42,976.90. As shown in Table 6, this represented 93.65% of the cost profile in all facilities with an average of GHS238.76(95%CI). The total direct cost profile at the private facility was approximately the same as the public facility (94%).This was probably due to the fact that the types of drugs (the main cost driver) prescribed in both facilities were not very different, hence the similarity in the cost of medication in both facilities. Medical costs contributed significantly to the direct cost with an average cost of GHS205.58(95% CI). Medicines alone contributed an average amount of GHS112.38(95% CI) to the average medical cost.

4.3.1 Medical Cost

The total direct medical cost was GHS 37,004.50 representing about 80% of the total cost (see Table 6). Medicines constituted the highest percentage of the direct medical cost with an amount of GHS 20,227.50 representing 44% of the total cost. At the private facility, cost of medicines constituted about 44% of total cost with an average cost of GHS107.70 (95%CI) whilst it constituted 44% of total cost with a comparable average cost of GHS 117.96 in the public facility. The average direct medical cost for the private and public facility were GHS192.60 (95%CI) and GHS221.10 (95%CI) representing 78.8% and 82.7% of total cost profiles respectively. In all facilities, medicines represented 44% of the total cost with an average cost of GHS112.38 (95% CI) per patient monthly. Laboratory/Diagnostics followed the cost of medicines in all facilities with an average cost of GHS 89.06 (95%CI) representing 23.3% of the cost profile. The laboratory/Diagnostics included routine diagnostic test for glaucoma such as visual field test (VFT) and Optical Coherence Tomography (OCT). Overall, medicines took a chunk of the direct medical cost with more than half of the direct medical cost being attributed to medications.

4.3.2 Non- medical cost

Table 6 shows that the total direct non-medical cost was GHS5 5,972.40 representing 13.01 % of the cost profile with an average of GHS 33.18 (95%CI) in all facilities. Cost of travel made up the bulk of the direct non-medical cost representing 11.4% of the cost profile. At the private facility, cost of travel was 13.32% of the cost profile with an average cost of GHS32.57 (95%CI) whereas at the public facility it was 9.34 % with an average cost of GHS9.34. Thus, there was a wide difference between the average costs of travel at the private compared to the public facilities.

4.4 Indirect Cost

Indirect cost contributed about 6% to the total cost (GHS 2912.38) of glaucoma with an average cost of GHS15.58 (0.75-30.41) and 16.89(0-41.21) in the private and public facility respectively.

The cost profiles were comparable in the private and public facility with 6.4%% and 6% respectively. Caregivers valued time lost was the highest contributor to the indirect cost followed by the patients valued time lost due to seeking glaucoma care. At the private facilities, patient valued time lost represented 1.5% of the cost profile whereas in the public facility, the patient's valued time lost was 3% of the cost profile. Thus patients in the public facility lost twice the time lost by patients in the private facility. Caregivers' valued time lost represented 4.9% of the cost profile as compared to 3.8% in the private facility.

Table 6: Total cost of glaucoma care by facility

Cost component	Private facility (CEC)			Public facility (TGH)		
	Cost	Mean (95% CI)	Cost Profile	Cost	Mean (95% CI)	Cost Profile
	GHS	GHS	(%)	GHS	GHS	(%)
Direct Cost						
Medical Cost						
Registration/Consultation	2,005.00	20.46 (18.42-22.49)	8.4	2,085.00	25.43(22.08-28.78)	9.5
Laboratory/diagnostics	4,315.00	65.38(30.84-99.92)	18.0	6,372.00	118.00(25.54-210.46)	29.1
Medicines	10,554.50	107.70 (33.18-182.22)	44.0	9,673.00	117.96 (18.76 – 217.16)	44.1
Surgery	2,000.00	1,000.00 (1,000-1,000)	8.3	0.00	0.00	0.0
Sub-total	18,874.50	192.60(2.20-383.18)	78.8	18,130.00	221.10(79.76-362.44)	82.7
Non-medical cost						
Travel	3,192.00	32.57 (6.88-58.26)	13.3	2,048.40	24.98 (2.41-47.55)	9.3
Food	215.00	10.24 (0 – 22.39)	0.9	224.00	7.47 (1.11 – 13.83)	1.0
Drinks/water	83.00	3.46 (0 – 7.00)	0.3	86.00	2.61 (0.49 – 4.73)	0.4
Miscellaneous	71.00	3.23 (0.37 - 6.09)	0.3	53.00	2.30(0.75 -3.85)	0.2
Sub-total	3,561.00	36.34 (5.05-67.66)	14.9	2,411.40	29.41(3.14-55.68)	11.0
Total direct cost	22,435.50	228.93 (28.06 - 429.80)	93.6	20,541.40	250.50 (97.14 – 403.86)	93.7
Indirect Cost						
Patients' valued lost time	364.43	3.72(0.57-6.87)	1.5	665.76	8.12(2.75-13.49)	3.0
Caregivers' valued lost time	1,162.79	11.87(0 -26.27)	4.9	719.40	8.77(0-30.80)	3.3
Total Indirect Cost	1,527.22	15.58 (0.75-30.41)	6.4	1,385.16	16.89(0-41.21)	6.3
TOTAL COST	**23,962.72**	**244.52 (39.74 – 449.30)**	**100.0**	**21,926.56**	**267.40 (109.00 – 425.80)**	**100.0**

*US$1.00 is equivalent to GHS4.36 (Bank of Ghana average monthly interbank exchange rate for June, 2017)

**National minimum wage of GHS8.8 per day was used to value loss productivity (Ministry of Finance, June, 2017)

Table 7: Total cost of glaucoma care

Cost component	Total Cost (GHS)	Total Cost (USD)*	Mean (95% CI)) (GHS)	Cost Profile (%)
Direct Cost				
Medical Cost				
Registration/Consultation	4,090.00	938.07	22.72(19.05-26.39)	8.9
Laboratory/diagnostics	10,687.00	2451.15	89.06(17.29-160.83)	23.3
Medicines	20,227.50	4639.33	112.38 (25.84 -198.92)	44.1
Surgery	2,000.00	458.72	1,000.00 (1,000 -1,000)	4.4
Sub-total	**37,004.50**	**8487.27**	**205.58 (35.51-376.31)**	**80.6**
Non-medical cost				
Travel	5,240.40	1201.93	29.11 (4.57-53.65)	11.4
Food	439.00	100.69	8.61 (0 – 17.79)	1.0
Drinks/water	169.00	38.76	2.96 (0.15 – 5.77)	0.4
Miscellaneous	124.00	28.44	2.76 (0.45 – 5.07)	0.3
Sub-total	**5,972.40**	**1369.82**	**33.18 (3.94-62.42)**	13.0
Total direct cost	**42,976.90**	**9857.09**	**238.76 (58.14 -419.38)**	93.7
Indirect Cost**				
Patients' valued lost time	1,030.19	236.28	5.72(0.90 -10.54)	2.2
Caregivers' valued lost time	1,882.19	431.69	10.46(0-28.79)	4.1
Total indirect cost	**2,912.38**	667.98	**16.18(0-35.86)**	**6.3**
Total Cost	**45,889.28**	**10525.06**	**254.94 (69.98 -439.90)**	**100.0**

*US$1.00 is equivalent to GHS4.36 (Bank of Ghana average monthly interbank exchange rate for June, 2017)

**National minimum wage of GHS8.8 per day was used to value loss productivity (Ministry of Finance, June, 2017)

4.4.1 Distribution of time lost

Average time lost by patients in the public facility was 2.46 hours as compared to the patients in the private facility who lost an average of 0.98 hours whilst seeking glaucoma care (see Table 70. Whilst average waiting time was 4.78 hours in the public facility, it was only 0.69 hours in the private facility. The caregivers time lost was mostly attributed to work absenteeism time lost (82.6%) of the total time lost.

Table 8: Distribution of time lost by facility

Category	Private (CEC)			Public (TGH)		
	Total hours lost	Average time lost	Percentage time lost	Total time lost	Average time lost	Percentage time lost
Patients						
Work absenteeism time lost	56	0.57	19.38	96	1.17	15.89
Travelling time lost	165	1.68	57.09	116	1.41	19.21
Waiting time lost	68	0.69	23.53	392	4.78	64.90
Total	289	0.98	100.00	604	2.46	100.00
Caregivers						
Work absenteeism time lost	944	24.2	89.31	528	29.3	82.63
Travelling time lost	61	3.1	5.77	18	0.5	2.82
Waiting time lost	52	1.3	4.92	93	5.8	14.55
Total	**1057**	**9.0**	**100.00**	**639**	**9.5**	**100.00**

*National minimum wage of GHS8.8 per day was used to value loss productivity (Ministry of Finance, June, 2017)

4.5 Total cost of glaucoma on patients

As shown in Table 8, the total cost of managing glaucoma for all facilities was GHS45,889.28 (USD10,525.06) for a period of one month. This translated into an average monthly cost of GHS254.94 (USD58.47) per person. Direct cost represented 93.7% of the total cost whereas indirect cost constituted the remaining 6.3% of the total cost.

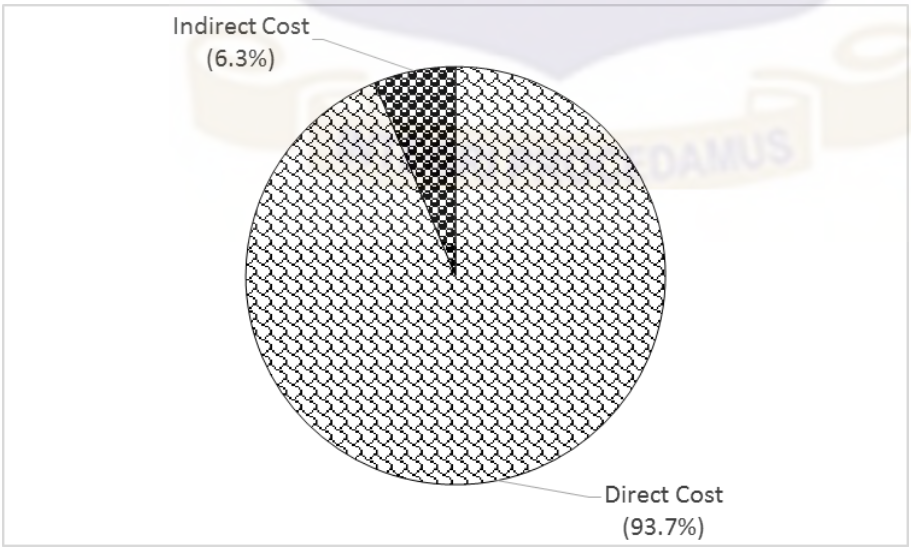


Figure 3: Distribution of total cost of glaucoma care

4.5.1 Cost burden glaucoma by wealth quintile

The respondents in the poorest wealth quintile with a mean income of GHS207.43 (USD 47.58) every month spent almost all (96.7%) of their total monthly income on seeking glaucoma care even though they had the lowest average cost of GHS200.63 (see Table 9). Those in the middle wealth quintile expended about 38.9% of their income on glaucoma care whereas the respondents in the richest quintile spent about 11.1% of their income on seeking glaucoma care. Thus, respondents in the poorest wealth quintile suffered the greatest cost burden whilst those in the richest wealth quintile suffered the least cost burden. Respondents in the richer wealth quintile incurred the highest cost (GHS322.35) for seeking glaucoma care.

Table 9: Cost burden by wealth quintile

Quintile	Mean income	Mean cost (GHS)	Mean cost (USD)*	Proportion of cost burden to income
Poorest	207.43	200.63	46.02	96.7
Poorer	465.00	264.82	60.74	57.0
Middle	702.27	273.23	62.67	38.9
Richer	1010.71	322.35	73.93	31.9
Richest	2300.00	256.16	58.75	11.1

*US$1.00 is equivalent to GHS4.36 (Bank of Ghana average monthly interbank exchange rate for June, 2017)

4.4.2 Cost burden by duration of glaucoma

Patients who had been on glaucoma treatment for more than five years incurred the highest average cost GHS270.37 (USD 62.01) per month as compared to patients who had been on treatment for less than five years.

Table 10: Mean cost by duration of glaucoma care

Duration of treatment (years)	N	Total cost (GHS)	Total cost (USD)*	Mean cost (SD) (GHS)
<1	51	11,185.61	2565.51	219.33(115.16)
1 - 5	63	16,859.44	3866.84	267.61(227.50)
>5	66	17,844.22	4092.71	270.37(182.35)
Total	**180**	**45,889.28**	10525.06	**254.94(184.96)**

US$1.00 is equivalent to GHS4.36 (Bank of Ghana average monthly interbank exchange rate for June, 2017)

4.5.3 Relationship between cost and background characteristics

There was a statistically significant difference between the means of total cost and educational level ($p<0.05$) and total cost and monthly income ($p<0.05$).

Table 11: Relationship between cost and background characteristics

Characteristic	Direct Cost		Indirect Cost		Total Cost	
	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value
Sex*						
Male	239.9(167.0)	0.67	14.7(20.2)	0.08	254.6(170.2)	0.75
Female	237.6(194.8)		17.7(19.1)		255.3(200.2)	
Age**						
< 40	229.3(96.8)	0.15	7.0(5.5)	<0.01	236.2(98.7)	0.07
40-60	190.3(100.5)		7.3(8.0)		197.6(101.6)	
>60	253.1(202.4)		19.7(21.8)		272.8(206.6)	
Marital Status**						
Married	228.1(154.2)	0.25	12.7(16.3)	<0.01	240.7(158.4)	0.08
Single	177.0(73.1)		10.0(10.3)		187.0(71.5)	
Widowed	293.8(265.6)		28.9(26.3)		322.7(268.8)	
Divorced/Separated	233.8(144.6)		19.6(19.0)		253.4(143.6)	
Educational Level**						
No education	239.4(149.8)	<0.05	17.9(14.6)	0.27	257.3(150.6)	<0.05
Primary/JSS	193.7(104.7)		20.5(28.9)		214.2(115.1)	
Secondary	230.8(224.4)		14.2(15.0)		245.1(228.8)	
Tertiary	290.3(198.3)		12.9(14.0)		203.3(203.3)	
Employment Status**						
Employed	233.3(118.5)	0.16	9.9(16.0)	<0.01	243.2(122.3)	0.07
Unemployed	154.9(72.7)		9.8(10.7)		164.6(75.6)	
Student/apprentice	200.0(102.1)		9.5(12.3)		209.5(99.7)	
Retired	261.6(234.3)		23.6(21.9)		285.2(238.3)	
Monthly income(GHS)						
<500	219.4(179.6)	<0.05	19.4(22.8)	0.01	238.8(184.8)	<0.05
500-1000	271.8(141.2)		12.8(13.5)		284.6(146.1)	
> 1000	246.1(97.9)		7.0(7.4)		253.2(99.7)	
Length of treatment (Years) **						
<1	208.6(114.5)	0.36	10.7(10.8)	0.18	219.3(115.2)	0.23
1-5	249.9(222.4)		17.7(20.7)		267.6(227.5)	
>5	251.4(177.7)		18.9(23.1)		270.4(182.3)	

*Wilcoxon Rank Sum test used to determine statistical significance in mean difference
** Kruskal-Wallis test used to determine statistical significance in mean difference

4.6 Sensitivity analysis

The components on which the sensitivity tests were done were the wage rate and the cost of medication. Both one –way and two- way sensitivity tests were carried out. These tests were performed by varying the wage rate and by varying the cost of medication by 3%, 5% and 7% respectively.

Table 12: Sensitivity analysis of total cost of glaucoma

Scenario	Cost component	Percentage change in parameter	Total cost		Percentage change in total cost	Proportion of total cost		Percentage change in proportions of cost	
			GHS	USD*		Direct	Indirect	Direct	Indirect
Base scenario		0	23,962.72	5,496.04	0.0	93.6	6.4	0	0
Variation (One-way Sensitivity Analysis)	Medication	3	24,279.36	5,568.66	1.3	93.7	6.3	0.1	-0.1
		5	24,490.45	5,617.07	2.2	93.8	6.2	0.1	-0.1
		7	24,701.54	5,665.49	3.1	93.8	6.2	0.2	-0.2
Variation (One-way Sensitivity Analysis)	Wage rate**	3	24,008.54	5,506.55	0.2	93.4	6.6	-0.2	0.2
		5	24,039.08	5,513.55	0.3	93.3	6.7	-0.3	0.3
		7	24,069.63	5,520.56	0.4	93.2	6.8	-0.4	0.4
Multi-variation (Multi-way Sensitivity Analysis)	Medication and Wage rate	3	24,325.17	5,579.17	1.5	93.5	6.5	-0.1	0.1
		5	24,566.81	5,634.59	2.5	93.5	6.5	-0.2	0.2
		7	24,808.44	5,690.01	3.5	93.4	6.6	-0.2	0.2

*US$1.00 is equivalent to GHS4.36 (Bank of Ghana average monthly interbank exchange rate for June, 2017)
**National minimum wage of GHS8.8 per day was used to value loss productivity (Ministry of Finance, June, 2017)

Table 12 shows that one-way SA conducted by varying the cost of medication by 3%, 5% and 7% yielded respectively 1.3%, 2.2% and 3.1% increases in total cost. Conversely, same analysis conducted on wage rate yielded percentage same analysis conducted on wage rate percentage

yielded increases of 0.2, 0.3 and 0.4 respectively in total cost. Furthermore, whereas 3%, 5% and 7% variations in medication respectively resulted in 0.1, 0.1 and 0.2 percentage gain in direct cost with respect to total cost. Same level of variations in wage rate respectively resulted in 0.2, 0.3 and 0.4 percentage increases in indirect cost. Furthermore, concurrent variations in both medication and wage rate by 3%, 5% and 7% resulted in a percentage fall in direct cost in proportions to total treatment cost and thus a percentage rise in indirect cost in proportions to total treatment cost. However, overall there was 1.5%, 2.6% and 3.5% increases in total treatment cost respectively. The results of the sensitivity analysis showed that the cost estimates of this study were sensitive to changes in wage and medicine cost variables.

4.7 Intangible burden of glaucoma

Emotional pain was the major driver for the intangible score followed by fear (see Figure 4). Depression was the least scored domain.

Respondents at the public facility experienced high levels of fear and emotional pain (i.e.18.3% and 28% respectively) as compared to the respondents in the private facility (28% and 16.3% respectively). The trend was the same for social isolation and depression where respondents at the public facilities suffered a greater burden (12.1% and 5.1%) than their private counterparts (6.1% and 2% respectively).

For the total intangible score, 4.4% of the respondents in the private facility had a high intangible score, 38.0 % had a moderate intangible score and 57.6% of the respondents had a low intangible score. However, at the public facility, 6.8% of the respondents had a high intangible score, 37.5% had a moderate intangible score and 55.7% had a low intangible score.

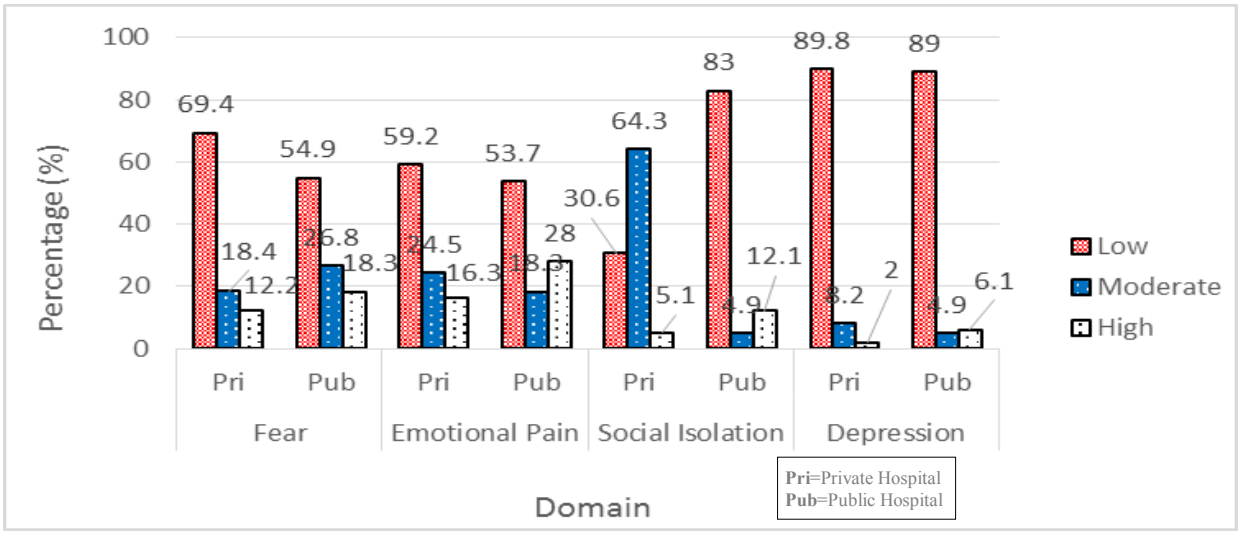


Figure 4: Intangible burden by domain and facility

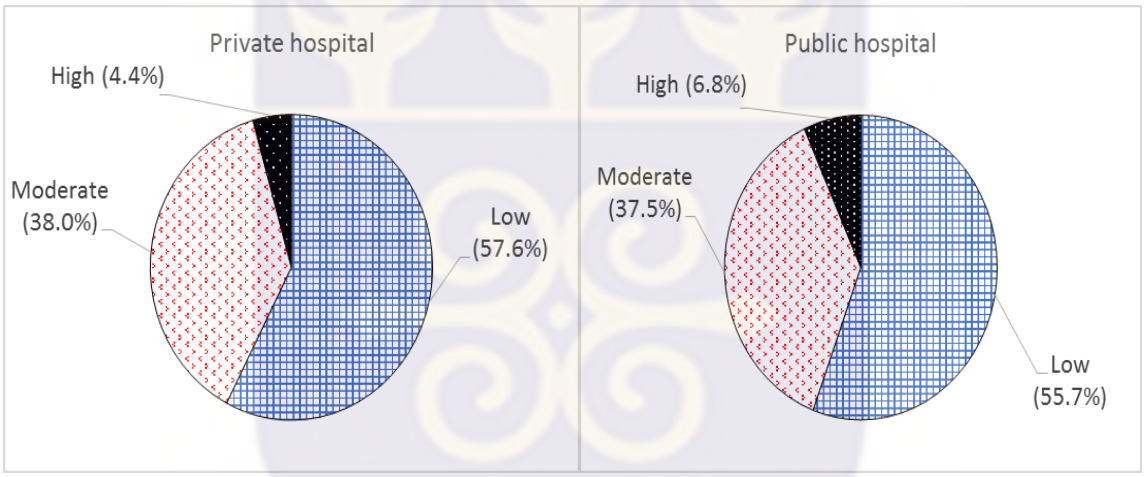


Figure 5: Distribution of total intangible cost by facility

Overall, more patients in the public hospital (6.1%) suffer high intangible burden compared to those in the private hospital (2.0%). However, considering all the facilities together, a larger percentage of patients (70.6) endured lower intangible burden of glaucoma.

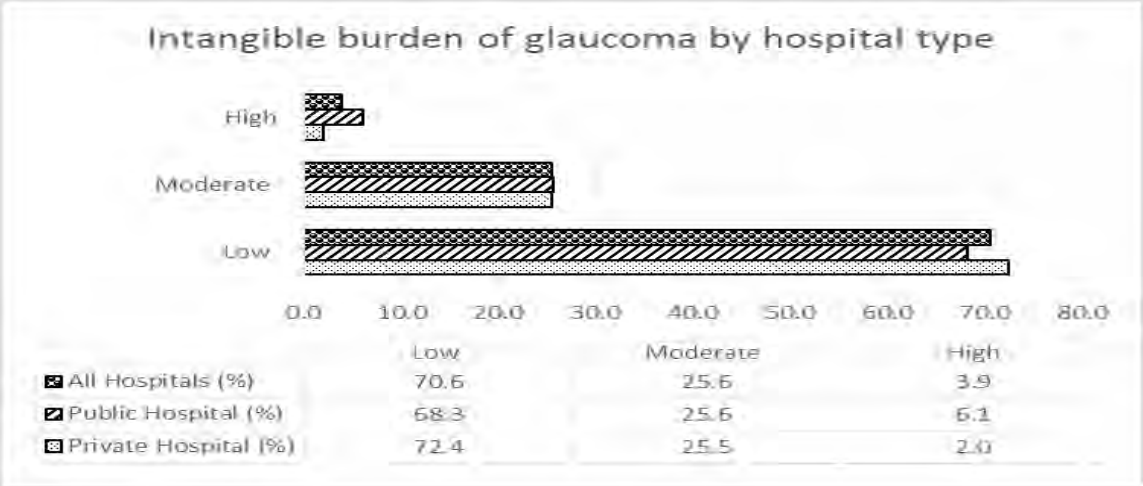


Figure 6: Intangible burden of glaucoma by hospital type

4.7.1 Relationship between intangible burden and background characteristics.

As shown in Table 13, in the total sample, average fear levels between the different age groups were significantly different ($p<0.01$), average fear levels and marital status ($p<0.01$), average fear levels and employment status ($p<0.01$) and average fear levels and monthly income ($p<0.01$) were all significantly different among the respective categories. There was a significant difference between average levels of social isolation and all of the background characteristics except sex. That is, social isolation and age ($p<0.01$), social isolation and marital status ($p<0.01$), social isolation and educational level ($p<0.05$), social isolation and monthly income ($p<0.01$) and finally, social isolation and length of glaucoma treatment ($p<0.01$).

There was a significant difference between average levels of emotional pain and educational level of participants ($p<0.05$), average levels of emotional pain and employment status ($p<0.05$), and then average levels of emotional pain and length of glaucoma treatment ($p<0.01$). Further, there was a significant difference between average levels of depression and the various educational level of participants ($p<0.01$), average

levels of depression and monthly income ($p<0.01$), and also average levels of depression and the length of glaucoma treatment ($p<0.05$).

However, for the total intangible burden, the only significant mean difference was with educational level ($p<0.05$).

Table 13: Relationship between intangible burden and background characteristics

Characteristic	Fear		Social Isolation		Emotional Pain		Depression		Total Intangible burden	
	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value
Sex*										
Male	8.8 (4.9)	0.24	8.4(2.2)	0.98	7.3(3.2)	0.37	7.9(4.0)	0.60	32.4(10.7)	0.99
Female	7.8 (4.2)		8.2(1.8)		8.0(4.1)		8.2(4.2)		32.2(10.8)	
Age**										
< 40	9.3 (4.9)	<0.01	7.4(1.9)	<0.01	7.0(2.3)	0.75	6.8(2.5)	0.46	30.5(9.2)	0.74
40-60	10.7 (4.7)		7.0(0.9)		7.1(3.0)		7.4(3.0)		32.2(8.6)	
>60	7.6 (4.3)		8.8(2.0)		7.8(4.0)		8.3(4.5)		32.5(11.4)	
Marital Status**										
Married	9.1(4.7)	<0.01	8.0(1.8)	<0.01	7.6(3.6)	0.78	7.8(3.5)	0.78	32.5(10.4)	0.82
Single	8.2(5.1)		7.5(1.6)		7.2(3.90		7.8(5.5)		30.7(13.3)	
Widowed	6.1(3.4)		9.7(2.3)		8.1(4.20		8.8(5.3)		32.6(11.4)	
Divorced/Separated	7.0(4.38)		8.3(1.6)		6.6(2.90		8.7(4.7)		30.6(10.1)	
Educational Level**										
No education	8.8(4.8)	0.62	8.8(2.1)	<0.05	8.0(3.8)	<0.05	9.6(4.5)	<0.01	35.2(11.4)	<0.05
Primary/JSS	9.1(5.0)		8.8(2.2)		9.0(4.4)		9.9(5.4)		36.7(13.6)	
Secondary	7.9(4.7)		8.0(2.0)		7.1(3.3)		7.4(2.8)		30.4 (8.5)	
Tertiary	7.8(3.9)		7.9(1.6)		6.6(2.8)		5.8(1.5)		28.1(6.5)	
Employment Status**										
Employed	10.4(4.9)	<0.01	7.3(1.4)	<0.01	7.1(3.2)	<0.05	7.2(2.7)	0.12	32.0(9.9)	0.13
Unemployed	6.8(4.6)		7.5(0.9)		7.0(4.0)		7.8(3.5)		29.1(9.2)	
Student/apprentice	6.0(2.9)		8.1(2.2)		5.4(2.5)		7.0(4.9)		26.5(9.5)	
Retired	6.9(3.7)		9.4(2.0)		8.4(4.0)		8.9(4.9)		33.6(11.6)	
Monthly income(GHS)										
<500	7.4(4.2)	<0.01	8.6(1.9)	<0.01	8.0(4.1)	0.18	8.8(4.7)	<0.01	32.8(11.7)	0.27

Characteristic	Fear		Social Isolation		Emotional Pain		Depression		Total Intangible burden	
	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value
500-1000	10.0(4.8)		8.3(2.4)		7.5(3.1)		7.4(2.7)		33.1(9.7)	
> 1000	9.6(4.6)		7.0(1.3)		6.2(2.3)		5.6(1.6)		28.5(7.1)	
Length of treatment (Years) **										
<1	8.5(4.6)	0.60	7.4(1.1)	<0.01	6.3(3.1)	<0.01	6.9(3.0)	<0.05	29.1(8.9)	0.06
1-5	8.7(4.9)		8.7(2.3)		7.8(3.6)		8.4(4.3)		33.7(12.1)	
>5	7.9(4.3)		8.6(2.0)		8.4(4.0)		8.5(4.5)		33.4(10.3)	

*Wilcoxon Rank Sum test used to determine statistical significance in mean difference

** Kruskal-Wallis test used to determine statistical significance in mean difference

CHAPTER FIVE

DISCUSSION

This study was inspired by the fact that only few studies have been done to estimate the cost of seeking glaucoma care in Ghana even though Ghana ranks second worldwide in the prevalence of glaucoma (Wittenborn & Rein, 2011). There is little empirical evidence on the cost borne by patients in the management of glaucoma in Africa including Ghana. This study was therefore conducted to assess the economic burden of glaucoma from the perspective of the patient. Notable findings of the study are discussed.

Males represented 51.1% (n=92) of the respondents whereas females represented the remaining 48.9% (n=88). Glaucoma patients who were over 60 years old constituted 58.8% (n=129) of the respondents. About 91% (n=163) were registered under the NHIS. Study patients mean monthly income was GHS496.89 (USD113.97).

The total cost of seeking glaucoma care from the perspective of the patient was estimated to be GHS45,889.28 (USD 10,525.06) with an average cost of GHS254.94(USD 58.47) per patient. The direct cost constituted 93.7% of the cost profile whilst the indirect cost represented 6.3% of the cost profile. Medical cost constituted 86.1% of the direct cost whereas non- medical cost constituted 13.9% of the direct cost. For the intangible burden, a greater percentage of the respondents experienced high levels of social isolation and fear of blindness whereas depression was generally low among the study participants.

5.1 Direct cost of glaucoma

Total medical cost was GHS37,004.50 (USD 8,487.27) which translated to an average of GHS205.58(USD 47.15) per patient every month. This represents 80.6% of the cost profile. Thus, the average medical cost of glaucoma is estimated to be USD 565.8 per patient every year. This is slightly higher than the finding by Ocansey et al (2016) which

estimated the management of POAG in Ghana to be USD484 per annum. The difference may be due to the difference in sample size and location.

The findings of this study indicates that the cost of medicines constituted more than half (54.7%) of the direct cost. A global study also found that medication costs ranged from 42% to 56% of direct costs at each disease stage of glaucoma with an increase in cost as the disease progressed The average cost of medicines was estimated in this study was GHS112.38 (USD 25.78) for every patient per month, this was considerable lower than the findings in Nigeria which estimated the average cost of medications to be USD 40 per month for each patient (Adio & Onua, 2012). The cost difference may be attributed to the considerably higher cost of living in Nigeria as compared to Ghana and thus, the difference in context.

The direct medical cost was comparable in both the private and public facilities. This may be attributed to the fact that the treatment guidelines in both public and private facilities are the same. Also the same kind of diagnostic test are required irrespective of whether one attends a public or private facility. Hence, patients in both facilities will eventually pay similar amounts for their cost of managing glaucoma since most of the glaucoma medication are not covered under NHIS (Koffuor & Amoateng, 2012). Timolol, which is the cheapest and most frequently used drug for glaucoma in this study, was not provided to patients who were insured even though it was covered by the NHIS. Hence patients had to pay for their drugs out of pocket whether or not they were registered under the NHIS. Also, consultation fees in both facilities were similar with the private facility charging a lower consultation fee than the private facility. The NHIS however paid for the consultation and registration fees for patients who attended the public facility.

The total direct non-medical cost was GHS5 5,972.40(USD 1,369.8) representing about 13 % of the total cost profile with an average of GHS 33.18(USD 7.61) for patients in all facilities. Like Adio and Onua, cost of travel made up the bulk of the direct non-medical cost (Adio & Onua, 2012). However, whereas the cost of travel in this study was estimated to be GHC 29.11(USD 6.67) per month, that of (Adio & Onua, 2012) was USD16.7 per visit. These cost differences may in the two studies may be attributed to contextual differences.

5.2 Indirect cost

Out of a total cost of GHS 2912.38 (USD 667.98) constituting the indirect cost, 64.6% represented care givers time lost. This could be attributed to the fact that about 71.7 % of the respondents were over 60 years old(n=129) and retired so they did not report any days lost from work apart from the time travelling to and from the facility and the time waiting to be attended to at the facility. Most of the patients in that age group came to the facility with caregivers. This is similar to the finding in the global study by Varma et al which suggested that late disease leads to greater indirect costs e.g. family/home help and rehabilitation costs (Varma et al., 2011).

The waiting times in the public facility was significantly higher than that in the private facility hence respondents in the public facility lost more valued hours due to waiting. This confirms a study by Atinga et al. (2011) that found that there are generally long patient waiting times in public health facilities as compared to their private health facilities

5.3 Total cost of glaucoma care

In this study, the total cost of managing glaucoma from the perspective of the patient for all facilities was GHS45,889.28 (USD 10,525.06) for a period of one month. The average

cost was GHS254.94 (USD 58.47) per person every month. Direct cost represented 93.7% of the total cost whereas indirect cost took up the remaining 6.3% of the total cost.

This finding was quite different from the findings of a similar study conducted by Adio and Onua (2012). They reported that an average of USD105.4 was spent by each patient per month. This is about half the average found in this study. The difference may be attributed to the different context of the two studies such as study duration.

This study also revealed that patients in the poorest wealth quintile with an average income of GHC200.63 (USD46.01) spent about 97.7% of their income treating glaucoma. It is worth mentioning that patients in the poorest wealth quintile of this study earn higher than the current minimum wage in Ghana (i.e. GHS8.8 per day). This implies that persons who earn the minimum wage or lower will spend all their income on glaucoma care. This is really a disturbing situation since it will inevitably lead to high levels of non-compliance and hence the unavoidable consequence of glaucoma such as blindness. This finding is similar to a study by Adio and Onua (2012) who reported that low-income earners spend all their monthly earnings on treatment for glaucoma, a situation that led to non-compliance in treatment. This study further revealed that the higher the duration of glaucoma treatment, the higher the cost of treatment. Patients who had been treating glaucoma for more than five years incurred the highest average cost GHS 270.37 (USD 62.01) per month as compared to patients who had been on treatment for less than five years. This is very similar to Varma et al. (2011) who asserted that the financial burden of glaucoma increases as disease severity increases with time. Furthermore,

As noted by Augusto et al. (2016), since glaucoma is of genetic origin and cannot be prevented, early detection and diagnosis is the most cost effective way of managing glaucoma and preventing blindness.

This study found a significant statistical difference between the cost burden and income. A similar finding was reported by Ocansey et al. (2016) that income showed a concurrent increase with cost ($p<0.05$).

5.4 Intangible Cost

Emotional pain was the major driver for the intangible burden followed by fear. Depression was the least scored domain. This contradicts findings by Skevas et al. (2013) who found that glaucoma caused depression and emotional pain such as anxiety. Another study by (Varma et al., 2011) also suggested that the psychological burden of glaucoma increases as vision decreases, along with a growing fear of blindness, social withdrawal from impaired vision, and depression. Even though the studies cited above reported high levels of depression among their study participants, depression was the least scored intangible burden in this study. This finding may be attributed to the fact that most Ghanaians have a general belief and faith in God, this religious factor plays a big role in every aspect of our lives, with health not being an exception. Many patients believe they would have a super natural healing and thus should not be worried about their condition. Another reason may be that many patients may not have knowledge about their disease conditions. The study by Varma et al. (2011) found a high level of depression among those with advanced disease and thus had severe VFD. This study's participants were made up of patients who had various stages of the disease and not necessary advanced stage diseases. Social isolation was the next low scored domain probably because Ghanaians are generally communal people who care for each other.

Also, respondents at the public facility experienced high levels of fear and emotional pain as compared to the respondents in the private facility. The trend was the same for social isolation and depression where respondents at the public facilities suffered a greater

burden than their private counterparts. This may be due to the fact that patients in the public facilities had longer waiting times at the facility and so they were generally more apprehensive whereas their private counterparts were more relaxed. Further, this study found a significant statistical difference between the means of the total intangible burden and educational level. This notwithstanding, the intangible cost may have been underestimated since it was not valued in monetary terms. This is due to the fact that no real market exists for such costs as stated by Xie et al,(2008)

5.5 Limitations of the study

The accuracy of the cost of glaucoma was based on the recall of the patients which may not be accurate. The intangible cost of glaucoma was not valued in monetary terms but rather described. This is may have led to the underestimation of the total cost of glaucoma.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

According to the findings of this study, the average cost of seeking glaucoma care was GHS254.94 (USD 58.47) per patient per month. The direct cost constituted 93.7% of the cost profile whilst the indirect cost represented the remaining 6.3% of the cost profile. Medical costs contributed significantly to the direct cost with an average cost of GHS205.58 (95% CI). Medicines alone contributed an average amount of GHS112.38 (95% CI) to the medical cost per patient per month.

Overall, glaucoma poses a significant burden on patients since patients have to be on treatment for the rest of their lives. This burden increases as the disease progresses. The direct cost of glaucoma are high and constitute more than two thirds of the total cost of glaucoma care with medicines being the main cost driver. Glaucoma patients also suffer significant intangible burden of fear and emotional pain.

6.2 Recommendations

Based on the findings of this study, the following recommendations are made;

1. Education and screening on glaucoma in the public should be intensified to ensure early diagnosis in order to minimize the cost of managing the disease.

2. The NHIS needs to ensure that the most frequently used medicines such as Timolol maleate which was covered by the scheme are actually provided to patients covered under the NHIS in order to reduce the cost burden on patients.

3. Health care providers in public facilities must endeavor to reduce patient waiting time that contributes highly to the overall productive time lost by patients compared to the private facilities.

4. Further studies needs be conducted to estimate the economic burden of glaucoma from the societal perspective and value intangible burden in monetary terms to ascertain the real economic burden of the disease.

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APPENDICES

Appendix A: Informed Consent Form

Informed Consent Form

Project Title: Economic burden of glaucoma on patients in the Tema Metropolis.

Background

My name is Dr. Matilda Adda, a student from the School of Public Health, University of Ghana, Legon. I am conducting a study to evaluate the economic burden of glaucoma on patients in the Tema Metropolis

Procedures

The study will involve answering questions from a questionnaire about the economic burden of glaucoma on you. No coercion will be used to obtain response from participants. It will be appreciated if you could participate in this study. This is a purely academic research which forms part of my work for the award of a Master's Degree in Public Health.

Confidentiality and Anonymity

This study will ensure that your participation remains anonymous. We will not be collecting or retaining any information about your identity. The records of this study will be kept strictly confidential. We will not include any information in any report we may publish that would make it possible to identify you.

Risks and Benefits

The study will inure to the benefit of both study participants and Ghana healthcare system in general. The study when completed would inform hospital managers and health policy makers with accurate knowledge about economic burden of glaucoma and would be

essential in the formulation and prioritization of health care policies and interventions. The information generated from the study may invoke a response from authorities towards the improvement of eye care in Ghana. There are no risks associated with this study.

Right to Refuse

Participation in this study is voluntary and you can choose not to answer any individual question or all questions. Refusal to participate (or discontinue participation) will involve no penalty or loss of medical benefits to which you are entitled to. However, I will be very grateful if you fully participate in the study.

Compensation

There will be no compensation for participating in this study.

Before taking consent

Do you have any questions you wish to ask about the study? Yes/No

If yes, please, indicate the questions below……

……

Voluntary Consent

I have read the information given above, or the information above has been read and duly explained to me and I understand. I have been given a chance to ask questions concerning this study; questions have been answered to my satisfaction. I now voluntarily agree to participate in this study knowing that I have the right to withdraw from the study at any time without affecting my ability to access eye care services in the future.

…… …… …… ……..

Name of Participant / Respondent Date Thumbprint Signature

Researcher's Statement

I, the undersigned, have explained this consent to the subject in English language/Twi/ Ewe/Ga/Hausa, and that she/he understands the purpose of the study, procedures to be followed, as well as the risks and benefits of the study.

The participant has fully agreed to participate in the study.

Signature of interviewer ……

Date ……

If you have any questions later please contact, Researcher: Dr Matilda Madiwe Adda (0208157416) E-mail: madiwe4@gmail.com or

Administrator of the GHS-ERC: Hannah Frimpong (0243235225 / 0507041223)

E-mail: Hannah.Frimpong@ghsmail.org

Appendix B: Questionnaire for Respondents

University of Ghana

College of Health Sciences

School of Public Health

Topic: Economic burden of glaucoma on patients in the Tema Metropolis

Dear Respondent,

This is a research carried out on the economic burden of glaucoma on patients. I will therefore like to take a few minutes of your time to answer these questions. You are assured that the answers you give will be strictly confidential and your name will not be mentioned in the research report. Thank you.

Qn. No.	Q	Response
Facility_____	Respondent ID :|__|_____|_____|	
Section 1	**Socio-demographic information**	
1	What is your sex? 1. Male 2. Female	|___|
2	What is your age in years?	|___|___|years
3	What is the highest level of school you attended? 1. No education 2. Primary/JSS 3. Secondary 4. Tertiary	|___|
4	What is your current marital status? 1. Married 2. Not married	|___|

5	What is your employment status? 1. Employed 2. Unemployed (*If **Unemployed**, answer Qns. 6 &7)* 3. Student/Apprentice 4. Retiree	|___|
6	If Unemployed, why are you not working now? 1. Unable to work due to illness 2. Other (please specify).....	|___|
7	If Unemployed, have you been looking for a job in the last 6 months? 1. Yes 2. No 3. Not applicable	|___|
8	If employed, in which sector are you employed? 1. Formal sector 2. Informal sector 3. Not applicable	|___|
9	If Employed, what is your average monthly income? (i.e. salary plus other monies from other sources)	GHS …….
10	Are you an NHIS beneficiary? 1. Yes 2. No	|___|
11	How long have you been on glaucoma treatment? 1. Less than one year 2. One year to 5 years 3. More than 5 years	|___|
12	Which drugs do you use? 1…… 2……. 3……. 4……..	
Section 2	**Direct cost information**	

13	***Medical cost: how much did you spend/pay in the last month for***	GHS
	(a) Registration	
	(b) Consultation	
	(c) Laboratory & other diagnostic tests	
	(d) Medicines/drugs	
	(e) Surgery	
14	How much did you pay for your last VFT/OCT test?	
14a	Cost of VFT	GHS
14b	Cost of OCT	GHS
15	When did you have your last VFT/OCT test?	
15a	VFT	
15b	OCT	
16	***Non-medical cost: how much did you spend/pay for (you and accompanying relative)….***	
	(a) Travel cost (to and fro the facility)	
	(b) Food cost	
	(c) Drinks/water cost	
	(d) Other miscellaneous costs (i.e., phone calls/phone credits used due to this illness)	
17	Did you rely on financial help from other source(s) for treatment, apart from normal income? 1. Yes 2. No	|_____|

18	What are the sources (multiple responses possible)? 1. Relative 2. Friend 3. Savings 4. Loan/Grant 5. Other (Specify) 6. Not applicable	|_____|
19	How much money did you receive from the identified source(s)?	GHS
20	Do you often skip treatment because of cost of treatment? 1. Yes 2. No	|_____|
Section 3	**Indirect cost information.**	
21	How many days have you been absent from work apart from the time you spent travelling and the time you spent at the hospital (if applicable) in the last month because of your illness (i.e. treatment, recovery)?	|___|___|___| days
22	How many minutes did you spend travelling to and from the health facility?	|___|___|___| Mins.
23	How many minutes did you spend waiting before you were called to see the doctor or health officer for	|___|___|___| Mins.
24	Did anyone accompany you from home to the health facility? 1.Yes 2. No	
	IF YES IN Qn. 24 PROCEED TO Qn 25. To 29. IF NO IN Qn. 24 PROCEED TO Qn. 30	
25	If anyone did accompany you to the health facility, what is his or her employment status? 1. Employed 2. Unemployed 3. Student 4. Retired	|_____|
26	Did the person who accompanied you, come with you from the house and stayed with you for treatment and take you back home? 1. Yes 2. No 3. Not applicable	
27	How many hours/minutes in total did he/she travel to and fro to be with you in the health facility?	|___|___|___| Mins.
28	How many hours/minutes in total did he/she spend with you when you were receiving treatment in the	|___|___|___| Mins.

29	How many days did he/she have to take care of you?	|___|___| days
Section 4	**Intangible cost information**	
	Please, rate the following statements concerning FEAR from "not at all" to 'extremely" depending on how it applies to you.	
30	I am afraid I may become blind 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
31	I am worried I may loose my job 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
32	I am worried my partner/spouse may leave me because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
33	My future is of concern to me because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
	Please, rate the following statements concerning EMOTIONAL PAIN from "not at all" to 'extremely" depending on how it applies to you.	
34	I am always anxious because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|

35	My condition gives me grief/sadness 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
36	I am devastated that I can no more do my usual visual tasks like reading, driving and sewing 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|___|
	Please, rate the following statements concerning SOCIAL ISOLATION from "not at all" to 'extremely" depending on how it applies to you.	
37	I feel embarrassed in social situations 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
38	I feel I am discriminated against because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	|_____|
39	I have lost my job because of my condition 1.Yes 2.No 3.Not applicable	|_____|
40	I have stopped schooling/training/apprenticeship because of my condition 1. Yes 2. No 3.Not applicable	|_____|
	Please, rate the following statements concerning DEPRESSION from "not at all" to 'extremely" depending on how it applies to you.	

41	I have trouble falling or staying asleep because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	
42	I feel bad about myself or I feel I am a failure because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	
43	I feel a sense of hopelessness because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	
44	I have little interest or pleasure in doing things because of my condition. 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6. Not Applicable	
45	I have thoughts that I will be better off dead because of my condition 1. Not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely 6.Not Applicable	

Appendix C: Ethical approval letter from Ghana Health Service

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

My Ref. ghs/rdd/erd/Admin/App/17/Amend
Your Ref. No.

Your Health - Our Concern

Research & Development Division
Ghana Health Service
P. O. Box MB 190
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Tel: +233-0302-681109
Fax + 233-0302-685424
Email: ghserc@gmail.com
7th July, 2017

Matilda Madiwe Addo
School of Public Health
University of Ghana
Legon

RE: Request for Permission to Amend Approved Study Protocol

Reference is made to your letter dated 5th July 2017 on the above-mentioned subject.

The Ghana Health Service Committee has reviewed the request and given approval for implementation of the amended protocol.

GHS-ERC Number	**GHSERC: 130/02/2017**
Project Title	Economic Burden of Glaucoma on Patients in the Tema Metropolis
Approval Date of Amendment	1st June, 2017
Expiry Date	31st May 2018
GHS-ERC Decision	**Amendment Approved**

The approval covers the following only:

1. Change of Study Title from 1 "Economic burden of glaucoma on patients attending the eye clinic of the Ridge Hospital, Accra to "Economic burden of glaucoma on patients in Tema Metropolis"

The following applies:

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months.
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing
- Submission of a final report after completion of the study
- Informing ERC if study is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

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

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

SIGNED...
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

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