SCHOOL OF PUBLIC HEALTH

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DIABETES MELLITUS: RISK FACTORS AND COMPLICATIONS IN PATIENTS ATTENDING MAAMOBI GENERAL HOSPITAL

BY

NANCY APEWE BIAH

(10598567)

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DECLARATION

I, Nancy Apewe Biah do hereby declare that, except for reference made to other people's work which have been duly acknowledged, this work was done by me under supervision .I also declare that this work has not been submitted for the award of any degree in this university or elsewhere.

NANCY APEWE BIAH (STUDENT) ..... SIGNATURE ..... DATE

PROF. KWASI TORPEY (SUPERVISOR) ..... SIGNATURE ..... DATE

DEDICATION

I dedicate this work to the Almighty God for providing me with wisdom, knowledge and good health which culminated to the success of this work. To my dad Colonel (Rtd.) Biah and my mum Mary Biah and my mother-law Benedicta Awe Moutrage for their prayers and encouragement. To my husband Faisal Webre Keliou and my two sons Akiwele and Zanbajia and my siblings Marci, Kingsley, Linda, Eva, Selina and Patience for the inspiration that I can do it all. To Shafic (brotherin-law) who helped with the kids. God richly bless you all.

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Thanks to the Almighty God for His care, guidance and protection for the successful completion of my dissertation.

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ABSTRACT

Background: Unhealthy diet, smoking, physical inactivity, overweight/obesity, impaired glucose tolerance (IGT) and/or impaired fasting glycaemia (IFG) result in diabetes mellitus. The hyperglycemic condition in diabetics leads to the development of some complications driven by both modifiable and non-modifiable risk factors. This study therefore seeks to determine the risk factors and associated complications in patients with diabetes mellitus at the Maamobi General Hospital in order to help guide policies and practices in diabetic care management plans. **General Aim:** To determine diabetes mellitus risk factors and complications in patients attending Maamobi General Hospital.

Methodology: This was a descriptive cross-sectional study using a quantitative method. This involved the use of structured questionnaires. The study population included all diabetes mellitus patient attending the diabetic clinic at the Maamobi General Hospital. Simple Random Sampling Without Replacement (SRSWOR) technique was employed to select 132 diabetes mellitus patients. Information was captured on sociodemographic characteristics, behavioral risk factors and diabetes mellitus related complications. Data from the questionnaire were entered into Microsoft Excel and then transferred to STATA Version 14 for analysis. Simple proportions and means were used to describe categorical and numerical data, respectively. Chi square and Cramer's v tests were used to test for association and strength between the explanatory variables and the outcome variables. A confidence interval of 95% was used to show significant relations between the dependent and the independent variables.

Results/Findings: The results show a high prevalence of complications with predominance of diabetic retinopathy (46.0%), followed by diabetic foot (24.0%) and erectile dysfunction (24%). The prevalence of hypertension was very high at 97.07% among the respondents. Additionally,

respondents' level of commitment to physical activity and good diet is low. There was also a significant association between gender of respondents and diabetes mellitus complications where the prevalence rate was high in males than females. Age, educational level, marital status and religious affiliations of the respondents were not significantly related to the complications observed.

Conclusion: The study concludes that there is a high prevalence of diabetes mellitus complications and hypertension comorbidity among diabetes patients at the Maamobi General Hospital. The study calls for regular medical screening of complications to prevent progression.

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LIST OF ABREVIATIONS

AMA	Accra Metropolitan Assembly
BMI	Body Mass Index
DM	Diabetes Mellitus
DM2	Diabetes Mellitus 2
GHS	Ghana Health Service
IDF	International Federation on Diabetes
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance
MOH	Ministry of Health
OPD	Out patient Department
PFRH	Population, Family and Reproductive Health
SPH	School of Public Health
SSA	Sub-Saharan Africa
SRSWOR	Simple Random Sampling without Replacement
PN	Peripheral Neuropathy
PVD	Peripheral Vascular Disease
TIA	Transient Ischemic Attack
TV	Television
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.0 Background

Diabetes mellitus is a group of metabolic disease of multiple etiology which is characterized by elevated levels of blood sugar. It occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces (WHO, 2016). Diabetes mellitus is a chronic non-communicable disease whose global distribution has given it the characteristics of a pandemic.

Diabetes mellitus may present symptoms such as polyuria (frequent urination), polydipsia (excess thirst) blurred vision, glycosuria (sugar in urine), dehydration and weight loss with or without polyphagia (increased hunger).

Diabetes mellitus is grouped into three (3) types. Type one (1) diabetes is characterized by lack of insulin production in the body. Regular insulin injection is needed on daily basis by type 1 and believe to be caused by genetic and unpreventable causes (Diabetes care, 2009). Type 2 refers to the body's ineffective use of insulin, it accounts for 90 - 95% of all diabetes mellitus cases (International Federation on Diabetes (IFD), 2012). This may go undiagnosed for many years until complications set in. Type 2 diabetes mellitus was seen only in adults but has begun to manifest in children. Gestational diabetes is a temporary condition that occurs in pregnancy which can result in long term-risk of type 2 diabetes. Women with gestational diabetes are at a greater risk of complication during pregnancy and delivery (WHO, 2016).

High blood glucose can result in life threatening conditions such as ketoacidosis and low blood glucose. It can also cause seizures or loss of consciousness especially when a meal is skipped during strenuous exercise or high dosage of anti-diabetic medication (WHO, 2016).

The number of people living with diabetes mellitus has quadrupled from 108 million in 1980 to 422 million in 2014 (WHO, 2016). Additionally, Shaw et al (2010) projected that by 2030, the number of diabetics within the age group 18 years and older would increase to six hundred million (600,000,000) within Sub-Saharan African countries alongside non-communicable diseases (Hall et. al, 2011). Compounding this is the fact that, majority of these people are oblivious of their status and therefore do not receive any treatment (WHO, 2016). This resulted in 1.5 million direct cause of death due to diabetes mellitus in 2012 and 2.2 million of indirect cause (WHO, 2016).

According to the WHO (2016), risk factors associated with diabetes mellitus include unhealthy diet, smoking, physical inactivity, overweight/obesity. Coupled with these factors are impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) which are intermediate conditions in the transition between normality and diabetes mellitus (WHO, 2013). However according to Nsiah (2015), the hyperglycemic condition in diabetics makes them prone to developing some complications driven by both modifiable and non-modifiable risk factors.

These complications include, renal impairment, peripheral neuritis, disease of the eye, erectile dysfunction, diabetic foot disease, cardiovascular and cerebrovascular conditions (Amissah & Amoako-Boateng, 2014). The prevalence of these conditions significantly increase with duration of illness. Individuals with undiagnosed diabetes mellitus are however at a higher risk of complications than the non-diabetic population (Fowler, 2008).

Moreover the level of diabetes management is very challenging especially in low and middle income countries such as Ghana (MOH, 2012). Studies by Amissah & Amoako-Boateng, (2014) recorded an increased incidence of lingering complications including 97.2% prevalence of hypertension among type two (2) DM patients at Cape Coast Teaching Hospital. This is expected to occur in low and middle income countries like Ghana (Woodward et al. 2003). In Ghana type 2 diabetes mellitus affects about 10.3% of adults in Greater Accra Region (Agyemang et al., 2016).

The impact of diabetes mellitus makes it a global health concern. To curb the pandemic, people should have knowledge on risk factors and its complications and adopt healthy lifestyle behaviors. No research has however been done on diabetes mellitus in the study area to enable generalization or estimation of the true burden of the disease (AMA report, 2016). Ayawaso East sub-district where Maamobi General Hospital (the study area) is located is one of the most populated sub-districts of the Accra Metropolis. In this area majority of the people are engaged in sedentary lifestyles.

1.2 Problem Statement

Diabetes mellitus is now one common non-communicable disease and is reaching epidemic proportions globally (Shaw et al. 2010). In sub-Saharan Africa (SSA), the death rates of diabetes mellitus and hypertension are among the highest worldwide (Danquah et al., 2012). While today an overall diabetes mellitus prevalence of 4% is assumed, the number of affected patients is projected to double from 12 to 24 million within the next 20 years (Danquah, et al., 2012). In Ghana, type 2 diabetes mellitus affects at least 6% of adults and is related to age and obesity. Some 23% of adults are overweight, and this has been related to advanced age, gender, urban environment, high income and tertiary education (Danquah, et al., 2012).

Unhealthy diet, smoking, physical inactivity, overweight/obesity, impaired glucose tolerance (IGT) and/or impaired fasting glycaemia (IFG) results in diabetes mellitus (WHO, 2016). The number of people living with diabetes mellitus has quadrupled from 108 million in 1980 to 422 million in 2014 (WHO, 2016). However, more than half of these people are unaware of their disease status and therefore do not receive any treatment (WHO, 2016) resulting in 1.5 million deaths and high blood glucose was the cause of another 2.2 million deaths (WHO, 2012). It is therefore not surprising that the WHO in its 2016 World Health celebration calls for action on diabetes mellitus, drawing the attention to the need to step-up prevention and treatment.

Diabetes mellitus remains one of the top 10 causes of OPD hospital attendance in Ghana (DeGraft, 2007). This results in 6.8% of all adult admissions and 7.8% of all adult death (Bruce *et al.*, 2015). Difference in the pattern, management and outcome of diabetes mellitus in sub-Saharan Africa including Ghana compared to the western world has been observed (Majaliwa *et al*, 2008). Poor or lack of management of diabetes mellitus results in renal impairment, peripheral neuritis, diabetic foot disease, disease of the eye, cerebrovascular, erectile dysfunction and cardiovascular conditions (Amissah *et al*, 2016). An increased incidence of prolonged complications including 97.2% prevalence of hypertension was found among type two (2) diabetes mellitus patients at a Ghanaian teaching hospital (Amissah *et al*, 2016). Nonetheless, the impact of diabetes mellitus makes it a global health concern and to curb this pandemic, people generally should have knowledge on risk factors and its complications and adopt healthy lifestyle behaviors.

1.3 Objective of the Study

The general objective is to determine associated risk factors and complications of diabetes mellitus in patients attending Maamobi General Hospital.

The specific objectives of the study are:

Unhealthy diet, smoking, physical inactivity, overweight/obesity, impaired glucose tolerance (IGT) and/or impaired fasting glycaemia (IFG) results in diabetes mellitus (WHO, 2016). The number of people living with diabetes mellitus has quadrupled from 108 million in 1980 to 422 million in 2014 (WHO, 2016). However, more than half of these people are unaware of their disease status and therefore do not receive any treatment (WHO, 2016) resulting in 1.5 million deaths and high blood glucose was the cause of another 2.2 million deaths (WHO, 2012). It is therefore not surprising that the WHO in its 2016 World Health celebration calls for action on diabetes mellitus, drawing the attention to the need to step-up prevention and treatment.

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1.3 Objective of the Study

The general objective is to determine associated risk factors and complications of diabetes mellitus in patients attending Maamobi General Hospital.

The specific objectives of the study are:

- To assess the risk factors for diabetics at Maamobi General Hospital.
- To identify common complications among diabetics attending Maamobi General Hospital.
- To assess the associations between diabetes mellitus complications and sociodemographics.

1.4 Research Questions

1. What are the risk factors for diabetics?
2. What are the common complications among diabetics studied?
3. Are there any associations between diabetes mellitus complications and socio-demographics of respondents?

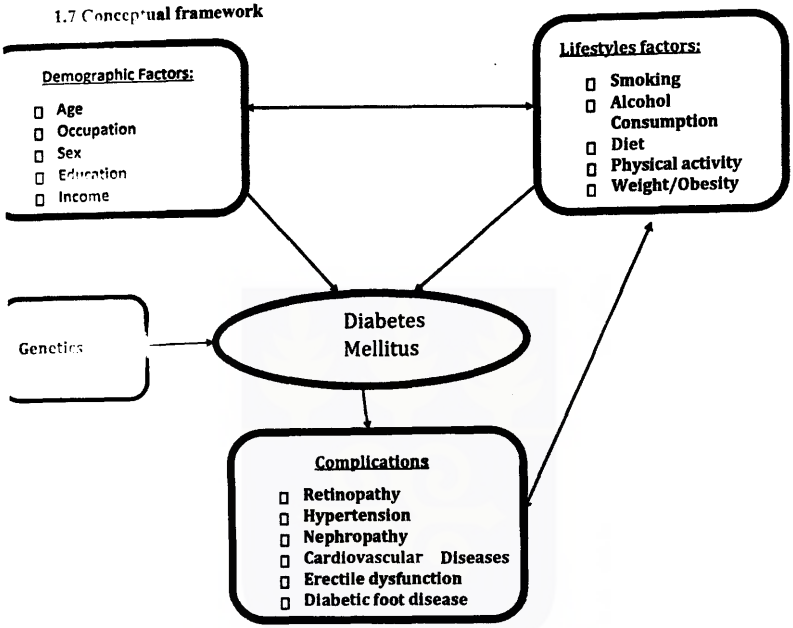
1.5 Justification of Study

The findings of the study will help increase awareness on risk factors and complications of diabetes mellitus. It will also help improve diabetes mellitus health programs and help health professionals to better manage diabetics. It will also help policy makers make informed decisions the best avenues to address the disease burden.

1.6 Scope and Limitations

This study will be conducted within Maamobi General Hospital in the Greater Accra and the study is confined to exploring risk factors among diabetics, identify common complications as well as determine comorbidities among diabetics. A major limitation of this study will be the time allocated for the study. The study will also be restricted from exploring other issues such as diabetes awareness.

1.7 Conceptual framework



Diabetes mellitus is a major public health issue and is due to increased urbanization and lifestyles changes. Sociodemographic characteristics have been recognized to influence health care in most countries. These include sex, age, occupation, body mass index (BMI), income, education, family history. Lifestyle factors influence ones risk of diabetes mellitus and if it is not controlled can lead to complications. Lifestyle factors interact with genetics to result in non-communicable disease.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section reviewed literatures on the subject matter and important published studies by other researchers relevant to this study. The literature review is structured around the objectives of this study and research process and presented as follows:

2.2 Diabetes mellitus as a global burden

The global burden of diabetes mellitus is increasing across the world (WHO, 2016). Adults with diabetes mellitus in 2014 was 422 million representing 8.5% of the world population, compared to 108 million (4.7%) in 1980 (WHO, 2016). This resulted in 1.5 million deaths in 2012 and an additional 2.2 million indirect deaths by increasing the risks of cardiovascular and other diseases. Moreover, the number of adults suffering from any form of diabetes mellitus globally is expected to increase to 600 million in 2030 (Shaw *et al*., 2010). However nearly 80% of these diabetics live in low- and middle-income countries (IFD, 2012). Meanwhile the epidemic of diabetes mellitus has major health and socioeconomic impact, especially in developing countries (Dall *et al*, 2010; Chodick *et al,* 2010). Sub-Saharan Africa is experiencing this increase in diabetes mellitus prevalence alongside other non-communicable diseases (Hall *et al*., 2011). Obesity which is a major risk factor for diabetes mellitus continues to escalate in both the developed and the developing world. For instance, in 2014, more than 1 in 3 adults aged over 18 years were overweight and more than one in 10 were obese (WHO, 2016). Complications of diabetes mellitus can lead to functional limitations in daily life and can result in shortening of life expectancy by several years (Seshasai *et al*, 2011; O'Reilly *et al,* 2011; Schunk *et al*, 2012).

2.3 Diabetes mellitus burden in Ghana

Earlier studies in Ghana on the prevalence of diabetes mellitus in the 1960s recorded 0.2 % in a population of men living in Ho (Aikins, 2007). However in the late 1990s, the crude prevalence of diabetes mellitus in the general population of people living in Accra was 6.3 %, with age adjusted prevalence and impaired glucose tolerance (IGT) of 6.1 and 10.7 % respectively (CookHuynh *et al.*, 2012).

Diabetes mellitus remains one of the top 10 causes of OPD hospital attendance in Ghana (DeGraft, 2007). This results in 6.8% of all adult admissions and 7.8% of all adult death (Bruce *et al.*, 2015). Similar studies recorded high prevalence of chronic complications including a 97.2% prevalence of hypertension among type two (2) DM patients at a Ghanaian teaching hospital (Amissah & Amoako-Boateng, 2014). Compounding this however is the fact that management of diabetes mellitus in Ghana is a challenge (MOH, 2012). There is therefore the need to understand the risk factors associated with diabetes mellitus in order to facilitate its management.

2.4 Risk Factors of Diabetes mellitus

There are several risk factors of diabetes mellitus. However for the purpose of this study, the risk factors are categorized and presented as follows:

2.4.1 Sociodemographic Risk Factors

Studies have shown significant associations between diabetes mellitus and demographic characteristics (Akter, Rahman, & Abe, 2014). These demographic characteristics are categorized and presented as follows:

2.4.1.1 Age

Studies have shown increasing diabetes mellitus prevalence with age (Kumar, 2008). Several other studies reported similar findings (Ghorpade et al, 2013). Studies by Zhao et al, (2016) revealed

that prevalence of prediabetes and diabetes mellitus vary substantially with the individual's age and are similar to those observed around the world. However Zhao et al, (2016) identified that the prevalence of diabetes mellitus peaked in the age group of 20–40 years and fell in the age group of 41–60 years. This is however contrary to other studies where the peak age group was in 35–44 years (in males) and 45–54 and 55–64 years (in females) in rural areas in Shanghai (Li et al, 2006). Further, recent studies shows the prevalence of diabetes mellitus and pre-diabetes increase with the increasing age (Muthunarayana et al, 2015). Moreover the risk of heart failure in patients with diabetes mellitus increases with the advancing age (Seshasai et al, 2011).

2.4.1.2 Gender

According to Seshasai et al, (2011) 'gender and diabetic are related. Gender has been found in several other studies as a risk factor that influences the progression of diabetic nephropathy' (Imai et al, 2008). Similar studies found higher prevalence of diabetes mellitus among males compared to females (Adejoh, 2013). However this is contrary to other studies which identified higher prevalence among females compared to males (Ekpenyong et al, 2012). Moreover, gender is a globally identified risk factor for diabetes mellitus (Ekpenyong et al, 2012). Further, a study by Seshasai et al, (2011) identified higher prevalence of prediabetes and diabetes mellitus among women compared to men. Similar finding was reported by Soewondo & Pramono, (2011). However contrary to this, a study by Mohan et al, (2008) and (Sajjadi et al, 2008) reported, higher prevalence of diabetes mellitus in men compared to women.

2.4.1.3 Education

Prevalence of prediabetes and diabetes mellitus vary significantly with the individual's educational level (Odume, 2015). This association varies internationally (Odume, 2015). In contrast, another

study in Nigeria found that the prevalence of diabetes mellitus was generally unaffected by educational level (Adejoh, 2013). Moreover, studies from both developing and developed countries have found inverse associations between diabetes mellitus and educational level perhaps because the better-educated were more health-conscious (Kumar, 2008; Adejoh, 2013).

Similarly, other studies found association between illiteracy and diabetes mellitus (Al-Moosa et al, 2006; Laramee et al, 2007).

2.4.1.4 Marital Status

Studies have shown no difference observed in the prevalence of diabetes mellitus and being married (K. Rahmanian et al, 2013). But other studies suggests that individuals who are single, divorced and widowed are significantly associated with diabetes mellitus (Azimi-Nezhad M. et al, 2008).

Furthermore, evidence from Poljicanin T. et al, 2012, shows that individuals who are widowed, divorced/separated or single are predisposed to diabetes development due to unhealthy lifestyle, lack of social support and stress.

2.4.1.5 Religion

According to (Sridhar, G R, 2013) 'the relationship between religion and diabetes mellitus might be attributed to lifestyle habits promoted by religious practices and not merely adhering to a specific religion.' Similar studies found religiosity was associated with short-term but not longterm glycemic control. However, religion on the other hand was significantly associated with longterm but not short-term glycaemic control (How, B. et al, 2011).

2.4.2 Lifestyles Risk factors

According to the WHO (2016), 'risk factors associated with diabetes mellitus include unhealthy diet, smoking, alcohol, physical inactivity and overweight/obesity.' The effects of these lifestyles

risk factors may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids, overweight and obesity. Similar studies reported cardiovascular risk factors for diabetes mellitus include overweight and obesity, sodium intake, alcohol intake, sedentary lifestyle. These risk factors are categorized for discussion as follows:

2.4.2.1 Diet

Several studies have shown that too much caloric intake is a major driving force behind accelerating obesity and type 2 diabetes mellitus epidemics worldwide (Hu, 2011; WHO, 2016). Quality of fats and carbohydrates play an important role in the development of diabetes mellitus, independent of BMI and other risk factors (Qi et al, 2009; de Munter et al, 2007). Additionally higher dietary glycemic load (GL) and *trans* fat are associated with increased diabetes mellitus risk, whereas greater consumption of cereal fiber and polyunsaturated fat is associated with decreased risk (Hu, 2011). Similarly studies have shown that a 2 serving/day increment in wholegrain intake is associated with a 21% lower risk of diabetes mellitus (Sun et al, 2010). However, higher consumption of white rice is associated with increased risk of diabetes mellitus, whereas consumption of brown rice, a whole grain, protects against the disease (Hu, 2011).

2.4.2.2 Physical activity

Studies indicate that being overweight/obese and low level of physical activity are the potential risk factors of diabetes mellitus (Barik et al, 2016). Also, irrespective of economic status, people living in both the urban and rural areas increasingly refrain from labor-intensive activities leading to low physical activity (Hu, 2011; WHO, 2016). Various epidemiologic studies show that increased physical activity reduces risk of diabetes mellitus, whereas sedentary behaviors increase risk. (Hu, 2011; WHO, 2016). Increased mechanization and driving have displaced physical activity over the last century in industrialized nations (WHO, 2016).

2.4.2.3 Smoking

Cigarette smoking is an independent risk factor for type 2 mellitus diabetes (Barik et al, 2016). A meta-analysis found that current smokers had a 45% increased risk of developing diabetes mellitus compared with nonsmokers (Willi et al, 2007). Several possible biological mechanisms may explain the association between cigarette smoking and diabetes mellitus. First, although smokers tend to be leaner than nonsmokers, smoking has been associated with increased risk of central obesity or abdominal fat which is an established risk factor for insulin resistance and diabetes mellitus (Willi et al, 2007; Bruin et al, 2008).

2.4.2.4 Alcohol

Light-to-moderate alcohol consumption is associated with reduced risk of diabetes mellitus (Koppes et al, 2005). On the other hand, heavy alcohol intake has multiple deleterious metabolic effects including excess caloric intake and obesity, increased triglyceride levels, pancreatitis, disturbance of carbohydrate and glucose metabolism, and impairment of liver function (Koppes et al, 2005).

2.5 Complications of diabetes mellitus

Persons with diabetes mellitus have an increased risk of developing a number of serious health problems. Consistently high blood sugar levels can lead to serious sicknesses affecting the heart and blood vessels, eyes, kidneys, nerves and teeth (International Federation of Diabetes, 2016). These complications are categorized and presented as follows.

2.5.1 Cardiovascular Condition

Cardiovascular disease is the most common cause of death in people with diabetes mellitus. High blood pressure, high cholesterol, high blood glucose and other risk factors contribute to increasing the risk of cardiovascular complications (Mostafavi-Pour-Manshadi & Naderi, 2016).

These complications and diseases are the main and notable causes of morbidity and mortality in the patients with diabetes mellitus and consequently, the financial burden and clinical involvements are considerably high (Freire *et al,* 2007). Diabetes mellitus increases the risk of cardiovascular diseases independently, especially coronary artery disease, in both male and female diabetic patients by 2-4 times and the associated morbidity by 2-6 folds (Preis, Hwang & Coady, 2009).

2.5.2 Diabetic Foot Disease

Studies have shown that the rates of lower limb amputation are 10 to 20 times higher for people with diabetes mellitus (WHO, 2016). Foot complications are common in diabetic patients and are considered one of the most expensive diabetes mellitus complications to treat (Al-Maskari & ElSadig, 2007). Peripheral neuropathy (PN) and peripheral vascular disease (PVD) have been reported as well-known common long-term complications of diabetes mellitus (Freire *et al*, 2007). However people with PN and PVD are known to be at high risk of foot complications including foot ulceration, infection and amputation (Al-Maskari & El-Sadig, 2007). Peripheral neuropathy (PN) and PVD are the main causes of non-traumatic lower limb amputation (Al-Maskari & ElSadig, 2007).

2.5.3 Diabetic Retinopathy

Consistently high levels of blood glucose, together with high blood pressure and high cholesterol, are found to be the main causes of retinopathy (Kotlarsky *et al*, 2015). Further, studies indicate that most people with diabetes mellitus will develop some form of eye disease (retinopathy) causing reduced vision or blindness (Kotlarsky *et al*, 2015).

Diabetic retinopathy is the leading cause of blindness among the working population in the United States of America (IDF, 2012). Similar studies report 10.1% of all blindness cases in Israel is due to diabetic retinopathy and with this figure is constantly rising (IDF, 2012).

2.5.4 Diabetic **Nephropathy**

Diabetic nephropathy is the leading cause of end stage kidney disease among type 2 diabetics worldwide (Brenyah1et al, 2013). Diabetic nephropathy results in damage to small blood vessels in the kidneys make it less efficient or fail altogether (Kotlarsky *et al*, 2015). Kidney disease is much more common in people with diabetes mellitus than in those without. Maintaining near normal levels of blood glucose and blood pressure can greatly reduce the risk of kidney disease ((Tamba *et al*, 2013).

Strong correlation is reported between diabetic retinopathy and diabetic nephropathy (Kotlarsky *et al*, 2015). The chronology of appearance of microvascular complications in type 1 diabetes mellitus is retinopathy prior to nephropathy (Romero-Aroca *et al*, 2010).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods that were employed to carry out the study. It discusses the research design, study area, population, sample size, sample and sampling procedure. Others are data collection method, data analysis and ethical considerations. They are presented as follows:

3.2 Research Design

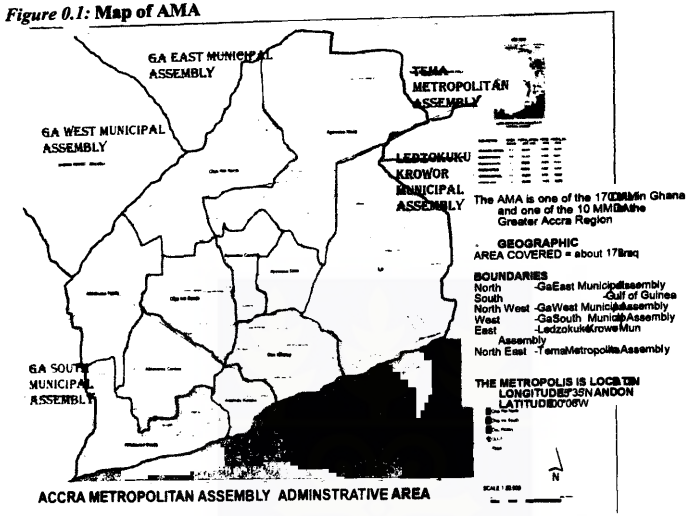
This is a descriptive cross-sectional study using a quantitative approach to determine the risk factors and associated complications in patients with diabetes mellitus at the Maamobi General Hospital.

3.3 Study Area

The study was conducted at the Maamobi General Hospital. Maamobi General Hospital is located within the Ayawaso East sub-district of the Accra Metropolitan Assembly of Ghana (AMA). The population of AMA according to the 2010 Population and Housing Census, is 1,665,086 representing 42 percent of the region's total population. Males constitute 48.1 percent and females represent 51.9 percent. The Metropolis is entirely urban (100%). It has a sex ratio of 93 and youthful population (42.6%) depicting a broad base population pyramid which tapers off with a small number of elderly persons (60+ years) constituting 5.9 percent.

The population of Maamobi is 49,812. Most residents are involved in informal businesses such as trading. Their surrounding conditions is characterized by poor drainage, inadequate housing, and disorganized development. (AMA, 2016). Maamobi General Hospital is the biggest public health institution in the Ayawaso East Sub District that serves Maamobi and surrounding communities.

Figure 0.1: **Map of AMA**



3.4 Study Population

The study population was all diabetes mellitus patients attending the diabetic clinic of the Maamobi General Hospital.

3.5 Inclusion criteria

The study included all persons with blood sugar related diseases diagnosed based on WHO standards (WHO, 1999) i.e. fasting plasma glucose ≥7.0mmol/L and /or 2 hours postprandial plasma glucose or random plasma glucose ≥11.1mmol/L, >18yrs old who agreed to participate.

3.6 Exclusion Criteria

We excluded all those who are below 18 years of age.

3.7 Variables

- Dependent Variables
  - Risk factors of diabetes mellitus
  - Complications of diabetes mellitus
- Independent Variables
  - Socio-demographics: age, religion, education, sex, marital status and occupation.

3.8 Sample Size Determination

Adopting sample size formula by Cochran for cross-sectional study:

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

where:

n: sample size p: prevalence of diabetes mellitus p=8.5%, global prevalence

(WHO, 2014) d: margin of error, 5%

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

Inputting the above into equation (1), the minimum sample size for external clients required for this study is given by

$$n = \frac{(1.96)^2 \times 0.085(1-0.915)}{(0.05)^2} = 119.512$$

Using expected loss ratio of 10%,

119.512×0.1=11.9512

119.512+11.9512=131.463

Therefore sample size is (approximate) is 132

3.9 Sampling Procedure

Simple Random Sampling without Replacement (SRSWOR) technique was employed to select 132 diabetes mellitus patients. SRSWOR means that once a participant is selected, he or she was not selected again (Ahmed, 2009). Simple random sampling technique was based on the patients' proportions at the diabetic clinic at the time of the data collection. The principal researcher and the assistants using a structured questionnaire interviewed the participants who attended routine review visits at the clinic.

Information was captured on socio-demographic characteristics (gender, age, religion and education), diabetes type (1, 2 or gestational), and related/associated factors including family history, smoking and amount/frequency, sedentary lifestyle, age at which diabetes was initially diagnosed, period of the diabetes mellitus diagnosis and other diabetic related complications. Related diabetes mellitus complications was extracted from participants' folders. Diabetes mellitus complications that were considered in this study was diabetic neuritis, erectile dysfunction (in men), cardiovascular conditions, eye problems and diabetic foot diseases. Foot diseases will consist of foot ulcer and amputation; cardiovascular conditions are heart failure; eye problems will include cataracts, retinopathy, glaucoma, blindness, blurry vision etc. Essentially, hypertension was considered as a co-morbid condition and not a complication. The diagnosis of diabetes mellitus complications was gotten from participants' medical records with no extra assessments clinically. Data collection was carried out during diabetic clinic day (Wednesday). Thirty-three (33) questionnaires were estimated to be issued out to participants each clinic day.

3.10 Questionnaire Design and Administration

Questionnaires will be used and participants were given consent form to read and sign prior to answering the questionnaire. Questionnaire and consent forms was read out and explained to participants who were not able to read or write and consent form signed / thumbprint by a witness. The questionnaire had three sections. Section one encompass the sociodemographic characteristics (gender, age, religion and education), diabetes mellitus types (1, 2 or gestational), and related/associated factors including family history, smoking and amount/frequency, sedentary lifestyle, age at which diabetes was initially diagnosed and period of the disease. Section two consist of the diabetes mellitus related complications. Each questionnaire took 15-30 minutes on the average to be completed.

3.11 Quality Control

- Pretesting of Data collection tool was done at the 37 Military Hospital prior to data collection to validate the survey tools.
- Questionnaires were explained to participants prior to interview.
- Research assistants were trained to carry out survey accurately.
- Questionnaires was cross checked by principal researcher at the time of the interview.

3.12 Data Processing and Analysis

Data from the questionnaires were entered into Microsoft Excel and then transferred to STATA Version 14 for cleaning, merging and analysis. Cleaning of the data was done by running frequencies of the variables. This checks inconsistently coded data. Inconsistently coded data was double checked with raw data from the questionnaire. Simple proportions and means were used to describe categorical and numerical data, respectively. Chi square and Cramer's v tests were used

to test for association and strength between the explanatory variables and the outcome variables. A confidence interval of 95% was used to show significant relations between the dependent and the independent variables.

3.13 Data Storage / Data Protection

Questionnaires were kept in a locked file and stored in a locked cabinet. A soft copy of data collected was coded and locked on a computer using a password and only accessible to principal researcher.

3.14 Pretesting

The questionnaire was designed to reflect objectives of the study. Pretesting of Data collection tools was done at the 37 Military Hospital with 10 participants to validate survey tools. The purpose is to establish if the tool is clearly worded and devoid of major biases and can seek the type of information intended. Pretesting was also carried out with the aim of eliminating irrelevant questions so as to make it reliable.

3.15 Ethical Consideration

Introductory letter was obtained from the Department of Population, Family and Reproductive Health (PFRH) of the School of Public Health (SPH) to Greater Accra Regional Health Directorate to be introduced to the head of the facility for permission from hospital authorities prior to the study. Letter of support from Ayawaso District Health Direcotorate was obtained and attached to the proposal.

The proposal was then submitted to the PFRH Department of the School of Public Health who then forwarded it to the review board of the Ghana Health Services (GHS) where ethical approval was given before data collection started (GHS-ERC:86/02/17). Participation in this study was entirely voluntary and participants had the option not to participate or to discontinue their

participation without any adverse consequence. Participants were given sufficient information about the study to enable them decide whether to take part or not. Participants were assured of the fact that this work is purposely academic and that no harm is intended. The study did not enquire any major cost for participants except the participants' time that was spent in answering the questionnaire and interviews. Written informed consent forms was given to participants to sign. All informed consent were in English. However consent form was be read out to patients who cannot read and write and then signed / thumbprint by a witness.

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter of the study presents analysis of data collection and discusses findings. It gives information on sociodemographic characteristics, family and medical histories, risk assessment, common complications, relationship between diabetes mellitus and sociodemographic characteristics of respondents. The data was collected from Maamobi General Hospital Diabetes Clinic. 132 respondents were interviewed for this study.

4.1 Demographic characteristics of respondents

Table 4.1a: **Socio-demographic characteristics**

Characteristics	Frequency (N=132)	Percent (%)
Gender		
Male	42	31.8
Female	90	68.2
Marital status		
Single	11	8.3
Married	89	67.4
Separated	3	2.3
Divorced	4	3.0
Widowed	25	18.9
Religion		
Christian	65	49.2
Muslims	66	50.0
Traditionalist	1	0.8
Educational level		
None	70	53.0
Primary / JHS	12	9.1
SHS	50	37.9
Employment		
Employed	69	52.3
Unemployed	60	45.5
Pensioner	3	2.3

Table 4.1a indicates 90 respondents are females representing 68.2 %. A total number of sixty six (66) respondents were Muslims representing 50 %, whilst Christians were 49.2 % and 1 (0.8 %) traditionalist. With regards to educational level, 70 respondents representing 53.0 % had no formal education, 50 (37.9 %) attended secondary school and 12 (9.1 %) attended Primary/JSS. More than half of the respondents (52.3 %) were employed, 60 (45.5 %) were unemployed and 3 (2.3 %) of the respondents were pensioners.

Table 4.1b: **Age and Weight of respondents**

Variable	Observations	Mean	Standard deviation	Min	Max
Age (years)	132	62.89	10.25	37	86
Weight (kg)	132	72.33	8.16	52	103

The table 4.1b indicates age and weight of respondents. A mean age of 62.89 with standard deviation of 10.25 with a minimum age of 37 and maximum age of 86. The mean weight of respondents is 72.33 with standard deviation of 8.16 having a minimum of 52 kilograms and maximum of 103 kilograms.

4.1.1 Type of employment by respondents

Figure 4.1.1: **Type of Employment**

Figure 4.1.1 shows type of employment by respondents. Sixty-three (91%) of the respondents who work were self-employed, 4 (6%) are in the formal sector while 2 (3 %) are in the informal sector.

4.2 Family History of Respondents

Table 4.2: Family History

Family history	Frequency	Percent (%)
Family history of diabetes		
Yes	53	40.2
No	51	38.6
Don't know	28	21.2
Relation to family member with diabetes		
Father	16	30.2
Mother	26	49.1
Brother	5	9.4
Sister	5	9.4
Uncle	1	1.9
Family knowledge of diabetes		
Yes	125	94.7
No	7	5.3
Family support		
Yes	82	65.6
No	43	34.4

**Totals differ based on number responding to the question.*

About 53 (40.2 %) of the respondents had at least a family member with diabetes, 51 (38.6 %) had no family history and 28 (21.2 %) were unsure. Out of the 53 respondents with a family history of diabetes, 26 (49.1 %) said their mothers had diabetes, 16 (30.2 %) mentioned their father, whilst 5 (9.4 %) and 5 (9.4%) were siblings.

Majority representing125 (94.70 %) of respondents had family members knowing about their diabetes status whereas 7 (5.3 %) had their relatives not knowing about their status. Out of the 125 respondents, more than half representing 82 (65.60 %) receive support from family members and 43 (34.40 %) do not.

4.3 Medical history of respondents

Table 4.3 shows the medical history of respondents in the study. This is presented as follows:

Table 4.3: **Medical history of respondents**

Variable	Frequency	Percent (%)
Type of diabetes		
Type 2	132	100.0
Type 1	0	0.00
Duration of diabetes		
≤ 2years	15	11.4
>2 ≤ 5 years	43	32.6
>5years	74	56.1
Current use of diabetes medication		
Yes	132	100.0
No	0	0.00
If yes, which do you use?		
Oral antidiabetics	130	98.5
Insulin	2	1.5
Type of drug use		
Metformin	130	100.0
Thiazolidinedione	0	0.0
Sulfonylureas (Daonil)	0	0.0
Peptic analogues	0	0.0
Alpha glucosidase inhibitors	0	0.0

**Totals differ based on number responding to the question.*

Table 4.3 indicates medical history of respondents. All the 132 respondents had type 2 diabetes. Majority of respondents, 74 (56.1 %) have been living with diabetes for more than five (5) years, 43 (32.6 %) of the respondents have also been living with the disease between two to five years (2-5years) and the least is 15 (11.4 %) of them who have been living with it for less than two years (2years).

All respondents (132) take diabetic medication with the majority using oral antidiabetic drugs. All respondents use metformin.

4.4 Smoking status of respondents

Table 4.4: **Smoking status of respondents**

Variable	Frequency (N=132)	Percent (%)
Tobacco smoking		
Yes	6	4.5
No	126	95.5
Duration of tobacco smoking		
<5years	0	0.0
5 - 10years	2	33.3
>10years	4	66.7

Only 6 (4.5%) of respondents smoked tobacco and the majority (66.7%) of them smoked for more than ten years.

4.5 Alcohol consumption by respondents

Table 4.5: **Alcohol consumption by respondents**

Variable	Frequency (N=132)	Percent (%)
Alcohol Intake		
Yes	11	8.3
No	121	91.7
Duration of alcohol intake		
<5years	0	0.0
5 - 10years	2	18.2
>10years	9	81.8

121 (91.7%) respondents do not take alcohol and 11(8.3%) do take alcohol. Out of the 11 respondents, 9 (81.8%) have been taking alcohol for more than ten years and 2 (18.8%) for five to ten years.

4.6 Physical activity by respondents

Table 4.6: **Physical activity of respondents**

Variable	Frequency	Percent (%)
Exercise regularly		
Yes	71	53.8
No	61	46.2
Duration of exercise?		
≤ 30mins	49	69.0
>30mins ≤1 hour	20	28.2
>1 hour	2	2.8
Exercise per week?		
Once a week	27	38.0
Two times a week	24	33.8
Three times a week	20	28.2
More than three times a week	0	0.0

**Totals differ based on number responding to the question.*

Table 4.6 indicates more than half, 71 (53.8 %) of the respondents do engage in physical activity. Of the 71 respondents, 49 (69.0%) do exercise for less than thirty (30) minutes, 28.2 % do exercise for more than thirty minutes to one hour and 2.8 % exercise for more than one hour per day.

For the 71 respondents who exercise, 27 (38.0 %) exercise once a week, 24 (33.8 %) do exercise two times a week and 20 (28.2 %), three times a week.

4.7 Dietary habits by respondent

Table 4.7: **Dietary habits of respondents**

Variable	Frequency (N=132)	Percent (%)
Fruits Consumption		
Often	43	32.6
Sometimes	89	67.4
Vegetables Consumption		
Often	43	32.6
Sometimes	89	67.4
Fats and oils Consumption		
Often	5	3.8
Sometimes	127	96.2
Grains and cereals Consumption		
Often	67	50.8
Sometimes	65	49.2
Protein Consumption		
Often	31	23.5
Sometimes	101	76.5

Table 4.7 shows dietary habits by respondents, 89 respondents representing 67.4 % take fruits sometimes and 43 (32.6 %) often take fruits. 89 (67.4 %) sometimes take vegetables whilst 43 (32.6 %) often take it. Majority of the respondents representing 96.2 % sometimes consume fats and oil and 5 (3.8 %) often consume it. In the consumption of grains and cereals, it was realized that 67 (50.8 %) consume grains and cereals often whilst 65 (49.2 %) said they consumes it sometimes. As indicated in the table, more than half (76.5%) of the 132 respondents affirmed that they sometimes consume protein whilst 23.4 said they often consume it.

4.8 Respondents on diabetes mellitus complications.

Table 4.8: **Respondent' diabetes mellitus complications**

Variable	Frequency (N=132)	Percent (%)
Complications of diabetes?		
Yes	50	37.9
No	82	62.1
Complications		
Diabetic foot disease	12	24.0
Diabetic retinopathy	23	46.0
Diabetic nephropathy	0	0.0
Erectile dysfunction	12	24.0
Cardiovascular disease	3	6.0

Almost two-thirds of 62.1 % of respondents (N=82) do not have any complications of diabetes mellitus. Out of the fifty respondents with complications, 46 % have diabetic retinopathy, 24 % have diabetic foot disease and erectile dysfunction and 6 % have cardiovascular disease.

4.9 Diabetic Comorbidity in respondents

Table 4.9: Comorbidity by respondents

Characteristics	Frequency (N=103)	Percent% (%)
Comorbidity		
Hypertension	100	97.1
Cardiac disease	3	2.9
Duration of disease since diagnosed		
<2 years	6	5.8
2-5years	24	23.3
>5years	73	70.9
Currently on medication for comorbidities		
Yes	101	98.1
No	2	1.9

Out of the 132 respondents, 97.1% had **hypertension** and 2.9% had cardiac disease. Of the 103 respondents, 70.9 % have had comorbidity for more than five years, 23.3 % for two to five years and 65.8 % for less than two years. Many of the respondents (98%) are on medication for the disease.

4.10 Association **between demographic characteristic and diabetic complications**

Table 4.10 shows the results of the association between respondents' demographic characteristics and their diabetes complications. This is presented as follows;

*Table 4.10: **Association between demographic characteristics and diabetes complications***

Characteristics	Diabetic foot	Diabetic retinopathy	Erectile dysfunction	CVD	Cramer's v	p-value
	N (%)	N (%)	N (%)	N (%)	V	χ^2
Gender						
Male	8(29.6)	6(22.2)	12(100.0)	1(3.7)	0.612	<0.001
Female	4(17.4)	17(73.9)	0(0.00)	2(8.7)		
Age (years)						
18-39	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0.245	0.420
40-59	3(37.5)	3(37.5)	2(25.0)	0(0.0)		
60-79	9(23.1)	19(48.7)	9(23.1)	2(5.1)		
≥80	0(0.0)	1(33.3)	1(33.3)	1(33.3)		
Educational level						
None	8(25.8)	12(38.7)	8(25.8)	3 (100.0)	0.267	0.309
Primary/JHS	1(14.3)	6(85.7)	0(0.00)	0(0.00)		
Secondary	3(25.0)	5(41.7)	4(33.3)	0(0.00)		
Employment						
Employed	9(30.8)	8(30.8)	7(26.9)	2(7.7)	0.252	0.387
Unemployed	3(13.0)	14(60.9)	5(21.7)	1(4.3)		
Religion						
Christian	3(15.8)	12(63.2)	3(15.8)	1(5.3)	0.257	0.360
Moslem	8(26.7)	11(36.7)	9(30.0)	2(6.7)		
Traditionalist	1(100.00)	0(0.00)	0(0.00)	0(0.00)		

Marital status						
Single	0(0.00)	1(100)	0(0.0)	0(0.0)	0.252	0.673
Married	9(25.0)	15(41.7)	10(27.8)	2(5.6)		
Separated	0(0.00)	0(0.00)	1(100)	0(0.0)		
Widowed	2(20.0)	6(60.0)	1(10.0)	1(10.0)		
Divorced	1(100)	0(0.00)	0(0.0)	0(0.)		

**Statistically significant difference between socio-demographic and diabetes complications ($p < 0.05$).*

The association between socio-demographic and diabetes complication shows a statistically significant (V=0.612, p<0.05) difference between gender and diabetic complications of respondents. Males have more complications compared to females. 17 (73.9%) females suffer from diabetic retinopathy compared to 22.2% among males. There is no statistical difference (V=0.245, p>0.05) between the age of the respondents and diabetes complications in this study.

Also, there is no statistically significant association (V=0.267, p>0.05) between the educational level of the respondents and their diabetes complications. The results showed that there is no significant relationship (V=0.252, p>0.05) between the employment status of the respondents and their diabetes mellitus complications.

Finally, there was no statistically significant association between religion and marital status of the respondents and diabetes complications.

4.11 Conclusion

The chapter presented sought to address the risk factors and complications of diabetes mellitus in patients attending Maamobi General Hospital. It presented a detailed analysis of data collected from respondents and established the relationship between these complications and their demographic characteristics

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.0 Introduction

This chapter presents the findings of the study in relation to reviewed literature on the research topic as well as the stated objectives and research questions. The study sought to assess the risk factors and complications of diabetes mellitus in patients attending the Maamobi General Hospital and consequently establish the relationship between these complications and their demographic characteristics. This chapter is in four sections. Section one presents the discussions on the risk factors. Section two presents the complications of diabetes mellitus identified in the study. Section three presents the relationship between these complications and their demographic characteristics and section four presents the conclusion on the chapter.

5.1 Risk factors

The assessment of risk factors associated with diabetes mellitus revealed areas where improvement is needed. Although the study population is not representative for the Maamobi community as a whole, it displays many features of urban life in Africa. These findings are similar to other studies (Danquah et al., 2012; Seyum et al, 2010). This is discussed and presented as follows:

5.1.1 Physical activity

Respondents' level and commitment to physical activity was low. This agrees with other studies (Barik et al.,2016; Danquah et al., 2012; Hu, 2011) which showed that people living in both the urban and rural areas increasingly refrain from physical activity. However, research has shown that diabetes complication reduces in those who practice vigorous physical activity (Williams, 2008). Physical activity is one of the principal therapies to acutely lower blood glucose in type 2 diabetes mellitus because of its synergistic action with insulin in insulin-sensitive tissues and

thereby reducing diabetes complications (Bhatti et al, 2014). The findings of this study may probably be because the respondents are unaware of the health benefits that come with physical activity. This may be attributed to lack of health education on the benefits of physical activities. This suggests an important area for improvement to combat the menace of diabetes and its complications.

5.1.2 Tobacco smoking

The study showed that majority of the respondents do not engage in tobacco smoking This is a good practice since tobacco smoking is an independent risk factor for type 2 diabetes (Hu, 2011; Barik et al, 2016). Although only 4.5% of the respondents engaged in tobacco smoking, it is important that the general patient population at Maamobi General Hospital continue to be counselled and educated on the harmful use of tobacco.

5.1.3 Alcohol consumption

The study showed low intake of alcohol by respondents (8.3%). This is consistent with a study by Seyum et al (2010). However, majority of the respondents in this current study had been drinking the alcohol for more than ten years. Meanwhile, heavy alcohol intake has multiple deleterious metabolic effects, including excess caloric intake and obesity, increased triglyceride levels, pancreatitis, disturbance of carbohydrate and glucose metabolism, and impairment of liver function (Koppes et al, 2005). Further patient education is needed in this regard.

5.1.4 Dietary habit

Respondents' level and commitment to good dietary habit was low. This confirms studies carried out in Ghana (Danquah et al., 2012). This is an indication that respondents may not be aware of the benefits of vegetables, fruits, cereals and grains, proteins and polysaturated fat since most of

them are uneducated. However greater consumption of vegetables, fruits, cereals and grains and polysaturated fat are associated with decreased risk to diabetes mellitus and its complications (Hu, 2011; de Munter et al, 2007). Effective education on dietary habits is necessary to help with the management of diabetes mellitus and reduction in the overall incidence and morbidity in the catchment area.

5.2 Complications of diabetes mellitus

From the study, 37.9% of the respondents suffered at least one chronic complication of diabetes mellitus. This is lower compared to the findings by Amissah & Amoako-Boateng (2014), where more than half (61.4%) of the respondents suffered from at least one chronic complication when the prevalence of DM complications were assessed among people with type two (2) DM attending a teaching hospital in Ghana. This current study further found high prevalence of hypertension (97.4%) among the respondents. Similar findings (97.2%) was obtained by Amissah & Amoako-Boateng (2014). Effective measures to prevent hypertension in the Maamobi catchment area are essential for reducing the overall morbidity due to diabetes. The predominant diabetes mellitus complications in this study were diabetic retinopathy (46%) followed by diabetic foot (24%), erectile dysfunction (24%) and cardiovascular diseases (6%). These are discussed and presented as follows:

5.2.1 Diabetic retinopathy

The predominant diabetes mellitus complication in this study population was diabetic retinopathy (46%). This finding is contrary to previous evidence(Amissah & Amoako-Boateng (2014) and Mohan, Shah and Saboo (2013) that have neuropathy as the most common diabetes - related complication .Evidence from China((McNeely & Boyko, 2005) and Britain(Morgan et al, 2000) found cardiovascular diseases as the predominant complication among inpatients and outpatients

type 2 diabetes respectively. Although the prevalence (46%) is lower compared to 58.6% observed by Amissah & Amoako-Boateng (2014), it is higher compared to findings obtained from similar studies carried out in Cameroon, 28% (Djirolo et al, 2012) and 23.6% (Tamba et al, 2013). A probable reason for the predominance of diabetic retinopathy may be because majority of the respondents in this study were old.

5.2.2 Diabetic foot disease

The prevalence of diabetic foot disease (24%) was higher than 4.9% reported by Amissah & Amoako-Boateng (2014) for a teaching hospital in Ghana and the 8.0% by McNeely and Boyko, (2005) for the Asian-Americans. The differences observed in this study and that of Amissah & Amoako-Boateng (2014) is quite huge although both studies employed same criteria (the use of doctor's diagnosis) to establish the diabetic foot disease. The older age and low level of education of respondents in this study may be the contributing factors to these differences.

5.2.3 Erectile dysfunction

The prevalence of erectile dysfunction among the male respondents in this study was 24.0%. This was lower than the 31.0% reported by Amissah & Amoako-Boateng (2014). This high prevalence may be due to the long duration of the diabetes mellitus among the respondents. Most of the respondents in this study had been suffering from diabetes mellitus for more than five years. Another probable factor may be because of the older ages of the study respondents. However, the difference in the prevalence between this current study and that by Amissah & Amoako-Boateng (2014) could be as a result of the smaller sample size of the latter.

5.2.4 Cardiovascular disease

The prevalence of cardiovascular disease was 6.0%. This was the complication with the lowest prevalence in this study. Similar study in a teaching hospital observed 21.0% prevalence (Amissah

& Amoako-Boateng, 2014). This is contrary to studies done in Britain and China where cardiovascular diseases were found to be the predominant complications among type 2 diabetes mellitus patients (Morgan et al, 2000; Shi et al, 2004).

5.3 Association between demographic characteristics and diabetic complications

The study showed some significant association between the demographic characteristics and diabetic mellitus complications. These are categorized, discussed and presented as follows:

5.3.1 Gender

In this study, the association between gender of respondents and complications was statistically significant ($p<0.05$) with the prevalence of diabetes mellitus complications. This agrees with similar study conducted in a teaching hospital in Ghana (Amissah & Amoako-Boateng, 2014). Males had more prevalence of diabetes mellitus complication in this study due to women'sm h health seeking behaviour. This finding confirms the result of similar studies which found higher prevalence among males compared to females (Adejoh, 2013).

More females suffered from diabetes retinopathy in this study compared to their male counterparts. This findings signify that special attention needs to be paid to patients in relation to the prevention and management of erectile dysfunction which is evident in men and diabetes retinopathy in both sexes.

5.3.2 Age

There exists no statistically significant relationship between the age of the respondents and diabetes complications in this study. This is contrary to other studies which identified diabetes complication with advancing age (Seshasai et al, 2011). Further, respondents within the age group

(60-79) years experienced more complications compared to age groups (40-59) years and those of 80 years and above. Similar findings were obtained by Amissah and Amoako-Boateng (2014) when diabetes complication was assessed among patients in a teaching hospital in Ghana.

5.3.3 Educational level

There was no significant association between the educational level of the respondents in this study and their diabetes mellitus complications. This finding confirms those obtained in studies conducted in Nigeria where diabetes and its complications were unaffected by educational level (Adejoh, 2013). However, our results further showed that though not statistically significant, lower level of education and those without any formal education are associated with higher prevalence of diabetes mellitus complications. This might be because of the indirect biological effect of educational level on the disease (Sacerdote et al, 2012). The effects of education on diabetes mellitus are mediated by other risk factors such as dieting, smoking, physical activity which can be biologically related to the disease.

5.3.4 Religion

The religious affiliations of respondents had no significant association with the diabetes mellitus complications they suffer. This findings was consistent with (How, B. et al, 2011). Again, Obisesan et al, 2006 have shown no significant associations between diabetes and metabolic risk factors such as serum lipids, dietary intake, prevalence of coronary heart disease and religiosity and/or spirituality. The relation between religion and diabetes might be attributed to lifestyle habits promoted by religious practices and not merely by adhering to a specific religion (Sridhar, G R, 2013). There is the need to undertake more studies in the future to have a more defined relationship between religion and diabetes complications.

5.3.5 Marital status

This study found no association between marital status of respondents and diabetes mellitus complications. However, there was higher prevalence of diabetes complication among the married compared to the singles, divorced, widowed and the separated. Only one of the respondent who is single had a complication in this study. Consistent to this was a study conducted in Iran where there was no significant difference observed in the prevalence of diabetes mellitus between the married (K. Rahmanian et al, 2013). Another study reported a similar results (Azimi-Nezhad M. et al, 2008). However, some findings (Poljicanin T. et al, 2012), suggested that single, divorced, and widowed statuses are significantly associated with diabetes mellitus. Further studies in future with much bigger sample size can help to ascertain a more distinctive understanding of the relationship between marital status and diabetes mellitus.

5.5 Conclusion

The chapter has analysed the findings of the study and related them to existing literature. It has demonstrated that while gender of the respondents was significant in influencing diabetes mellitus complications, others were not significant. The next chapter presents the conclusions and recommendations of the study.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the summary, conclusions and recommendations of the study. These are in four sections. Section one presents the summary of the study. Section two presents the conclusion of the study. Section three presents the recommendations of the study and future research and section four presents the limitations.

6.1 Summary of the study

This study sort to determine the risk factors and complications of diabetes mellitus in patients attending the Maamobi General Hospital. This was achieved by using quantitative research method to collect data. The data was analysed using Stata version14. Inferential statistics using Chi Square and Cramer's V tests were used to assess the association between demographic characteristics and diabetes mellitus complications. The key conclusions presented as follows:

6.2 Conclusions

The study provides estimates of the prevalence of diabetes mellitus risk factors, complications and the relationship between these complications and their demographic characteristics. A high prevalence of complications was found with the predominance of diabetic retinopathy (46.0%), followed by diabetic foot (24.0%) and erectile dysfunction (24%). The prevalence of hypertension was very high at 97.07% among the respondents.

Additionally, respondents' level of commitment to physical activity and good diet was low. However most of the respondents do not engage in alcohol intake and smoking. There was a significant association between gender of respondents and diabetes mellitus complications. Age,

educational level, marital status and religious affiliations of the respondents were not significantly related to the complications observed.

6.3 Recommendations and future research

Based on the findings from this research, the following recommendations were made:

1. There is the need for gender specificity in regards to diabetes mellitus disease interventions at the Maamobi General hospital.
2. The differences observed in the prevalence of the diabetes mellitus complications in this study and previous studies call for the need to allocate medical resources efficiently per the local burden of the disease.
3. There is the need for regular monitoring of diabetes by health facilities to prevent complication.
4. The lack of good dietary habits and the lack of commitment towards physical activity observed in this study demands for more intensive health education on the risk factors of diabetes mellitus both within the Maamobi General Hospital and the Maamobi catchment Area by individuals and health personnel.
5. There is the need to create awareness about diabetes mellitus to facilitate early diagnosis and prevent complications by health facilities.

6.4 Limitations of the study

This study has some limitations. The e study focused on the risk factors and complications of diabetes mellitus in patients at the Maamobi General Hospital, any conclusions drawn from the study may not be generalizable. However, the conclusions might extend to the other health institutions that share similar characteristics. The study could not obtain data on the income of the

respondents. This was because, most of the respondents were informal self-employees with small scale business and so did not know how much they earn at the end of a month.

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APPENDICES

Appendix 1: **Informed Consent Form for Patients**

Project Title: Diabetes Mellitus: risk factors and complications in patients attending Maamobi General Hospital.

Principal Investigator: Nancy Apewe Biah

Address: School Of Public Health

Department of Population Fertility and Reproductive Health (PFRH)

University Of Ghana, Legon.

Email:nayybby@yahoo.com

Telephone: 0244080259

Introduction

Dear Participants, diabetes mellitus is a disease which occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces, resulting in elevated levels of blood sugar. Insulin is a hormone that regulates blood sugar. This study seeks to determine the risk factors and associated complications in diabetes mellitus patients at the Maamobi General Hospital in order to help guide policies and practices in diabetic care management plans.

Procedure, Possible Risk and Benefits

Questions will be asked based on diabetes mellitus, its risk factors and complications. It will involve the use of questionnaire. No risk or discomfort is foreseen concerning your participation in this research apart from your time that will be spent on answering the questionnaire. Each questionnaire will take 15-30 minutes on the average to complete. There is no direct benefit to the

participants of this study. However the outcome of this study will be used to inform policy on diabetes management.

Right to Refuse and Confidentiality

Your participation in this study is voluntary and you are at liberty to withdraw at any time. There will not be any penalty in opting out of this study or not answering any question. This study has been reviewed and approved by the Ethical Review Committee of Ghana Health Services.

Participant personal identification such as names and address will not be written on questionnaire. Whatever information you provide will be handled with strict confidentiality, it will be used solely for the research purpose and will never be used against you. Each questionnaire will be given a unique identification number.

Thank you.

PARTICIPANT CONSENT FORM

I have been thoroughly briefed on the entire methodology and significance of the ongoing study which is being conducted by Nancy Apewe Biah. On my own free will, I hereby consent to be part of the study, based on my understanding of what the study entails.

I am doing this on condition that under no circumstance should my references be made to my actual identity to any other person(s) after providing all the information requested from me for this particular study as promised by the researcher.

_____ ____/____/_____ (Participant's

Signature (Date)

Or Thumbprint)

If the participant cannot read the form themselves, a witness must sign here.

I, _____ was present while the purpose, procedures as well as the risks and benefits were read to the participant. All questions were answered and the participant has voluntarily agreed to participate as a subject in this study.

_____ ____/____/_____

(Witness Signature (Date)

Or Thumbprint)

Interviewer's Statement and Signature

I, _____ certify that the purpose, procedures as well as the risks and benefits associated with participating in this study have been explained to the above individual in the English / Ga / Twi / local language. The individual has freely agreed to participate in the study.

_____ ____/_____/____ (Signature of interviewer) (Date)

Appendix 2: Questionnaire on risk factors and complications among diabetics at Maamobi

General **Hospital**

TOPIC: **RISK FACTORS AND COMPLICATIONS AMONG DIABETICS AT MAAMOBI GENERAL HOSPITAL.**

Participant No..... Date.....

Personal Profile

1. Signature.....
2. Age.....
3. 3. Sex: 1.Male 2.Female
4. Educational Level: 1.None 2. Primary 3.Secondary 4.Tertiary
5. Occupation: 1.Employed 2.Unemployed 3.Pensioner
6. Type of Employment: 1.Public servant 2. Informal sector 3.Self employed
7. Religion: 1. Christian 2.Muslim 3. Traditional

Others Specify.....

8. Marital status: 1.Single 2. Married 3. Separated 4. Divorced 5. Widowed

Family History

9. Does any member of your family have Diabetes Mellitus? Yes [ ] No [ ] Don't know[ ][

10. If yes, how do you relate to the person? .....

11. Do your family know about your diabetes Yes [ ] No [ ] Don't know[ ]

12. If yes, do you receive any support from them? Yes [ ] No[ ]

Medical History

13. What type of diabetes do you have? 1). Type 1[ ] 2). Type 2 [ ]

14. How long have you been diagnosed with diabetes?

1).1-2yrs [ ] 2) .2-5years [ ] 3). >5 years [ ]

15. Do you currently use any form of diabetic medication? Yes [ ] No [ ] If yes which of these do you use? 1. Oral antidiabetics [ ] 2.Insulin [ ] 3.Diet [ ]

Tick if you take any of the drugs.

A .Metformin[ ] b. Thiazolidinediones [ ] c .Sulfonylureas (Daonil)[ ] d. Peptic analogues[ ] e .Alpha glucosidase inhibitors[ ]

.....

Risk factors

Smoking status

17. Do you smoke tobacco? Yes [ ] No [ ]

If yes, how long have you been smoking? .....

How many cigarettes on average do you smoke per week? .....

Alcohol consumption

18. Do you take alcohol? Yes [ ] No [ ]

If yes, how long have you been using it? .....

How often do you take alcohol on average per week? .....

Exercise

19.Do you exercise regularly? Yes No

If yes,how long do you exercise?.....

How often do you exercise per week?.....

Diet

20.How often do you eat the following foods? Tick where appropriate

a. Fruits. Often [ ] Sometimes[ ] Never[ ]

b. Vegetables. Often[ ] Sometimes[ ] Never[ ]

c. Fats and Oils. Often[ ] Sometimes[ ] Never[ ]

d. Grains and Cereals. Often[ ] Sometimes[ ] Never[ ]

e. Protein. Often[ ] Sometimes[ ] Never[ ]

Complications

21. Do you have complications as a result of diabetes? Yes [ ] No[ ]

What complications Tick where appropriate

1. Diabetic foot disease [ ]

2 .Diabetic retinopathy [ ]

3 .Diabetic nephropathy (Kidney) [ ]

4 .Erectile dysfunction [ ]

5 .Cardiovascular disease (Heart disease) [ ]

22. Do you have any of these diseases? Hypertension [ ] Cardiac Disease [ ]

If others, state type.....

When was these diseases diagnosed? .....

Are you on any medication for any of these diseases?.....

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com

MyRef. GHS/RDD/ERC/Admin/App/505
Your Ref. No.

Biah Nancy Apewe
University of Ghana
School of Public Health
Legon, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 86/02/17**
Project Title	**Diabetes Mellitus: Risk Factors and Complications in Patients Attending Maamobi General Hospital**
Approval Date	**15th May, 2017**
Expiry Date	**14th May, 2018**
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- 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 cannot be implemented or 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