

**ENSIGN COLLEGE OF PUBLIC HEALTH, KPONG  
EASTERN REGION, GHANA**

**FACULTY OF PUBLIC HEALTH  
DEPARTMENT OF COMMUNITY HEALTH**

**ASSESSMENT OF DIABETIC PATIENTS' KNOWLEDGE OF DIABETIC EYE  
COMPLICATIONS AT SELECTED HEALTH FACILITIES IN THE TEMA  
METROPOLIS OF THE GREATER ACCRA REGION OF GHANA**

**BY  
GEORGE OPPONG MANUH**

**MAY, 2020**

**ENSIGN COLLEGE OF PUBLIC HEALTH, KPONG, EASTERN REGION, GHANA**

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COMPLICATIONS IN TEMA METROPOLIS, GREATER ACCRA REGION, GHANA**

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**A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH,  
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PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF  
PUBLIC HEALTH DEGREE**

**MAY, 202**

**DECLARATION**

I hereby do declare that except for the references made to other literature and works of other researchers which have been duly acknowledged, the content of this work is an output of my own investigation and has not been presented either in whole or in part for the award of any other degree elsewhere.

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## **DEDICATION**

I dedicate this work to God, my precious wife and family, especially my father, who has guided my path with encouragement.

## **ACKNOWLEDGEMENT**

I am most grateful to Almighty God for making this study a success. I am also much appreciative to my diamond, Dr. Rosemond Oppong Manuh. This thesis would not have been possible without the tremendous support and patience of my principal supervisor, Dr. Stephen Manortey.

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## DEFINITION OF TERMS

**Pancreas**-A large elongated exocrine gland located behind the stomach; secretes pancreatic juice and insulin.

**Insulin**-Hormone secreted by the isles of Langerhans in the pancreas; regulates the storage of glycogen in the liver and accelerates oxidation of sugar in cells.

**Diabetic Retinopathy**-It refers to retinal changes seen in patients with diabetes mellitus.

**Cataract**- any opacity of the crystalline lens of the eye.

**Glaucoma**- a progressive disease of the optic nerve with specific patterns of irreversible blindness.

**Optic neuropathy**-disease of the optic nerve.

**Macular degeneration**- changes that occur at the posterior pole of the eye

## **ABBREVIATION/ACRONYMS**

**AOR-** Adjusted Odds Ratio

**CI-** Confidence Interval

**COR-** Crude Odds Ratio

**DM -** Diabetes Mellitus

**DR -**Diabetic Retinopathy

**GHS-** Ghana Health Service

**IDF-** International Diabetes Federation

**JHS-** Junior High School

**MoH-** Ministry of Health

**NHIS-** National Health Insurance Schemes

**PACG-**Primary Angle Closure Glaucoma

**POAG-**Primary Open Angle Glaucoma

**SHS-** Senior High School

**VEGF-** Vascular Endothelial Growth Factor

**WHO-** World Health Organization

## ABSTRACT

**Background:** Diabetes mellitus (DM) is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Diabetes prevalence has been rising more rapidly in the middle- and low-income countries. The leading causes of blindness secondary to diabetes are diabetic retinopathy, cataracts, and glaucoma. Awareness and understanding of diabetes and its eye complications is a reliable factor that informs patients' attitude towards adhering to management regimen and regular eye examination.

**Aim:** To assess the knowledge level of diabetic patients on diabetes and its eye complications in selected health facilities within the Tema Metropolis in the Greater Accra Region of Ghana.

**Materials and Methods:** A cross-sectional survey was carried out between January and May, 2020 in the Tema Metropolis. A total of 422 pretested structured questionnaires were systematically administered to interview diabetic patients at Tema General Hospital, Tema Polyclinic and Manhean Health Centre. Data was collected on respondents' socio-demographic characteristics, knowledge of diabetic status, knowledge of diabetic eye disease and referral rate for eye examinations. Univariate analysis was applied to establish the frequency and percentage distributions of the responses. Chi-square ( $\chi^2$ ) and Fisher's exact tests were employed to determine the factors associations. Regression analysis was used to predict the strength of the associations. The threshold for statistical significance was set at a p-value less than 0.05.

**Results:** A few (3.86%) of diabetic patients did not know that they were diabetic. Knowledge on diabetic ocular complications was low, and only 77 (18.60%) of the patients knew two or more of the ocular complications of diabetes. Knowledge of diabetic ocular complications was



significantly associated with age group ( $p=0.019$ ), educational level ( $p<0.001$ ), marital status ( $p=0.002$ ), occupation ( $p=0.001$ ), ethnicity ( $p=0.030$ ), income level ( $p<0.001$ ) and residence ( $p=0.008$ ). Majority of the interviewees (63.04%) had a history of an eye examination. Only 57.33% of them were referred for the eye examination by the doctor managing diabetes.

**Conclusion:** Knowledge of diabetic eye complications is low among diabetic patients. Most of the referrals for eye exams are done by their physicians managing diabetes. Policies by the government are required to decrease the incidence of diabetes. Also, healthcare authorities are also required to intensify the education on diabetic eye complications and early referral for an eye examination.

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# CHAPTER 1

## 1.0 INTRODUCTION

### 1.1 Background Information

Diabetes mellitus (DM) is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular, the blood vessels and nerves. There are two main principal forms of diabetes mellitus, namely *type 1* and *type 2*. Type 1 diabetes (formerly known as *Insulin-Dependent*) occurs when the pancreas fails to produce insulin which is essential for survival. This form develops most frequently in children and adolescents but is being increasingly noted later in life. Type 2 diabetes (formerly named *Non-Insulin Dependent*) results from the body's inability to respond properly to the action of insulin produced by the pancreas (WHO, 2016)

Type 2 diabetes is much more common and accounts for around 90% of all diabetes cases worldwide. It occurs most frequently in adults but is being noted increasingly in adolescents as well (WHO, 2016). In the year 2000, the global prevalence of diabetes among adults age 20 years and above was estimated to be about 171 million (Wild *et al.*, 2004). This is expected to be higher than 342 million by the year 2030 (Wild *et al.*, 2004). Developing countries shall experience much of this increase and will be due to population growth, ageing, unhealthy diets, obesity and sedentary lifestyles (WHO, 2016). Diabetic patients suffer systemic complications, including eye disorders (Ovenseri-Ogbomo *et al.*, 2013). The leading causes of blindness secondary to diabetes are diabetic retinopathy, cataracts, and glaucoma (Jeganathan *et al.*, 2008).



Some of the other known causes of blindness include nerve palsies, optic neuropathy and macular degeneration (Jeganathan *et al.*, 2008).

## **1.2 Problem Statement**

In the year 2000, the worldwide prevalence of Diabetes Mellitus was 171 million (Wild *et al.*, 2004). It is projected to hit 366 million by the year 2030 with developing countries being the most affected (Wild *et al.*, 2004). The prevalence of diabetes has been ascending more rapidly in the middle- and low-income countries. The prevalence of diabetes among old adults in Ghana was 3.95% in 2016 (Gatimu *et al.*, 2016). Diabetes is a major cause of blindness (WHO, 2016). Diabetic patients suffer systemic complications, including ocular disorders (Meuleneire, 2008). It is estimated that 4.51 million of the diabetic population in sub-Saharan Africa have one form of ocular complications due to diabetes (Meuleneire, 2008).

People living with diabetes are about 25 times more likely of becoming blind compared to the normal population (Thomann *et al.*, 2001). In the United States, the incidence of vision loss or blindness as a result of ocular complications of diabetes arouses sufficient public health concern, with diabetic retinopathy alone responsible for 12,000 to 24,000 new cases of blindness annually (Department of Health, Services and Information, 2007). Diabetic patients are required (due to the disposition of their condition) to have sufficient knowledge regarding their illness so as to exhibit a positive attitude to health care (Mumba *et al.*, 2009). Despite the increased tendency of blindness, studies have shown that most diabetic patients do not often seek the recommended ocular examinations (such as regular dilated fundus examination) aimed at preventing visual impairment and blindness (Mumba *et al.*, 2009). Patients in Ghana are no exception to this worrying global public health menace.

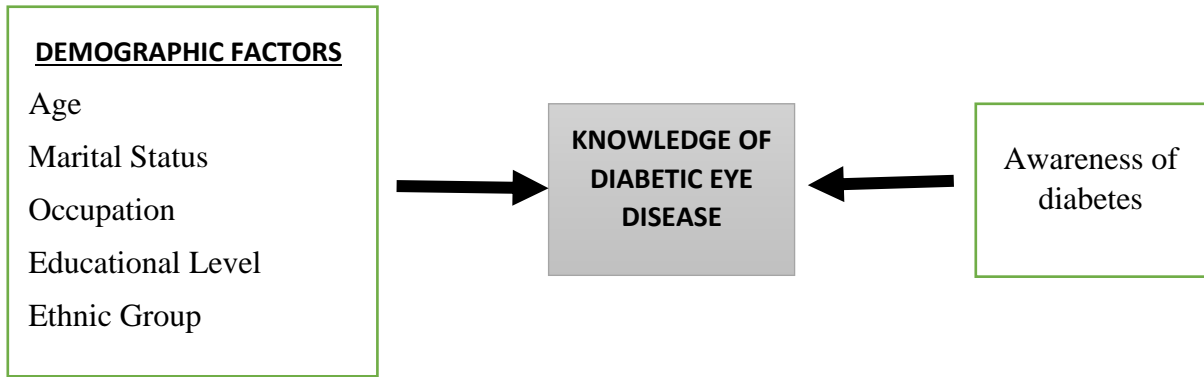
It is therefore very essential that patients' knowledge on the ocular manifestations of diabetes be ascertained (Ovenseri-Ogbomo *et al.*, 2013). This is to determine if the knowledge level of ocular manifestations of diabetes is the barrier to seeking recommended eye examination among the diabetic population (Ovenseri-Ogbomo *et al.*, 2013). Thus, the diabetic population in Tema.

### **1.3 Rationale of the Study**

Awareness and understanding of diabetes and its eye complications is a reliable factor that informs patients' attitude towards adhering to management regimen and regular eye examination. Up to 6% of the population in Ghana could be having diabetes (Amoah *et al.*, 2002; Danquah *et al.*, 2012; Saeed *et al.*, 2013). Late reporting of eye complications still remains a challenge in the quest to prolong vision in diabetic patients. Unaware diabetics also stand the risk of not adhering to a treatment regimen which defies the quest to delay the onset of ocular complications. Lack of knowledge about diabetes and its eye complications puts the vulnerable patients at risk of developing early visual impairments. This places a huge economic burden on the country because Tema contributes significantly to the economic development of Ghana. It is therefore important to assess the knowledge of diabetes and its eye complications among diabetics and make recommendations to strengthen public health education on diabetes (Ovenseri-Ogbomo *et al.*, 2013).

### **1.4 Conceptual Framework**

The figure below describes the conceptual framework the project adopted to ascertain the knowledge level of the study participants of diabetic eye disease. The framework suggests that external factors, including the demographic indicator and one's awareness level have a direct influence on the worth of knowledge on the disease.



**Source:** *Author's own construct*

### **1.5 Research Questions**

The study seeks to answer the following questions:

1. Are diabetic patients aware of their diabetic status?
2. Do diabetic patients know of diabetic eye disease?
3. What is the association between diabetic patients' demographic factors and their awareness of diabetes?
4. What is the association between diabetic patients' demographic factors and their knowledge of diabetic eye disease?
5. How often are diabetic patients referred for an eye examination?

### **1.6 General Objective**

The primary objective of this project is to assess the knowledge level of diabetic patients on diabetes and its eye complications in selected health facilities within the Tema Metropolis in the Greater Accra Region of Ghana.

## **1.7 Specific Objectives**

1. To determine the awareness of diabetes among diabetic patients.
2. To assess the knowledge of diabetic patients on diabetic eye disease.
3. To examine the association between the demography of diabetic patients and their level of awareness of the disease condition and of diabetic eye disease.
4. To evaluate the referral rate of diabetics to eye clinics.

## **1.8 Profile of Study Area**

This study was carried out in the Tema Metropolis of the Greater Accra Region of Ghana. Tema is a commercial city, and it has a diverse population coming from all the regions of the country and beyond.

## **1.9 Scope of Study**

The coverage area of the study included Tema General Hospital, Manhean Health Centre and Tema Polyclinic all in the Tema Metropolis. The study sought to assess the knowledge of diabetic patients on diabetic eye complications.

## **1.10 Organization of Report**

Chapter One presents the introduction, which comprises the background to the study, the problem statement, rationale of the study, conceptual framework, research questions and objectives. Chapter Two entails the literature review, which is the selection and analysis of available published works in relation to the topic under study. Chapter Three describes the methodology followed. Chapter Four presents the analysis of data, and the results are presented

according to the study objectives. Chapter Five consists of the discussion of results using existing information. Chapter Six provides the conclusions and recommendations.

## CHAPTER 2

### 2.0 LITERATURE REVIEW

#### 2.1 Burden of Diabetes

Diabetes mellitus (DM), a multi-systemic disease characterized by hyperglycemia, is on the increase worldwide (Wild *et al.*, 2004). The prevalence of DM was estimated at 171 in 2000 and future projections made to the next three decades indicate that this prevalence could reach 366 million with developing countries being the most affected (Wild *et al.*, 2004). Report indicates that in the year 2000, there were 7.5 million cases of DM in Africa, with more than 80% of these cases remaining undiagnosed (Hall *et al.*, 2011). According to the International Diabetes Federation (IDF), over 7.1 million people in sub-Saharan Africa are now estimated to suffer from DM, and this will increase to 15.0 million by 2025 (Meuleneire, 2008). Diabetes used to be very uncommon some decades ago, with estimates ranging from 0.2 to 0.4% in Ghana (Dodu *et al.*, 1966). This situation is steadily changing as the prevalence of diabetes among old adults in Ghana was 3.95% in 2016 (Gatimu *et al.*, 2016). Also, diabetes now accounts for 6.8% adult admissions at the Korle-Bu Teaching Hospital in Accra, Ghana (Ovenseri-Ogbomo *et al.*, 2013). This estimate is close to the finding of a population-based survey in Accra which recorded a prevalence of 6.3% among subjects aged 25 years and older (Amoah *et al.*, 2002). Specifically, in Ghana, studies in the general population have estimated that between 3.3 and 6% of the population has diabetes with the prevalence increasing with age and being higher in urban than in rural areas (Amoah *et al.*, 2002; Danquah *et al.*, 2012; Saeed *et al.*, 2013). This increase in prevalence could be attributed to several risk factors including ageing, diet, obesity and physical inactivity (Tuomilehto *et al.*, 2001).

## **2.2 Leading Causes of Blindness from Diabetes**

### **2.2.1 Diabetic Retinopathy**

Diabetes affects nearly all organs of the body. Eyes are commonly involved in longstanding diabetes. The retina is the most commonly involved part of the eye in a person with chronic diabetes. Diabetic Retinopathy (DR) is a debilitating disease and hampers sight if not diagnosed and treated early (Chattopadhyay *et al.*, 2017). It is estimated that in 2002, diabetic retinopathy accounted for about 5% of world blindness, representing almost 5 million blind people (World Health Organization, 2014). As the incidence of diabetes gradually increases, there is the possibility that more individuals will suffer from eye complications which, if not properly managed, may lead to permanent eye damage (World Health Organization, 2014). Diabetic retinopathy is the most well-known ocular complication of diabetes and the leading cause of blindness among people 20–64 years of age in the U.S (Congdon, 2003). Up to 4 million Americans with diabetes, 40 years of age and older, have retinopathy, and nearly 1 million have sight-threatening retinopathy (Kempen *et al.*, 2004). In India, today DR is the sixth commonest cause of blindness (Raman *et al.*, 2016). It is estimated that 4.51 million of the population in sub-Saharan Africa have one form of ocular complications due to diabetes (IDF, 2013). Nationally, 270 thousand are estimated to have diabetes and 93 thousand have diabetic retinopathy and 27 thousand have vision-threatening retinopathy (Myjoyonline, 2018). Past studies have shown various risk factors for diabetic retinopathy. The Wisconsin Epidemiological Study has proved that the most significant risk factor for DR is the duration of diabetes (Klein *et al.*, 1989). In patients diagnosed with diabetes before the age of 30 years, the incidence of DR after 10 years is 50%, and after 30 years, 90%. DR rarely develops within five years of the onset of diabetes or before puberty, but about 5% of type 2 diabetics have DR at presentation. It appears that duration

is a stronger predictor for proliferative disease than for maculopathy (Bowling, 2015). DR cannot be prevented, but blindness from DR can be prevented by timely intervention and hence needs diligent screening for DR (Kanski *et al.*, 2015). Diabetic retinopathy being a silent condition, the need for regular screening cannot be overstated. In Ghana, for optimum utilization of the limited resources available for management of DR and the huge burden of patients to be taken care of, it is essential to make persons with diabetes aware of this preventable cause of blindness and the need for at least yearly examination of the fundus with a direct ophthalmoscope, which can be done at the secondary level of healthcare. We need to increase the demand for regular eye checkups of persons with diabetes. This can only happen if the awareness level of diabetics is increased. Diabetic patient's knowledge on the type of diabetes suffered and its ocular complications is poor in Ghana. Obirikorang *et al.* (2016), has observed a low level (17.7%) of awareness about DR among type 2 diabetics at Sampa in the Bono Region of Ghana.

### **2.2.2 Cataract**

Cataract is a major cause of vision impairment in people with diabetes (Kanski *et al.*, 2015). Studies have documented an association between diabetes and cataracts. This association is supported by an abundance of data from clinical epidemiological studies and basic science studies. Both cross-sectional and prospective data from three population-based studies, the Beaver Dam Eye Study, the Blue Mountains Eye Study, and the Visual Impairment Project have documented associations between diabetes and both prevalent and incident posterior subcapsular cataract and, less consistently, with prevalent and incident cortical cataracts but not nuclear cataract (Miglior *et al.*, 1994; Delcourt *et al.*, 2000; Jeganathan *et al.*, 2008). The Blue Mountains Eye Study showed that impaired fasting glucose, in the absence of clinical diabetes, was also a risk factor for the development of cortical cataract (Rowe *et al.*, 2000). There is



additional evidence that the risk of cataract increases with increasing diabetes duration and severity of hyperglycemia (Negahban *et al.*, 2002). The deposition of advanced glycation end products in the lens has been postulated as one possible pathogenic mechanism for diabetic cataracts (Pirie, 1962). In Ghana, the prevalence of blindness is 0.74% while the prevalence of severe visual impairment is 1.07%, with cataract (54.8%) being the most common cause of blindness (Kumah *et al.*, 2017).

### **2.2.3 Glaucoma**

Glaucoma is a progressive optic neuropathy associated with typical optic disc changes and visual field defects (Jeganathan *et al.*, 2008). Elevated intraocular pressure is the major risk factor for glaucoma, although a proportion of patients with glaucoma do not have raised intraocular pressure (Jeganathan *et al.*, 2008). Patients with diabetes are at risk of two major types of glaucoma, primary glaucoma and neovascular glaucoma (Jeganathan *et al.*, 2008). Several large epidemiological studies have reported positive associations between diabetes with primary open-angle glaucoma (POAG), the most common form of primary glaucoma, or elevated intraocular pressure in the absence of glaucoma optic neuropathy (Hennis *et al.*, 2003; Lin, 2005). Glaucoma occurs more often in patients with diabetes than in the general population (Shen *et al.*, 2016). The risk of glaucoma has been reported to be 1.6–4.7 times higher in individuals with diabetes than in nondiabetic individuals (Wilson *et al.*, 1987; Katz *et al.*, 1988). In the Blue Mountains and Beaver Dam Eye studies, participants with diabetes were twice as likely to have glaucoma as those without (Tielsch *et al.*, 1995). However, not all population-based studies have identified such an association (Tielsch *et al.*, 1995; Vijaya *et al.*, 2005). There are clear biologically plausible mechanisms supporting an association between diabetes and POAG. First, microvascular damage from diabetes could impair blood flow to the anterior optic nerve,

resulting in optic nerve damage (Piltz-seymour *et al.*, 2001; Flammer *et al.*, 2002). Diabetes also impairs the autoregulation of posterior ciliary circulation, which may exacerbate glaucomatous optic neuropathy(Kanski *et al.*, 2015). Second, patients with diabetes often have concomitant cardiovascular risk factors (e.g., hypertension) that may affect vascular perfusion of the optic nerve head (Nakamura *et al.*, 2005). Finally, relative to those without diabetes, individuals with diabetes may be more vulnerable to elevated intraocular pressure, with more severe visual field loss at the same intraocular pressure level (Zeiter *et al.*, 1991). It is important to screen for POAG among individuals with diabetes, as POAG can be asymptomatic until the late stages when decreased vision and/or constricted visual fields are noted (Roy *et al.*, 1985). Treatment involves lowering intraocular pressure through topical eye drops and laser and surgical procedures (Kanski *et al.*, 2015). Primary angle-closure glaucoma (PACG), the other common primary glaucoma, is characterized by narrow or closed anterior chamber angles, which impedes drainage of aqueous humor and leads to raised intraocular pressure (Roy *et al.*, 1985). Patients with PACG appear to be more likely to have abnormal glucose tolerance than those with POAG or those without glaucoma (Roy *et al.*, 1985). Diabetes may be associated with PACG (Clark, 1989). This occurs through systemic autonomic dysfunction or increased lens thickness due to sorbitol overload ( Clark, 1989). Patients with PACG may present with an acute attack, which is associated with severe ocular pain, headaches, and nausea, with substantially elevated intraocular pressure (Schertzer *et al.*, 1998). Also, Studies have shown a consistent association between diabetes and neovascular glaucoma (Schertzer *et al.*, 1998), with proliferative retinopathy the leading cause of this type of secondary glaucoma. Between 32 and 43% of neovascular glaucoma cases are caused by proliferative diabetic retinopathy (Brown *et al.*, 1984; Madsen, 2009). Neovascularization of the iris, an early precursor of neovascular glaucoma, is commonly seen in

patients with long-standing poorly controlled diabetes (Löffler, 2006). Hypoxia in the retina and other ocular tissue causes an increased expression of vascular endothelial growth factor (VEGF), which stimulates new vessel formation in the iris or in the anterior chamber angle (Zirm, 1982). Neovascular glaucoma requires aggressive intervention to lower intraocular pressure with medication, followed by surgery (Sivak-Callcott *et al.*, 2001). Regression of neovascularization following panretinal laser photocoagulation can occur if treated early (Piltz-seymour *et al.*, 2001; Flammer *et al.*, 2002). Glaucoma is the second leading cause of blindness in Ghana (Kumah *et al.*, 2017).

## CHAPTER 3

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Research Method and Design

A cross-sectional study design was employed for the study. The study was conducted between January and May 2020 with a quantitative approach that provided the option to examine the relationship between variables.

#### 3.2 Study site

The Tema Health Metropolitan was previously made up of Tema West, East, and Central Health Districts until a recent detachment of Tema West Health Metropolis. Tema Polyclinic is the prime health facility in the Tema West Metro. It was established in 1962 as a Municipal health centre and was later upgraded to a Polyclinic in 1982. It is located at Community 2 and provides preventive, curative and rehabilitative health services to about 33 communities within the Tema Metropolis and its environs. Tema Polyclinic provides health services to all age groups and also to all patients on National Health Insurance Scheme (Gadzekpo, 2015). Additionally, Tema General Hospital, the prime facility of Tema Central Sub-Metro is located at Community 12 and was established between 1954 and 1957. The Hospital has a total bed capacity of 280 and 10 wards. It serves both General and Specialist Care Services in all the major clinical disciplines including Internal Medicine, General Surgery, Paediatrics, Obstetrics and Gynaecology, Dental and Eye care. The total consulting staff strength includes 13 Specialist doctors, 11 General Practitioners, 3 Physician Assistants and 30 nurses (Ghana Health Service, 2014). Moreover, Manhean Health Centre, the main facility in Tema East was originally constructed as a health post during Dr Kofi Abrefa Busia's administration in the 1970s (Ghana News Agency, 2020). It

is located at the Eastern section of the fishing harbour and serves as the district health centre for the Sub-Metropolitan (Asare *et al.*, 2018). Tema Metropolis is one of the 16 districts of the Greater Accra Region, located in the Southeastern part of Ghana (Ghana Statistical Service, 2014). Tema Metropolis is a virtually fully-built-up area. It is a vibrant commercial and industrial city, about the only well-planned city in the country. It has a large harbor, one of the world's biggest man-made harbours which is the main sea-port entry to Ghana. The estimated 2015 population of Tema Metropolis was 341,045 (as projected from the 2010 National Population and Housing Census), making it the second largest-populated of the 16 districts in the Greater Accra Region, after Accra Metropolis (Ghana Statistical Service, 2014). Tema Metropolis is considered as being the city in the center of the world. The Greenwich Meridian (longitude zero) passes through the Metropolis and situated only about 5<sup>0</sup> N from the Equator.

Tema was commissioned by Ghana's first president, Dr. Kwame Nkrumah, and grew rapidly after the construction of a large harbour in 1961. It is now a major trading center, with numerous industries that produce aluminum, refined petroleum, chemicals, food products, and building materials.

### **3.3. Study population.**

Diabetic patients, who visited the Tema Polyclinic, Manhean Health Centre and Tema General Hospital from January to May, 2020 represented the study population.

### **3.4. Data Collection Techniques and Tools**

Both structured and semi-structured open-ended format questions designed to elicit information about knowledge of diabetes and its eye complications were used. The researcher and the trained field assistants administered the questionnaires. The questionnaire was composed of two sections. The first section demanded respondents to provide demographic information, including

age, sex, educational level, and occupation. The second section assessed whether or not a respondent knew his/her diabetic status. It also assessed a respondent's knowledge about diabetic eye disease and his/her attitude towards seeking an eye examination. The participants completed and submitted the questionnaires at the spot.

### **3.5 Inclusion and Exclusion Criteria**

#### **3.5.1 Inclusion Criteria**

Known diabetic patients aged 18 years and above consenting to participate in the study.

#### **3.5.2 Exclusion criteria**

All patients with diabetes either than Types 1 and 2

### **3.6 Research techniques**

A multi-stage sampling technique was used in selecting study participants. At first, the prime health facilities in the three Sub-Metropolitan Health districts namely, Tema General Hospital, Manhean Health Centre and Tema Polyclinic were selected. Systematic sampling was then used to select the study participants from the three facilities. The average daily attendance at the diabetic clinics of Tema General Hospital, Manhean Health Centre and Tema Polyclinic was in the ratio 4:3:2. This was used to calculate for the sample size for each facility. The sample size for each facility was then divided by the number of data collection days to get the daily sample size. Finally, the daily sample size was used to calculate for the skip interval for the Systematic sampling.

### 3.7 Sample size

The sample of a study is a section of the population that is drawn to make inferences or projections to the general population. This sample size was calculated based on previous research findings on the knowledge of diabetes and its associated ocular manifestations by diabetic patients at Korle-Bu Teaching Hospital using a 50% prevalence (Ovenseri-Ogbomo *et al.*, 2013).

The sample size was calculated using the Cochran's formula as shown below;

$$n = \frac{Z^2 \times pq}{e^2}$$

Where,

$n$  = sample size (Cochran, 1977)

$Z$  = the z-score that corresponds with 95% confidence interval which is 1.96

$p$  = proportion of diabetic patients with knowledge on diabetic eye disease which is 50%  
or 0.50

$q$  = Proportion of diabetic patients with no knowledge on diabetic eye disease which is equal to  $1-p$ . That is,  $100-50\% = 50\% = 0.5$

$e$  = Margin of error set at 5% (0.05)

Therefore,

$$n = \frac{(1.96)^2 \times (0.5 \times 0.5)}{(0.05)^2} \cong 384$$

A non-response rate of 10 %, resulting in about 38 respondents was added to the minimum sample size to get 422 participants. Of the total 422 questionnaires administered, 414 were completed and included in data analysis. One hundred and eighty five (185) participants were

selected from Tema General Hospital, 137 from Manhean Health Centre and 92 from Tema Polyclinic.

### **3.8. Pre-Testing**

The questionnaires were tested at Empat-Caiquo Medical Centre, a health facility located in Community 6, Tema. Questionnaires were pre-tested to identify any potential problems in the questions. After the pre-testing exercise, all necessary corrections were made before proceeding to the field for the actual data collection.

### **3.9. Data Analysis.**

Statistical data analysis was conducted using the STATA statistical software package (StataCorp.2007. Stata Statistical Software. *Release 14*. StataCorp LP, College Station, n, TX, USA). Univariate analysis was applied to establish the frequency and percentage distributions of the responses. Chi-square ( $\chi^2$ ) and Fisher's exact tests were employed to determine the factors associated with the awareness of diabetics and its ocular complications. Regression analysis of demographic and diabetic awareness characteristics was used to predict the likelihood of awareness of diabetes and its eye complications in some participants as compared to particular participants. The threshold for statistical significance was set at a p-value less than 0.05.

#### **3.9.0 Ethical Consideration.**

Ethical approval for the study was obtained from the Ethical Review Committee of Ensign College of Public Health and Ghana Health Service Ethical Review Committee. Permission was also sought from the management of the Tema General Hospital, Tema Polyclinic, and Manhean Health Centre before the commencement of the study. Privacy and confidentiality were maintained during data collection. No personal identifiers like names of patients were recorded.



Written informed consent was obtained from the individual respondents before interviewing them. The interviewees were assured of confidentiality regarding the information collected and had the option to opt-out of the study at any time. Data access was limited to the principal investigator, research assistants, and supervisor of the study only. All data collected were stored under lock and key and will be destroyed after ten years.

### **3.10 Limitations of Study**

The participants at the data collection points may not necessarily be inhabitants of Tema.

### **3.11 Assumptions**

It was assumed that all the participants adhere to their regular diabetic reviews and medications. External factors that could influence the research and were beyond control did not impact the conduct of the study.

## CHAPTER 4

### 4.0 RESULTS

#### 4.1 Introduction

This chapter presents the findings of the survey designed to assess the knowledge level of diabetic patients on diabetes and its eye complications in selected health facilities within the Tema Metropolis in the Greater Accra Region of Ghana. Of the total 422 questionnaires administered, 414 were completed and included in data analysis yielding a response rate of 98.1%.

#### 4.2 Demographic characteristics

The mean age of the diabetic patients in this study was  $59.63 \pm 11.39$  years. A higher proportion [215 (51.93%)] of them was between the ages of 41–60 years. This was followed by those between 61 to 80 years [180 (43.48%)] and less than 41 years [19 (4.59%)]. Among them were more females [242 (58.45 %)] than males [172 (41.55 %)]. One hundred and thirty-eight (33.33%) had no formal education. Out of 414, 272 (65.70%) were married, 247(59.66%) were self-employed, 197 (47.58%) were Akans while 387 (93.48%) were Christians. The majority [403 (97.34%)] of the diabetic patients had active National Health Insurance Schemes (NHIS), 180(43.48%) had an income of less than GHC500.00 while 160(38.65%) resided in the Tema East constituency. Table 4.1 illustrates the demographic characteristics of the diabetic patients.

**Table 4.1: Demographic characteristics of the respondents**

<b>Factors</b>	<b>Frequency</b>	<b>Percentage(%)</b>
<b>Age group</b>		
≤40	19	4.59
41-60	215	51.93
61-80	180	43.48
<b>Gender</b>		
Male	172	41.55
Female	242	58.45
<b>Education</b>		
Tertiary	60	14.49
SHS/Tech/Voc	74	17.87
JHS	77	18.60
Primary	65	15.70
None	138	33.33
<b>Marital Status</b>		
Married	272	65.70
Single	34	8.21
Widow/Separated/Divorced	108	26.09
<b>Employment Status</b>		
Self-employed	247	59.66
Government worker	27	6.52
Pensioner	34	8.21
Unemployed	76	18.36
Other	30	7.25
<b>Ethnicity</b>		
Akan	197	47.58
Ewe	102	24.64
Ga/Dangme	81	19.57
Other	34	8.21
<b>Religious Beliefs</b>		

Christian	387	93.48
Muslim	25	6.04
Other	2	0.48
<b>NHIS status</b>		
Active	403	97.34
Not active	11	2.66
<b>Income</b>		
< 500 GHC	180	43.48
500-1,000 GHC	163	39.37
>1,000 GHC	71	17.15
<b>Residence</b>		
Tema East	160	38.65
Tema Central	60	14.49
Tema West	136	32.85
Ashaiman	37	8.94
Other	21	5.07

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**Source: Field data, 2020**

### **4.3 Awareness of Diabetes**

Although all [414 (100.00%)] the participants were diabetic patients, a few [16 (3.86%)] of them did not know they had diabetes when asked of their status. This is represented in table 4.2.

**Table 4.2: Awareness of Diabetes**

<b>Factors</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Do you know whether you have Diabetes or not?</b>		
Yes	360	86.96
No	54	13.04
<b>Do you have Diabetes?</b>		
Yes	398	96.14
No	16	3.86

**Source:** *Field data, 2020*

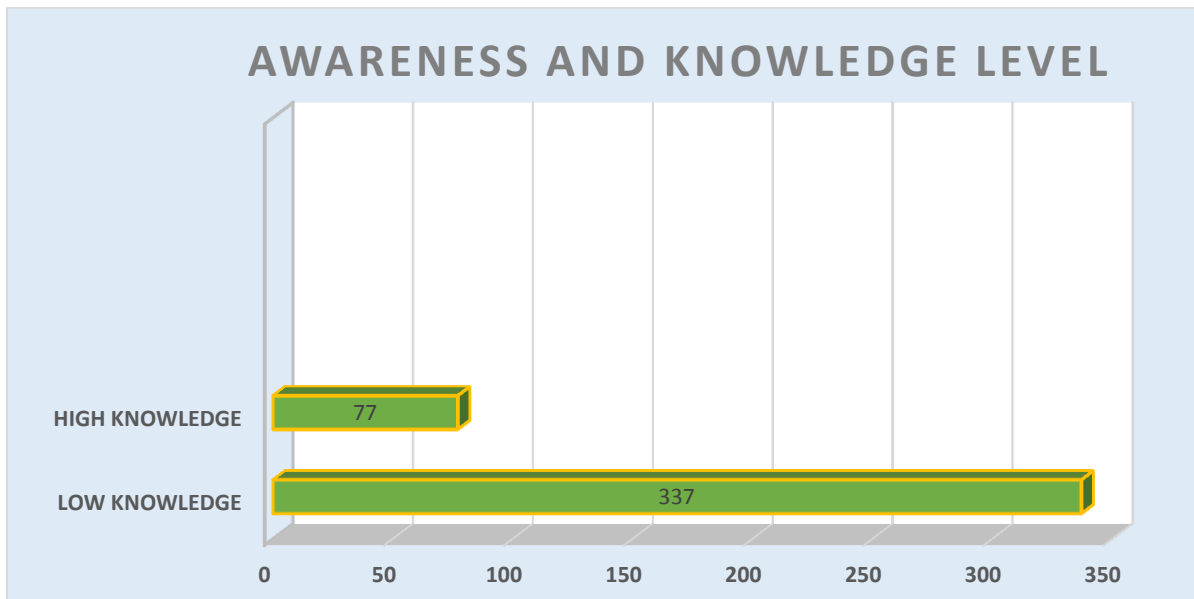
#### **4.4 Awareness and Knowledge Level of Diabetic Eye Complications**

The participants were asked whether they knew three common eye complications of Diabetes and whether diabetes could cause those complications. Again, they were asked whether diabetes could cause any eye disease and if so, they were offered the opportunity to write them out. The response of the interviewees is presented in Table 4.3. A score of 1 was awarded to each correct answer without repetition to attain a minimum total of 4. Individuals who scored below two (2) were ranked as having low knowledge, while those who scored two (2) or more had high knowledge. Figure 4.1 shows levels of knowledge of diabetic eye complications. In general, the majority [337(81.40 %)] of the diabetic patients had a low knowledge on diabetic eye complications. Only 77(18.60%) of them had high knowledge of the ocular complications of diabetes.

**Table 4.3: Response of Diabetic patients on Diabetic eye complications**

Variables (N=414)	Yes n(%)	No n(%)
Do you know Diabetic Retinopathy?	60(14.49%)	354(85.51%)
Do you know Glaucoma?	207(50.00%)	207(50.00%)
Do you know Cataract?	240(57.97%)	174(42.03%)
Can Diabetes cause any eye complication?	214(51.69%)	200(48.31%)
Asked among those reporting only awareness		
Preprinted eye complications participants selected from	Can Diabetes cause Diabetic Retinopathy? (n=60)	58(96.6701%)
	Can Diabetes cause Glaucoma? (n=207)	87(42.03%)
	Can Diabetes cause Cataract? (n=240)	119(49.58%)
Eye complications participants wrote themselves (n=214)	Diabetic Retinopathy	1(0.47%)
	Glaucoma	35(16.36%)
	Cataract	33(15.42%)
	Poor vision	8(3.74%)
	Blindness	28(13.08%)
	Don't know	109(50.93%)

Source: *Field data, 2020*



**Figure 4.2: Awareness and knowledge level of diabetic eye complications**

#### 4.5 Bivariate Analysis of Demographics on knowledge level of Diabetic Eye Complications

Awareness and knowledge of diabetic ocular complications was significantly associated with age group ( $\chi^2=7.938$ ,  $p=0.019$ ,  $df=2$ ), educational level ( $\chi^2=36.503$ ,  $p<0.001$ ,  $df=4$ ), marital status ( $\chi^2=12.707$ ,  $p=0.002$ ,  $df=2$ ), occupation ( $\chi^2=19.349$ ,  $p=0.001$ ,  $df=4$ ), ethnicity ( $\chi^2=8.947$ ,  $p=0.030$ ,  $df=3$ ), income level ( $\chi^2=15.694$ ,  $p<0.001$ ,  $df=2$ ) and residence ( $\chi^2=13.765$ ,  $p=0.008$ ,  $df=4$ ). However, the awareness and knowledge of diabetic ocular complications was insignificantly associated with gender ( $\chi^2=2.373$ ,  $p=0.123$ ,  $df=1$ ), religious beliefs ( $\chi^2=1.351$ ,  $p=0.509$ ,  $df=2$ ), NHIS status ( $\chi^2=0.001$ ,  $p=0.971$ ,  $df=1$ ) and awareness of being diabetic ( $\chi^2=3.803$ ,  $p=0.051$ ,  $df=1$ ). The bivariate analysis of demographics and awareness of Diabetes on knowledge level of Diabetic eye complications is presented in Table 4.4.

**Table 4.4: Bivariate analysis of demographics and awareness of diabetes on knowledge level of diabetic eye complications**

Demographic characteristics (N=414)	Awareness and knowledge of diabetic eye complication		P-value
	Low n=337(%)	High n=77(%)	
<b>Age group (years)</b>			
<40	19(5.64)	0(0.00)	<b>0.019*</b>
41-60	166(49.26)	49(63.64)	
61-80	152(45.10)	28(36.36)	
<b>Gender</b>			
Male	134(39.76)	38(49.35)	0.123
Female	203(60.24)	39(50.65)	
<b>Educational level</b>			
None	115(34.12)	23(29.87)	<b>&lt;0.001*</b>
Primary	60(17.80)	5(6.49)	
JHS	69(20.47)	8(10.39)	
SHS/Tech/Voc	60(17.80)	14(18.18)	
Tertiary	33(9.79)	27(35.06)	
<b>Marital status</b>			
Married	220(65.28)	52(67.53)	<b>0.002*</b>
Single	21(6.23)	13(16.88)	
Widow/Separated/Divorced	96(28.49)	12(15.58)	
<b>Occupation</b>			
Self-employed	201(59.64)	46(59.74)	<b>0.001*</b>

Government worker	14(4.15)	13(16.88)	
Pensioner	28(8.31)	6(7.79)	
Unemployed	67(19.88)	9(11.69)	
Other	27(8.01)	3(3.90)	
<b>Ethnicity</b>			
Akan	149(44.21)	48(62.34)	
Ewe	86(25.52)	16(20.78)	<b>0.030*</b>
Ga/Dangme	72(21.36)	9(11.69)	
Other	30(8.90)	4(5.19)	
<b>Religious Beliefs</b>			
Christian	316(93.77)	71(92.21)	0.509
Muslim	20(5.93)	5(6.49)	
Other	1(0.30)	1(1.30)	
<b>NHIS status</b>			
Active	328(97.33)	75(97.40)	0.971
Not active	9(2.67)	2(2.60)	
<b>Income level</b>			
<GH500.00	146(46.95)	34(33.01)	<b>&lt;0.001*</b>
GH500.00-GH1,000.00	132(39.17)	31(40.26)	
>GH1,000.00	47(13.95)	24(31.17)	
<b>Residence</b>			
Tema East	139(41.25)	21(27.27)	<b>0.008*</b>
Tema Central	52(15.43)	8(10.39)	
Tema West	102 (30.27)	34(44.16)	
Ashaiman	25(7.42)	12(15.58)	
Other	19(5.64)	2(2.60)	
<b>Awareness of having diabetes</b>			
Yes	321(95.25)	77(100.00)	0.051
No	16(4.75)	0(0.00)	

\*Statistically significant effect at a 95% Confidence Interval.

Source: *Field data, 2020*

#### 4.6 Multivariate Analysis of Demographic Characteristics Associated with Knowledge

##### Level of Diabetic Eye Complications

The respondents with a tertiary level of education were 4.1 times more likely to have high knowledge in diabetic eye complications compared to those with no formal education (COR=4.1, 95% CI=2.08-8.06,  $p<0.001$ ) but 4.2 times more likely upon adjusting for all other covariates in the model (AOR=4.2, 95% CI=1.64-10.64,  $p=0.003$ ). Also, the unmarried diabetic patients were



2.6 times more likely to have high knowledge in diabetic eye complications compared to the married interviewees (COR=2.6, 95% CI=1.23-5.57, p=0.012) but 3.2 times more likely holding all other variables constant (AOR=3.2, 95% CI=1.25-8.05, p=0.015). Government workers were 4.1 times more likely to have high knowledge in diabetic eye complications compared to self-employed workers (COR=4.1, 95% CI=1.79-9.21, p=0.001). The association between ethnicity and knowledge of diabetic eye complications was such that, Ga/Dangmes were 0.4 times more likely to have high knowledge compared to Akans (COR=0.4, 95% CI=0.18-0.83, p=0.015) but 0.3 times more likely holding all other variables constant (AOR=0.3, 95% CI=0.13-0.76, p=0.010). Furthermore, a higher socioeconomic income was likely to increase the awareness of diabetic eye disease. The participants who earned more than GHC 1,000.00 were 3.7 times more likely to have high knowledge in diabetic eye disease compared to those who earned below GHC 500.00 (COR=3.7, 95% CI=1.89-7.12, p<0.001). Finally, those residing in the Tema West constituency were likely to have increased knowledge in diabetic eye disease. That is, those residing in the Tema West constituency were 2.2 times more likely to have high knowledge in diabetic eye complications as compared to those residing in Tema east constituency. This is illustrated in Table 4.5.

**Table 5: Multiple logistic regression analysis of demographic characteristics associated with knowledge level of diabetic eye complications**

<b>Demographic characteristics</b> N=414	<b>COR</b>	<b>(95% CI)</b>	<b>P-value</b>	<b>AOR</b>	<b>(95% CI)</b>	<b>P-value</b>
<b>Age group (years)</b>						
<40( <i>ref</i> )	1.0	-	-	-	-	-
41-60	1.6	(0.96, 2.68)	0.072	-	-	-
61-80	1.0	-	-	-	-	-
<b>Educational level</b>						
None( <i>ref</i> )	1.0	-	-	1.0	-	-
Primary	0.4	(0.15, 1.15)	0.091	0.5	(0.16, 1.40)	0.161
JHS	0.6	(0.25, 1.37)	0.213	0.6	(0.22, 1.41)	0.218
SHS/Tech/Voc	1.2	(0.56, 2.43)	0.681	1.1	(0.45, 2.72)	0.816
Tertiary	4.1	(2.08, 8.06)	<0.001*	4.2	(1.64, 10.64)	0.003*
<b>Marital status</b>						
Married( <i>ref</i> )	1.0	-	-	1.0	-	-
Single	2.6	(1.23, 5.57)	0.012*	3.2	(1.25, 8.05)	0.015*
Widow/Separated/Divorced	0.5	(0.27, 1.04)	0.063	0.7	(0.29, 1.45)	0.293
<b>Occupation</b>						
Self employed( <i>ref</i> )	1.0	-	-	1.0	-	-
Government worker	4.1	(1.79, 9.21)	0.001*	0.9	(0.31, 2.83)	0.910
Pensioner	0.9	(0.37, 2.39)	0.891	1.0	(0.32, 3.35)	0.946
Unemployed	0.6	(0.27, 1.26)	0.173	0.9	(0.33, 2.23)	0.746
Other	0.5	(1.14, 1.67)	0.252	0.3	(0.07, 1.16)	0.078
<b>Ethnicity</b>						
Akan( <i>ref</i> )	1.0	-	-	1.0	-	-
Ewe	0.6	(0.31, 1.08)	0.085	0.6	(0.27, 1.14)	0.109
Ga/Dangme	0.4	(0.18, 0.83)	0.015*	0.3	(0.13, 0.76)	0.010*
Other	0.4	(0.14, 1.23)	0.114	0.4	(0.11, 1.27)	0.114
<b>Income level</b>						

<GH500.00( <i>ref</i> )	1.0	-	-	1.0	-	-
GH500.00 -GH1,000.00	1.7	(0.93, 3.05)	0.084	1.3	(0.62, 2.64)	0.504
>GH1,000.00	3.7	(1.89, 7.12)	<0.001*	2.0	(0.77, 5.33)	0.150
<b>Residence</b>						
Tema East( <i>ref</i> )	1.0	-	-	1.0	-	-
Tema Central	1.0	(0.42, 2.44)	0.968	0.7	(0.25, 1.76)	0.413
Tema West	2.2	(1.21, 4.02)	0.010*	1.7	(0.88, 3.41)	0.110
Ashaiman	3.2	(1.39, 7.27)	0.006*	4.3	(1.63, 11.20)	0.003*
Other	0.7	(0.15, 3.21)	0.643	0.6	(0.12, 0.43)	0.590

\*Statistically significant effect at a 95% Confidence Interval.

Source: *Field data, 2020*

#### 4.7 Referral Rate of Diabetics for Eye Examination

Majority of the interviewees [261 (63.04%)] had a history of an eye examination. About one-third [86 (57.33%)] of those who had a history of eye examination were referred for the eye examination by the doctor managing the diabetes. This is showed in table 4.6.

**Table 4.6: Referral rate for eye examination**

Variables (N=414)	Yes n(%)	No n(%)
History of eye examination	261(63.04%)	153(36.96%)
<b>Asked among only those reporting of history of eye examination (n=261)</b>		
Referrals to the eye clinic (n=150)	By Physician (Diabetes cases)	86(57.33%)
	By Nurse	19(12.67%)
	By Dietician/Nutritionist	4(2.67%)
	Other	41(27.33%)

Source: *Field data, 2020*

## CHAPTER 5

### 5.0 DISCUSSION

#### 5.1 Introduction

Diabetes mellitus is an important determinant of visual impairment among diabetic patients. Both Type 1 and Type 2 diabetes have varying roles in the damage of small retinal blood vessels that initiate a cascade of microangiopathy from retinopathy (both proliferative and non-proliferative) through to retinal detachment. Collateral neovascularization of the iris may cause neovascular glaucoma. Also, hyperglycaemic aqueous humour may diffuse into the crystalline lens where glucose is metabolized into sorbitol that leads to cataract formation (Bowling, 2015; Khurana, 2007). However, with early detection and management of Diabetes Mellitus, complications are well delayed or prevented. When patients have adequate knowledge of diabetic ocular complications, their health-seeking behavior and for that matter eye examination seeking behavior is influenced to prolong their vision better. This study sought to show whether diabetic patients were aware of having diabetes and of assessing their knowledge level of diabetic eye complications. The associations between the demographic factors and their diabetic eye complications knowledge level were also assessed as well as the rate at which diabetic patients were referred for eye examinations.

#### 5.2 Awareness of Diabetes

In this study, a more significant proportion of respondents (96.14%) were aware of their diabetic status. However, the awareness level was not significantly associated with the knowledge of diabetic ocular complications ( $p=0.051$ ). However, this was the opposite of a community-based prevalence study in Greater Accra, where Amoah *et al.*, found out that out of 300 subjects with

diabetes, 209 (69.7%) had no prior history of the disease (Amoah *et al.*, 2002). In another study looking at the prevalence of diabetes and impaired glucose tolerance in a rural and an urban community in Cameroon, 67% of diabetic subjects in the rural area were unknown before the survey, compared with 57% in the urban area (Mbanya *et al.*, 1997).

### **5.3 Knowledge of Diabetic Eye Complications**

Knowledge of diabetic eye complications is a necessary tool to influence eye examination seeking behavior and the management of diabetes in general. This study showed that patients had little knowledge of the ocular complications of diabetes. Only a few (18.6%) of the participants had a high knowledge of diabetic eye complications. This is consistent with a previous study where only 13.1% of diabetic patients had adequate knowledge of complications of diabetics (Obirikorang *et al.*, 2016). In a similar survey at Korle-Bu, it was revealed that about half (49%) of the diabetic patients reported that the disease could affect vision (Ovenseri-Ogbomo *et al.*, 2013).

On the contrary, the knowledge of diabetic eye complications has been reported to be higher in some Asian countries and Australia. A cross-sectional study conducted within seven regions of Oman reported of 72% knowledge level of diabetic eye complications in diabetic patients (Khandekar *et al.*, 2010). Elsewhere on the far eastern region of the Asian continent, a cohort study to identify why diabetic patients in Japan did not undergo periodic ocular examination showed that more than 98% of the patients were aware of diabetic eye disease (Funatsu *et al.*, 2003). Also, in a study eliciting knowledge of the ocular effects of diabetes among the general population of Australia and the members of Diabetes Australia, it was observed that 96% of people with diabetes knew that diabetes could be sight-threatening (Schmid *et al.*, 2003).

## **5.4 Association between Demography and knowledge of Diabetic Eye Complications**

### **5.4.1 Age Group**

In this study, the majority of the diabetic patients (51.93%) were between the ages of 41–60 years with the mean age of the patients being  $59.63 \pm 11.39$  years. This mean age was very similar to that of a similar study to ascertain the knowledge level of diabetes and its associated ocular manifestations by diabetic patients at Korle-Bu Teaching Hospital which found the mean age to be  $56.98 \pm 12.93$  years (Ovenseri-Ogbomo *et al.*, 2013). Also, in a study to determine the awareness of ocular complications of diabetes among diabetic patients in a tertiary hospital in Western Nigeria, the mean age of the participants was  $58.53 + 10.4$  years with the majority of them between 36-60years of age ( Bodunde *et al.*, 2014). These studies among others buttress the standpoint that the prevalence of diabetes increases with age (Amoah *et al.*, 2002; Danquah *et al.*, 2012; IDF, 2013; Saeed *et al.*, 2013). This increase in prevalence could be attributed to several risk factors including ageing, diet, obesity and physical inactivity (Tuomilehto *et al.*, 2001). It is thought of that while a person ages, the possibility of him learning or knowing new things is enhanced. Nonetheless, the age group was statistically insignificant with the knowledge of diabetic eye disease in this current research work.

### **5.4.2 Gender**

This current study revealed that the association between gender and the knowledge of diabetic eye complication is statistically not significant ( $p=0.123$ ). This fact is surprisingly the opposite of what previous studies at different jurisdictions have uncovered. Male diabetic participants were found to have adequate knowledge of diabetic complications compared to their female counterparts in a study to determine the knowledge of complications of diabetes mellitus among patients visiting the diabetes clinic at Sampa Government Hospital, Ghana (Obirikorang *et al.*,

2016). These results are consistent with the findings of a study conducted among people with diabetes living in Pakistan (Nisar *et al.*, 2008). Another study conducted in rural Northwest of Pakistan regarding knowledge of diabetes among patients showed that high proportion of males have a better understanding of diabetes symptoms, signs and complication as compared to females (Hawthorne and Tomlinson, 1999). These findings are also consistent with findings made by several other authors in a descriptive cross-sectional study (Gulabani *et al.*, 2008; (Mehrotra *et al.*, 2000).

### **5.4.3 Educational level**

The knowledge level of diabetic eye complications among diabetics is explained by the educational level of the patient. The higher the education level of a diabetic patient, the higher his knowledge level in diabetic complications. Ovenseri-Ogbomo *et al.* reported that most of the diabetic patients [2 (76.9%)] with basic education or more were knowledgeable on some ocular effects of Diabetes Mellitus (Ovenseri-Ogbomo *et al.*, 2013). Also, Obirikorang *et al.*, found out that all (100.0 %) participants who had completed tertiary education had adequate knowledge followed by those who had completed Senior High school (40.0 %), Junior High school (33.3 %), Basic school (22.0 %) and those who were unschooled (6.8 %) ( $p < 0.0001$ ) (Obirikorang *et al.*, 2016). These findings are not different from what this present study found as the bivariate analysis demonstrated a statistically significant association between educational level and knowledge of diabetic ocular complications. Diabetic patients with tertiary education were 4.2 times more likely to have high knowledge in diabetic eye complications (AOR = 4.2, 95% CI 1.64-10.64) compared to diabetic patients with no formal education after adjusting for all other variables.

#### **5.4.4 Marital status**

The association between the marital status of diabetic patients and knowledge of diabetic ocular complication is statistically significant in this study. Though the unmarried patients were the least (8.21%) among the participants, statistical significance repeated itself in the multivariate analysis as the unmarried diabetic patients were 2.6 times more likely to have high knowledge in diabetic eye complications compared to the married interviewees (COR=2.6, 95% CI=1.23-5.57) but 3.2 times more likely holding all other variables constant (AOR=3.2, 95% CI=1.25-8.05). Notwithstanding, most of the previous studies on diabetes and its complications excluded marital status as part of the participants' demography. One previous study, however, found a contrary view on the association between marital status and diabetic complications. The association between marital status and knowledge of complications of diabetes mellitus among patients visiting the diabetes clinic at Sampa Government Hospital in Ghana was found to be statistically significant (Obirikorang *et al.*, 2016).

#### **5.4.5 Occupation**

The respondents' occupational status was noted to have a statistically significant association with the knowledge of diabetic eye complications where self-employed participants constituted more than half of the individuals with knowledge on the ocular effects of diabetes. However, government workers were 4.1 times more likely to be knowledgeable in diabetic eye complications compared to self-employed participants (COR: 4.1, 95% CI 1.79-9.21). In contrast to this study, a previous study found out that though traders were more than half of the diabetics with knowledge on the ocular effects of diabetes (  $p = 0.221$ ) occupation was not statistically significant with the knowledge of ocular effects of diabetes (Ovenseri-Ogbomo *et al.*, 2013).



#### **5.4.6 Ethnicity**

Although Tema is in the Greater-Accra Region, most of the diabetic patients in this thesis work were Akans (mainly Fantes) (47.58%), followed by Ewes (24.64%). This can be attributed to the close proximity of Volta and Central Regions to Greater-Accra Region. It can also be attributed to employment opportunities. This came in soon after the building of the city by Dr. Kwame Nkrumah, when the industrial, and commercial employment opportunities created drew people from all parts of Ghana and beyond. As a result, Tema is a cosmopolitan area comprising of several ethnic groups. This study found ethnicity to be statistically significant with knowledge of diabetic eye complications. The study again found that the odds of a diabetic patient having high knowledge in diabetic eye complications decreased when the patient was a Ga/Adangme and increased when the patient was an Akan. This may probably suggest that the Akan diabetic patients had been exposed to more knowledge-seeking practices such as regular visits to physicians managing their diabetes.

#### **5.4.7 Religious beliefs**

Majority of the patients indicated they were Christians (93.48%). The religious belief of diabetic patients was statistically not significant with the knowledge of diabetic eye complications. This meant that the knowledge levels of the diabetic patients were irrespective of their religious affiliations. Religiosity, diabetes and its complications is an area to explore as most of the existing studies were silent on it.

#### **5.4.8 Income level**

Although a third of the participants (33.33%) had no formal education, they could give a range of their monthly earnings. There was a significant association between the respondents'

socioeconomic status and the level of knowledge of diabetic complication ( $p < 0.001$ ). Diabetic patients who earned more than GH¢1000.00 were 3.7 times more likely to have high knowledge in diabetic eye complications compared to those who earned below GH¢500.00 (COR = 3.7, 95% CI 1.89-7.12). However, previous studies have shown diverse stance on associations between income and knowledge of diabetic complications. A previous study by Al Shafae *et al.*, found out that a higher household income was associated with adequate knowledge on diabetic complications (Al Shafae *et al.*, 2008). Also, another study by Obirikorang *et al.*, discovered that diabetic patients irrespective of low, moderate or high economic income were significantly associated with adequate knowledge on diabetic complication compared to patients without economic income (Obirikorang *et al.*, 2016). Despite these significant associations, Hoque *et al.* observed no significant association between patients' socioeconomic income and degree of understanding for diabetic complications (Hoque *et al.*, 1970).

#### **5.4.9 Residence**

This study found the residence of diabetic patients to be statistically significant with the knowledge of diabetic ocular complications. The likelihood of having a high knowledge of diabetic ocular complication increased for participants who resided in the more developed areas of Tema. Diabetic patients who resided in the Tema West Constituency were 2.2 times more likely to have higher knowledge in diabetic ocular complications compared to those who resided in Tema East (COR=2.2, 95% CI 1.21-4.02). The study area being an urban setting agrees with a previous study in Pakistan which indicated that Type 2 diabetic patients who were urban dwellers were more knowledgeable than their counterparts residing in the rural area (Sabri *et al.*, 2007). However, there was no significant difference in knowledge on diabetic complications between rural and urban dwellers in a previous study at Sampa Government Hospital, Ghana

(Obirikorang *et al.*, 2016). This was probably because diabetes targeted education was lacking in both groups.

### **5.5 Rate of referrals for eye examinations**

Regarding the likelihood of diabetics developing ocular complications, these patients mostly require eye examination. Most of the diabetic patients (63.04%) had a history of an eye examination. Still, only about one-third of those who had a history of eye examination were referred for the eye examination. Diabetics are generally more conscious of their general health and therefore, pay more frequent visits to their primary diabetic physicians. This may probably be the reason why most (57.33%) of them who had undergone eye examination cited their physicians as their source of referrals to the eye clinic. The patients may also visit other health professionals such as dieticians/nutritionists and nurses who are part of the multidisciplinary diabetes management team. A few of the diabetic patients cited other health personnel as their source of referral for eye examinations. Education on diabetic eye complications could be intensified at all departments of the health setting, especially by the Physicians managing diabetes due to their regular contact with the patients.

## CHAPTER 6

### 6.0 CONCLUSIONS AND RECOMMENDATIONS

The importance of vision cannot be underrated but can be maintained only through concerted efforts of all the stakeholders involved. This chapter sums up the key findings of the study and suggests recommendations to increase the knowledge level of diabetic eye complications among diabetic patients.

#### 6.1 Conclusions

This study was first of its kind in the Tema Metropolis and among a few studies on diabetes and its complications in Ghana. It was noted that 96.14% of the diabetic patients were aware of their condition irrespective of their knowledge of its ocular complications. Previous studies on diabetes have affirmed aging as a risk factor. This research confirmed the findings from the previous studies as 51.93% of the participants were between 41-60 years, while 43.48% were beyond 60 years old. Nonetheless, only 18.6% of the participants in this study had a high knowledge of diabetic eye complications for which existing studies have found equivocal conclusions. Age group was found to be significantly associated with the knowledge of diabetic ocular complications. Attainment of formal education was also discovered to substantially influence the knowledge of diabetic eye complications, both independently and when adjusted for with other covariates. Thus, those with tertiary education were more likely to have higher knowledge compared to those with no formal education.

Occupation, area of residence and socioeconomic income of the patients independently predicted the knowledge level of diabetic ocular complications. Being a government worker or residing at the more developed enclaves of Tema or earning higher income increased the likelihood of

attaining higher knowledge. Also, marital status and ethnicity influenced the knowledge of diabetic ocular complications both independently and when all other associated variables are adjusted for. An unmarried or an Akan patient was likely to have a higher knowledge compared to patients of other marital statuses or ethnic descents. However, the patients' gender, religious beliefs, awareness of diabetes and their National Health Insurance Scheme (NHIS) status were not significantly associated with the knowledge of diabetic ocular complications. Majority of the diabetic patients (63.04%) had a history of an eye examination, but only about one-third of those who had a history of eye examination were referred for the eye examination. About half of the referrals (57.33%) were done by the patients' physician managing their diabetes, while a few were done by dietitians/nutritionists and nurses.

## **6.2 Recommendations**

### **6.2.1 Government and health regulatory authorities**

- It is incumbent on government and policy makers to formulate policies to influence the primordial and primary prevention of diabetes in the general population of Ghana. These include policies to ban the importation of unwholesome food items and tobacco products. Also, policies to increase physical activity of predominantly sedentary workers.
- The Ministry of Health (MoH) and Ghana Health Services (GHS) could provide extensive diabetic education, including complications targeting the aged and rural populace through appropriate channels such as the electronic media and public announcers.

- The National Health Insurance must be expanded to cover for the management of the ocular complications of diabetes which includes surgeries and intravitreal anti-VEGF injections.

### **6.2.2 Healthcare workers**

- Health facilities are required to embark on health education programmes as well as health outreaches on preventives measures of diabetes such as lifestyle and dietary modifications.
- Healthcare givers are to provide intensive early diabetic education regarding causes, management and preventive measures of diabetic complications.
- Referral of diabetic patients for periodic eye examinations by care givers in the diabetes management cycle must include all diabetic patients and done early enough.

### **6.2.3 Future Research**

- Future research work must consider increasing the sample size for study participants to enable the generalization of the research findings to a larger population.
- Future research work must also consider adopting a qualitative methodology to help unearth all the attributable risk factors to the disease condition.

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## APPENDIX II

### INFORMED CONSENT

Hi, my name is \_\_\_\_\_ and I am working with the Tema Metropolitan Health Directorate in conjunction with Ensign College of Public Health. We are conducting interviews in the Tema Metropolis on the assessment of diabetic patients' knowledge of diabetic eye complications. We would very much appreciate your participation in this interview.

Diabetic patients suffer systemic complications including eye disorders. Diabetes is a major cause of blindness globally. The lifestyle of people living in an industrial urban areas like Tema influences the risk of developing Diabetes as sugary and junk foods saves time for people to meet their busy schedules. This may be coupled with sedentary lifestyle as people spend long hours sitting and driving. We want to learn whether Diabetic patients in Tema know the eye effects that they are predisposed to as a result of their condition. We are exploring their awareness, knowledge, association of demographics with awareness and knowledge and the referral rate to eye clinics that may influence their uptake of eye examinations. We want to find ways to increase utilization of eye care services to promote early detection and management of irreversible blindness caused by Diabetes. We want to assess people who have been diagnosed of Diabetes by physicians. We believe you can help us by telling us about what you know of diabetic eye disease.

### ***Confidentiality***

We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone except the research team on this study.

### ***Risks***

We are asking you to share with us some very personal information about diabetic eye disease, and you may feel uncomfortable talking about some of the topics. You do not have to answer any question if you don't wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question, or for refusing to take part in the interview.

### ***Benefits***

Your participation is likely to help us find out more about the awareness and knowledge on diabetic eye diseases to improve on the referral of diabetics for eye examinations as well as to enhance health education on diabetic eye disease which will enhance early detection and management, thereby, reducing irreversible blindness. You will not be provided any incentive to take part in the research.

### ***Duration***

I would like to ask you some questions about your knowledge of diabetic eye complications. The interview usually takes about 30 minutes to complete.

Participation in this survey is voluntary and you can choose not to answer any question or all of the questions.

At this time, do you want to ask me anything about the interview?

Would you want to participate now?      **YES**      **NO**

**ANSWER ANY QUESTION AND ADDRESS RESPONDENT'S CONCERNS.**

RESPONDENT AGREES TO BE INTERVIEWED

1      ----- → BEGIN

**OR**

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED

2      ----- → END

**Name of Interviewer** \_\_\_\_\_

**Date:** \_\_\_\_\_

THUMB  
PRINT

**RESPONDENT'S SIGNATURE:** \_\_\_\_\_

**DATE** \_\_\_\_\_

**APPENDIX III**

**SAMPLE QUESTIONNAIRE**

**ASSESSMENT OF DIABETIC PATIENTS KNOWLEDGE OF DIABETIC EYE  
COMPLICATIONS IN TEMA**

**Respondent's ID #:** .....

**Date:** /...../.....

My name is .....I am a Graduate student at Ensign College of Public Health, Kpong. I am conducting the research on assessment of diabetic patients' knowledge of diabetic eye complications in Tema. I would be grateful if you could spare some time to answer this questionnaire. You are hereby assured of anonymity and that any information provided will be treated with the utmost confidentiality. If at any point you feel reluctant to participate, you have the right to drop out without any offense or hindrance. Thank you.

At this time, do you want to ask me anything about the survey?

Would you want to participate now?       **YES**       **NO**

## BACKGROUND OF RESPONDENTS

1. Age: .....
2. Gender:
  - a) Male
  - b) Female
3. Marital Status
  - a) Married
  - b) Single
  - c) Cohabiting
  - d) Widow/widower
  - e) Divorced/Separated
4. Educational level
  - a) No Formal Education
  - b) Primary
  - c) JHS
  - d) SHS equivalent
  - e) Tertiary
5. Occupation: .....
6. Ethnicity:
  - a) Akan
  - b) Ewe
  - c) Ga/Dangme
  - d) Northerner

e) Other:.....

**7. Religion**

- a) Christianity
- b) Islamic
- c) Traditionalist
- d) Other:.....

**8. NHIS Status?**

- a) Active [ ]
- b) Not active [ ]
- c) Not enrolled [ ]

**9. Income level (Monthly)**

- a) Less than 500 Gh [ ]
- b) Between 500 – 1,000 Gh [ ]
- c) More than 1,000 Gh [ ]

**DIABETIC STATUS**

1. Do you know your diabetic status YES[ ] NO[ ]

2. Do you have diabetics YES[ ] NO[ ]

3. How did you acquire your information about diabetes?

- a) Other diabetic patients [ ]
- b) Doctors [ ]
- c) Family and friend [ ]

d) Media [ ]

e) Others [ ]

**DIABETIC EYE DISEASE**

1. Do you know of Diabetic Retinopathy? YES[ ] NO[ ]
2. If yes, can diabetes cause Diabetic Retinopathy? YES[ ] NO[ ]
3. Do you know of Glaucoma? YES[ ] NO[ ]
4. If yes, can diabetes cause Glaucoma? YES[ ] NO[ ]
5. Do you know of Cataract? YES[ ] NO[ ]
6. If yes, can diabetes cause cataract? YES[ ] NO[ ]
7. Can diabetes cause any eye disease? YES[ ] NO[ ]
8. If yes, name as much of such diseases.....
9. Have you undertaken an eye test before? YES[ ] NO[ ]
10. If yes, were you referred for the eye test? YES[ ] NO[ ]
11. If yes, who referred you?
- a) The doctor managing your diabetes
  - b) Nurse
  - c) Dietician/Nutritionist
  - d) Other.....