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SOCIO-ECONOMIC BURDEN OF TYPE-2 DIABETES AMONG PATIENTS ATTENDING PANTANG GOVERNMENT HOSPITAL

BY

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DECLARATION

I, **MARGARET SERWAA AMOAKO** hereby declare that this dissertation is a result of my independent work. References to other works have been duly acknowledged. I further declare that this dissertation has not been submitted for award of any degree in that institution and other universities elsewhere.

Signature …… Date……

MARGARET SERWAA AMOAKO

(STUDENT)

Signature …….. Date……..……

Dr. IRENE KRETCHY

(ACADEMIC SUPERVISOR)

DEDICATION

This dissertation is dedicated to my late parents, my supervisor and all my friends for their support in diverse ways including prayer and encouragement that has enabled me to reach this far.

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First and foremost, I thank God who is the source of my knowledge, wisdom and strength with which I am able to accomplish this work.

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ABSTRACT

Introduction

Type-2 Diabetes is fast attaining pandemic levels. Globally, it exerts a huge toll on patients and society, physical, financial and psychosocial burden. The objectives of the study include were the following: to estimate the direct treatment cost (consultation, lab test, treatments) of type-2 diabetes, to estimate the indirect treatment cost (working hours lost, lost wages) of type-2 diabetes, to determine intangible cost (physical pain, psychological pain, social isolation, anxiety, stress, depression, stigmatization, self-esteem etc.) associated with type-2 diabetes.

Methods

The study was a cross-sectional survey study which adopted the cost-of-illness approach to estimate the socio-economic burden of type-2 diabetes patients. The explanatory variables were direct, indirect and intangible costs (including socio-behavior factors) of type-2 diabetes. The study participants were patients with type-2 diabetes who sought care at the out-patient division of Pantang Government Hospital. The study relied on consecutive random sampling technique. Data were analyzed using STATA 13 and the excel version 2007.

Results

The overall total direct medical cost and direct non-medical cost of type-2 diabetics was estimated to be GHS 30,693.50 (USD$ 138, 910.95) with total direct average cost of GHS 4,384.79. With the indirect medical cost, the overall value of time absent from productive work within past month was estimated as GHS 1,268.08 (US$ 589.50). The mean indirect cost was GHS 93.67 (95% CI: 0-88.54). With the intangible medical cost, a higher percentage of complicated diabetic patients suffered severe physical pains (37.86%). The majority of the

patients also indicated that, they got fatigued due to diabetes. About 36.9% of the diabetic patients reported feeling depressed often while 26.7% were always depressed.

Conclusion

The analysis of estimated total treatment cost and related intangible burden of type-2 diabetes suggest that the disease posed socio-economic burden on individuals. The complexity of the disease requires constant and regular treatment regime to avoid complications and its associated cost burden.

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LIST OF ABBREVIATION

NCDs …….....Non-communicable diseases

CVD…….....Cardiovascular diseases

WHO……...World health organization

GHS……Ghana health service

LMIC…….....Low middle-income countries

GAR…….....Greater Accra Region

NPH…….....Neutral Protamine Hagedorn

OPD …….....Out-patient Department

RAPIA …….....Rapid Assessment Protocol for Insulin Access

EU…….....Europe, Union

USA…….....United State of America

NHIS…….....National Health Insurance Scheme

CI…….....Confidence interval

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Non-communicable diseases (NCDs) will be the leading cause of mortality worldwide by 2030 (Mather's & Lon car, 2006). The contribution of cardiovascular disease (CVD) to overall disease burden is determined by the risk factors associated with diabetes and hypertension (Lon car, 2006). Diabetes is a chronic illness that occurs either when the patient does not produce enough insulin or when the insulin cannot be used. Insulin is a hormone that regulate sugar. Hyperglycaemia or raised blood sugar is a common symptom of uncontrolled diabetes, and overtime leads to serious damage of the body's systems, especially the nerves and blood vessels. In 2014, 8.5% of adults aged 18 years and older had diabetes and the World Health Organization (WHO) projects that diabetes will be the sixth leading cause of death by the year 2030.

Progressive globalization and industrialization have brought about changes in the environment and lifestyle. This has led to more deskbound jobs, increased availability and high consumption of drinks, foods with high sugar, fat and salt content which results in rapid increase of diabetes (Kolb & Mandrel-Poulsen, 2010). According to the International Diabetes Federation (2009), four out of every five people with diabetes will soon live in developing countries.

Type-2 diabetes is much more common and accounts for 90% to 95% of people with diabetes in sub-Saharan Africa (Hall et al., 2011). Diabetes is a cardiovascular metabolism disease with characteristics of chronic high blood glucose levels (fasting glucose level 6.1 mom/L or 108 mg/dL and above) and a high risk of complications such as retinopathy (eyes damage), nephropathy (kidneys damage), neuropathy (nervous system damage), hearing impairment,

Alzheima and CVD (Strine et al., 2005). In addition, adults with diabetes have two to three-fold increased risk of heart and strokes. Combined with reduce blood flow, there is an increase in damaged nerves in the feet, foot ulcer, infections and eventual limb amputation and kidney failure (Mathers CD, Loncar et al.,2006).

The World Economic Forum (2009) reported that non-communicable disease burden is among the five most severe economic risk globally. Substantial economic losses in developing economies are as a result of reduced productivity caused by NCDs (Tunstall-Pekoe, 2006). To add to this burden of huge costs, diabetic patients and their families commonly go through various forms of psychological and emotional stress due to the chronic nature and complications associated with the disease (International Diabetes Federation, 2009).

Abegunde et al. (2007) recommended that attention needs to be paid to the risk associated with chronic diseases, including diabetes in low and middle-income countries (LMICs) due to the huge socio-economic burden it poses. In Nigeria, diabetes was found to be among the top three non-communicable diseases reported at out-patient departments (Abegunde et al., 2007). Kumi-Ampofo (2015) reported that financial and non-financial household cost of diabetes mellitus in Ghana account for over two-thirds of household income. Diabetes is also associated with other economic cost (Kumi-Ampofo, 2015). These include direct cost comprising the cost of treatment. Indirect cost include lost wages due to diabetes and its accompanying complications and intangible costs such as physical, psychological (pains, stress, anxiety) and reduced quality of life (Brown et al., 2014; WHO, 2005). Notwithstanding the significant economic cost incurred by patients living with type-2 diabetes, there is limited study especially in sub-Saharan Africa on the socio-economic burden on people living with the disease.

1.2 Statement of Problem

In Ghana, diabetes was among the top three non-communicable disease of recorded out-patient department (OPD) cases, increasing from 39,789 in 2005 to 156,076 in 2010 (NCDCP-Ghana, 2010). Cases of diabetes have been observed disproportionately among the poor who are most vulnerable to disease complications and mortality (GHS, 2014). Studies have shown that more than 50% of people living with diabetes are not aware of their condition. Although diabetes is common among adults, those aged 40 and over; recently, many cases of the disease among children have been recorded. This has been attributed to unhealthy personal behaviours or lifestyle.

Abegunde et al. (2007) lamented about the implication of chronic diseases, including diabetes in LMICs. He asserted that the risk of chronic diseases such as diabetes and hypertension should be reduced considering their impact on economic production. Studies show that for every estimated 10% rise in NCD-related mortality, there is a decline in annual economic growth by 0.5% (Gameau et al., 2010). The costs associated with diabetes, especially its complications create a considerable socio-economic burden for patients, families, and society (Gilmer et al, 2005). The main driver of total cost is direct medical cost (Tague, 2012; Henriksen et al., 2000; Kirgizia et al., 2009).

In order to aid stakeholders develop better and more effective strategies to ensure that diabetic patients live a longer and better life, there is a need to understand the socio-economic burden of diabetes and more importantly, its complications and comorbidities. This study therefore sought to estimate the socio-economic burden of type-2 diabetes among patients attending the Pantang Government Hospital while noting issues of complication and comorbidities.

1.3 Justification of the Study

Diabetes is associated with great economic cost. These include direct costs (medical and non-medical cost of treatment), indirect (e.g. lost wages) and intangible costs such as physical and psychological pains, stress, anxiety and reduced quality of life (Brown et al., 2014). Furthermore, families with members who have complicated diabetes condition bear the brunt of higher out-of-pocket expenses which invariably reduce household earnings and lower quality of life (Dall et al., 2010).

There are, however, limited studies in sub-Saharan Africa on the socio-economic burden of diabetes, of which Ghana is no exception. This is mainly due to unavailability of data, especially on the loss of income and productivity. Subsequently, even though a number of studies have been conducted in developed countries on diabetes, most of these studies have been on the type-1 diabetes. Studies on type-2 diabetes in sub-Saharan African countries is scarce despite its prevalence on the continent. In the Greater Accra Region of Ghana, for example, diabetes is one of the top five health condition (GHS-GRA,2012).

Diabetic patients in Sub-Saharan Africa qhave greater risk of serious complications and the cost of treatment is high as well (Kirigia et al., 2009; Mbanya et al., 2014). Some complications include neural damage, foot ulcer leading to amputation, heart attack, kidney damage and blindness. Patients with diabetes also suffer from emotional distress, anxiety and physical and psychological pains. It is the number six cause of admission, accounting for 2.4% of all admissions and number nine cause of death, accounting for 2.8% of all death in the region (GHS-GRA, 2012). The attention of government, policy makers and other stakeholders must therefore be drawn to the relevance of affordable and accessible type-2 diabetes care. Estimating the socio-economic burden of this disease is a way to achieve this aim.

This study will provide an overall view of the socio-economic burden of type-2 diabetes on the patient which may inform government and policy makers about the allocation of resources. The study may also be useful in strategic planning and budgeting to facilitate easy access to type-2 diabetes care in other health facilities. Aside from specifically estimating the socio-economic burden of type-2 diabetes disease at the Pantang Government Hospital, information gathered by this study may be relevant for future studies.

1.4 Research Question

1. What is the direct treatment cost (consultation, lab test, treatments) of type-2 diabetes?
2. What is the indirect treatment cost (working hours lost, lost wages) of type-2 diabetes?
3. What is the intangible cost (physical pain, psychological pain, social isolation, anxiety, stress, depression, stigmatization, self-esteem etc.) associated with type-2 diabetes?

1.5 Aim and Objectives

1.5.1 Aim

The general objective of this study was to determine the socio-economic burden of type-2 diabetes among patients attending Pantang Government Hospital.

1.5.2 Specific Objectives

1. Estimate the direct treatment cost (consultation, lab test, treatments) of type-2 diabetes.
2. Estimate the indirect treatment cost (working hours lost, lost wages) of type-2 diabetes.
3. Determine intangible cost (physical pain, psychological pain, social isolation, anxiety, stress, depression, stigmatization, self-esteem etc.) associated with type-2 diabetes.

Conceptual Framework of socio-economic burden of Type-2 Diabetes

Figure 1 conceptual frame work shows the theoretical relationship between type-2 diabetes and its socio-economic burden on the people living with diabetes. The framework was based on the cost-of-illness concept. Many people living with diabetes suffer certain comorbidities and complications (e.g. neuropathy, nephropathy, retinopathy, foot ulcer, skin conditions, hearing impairment etc.) which exerts a heavy socio-economic burden on patients and households.

Key among costs associated with treatment of diabetes complications are direct cost, indirect cost (i.e. lost productivity, income and assets) and intangible cost (i.e. pain, anxiety, stress, isolation etc.). The direct cost is made up of two components: medical and non-medical cost. Medical cost includes expenditure on medical product and services such as medication, hospitalization and other treatment. Non-medical direct cost includes cost of visits to the health facilities (e.g. transportation), diet and other subsistence expenses. Indirect cost in the conceptual framework were the severe complications, absenteeism, disability, premature retirement and premature mortality leading to productivity loss (WHO, 2015). Individuals suffering from diabetes complications also bear the brunt of pains and suffering in the form of anxiety, stress, and isolation, physical and psychological pains, all of which constitute intangible costs. Pain and suffering reduce quality of life of people living with diabetes. The sum of all of these costs constitutes the socio-economic burden of type-2 diabetes.

Source :Kirigia *at al.*(2009).

1.3 Conceptual Framework

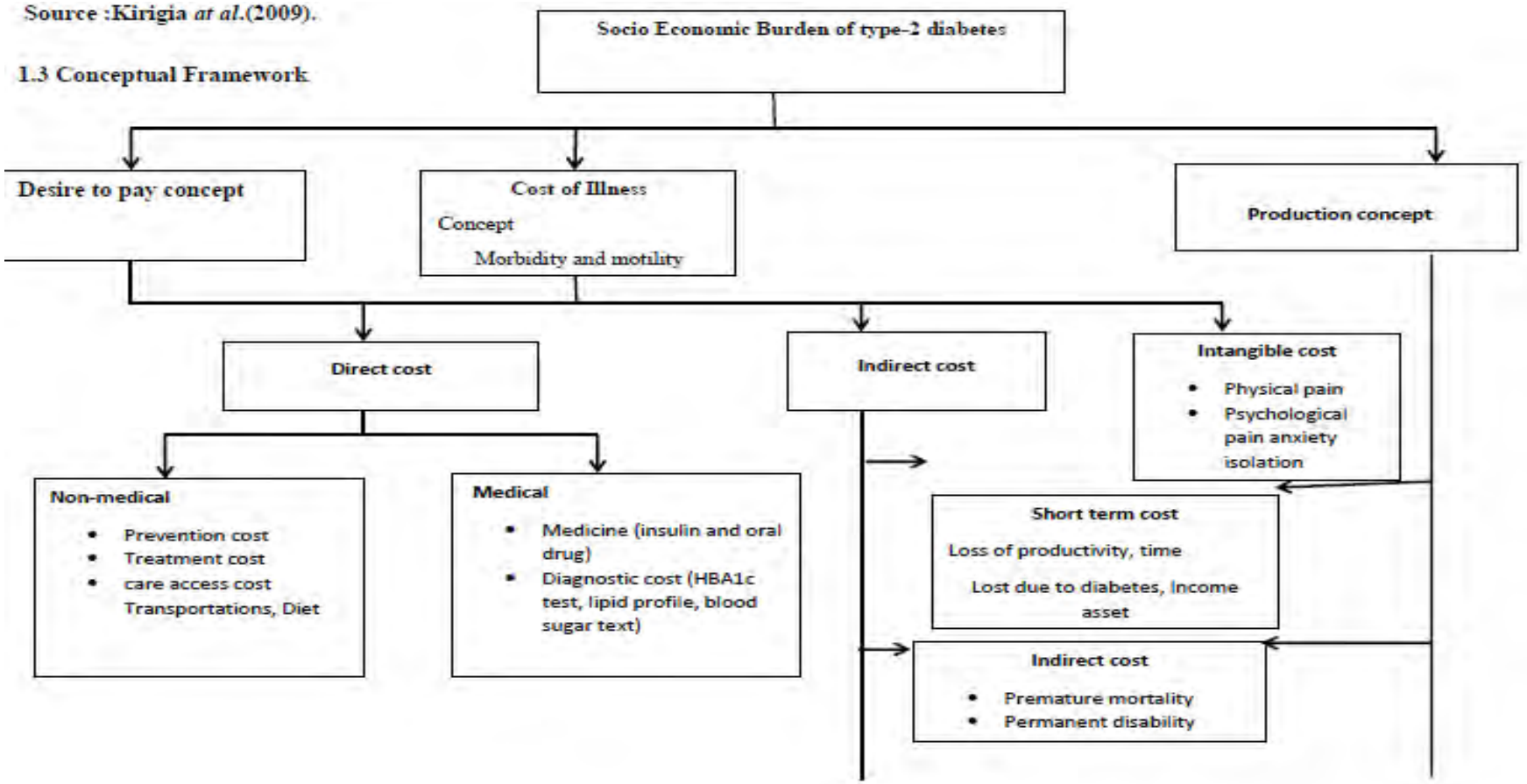

Figure 1: Conceptual Framework

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews available literature on type-2 diabetes. The review aims to provide insight into the cost burden associated with management of the disease. It focused on: diabetes and its related comorbidities and complications, and direct, indirect and intangible cost associated with the disease as documented in the scientific literature.

2.1 The Diabetes Disease

Diabetes mellitus (or diabetes) is a chronic, metabolic, lifelong disease that affects the body's ability to use the energy found in food. It occurs when the pancreas does not produce sufficient insulin, or when the body cannot effectively use the insulin it produces. Uncontrolled diabetes over time causes hyperglycaemia or raised blood sugar which leads to serious damage to some parts of the body such as the heart, blood vessels, eyes, kidneys, nerves etc.

Type-1 diabetes also known as insulin-dependent diabetes usually occurs in children and it is a chronic condition in which the pancreas produces little or no insulin by itself. Most people with the type-1 diabetes also have the type-2 diabetes which is usually found in adults. It occurs when the body becomes resistant to insulin or does not make enough insulin.

2.2 Forms of diabetes

Generally, diabetes is categorized into three major forms: diabetes type-1, ddiabetes type-2 and gestational diabetes.

Type-1 Diabetes

Diabetes Type 1 is not preventable with current knowledge and was previously referred to as insulin-dependent, juvenile or childhood-onset diabetes. The cause of diabetes type 1 isstill not known. However, the risk for developing type 1 diabetes has been linked to exposure to some viral infections or environmental factors. Also, the risk for developing the disease slightly increases if there is a family member with the disease (IDF, 2014). Diabetes type-1 is identified by the lack of insulin production by the pancreas and requires daily administration of insulin. Symptoms of type-1 diabetes include polyuria (excessive urine), polydipsia (excessive thirst), weight loss, changes in vision, tiredness and constant hunger (WHO, 2015).

Type-2 Diabetes

Diabetes type-2, also known as non-insulin dependent or adult-onset diabetes, occurs as a result of the body's ineffective insulin usage. The common causes of diabetes type-2 are unhealthy diet, lack of physical activity and obesity (overweight). Its symptoms are similar to that of diabetes type-1, except that they are less obvious. Hence, they are very difficult to be diagnosed in the early stages and as a result complication would have already arisen (WHO, 2015).

Diabetes type-2 was previously observed only among adults but can now be diagnosed at any age, even among children. It is not always, but usually itis associated with obese or overweight people with a sedentary lifestyle. Other risk factors that could lead to the development of diabetes type-2 include family history and history of gestational diabetes. It is often diagnosed when complications appear (e.g. kidney failure, blindness, lower limb amputation, cardiovascular disease) or when a routine blood or urine glucose test is done.

During the early stages, diabetes type-2 can be managed through healthy diet and regular physical activity but as it progresses, there will be a need for oral drug or insulin (IDF, 2014). Management and treatment of type-2 diabetes require monitoring the blood glucose level which can be done by a caregiver or the patients themselves. This helps caregivers and the patients to access and follow the efficiency of their glycemic control plan.

Diabetes screening should be done for overweight children starting at the age of 10 and repeated every 2 years, same for adults with body mass index (BMI) of 25 and above, adults aged 45 years and above; repeating it every other 3 years. Every three months, examinations of blood pressure, eyes as well as skin and bones in feet and legs should be done to prevent diabetes-related complications.

Gestational diabetes

Gestational diabetes occurs to women during pregnancy. It is indicated by hyperglycaemia with above normal blood glucose levels. When this happens, the risk of complications during pregnancy and at delivery is increased. Also, the possibility of having diabetes type-2 in the future is higher. Gestational diabetes is determined through prenatal screening instead of reported symptoms. (WHO, 2015a.).

The thesis focuses on type-2 diabetes because it is becoming an increasingly common disease among all ages and it is riddled with poor management, leading to micro and macro vascular complications. These complications can minimize quality of life and increase morbidity and mortality rate (WHO, 2015a).

2.3 Insulin Therapy

Insulin therapy was usually initiated by practitioners in the majority of type-2 diabetic patients in order to reach a desired and optimal glycaemia control (HbA1C <6) when the combination of non-insulin therapies and changes in lifestyle do not produce a satisfactory glycaemia control. Different kinds of individual factors such as type of diabetes, the patient's degree of interest, patient needs, presence of diabetic complication (e.g. blindness), the patient's job and financial situation may influence the decision to start insulin therapy and a final decision should be made only after having a full discussion with the patient.

A potential insulin therapy's side effect, hypoglycaemia, weight gain as well as patient's own reluctance to monitor blood glucose in addition to needle phobia are the common reasons why some patients want to or try to avoid insulin therapy. Some patients also belive insulin therapy is a sign that they have failed their treatment and would rather prefer to live with poor glycaemia control instead of starting insulin injection. Therefore, it is the duty of the healthcare professional to educate and help patients to accept and start insulin therapy in order to succeed. Oral anti-diabetics such as metformin, sulfonylurea, sitagliptin and pioglitazone may still be continued or used while using insulin unless contraindicated (Morris 2011, 496.) Insulin therapy generally consists of three insulin regiments, namely basal, prandial, and premixed insulins

Basal insulin is the most common starting point for insulin therapy initiation consisting of glargine, detemir and Neutral Protamine Hagedorn (NPH) and a dosage of once daily. They reduce pre-prandial glucose level, minimize the level of fasting glucose and weight gain with a low risk of both nocturnal and pre-breakfast hypoglycaemia. This is achieved by basal insulin's function of indicating the amount of insulin required to minimize the liver's production of

glucose and maintain good glucose levels between meals (Spollet, 2012). Basal insulin is usually started when the HbA1c level is less than about 9.5%. (Morris, 2011).

Prandialinsulin (Rapid & short-acting insulin) according to Spollet (2012) is short-acting insulin administered as a bolus to regulate postprandial hyperglycaemia. It is given before meal as a replacement therapy for basal insulin, or as an add-on therapy to the basal insulin. This has a quicker onset effect with a shorter acting time. Hence, producing a great reduction in the glycaemia levels.

The actions of the prandial insulin could be fast and/or short. The fast/rapid acting prandial insulin should be taken during meals, while the short acting prandial insulin should be injected 30 minutes before meal. There is an increased risk of hypoglycaemia if prandial insulin is not injected at the right time. Types of prandial insulin analogues include: insulin as part (novolog), glulisine (apidra) and lispro (Humalog) (Boyle, 2008). Morris (2011) stated that this is given or intensified when basal insulin does not achieve the required glucose level or when the HbA1c level is greater than 9.5%.

Premixed Insulin therapy is a premixed combination of a fixed dose of basal and regular or analogue rapid-acting insulin used twice or thrice daily with meals if greater control is required. Patients may, however, switch back to the basal-bolus therapy if an excellent or desired glucose control is not achieved after two or three premix insulin injections. Premixed insulin also has a high risk of hypoglycemia if not used at the right time (Spollet, 2012). According to Nice (2009), pre-mixed insulin therapy should be considered if a patient's HbA1C> = 9.

For people with type-2 diabetes, keeping blood glucose levels at normal (fasting glucose level below 6.1 moll/L or 108 mg/ld.) levels depends on release and functioning of insulin from the

pancreas. However, the targeted cells of people with type-2 diabetes are not reactive to insulin effect thereby resulting in large amount of glucose circulation.

Certain lifestyle factors like smoking, sedentariness, and high dietary fatintake promote the development of insulin resistance by the targeted cells. Insulin is a commonly used medication for the treatment of type-2 diabetes. For people living with diabetes, access to affordable treatment as well as insulin is critical to their survival. Long standing evidence shows that early insulin treatment has a significant effect in delaying or preventing complications (Solar, 2010; American Diabetes Association, 2010).

2.4 Global Socio-Economic Burden of Type-2 Diabetes

Diabetes is a growing global challenge for both developed and developing countries and healthcare systems. Cost estimates from literature reviewed highlight the substantial burden that diabetes imposes on society. Diabetes substantially causes premature mortality and the situationis projected to worsen, particularly in low and middle-income countries. Prevalence of type-2 diabetes is projected to increase by 69% in adults in low and middle-income countries and 20% in developed countries between 2010 and 2030 (Relic & Unwin, 2010). Whiting et al. (2011) further reported that majority of people with diabetes livein low and middle-income countries, and by 2030 these countries will witness the highest increase. Hence, there is urgent need to investin prevention to mitigate the burden (Shaw et al., 2010).

In 2007, medical costs attributed to diabetes include $27 billion for care to directly treat diabetes, $58 billion to treat the portion of diabetes-related chronic complications that are attributed to diabetes, and $31 billon in excess general medical costs. American Diabetes Association (2008) reported that the estimated cost of diagnosed diabetes was $174 billion, which comprised of $116 billion in excess medical expenditures and reduced national

productivity of $58 billion in 2007. Furthermore, annual medical costs per person on type-2 diabetes is US$9,677 (Dell et al., 2010).

Dall et al. (2010) estimated productivity loss due to higher levels of work absenteeism, disability and early mortality to be US$65 billion. In addition, families with members who have complicated diabetes condition bear the burden of higher out-of-pocket expenses and reduced earnings as well as low quality of life. In sub-Saharan Africa, risk of diabetes complications is great and costly (Hall et al., 2011; Ortegon et al., 2012). These include emotional distress (Aikins, 2005; Brown et al., 2014), stroke (Kengne et al., 2005), neural damage leading to amputation, heart attack, kidney damage and blindness (Nisar et al., 2015), and also reduced life expectancy (WHO, 2005).

It is estimated that one-third of the world's population lacks consistent access to necessary medications partly due to the high price in the private market (WHO, 2005). In LMICs of sub-Sahara Africa, diabetes management is a challenge because many people do not have access to a reliable, affordable supply of insulin. Despite initiatives from insulin-producing companies, including Novo Nordisk that have attempted to improve insulin supply by introducing price differentials, the price of insulin to the user is usually inflated along the distribution chain. A number of initiatives to improve the situation have been advanced by the International Insulin Foundation. This includes a practical guide called Rapid Assessment Protocol for Insulin Access (RAPIA) that enables evaluation of access that diabetics have to both diabetes care and insulin (Beran et al., 2005). The RAPIA have been piloted in Mozambique, Zambia, Mali and Nicaragua (Diabetes Leadership Forum - Africa, 2010).

2.4.1 Direct Cost of Diabetes Disease

The direct costs of diabetes disease to individuals and their families include medical care, drugs, insulin and other supplies. In addition to these, in some countries, patients may also bear other personal costs, such as increased payments for health, life and automobile insurance (WHO, 2015). Also, there is direct costs to the healthcare sector which include hospital services, physician services, laboratory tests and the daily management of diabetes by use of products such as insulin, syringes, oral hypoglycemic agents and blood-testing equipment (WHO, 2015). Direct cost of diabetes ranges from relatively low-cost items such as primary-care consultations to very high-cost items such as long hospitalization for treatment of complications (WHO, 2015). The direct cost of diabetic healthcare is estimated between 2.5% and 15% of yearly healthcare budgets depending on the local diabetes prevalence, complications and difficulty of treatment accessibility (WHO, 2013). Direct costs of diabetes disease management were generally found to be higher than indirect costs globally (Seurin & Suhrcke, 2015).

2.4.2 Direct Cost to individuals

Sickness and poor health burdens the individual economically in the short term and in the long term for chronic diseases like diabetes. A study by Kanavos et al. (2012) indicated that total direct cost burden of people with diabetes in five EU countries (i.e. France, Germany, Italy, Spain, and the UK) was €90 billion. Per patient direct medical costs for Spain is estimated as €1,708 and that of Germany was estimated as €5,899 in 2010.

Also, treatment of diabetes related complications accounted for significant portion of inpatient direct costs. People living with diabetes, especially those with complications in sub-Saharan Africa often face all kinds of difficulties (financial etc.) in undertaking regular access to treatment (Lamri et al., 2014). De-Graft (2010) and Lamri et al., (2014) reported that medical

treatment is often expensive, irrationally prescribed and inconsistent. Hence, many people with diabetes often turn to traditional herbal healers whose treatment cost is less. Also, more often than not ethnomedical and pharmaceutical treatments are combined. However, many return to inconsistent medical care as and when they can afford (Lamri et al., 2014).

The estimated direct cost of diabetes care per person is about 25% of the estimated annual income for the richest countries in sub-Saharan Africa, and almost 125% for the region's poorest countries (Kirigia et al., 2009). Mbanya (2014) and his colleagues reported that the huge financial cost diabetes pose to society and individuals is predicted to increase in sub-Saharan Africa over the next 20 years due to rapid urbanization and the ageing population. The estimated total economic cost (direct and indirect) of diabetes in the WHO's Africa region in 2000 was US$8836 per person with diabetes per year (Kirigia et al., 2009). Furthermore, Kiriga et al. (2009) estimated the direct cost of treating diabetes in 2000 to range from US$2302 to US$3207 per person.

Since the 1990s, the burden on people living with non-communicable diseases (NCDs) has been worsened due to change in Ghana's health policy. Thus, in 1992 the introduction of user fees in all public health facilities resulted in a reduction in subsidies on all health services in the country as well as full cost pricing of drugs and pharmaceuticals (Jehu-Appiah et al., 2010; Tagoe, 2012).

Furthermore, the existing national health insurance scheme (NHIs) does not cover all non-communicable diseases. Ironically, the introduction of the national health insurance scheme in Ghana reduced government's percentage budget expenditure on health by 39% in 2003 and increased household healthcare costs. Tagoe (2012) reported that average healthcare expenditure for households with respondent currently living with non-communicable diseases is 49% more than households with healthier respondents.

This according to him places undue stress on households due to the relatively high direct cost of treating illness and the associated high indirect burden of illness. He further established significant difference in the mean household healthcare expenditure between household with a member having NCD(s) (GH¢13.09) and household with non-NCD(s) members (GH¢8.76) representing a 49% higher cost with a p-value (0.007). Another study in Sweden reported that averagely, 60% of annual medical cost of type-2 diabetes in a study conducted in Sweden was attributable to diabetes (Henriksson et al., 2000). Beran (2005) in a study conducted in Malawi found that one month of insulin treatment cost to a patient was almost 20 days' wages.

2.4.3 Direct cost on governments

Chronic non-communicable disease like diabetes severely impact on the economic development of nations (Mayer-Foulkes, 2011). Diabetes is a chronic and progressive disease which if not treated over time leads to complications that are costly to treat. Hence, avoiding complications through preventive policies and proper treatment saves money in the long term. However, many government especially in sub-Sahara Africa find it difficult balancing treatment with prevention (Beran & Yudkin, 2006).

Cost of diabetes to national economies though hard to estimate can be very significant. Annual direct cost estimates recently quoted for Brazil was US$ 3.9 billion), Argentina was US$ 0.8 billion and Mexico was US$ 2.0 billion and these costs were rising as diabetes prevalence increased. This implies that a rise in diabetes prevalence is associated with a concurrent increase in the direct healthcare cost from the disease (WHO, 2015). Generally, the diabetes share of direct healthcare costs ranges from 2.5% to 15% annual healthcare budgets, depending on local diabetes prevalence and the sophistication of the treatment available (WHO, 2015). Kanavos et

al. (2012) reported that estimated direct annual cost was €5.45 billion for Spain and €43.2 billion for Germany in 2010.

Likewise, Sweden's annual direct medical cost of drugs per patient averagely accounted for 27% of total direct cost of treating the disease (Henriksson et al., 2000). The UN Resolution 61/225 recognized "…diabetes is a chronic, debilitating and costly disease associated with severe complications which pose severe risks for families, [UN] Member States and the entire world and serious challenges to the achievement of internationally agreed development goals including the Millennium Development Goals …" In 2006 African Diabetes Declaration called on all stakeholders and partners in diabetes and particularly governments of African countries to prevent diabetes and its related chronic complications, to improve quality of life and reduce morbidity and premature mortality from diabetes. Beran et al. (2008) reported that medication, insulin and equipment like syringes needed for diabetic management are commonly in short supply in many countries.

Furthermore, in countries where they are available, often they are unaffordable due to limited access to subsidized medicine or unavailability of subsidy. Substantial difference exist in the availability and price of insulin obtained through the private and public sectors due to a combination of taxes, mark-ups etc.

Due to these reasons, since 2001 a differential insulin price are offered by Novo Nordisk to the world's less developed countries, of which 33 are in sub-Saharan Africa (UN Least developed countries). Novo Nordisk's differential pricing for insulin supplied is targeted basically at the UN least developed countries where insulin is sold at a maximum 20% of the average price for Europe, USA, Canada and Japan. Annually, insulin is offered at a differential price to all 49 governments of the Least Developed Countries defined by the UN84.

2.4.4 Indirect Cost of Diabetes Disease

The majority of diabetic patients with complications may not be able to continue working or work effectively as they used to prior to the onset of their condition. Severe complications, absenteeism, disability, premature retirement or premature mortality could cause productivity loss (WHO. 2015). Though the estimation of cost to society in relation to productivity loss could be complex in many cases where estimates have been made, the costs may be as great or even greater than direct healthcare costs.

Also, families suffer loss of earnings as a result of diabetes and its complications (WHO. 2015). Health conditions curtail people's ability to engage in economic activity. Schofield (2014) reported that when this happens, individuals bear the cost of lost income in addition to the burden of the diabetes disease, the impacts of lost productivity and income taxation revenue is endured by Government. These national costs are in addition to the government's direct healthcare costs. Brown and his colleagues (2014) showed that 15% of family members of patients with diabetes had to stop work to care for a family member with diabetes, and 20% had to cut back on work.

Also, since in sub-Sahara Africa, family members often endure the primary responsibility for care, the effect on the family exceeds monetary costs. Patients and affected family members are hugely burdened in instances where home-based care is required. Apart from the fact that people with diabetes have to pay for medication, consultation, treatment and transport to treatment centers, they also suffer from loss of earnings due to days off work thereby risking losing their job. Thus, in addition to the direct cost associated with diabetes and complications, the disease affects not only patients but their families and by extension their community.

Beran (2005) in a study conducted in Malawi found that affected families often suffer economic loss through giving up work to provide nursing care for family members suffering diabetes illness causes (Diabetes Leadership Forum Africa, 2010) A study conducted in Ghana by Tagoe (2012) showed that households with respondents currently living with non-communicable diseases and were not working was about 59% more than households with healthier respondents. Eleven percent of the respondents attributed their unemployment status to their health. Due to limited support networks for people living with NCDs in Ghana, especially in rural areas (Aikins, 2005), patients had to depend on household members, friends and social groups to support treatment and management of disease condition (Tagoe, 2012).

2.4.5 Intangible Cost of Diabetes Disease

There is a higher risk of mood and anxiety disorders among individuals with diabetes relative to those without the disease (WHO, 2015). These risks which affect quality of life are termed as intangible cost. Pain, anxiety, discrimination at workplace and difficulty in obtaining jobs due to complications, stigmatization and other factors also decrease quality of life (WHO, 2015). Prevalence of depression among diabetic patients varies by lower and higher income countries although there is disproportionate evidence base for countries (Egede Ellis, 2010). High risk of complications such as retinopathy (eyes damage), nephropathy (kidneys damage), and neuropathy (nervous system damage), hearing impairment, Alzheimer and CVD burden a person suffering from diabetes with emotional, physical and psychological pains (Strine et al., 2005).

Common symptoms of diabetes neuropathy are pain in extremities. Symptoms of CVD associated with diabetes include chest pain to leg pain, to confusion and paralysis. Abbas and Archibald (2007) reported that significantly long-term disability and premature mortality have

association with foot ulceration and infection. Regular and proper care of the foot is needed to prevent amputations which can lead to psychological pain and limited mobility.

2.4.6 Socio-economic Status and Diabetes

Studies from high income countries have reported that depression among diabetic patients has association with socio-economic status, marital status, physical activity and chronic somatic diseases (Engum et al., 2005; Safraj et al., 2012). There is a relationship between psychosocial factors (including social isolation or support, coping styles, behaviour and job stress or strain), socio-economic status and depression as a result of diabetes (Lustman & Clouse, 2005; Golden et al., 2008). Studies had attributed higher risk to people with lower socio-economic status, also known as inverse social gradients (Engum et al., 2005; Knol et al., 2007). Nevertheless, there may be variations in the relationship depending on the socio-economic context of the particular country. For instance, in low-income countries LICs, higher socio-economic status may be related to higher levels of chronic disease risk factors while the poor experience a double burden of infectious and chronic diseases according to the protracted polarized model of epidemiological transition (Fleischer et al., 2008).

Studies show association between socio-economic status at the individual level (e.g. unemployment and education) and psychological comorbidity due to diabetes (Acosta et al., 2010; Yang et al., 2009; Youssef et al., 2013). A study conducted in Syria by Kilzieh et al. (2008) showed that depression comorbidity with any chronic disease increase with lower socio-economic status. Yang et al. (2009) also reported significant associations between unemployment and psychological pain in diabetic patients. A study further shows that households with low income were more likely to be depressed due to diabetes complications compared to households who were wealthier (Kilzieh et al., 2008).

Furthermore, studies suggest an association between lower education and depression among diabetic patients. For instance, Mier et al. (2008) reported statistically significant associations between diabetic patients who were educated up to secondary level and depression, with diabetic having less than 5 years of education being more depressed (Zhang et al., 2008). Also, diabetic patients in Thailand with less than 12 years education were significantly more likely to be depressed (Thaneerat et al., 2010).

Finally, Yekta et al. (2010) reported that non-depressed diabetic patients in Iran were more educated than depressed diabetic patients. From Thailand, Thaneerat et al. (2010) reported statistically significant association between poor social support (especially support) and diabetes-depression among people living with diabetes. Furthermore, Zhang et al. (2008) reported negative correlation between depressive symptoms and social support in China.

2.5 Risk Factors for Type-2 Diabetes

Decades of research have shown that much of the burden of chronic disease is attributable to modified lifestyle factors working collectively. Proximate risk factors for type-2 diabetes are obesity, family history, insufficient physical activity, raised cholesterol, tobacco use, and harmful use of alcohol, unhealthy diets and hypertension. Studies have also shown a link between NCDs and stress (Eriksson et al. 2008, Eriksson et al. 2013). Lindenberg, Ostergren and colleagues have cited a close association between psychosocial stress and exhaustion with disease (Lindeberg et al. 2011). Because all these factors are modifiable, NCDs are to an extent preventable (Miranda et al. 2008). Personal lifestyle measures to reduce risk of type-2 diabetes have been known for decades (Stuckler and Siegel 2011, Lagerros and Rossner 2013, Schellenberg et al. 2013). Theyinclude healthy diets, physical activity and regular monitoring of health parameters (body weight, blood sugar, blood pressure, blood lipids and adherence to

therapy) (Pan et al. 1997; Booth et al. 2013). Others are cessation of smoking and harmful alcohol intake (Stuckler and Siegel 2011).

While sedentariness is highest in HICs, high levels are now increasingly seen in some LMICs (WHO 2011c). Smoking is still low in many LICs but data from 23 high burdened LMICs show that it is increasing (Alwan et al. 2010). Adult per capita consumption of alcohol is highest HICs, but nearly as high in some LMICs, especially of local potent brew (WHO 2011c). Dangerous alcohol consumption has also been linked to other lifestyle diseases (Choudhry et al. 2014). Unhealthy diets are rising in lower-resource settings. In some countries in sub-Saharan Africa (e.g. Ghana, South Africa and Cameroon), hypertension has increased to epidemic proportions (Fezeu et al. 2006, Thorogood et al. 2007, Bosu 2010). Overweight has tripled in sub-Saharan Africa over the last two decades (Hossain et al. 2007).

A synopsis of the distribution of risk factors for type-2 diabetes in sub-Saharan Africa is presented in three systematic reviews: (Addo et al. 2007, Dalal et al. 2011, Kengne et al. 2013a). According to these reviews, prevalence of risk factors varies considerably between countries, urban-rural gradients and gender. Obesity rates ranged from 0.4 to 43%; smoking from 0.4% to 71%. Hypertension is the most frequently reported cardiovascular risk factor in Africa, with prevalence ranging from 4% to 65% across contexts (Dalal et al. 2011; Kengne et al. 2013a). Hypertensio is consistently equal in men and women, higher in urban areas, and increases with age (Dalal et al. 2011). Less than 40% of people with hypertension have been detected and of those detected, less than 30% were on treatment. For those on treatment, less than 20% are controlled (Dalal et al., 2011).

Most evidence on cross-linkages between risk factors for type-2 diabetes is from high income countries (Mendis et al., 2004) and may not apply to other contexts (Miranda et al. 2008). For

example, contrary to wha is observed in Europe, obesity in Africa is predominant among women compared to men, but smoking is higher in men (Dalal et al. 2011). More than half of the LMICs are in the early stage of the nutritional transition (Abrahams et al. 2011). The distribution of overweight in such countries is still socially segregated with wealthier persons being more likely to be obese (Fezeu et al. 2006, Subramanian et al. 2009). Some data, however, show that in transitioning countries obesity is increasingly occurring in low socio-economic status groups (Hossain et al. 2007). Some transitioning countries face the paradox of families in which the children are underweight and the adults are overweight (Hossain et al. 2007).

The degenerative models of NCD causation pay little attention to processes that build up to the optimal phenotypic state leading to disease (Miranda et al. 2008). Known proximate risk factors arein reality underlined or modified by other context specific factors. Yet, only few studies explore these relationships. Effective prevention requires unravelling these root causes of risk (Miranda et al. 2008). These underlying causes are often deeply rootedin a society, in complex causal pathways, act across an individual's life course, driven by societal norms (Penn et al. 2013), to create the optimal phenotypic state for type-2 diabetes – "developmental hypotheses" (Miranda et al. 2008). Societies' people are born, live and age may increase their risks for chronic diseases, of which indiviudals for little choice (Stuckler & Siegel 2011).

Studies on the distribution of type-2 diabetes related risk factors in sub-Saharan Africa are patchy, with many contexts especially the rural areas insufficiently explored (Dalal et al. 2011). Fewer studies have assessed the cross-linkages between risk factors and latent factors which is important in contextualizing interventions. Three population-based studies on the prevalence of CVD risk factorsin Uganda and another in Cameroon focused on demographic correlates of either hypertension or abnormal glucose regulation ((Lasky et al. 2002, Fezeu et al. 2006,

Wamala et al. 2009, Maher et al. 2011) nut did not include behavioural correlates. The lack of a holistic assessment of socio-behavioural risk factors is not noticeable in other studies in sub-Saharan Africa (Addo et al. 2007, Mbanya et al. 2010, Dalal et al. 2011, Hall et al. 2011). Likewise, very few studies have explored community perception about risk and preventive behaviour. Therefore, while the recommended behaviour are well known, there is inadequate information on forms of these behaviour that are feasible within the normative contexts of communities in sub-Saharan Africa (Whyte 2012). Lifestyle measures ought to be relevant to the context in which they are applied (Carmoi et al. 2008).

2.6 Conclusion

It was apparent that the direct consequences that diabetes and its accompanying complications place on people living with the disease cannot be underestimated. The disease places a lot of socio-economic burden on individuals and affects their quality of life. It could be observed from the literature review that studies cited were mainly from developed countries. There are limited studies on the burden posed by type-2 diabetes mellitus on individuals living with the disease, especially in Low and Middle-Income Countries (LMIC). This study therefore becomes relevant as it will not only bridge the knowledge gap in the area but also provide useful information on the socio-economic burden of type-2 diabetes mellitus in Ghana for individuals and policy makers in the health sector. Cost-of-illness approach is considered appropriate for this study.

CHAPTER THREE

METHODOLODY

3.1 Study Design

The study was a cross-sectional study which adopted the cost-of-illness analytical approach to estimate the socio-economic burden of type-2 diabetes on patients who were seeking treatment at the Pantang Government Hospital. Bryman (2012) defines quantitative research as, a research strategy the essentially focuses on quantification in both the collection and analysis of data. In other words, quantitative research method places emphasis on measuring a phenomenon in the social world. Nonetheless, findings in a quantitative research paradigm are likely to be generalised to a whole population or a sub-population.

3.2 Study Area

The Pantang General Hospital is situated on the Accra-Aburi road. It boast of facilities which are comparable to those available at the principal sanatorium in Accra. The Pantang hospital was the brainchild of Ghana's first President Dr. Kwame Nkrumah. It was built to cater for psychiatric care in the West African sub-region and its facilities include an excellent facility for medical and psychiatric needs as well as a nursing training school. The hospital is situated on the outskirts of Pantang Township and serves as a health facility for those who live in the environs. The hospital vision is to take care of the mentally challenged patients as well as those with other types of diseases. The Pantang Hospital has a lot of departments in operations (medical, surgical, emergency, OPD etc.). With the except of the medical department, the hospital administration department takes in charges of all internal and external activities comprising compilations of medical bills, data collection, preparations of bills and the like.

3.3 Study Variables

The outcome variable is the socio-economic burden of type-2 diabetes. The explanatory variables are direct, indirect and intangible costs of type-2 diabetes. Table 1 shows the variables of interest for this study.

Table 1: Study Variables

COST TYPE	COST VARIABLE	COST DESCRIPTION
DIRECT COST	Medical	1 Cost of consultation
		2 Cost of diagnostic
		3 Cost of treatment
		4 Cost of medication
	Non-medical	1 Travel cost
		2 Cost of diet
		3 Other substantial expenses
INDIRECT COST	Productivity lost	1 Work hours lost
		2 Lost wages
INTANGIBLE COST	Intangible burden	1 Physical pain
		2 Psychological pain
		3 Social isolation
		4 Anxiety
		5 Stress
		6 Depression
		7 Stigmatization
		8 Self-esteem
		9 Quality of life measure

3.4 Sampling

3.4.1 Study Population

The study population will be made up of all type-2 diabetes patients who sought care at the OPD of Pantang Government Hospital between May and July, 2017.

3.4.2 Sample Size

A sample of 206 type-2 diabetes patients were selected for the study. The prevalence of Type-2 diabetes in Ghana was last measured in 2012 at 159 per 100,000 population (MOH, 2013). Using a Z-value of 1.96, prevalence (p) of 0.159, a q value of 0.841 and a precision of 0.05 due to limited resources and time of data collection. The sample size for the type-2 diabetes type-2 diabetes patient was calculated using the people living with type-2 diabetes

of d = allowable error of 5% following formula (Naing et al, 2006):

$$\text{pe } N = \frac{Z^2_{\alpha/2} p(1-p)}{d^2}$$

Where:

N = sample size,

Z =is the standard score for the confidence interval of 95%

P= proportion

$$N = \frac{1.96^2 \times 0.159 \times 0.841}{0.05^2}$$

$$= 205.57796$$

$$\approx 206$$

Therefore, the sample size determined for this study was approximately 206.

3.4.3 Sampling Procedure

The study relied on consecutive random sampling technique. The first random number selected between 1 and 2 was 1. Hence, the sample selected each day for data collection was 1, 3, 5, 7, 9 etc. That is, on each diabetic clinic day within the period of data collection, approximately half of diabetes patients waiting in a queue for treatment were recruited in a manner such that every second patient was excluded. When a selected patient did not meet the inclusion criteria or refused to participate, the next eligible patient was recruited.

3.5 Data Collection Technique and Tools

Researcher-administered questionnaire was used to collect the data. The questionnaire had both open and closed ended questions covering relevant information on patients' demographic information, employment status and occupation. Another aspect of the questionnaire was the cost incurred by patients as a result of the surgery done, therapy sessions, stage of diagnosis and duration of treatment and their time lost in a month to seek treatment (direct and indirect costs).

3.6 Quality Control

Several mechanisms where be put in place to ensure and guarantee data accuracy and quality devoid of biases. These included training of research assistants, pre-testing of questionnaires and supervised data entry and processing. The research assistants were monitored on daily basis. Completed questionnaires were validated and entered daily after which data was cleaned.

3.7 Pre-testing of Questionnaire

The questionnaire was pre-tested with two research assistants before the actual administration was done. Pre-testing included patients with type-2 diabetes. The principal investigator held meetings daily with the research assistants to cross-check and validate all completed

questionnaires and discussed matters that cropped up. This helped in correcting errors and planning for the subsequent days.

Reliability: The general criterion of acceptability was quite high, with Cronbach's alpha of .90.

Validity: The construct validity was used to determine the psychological concept the Determine intangible cost (physical pain, social isolation, anxiety, stress, depression, stigmatization, self-esteem etc.) associated with type-2 diabetes. Divergent validity score on a measure of self -esteem was negatively correlated with measures of insecurity and anxiety. A depression scale was able to discriminate between people with type-2 diabetes who were depressed and those who were not. The test was valid and reliable, and described how data was collected as well as the process of analysis. The study ensured validity by reducing subject or participant error, subject or participant bias, observer error and observer bias.

3.8 Ethical Consideration

Ethical approval was sought from the Ethical Review Committee of the Ghana Health Service. Permission from the Administrator of Pantang Government Hospital was sought. Informed consent was obtained from the sampled diabetic patients and confidentiality/privacy assured before their engagement in the study. They were informed about the purpose, procedures, risks and benefits of participating in the study. Study participants were informed about the minimal risk involved in participating in the study. The participants were, however, informed of possible minor discomforts in answering certain questions for which they may choose not to answer. For participants. For participants who could not read, the consent form was read out and explained to them in the presence of an independent witness. Only participants who agreed to be part of the

study were recruited for the study and required to sign or thumbprint a consent form as an indication of their willingness to participate.

The participants were informed that there would be no consequences of forfeiting healthcare or other benefit if they chose to withdraw from the study. Study participants were given sugar free biscuits at the completion of the researcher-administered questionnaire as a token of appreciation for the time spent answering the research questions.

Data collected for the study was kept confidential and used solely for the purpose indicated for the study. Data files were password protected. Hard copy and electronic data were stored securely in locked file cabinets without the names of the participants, and access was limited to the Principal Investigator and the supervisors of the study. Extraction of data from patients' records were done only by trained Research Assistants and Principal Investigator.

3.9 Data Analysis

Cost data were entered into Microsoft Excel version 2013. Responses to intangible burden associated with diabetes were entered into Epi. Info Version 7. The entries was done by two independent data entry clerks. To prevent data entry errors, the completed questionnaires were coded, double entered and cleaned. Detected discrepancies were resolved by consulting the original completed questionnaires. Direct medical cost, direct non-medical cost and indirect cost incurred by diabetic patients were estimated using Microsoft Excel version 2017 and STATA version 13.

Total direct cost was estimated by summing total direct medical cost and total direct non-medical cost. Indirect cost was estimated by multiplying productive work hours lost and average lost wage. Total cost was estimated by summing direct and indirect cost. All costs data was

presentedin total aggregates, averages, median and percentage share of cost profile. The Likert scale responses to intangible burden associated with diabetes were analyzed using STATA version 13 and expressed in percentages. The results were presented using charts, graphs and figures. Results of patients' assessment of quality of life were presented in a radar chart.

For study participants' socio-economic status (SES) determination, wealth index was constructed from household asset data using principal components analysis. By this, categorical variables used for assets ownership were transformed into separate dichotomous (0-1) indicators. Common factor score for each participant was produced based on the asset indicators. Wealth quintiles (i.e. lowest, second, middle, fourth and highest) was then obtained by assigning score to each respondent, ranking each study participant by his or her score, and then dividing the ranking into five equal categories, each comprising 20 percent of the total patients. Total direct and indirect treatment cost of diabetics was then sorted and classified by wealth quintiles or socio-economic status with the aid of STATA version 1.

CHAPTER FOUR

RESULTS

1.1 Introduction

This chapter presents the study results. The chapter has these sections: background characteristics of study patients, health state of study patient; direct treatment cost of type-2 diabetes; indirect treatment cost of type-2 diabetes; intangible cost associated with type-2 diabetes; and total treatment cost of type-2 diabetes by socio-economic status.

4.1 Demographic Background of the respondents

According to table 2, the majority of the type-2 diabetes patients who responded to the questionnaire were female, constituting 59.7%. Out of the total sample of 206 patients, most of the type-2 diabetes patients who responded to the questionnaire were between 41 - 60 years, representing 30.6%. The least age group of patients was above 60 years, constituting 11.2 %. Furthermore, most of the patients had completed JSS/JHS education (21.8%). About 37.9% of the patients were married whilst 22.3% were divorced. More than half of the patients (65%) were employed. For those unemployed, it was mainly due to diabetes (35%). Most of the patients representing 28.2 % earned between GHS 401-500 (USD 445.5) monthly and 16.8% earned between GHS 501-1000 (USD 2245.5). More than 16% earned above GHS 1001. However, most of the patients reported that their medical bill was sponsored by two family members 33.5 %.

Table 2: Socio-demographic characteristics of study

Variable	Category	Frequency N=206	Percentage (%)
Sex			
	Male	83	40.3
	Female	123	59.7
Age category			
	Less than 20 years	-	-
	20-30 years	14	6.8
	31-40 years	49	23.8
	41-50 years	63	30.6
	51-60 years	57	27.7
	Above 60 years	23	11.2
Level of education			
	No education	23	11.2
	Primary	30	14.6
	Middle	28	13.6
	JSS/JHS	45	21.8
	Secondary/Vocational	29	14.2
	SSS/SHS	31	15
	Higher	20	9.7
Marital Status			
	Married/living together	78	37.9
	Divorced/ Separated	48	23.3
	Widow	42	20.4
	Never married	38	18.4
Employment Status			
	Employed	134	65
	Unemployed	72	35

Table 2 continued.

Variable	Category	Frequency N=206	Percentage (%)
Average Monthly income (salary plus other sources)			
	001-100	-	
	GH 101-200	24	11.7
	GH 201-300	33	16
	GH 301-400	27	13.1
	GH 401-500	58	28.2
	GH 501-1000	34	16.5
	GH 1001 and above	34	16.5
Numbers of people supporting the Patients			
	1	40	19.4
	2	69	33.5
	3	47	22.8
	4	28	13.6
	5 and above	22	10.7

US$1.00 equivalent to GHS4.50 (Bank of Ghana average monthly interbank exchange rate, July 2018)

4.2 Direct Treatment Cost of Type-2 Diabetes

The direct cost was made up of two main components i.e. estimated direct medical and direct non-medical cost incurred by the diabetic patient.

4.2.1 Direct Medical Cost

The components of direct medical costs were consultation, laboratory test, medicine and other treatment. Table 3 shows distribution of direct medical cost by diabetes. Medicine cost constituted a bulk of total direct medical cost profile of diabetes healthcare (71.9%). Patients spent an estimated GHS18, 540.00 on medicine with a mean medicine costs of GHS 90.00 (95%

CI: 0-90.00). Consultation cost recorded the second highest share of the cost profile with a mean of GHS18.00 (95% CI: 18.20-20.00). The total direct medical cost estimated was GHS3,708.00 (USD 16, 686). The overall estimated direct medical cost for the year was GHS25, 801.00 (USD 38,563.2) with a yearly average cost of GHS 6,450.00.

Table 3: Direct Medical Cost

		Diabetes Patient N=206		
Cost item	**Cost (GHS)**	**Mean (95% C.I)**	**Median**	**Cost Profit (%)**
Consultation	3,708.00	18.00 (18.20-20.00)	19.1	14.4
Lab tests	1,596.50	4.50 (5.50-10.00)	7.75	6.2
Treatment	1,957.00	9.50 (10.50-20.00)	15	7.6
Medicine	18,540.00	90.00 (0-90.00)	85	71.9
Total cost estimates	**25,801.00**	**41.60**	**126.85**	**100**
Total average cost	**(6,450.00) ***			

*US$1.00 equivalent to GHS 4.50 (Bank of Ghana average monthly interbank exchange rate, 2018)

4.2.2 Direct Non-Medical Cost

The components of direct non-medical costs were travel cost, food cost and miscellaneous. Distribution of direct medical cost among diabetes patients is presented in table 4. Less than half of the total non-medical cost profile composed of travel cost (41.1%). The yearly total food cost estimated for type-2 diabetics constitute 35.8% with a cost of GHS 1,751.00 and a mean value of 8.50 (95% CI: 1.50-10.00).

Table 4: Direct Non-Medical Cost

	Diabetes Patient N=206			
Cost item	**Cost (GHS)**	**Mean (95% C.I)**	**Median**	**Cost Profit (%)**
Travel cost	2,008.50	9.75 (0.19.50)	10.00	41.1
Food cost	1,751.00	8.50 (1.50-10.00)	8.00	35.8
Miscellaneous	1,133.00	5.50 (0-5.50)	5.00	23.2
Total cost estimates	**4,892.50**	**23.75**	**23.00**	**100**
Total average cost	**(1,630.83) ***			

*US$1.00 equivalent to GHS 4.50 (Bank of Ghana average monthly interbank exchange rate, 2018)

Total average cost (1,630.83) *

4.2.3 Total Direct cost of Type-2 Diabetes

The total direct cost estimate was made up of direct medical and non-medical costs. It is the sum of total direct medical cost and total direct non-medical cost. Table 5 presents an amalgamation of the direct medical and non-medical costs estimated table 3 and 4. The overall yearly total direct medical cost and direct non-medical cost of type-2 diabetics is estimated to be GHS 30,693.50(USD$138,910.95) with total direct average cost of the GHS 4,384.79.

Table 5: Total Direct Cost of Type-2 Diabetes

		Diabetes Patient N=206		
Cost item	**Cost (GHS)**	**Mean (95% C.I)**	**Median**	**Cost Profit (%)**
Consultation	3,708.00	18.00 (18.20-20.00)	19.1	14.4
Lab tests	1,596.50	4.50 (5.50-10.00)	7.75	6.2
Treatment	1,957.00	9.50 (10.50-20.00)	15	7.6
Medicine	18,540.00	90.00 (0-90.00)	85	71.9
Sub-total cost estimate	**25,801.00**	**41.60**	**126.85**	**100**
Sub-total average cost	**(6,450.00) ***			
Cost item	**Cost (GHS)**	**Mean (95% C.I)**	**Median**	**Cost Profit (%)**
Travel cost	2,008.50	9.75 (0.19.50)	10.00	41.1
Food cost	1,751.00	8.50 (1.50-10.00)	8.00	35.8
Miscellaneous	1,133.00	5.50 (0-5.50)	5.00	23.2
Sub-total cost estimates	**4,892.50**	**23.75**	**23.00**	**100**
Sub-total average cost	**(1,630.83) ***			
Total direct cost	30,693.50	65.35	149.85	100
Total direct average cost	(4,384.79) *			

*US$1.00 equivalent to GHS 4.50 (Bank of Ghana average monthly interbank exchange rate, 2018)

4.2.4. Indirect treatment cost of type-2-diabetes

The indirect cost estimated the productive working days lost due to diabetes by using the human capital approach. Figure 2 shows the percentage distribution of total working days patients were absent. Most of the patents representing 36.4% were absent from work for one day. This is followed by patients who were absent from work for two days and more than five days also constituting 20.9% and 14.6% respectively. Patients who were also absent from work for three days and four days also constituted 18% and 10.1% respectively.

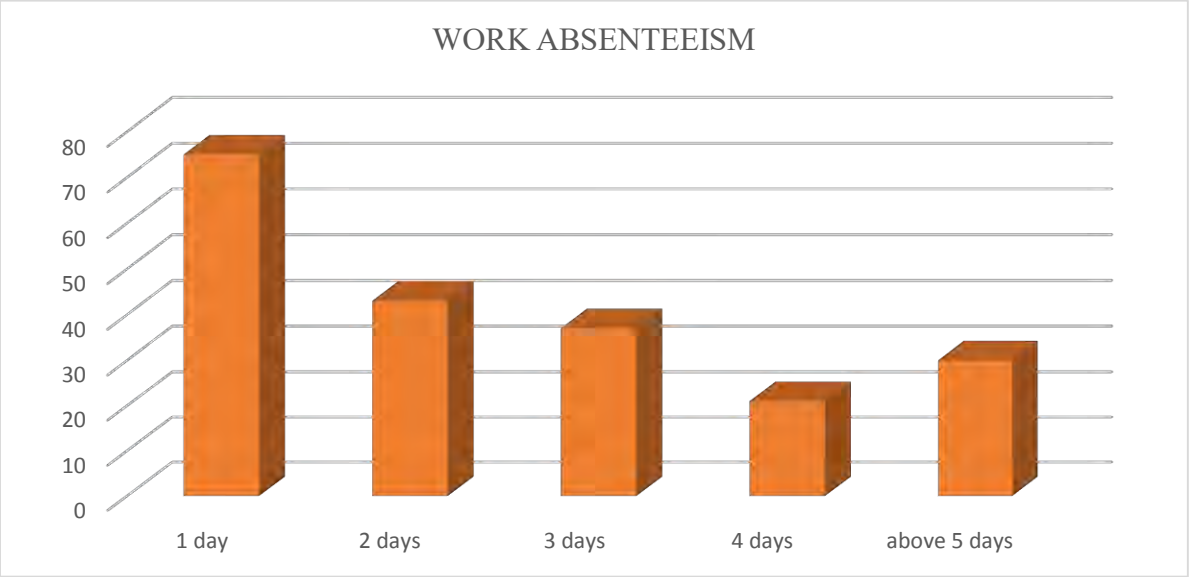

Figure 2: Number of days absent from work by Diabetes Patients

The indirect cost estimated the productive work hours lost due to diabetes by using the human capital approach. Figure 3 shows the percentage distribution of total time spent travelling to and from diabetic clinic by both employed and unemployed diabetics. It was realized that most of the patients spent 11-20 minutes in travelling from their homes to the clinic representing 24.8%. Some of them also indicated that they spent 1-10 minutes and 41-50 minutes in travelling from the clinics to their home, constituting 19.4% and 11.2% respectively.

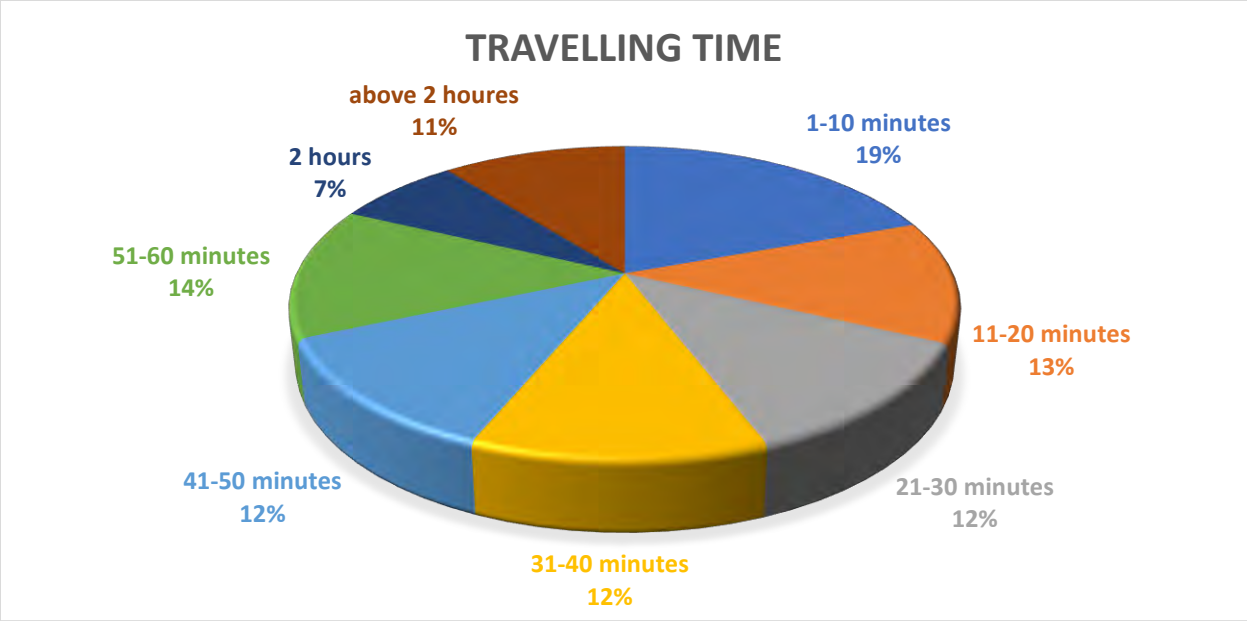

Figure 3: Travelling times of Diabetes Patients

The indirect cost estimated the productive work hours lost due to diabetes by using the human capital approach. Figure 4 shows the percentage distribution of the total waiting time spent at the diabetes clinic seeking healthcare by both employed and unemployed diabetics. Most of the patients indicated that they spent between 40-50 minutes in the hospital before they are served, constituting 19.9%. Some of them also indicated that they spend between 51-60 minutes and between 31-40 minutes in the hospital before they are served constituting 14.6% and 12.1% respectively.

Figure 4: Waiting times of Diabetes Patients

The total indirect cost estimation was done for only productively engaged (employed) diabetics. The total productive days lost by employed type-2 diabetics was 131. The valuation of productive time lost to patient relied on the national minimum wage per day of GHS9.68 as at July, 2018 (Ministry of Finance and Economic Planning, July 2018). The total productive days lost by diabetics was 281 days. Overall, the value of time absent from productive work within past month was estimated as 1,268.08 (US$589.5). The mean indirect cost was GHS93.67 (95% CI: 0-*88.54*).

Table 6: Total indirect cost of diabetes disease

	Diabetes Patients Employed (N=134)		
Category	**Item**	**Productive days lost**	**Valued productive days lost (GHS)**
Health seeking	**Travelling time (per month)**	(3hrs * 30 days) 90	-
	Waiting time	(2hrs * 30 days) 60	-
Work absenteeism	**Absent from work**	131	1,268.08
Total		**281**	**1,268.08 (US $ 589.50) ***
$mean = 93.67$;	95% CI $(0 - 88.54)$;	$Median = 90$	

***Estimation done for only employed diabetics based on work absenteeism

**National minimum wage per day of *GHS9.68* was used to value lost productivity (Ministry of Finance, July,2018)

*US$1.00 equivalent to GHS4.50 (Bank of Ghana average monthly interbank exchange rate, June 2016)

4.2.5 Intangible Cost associated with Type-2 Diabetes

The intangible cost assesses the incalculable burden – usually physical and psychological pain and suffering - associated with the diabetes disease. The elements assessed was categorized into physical and psychological effect, social effect, and quality of life assessment.

Physical, psychological and social effect

Higher percentage of complicated diabetics (37.86%) (n = 78) suffered severe physical pains. Furthermore, 25.7% (n = 53) diabetics felt very severe physical pains, about 16% (n = 33) of patients indicate they felt moderate pains. About 36.9% (n = 76) of diabetics' patient very often felt depressed while 26.7%(n = 55) always felt depressed due to type-2 diabetes. However, a smaller percentage of diabetics (17%) (n = 35) seldom often felt depressed. About 37.9% (n = 78) said they always felt uncomfortable when insulin injection was administered to them. Moreover, 30.6% (n = 63) patients indicated that they often felt uncomfortable with insulin

injection while 5.8% (n = 12) said they seldom felt uncomfortable. Also, higher percentage of diabetics (37.9%) (n = 78) who used insulin very often felt stressed out. Also, higher percentage of diabetics (34%) (n = 70) who used insulin always often felt stressed out , while a significant percentage (2.4%) (n = 5) said they never felt stressed out in issuing insulin.

Table 7: Intangible cost (physical pain, psychological pain, social isolation, anxiety, stress, Table depression, stigmatization, self-esteem etc.)

Variable	**(N=206)**	**(N, %)**
How much physical pain do you suffer as a result of diabetes?		
None		13(6.3)
Very little		29(14)
Moderate		33(16)
Severe		78(37.9)
Very severe		53(25.7)
How often do you feel depressed by the fact that you have diabetes?		
Always		55(26.7)
Very Often		76(36.9)
Quite often		31(15)
Seldom		35(17)
Never		9(4.3)
How often do you feel uncomfortable when you administer insulin injection?		
Always		78(37.9)
Very Often		63(30.6)
Quite often		45(21.8)
Seldom		12(5.8)
Never		8(3.9)
How often do you feel stressed out when you have to administer insulin injection?		
Always		70(34)
Very Often		78(37.9)
Quite often		33(16)
Seldom		20(9.7)
Never		5(2.4)
If married, how has diabetes affected your marriage?		
No effect		136(66)
Divorced		34(16.5)
Separated		39(18.9)

Quality life assessment

According to table 4.3, majority of the diabetes patients indicated that, they get fatigue due to diabetes representing a mean of 2.391 and a standard deviation of 1.076. Moreover, they also indicated that diabetes has made them not enjoy their hobbies. Therefore, making their quality of life looking miserable, constituting a mean value of 2.361 and a standard deviation of 0.964. Also, patients indicated that the stigmatization have made them avoid company of others because of diabetes condition having a mean of 2.274 and a standard deviation of 1.230.

Table 8: Intangible cost (physical pain, psychological pain, social isolation, anxiety, stress, Table depression, stigmatization, and self-esteem)

Variable	N=**206**	Mean	Standard Deviation
I am not able to enjoy my hobbies as I did prior to the diagnosis of the disease?		2.361	0.964
I have sleepless nights because of diabetes condition?		1.622	0.665
I have low self-confidence because of diabetes condition		1.578	0.512
I have low self-esteem because of diabetes condition		1.522	0.512
I avoid company of others because of my diabetes condition		2.274	1.230
I easily get fatigued because of my diabetes condition		2.391	1.076
I have to change diet because of diabetes		2.044	0.928
I easily get irritated because of my diabetes condition		2.057	0.767

CHAPTER FIVE

DISCUSSION

This chapter presents the discussions of the study. The outline is based on the objectives of the research. It includes summary and discussion of the key findings of the study and relates it to published literature on cost burden of type-2 diabetes mellitus treatment as well as physical and psychological pain associated with the disease.

5.1 Direct Treatment Cost of Type-2 Diabetes

The direct non-medical cost contributes an inappreciable proportion (10.7%) to the total direct cost profile compared to direct medical cost (71.9%). This is contrary to finding by Chatterjee (2011) which reported relatively substantial contribution of 40% direct non-medical cost to total direct cost profile among diabetes patients. Medicine cost constituted a bulk of total direct medical cost profile of diabetes healthcare was 71.9% (GHS18,540.00). Diabetics patients spent an estimated GHS18,540.00 on medicine with a mean medicine costs of GH¢90.00 (95% CI: 0-90.00). Consultation cost recorded the second highest share of the cost profile with a mean of GHS18.00 (95% CI: 18.20-20.00). The total direct medical cost estimated was GHS3,708.00 (USD16,686).

The overall estimated direct medical cost was GHS25,801.00(USD38,563.2) with an average cost of GHS 6,450.00. The high percentage share of direct cost estimated in this study confirms findings by American Diabetes Association (2013), where the direct cost of diabetic healthcare formed about 71.8% of the total cost of diabetic healthcare. Likewise, results from a study conducted by Kirigia et al. (2009) showed that the direct cost of diabetic healthcare (56%)

formed a greater portion of the total cost of diabetic healthcare. However, findings of this study are in sharp contrast to study results obtained by Barceló et al (2003) which concluded that the direct cost of diabetic healthcare constituted a lesser proportion (16%) of the total cost of diabetic healthcare.

This study's estimates of high percentage share of direct cost over total treatment cost can largely be ascribed to the influence of cost of medications prescribed for treatment of diabetics and its related complications/comorbidities. Medication cost alone accounts for 67.2% of the total cost profile. The same finding was observed by the American Diabetes Association (2013) which found that the largest proportion of the direct cost of diabetic healthcare was attributable to the percentage share of medicine cost (18%).

Similarly, this study's result is corroborated by the study findings of Barceló et al. (2003), which also concluded that medications cost formed the highest proportion of the direct cost of diabetic healthcare (41%). Notwithstanding the influence of medicine cost which resulted in high percentage share of direct cost over total treatment cost profile, the real effect of cost of medications is possibly underestimated.

This is due to the fact that most of the medications used in diabetes treatment were covered under the National Health Insurance Scheme (NHIS) (NHIS medication Tariffs, 2012) and majority of the study patients are NHIS subscribers. Type-2 diabetics unlike type-1 diabetics are strictly supposed to be non-insulin dependent. Measures used to manage the disease include oral medication, regular exercise and adherence to dietary plan. However, more than half of the studied diabetics (51.2%) are insulin dependent.

Reasons attributed to patient's reliance on insulin are: (1) study hospital's standard of practice to use insulin to normalize severely high glucose levels of type-2 diabetics; (2) patients' resistance to medication over time (e.g. the average years patients had been diagnosed with type-2 diabetes in this study was 8years); and (3) to supplement patient's medication in order to keep glucose at normal levels and prevent complication risk. This study's findings partially disprove Beran et al. (2008) study report that medication, insulin etc. needed for management of the disease are frequently in short supply in many countries and where they are available, often they are unaffordable due to lack of subsidies. This study finds that though there is constant supply of insulin, the NHIS did not cover the entire cost and thus patients are made to pay about 20% of high price medicinal products like insulin.

5.2 Indirect Treatment Cost of Type-2 Diabetes

The cost burden of managing type-2 diabetes goes beyond direct spending on medical products and commodities. It extends to other indirect cost elements. This is expressed as loss of productivity resulting from absenteeism and patient's inability to engage in productive activities.

According to WHO (2013), due to the chronic and complex nature of the disease, diabetic patients may either be unable to work or effectively work as they could prior to the onset of the disease. This study's findings reveal that diabetics with complications and those without complications lost over 70% of the estimated productive work time due to work absenteeism.

WHO (2013) further reported indirect cost estimates for type-2 diabetes management in many countries may be as great as or even greater than the direct healthcare cost. In this study, due to cultural factors which inhibit people from revealing correct information about their income,

Ghana's minimum wage as of July 2016 (GHS 9.68) is used to estimate indirect cost of all employed diabetics.

This approach may have biased the cost estimation and thus confirms WHO's stance. Also, this was evident in the study results of Barceló et al. (2003) in which the percentage share of total indirect cost constituted about 82% of the total cost of diabetic care.

Furthermore, a survey conducted by Kapur (2007) on the cost of diabetes mellitus in India reported that the indirect cost burden in the management of diabetes mellitus disease formed more than half of the total healthcare expenditure.

However, in contrast to the finding of Kapur's (2007), indirect cost estimated in this study constitute less than 10% of the total treatment cost. Again, this finding is in sharp contrast with study results of Kirigia et al. (2009), who in a standard cost-of-illness study in the WHO African region reported that the indirect cost burden of type-2 diabetes disease management was significantly not different from the direct cost resulting from the disease (i.e. direct cost was 57% and indirect cost was 43%).

Nonetheless, consistent with this study was a research by Chatterjee et al. (2011) which reported that the indirect cost of diabetic healthcare formed less than half of the total cost of diabetic healthcare. Likewise, American Diabetes Association (2013) reported that indirect cost of diabetes mellitus disease management constituted less than 30% of the total healthcare expenditure.

According to American Diabetes Association (2013) report which documented the extent of economic loss from absenteeism and low productivity due to diabetes care, diabetic management leads to more than 7% increase in absenteeism.

5.3 Intangible Cost Associated with Type-2 Diabetes

The burden associated with managing type-2 diabetes further extends to physical and psychological pain, stress and anxiety which adversely affect the quality of life of diabetics. Findings of this study shows that a substantial number (37.9%) of type-2 diabetics who used insulin often felt discomfort and stressed during its administration.

This corroborates WHO (2013) report which observed that the management of the disease especially by insulin injection may be inconvenient, time-consuming and a potential source of psychological stress. Kirigia et al. (2009) in a study emphasized the point that intangible burden suffered due to diabetes contributes significantly to the overall cost burden. The majority of patients suffer various degrees of depression and physical pains ranging from moderate to very severe.

Similarly, a study by Anderson et al (2001) showed that people with diabetes had twice the odds of depression compared to those without depression. Diabetics must be encouraged to regularly engage in physical activities and hobbies in order to prevent stress and depression associated with the diabetes mellitus disease. Trovato et al. (2006) reported an association between diabetes and psychological stress. Similarly, Donald et al. (2012) examined the cost of diabetes and concluded that about 37.9% of diabetics lived with pain and discomfort. The lower levels of physical pain among diabetics can be attributed to their constant adherence to treatment schedule as a result of NHIS membership.

Donald et al (2012) stated that less than a third of study patients had problems with mobility and ability to undertake usual activities with ease. This is similar to findings of this study in which even lower proportion of patient report of inability to enjoy hobbies. WHO (2015) reported that pain, anxiety, discrimination at workplace, difficult in obtaining jobs was mainly due to

complications, stigmatization and other factors which decrease quality of life. In this study, diabetics with complications have slightly lower quality of life (weighted mean score of 3.3) compared to patients without complications (weighted mean score of 3.5)

5.4 Limitation of the Study

1. The study was conducted in only one facility and the sample size used was minimal compared to other studies. Hence, findings could not be generalized to the larger population of diabetic patients.
2. Intangible cost could not be valued in monetary terms due to methodological limitations. Therefore, these were described but not added to the total cost.
3. The direct and indirect cost incurred as well as the number of productive hours lost by the patient was solely based on recall which may not be accurate.
4. Time lost by accompanying relatives was not accounted for since there was no data collected on their occupational backgrounds.

CHAPTER SIX

CONCLUSIONS AND RECOMMEDATIONS

This chapter summarizes the significance and implication of the study and makes recommendations which aims to inform policies and programmes targeted at improving the current management of the diabetes mellitus disease in order to mitigate the economic burden associated with the disease.

6.1 Conclusion

This study aimed at assessing the cost of living with diabetes type-2 in Ghana, precisely among patients who visit Pantang Government Hospital. From the results of the study it became apparent that the cost of treatment across various dimensions studied was moderately to highly expensive for people living with diabetes. The cost of medicine was a huge burden on diabetes type-2 patients, which totaled 71.9% (representing GHS 18,540) of total direct medical cost. Beyond the direct medical cost, travel and food cost figured prominently in participants burden.

It is also apparent from the study that the diseased also posed a significant burden on the productive lifestyle of the patients. Many of the patients reported absenteeism from work as well as the combined problem for long travel times to and waiting times at the diabetic clinics. The burden of living with diabetes type-2 was not only limited to finance or the economy of the patients but the disease also posed significant physical and psychosocial problems. Severe physical pains and depressed feeling were mostly reported by the patients. The discomfort and stress associated with insulin administration were also burdensome to the patients. Although the economic and psychosocial impact of the disease on the patients was worrying, it did not appear to affect the marriages. Most of the patients reported no effect of the condition on their

marriages. Moreover, certain intangible costs including the impact of the disease on hobbies, sleep, confidence and social participation were not impacted much.

As can be seen thus far the impact of the condition spans the individual, family and societal levels. Thus, diabetes type-2 requires a multilevel intervention to reduce some of the burden associated with living with the disease. The next section will delineate some recommendations targeted at various stakeholders.

6.2 Recommendation

The study makes the following recommendation:

The Government

To the extent that direct cost constitutes the major cost incurred by the type-2 diabetes patients, there is the need for a policy on diabetes treatment with the aim of subsidizing the direct cost components of treating diabetes. This could be done through effective advocacy and collaboration with private sector partners and interest group to raise the needed resources for reducing the direct treatment cost of diabetes.

The Ministry of Health

Services for diabetes management should be decentralized by Ministry of Health since it costs patients a lot of money travelling in and out of treatment centers. Besides the money spent on transportation, time spent travelling is also another source of loss to patients and their accompanying relatives.

The Supporting Groups

Considering the intangible cost borne by women (59.7%) with diabetes, the support groups or the hospital should be encouraged in order to assist patients psychologically as well as reduce the stigma associated with the disease.

Individual patients' diabetes

Based on the study results patients should be encouraged to adhere to their dietary plan, undertake regular physical activities and exercises. This would increase insulin sensitivity in order for the cells to better be able to utilize insulin and keep glucose at normal level thereby improving their health and thus prevent complications and its associated costs.

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APPENDIX

UNIVERSITY OF GHANA
SCHOOL OF PUBLIC HEALTH

Dear Respondent,

I am Amoako Margaret, a student of the above-mentioned school, undertaking a master's programme in public health. I am researching on the topic:" SOCIO-ECONOMIC BURDEN OF TYPE-2 DIABETES AMONG PATIENTS ATTENDING PANTANG GOVERNMENT HOSPITAL" and would be grateful if you could take some time to answer the below question to enable the completion of this research. All answers provided would be treated with the utmost confidentiality. Please kindly indicate your answer with a tick (√) or write in the space provided.

Qn. No.	Questions	Response
		Questionnaire No. ……
Section 1	**Socio-demographic information**	
1	What is your sex 1. Male 2. Female	☐
2	What is your age in years (i.e. age at last birthday)?	☐☐☐ Years
3	What is the highest level of school you attended? 1. No education 2. Primary 3. Middle 4. JSS/JHS 5. Secondary/Vocational 6. SSS/SHS 7. Higher	☐
4	What is your current marital status? 1. Married/living together 2. Divorced/ Separated 3. Widowed 4. Never married	☐

5	What is your employment status? 1. Unemployed 2. Employed *If **unemployed**, go to Qn 7*	☐
6	If employed, what is your occupation, that is, what kind of work do you mainly do?	…… ……..
7	If unemployed, reason for not being employed? 1. Student 2. Housewife 3. Retired 4. Unable due to diabetes 5. Other (please specify) ..……	☐
8	What is your average monthly income? (salary plus other monies from other sources)	☐☐☐☐☐☐☐
9	How many people are supported on this income?	☐☐
Section 2	**Direct cost information**	
10	***Direct medical cost information*** How much money (GHS) did you spend for:	
	(a)Consultation?	☐☐☐☐☐☐☐
	(b)Lab test?	☐☐☐☐☐☐☐
	(c)treatments?	☐☐☐☐☐☐☐
11	***Direct non-medical cost information*** How much money did you spend for? (GHS)	
	(a)travel cost	☐☐☐☐☐☐☐
	(b)food cost	☐☐☐☐☐☐☐
	(c)other cost	☐☐☐☐☐☐☐
Section 3	**Indirect cost information**	
12	How many days have you absent from work (if applicable) in the last month because of diabetes (i.e. treatment, recovery)?	☐☐ Days

13	How many minutes did you spend travelling to and from the diabetic clinic?	☐☐☐ Minutes
14	How many minutes did you spend at the diabetic clinic?	☐☐☐ Minutes
15	Does anyone accompany you to the clinic? 1. Yes 2. No ***If No, go to Qn 17***	☐
16	What is his/her employment status? 1. Unemployed 2. Employed	☐
17	Any other information on expenses incurred due to diabetes? ……	☐☐☐
Section 4	**Intangible Cost information**	
18	How much physical pain do you suffer as a result of diabetes? 1. None 2. Very little 3. Moderate 4. Severe 5. Very severe	☐
19	How often do you feel depressed by the fact that you have diabetes? 1. Always 2. Very Often 3. Quite often 4. Seldom 5. Never	☐
20	If employed by another person or organization, are you side-lined at work because of diabetes? 1. Yes 2. No 3. Not employed	☐
21	If retired, was the retirement as a result of the diabetes? 1. Yes 2. No 3. Not applicable	☐
22	How often do you feel uncomfortable when you administer insulin injection? 1. Always 2. Very Often	☐

	3. Quite often 4. Seldom 5. Never	
23	How often do you feel stressed out when you have to administer insulin injection? 1. Always 2. Very Often 3. Quite often 4. Seldom 5. Never	☐
24	If married, how has diabetes affected your marriage? 1. No effect 2. Divorced 3. Separated 4. Other (please specify) ……..……	☐
25	I am not able to enjoy my hobbies as I did prior to the diagnosis of the disease? 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree	☐
26	I have sleepless nights because of my diabetic condition? 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree	☐
27	I have low self-confidence because of my diabetic condition. 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree	☐
28	I have low self-esteem because of my diabetic condition. 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree	☐

<table>
<tr><td>29</td><td>I avoid company of others because of my diabetic condition.
1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree</td><td></td></tr>
<tr><td>30</td><td>I easily get fatigued because of my diabetic condition.
1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree</td><td></td></tr>
<tr><td>31</td><td>I have to change diet because of diabetes
1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree</td><td></td></tr>
<tr><td>32</td><td>I easily get irritated because of my diabetic condition
1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree</td><td></td></tr>
<tr><td>33</td><td>On a scale of one to five, how would you rate your quality of life?
<table><tr><td>Very poor</td><td>Poor</td><td>Neither poor nor good</td><td>Good</td><td>Very good</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table></td><td></td></tr>
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