

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY, KUMASI, GHANA**



COLLEGE OF SCIENCE

**DEPARTMENT OF BIOCHEMISTRY AND
BIOTECHNOLOGY**

**KNOWLEDGE OF TRADITIONAL HERBALISTS ON DIABETES
MELLITUS AND THE EFFECT OF HERBAL MEDICINE ON
GLYCAEMIC CONTROL**

BY

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MAY, 2015

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GLYCAEMIC CONTROL**

BY

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A Thesis submitted to the Department of Biochemistry and Biotechnology

College of Science

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HUMAN NUTRITION AND DIETETICS

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DECLARATION

I hereby declare that this submission is my own work towards the MPhil and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made.

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ABSTRACT

Response to the high epidemic of diabetes mellitus on the African continent is bedeviled by challenges including lack of access to accurate information on the disease. Many diabetics therefore turn to traditional herbalists who promise cure for diabetes mellitus using herbal medicine. Traditional herbalists are therefore a significant source of management and information on diabetes mellitus, yet there is little published information about knowledge of traditional herbalists on diabetes mellitus and the effect of herbal medicine on glycaemic control. A descriptive study employing interviews was conducted with 55 traditional herbalists and 235 diabetics in the Techiman Municipality of Ghana. The objectives were to assess traditional herbalists' knowledge on diabetes mellitus and its management, and to determine the effect of herbal medicine use for diabetes mellitus management on glycaemic control of diabetics who use herbal medicine and are attending the diabetic out-patient clinic of Holy Family Hospital in Techiman. Traditional herbalists' overall knowledge scores on diabetes mellitus were classified as; good (if $\geq 70\%$), satisfactory (if 50-60%) or poor (if $< 50\%$) based on classification used in a similar study. The results showed that the traditional herbalists' overall knowledge on diabetes mellitus is poor (average percentage score of 15.6 ± 9.4). Only 38.2% of the traditional herbalists correctly identified diabetes mellitus as too much "sugar" in the blood. A few (7.3%) said diabetes mellitus is caused by a malfunctioning organ that helps body cells utilise sugar. There was no complete distinct understanding between the causes and risk factors of diabetes mellitus among the studied traditional herbalists because 44% mentioned some established risk factors as causes of diabetes mellitus. Few (25.5%) agreed that there are various types of diabetes mellitus but could not mention the specific types and 33% said they had no idea about the risk factors of diabetes mellitus. None of the traditional herbalists mentioned overweight/obesity and advancing age as risk factors of diabetes mellitus. Only 7.3% of the traditional herbalists mentioned polyphagia or polydipsia as signs/symptoms of diabetes mellitus. Important complications of diabetes mellitus such as kidney disease and heart disease were not mentioned by any of the traditional herbalists. Almost all the traditional herbalists (92.7%) considered dietary modification by consuming high servings of vegetables while reducing the intake of starches and sugar as an essential part in the management of diabetes mellitus. The prevalence of herbal medicine use for diabetes mellitus among diabetics attending the diabetic out-patient clinic of Holy Family Hospital, Techiman was 8.9% and this did not significantly affect their glycaemic control. The findings imply that people who consult traditional herbalists for diabetes mellitus management are more likely to receive inaccurate information and not more effective herbal medicines compared to orthodox management which can negatively affect diabetes mellitus self-management practices. Based on the results of this study, it is recommended that capacity building programmes to help improve upon traditional herbalists' knowledge on diabetes mellitus be encouraged and further studies should be conducted on the effect of only herbal medicine use on glycaemic control.

Key words: Knowledge, Traditional herbalists, Herbal medicine, Diabetes mellitus.

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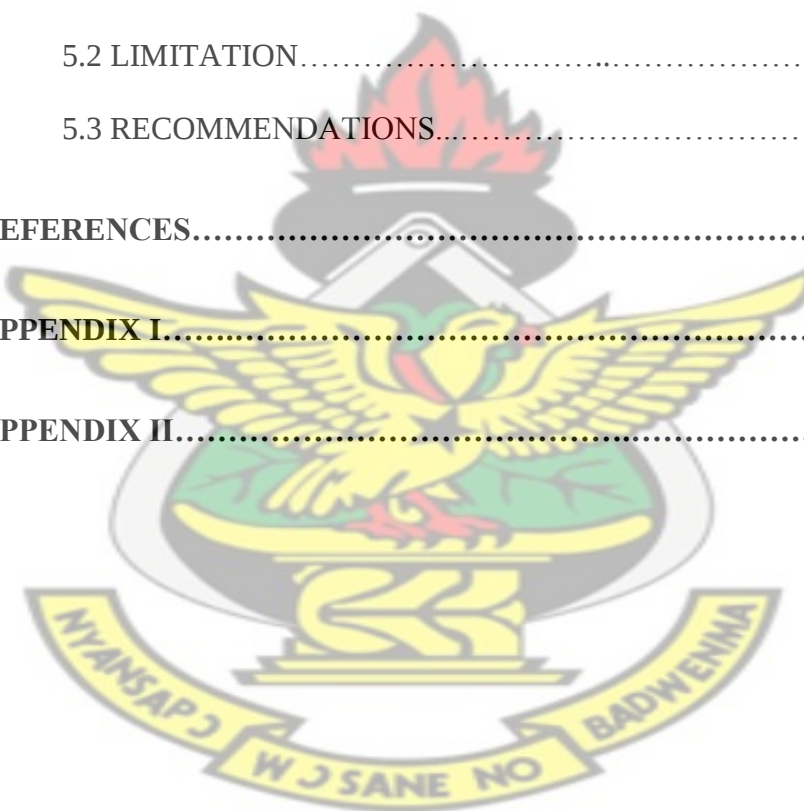
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ACRONYMS/ABBREVIATIONS



ADA	American Diabetes Association
AIDS	Acquired Immunodeficiency Syndrome
A-Level	Advanced Level
BMI	Body Mass Index
CAM	Complementary and Alternative Medicine
Cm	Centimetre
CSRPM	Center for Scientific Research into Plant Medicine
CHPS	Community-based Health Planning and Services
DANIDA	Danish International Development Agency
DM	Diabetes Mellitus
DKA	Diabetic ketoacidosis
FAO	Food and Agriculture Organisation
FBG	Fasting Blood Glucose
FPG	Fasting Plasma Glucose
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service

GSS	Ghana Statistical Service
GTMPC	Ghana Traditional Medicine Practice Council
HbA1c	Glycated Haemoglobin
HDL	High Density Lipoprotein
HHF	Holy Family Hospital
HHS	Hyperglycaemic Hyperosmolar State
HIV	Human Immunodeficiency Virus
IDDM	Insulin Dependent Diabetes Mellitus
IDF	International Diabetes Federation
JHS	Junior High School
KAP	Knowledge Attitude and Practices
Kcal	Kilocalorie(s)
Kg	Kilogram
Kg/m ²	Kilogram Per Metre Square
LADA	Latent Autoimmune Diabetes in Adults
LDL	Low density lipoprotein
mg/dL	Miligram Per Decilitre

mmol/l	Milimole Per Litre
MNT	Medical Nutrition Therapy
MODY	Maturity Onset Diabetes in the Young
MOH	Ministry of Health
NCDs	Non-Communicable Diseases
NCTC	National Cardiothoracic Centre
NDIC	National Diabetes Information Clearinghouse
NIDDKD	National Institute of Diabetes and Digestive and Kidney Diseases
NIDDM	Non Insulin Dependent Diabetes Mellitus
NIH	National Institute of Health
NPH	Neutral Protamine Hagedorn
NPL	Neutral Protamine Lispro
OGTT	Oral Glucose Tolerance Test
OHAs	Oral Hypoglycaemic Agents
PHC	Primary Health Care
RCTs	Randomised Clinical Trials

SD	Standard Deviation
SHS	Senior High School
SPSS	Statistical Package for the Social Sciences
STDs	Sexually Transmitted Diseases
STI	Sexually Transmitted Infection
TB	Tuberculosis
TBAs	Traditional Birth Attendants
TG	Triglyceride
THs	Traditional Herbalists
TM	Traditional Medicine
TMA	Techiman Municipal Assembly
TMHD	Techiman Municipal Health Directorate
TMPs	Traditional Medicine Practitioners
USSR	Union of Soviet Socialist Republics
W/H	Waist to Hip Ratio
WHO	World Health Organisation

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Diabetes mellitus (DM) is a chronic metabolic disorder resulting from decreased ability or inability of the beta cells within the islets of Langerhans in the pancreas to produce insulin or, reduced effective utilisation of the insulin produced by the body cells or both, resulting mostly in hyperglycaemia. Diabetes mellitus is one of the non-communicable diseases (NCDs) that in recent times has had great impact on man's health owing partly to modernisation brought about by advancement in technology which contributes to decreased physical activity and poor dietary pattern (Agyei-Mensah and Aikins, 2010). The prevalence of diabetes mellitus continues to increase worldwide. The World Health Organisation (WHO, 2012) reports that one in ten adults worldwide has diabetes mellitus and 12% of the world's population are considered obese, a risk factor for diabetes mellitus. About 80% of people living with diabetes mellitus in the world live in low and middle income countries and 72.8% of all deaths in Africa attributable to diabetes mellitus occur in people under the age of 60 years (WHO, 2013).

Response to the high epidemic of diabetes mellitus on the African continent is challenged by psychological stress (Aikins, 2006), inadequate trained staff, burden imposed by daily therapeutic routines (Levitt, 2008), lack of access to diagnosis and management, high cost of treatment (Hall *et al.*, 2011) and lack of access to

accurate information for people and families affected (Kratzer, 2012). There is therefore the need to explore different options for diabetes mellitus care.

Generally, traditional medicine practitioners (TMPs) have been involved in the treatment of disease conditions such as mental illnesses (Abbo, 2011), HIV/AIDS/STI/TB (Peltzer *et al.*, 2006; Tabuti *et al.*, 2010), cancer (Xu *et al.*, 2007; O'Brien *et al.*, 2012), Alzheimer's disease (Santos-Neto *et al.*, 2006), chronic hepatitis B and C (Modi *et al.*, 2006), hypertension (Osamor and Owumi, 2010; Kretchy *et al.*, 2014), cough, diarrhoea, dysentery and fever (Rahman, 2013), malaria (Orwa *et al.*, 2007), liver diseases (Stickel and Schuppan, 2007) and kidney and urinary disorders (Ballabh *et al.*, 2008).

The WHO (2002) defines African Traditional Medicine as the sum total of all knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental, or societal imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing. Traditional medicine (TM) has been practised in Ghana for a long time (Puckree *et al.*, 2002; Ashanti and Avornyo, 2013) and will not go away (Tabi *et al.*, 2006; Dick, 2010) because traditional medicine practice is consistent with local cultural values and beliefs (Peltzer and Mngqundaniso, 2008). It is used by many people in Ghana to manage several disease conditions (Gyasi *et al.*, 2011). Traditional medicine practitioners use herbs, spiritual beliefs, and local wisdom in providing health care (WHO, 2001).

The WHO and its member states promote the use of traditional medicine by supporting its integration into national health systems and also developing national policy and regulation for products, practices and providers to ensure safety and quality.

People living with chronic diseases that conventional medicine cannot cure invariably turn to seek answers from the ethnomedical sphere or dual use (Aikins, 2002). Lay health beliefs and treatment practices which are linked to ethnomedicine make diabetes mellitus self-care problematic (Aikins, 2002). Some diabetics opt for traditional medicine for treatment because of easy accessibility, acceptability, availability and affordability (Agbor and Naidoo, 2011). Influence from family and friends and influence from traditional herbalists (Rutebemberwa *et al.*, 2013) also drive some diabetics to use traditional medicine. Others use traditional medicine because they find it to be more congruent with their own culture and traditions (Astin, 1998) or because they disagree with the diagnosis of diseases that are incurable with orthodox medicine (Chipfakacha, 1997). A range of programmes showed that incorporating traditional healers into the primary health care system would benefit patients because they offer first health care contact depending on the disease condition, the patient perception about the cause of the disease and proximity of the next health facility (Heinzerling, 2005). Collaboration between public and other health care providers are likely to be important in enhancing continuity of care required for ensuring effectiveness of individual interventions for diabetes mellitus (Reeves *et al.*, 2013).

Lifestyle modification is an integral component of the management of diabetes mellitus. Diabetics should therefore be given the right information about diabetes mellitus and its management to ensure effective management of the disease. This study would provide a basis for improving upon traditional herbalists knowledge level on diabetes mellitus so that they can be in a position to help address the diabetes menace.

To develop effective disease management, health workers must have knowledge on the ideas of lay people on health, nutrition and disease. This is because a medical and public health programme can only be comprehensive and successful if the local cultural values and beliefs in connection with health and illness are taken into consideration in their design and operation. Understanding the culture of people is crucial to disease prevention and management (Drozd, 2000) and most public health interventions do not realise sustained change of behaviour because the role of culture is not given attention (Gordon, 2002; Dutta, 2007; Airhihenbuwa *et al.*, 2013). The impact of indigenous knowledge in the management of diabetes mellitus has been realised in Africa (Awah *et al.*, 2009). In a developing country like Ghana where health resources are limited posing a challenge to diabetes management, there is the need to include indigenous healers in the fight against diabetes mellitus.

1.2 PROBLEM STATEMENT

About 382 million people worldwide had diabetes mellitus in 2013 (Guariguata *et al.*, 2014) and in 2014, 9% of adults 18 years and older worldwide had diabetes mellitus (WHO, 2015). More than 80% of all diabetes mellitus deaths in the world occur in low and middle income countries (WHO, 2013). About 6.1% of all deaths in Africa is attributable to diabetes mellitus (WHO, 2012). The number of people living with diabetes mellitus is expected to increase to 552 million by 2030 (Whiting *et al.*, 2011).

Informal health care providers make up a significant portion of the health care sector globally and especially in developing countries but with gaps in knowledge of provider practice (Sudhinaraset *et al.*, 2013). About 80 to 85% of the sub-Saharan Africa population get health information or health care from traditional medicine practitioners (Renckens and Dorlo, 2013) who do not have any structured protocol for their practice (WHO, 2002). Many people in Ghana are very satisfied with traditional medicine use for chronic illness (Sato, 2011). In Ghana, the medical doctor to patient ratio is approximately 1:11,500 while the traditional medicine practitioner to patient ratio is about 1:400 (Antwi-Baffour *et al.*, 2014). Herbal medicines are the most widely used traditional medicines (WHO, 2005). Research shows that healer shopping between medical systems among people with diabetes mellitus is common (Aikins, 2005). Traditional herbalists (THs) are the largest group within the ranks of traditional medicine practitioners (Senah *et al.*, 2001). Currently, receiving a formal training with a defined curriculum from any

government institution, non-governmental organisation (NGO) or academic institution is not a pre-requisite to practise as a herbalist in Ghana. Some diabetics opt for herbal medicine for management because traditional herbalists promise cure for diabetes mellitus using their unregulated systems which worsen the complications of the disease (Aikins, 2004). Herbal remedy use in self-management of diabetes is a cross ethnic phenomenon and negatively impact diabetes mellitus self-management practices (Pegado *et al.*, 2003). Poor knowledge level of traditional medicine practitioners on diseases that they are involved in treatment is also reported in some instances (Orwa *et al.*, 2007; Osamor and Owumi, 2010). Additionally, traditional herbalists' treatment processes do not recognise long term management of chronic diseases (Meli *et al.*, 2009). Unregulated ethnomedical and faith healers and their practises also undermine health care goals (Aikins, 2005).

1.3 STATEMENT OF OBJECTIVES

The principal objectives of the study were;

1. To assess the knowledge of traditional herbalists on diabetes mellitus and its management in Techiman.
2. To determine the effect of herbal medicine use for diabetes mellitus management on glycaemic control of diabetics who use herbal medicine and are attending the diabetic out-patient clinic of Holy Family Hospital in Techiman.

1.3.1 SPECIFIC OBJECTIVES OF THE STUDY

The specific objectives of the study were;

1. To assess traditional herbalists' knowledge on diabetes mellitus, its causes, types, risk factors, signs/symptoms and complications.
2. To assess the views of traditional herbalists about the management of diabetes mellitus and nutrition/diet.
3. To determine the effect of herbal medicine use for diabetes mellitus management on fasting blood glucose of diabetics who use herbal medicine and are attending the diabetic out-patient clinic of Holy Family Hospital in Techiman.

1.4 JUSTIFICATION

The widespread use of traditional medicine practitioners coupled with the shortage of biomedical human resource highlights the need for innovation in making traditional herbalists potential co-partners in health care (Patel, 2011). The WHO and its member states cooperate to promote the use of traditional medicine for health care. The collaboration aims among other things to ensure patients safety by upgrading the skills and knowledge of traditional medicine providers. Owing to the fact that resources for health in general are insufficient in Africa (Whiting *et al.*, 2003), diabetics make choices between different options for health care and mechanisms are required to facilitate the implementation of the selected options and ensure that quality of care is maintained (Shizha and Charema, 2011). Traditional medicine is mother medicine (Panda, 2013) but its full benefit and

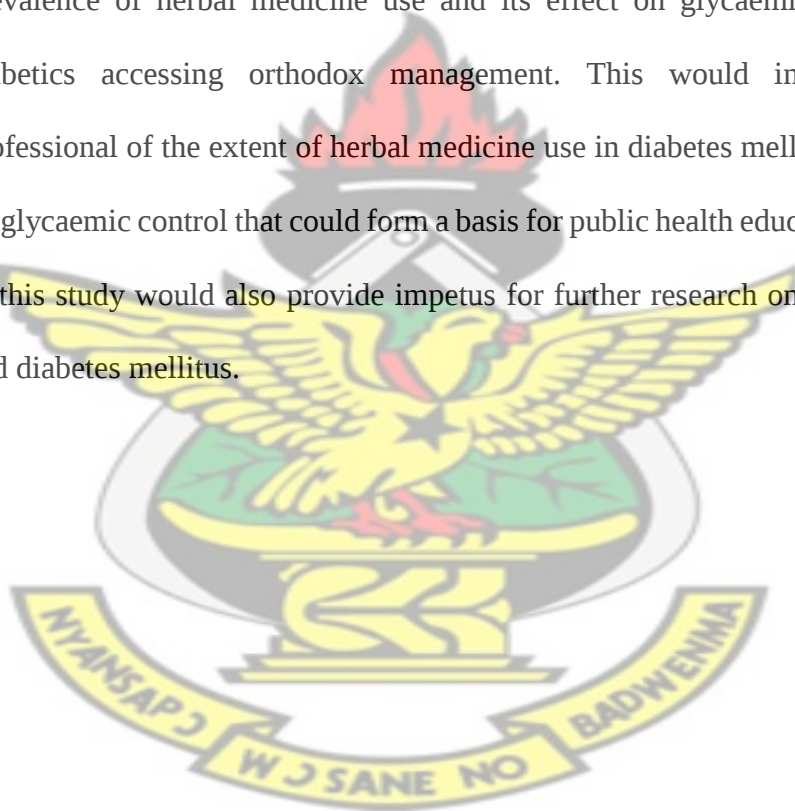
safety can be realised by investigating its practices. Most traditional herbalists claim they have cure for diabetes mellitus but literature on their knowledge on diabetes mellitus and effect of herbs on glycaemic control on diabetics is scanty. Assessment of knowledge of traditional herbalists on diabetes mellitus and effect of herbal medicine on glycaemic control will provide data that would be used in upgrading knowledge of traditional herbalists on diabetes mellitus to make them potential partners in diabetes mellitus care and ensure quality and safety of care for diabetics.

One of the policy guidelines on traditional medicine development by the MOH is professionalisation of traditional medicine through formal training and states that “Training shall be provided for traditional medicine practitioners to improve their knowledge and skills of practise” (MOH, 2005). This research provides training needs assessment which can be used to design appropriate training programmes for traditional herbalists about diabetes mellitus and its management. Traditional herbalists take responsibility for advising their clients on their health conditions (Abel and Busia, 2004) but for effective chronic disease education strategies to be developed by healers, the first crucial step is to train these healers to provide accurate information, in practical language that lay people can understand and apply to their daily lives (Aikins *et al.*, 2012). This is because the provision of essential and culturally oriented primary health care services to communities by trained traditional health practitioners have been shown to be effective (Hoff, 1997). They are also willing to refer patients for biomedical care (Mngqundaniso

and Peltzer, 2008). Not only is the effect on glycaemic control of the herbs they prescribe for diabetics not known, the advice they may offer to diabetics based on their knowledge on the disease is not known. This matters because effective management of diabetes mellitus depends on both medicine and lifestyle modification. Furthermore, collaborative efforts between patients and their health care providers along with support from family and friends are important for patients' better understanding and self-management of their disease condition (Ng *et al.*, 2012). Traditional herbalists are culturally and traditionally accepted hence they can help educate their clients on diabetes mellitus if well structured. Knowledge of traditional herbalists on diabetes mellitus is important in ascertaining what they are likely to advise their clients on diabetes mellitus to ensure effective individual management of the disease. Traditional herbalists are a major source of health information for most people in Africa and therefore can be a major resource in educating diabetics about their disease condition and how to manage it. The traditional herbalist should therefore have the right information about diabetes mellitus in order to help educate diabetics. Traditional herbalists' knowledge on diabetes mellitus therefore needs to be ascertained.

There is limited research on knowledge of traditional herbalists on diabetes mellitus and its management and the prevalence of herbal medicine use and its effect on glycaemic control in developing countries including Ghana. Despite the availability of conventional hypoglycaemic medications, many diabetics still prefer to use herbal remedies because of the uneven availability or side effects of conventional

hypoglycaemic medicines. Some herbal products may be beneficial but the lack of clinical research data make their use controversial. Previous retrospective studies assessing the effect of herbal medicine use on glycaemic control of diabetics did not use standard measures but patients' judgment to assess the relationship between herbal medicine use and control of blood glucose (Al-Rowais, 2002; Kumar *et al.*, 2006; Al-Asadi and Salih, 2010; Khalaf and Whitford, 2010 and Niswah *et al.*, 2014). The results of this study would provide standard clinical data on the prevalence of herbal medicine use and its effect on glycaemic control among diabetics accessing orthodox management. This would inform healthcare professional of the extent of herbal medicine use in diabetes mellitus and its effect on glycaemic control that could form a basis for public health education. The results of this study would also provide impetus for further research on herbal medicine and diabetes mellitus.



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 DIABETES MELLITUS

Diabetes mellitus once described as disease of the wealthy (Aikins, 2003) is a chronic metabolic disorder characterised by rise in blood glucose level due to defects in insulin secretion, insulin action or both. Insulin is a hormone that helps cells in the body to absorb glucose and use it as energy. When insulin is not produced in adequate quantities, or the body cells do not respond effectively to the insulin produced, glucose builds up in the blood because it is not being absorbed by the body cells. In this case the cells in the body are starved of energy despite the high sugar levels in the blood.

Signs and symptoms that suggest the possibility of diabetes mellitus resulting from the marked hyperglycaemia include frequent thirst (polydipsia), frequent urination (polyuria), frequent feeling of hunger (polyphagia), fatigue, unintentional weight loss, having sores that heal slowly, dry itchy skin and blurry vision (ADA, 2014). Currently diabetes mellitus is diagnosed when glycated hemoglobin (HbA1c), the average plasma glucose concentration over prolonged period of time (about three months) is greater than or equal to 6.5%, or when fasting plasma glucose (FPG) is greater than or equal to 126 mg/dL (7.0 mmol/l), or when 2-hour plasma glucose is greater than or equal to 200 mg/dL (11.1 mmol/l) through an oral glucose tolerance test (OGTT) (ADA, 2012). The risk for diabetes mellitus increases with increasing age, body mass index (BMI), blood pressure, triglycerides and uric acid and with

decrease in high density lipoprotein (HDL) cholesterol (Eckardstein *et al.*, 2000). Gout is also independently associated with an increased risk of diabetes mellitus especially in women (Rho *et al.*, 2014). There are three main forms of diabetes mellitus. Type 1 diabetes mellitus, type 2 diabetes mellitus and Gestational diabetes mellitus.

2.1.1 TYPE 1 DIABETES MELLITUS

Type 1 diabetes mellitus was formerly called juvenile onset diabetes mellitus or insulin dependent diabetes mellitus (IDDM). This type of diabetes mellitus accounts for about 5-10% of diabetics and is commonly first diagnosed in children, teenagers and young adults (NDIC, 2012). In this type of diabetes mellitus, the beta cells of the pancreas do not produce insulin as a result of autoimmune destruction or may be idiopathic, hence, two main forms of type 1 diabetes mellitus are identified; Type 1A which results from a cell-mediated autoimmune attack on the beta cells (Devendra *et al.*, 2004) and type 1B, which is idiopathic, less frequent, has no known cause and occurs mostly in individuals of Asian and African descent (Abiru *et al.*, 2002). Type 1 diabetes mellitus has genetic predisposition and is also related to environmental factors but the cause is not known. Type 1 diabetics require daily administration of insulin for survival (WHO, 2013). Fulminant type 1 diabetes mellitus is a subtype of type 1 diabetes mellitus with acute onset. It is triggered by viral infection of beta cells in susceptible individuals and is diagnosed when the following criteria are present; elevation of urinary or serum ketone bodies at first visit, plasma glucose levels ≥ 16.0 mmol/L and haemoglobin A1c level $<$

8.5% at first visit, urinary c-peptide level < 0.3 and < 0.5 ng/mL after intravenous glucagon (or meal) load at onset (Imagawa and Hanafusa, 2011). It is also related to early microvascular complications (Shibasaki *et al.*, 2012).

2.1.2 TYPE 2 DIABETES MELLITUS

The second form of diabetes mellitus, type 2 diabetes mellitus, was formerly called adult onset diabetes mellitus or non-insulin dependent diabetes mellitus (NIDDM) (Chou, 2004). Type 2 diabetes mellitus is the most prevalent form of diabetes mellitus (Levitt, 2008). Impaired insulin secretion, insulin resistance, impaired glucose tolerance and impaired fasting glucose precede type 2 diabetes mellitus (Amoah *et al.*, 2002b and WHO, 2013). Both genetic and environmental factors predispose to type 2 diabetes mellitus (Eckardstein, 2000). Being overweight/obese, especially abdominal adiposity and physical inactivity, increase the chance of developing type 2 diabetes mellitus and the risk also increases with age (ADA, 2014). Age 65 years and older is considered the age group with the most significant prevalence of type 2 diabetes mellitus (Dunn and Dixon, 2013). Increase in triglycerides is also linked to type 2 diabetes mellitus (Danquah *et al.*, 2012). The risk is found to be lower in children who regularly take high fibre breakfast (Donin *et al.*, 2014). Overweight/obesity sometimes leads to inflammation that could contribute to diabetes mellitus. The insulin resistance that characterises type 2 diabetes mellitus may improve with weight reduction and/or pharmacological treatment of hyperglycaemia but is rarely restored to normal. Figure 2.1 illustrates factors that lead to insulin resistance causing hyperinsulinaemia.

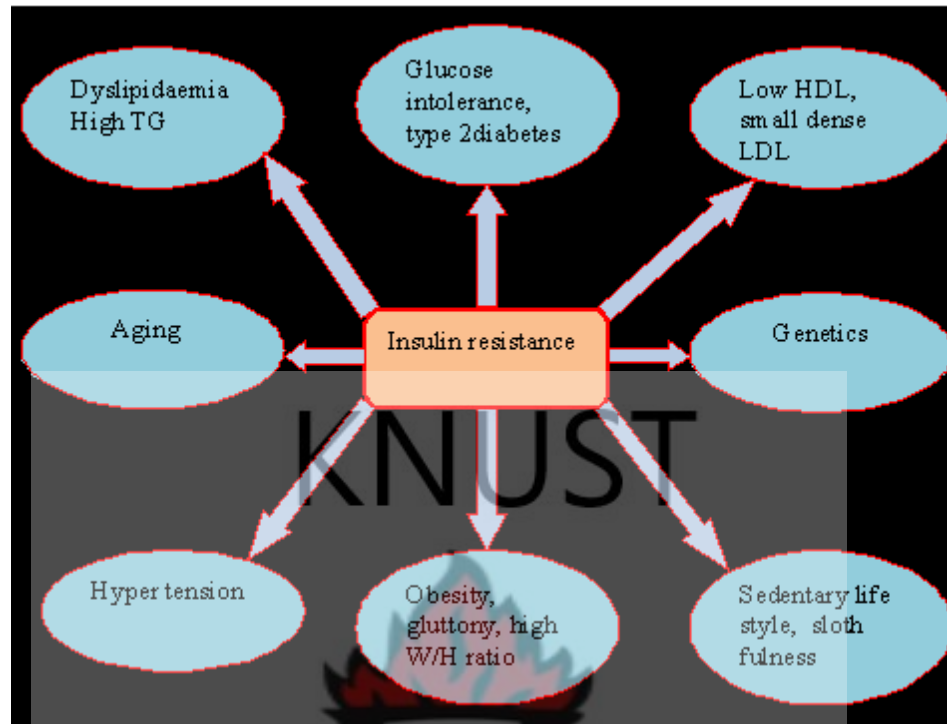


Figure 2.1: Factors leading to insulin resistance. Source: Sollu *et al.*, 2010.

2.1.3 GESTATIONAL DIABETES MELLITUS

Gestational diabetes mellitus is another form of diabetes mellitus and is any degree of glucose intolerance with onset or first recognition during pregnancy. It is usually diagnosed on the basis of an OGTT (Naylor *et al.*, 1997). It usually develops during the late stages of pregnancy in some women caused by the hormonal changes in pregnancy or inadequate insulin production. Gestational diabetes mellitus may resolve after the baby is born, however, women who develop gestational diabetes mellitus are at higher risk of developing type 2 diabetes mellitus later in life or gestational diabetes in subsequent pregnancies (NDIC, 2012).

2.1.4 OTHER FORMS OF DIABETES MELLITUS

Other forms of diabetes mellitus exist. Maturity onset diabetes of the young (MODY) is a rare form of diabetes mellitus caused by mutations in a number of genes. It runs in families and comprises 1 to 2% of diabetics (Thanabalasingham and Owen, 2011). Key features of MODY are being diagnosed with diabetes mellitus under the age of 25, having a parent with diabetes, being diabetic in two or three generations and not necessarily needing insulin. It has the characteristic of insulin resistance and obesity, together with markers of autoimmunity of the pancreas present (Pozzilli and Buzzetti, 2007). Latent Autoimmune Diabetes in Adults (LADA) is another subtype of diabetes mellitus and accounts for about 10% of people with diabetes mellitus. LADA patients share features common to both type 1 and type 2 diabetes mellitus. They may lack some of the type 2 features including age and obesity yet do not require insulin in its early stages (Pozzilli and Mario, 2001). Inappropriate management of diabetes mellitus including medication, diet and lifestyle modification can lead to complications (Hashmi *et al.*, 2008).

2.1.5 COMPLICATIONS OF DIABETES MELLITUS

Complications such as coronary artery disease, peripheral artery disease, stroke, diabetic nephropathy, neuropathy and retinopathy can occur if diabetes mellitus is not well controlled (Fowler, 2008 and Tamba *et al.*, 2013). These complications of diabetes mellitus are also significantly and consistently associated with depressive symptoms (Groot *et al.*, 2001). Diabetes mellitus is one of the established risk

factors of stroke (Donkor *et al.*, 2014) and is strongly associated with male infertility (Bener *et al.*, 2009). In a review of cardiovascular complications of diabetes mellitus in sub-Saharan Africa, the authors concluded that “2 of 3 diabetics will die as a result of cardiovascular complications and approximately 30% of patients treated in cardiovascular intensive care units have diabetes mellitus” (Kengne *et al.*, 2005). In a study of subjects with cardiovascular disease presenting to the National Cardiothoracic Centre (NCTC) in Ghana, 22.5% of those presenting with coronary artery disease had diabetes mellitus (Amoah, 2000). In a cohort of type 2 diabetic subjects with mean age of diagnosis of 46.5 years and average duration of diabetes of 7.0 years, the prevalence of diabetic retinopathy was found to be 17.9%, with an odds of developing retinopathy of 3.4 for those with the highest fasting plasma glucose (FPG) level compared to subjects with the lowest FPG level (Rotimi *et al.*, 2003). The most prevalent chronic complication of diabetes mellitus is peripheral neuropathy (Singh *et al.*, 2014) and diabetics with ten (10) or more years of diabetes mellitus are at increased risk for diabetic peripheral neuropathy (Lazo *et al.*, 2014). Dyslipidaemia has also been found to be common among type 2 diabetics and contribute to macrovascular and microvascular complications (Adinortey *et al.*, 2011). Overall rate of atherosclerosis, cancer and end-stage renal failure also tend to be higher in type 1 diabetes mellitus patients (Yap, 2014).

2.1.6 EPIDEMIOLOGY OF DIABETES MELLITUS

The incidence of diabetes mellitus has exploded worldwide and its pattern varies in countries according to their income levels. In high income countries, most people with diabetes mellitus are 60 years and above whereas, most people with diabetes mellitus in low and middle income countries are of working age of 40 to 60 years (Whiting *et al.*, 2011). An estimated 2.8% (171 million) people of all ages worldwide were living with diabetes mellitus in 2000 (Wild *et al.*, 2004). Globally 382 million people were living with diabetes mellitus in 2013, this is projected to rise to 592 million by 2035 (Guariguata *et al.*, 2013). About 6.4% (258 million) adults aged 20-79 years globally were living with diabetes mellitus in 2010 and the number of adults aged 20-79 years with diabetes mellitus in developing countries is estimated to increase by 69% between 2010 and 2030 (Shaw *et al.*, 2010). A systematic review found the prevalence of diabetes mellitus in sub-Saharan Africa to be approximately 4.0% and 2.6% among urban and rural adults respectively (Abubakari *et al.*, 2009). In 2003, 5.5% of Ghanaians 18 years and above were found to be obese (Biritwum *et al.*, 2005) and 3 in 10 women in Ghana are overweight or obese (GDHS, 2008), a risk factor for diabetes mellitus. A community-based prevalence study in Greater Accra had the crude prevalence of diabetes mellitus among Ghanaians aged 25 years and above to be 6.3% (Amoah *et al.*, 2002a). In 2011, 230 people were admitted for diabetes mellitus at the Holy Family Hospital in Techiman out of which 16 died and this rose to 348 in 2012 with 38 deaths (HFH, 2012).

2.1.7 GLYCAEMIC CONTROL IN DIABETES MELLITUS

The production of hormones involved in controlling blood glucose level by the pancreas is altered in diabetes mellitus. This can lead to poor glycaemic control commonly in the form of hyperglycaemia which is associated with long term complications (ADA, 2014). According to Kitabchi *et al.* (2009), when blood glucose level is not properly controlled within a range of 4.4 – 6.1 mmol/L as measured by a fasting blood glucose test in non-pregnant adult diabetics, it can also lead to acute severe hyperglycaemic metabolic complications such as diabetic ketoacidosis (DKA) and hyperglycaemia hyperosmolar state (HHS). In DKA, there is an increase in insulin counter-regulatory hormones (glucagon, catecholamines, cortisol and growth hormones) which stimulate lipolysis which lead into the production of acetone, acetoacetate and β -3-hydroxybutyrate, characterised by hyperglycaemia, ketonemia and metabolic acidosis resulting from insulin deficiency (Ness-Otunnu *et al.*, 2013). HHS is characterised by hyperglycaemia, hyperosmolarity and dehydration with enough pancreatic production of insulin to prevent the initiation of lipolysis required to generate ketosis and acidemia (Corwell *et al.*, 2014). Morning hyperglycaemia may be caused by poor glycaemic control, dawn phenomenon (a normal rise in blood glucose level especially if the blood glucose levels are too low in the early morning hours as the body prepares to wake up that could lead to hyperglycaemia if the body does not produce enough insulin) or may be caused by somogyi effect (high blood glucose level in the early morning triggered by the release of hormones in response to low blood glucose in the night of a person who is taking insulin and not eating regularly (Brijesh, 2015).

Hypoglycaemia is also a common diabetes mellitus emergency, usually an adverse effect of the management of diabetes mellitus with insulin and sulphonylureas and can lead to coma and seizures (Frier, 2014).

Glycaemic control in diabetes mellitus is designed to achieve blood glucose values as close to the non-diabetic range of A1C < 7% as possible in non-pregnant adults (ADA, 2014). Management of diabetes mellitus aims to deliver adequate glucose to the body cells while ensuring that the cells are not negatively affected by hyperglycaemia. This is achieved through lifestyle modification including diet through medical nutrition therapy and exercise as single therapy or in combination with oral hypoglycaemic agents and/or insulin (ADA, 2013).

2.1.8 CONVENTIONAL MANAGEMENT OF DIABETES MELLITUS

The World Health Organisation (WHO) recommends blood pressure control, glycaemic control and foot care as feasible and cost effective interventions for managing diabetes mellitus in developing countries (WHO, 2013). Diabetics should receive a conventional medical care from a multidisciplinary team that may include medical officers, nurses, dietitians, pharmacists and other health care professionals with expertise and interest in diabetes mellitus since such an approach is more likely to improve diabetes mellitus care (Windus *et al.*, 2007).

2.1.8.1 Medical Nutrition Therapy for Diabetes Mellitus

Diet forms the mainstay in the management of diabetes mellitus (Platel and Srinivasan, 1997). Medical Nutrition Therapy (MNT) provided by dietitians on a follow up basis to diabetics as monotherapy or in combination with other interventions plays an important role in controlling diabetes mellitus (Franz *et al.*, 1995; Pastors *et al.*, 2002). The diabetic diet should comprise of 60% carbohydrates, 20-25% fat, 15-25% protein and high in dietary fibre with restriction in simple carbohydrates with the quantity of diet considered according to each individual clinical condition (Khan and Safdar, 2003). Simple sugars may increase the demand for insulin (Fowler *et al.*, 2008).

Weight loss is recommended for all overweight or obese diabetics. To lose weight and maintain normoglycaemia, the ADA recommends for overweight/obese diabetics to consume about 150 grams of carbohydrates per day (ADA, 2013), but a recent randomised pilot trial of a very low carbohydrate diet (≤ 50 grams of carbohydrates per day not including fibre) significantly decreased mean HbA1c by 0.6% and mean weight by 5.5 kg with more of the subjects discontinuing one or more diabetes medications (Saslow *et al.*, 2014). In another randomised trial by Esposito *et al.* (2014), after 8.1 years follow up on a low carbohydrate Mediterranean diet, coupled with increased physical activity on newly diagnosed overweight diabetics, greater reduction of HbA1c levels and delayed need for diabetic medication was realised. This low carbohydrate Mediterranean diet consisted of 1500 and 1800 kcal/day diet for women and men respectively, with no

more than 50% of calories from carbohydrates and no less than 30% calories from fat with 30-50 g of olive oil as added fat, rich in vegetables and whole grains and low red meat replaced with poultry and fish. Similarly, Bazzano *et al.* (2014), found that a low carbohydrate diet (< 40g/d) had greater decreases in weight than a low fat diet (< 30% of daily energy intake from total fat or < 7% saturated fat) after 12 months of a randomised, paralleled-group trial on 60 and 59 participants respectively. To lose weight, a low carbohydrate diet may be a best option and can also improve health related quality of life in diabetics (Guldbrand *et al.*, 2014). It has been suggested that adult diabetics who decide to take alcohol should limit it to two drinks or less per day for men and one drink or less per day for women (ADA, 2012), but in such people education about hypoglycaemia and its management is necessary (Evert *et al.*, 2013).

2.1.8.2 Exercise/Physical Activity and Diabetes Mellitus

Exercise or increase in physical activity is not only crucial in the management of diabetes mellitus but it can also delay the development of non-insulin dependent diabetes mellitus in people at greater risk (Pan *et al.*, 1997). Muscular contractions during exercise help normalise blood glucose uptake into muscle through a separate mechanism even in diabetes mellitus (Braun *et al.*, 2004) and with increase in exercise intensity, there is more reliance on carbohydrate as source of fuel (Colberg *et al.*, 1996; Boon *et al.*, 2007). Exercise could also improve the body's sensitivity to insulin (Helmrich *et al.*, 1991). A meta-analysis of 11 randomised and 3 non randomised controlled trials, each of eight (8) weeks duration or more evaluating

the effects of exercise training on glycosylated haemoglobin (HbA1c) in adult patients with type 2 diabetes mellitus showed that exercise training reduces HbA1c by an amount capable of decreasing the risk of complications (Boule *et al.*, 2001).

2.1.8.3 Oral Hypoglycaemic Agents for Diabetes Mellitus

Oral glucose lowering drugs are used in conventional medicine to achieve acceptable glycaemic control in patients in whom diet and exercise fail to achieve euglycaemia but may lose their effectiveness in a significant number of patients with time (Pandey *et al.*, 2011). Oral hypoglycaemic agents (OHAs) include agents that stimulate insulin secretion (sulphonylureas and rapid-acting secretagogues), reduce hepatic glucose production (biguanides), delay digestion and absorption of intestinal carbohydrate (α -glucosidase inhibitors) or improve insulin action (thiazolidinediones). Majority of patients on OHAs experience adverse effects such as hypoglycaemia, sensitivity reactions and gastrointestinal discomfort (Krentz and Bailey, 2005). Antidiabetic agents help lower blood glucose level by stimulating insulin secretion and muscle glucose uptake and inhibiting hepatic glucose production (DeFronzo, 1999). Increased mean platelet volume, a known risk factor for various acute vascular complications is commonly associated with patients with diabetes mellitus and is significantly higher in those patients on oral hypoglycaemic therapy than patients on insulin therapy (Vernekar and Vaidya, 2013). Table 2.1 shows oral hypoglycaemic agents, their mechanism of action and possible side effects.

Table 2.1: Oral hypoglycaemic agents, their mechanism of action and possible side effects.

Oral agents	hypoglycaemic	Mechanism of action	Possible side effects
Sulfonylureas: Glimiperide, Glipizide, Glipizide-gits, Glyburide, Glyburide micronized, Tolbutamide, Chlorpropamide, Tolazamide, Acetohexamide		Stimulate first-phase insulin secretion by blocking K^+ channel in β -cells.	Late hyperinsulinaemia, hypoglycaemia and weight gain.
Meglitinides: Repaglinide, Nateglinide		Stimulate first-phase insulin secretion by blocking K^+ channel in β -cells.	Hypoglycaemia and weight gain
Biguanides: Metformin, Metformin-XR		Decrease hepatic glucose production. Increase muscle glucose uptake and utilization.	Nausea, diarrhoea, anorexia and lactic acidosis.
Thiazolidinediones: Rosiglitazone, Pioglitazone		Increase insulin sensitivity via activation of PPAR-g receptors.	Fluid retention and weight gain.
α-Glucoside Inhibitors: Acarbose, Miglitol		Decrease hepatic glucose production. Delays glucose absorption.	Flatulence and abdominal bloating.

Source: Sollu *et al.*, 2010.

2.1.8.4 Insulin Therapy for Diabetes Mellitus

When diet, exercise and oral glucose lowering drugs are not able to meet treatment goals of diabetes mellitus, insulin therapy is indicated (Sollu *et al.*, 2010). Insulin administration is however associated with the possibility of weight gain and hypoglycaemia (Nathan *et al.*, 2009). Table 2.2 shows currently available insulin products.

Most diabetics however, require multiple therapies to achieve acceptable glycaemic levels in the long term (Turner *et al.*, 1999). Goudswaard *et al.* (2009), found that insulin-OHAs combination therapy had statistically significant benefits on glycaemic control over insulin (NPH) monotherapy. In any disease condition, adherence by the patient to treatment regimens is crucial in the outcome of medical treatment (DiMatteo *et al.*, 2002) and diabetics are not an exception.

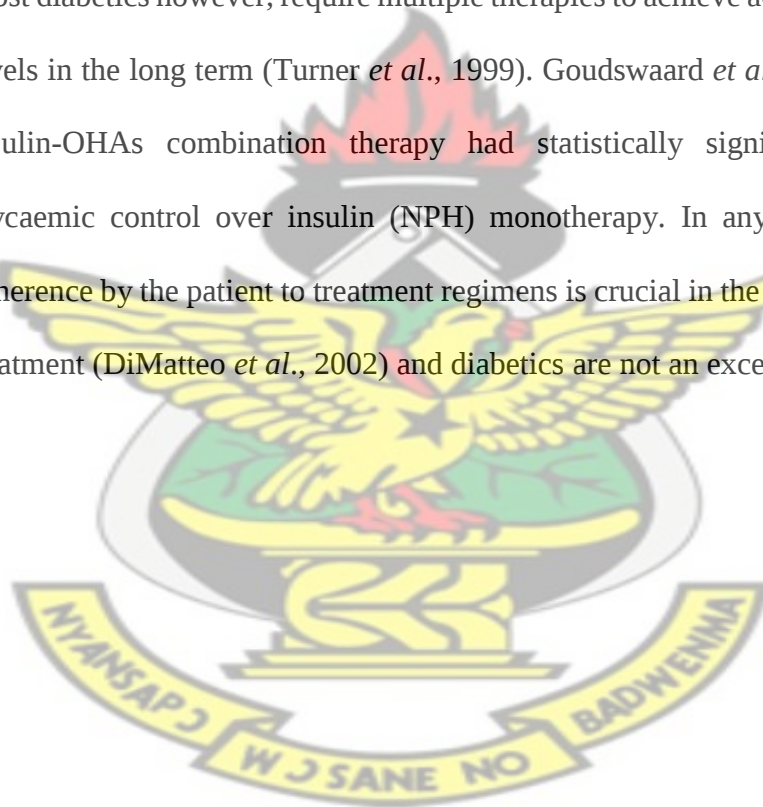


Table 2.2: Currently available insulin products.

Insulin	Onset	Peak	Effective Duration (hours)
Rapid-acting: Lispro (Humalog) Aspart (Novolog)	5-15 min	30-90 min	5
Short-acting: Regular U 100 Regular U 500 (Concentrated) Buffered regular (Velosulin)	30-60 min	2-3 hours	5-8
Intermediate-acting: Isophane insulin (NPH, Humulin N/Novolin N) Insulin zinc (Lente, Humulin L/Novolin L)	2-4 hours	4-10 hours 4-12 hours	10-16 12-18
Long-acting: Insulin zinc extended (Ultralente, Humulin U) Glargine (Lantus)	6-10 hours 2-4 hours	10-16 hours No peak	18-24 20-24
Premixed: 70% NPH/30% regular (Humulin 70/30) 50% NPH/50% regular (Humulin 50/50) 75%NPL/25% lispro (Humalog mix75/25) 70% NP/30% aspart (NovoLogMix)	30-60 min 30-60 min 5-15 min 5-15 min	Dual Dual Dual Dual	10-16 10-16 10-16 10-16

Source: Witt and Hirsch, 2003.

2.2 TRADITIONAL MEDICINE AND PRACTITIONERS

The WHO (2005) defines Traditional Medicine as the sum total of the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in prevention, diagnosis, improvement or treatment of physical and mental illnesses. The WHO (2002) also defines a Traditional Medicine Practitioner (TMP) as "a person who is recognised by the community where he or she lives as someone competent to provide health care by using plant, animal and mineral substances and other methods based on social, cultural and religious practises. Traditional medical knowledge may be passed on orally from generation to generation or may be taught in officially recognised schools (WHO, 2005). The Kwame Nkrumah University of Science and Technology (KNUST), Kumasi in 2003 officially began the training of herbal medical doctors (Darko, 2009). Two groups of TMPs are identified. The non-spiritually based practitioner who tends to look at medicinal plants with an increasingly biomedical approach and the spiritually based practitioner who believes that illness cannot be treated without dealing with the spiritual factors (Tsey, 1997).

2.2.1 SPIRITUAL-BASED TRADITIONAL MEDICINE PRACTITIONERS

These include the following:

Spiritualists or diviners or soothsayers (fetish priests and priestesses) who claim their powers arise from spiritual agencies, they use methods of possession,

divinations, and rituals to facilitate diagnosis and healing and their practices cannot be scientifically investigated (Isola, 2013).

Shrine Devotees are men or women whose lives are devoted to the service of gods/goddesses. Healing involves possession and communication with supernatural elements, including resolving afflictions from witchcraft.

Faith Healers are often a senior member of an African church, they use the Bible, holy water, and prayer to affect healing.

Spiritual-Herbalists are herbalists who in addition to practising herbalism deal with supernatural causes of diseases. They indulge in occult practices such as rubbing magical medicines into facial or bodily incisions (Senah *et al.*, 2001).

2.2.2 NON-SPIRITUAL-BASED TRADITIONAL MEDICINE PRACTITIONERS

These include the following:

Non spiritual-herbalists are men and women well versed in the knowledge of herbs and other natural and medicinal products. They approach healing through the use and application of herbs. They are very knowledgeable in the use of medicinal plants and other natural products.

Bonesetters are specialists in mending fractured limbs.

Traditional Birth Attendants (TBAs) include traditional midwives, usually older women, who assist in maternity care.

2.3 HERBAL MEDICINE

Herbal medicine is plant derived material or preparations with therapeutic or other human health benefits, which contain either raw or processed ingredients from one or more plants. In some traditions, materials of inorganic or animal origin may also be present (WHO, 2005). Herbs include crude plant material such as leaves, flowers, fruits, seeds, stems, stem bark, wood, bark, roots, rhizomes or other plant parts, which may be entire, fragmented or powdered (WHO, 2000; Ampofo *et al.*, 2012). Different herbs contain phytochemicals of different kinds such as polyphenols and flavonoids with biological activity capable of reducing high blood cholesterol, protecting against cancer, strengthening the immune system and interfering with diabetes related enzymes (Craig, 1999). The most common technique used to obtain the phytochemical components from plant species cross-culturally is by boiling (Halberstein, 2005).

2.4 HISTORY OF TRADITIONAL MEDICINE IN GHANA

The climax of the WHO moves to convince member governments to utilise the vast untapped resources of traditional medicine was reached at the international conference on Primary Health Care (PHC), Alma-Ata in the USSR, in September 1978. The conference not only gave birth to the Primary Health Care (PHC) concept but also advocated for the use of indigenous healing in national health care systems in member countries. The Alma Ata conference was followed in 1988 by another conference in Thailand where it was further directed that all countries should adopt a traditional medicine programme based on the following principles: A national

development programme, health system and operational research, clinical and scientific investigation, education and training and exchange of information. Since then, several African countries including Ghana, have initiated programmes aimed at maximising the contribution of herbal medicine to primary health care delivery (Abbott, 2009).

In Ghana, laws and regulations on traditional medicine were issued in 1992, a national office and programme on traditional medicine were also established in 1999 and 2000 respectively, followed by a national policy issued in 2002 (WHO, 2005). As a result, the government of Ghana has set aside the third week of March every year as traditional medicine week starting from the year 2000. The Centre for Scientific Research into Plant Medicine was established in 1975 (WHO, 2005). In addition to its research capacity, the Centre operates a hospital providing both traditional and allopathic medicine. The traditional medicine practice act 595 was passed on 23rd February, 2000. The act establishes the Ghana Traditional Medicine Practice Council (GTMPCC) to regulate the practice of traditional medicine, register practitioners and license them to practise and to regulate the preparation and sale of herbal medicines to ensure standard of care (MOH, 2005).

There are a number of associations of traditional medicine practitioners including the Ghana Psychic and Traditional Medicine Practitioners' Association which was formed in 1961. In 1999 the Government brought all the traditional medicine associations together under one umbrella organisation, the Ghana Federation of

Traditional Medicine Practitioners' Association (WHO, 2001). These therefore, set the platform for initiating a programme for the development of traditional medicine. Before such a programme can however be undertaken, there is the need to provide baseline data on the practice of traditional medicine in the country. The orientation of this study addresses part of this need.

2.5 PREVALENCE OF HERBAL MEDICINE USE AND ITS EFFECT ON GLYCAEMIC CONTROL AMONG DIABETICS.

Complementary and alternative medicine (CAM) has been found to be used in the management of diabetes mellitus (Egede *et al.*, 2002; Kumar *et al.*, 2006; Khalaf and Whitford, 2010; Chang *et al.*, 2011; Fabian *et al.*, 2011; Ali-Shtayeh *et al.*, 2012; Ching *et al.*, 2013; Matheka and Demaio, 2013; Surucu *et al.*, 2013; Niswah *et al.*, 2014) and it includes the use of herbal medicines, dietary supplements, spiritual healing, relaxation techniques, yoga, massage therapy, acupuncture, aromatherapy, biofeedback, hydrotherapy, chromotherapy, homeopathy, chiropractic manipulation, meditation and prayer (Miller *et al.*, 2004). CAM users are more likely not to adhere to conventional treatment than non CAM users (Kretchy *et al.*, 2014). CAM has thrived through ages and is practised by a large population for the management of diabetes mellitus. This is partly due to the high cost, side effects or irregular availability of oral glucose lowering drugs and insulin (Rizvi *et al.*, 2013). The use of natural products in controlling diabetes mellitus in developing countries is cost effective (Khan and Anderson, 2003).

Herbal medicine is the most used complementary and alternative medicine among diabetics (Mehrotra *et al.*, 2004; Surucu *et al.*, 2013; Niswah *et al.*, 2014) and its use may affect the outcome of the management of diabetes mellitus (Al-Rowais, 2002). A prevalence of 51.9% use of herbal medicine among diabetics has been reported in Palestine (Ali-Shtayeh *et al.*, 2012), 50% reported in Malaysia (Ching *et al.*, 2013), 25% reported in Turkey (Surucu *et al.*, 2013), 23% reported in Tunisia (Othman *et al.*, 2013), 17.4% reported in Saudi Arabia (Al-Rowais, 2002) and 17.3% has been reported in Iraq (Al-Asadi and Salih, 2010). More than 600 medicinal plants have been reported to have anti-diabetic potential (Talaviya *et al.*, 2014). Herbs may provide a natural way to help lower blood sugar for some diabetics who cannot control their disease with changes in diet and exercise and/or have trouble accessing anti-diabetic medication. Herbs have been used in the management of impaired glucose tolerance or impaired fasting blood glucose (Grant *et al.*, 2010) and diabetes mellitus (Mahabir and Gulliford 1997; Lin *et al.*, 2002; Cicero *et al.*, 2004; Erasto *et al.*, 2005; Jaradat, 2005; Balde *et al.*, 2006; Lans, 2006; Inanc *et al.*, 2007; Hasani-Ranjbars *et al.*, 2008; Khan *et al.*, 2009; Oyedemi *et al.*, 2009; Al-Asadi and Salih, 2010; Rao *et al.*, 2010; Patil *et al.*, 2011; Jegede *et al.*, 2011; Diallo *et al.*, 2012; Li *et al.*, 2012; Othman *et al.*, 2013; Rizvi and Mishra, 2013; Oyagbemi *et al.*, 2014). Medicinal plants have specific active ingredients such as phenolic compounds, flavonoids, terpenoids, coumarins among others that give therapeutic effects but herbalists prefer to use whole plants (Rao *et al.*, 2010). Most of these herbs perform their anti-diabetic activity through mechanistic pathways such as increased insulin secretion, improvement in insulin

sensitivity, enhanced glucose uptake by adipose and muscle tissues, inhibition of glucose absorption from intestines, inhibition of glucose production from hepatocytes and anti-inflammatory activities (Li *et al.*, 2012).

Some herbal medicines have been shown to have beneficial effects on blood glucose control in people with diabetes mellitus (Lin *et al.*, 2002; Khan *et al.*, 2009; Hosseini *et al.*, 2014). Recommendation regarding their routine clinical use is however challenged by lack of trials of high methodological quality and unknown possible serious consequences of interactions between herbal medicines and drugs (Izzo and Ernst, 2001; Rana and Rana, 2014). Significant difference has been found between body mass index of herbal users and non-herbal users in diabetes mellitus (Inanc *et al.*, 2007).

2.6 TRADITIONAL HERBALISTS' KNOWLEDGE ON DIABETES MELLITUS, ITS CAUSES, TYPES, RISK FACTORS, SIGNS/SYMPTOMS, COMPLICATIONS AND MANAGEMENT

Some information on diabetes mellitus given by traditional herbalists have been documented. All eight traditional herbalists interviewed in Accra and Nkoranza described diabetes mellitus as a condition of high sugar in the blood (Aikins, 2002). Traditional herbalists hold many views about the causes of diabetes mellitus but with less reference to its pathophysiology or lack of insulin. Available literature reports that, almost all traditional herbalists interviewed mentioned too much sugar consumption as a cause of diabetes mellitus. Traditional herbalists also attribute the

cause of diabetes mellitus to too much salt and alcohol intake, heredity, supernatural, psychological (Peltzer *et al.*, 2001), age, culture (Huyssteen *et al.*, 2004) and contaminated blood (Mbeh *et al.*, 2010). Modern traditional herbalists who had access to local and international conferences and workshops or informal interactions with biomedical personnel and patients affirmed that diabetes mellitus could also be caused by a malfunctioning pancreas (Aikins, 2002). The traditional herbalists however, did not illustrate the true pathophysiology of diabetes mellitus and did not show clear understanding between the cause and risk factors of diabetes mellitus. After eight months of attending a training workshop on diabetes mellitus, traditional herbalists however remembered and mentioned overweight/obesity, alcohol, physical inactivity, tobacco, more than 40 years of age and family history as risk factors for diabetes mellitus (Mbeh *et al.*, 2010). This suggests that training traditional herbalists could help acquaint them with the knowledge of diabetes mellitus.

Traditional herbalists also have different views about signs/symptoms of diabetes mellitus. Traditional herbalists from the Nelson Mandela Metropole and the Limpopo province both in South Africa made similar statements of the signs and symptoms of diabetes as swelling of the body, body weakness, sweating, sexual dysfunction, skin colour changes and poor eye sight (Huyssteen *et al.*, 2004). Traditional herbalists from the Nelson Mandela Metropole however mentioned foot ulcers as a sign/symptom of diabetes mellitus which traditional healers from the Limpopo province did not mention. In addition, traditional herbalists from the

Limpopo province mentioned foul smelling urine, increased heart rate, reduced body weight, bodily pains, temper outbursts and aggression, dizziness and headache, decreased/increased appetite, diarrhoea and constipation and persistent thirst which those at Nelson Mandela Metropole did not mention (Huyssteen *et al.*, 2004). Polyuria, polydipsia and polyphagia which are the major manifestations of diabetes mellitus were not however mentioned by any of the traditional herbalists. In Nigeria, most traditional herbalists do refer patients to biomedical health facilities for blood sugar tests before and after treatment while a few diagnose diabetes mellitus by physical observation of the patient for signs/symptoms (Jegade *et al.*, 2011). There is no clear distinction between signs/symptoms and complications of diabetes mellitus among traditional herbalists. Literature is however lacking on knowledge of the types of diabetes mellitus by traditional herbalists.

Generally traditional herbalists believe in the curability of diabetes mellitus. About 86% of traditional herbalists interviewed at the Northern Province now the Limpopo Province, South Africa indicated that diabetes mellitus is curable using herbs as adjunct to diabetic medicines (Peltzer *et al.*, 2001). All traditional herbalists interviewed in Ghana responded that management of diabetes mellitus involves herbal drugs and diet restrictions while stressing the curability of their herbs (Aikins, 2002). They however defined cure of diabetes mellitus as sustained absence of physical symptoms of the disease. In Cameroon traditional herbalists made the assertion that diabetes mellitus is well managed through collaboration

between a traditional herbalist who takes care of the witchcraft and/or sorcery part of the illness and a biomedical health facility or approach which treats the natural part of the illness (Mbeh *et al.*, 2010). Most traditional herbalists interviewed recommend dietary modification for diabetics to help in the management of their condition mostly by advising them to take fruits and vegetables (Peltzer *et al.*, 2001; Huyssteen *et al.*, 2004; Mbeh *et al.*, 2010; Jegede *et al.*, 2011).

Healer shopping is common among people suffering from chronic diseases and diabetics are not an exception. Healer shopping among diabetics within the biomedical and the ethnomedical arenas for cheaper management options, to prevent complications and to find a cure has been reported (Aikins, 2002). Sixty-eight percent (68%) of traditional herbalists interviewed at the Northern Province now the Limpopo Province, South Africa said diabetics come to consult them (the herbalists) after they (the diabetics) had already been to the clinic or a prayer camp (Peltzer *et al.*, 2001). Traditional herbalists reported that patients they refer to biomedical health facilities refuse or never return with the fear that their condition cannot be cured and that they will die in the health facility (Mbeh *et al.*, 2010).

Traditional herbalists get, learn or acquire information on diabetes mellitus from different sources. Traditional herbalists from the Northern Province now the Limpopo Province, South Africa gave their source of information on diabetes mellitus as through spiritual means, ancestors, dreams and colleagues (Peltzer *et*

al., 2001). Those at the Nelson Mandela Metropole however mentioned learning it as a trade, born with it as a gift from God and in their dream or by intuition as their source of information on diabetes mellitus (Huyssteen *et al.*, 2004).

Traditional herbalists believe in the curative properties of their herbs with modernised traditional herbalists claiming specific disease areas of specialties, with the perception that their medicines are pure. They also made mention of the geographical spread and economic accessibility of their services claiming it is relatively inexpensive. Traditional herbalists perceived external factors impacting on their care for diabetes mellitus as patients consulting at late stages of the illness because of their early unsuccessful engagement with the biomedical system, patients not turning up for follow up, the non-curable effects of biomedical practice and side effects of biomedical drugs for diabetes mellitus (Aikins, 2002).

Even though traditional herbalists acknowledged that biomedicine is able to treat a wide range of physical conditions and perform highly specialised procedures, they were skeptical about its efficacy, safety and ability to handle spiritual aspects of diseases, the iatrogenic effect of biomedical drugs and the physical complications of insulin injections (Aikins, 2002). Traditional herbalists recommend the merging of beneficial aspects of both ethnomedical and biomedical treatment systems in order to improve diabetes mellitus care (Aikins, 2002).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 BACKGROUND OF THE STUDY AREA

The study was conducted in Techiman Municipal Assembly of Brong Ahafo Region. The Techiman Municipal Assembly was established under subsection 1 of section 3 of the Local Government Act, (Act 462) on 17th March, 2004 (GHANADISTRICTS.com). Some major towns in the municipality are Techiman, Kenten, Tanoso, Takofiano, Oforikrom, Asueyi, Fiaso, Nkwaeso, Nsuta, Mangoase, New Techiman, Ahansua and Mesidan (TMA, 2010).

3.1.1 LOCATION AND SITE

Techiman Municipality is one of the twenty-seven administrative districts in the Brong Ahafo Region of Ghana. The Municipality is located North of the regional capital, Sunyani. It lies between longitudes 1.49° E and 2.30° W and latitudes 8.00° N and 7.35° S. The Municipality shares boundaries with Wenchi District to the North-West, Nkoranza District to the South-East and Offinso North District in the Ashanti Region to the South. Figure 3.1 shows map of Brong Ahafo Region showing the study area (Techiman Municipality).

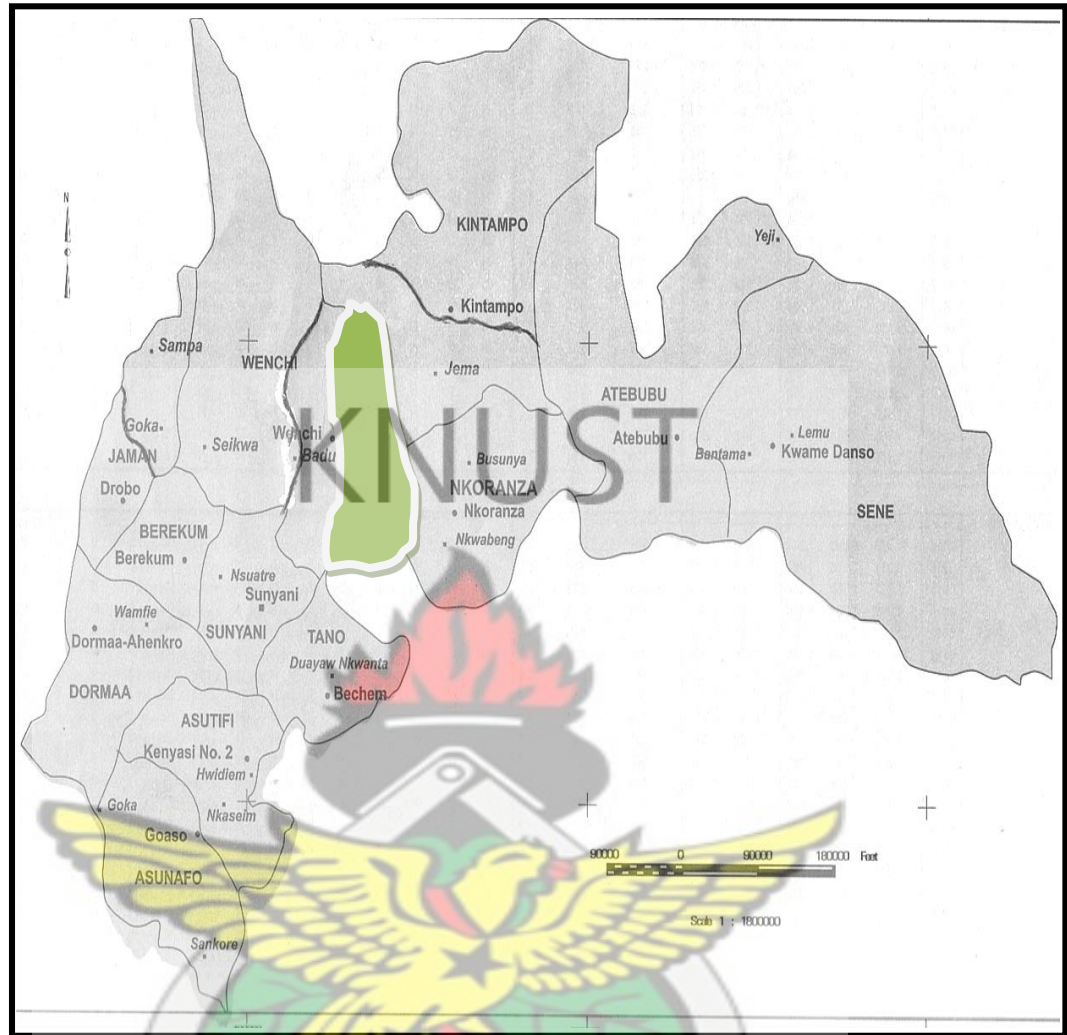


Figure 3.1: Map of Brong Ahafo Region showing the study area (Techiman Municipality). Source: TMA, 2010.

3.1.2 SOCIO-DEMOGRAPHIC CHARACTERISTICS

The 2010 Housing and Population Census put the population of Techiman Municipality at 206,856, accounting for 9.0% of the total population of Brong Ahafo Region with 112,248 being 18 years and above. This makes it the district

with the highest population in the Region with a growth rate of 2.3%. The population of the Municipality is made up of 100,498 males and 106,358 females with the male-to-female ratio being 1:1.1 (GSS, 2012).

The Municipality has a population density of about 307 persons per square kilometer. The indigenous Akans constitute 58.11% of the total population of the Municipality. Other ethnic groups in the municipality include; Mole-Dagbani (24.6%), Grusi (6.0%), Guruma (2.94%), Guan (2.45%), Mande (2.26%), Ewe (1.5%), Ga-Dangme (0.4%) and others (1.8%) (TMA, 2010). The indigenous language of the Municipality is Ashante Twi or Bono which has dominated the whole municipality. The average household size in the Municipality is 4.3 compared to the Regional average of 5.3 and children below 18 years constitute 45.7% of the total population in the Municipality (TMA, 2010).

3.1.3 PHYSICAL ENVIRONMENT

The elevation of Techiman Municipality ranges between 210 and 280 metres above sea level with an area of 669.7 square metres. The Municipality is drained mainly by the River Tano and its tributaries (GHANADISTRICTS.com). The Municipality experiences an annual rainfall of 1,050 millimetres and two rainy seasons. The major rainy season starts from April to August and the minor rainy season from September to November. From November to March, the weather is usually dry and dusty. Generally, the average daily temperature is about 27°C (80°F) (TMA, 2010).

3.1.4 SOCIO-ECONOMIC CHARACTERISTICS

The economically active population in the Municipality is 54.3% (GSS, 2012), however, 2.2% of this population is unemployed (TMA, 2010). The Techiman Municipality is home of the famous Techiman Market, the largest food crop market in Ghana and a major commercial centre in the region. The Techiman Market is the hub of economic activities as well as the life blood of the Assembly's revenue. The strategic location of the Municipality also makes it a transit point for most vehicles from the southern sector to the northern part of Ghana and other land locked countries (GHANADISTRICTS.com).

Agriculture and related trade is the main economic activity in the municipality accounting for about 57% but the proportion of self-employed without employees is high (78.6%) (GHANADISTRICTS.com). This adversely affects the relative capacity of the local economy to create future employment. Production, transport operators and labourers represent 12.4%. The establishment of the Ghana Nuts Company, the major production establishment in Techiman has provided regular employment to over 250 people (GHANADISTRICTS.com). The self-employed are mostly gari producers, artisans, auto-repairers, tailors/dressmakers, barbers/hairdressers and caterers (TMA, 2010).

3.1.5 RELIGION AND CULTURAL HERITAGE

Christianity is the predominant religion in the Municipality accounting for 68.2% of the population, Islam constitutes 25%, 1% profess Traditional religion while 5.7% do not belong to any religion (TMA, 2010). The Techiman Traditional Council is the traditional authority in the Municipality. It is constituted by twenty eight Divisional Chiefs including the Omanhene. The council is currently headed by Oseadeyo Akumfi Ameyaw IV, as Omanhene (GHANADISTRICTS.com).

The major festivals are the Apour and Yam festivals. The annual Apour festival is celebrated between April and May. The major significance is that it gives the citizenry the right to come out openly and constructively criticise those in authority, with impunity. This demonstrates democratisation of the rule of law and good governance. It also serves as introspection for those in authority to re-assess themselves and make amends for any wrong doings, in order to promote effective development. The yam festival is also celebrated between August and September annually to mark the two farming seasons. It serves as thanksgiving to the Almighty God and the ancestral spirits for a bumper harvest. This helps maintain the relationship between the ancestral spirits and the living (GHANADISTRICTS.com).

3.1.6 HEALTH CARE

The Municipality has the responsibility among other things to promote and safeguard the health of its inhabitants by collaboration with the Ministry of Health (MOH) and other agencies through the Ghana Health Service (GHS). The Ghana Health Service and partners operate through health facilities where health care is rendered. There are a total of 25 health facilities in the Municipality made up of 6 hospitals, 4 health centres, 2 clinics, 8 CHIPS compounds and 5 maternity homes, however, the level of satisfaction with medical services among clients in the Municipality is 74% which is lower than the regional average of 82.3% (TMHD, 2012). Inadequate skilled manpower is one of the major challenges facing the health sector in the Municipality (TMHD, 2013).

The Municipality can boast of only 22 medical officers, 10 medical assistants, 61 midwives, 114 public health and state registered nurses, 82 community health nurses, 4 pharmacists and 197 other health workers in its health facilities (TMHD, 2013). This puts the doctor to client ratio in the Municipality at 1:10,298. Most people are therefore likely to resort to alternative health care for their health needs.

There are also a number of traditional medical practitioners who offer their services to complement the existing modern health facilities. By the nature of their administration of health care, it is difficult to identify and locate these traditional healers and have any proper records of their activities. Their contribution to the

general health care delivery to the people of the Municipality cannot however be underestimated.

3.2 DATA SOURCES AND COLLECTION

Both primary and secondary sources of data were used to gather information for this thesis. The primary sources used were observations and interviews. Formal or structured form of interview was used to collect data. Other documents like relevant scientific literature including books, electronic journals, publications, websites and annual reports of the Holy Family Hospital and that of the Ghana Health Service in Techiman were used.

3.3 STUDY DESIGN

A descriptive study was undertaken. Purposive sampling was employed for the recruitment of traditional herbalists practising in Techiman Municipality while diabetics attending the diabetic out-patient clinic of Holy Family Hospital, Techiman were recruited through a systematic random sampling. Holy Family Hospital was used because it was the only hospital operating a diabetic clinic in the Municipality. In-depth structured interviews were conducted from April to June, 2014 with the traditional herbalists and from October to November, 2014 with the diabetics.

3.4 STUDY POPULATION, INCLUSION AND EXCLUSION CRITERIA

This study included traditional herbalists who operate in the Techiman Municipality. This did not include soothsayers/diviners, shrine devotees, priest/priestess healers and traditional birth attendants. The study also included diabetics attending the diabetic out-patient clinic of Holy Family Hospital in Techiman who are 18 years and above.

3.5 SAMPLE SIZE AND SAMPLING TECHNIQUE

The number of traditional herbalists currently practising in Techiman Municipality is estimated to be 300 (Based on informal conversations with leaders of Traditional Herbalists' Associations in the Municipality; Nana Adjei Bismark of Northern Sector Traditional Herbalists Association and Mr. Donsoba Yaw Ganao of Ghana National Association of Traditional Herbalists on February 10, 2014), representing a proportion of 0.003 of adult population in the Municipality. Based on the Cochran formula for sample size calculation in cross-sectional studies;

$$n = \frac{Z^2 P(1-P)}{d^2} \text{ (Pourhoseingholi } et al., 2013), \text{ where;}$$

n = the sample size,

p = estimated proportion of traditional herbalists in the Municipality (0.003),

z = z-score of 99% confidence level which corresponds to 2.326 and

d = precision (2.5%).

$$n = \frac{(2.326)^2 \times 0.003 \times 0.997}{(0.025)^2} = 25.89.$$

A minimum sample size of about 26 traditional herbalists was therefore needed. In all fifty-five (55) traditional herbalists were interviewed. Similarly, using a z-score of 99% confidence level and a precision of 2.5%, a minimum sample size of 211 diabetics was calculated based on 2.5% prevalence of diabetes mellitus in Holy Family Hospital, Techiman (HFH, 2013). In all 235 diabetics were interviewed.

In order to get representative views from all traditional herbalists in the Municipality, the traditional herbalists were interviewed across the various communities in the Municipality. Purposive sampling technique was employed. Traditional herbalists were identified and interviewed in the various communities in the Municipality with the help of leaders of traditional herbalists' associations and some community members. Some traditional herbalists who were initially contacted also assisted in recruiting more of their colleagues to participate in the study. Diabetics were interviewed at the diabetic OPD clinic of Holy Family Hospital, Techiman, through a systematic random sampling.

3.6 DATA COLLECTION TOOLS, RECRUITMENT AND PROCESSES

Questionnaires with open and close-ended questions were used to elicit information from respondents. The questionnaire for traditional herbalists was designed to capture personal socio-demographic data, their knowledge on diabetes mellitus and

its management and possible challenges they face in treating diabetes mellitus. A pilot study was conducted on five traditional herbalists in the Municipality to test the accuracy and reliability of the interview questionnaire and process. The questionnaire for diabetics was designed to capture personal socio-demographic data, history of diabetes mellitus and use of herbal medicine for the management of diabetes mellitus, weight, height and fasting blood glucose. A pilot study was also conducted on ten diabetics at the diabetic out-patient clinic of Holy Family Hospital to test the accuracy and reliability of the interview questionnaire and process. The pilot studies were not included for analyses.

Fasting blood glucose was measured using a glucometer. After cleaning the thumb with alcohol, a lancet was used to prick it and blood was dropped on a test strip inserted into the glucometer. The reading was recorded as registered on the glucometer (in millimole per litre). Using a stadiometer attached to a weighing scale, body weight and height were measured to the nearest 0.1 kg and 1 cm respectively with the subjects in an upright position wearing light clothing and without shoes. Body mass index (BMI) was calculated by dividing the weight in kilogram by the square of the height in metres and recorded in kilogram per metre squared (kg/m^2).

The aim and objectives of the study were explained to each respondent to obtain verbal consent. They were also told that participation in the research was voluntary.

Ethical clearance for the research was sought from the Committee on Human Research Publication and Ethics of the School of Medical Sciences, KNUST/Komfo Anokye Teaching Hospital, Kumasi (dated June 12, 2014 with reference CHRPE/AP/206/14). Permission to conduct the research was also sought from leaders of traditional herbalists' associations and management of Holy Family Hospital in Techiman. Respondents were asked what language they understood and prefer to be communicated in the interview process. All the respondents said they understood and preferred Ashanti Twi or Bono, the indigenous and predominant language in the Municipality. The interviews were then transcribed in English.

Traditional herbalists were interviewed at their places of practice using the questionnaire. This allowed traditional herbalists to express themselves adequately. In some cases, because of the busy nature of the traditional herbalists, interview schedules were made with them at a later time. Diabetics were interviewed at the diabetic clinic during a time they were waiting to have a consultation with a doctor. This also allowed the diabetics to express themselves adequately.

3.7 STATISTICAL ANALYSIS

Data were categorized, coded and then entered into the computer. All statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) for Windows, version 16.0. (2007). Basic descriptive analysis was done and the data presented in tables, graphs and charts. Traditional herbalists' response to

questions about diabetes mellitus, its causes, types, risk factors, signs/symptoms, complications and diabetes mellitus management and nutrition/diet was analysed using thematic content analysis.

3.7.1 TRADITIONAL HERBALISTS' OVERALL KNOWLEDGE SCORE ON DIABETES MELLITUS

Knowledge level on diabetes mellitus in previous studies has been assessed by scores based on correct answers to questions on diabetes mellitus (Wee *et al.*, 2002; Murugesan *et al.*, 2007; Upadhyay *et al.*, 2008 and Ng *et al.*, 2012). Scores based on correct answers to questions about diabetes mellitus, its causes, types, risk factors, signs/symptoms and complications (Appendix) were used to assess the traditional herbalists' composite knowledge score on diabetes mellitus. The total maximum possible score was 28. A percentage knowledge score of diabetes mellitus was calculated as $x/28 \times 100\%$. This was done to combine the strengths of both qualitative and quantitative approaches to enable hypotheses testing with statistical methods of the theory resulting from the qualitative method. This mixed method has been advocated and used by most scholars (Srlnka and Koeszegi, 2007). The knowledge scores were classified as; good (if $\geq 70\%$), satisfactory (if 50-69%) or poor (if $< 50\%$), classification used in a similar study (Desalu *et al.*, 2011).

3.7.2 TEST OF ASSOCIATION AND SIGNIFICANCE

The knowledge (dependable factor) scores of traditional herbalists were analysed with the following independent factors; age, gender, religion, education, type of practise, level of involvement, registration status, type of training, number of years practised, status of membership with a herbalist' association and whether they treat diabetes mellitus. The Pearson Chi-Square test was used to test the relationship between independent variables of traditional herbalists and their overall knowledge on diabetes mellitus. The overall effect of independent variables on traditional herbalists' overall knowledge on diabetes mellitus was analysed using multiple linear regression analysis. The independent-sample T test was used to determine the difference between fasting blood glucose of diabetics using herbal medicine and fasting blood glucose of diabetics not using herbal medicine. Probability (p) value of less than 0.05 was considered statistically significant. The research hypotheses were;

Research hypothesis 1 (H₁₁): There is significant association between at least one of the independent variables of traditional herbalists' tested and overall knowledge of traditional herbalists on diabetes mellitus.

Research hypothesis 2 (H₁₂): Use of herbal medicine for diabetes mellitus management has significant impact on fasting blood glucose of diabetics who use herbal medicine and are attending the diabetic out-patient clinic of Holy Family Hospital in Techiman.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 GENERAL CHARACTERISTICS OF THE TRADITIONAL HERBALISTS INTERVIEWED

A total of 55 traditional herbalists were interviewed of which 45 (81.8%) were males and 10 (18.2%) were females. This pattern of gender structure among traditional herbalists has been found by other researchers including Senah *et al.* (2001), Aikins (2002), Agbor and Naidoo (2011), Jegede *et al.* (2011) and O'Brien *et al.* (2012). The gender disparity among the respondents is a reflection of gender bias within the practice. Herbal practice in Ghana is largely the preserve of men. This may be partly due to the nature of the practice which involves the search of herbs in the forest not attracting most women. Additionally, female traditional herbalists are considered witches in some cultures (Senah *et al.*, 2001).

Most traditional herbalists were in the age group of 51-60 years and the age group of 21-30 years had the smallest number of traditional herbalists. Figure 4.1.1 which shows the age structure of the traditional herbalists interviewed depicts an aged population, with a large number of the traditional herbalists (56.4%) aged more than fifty (50) years. Peltzer *et al.* (2001) and Agbor and Naidoo (2011) also reported the mean ages of traditional herbalists in their studies to be 52 and 46 years respectively. It can be postulated that per this age structure, the number of traditional herbalists may reduce in the future. This has the potential to make

investment in the training of traditional herbalists unattractive. It also suggests that efforts must be made to include younger traditional herbalists during recruitment process for their training.

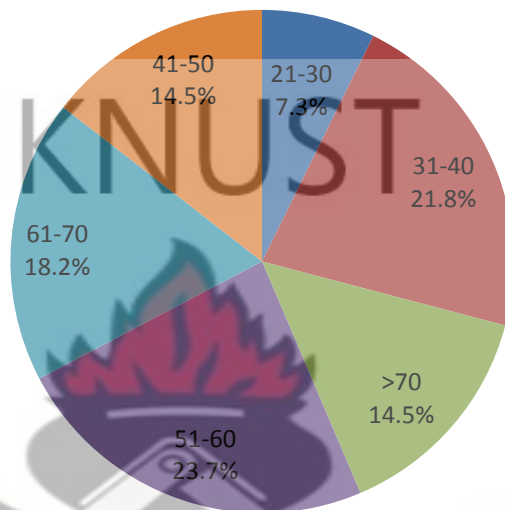


Figure 4.1.1: Age (years) distribution of the Traditional Herbalists.

Majority of the traditional herbalists, 49 (89.1%), belong to the Akan ethnic group, the indigenous and predominant ethnic group in the Municipality. More than half of the traditional herbalists, 43 (78.2%), practised herbalism while the remainder practised both divination and herbal medicine. Majority of the traditional herbalists, 38 (69.1%), profess the Christian religion as indicated in Figure 4.1.2. The 69.1% Christian respondents indicate that Christianity is increasingly taking over a practice which hitherto was associated with “juju” and belief in magic and witchcraft hence was openly avoided by Christians and the educated (Senah *et al.*,

2001). This should however be explained with respect to the study area since Christianity is the predominant religion in the study area. In their study, Senah *et al.* (2001), found that 82% of the TMPs interviewed in the northern region were Muslims, the predominant religion in the North (GSS, 2012). O'Brien *et al.* (2012), also reported that 71.4% of traditional herbalists interviewed in their study in Kumasi in the Ashanti region were Christians. This study did not assess the detail religious practices of the traditional herbalists and so it is not clear whether the religious affiliation of the traditional herbalists is a real reflection of their religious practices or a disguise for business purposes since majority of the inhabitants in the municipality are Christians.

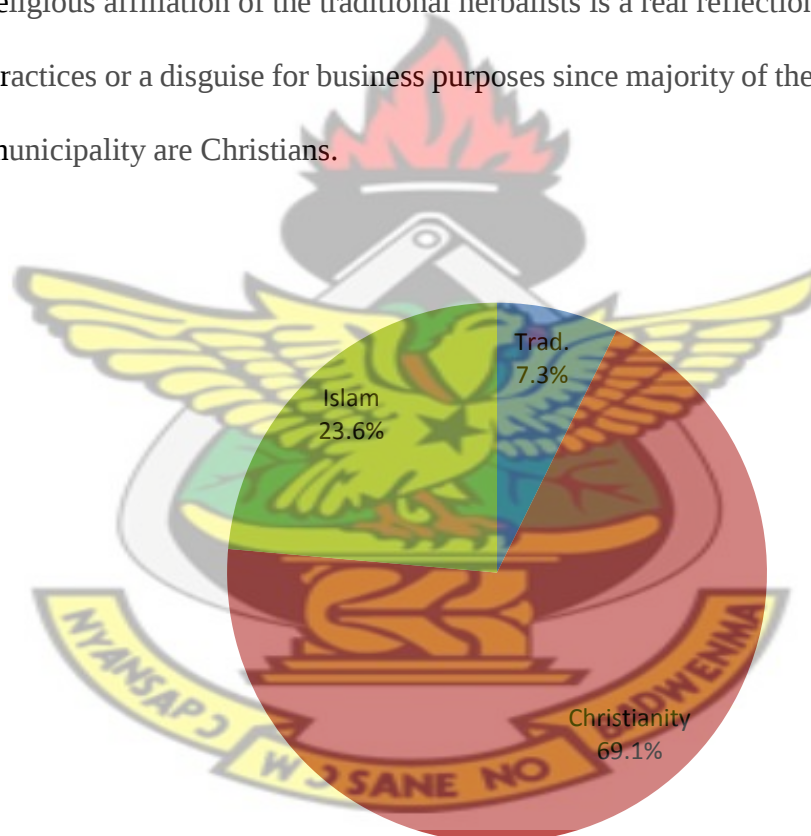


Figure 4.1.2: Religious affiliation of the Traditional Herbalists

Formal education could facilitate communication between traditional herbalists, biomedical health care providers and health policy makers hence *sine qua non* to

the development and promotion of herbal medical practice. Almost three-quarters, (40; 72.7%) of the traditional herbalists had at least primary school education, but few, 10 (18.2%) could however read or write (those who had A-level/SHS education or more). Only 3 (5.5%) traditional herbalists had tertiary education. Figure 4.1.3 shows educational level attained by the traditional herbalists. Agbor and Naidoo's study (2011) revealed similar findings. They reported that majority of traditional healers they interviewed were illiterates. All nine (9) ethnomedical practitioners interviewed by Aikins (2002) were illiterates. Policies and programmes involving or targeting traditional herbalists should take into consideration their low educational background.

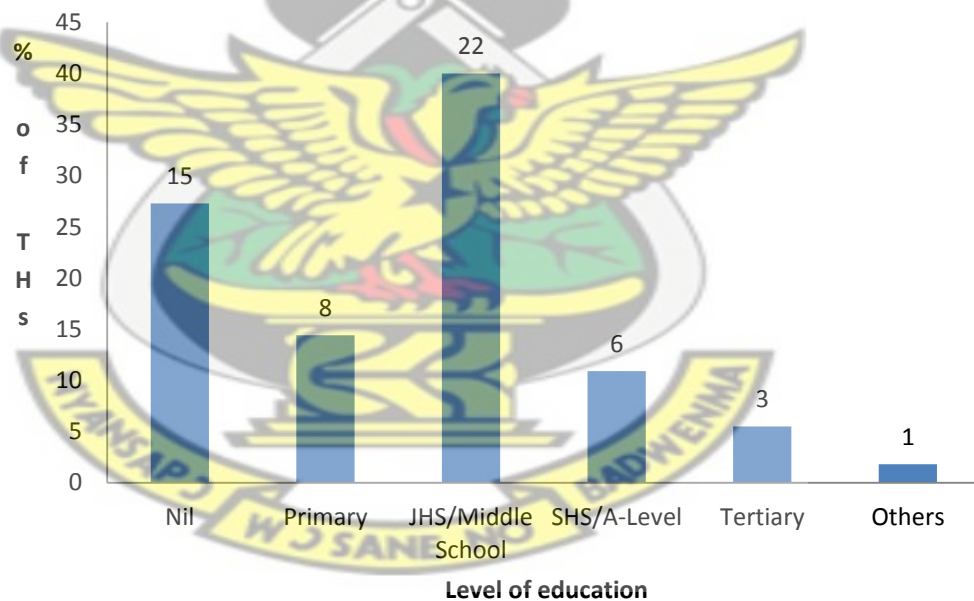


Figure 4.1.3: Educational level attained by the Traditional Herbalists

Only 8 (14.5%) of the traditional herbalists were practising in an office/shop. The rest were practising in their homes. Efforts to integrate traditional herbalists into

the national health care system should consider the establishment of a traditional medicine clinic or hospital, where traditional herbalists can provide services to people since many currently practise in their homes with limited space.

Full time practitioners were 27 (49.1%), the rest were part time practitioners. Figure 4.1.4 shows other livelihoods of part time traditional herbalists. About half of the traditional herbalists combining the practice with other economic activities may be explained by the underutilisation of their services. Casual observation during the field work revealed that traditional herbalists' services were not heavily utilised. Additionally, among the eight (8) traditional herbalists who keep records on their services, the modal number of clients that consult each traditional herbalist per month was 11-20. The poor utilisation of services of traditional herbalists contributed to an inability to conduct client exit interviews which could have enriched this study. Most traditional herbalists therefore engage in other economic activities for their livelihood in addition to herbal practice. Senah *et al.* (2001) and Mbeh *et al.* (2010), have observed similar trends in their studies. O'Brien *et al.* (2012), however, reported that 52.4% of traditional herbalists in their study were full time practitioners. This may be due to the fact that only registered traditional herbalists participated in their study. Adequate remuneration should therefore be considered so they may not engage in other forms of economic activities should their services be required in the national health care system.

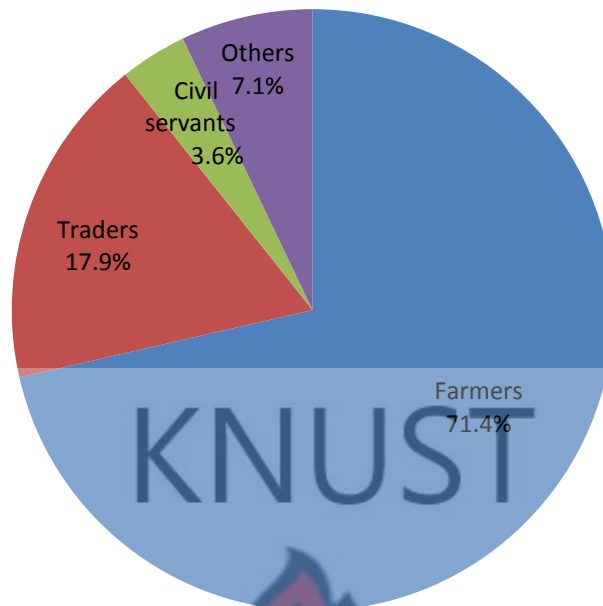


Figure 4.1.4: Other livelihoods of part time Traditional Herbalists

More than half of the traditional herbalists, 34 (61.8%) said they inherited the profession from a relation. Table 4.1.1 shows means through which traditional herbalists entered into the practice. Those who inherited the practice from a relation mostly did so from grandparents, parents, uncles and aunts. These traditional herbalists did not go through any formal apprenticeship. Those who were trained by a relative or non-relative went through formal apprenticeship. Those who claim they entered the practice through divine gift from God said they were born with it. Those who entered the practice through spiritual means said they did encounter dwarfs or ghosts in their dreams or normal life who taught and revealed the practice to them. Generally entry and level of training into the practice in the country is

unstructured and informal. Formal structure of entry into the practice would help develop and promote traditional herbal practice in the country.

Table 4.1.1: Means through which the Traditional Herbalists entered the practice (n = 55).

Means of entry	Number (%)
Inherited from a relation	34 (61.8)
Trained by a relation	11 (20.0)
Trained by a non-relation	3 (5.5)
Divine gift/born with it	3 (5.5)
Spiritual means	2 (3.6)
Others	2 (3.6)

Out of the total number of traditional herbalists interviewed, 39 (70.9%) were registered with the Ghana Traditional Medicine Practice Council (GTMPCC). Those who were not registered or licensed cited tax liabilities and high fees for analysing herbal products as obstacles. Almost all the traditional herbalists, 49 (89.1%) belonged to a traditional herbalist association. Two traditional herbalists associations were encountered in the Municipality; Ghana National Association of Traditional Herbalists and Northern Sector Traditional Herbalists Association. Members of these two associations all claim to belong to the Ghana Federation of Traditional Medicine Practitioners (GHAFTRAM) which does not currently exist

structurally in the Municipality. Almost a quarter, 14 (25.5%) of the traditional herbalists said they had practised for more than twenty (20) years. Table 4.1.2 represents number of years traditional herbalists had practised. Out of the total number interviewed, 34 (61.8%) indicated they manage or treat diabetes mellitus (Figure 4.1.5). All the traditional herbalists mentioned more than one condition that they claim to treat or manage.

Table 4.1.2: Number of years the Traditional Herbalists had practised (n = 55).

Number of years practised	Number (%)
1-5	14 (25.5)
6-10	14 (25.5)
11-15	8 (14.5)
16-20	5 (9.1)
>20	14 (25.5)

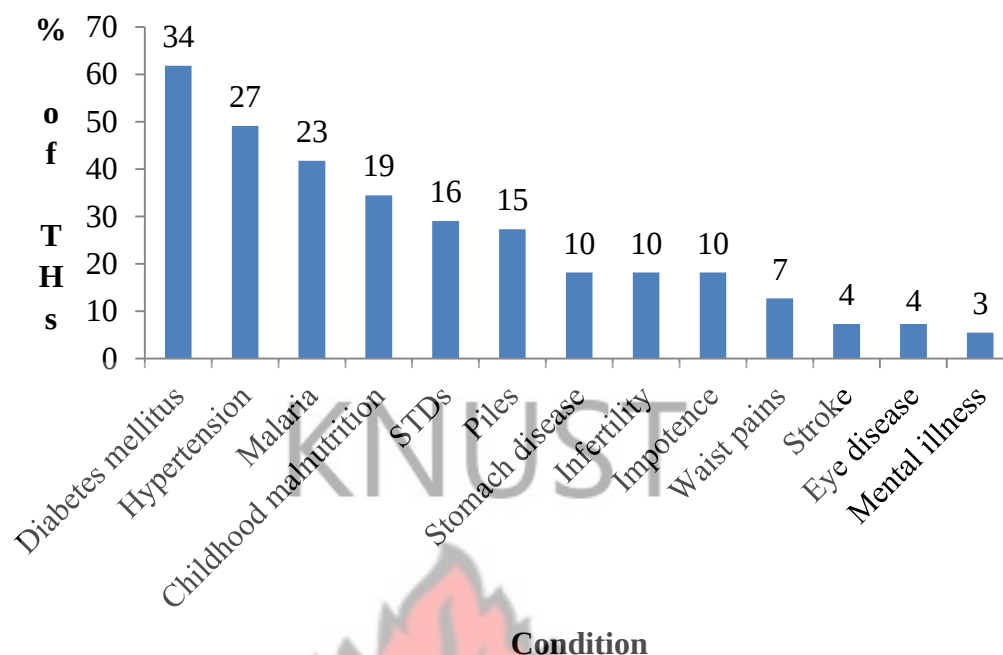


Figure 4.1.5: Conditions the Traditional Herbalists treat.

4.2 KNOWLEDGE ABOUT DIABETES MELLITUS, ITS CAUSES, TYPES, RISK FACTORS, SIGNS/SYMPTOMS AND COMPLICATIONS AMONG THE TRADITIONAL HERBALISTS

Only 21 (38.2%) of the traditional herbalists interviewed correctly identified diabetes mellitus as a disease of high sugar (glucose) level in the blood and 22 (40%) described it as a group of signs/symptoms. The rest, 12 (21.8%) said they had no idea about diabetes mellitus. Aikins (2002) however reported that all seven traditional herbalists in his study described diabetes mellitus as high blood sugar level, but his sample size is too small for comparative purposes with this study. Explaining diabetes mellitus by relating it only to signs/symptoms by most

traditional herbalists in this study without linking it to high blood sugar level does not explicitly describe the condition because most diabetics may not experience signs/symptoms especially in the early stages. Besides, people with other disease conditions may share common signs/symptoms experienced by diabetics. Any training for traditional herbalists on diabetes mellitus should focus on the understanding of the condition beyond its signs/symptoms.

Few traditional herbalists, 4 (7.3%) said diabetes mellitus is caused by a malfunctioning organ that helps body cells utilise sugar in the blood. One (1) traditional herbalist who claims to have migrated from Cape Coast in the Central region said diabetes mellitus is caused by low production of insulin in the body. Too much sugar or starch intake was given by 13 (23.6%) of the traditional herbalists as cause of diabetes mellitus while 15 (27.3%) said they did not know the cause of diabetes mellitus. Other causes given by the traditional herbalists include; fatty foods intake (12.7%), family history (5.5%) and blockage of arteries (3.6%). One traditional herbalist each attributed the cause of diabetes mellitus to the following; alcohol intake, too much meat intake, spiritual, late eating, lack of exercise, worms in the stomach, sore on the body, lack of exposure to sunlight, inhalation of bad air and the intake of food contaminated with chemicals. Majority of the traditional herbalists in this study therefore could not demonstrate the true pathophysiology of diabetes mellitus. As reported by Peltzer *et al.* (2001), Akins (2002) and Huyssteen *et al.* (2004), 24 (44%) of the traditional herbalists in this study directly linked some established risk factors of diabetes mellitus as causes of

diabetes mellitus. There is therefore no complete distinct understanding between the causes and risk factors of diabetes mellitus among traditional herbalists.

Only 14 (25.5%) of the traditional herbalists indicated that there are different types of diabetes mellitus. A total of 33 (60%) said diabetes mellitus does not exist in types and 8 (14.5%) said they did not know. All the traditional herbalists who said diabetes mellitus exists in types were not able to correctly mention the various types of diabetes mellitus. There is therefore complete lack of knowledge about the specific types of diabetes mellitus by the traditional herbalists interviewed. This has potential to affect management modalities given by traditional herbalists to diabetics. This is because the type of diabetes mellitus that a person is affected with to some extent guides clinical reasoning about the management offered.

Majority, 22 (40%) of the traditional herbalists mentioned the consumption of sugar/sweets or high calorie or junk foods as a risk factor for diabetes mellitus. Some traditional herbalists, 18 (32.7%) said they had no idea about the risk factors of diabetes mellitus (Figure 4.2.2). Overweight/obesity was not mentioned by any of the traditional herbalists, neither was it linked to the consumption of sugar/sweets or high calorie or junk foods as a risk factor for diabetes mellitus by the traditional herbalists. Advancing age was not also mentioned as a risk factor of diabetes mellitus by the traditional herbalists interviewed. It therefore suggests that the

traditional herbalists are unlikely to advocate for weight reduction as a preventive measure against diabetes mellitus.

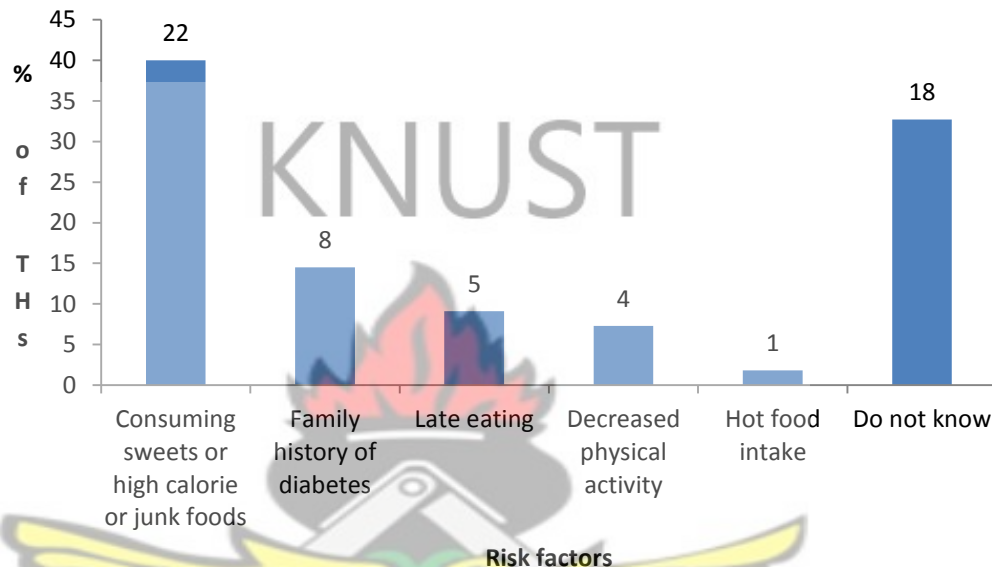


Figure 4.2.1: Risk Factors of Diabetes Mellitus as indicated by the Traditional Herbalists.

Most of the traditional herbalists, 19 (34.5%), mentioned frequent urination as a sign/symptom of diabetes mellitus. Other signs/symptoms of diabetes mellitus held by the traditional herbalists are shown in Figure 4.2.3. Similar statement of poor eye sight as sign/symptom of diabetes mellitus was given by some traditional herbalists at the Northern Province (Peltzer *et al.*, 2001) and at the Nelson Mandela Metropole (Huyssteen *et al.*, 2004) both in South Africa. Only 1 (1.8%) and 3 (5.5%) of the traditional herbalists mentioned polyphagia and polydipsia

respectively even though they are some of the major signs/symptoms of diabetes mellitus. People who consult traditional herbalists for health care with polyphagia and polydipsia as signs/symptoms may not be advised to undertake diabetes mellitus screening since most of the traditional herbalists do not know that polyphagia and polyuria are signs/symptoms of diabetes mellitus.

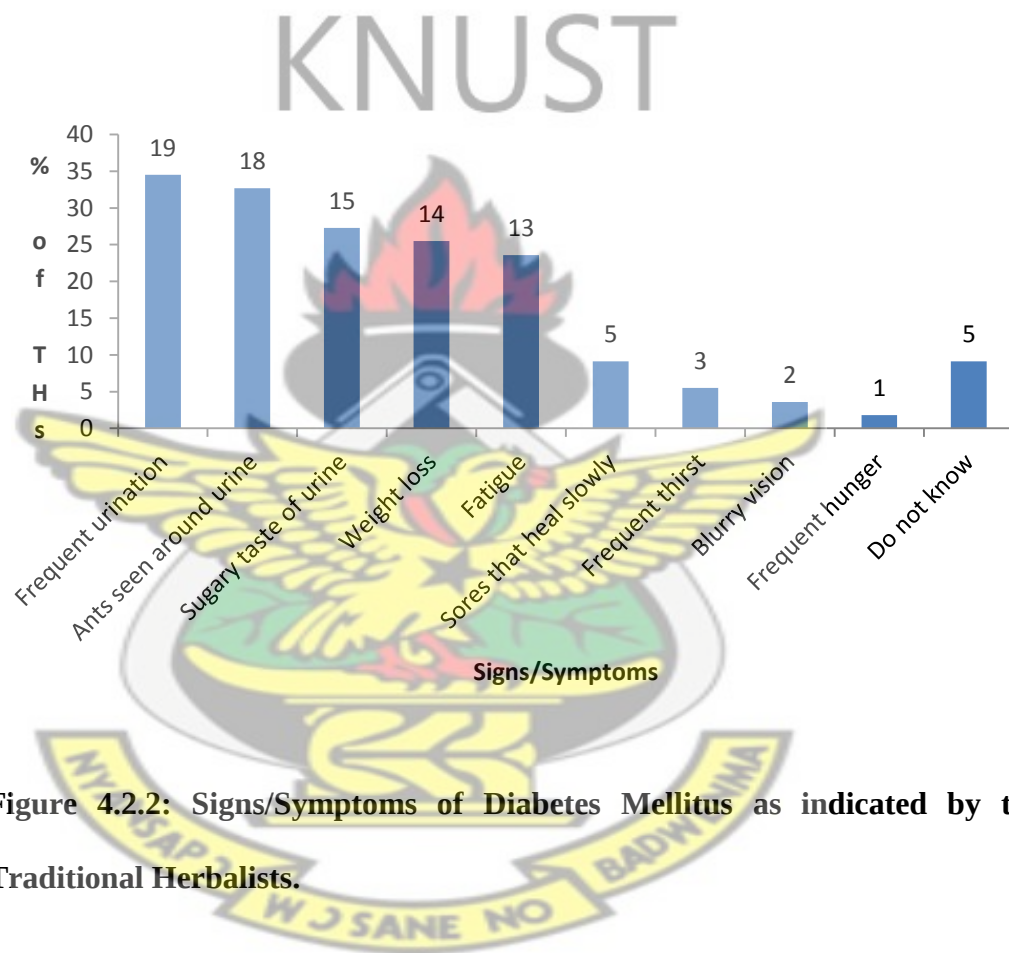


Figure 4.2.2: Signs/Symptoms of Diabetes Mellitus as indicated by the Traditional Herbalists.

Most of the traditional herbalists, 18 (32.7%) mentioned numbness in the extremities leading to amputation as a complication of diabetes mellitus. A total of 10 (18.2%) traditional herbalists said they had no idea about the complications of diabetes mellitus. Complications of diabetes mellitus by the traditional herbalists is

shown in figure 4.2.4. Other important complications of diabetes mellitus such as kidney disease and heart disease were not mentioned by the traditional herbalists. Knowledge about the complications of diabetes mellitus is poor among the traditional herbalists.

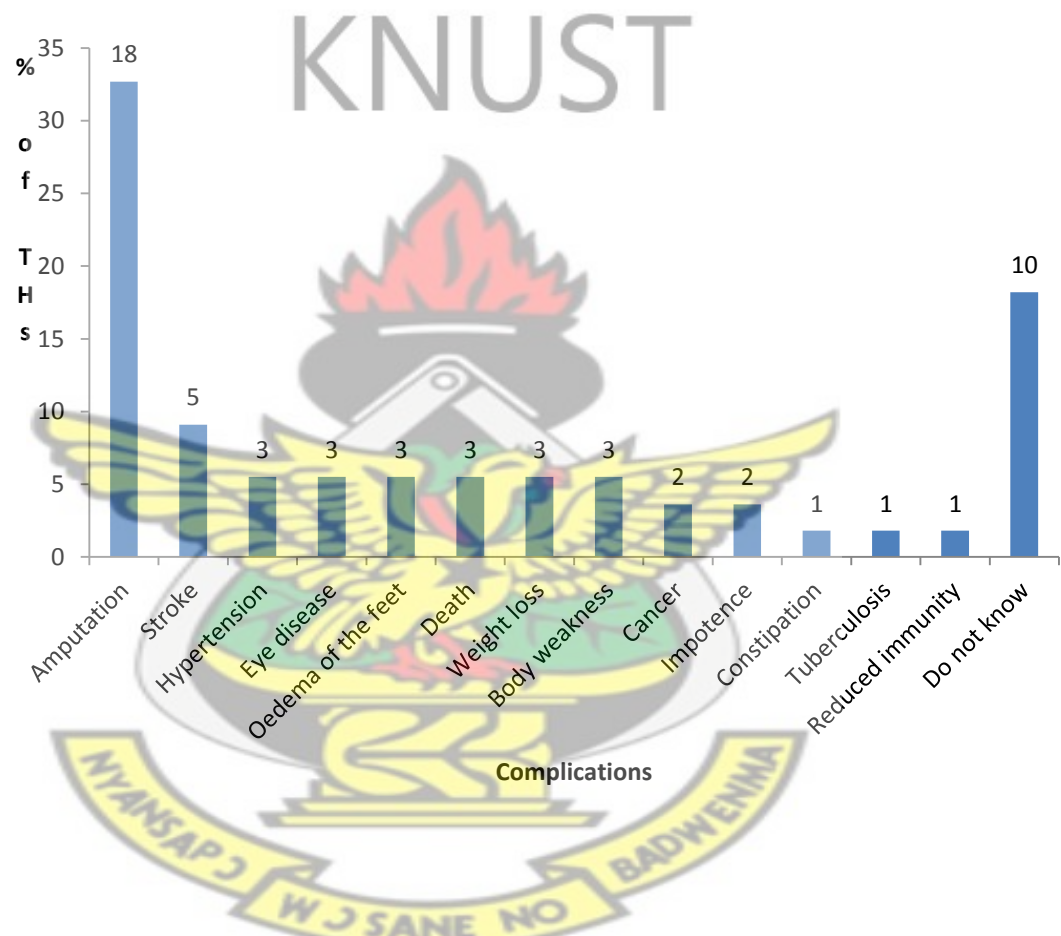


Figure 4.2.3: Complications of Diabetes Mellitus as indicated by the Traditional Herbalists.

4.3 THE TRADITIONAL HERBALISTS VIEWS ABOUT DIABETES MELLITUS MANAGEMENT AND NUTRITION/DIET

Almost all the traditional herbalists, 51 (92.7%) said they consider dietary modification as essential in the management of diabetes mellitus while only 4 (7.3%) said a diabetic diet should not be modified. All the traditional herbalists who said dietary modification is essential in diabetes mellitus management said diabetics should consume high servings of vegetables while reducing the intake of sweets and starches. The realisation of dietary modification by consuming high servings of vegetables while reducing the intake of sweets and starches as an integral component of diabetes mellitus management by traditional herbalists has been corroborated in previous studies including Peltzer *et al.* (2001), Aikins (2002), Huyssteen *et al.* (2004) and Jegede *et al.* (2011). Most traditional herbalists therefore consider the role of diet in diabetes mellitus and could help educate people who consult them on dietary modification and diabetes mellitus if given minimal orientation. The view by majority of the traditional herbalists that diabetics should consume high servings of vegetables while reducing the intake of sweets and starches should be harnessed to help decrease the incidence and improve on effective dietary management of diabetes mellitus. This is because available data support the intake of high servings of vegetables while reducing the intake of sweets and starches to help in reducing the incidence or improve upon effective management of diabetes mellitus (Bazzano, 2004; Barnard *et al.*, 2009b). Increase in green leafy vegetable consumption has been found to be associated with decrease in the incidence of type 2 diabetes mellitus (Bazzano *et al.*, 2008; Carter *et al.*,

2010)) and is also associated with decrease in all-cause mortality (Bellavia *et al.*, 2013). Vegetables contain a combination of anti-oxidants and phytochemicals postulated to counteract free radicals responsible for the development of some chronic diseases including diabetes mellitus (Miller *et al.*, 2000; Liu, 2013). Increase in vegetables intake in the diet of people with type 2 diabetes also lower markers of oxidative stress (Asgard *et al.*, 2007). High intake of green leafy vegetables is advocated for diabetics because vegetables are high in fibre and could help in blood glucose control (Asif, 2011). Imai *et al.*, (2013), found that eating vegetables before carbohydrates was effective in reducing postprandial hyperglycaemia. A vegan diet of low glycaemic index foods such as beans and green leafy vegetables was shown by Barnard *et al.*, (2009a) to improve glycaemia and plasma lipids more than did a conventional diabetes mellitus diet.

Conversely, higher consumption of sugar sweetened beverages has been associated with the development of metabolic syndrome and type 2 diabetes mellitus (Schulze *et al.*, 2004; Johnson *et al.*, 2007; Malik *et al.*, 2010) while the intake of foods of low glycaemic index have been found to offer protective role in the development of diabetes mellitus (Meyer *et al.*, 2000). Although the nutritional merits of low glycaemic index compared with higher glycaemic index carbohydrates such as sugar in diabetes mellitus continue to be examined and debated (Kelley, 2003), there is evidence to support advice for diabetics to reduce the intake of refined sugars of high glycaemic index. A meta-analysis of randomised controlled trials by Brand-Miller *et al.*, (2003), revealed clinically useful effect on medium-term

glycaemic control in patients with diabetes mellitus on low glycaemic index foods in place of conventional or high glycaemic index foods.

Programmes targeting traditional herbalists and diabetes mellitus management should however emphasise the role of exercise or increase in physical activity in the management of diabetes mellitus since none of the traditional herbalists mentioned exercise or physical activity as important in diabetes mellitus management. This is because there is compelling evidence to support the role of exercise and physical activity in reducing the risk of metabolic syndrome (LaMonte *et al.*, 2005a) and diabetes mellitus (LaMonte *et al.*, 2005b). Exercise and physical activity have also been shown to be effective in improving glycaemia (Agurs-Collins *et al.*, 1997) and moderate to high levels of physical activity and cardio-respiratory fitness are associated with substantial reductions in morbidity and mortality in diabetes mellitus (Sigal *et al.*, 2008).

Almost all, 52 (94.5%) of the traditional herbalists interviewed said diabetes mellitus is curable and only 3 (5.5%) said diabetes mellitus is not curable. All the 34 traditional herbalists who said they manage diabetes mellitus stressed the ability of their herbs to cure diabetes mellitus. This perception of the curability of diabetes mellitus was also realised by Peltzer *et al.* (2001) and Aikins (2002) in their studies. This is probably the single most important factor that drives diabetics to seek diabetes mellitus care from traditional herbalists. Traditional herbalists hold to the perception that diabetes mellitus is curable because of their lack of understanding

about its true pathophysiology. Most traditional herbalists understand diabetes mellitus as acute onset of signs/symptoms, because all the traditional herbalists who said diabetes mellitus is curable described cure as sustained absence of signs/symptoms or normalisation of blood sugar level without linking it to the pancreas or insulin resistance. The perception of the curability of diabetes mellitus by most traditional herbalists can only be changed if they are made to appreciate the true pathophysiology of diabetes mellitus with reference to the pancreas and/or insulin resistance. Educational programmes targeting traditional herbalists about diabetes mellitus should therefore emphasise this point. This is because no herbal product has so far been shown to restore normal function of the pancreas and/or insulin resistance in diabetics.

Out of the 34 traditional herbalists who said they manage diabetes mellitus, 25 (73.5%) said they do refer diabetics to biomedical health facilities mostly for blood sugar tests or monitoring. This suggests that traditional herbalists are willing to collaborate with biomedical health personnel. Almost a quarter of the traditional herbalists, 16 (29.1%) said they do refer diabetics to other herbalists for adjunct management.

Most traditional herbalists mentioned lack of public herbal clinics for them to practise (as many currently practise in their homes) and lack of financial support for their practice as challenges limiting their effective management of diabetes

mellitus. The establishment of public herbal clinics for traditional herbalists to practise should be considered should their services be required in the national health care system. Future capacity building programmes targeting traditional herbalists should include basics and importance of records keeping. This is because 47 (85.5%) of the traditional herbalists interviewed said they were not keeping records on their practice and this does not help in proper evaluation of the impact of their services.

4.4 OVERALL KNOWLEDGE SCORE OF THE TRADITIONAL HERBALISTS ON DIABETES MELLITUS

The mean percent score of traditional herbalists' overall knowledge regarding diabetes mellitus was 15.6 ± 9.4 . The range of the knowledge scores was 0 - 43%. Three (3) traditional herbalists obtained the least score and two (2) obtained the highest score. The modal score was 7%. Figure 4.4 shows the distribution of overall knowledge scores of the traditional herbalists on diabetes mellitus. On classifying the diabetes mellitus knowledge scores of the traditional herbalists, all had overall knowledge score less than 50% which corresponds to poor knowledge of diabetes mellitus (Desalu *et al.*, 2011). The poor knowledge level in this study is in agreement with previous studies assessing knowledge level of traditional herbalists on malaria (Orwa *et al.*, 2007) and hypertension (Osamor and Owumi 2010) which traditional herbalists claim to treat. Literature search however, resulted in the lack of data on knowledge of other health care providers or the general Ghanaian

population on diabetes mellitus for comparison with findings of this study. The poor knowledge level in this study suggests that education of traditional herbalists on diabetes mellitus needs to be encouraged if diabetics are expected to receive accurate information from traditional herbalists.

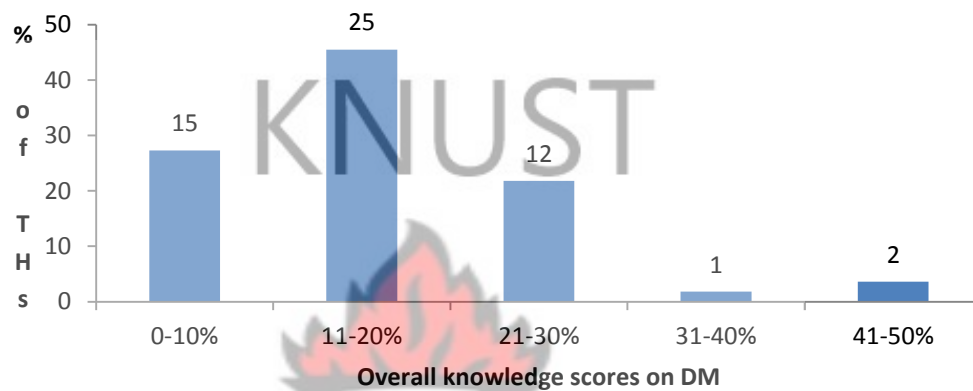


Figure 4.4: Overall Knowledge scores of the Traditional Herbalists on Diabetes Mellitus.

4.5 TEST OF ASSOCIATION AND INFLUENCE BETWEEN THE INDEPENDENT VARIABLES AND OVERALL KNOWLEDGE OF THE TRADITIONAL HERBALISTS ON DIABETES MELLITUS

A chi-squared test showed that gender, type of practice, status of registration with GTMPC, religion, education, status of registration with traditional herbalists' association and type of training were significantly associated with overall knowledge score of traditional herbalists on diabetes mellitus (Table 4.5.1). Probability (p) value of less than 0.05 was considered statistically significant. The

research hypothesis 1, H_{11} (There is significant association between at least one of the independent variables of traditional herbalists' tested and overall knowledge of traditional herbalists on diabetes mellitus) accepted.

Males significantly scored more than females (16.84 and 10.00 respectively; $p = 0.000$). This may be explained by the fact that most female respondents had no formal education compared to their male counterparts. Literate traditional herbalists may be able to access information about diabetes mellitus from print sources in addition to other sources. Due to socio-cultural beliefs, women previously were not allowed to attain higher educational status compared to their male counterparts in the family. This has reflected in most female respondents in this study attaining relatively lower educational level compared to male respondents, eventually resulting in women scoring relatively lower on overall knowledge on diabetes mellitus. This could however be due to the small number (10) of female traditional herbalists encountered in the practice and interviewed. Those who practise herbal and divination significantly scored more than those who practise only herbal (17.25 and 15.14 respectively; $p = 0.000$). Those who were not registered with GTMPC significantly scored more than those registered (18.00 and 14.62 respectively; $p = 0.000$). It means that having adequate knowledge on conditions that traditional herbalists claim to treat is not a prerequisite for their registration with the GTMPC. Assessment of knowledge of traditional herbalists on disease conditions that they claim to treat should be considered before registering them with the GTMPC because they are potential source of information for people who consult them.

Muslims significantly scored more than Christians and Traditionalists (17.23, 15.47 and 11.50 respectively; $p = 0.000$). Those who attained SHS/A-level education significantly scored more than those who attained JHS/Middle school education, followed by those who attained primary school education and those with no formal education (22.0, 17.45, 12.88 and 10.47 respectively; $p = 0.000$). Highly educated traditional herbalists may be able to access information about diabetes mellitus from the print media in addition to other sources. Those who were trained by a non-relative significantly scored more than those who inherited the practice followed by those who were trained by a relative, followed by those who acquired the profession through divine gift/born with it and followed by those who acquired the profession through spiritual means (17.67, 16.88, 14.55, 10.67 and 9.00 respectively; $p = 0.000$). Traditional herbalists trained by non-relatives are likely to go through a formal apprenticeship of relatively longer duration exposing them to more information about the condition. Those who did not belong to a traditional herbalists' association significantly scored more than those who did (19.67 and 15.10 respectively; $p = 0.000$). More surprising is that whether traditional herbalists manage diabetes mellitus or not was not significantly associated with overall knowledge of traditional herbalists on diabetes mellitus (17.79 and 12.05 respectively; $p = 0.08$). This suggests that traditional herbalists' claim of managing (curing) diabetes mellitus is not based on their knowledge on the condition. Their claim of curing diabetes mellitus may be for undue economic gains or may be due to their erroneous belief that herbs can treat all conditions.

Table 4.5.1: Association of Independent Variables and Overall Knowledge of the Traditional Herbalists on Diabetes Mellitus (Results of Chi-squared test)

Variable	Mean percentage knowledge score ($\pm$ SD)	P value
Gender		
Male	16.84 (9.65)	
Female	10.00 (5.60)	0.000
Type of practice		
Herbal	15.14 (9.53)	
Herbal and divination	17.25 (9.07)	0.000
Involvement		
Part time	13.61 (6.52)	
Full time	17.67 (11.42)	0.893
Registration with GTMPC		
Yes	14.62 (9.81)	
No	18.00 (8.08)	0.000
Do you manage diabetes		
Yes	17.79 (10.41)	
No	12.05 (6.15)	0.800
Age (Years)		
21-30	21.50 (8.66)	
31-40	19.75 (9.52)	
41-50	13.75 (7.92)	
51-60	13.77 (6.17)	
61-70	12.90 (11.35)	
>70	14.62 (11.89)	0.330
Religion		
Traditional	11.50 (9.75)	
Christian	15.47 (9.08)	
Islam	17.23 (10.52)	0.000
Educational level		
Nil	10.47 (6.71)	
Primary	12.88 (5.14)	
JSH/Middle school	17.45 (10.04)	
SHS/A-Level	22.00 (6.00)	
Tertiary	20.33 (19.73)	0.000

Table 4.5.1 continued.

Registered with a traditional herbalist association		
Yes	15.10 (8.93)	
No	19.67 (12.88)	0.000
Type of training		
Inherited	16.88 (10.54)	
Trained by relative	14.55 (7.15)	
Trained by non-relative	17.67 (3.51)	
Divine gift/inborn	10.67 (6.35)	
Spiritual means	9.00 (12.73)	
Others	10.50 (4.95)	0.000
Number of years practised		
1-5	18.57 (9.40)	
6-10	16.57 (11.57)	
11-15	12.75 (5.34)	
16-20	15.60 (10.14)	
>20	13.29 (8.72)	0.162

Table 4.5.2: **Factors Influencing the Overall Knowledge of the Traditional Herbalists on Diabetes Mellitus (Results of Multiple Regression test)**

Significantly associated Independent Variable	Dependent Variable (Overall Knowledge of Traditional Herbalists on Diabetes Mellitus)		
	β -coefficient	Significance	R ² (%)
(Constant) (a)	3.770		
Gender (X ₁)	0.115	0.505	
Type of practice (X ₂)	0.152	0.321	
Status of registration with GTMPC (X ₃)	0.174	0.216	
Religion (X ₄)	0.064	0.610	
Education (X ₅)	0.351	0.017	
Type of training (X ₆)	-0.180	0.205	
Status of registration with herbalists' association (X ₇)	0.156	0.286	
Total variance			38

Table 4.5.2 represents a multiple regression to establish the influence of significant associated independent variables on overall knowledge of traditional herbalists on diabetes mellitus. The variables that predict the outcome of interest or the dependable variable (overall knowledge of traditional herbalists on diabetes mellitus) are; the constant and the significantly associated independent variables (gender, type of practice, status of registration with GTMPC, religion, education, type of training and status of registration with a traditional herbalists' association). R^2 or total variance represents how much of the dependent variable can be explained by the independent variables. This is translated into a linear regression model of;

$$y = (a) + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 \text{ (equation 1). Where;}$$

y = overall knowledge of traditional herbalists on diabetes mellitus (Dependent variable)

(a) = constant

X_{1-7} = Independent variables

β_{1-7} = Coefficients of the independent variables

Substituting the values from table 4.5.2, the regression equation becomes

$$y = 3.770 + 0.115(X_1) + 0.152(X_2) + 0.174(X_3) + 0.064(X_4) + 0.351(X_5) - 0.180(X_6) + 0.156(X_7) \text{ (equation 2).}$$

From equation 2, it means that, there exists positive correlations between gender, type of practice, status of registration with GTMPC, religion, education and status of registration with herbalists' association and overall knowledge of traditional herbalists on diabetes mellitus. It means that when the other independent variables are held fixed, a one (1) unit increase in X_1 , X_2 , X_3 , X_4 , X_5 or X_7 , would increase y by 0.115, 0.152, 0.174, 0.064, 0.351 and 0.156 respectively. There exists also a negative correlation between type of training and overall knowledge of traditional herbalists on diabetes mellitus. This means that when the other independent variables are held constant, a one (1) unit increase in X_6 , would decrease y by 0.180.

From table 4.5.2, it also shows that, of all the variables, only education has a significant influence on overall knowledge of traditional herbalists on diabetes mellitus (β -coefficient of 0.351, $p = 0.017$). In other words, overall knowledge score of traditional herbalists on diabetes mellitus depends on level of education. This is not surprising because traditional herbalists who have had formal education can access information about diabetes mellitus from books and the World Wide Web. The R^2 value of thirty-eight percent (38%) indicates that 38% variation in overall knowledge of the traditional herbalists on diabetes mellitus could be explained by the associated independent variables (gender, type of practice, status of registration with GTMPC, religion, education, type of training and status of registration with a traditional herbalists' association) and 62% could not be explained. This indicates that there may be other important variables that influence overall knowledge of traditional herbalists on diabetes mellitus. Determination of

other variables that influence overall knowledge of traditional herbalists on diabetes mellitus should be considered in future research. This would help in designing appropriate interventions to improve traditional herbalists' knowledge on diabetes mellitus.

4.6 SOCIO-DEMOGRAPHIC FEATURES OF THE DIABETICS STUDIED

A total of 235 diabetics (46 males and 189 females) in an age range of 18 to 85 (54.9 ± 13.1) years attending the diabetic out-patient clinic of Holy Family Hospital, Techiman were interviewed. Majority of the diabetics, 209 (88.9%) said they were aware of the existence of herbal medicine for managing diabetes mellitus, 50 (21.3%) said they had ever consulted a herbalist for diabetes mellitus treatment and 21 (8.9%) professed that they were currently using herbal medicine as adjunct in managing their condition. The relationship between herbal medicine use and respondents' demographic and diabetes status is shown in Table 4.6.

4.7 PREVALENCE OF HERBAL MEDICINE USE FOR DIABETES MELLITUS MANAGEMENT AMONG THE DIABETICS STUDIED

The prevalence of herbal medicine use among diabetics in this study was 8.9%. This is lower than that of 51.9% reported in Palestine (Ali-Shtayeh *et al.*, 2011), 50% reported in Malaysia (Ching *et al.*, 2013), 25% reported in Turkey (Surucu *et al.*, 2013), 23% reported in Tunisia (Othman *et al.*, 2013), 17.4% reported in Saudi

Arabia (Al-Rowais, 2002) and 17.3% reported in Iraq (Al-Asadi and Salih, 2010). This may be due to difference in time frames since this study assessed only the prevalence of current users of herbal medicine and may also be due to socio-cultural differences.

The use of herbal medicine as an adjunct to conventional medicine by diabetics should be taken as a matter of concern because negative effects of drug-herb interactions including raised blood pressure and hypoglycaemia have been documented (Izzo and Ernst, 2001) and there is limited scientific evidence to establish the safety of most herbal products (Bent, 2008). Healthcare providers should therefore endeavour to ask and advise diabetics on the use of herbal medicine in adjunct to conventional medicine and the possible dangers of such practice. Herbal medicine use concomitantly with conventional medicine found in this study confirms that patients do not use herbal medicine to replace conventional medicine but rather to complement it. Although no significant association was found between any demographic and diabetes status of respondents and herbal medicine use, the prevalence of herbal medicine use was higher among those diagnosed 1-5 years ago. This is in congruent with a study conducted in Malaysia (Huri *et al.*, 2009) and in Iraq (Al-Asadi and Salih, 2010). This means people with diabetes mellitus tend to use herbal medicine shortly after they are diagnosed in search for a cure.

Table 4.6 Characteristics of the Diabetics Studied

Characteristics	Herbal Medicine Users n (%)	Non-herbal Medicine Users n (%)	P-Value
Gender			
Male	6 (2.6)	40 (17.0)	0.21
Female	15 (6.4)	174 (74.0)	
Age (Years)			
18-30	1 (0.4)	8 (3.4)	0.99
31-40	2 (0.9)	23 (9.8)	
41-50	4 (1.7)	47 (20.0)	
51-60	6 (2.6)	71 (30.2)	
61-70	5 (2.1)	41 (17.4)	
>70	3 (1.3)	24 (10.2)	
Educational level			
Nil	4 (1.7)	85 (36.2)	0.09
Primary	2 (0.9)	40 (17.0)	
JHS/Middle School	8 (3.4)	42 (17.9)	
SHS/ A-level	5 (2.1)	39 (16.6)	
Tertiary	2 (0.9)	8 (3.4)	
Religion			
Traditionalist	0 (0.0)	3 (1.3)	0.85
Christian	18 (7.7)	172 (73.2)	
Muslim	3 (1.3)	38 (16.2)	
None	0 (0.0)	1 (0.4)	
Duration of diabetes mellitus (Years)			
< 1	2 (0.9)	33 (14.0)	0.31
1-5	11 (4.7)	100 (42.6)	
6-10	5 (2.1)	51 (21.7)	
11-15	1 (0.4)	24 (10.2)	
16-20	2 (0.9)	4 (1.7)	
>20	0 (0.0)	2 (0.9)	
Hypertensive			
Yes	13 (5.5)	109 (46.4)	0.30
No	8 (3.4)	105 (44.7)	

4.8 EFFECT OF USE OF HERBAL MEDICINE FOR DIABETES MELLITUS MANAGEMENT ON FASTING BLOOD GLUCOSE OF THE DIABETICS STUDIED

Mean fasting blood glucose (FBG) and mean body mass index (BMI) of the diabetics interviewed were 10.0 ± 5.5 mmol/L and 25.2 ± 5.3 kg/m² respectively. Diabetics using herbal medicine and those not using herbal medicine were compared to determine the effect of the use of herbal medicine. Table 4.8 shows fasting blood glucose and body mass index of the diabetics interviewed. There were no statistically significant differences in fasting blood glucose and body mass index of diabetics using herbal medicine and those not using herbal medicine. The research hypothesis 2, H_{12} (Use of herbal medicine for diabetes mellitus management has significant impact on fasting blood glucose of diabetics who use herbal medicine and are attending the diabetic out-patient clinic of Holy Family Hospital, Techiman) is rejected.

Table 4.8 Mean ($\pm$ SD) Fasting Blood Glucose and Body Mass Index of the Diabetics attending the Diabetic Outpatient Clinic of Holy Family Hospital, Techiman.

Outcome Measure	Herbal Medicine Users (n=21)	Non-herbal Medicine Users (n=214)	P-Value
BMI (kg/m ²)	24.5 ± 5.5	25.2 ± 5.2	0.26
FBG (mmol/L)	10.2 ± 6.6	10.0 ± 5.4	0.43

This study has therefore shown that use of herbal medicines as adjunct to conventional management had no significant effect on fasting blood glucose of the diabetics studied. Experimental studies in some single herbal products has however seen significant effect on glycaemic control (Khan *et al.*, 2009 and Hosseini *et al.*, 2014). This means some herbal products possess anti-diabetic activity. Experimental studies in single herbal products use for diabetes mellitus should be encouraged to provide evidence based information on herbal medicine and management of diabetes mellitus. Even though this study found no effect of the use of herbal medicine on fasting blood glucose of the diabetics studied, patients should be advised against such practice because possible dangers of herb-drug interactions has been documented (Izzo and Ernst, 2001).



CHAPTER FIVE

5.0 CONCLUSION, LIMITATION AND RECOMMENDATIONS

5.1 CONCLUSION

This study revealed deficit and gaps in knowledge of the traditional herbalists interviewed on diabetes mellitus and its management. Only 21 (38.2%) of the traditional herbalists interviewed correctly identified diabetes mellitus as too much “sugar” in the blood. Only 4 (7.3%) said diabetes mellitus is caused by a malfunctioning organ that helps body cells utilise sugar and only 14 (25.5%) agreed that diabetes mellitus come in types but could not identify the types. There is no complete distinct understanding between the cause and risk factors of diabetes mellitus among the studied traditional herbalists since 24 (44%) directly linked some established risk factors as causes of diabetes mellitus. The traditional herbalists did not mention overweight/obesity and advancing age as risk factors of diabetes mellitus. Many of the traditional herbalists, 51 (92%) did not mention polyphagia or polydipsia as signs/symptoms of diabetes mellitus. Important complications of diabetes mellitus such as kidney disease and heart disease were not mentioned by the traditional herbalists. Majority of the traditional herbalists, 51 (92%) agreed that a diabetic diet should be modified by consuming more vegetables while reducing the intake of sweets and starches. The prevalence of diabetics who use herbal medicine for diabetes mellitus management and are attending the diabetic out-patient clinic of Holy Family Hospital in Techiman was 8.9% and this did not significantly affect their glycaemic control. The poor knowledge of the

traditional herbalists interviewed on diabetes mellitus in this study implies that people who consult traditional herbalists for diabetes mellitus management are more likely to receive inaccurate information which can negatively affect diabetes mellitus self-management practices. Majority of the traditional herbalists considering dietary modification by consuming high servings of vegetables while reducing the intake of starches and sugar as essential in the management of diabetes mellitus helps in managing diabetes mellitus and may be the most reason why traditional herbalists promise cure for diabetes mellitus. Glycaemic control not significantly affected among diabetics who use herbal medicine and are attending the diabetic out-patient clinic of Holy Family Hospital, Techiman implies that the diabetics may be combining orthodox management with not more effective herbal medicines in managing diabetes mellitus.

5.2 LIMITATION

Efforts to recruit diabetics who were using only herbal medicine for the management of diabetes mellitus in the study proved futile therefore, diabetics who were using orthodox management as well as herbal medicine were recruited. This resulted in 21 diabetics who were using herbal medicine and 214 diabetics who were not using herbal medicine. The effect on glycaemic control in this study is therefore attributed to the use of both orthodox and herbal medicines for the management of diabetes mellitus.

5.3 RECOMMENDATIONS

Based on the findings of this study, it is recommended that;

1. Capacity building programmes to help improve upon traditional herbalists' knowledge on diabetes mellitus should be encouraged.
2. Further studies should be conducted on the effect of only herbal medicine use on glycaemic control.
3. Healthcare providers should endeavour to advise diabetics on the possible dangers of the use of herbal medicine.



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APPENDIX I

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI, GHANA

COLLEGE OF SCIENCE

DEPARTMENT OF BIOCHEMISTRY AND BIOTECHNOLOGY

KNOWLEDGE OF TRADITIONAL HERBALISTS ON DIABETES

MELLITUS AND THE EFFECT OF HERBAL MEDICINE ON

GLYCAEMIC CONTROL

QUESTIONNAIRE FOR TRADITIONAL HERBALISTS

1. Age (Full years): ≤20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐
51-60 ☐ 61-70 ☐ >70 ☐
2. Gender: Male ☐ Female ☐
3. Marital Status: Single ☐ Married ☐ Divorced ☐
Widow/Widower ☐
4. Ethnicity: Akan ☐ Gruma ☐ Grusi ☐ Dagomba ☐ Others
(Specify) ☐
5. Religious denomination: Traditional ☐ Christian ☐

Islamic ☐ None ☐ Others (Specify) ☐

6. Educational background: Nil ☐ Primary ☐ Junior
High ☐ Senior High ☐ Tertiary ☐ Others (Specify) ☐

7. Type of practice: Herbal ☐ Divination (spiritual) and Herbal ☐

8. Place of practice: Office/Shop ☐ Home ☐
Market ☐ Others (Specify) ☐

9. How are you involved in this profession? Part time ☐ Full-time ☐

10. If part-time, what do you do for your livelihood?

Farming ☐ Trading ☐ Civil servant ☐
Others (Specify) ☐

11. How were you trained for your profession?

Inherited from a relation ☐ Trained by a relation ☐

Trained by a non-relation ☐ Divine gift/Born with it ☐ Spiritual

means ☐ Formal training ☐ Others (Specify) ☐

12. How long were you trained for (full years)? <1 ☐ 1-2 ☐ 3-4 ☐
7-8 ☐ 9-10 ☐ >10 ☐

13. Are you registered with the Ghana Traditional Medicine Practice Council?
Yes ☐ No ☐

14. Are you registered with the Ghana Federation of Traditional Medicine Practitioners (GHAFTRAM)?
Yes ☐ No ☐

15. Are you registered with the Ghana Traditional Herbalists Association? Yes ☐
No ☐

16. How many years have you practised in this profession? 1-5 ☐
6-10 ☐ 11-15 ☐ 16-20 ☐ Others (Specify) ☐

17. Do you manage diabetes mellitus? Yes ☐ No ☐

18. What age ranges of diabetics consult you for management? ≤ 20 ☐
21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61-70 ☐ >70 ☐

19. What other common disease condition(s) do you manage or treat?

Childhood malnutrition ☐ Hypertension ☐ Malaria ☐

HIV/AIDS ☐ Others (Specify) ☐

20. What is diabetes mellitus? Too much sugar in the blood ☐ Group of

symptoms ☐ Others Specify ☐

21. Does diabetes mellitus come in different forms or types?

Yes ☐ No ☐

22. If different types or forms, please name and explain them.

23. What is the cause of diabetes mellitus?

24. What is/are the risk factor(s) of diabetes mellitus?

25. What are the signs/symptoms or clinical manifestations of diabetes mellitus?

26. How do you diagnose diabetes mellitus?

27. What can happen to a diabetic if diabetes mellitus is not well managed?

28. Is diabetes mellitus curable? Yes ☐ No ☐

29. If no what are your goals in managing diabetes mellitus?

30. What recommended lifestyle modification do you recommend for diabetics?

31. Do you consider dietary modification integral in the management of diabetes mellitus? Yes ☐ No ☐

32. If yes how should the diet be modify?

33. Do you refer diabetics for biomedical care? Yes ☐ No ☐

34. Why?

35. Do you refer diabetics to other herbalists? Yes ☐ No ☐

36. Why?

37. What is your perception about the health seeking behavior of diabetics?

Tick all that apply. They come to me after been to the clinic ☐

They come to me after been to a pastor/traditional priest ☐

They refuse to be referred for biomedical care ☐

38. Do you allow your clients to take hospital medicine? Yes ☐ No ☐

39. Why?

40. What is your perception about biomedical management of diabetes mellitus?

41. Do you keep records on your practice? Yes ☐ No ☐

42. If yes, what type of records do you keep?

43. How many people in all do you manage in a month? 1-10 ☐

11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐

61-70 ☐ 71-80 ☐ 81-90 ☐ 91-100 ☐ >100 ☐

44. How many cases of diabetes mellitus do you manage in a month?

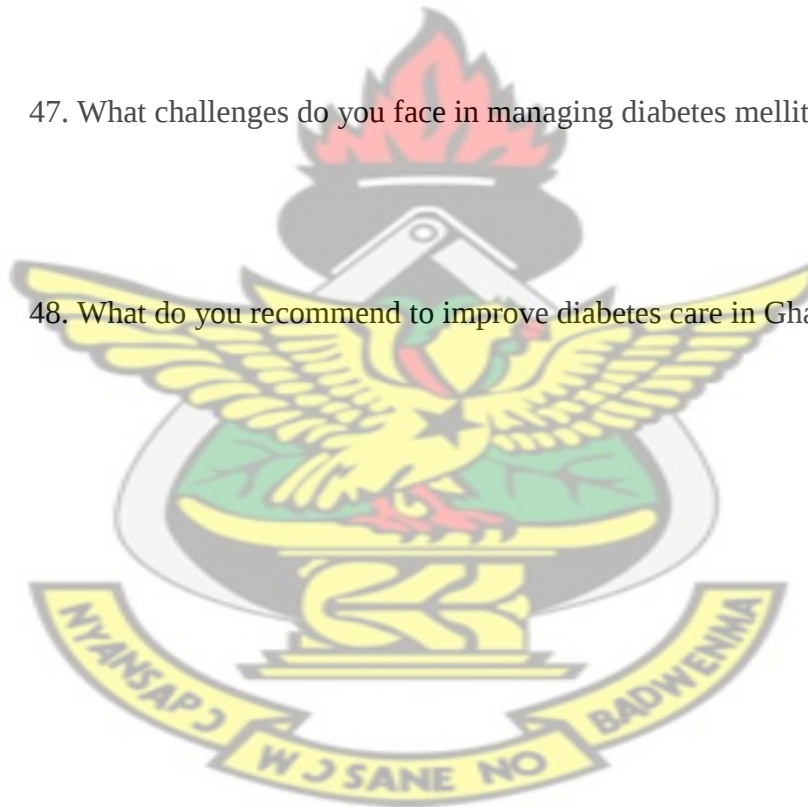
1-10	☐	11-20	☐	21-30	☐	31-40	☐	41-50	☐		
51-60	☐	61-70	☐	71-80	☐	81-90	☐	91-100	☐	>100	☐

45. What herbs do you use to manage diabetes mellitus?

46. What is your source of information about diabetes mellitus?

47. What challenges do you face in managing diabetes mellitus?

48. What do you recommend to improve diabetes care in Ghana?



APPENDIX II

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

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COLLEGE OF SCIENCE

DEPARTMENT OF BIOCHEMISTRY AND BIOTECHNOLOGY

KNOWLEDGE OF TRADITIONAL HERBALISTS ON DIABETES

MELLITUS AND THE EFFECT OF HERBAL MEDICINE ON

GLYCAEMIC CONTROL

QUESTIONNAIRE FOR DIABETICS

Name of patient:.....

SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age (Full years):.....
2. Gender: Male.....1
 Female.....2
3. Marital Status: Single.....1
 Married.....2
 Separated.....3
 Divorced.....4
 Widow/Widower...5

4. Ethnicity: Akan.....1
 Gruma.....2
 Grusi.....3
 Dagomba.....4
 Others (Specify)...5
5. Highest education attained: Nil.....1
 Primary.....2
 Junior High.....3
 Tertiary.....5
 Others (Specify).....6
6. Religious denomination: Traditional.....1
 Christian.....2
 Islamic.....3
 None.....4
 Others (Specify).....5

HISTORY OF CONDITION

7. How long (Years) since you were first diagnosed diabetic?
- < 1.....1
 1 – 5.....2
 6 – 10.....3
 11 – 15.....4
 16 – 20.....5
 >20.....6

8. Do you have any of the following complications?

Neuropathy/Amputation.....1

Retinopathy.....2

Stroke.....3

Kidney disease.....4

Foot ulcer.....5

Others (Specify).....6

No complication.....7

9. Do you have any of the following co-morbidities?

Hypertension.....1

Dyslipidaemia.....2

Heart disease.....3

No co-morbidities.....4

10. Type of medical management for diabetes mellitus:

Dietary/Lifestyle modification only.....1

Oral hypoglycaemic agents only.....2

Insulin only.....3

Dietary/Lifestyle modification + oral hypoglycaemic agents only.....4

Dietary/Lifestyle modification + insulin only.....5

Oral hypoglycaemic agents + insulin only.....6

Dietary/Lifestyle modification + Oral hypoglycaemic agents + Insulin....7

HISTORY OF HERBALIST CONSULTATION OR USE OF HERBAL
MEDICINE

11. Have you ever consulted a herbalist for diabetes mellitus management?

Yes.....1

No.....2

12. Are you aware of herbs for diabetes mellitus management?

Yes.....1

No.....2

13. Are you currently using herb(s) for diabetes mellitus?

Yes.....1

No.....2

IF YES, CONTINUE FROM 14. IF NO, MOVE TO 24.

14. Which herb(s) are you currently using for diabetes mellitus?

Woala wobeba herbal.....1

Pomaa herbal bitters.....2

Diabetecure.....3

Adom HyDia-MIX.....4

Top Naatah syrup.....5

Others (Specify).....6

15. In what form of the herb(s) are you currently using for diabetes mellitus?

Liquid.....1

Powder.....2

Tablet.....3

Bitters (In alcohol).....4

Others (Specify).....5

16. How often do you use this herb? Daily.....1

Weekly.....2

Others (Specify)....3

17. Are you satisfied with the use of this herb(s) for diabetes mellitus?

Yes.....1

No.....2

18. Have you ever experienced any side effect(s) after using the herb(s)?

Yes.....1

No.....2

19. If yes, what side effect(s) did you experience?

Hypoglycaemia.....1

Nausea.....2

Stomach problems.....3

Weight loss.....4

Weight gain.....5

Others (Specify).....6

20. If on oral hypoglycaemic agents and/or insulin, are you taking the drug/insulin alongside the herbal medicine?

Yes.....1

No.....2

21. Why?

22. Have you inform your doctor of this herbal medicine use?

Yes.....1

No.....2

23. Why?

DIETARY RECALL

24. Have you ever been counseled on dietary management of your condition?

Yes.....1

No.....2

25. If yes, by who? Dietitian/Nutritionist.....1

Doctor.....2

Nurse.....3

Others (Specify).....4

26. 24-Hour dietary recall

Meal	Time	Food	Amount (Handy measure)
Bed time			
snack			
Supper			
Late afternoon snack			
Lunch			
Mid morning snack			
Breakfast			

OUTCOME MEASURE

27. Height (m):

28. Weight (kg):

29. Body Mass Index (kg/m^2):

30. Fasting blood glucose level (mmol/L):

