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

KNOWLEDGE ON DIABETES AMONG ADULTS IN THE KWAHU SOUTH DISTRICT

BY

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A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH, COLLEGE OF HEALTH SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MPH DEGREE IN HEALTH EDUCATION AND PROMOTION

OCTOBER, 2014

DECLARATION

I hereby declare that with the exception of reference of other people's work, which have been duly acknowledged, this submission is a true account of my own original research towards the MPH degree. I hereby also declare that this work has neither in part nor whole been presented for a degree in the university.

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ABSTRACT

Background

An estimated 371 million people are believed to be living with Diabetes worldwide but this figure is expected to rise to 552 million by 2030. In the Kwahu South District of Ghana, Diabetes is one of the top 10 causes of Out Patient Department (OPD) attendance. Yet, it is unclear as to the level of knowledge on diabetes among the people. This study assessed the knowledge on diabetes among adults in the Kwahu South District of Ghana.

Methods

A community based cross-sectional and descriptive study was conducted in February and March 2013 in three sub-districts (Kwahu Praso, Mpraeso and Asakraka). A total of 423 respondents (18 years and over) were randomly sampled from households in the selected communities. Data was collected by interviewing respondents with a structured questionnaire on the: definition, risk factors, signs and symptoms, complications and prevention of diabetes. Four hundred and nine (409) completed questionnaires were statistically analyzed with STATA version 11 using chi-square, multivariate logistic regression and frequencies. The total mark for each respondent was divided by 26 (maximum mark) and then multiplied by 100% to get a knowledge score. Based on the researcher's own discretion, knowledge score was categorized as: poor (below 50%), average (50-75%) and good (above 75%).

Results

Although majority of the respondents (77%) had heard of diabetes, only 6% knew that diabetes was associated with defects in insulin leading to high blood sugar. High intake of sugar was the common risk factor stated by the respondents (79%). 36% of the respondents knew diabetes could cause complications with eye disease being the common complication mentioned. Over 50% of the respondents (irrespective of their diabetes status) thought diabetes could be cured. Generally, knowledge on diabetes was poor with majority (76%) having a knowledge score below 50%. The knowledge on diabetes was significantly associated with the person living with diabetes and having a higher educational level ($p<0.005$).

Conclusion

The findings of this study have revealed inadequate knowledge on diabetes among adults in the district. More health education is therefore advocated to increase awareness and knowledge on all aspects of diabetes. This will help the people to live healthy lifestyles and also contribute to efforts towards the prevention and control of diabetes in the district.

DEDICATION

This thesis is dedicated to my lovely parents, Mr Daniel Boakye and Miss Margaret Addison.

It is also dedicated to my lovely siblings (Mercy Owusua Boakye and Daniel Boakye Boateng) and all loved ones who supported me during the programme.

ACKNOWLEDGEMENT

I express my sincere gratitude to the Almighty God for His guidance and protection throughout this programme of study and the project.

My deepest gratitude also goes to my lecturer and supervisor, Dr Harry Tagbor for his directions, suggestions and guidance at all stages of the work. The advice and cooperation of the staff at Kwahu South District Health Administration is very much appreciated.

I am so grateful to Mr. Denis Edem Dzebre for his support during data management and analysis. My thanks also go to Dr. Francis Addai (Medical Superintendent, Asesewa Government Hospital) for his immense assistance during my fieldwork.

Finally, I thank my parents, Mr Daniel Boakye and Miss Margaret Addison for their support and encouragement during my entire education.

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LIST OF ABBREVIATIONS

ADA	The American Diabetes Association
BMI	Body Mass Index
DKA	Diabetic Ketoacidosis
DM	Diabetes Mellitus
FPG	Fasting Plasma Glucose
GAD	Glutamic Acid Decarboxylase
GDM	Gestational Diabetes Mellitus
HDL	High Density Lipoprotein
HHNS	Hyperosmolar Hyperglycaemic Non-Ketotic Syndrome
HHS	Hyperosmolar Hyperglycemic State
HLA	Histocompatibility Leucocyte Antigen
IDDM	Insulin-Dependent Diabetes Mellitus
IDF	The International Diabetes Federation
IGT	Impaired Glucose Tolerance
KAP	Knowledge Attitude Practices
LADA	Latent Autoimmune Diabetes in Adults
MODY	Maturity Onset Diabetes in Youth
NIDDM	Non-Insulin-Dependent Diabetes Mellitus
OGTT	Oral Glucose Tolerance Test
OPD	Out Patient Department
PVD	Peripheral Vascular Disease
RPG	Random Plasma Glucose
UK	The United Kingdom
WHO	The World Health Organization

DEFINITION OF TERMS

Diabetes mellitus	A group of metabolic diseases of multiple aetiology which is characterized by chronic high blood sugar that is caused by either defects in insulin production, insulin action or both.
Diabetic ketoacidosis (DKA)	Acute complication of diabetes which occurs when absolute or relative insulin deficiency prevents glucose uptake by the cells leading to break down of fat as an alternative source of fuel. This causes a build-up of ketones which lowers the blood pH and leads to metabolic acidosis.
Hyperosmolar Hyperglycaemic State (HHS)	Acute complication of diabetes. It is a state of altered consciousness when coma is not present. In HHS, there is severe hyperglycaemia and hyperosmolarity than DKA.
Hypoglycaemia	Low blood sugar (<4.0mmol/l)
Knowledge on diabetes	Being aware or informed about diabetes.
Lactic acidosis	Acute complication of diabetes characterized by low pH in body tissues and blood (acidosis) accompanied by the build-up of lactate.
Prediabetes	A condition in which a person's blood sugar level is above normal range but below values diagnostic of diabetes

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Diabetes, without qualification, usually refers to Diabetes Mellitus (DM), a group of metabolic diseases of multiple aetiology which is characterized by chronic hyperglycaemia (high blood sugar) that is caused by either defects in insulin production, insulin action or both. These defects in insulin result in disturbances in carbohydrate, protein and fat metabolism (Alberti and Zimmet, 1998). Diabetes may present with characteristic symptoms such as; polyuria (frequent urination), polydipsia (excessive thirst), blurred vision, glycosuria (sugar in urine), dehydration, weight loss with or without polyphagia (increased hunger).

Diabetes Mellitus may result in acute complications such as Diabetic Ketoacidosis (DKA), Hyperosmolar Hyperglycemic State (HHS), hypoglycaemia and Lactic Acidosis. Chronic complications of Diabetes include macrovascular and microvascular diseases with progressive development of conditions such as; retinopathy which leads to blindness, nephropathy that leads to renal failure, peripheral neuropathy with risk of foot ulcers, amputation, charcot joints and autonomic neuropathy causing gastrointestinal, genitourinary, cardiovascular symptoms and sexual dysfunction (Stratton et al., 2000).

There are four main types of Diabetes, namely; Type 1, Type 2, gestational diabetes and other specific types. Among these, Type 2 Diabetes, accounting for 90-95% of all Diabetes cases ((International Diabetes Federation (IDF), 2011), is the principal cause of the global diabetes pandemic (Haslett et al., 2002). It is now a common and serious global health problem, which has evolved in association with rapid and major lifestyle

changes such as; diet, reductions in physical activity, with consequent increases in prevalence of overweight and obesity (Zimmet, 2001).

Diabetes is now one of the most prevalent chronic diseases in the world and the number of people with the disease is reported to be increasing in every country (International Diabetes Federation (IDF), 2011). Yet, there are reports that suggest that knowledge on diabetes is poor (Aljoudi and Taha, 2009; Tessaro et al., 2005; Rosal et al., 2011; Maina et al., 2010). Global prevalence of the condition is estimated to be 8.3%, but varies from 10.9% in the Middle East and North Africa to 4.3% in Southern Africa (International Diabetes Federation (IDF), 2011). Three hundred and seventy-one (371) million people are currently living with the condition worldwide, but this is predicted to rise to 552 million by 2030 (International Diabetes Federation (IDF), 2011). Unfortunately, a disproportionate amount of this increase in Diabetes prevalence is expected to occur in low and middle-income countries like Ghana (Woodward et al., 2003). In Ghana, Type 2 Diabetes affects about 6% of adults in Greater Accra Region (Amoah, et al., 2002).

The devastating impact of Diabetes on health makes it a major health concern. In other to curb the global pandemic growth of Diabetes, people should have adequate knowledge on the condition because the knowledge will affect their attitude and uptake of health services, including health education (Baradaran and Knill-Jones, 2004).

1.2 Problem Statement

The number of diagnosed cases of diabetes in Africa has increased over the years from 7 million in 2000, to 15 million in 2011 (International Diabetes Federation, 2011). In the Kwahu South District in the Eastern Region, Diabetes accounted for a significant proportion of OPD attendance from 2009 to 2011. Ranking fourth in the top 10 causes of Out Patient Department (OPD) attendance, Diabetes accounted for 7.8% of OPD cases (6886/ 88323) in 2009 and 7.4% (7022/93948) cases in 2010. In 2011, it rose in rank from the fourth to the third most frequent OPD case, with 7.5% (6239/82209) cases (Source: Kwahu South Health Administration Annual Report, 2011).

In a Diabcare study (2008), conducted in the district, complications such as background retinopathy (23.94%), leg amputation (1.01%), neuropathy (38.2%) and stroke (5.23%) were reported among those with Diabetes (Novo Nordisk, 2008). While there is increased prevalence of Diabetes in the district, it is unclear as to the level of knowledge on Diabetes among the people as most studies on Diabetes in the country have focused mainly on prevalence, risk factor assessment and management of the condition. The study therefore seeks to evaluate the knowledge on Diabetes among Ghanaian adults in the Kwahu South District.

1.3 Rationale of Study

This study seeks to give an idea of what adults in Kwahu South District know about diabetes since their knowledge on the condition is not known by any study. The findings of the study will help in planning diabetes health education programs that will enable people to better understand the condition, thus, engendering healthy lifestyle towards prevention of diabetes and its associated complications.

1.4 Research Question

What do the people of Kwahu-South District know about Diabetes?

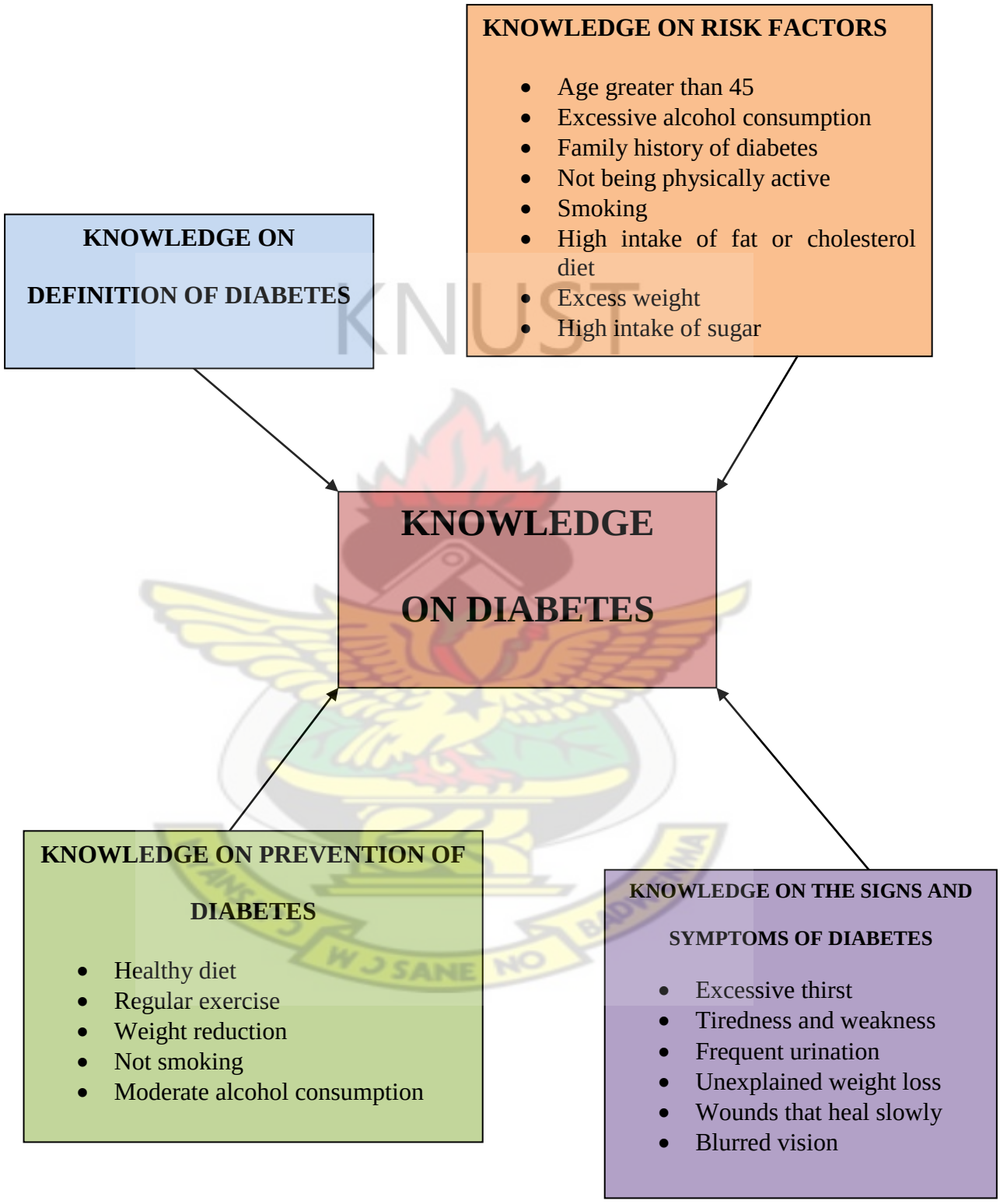
1.5 General Objective

The main objective of the study is to assess knowledge on Diabetes among adults in the Kwahu South District in the Eastern Region of Ghana.

1.6 Specific Objectives

1. To assess knowledge on diabetes in terms of; definition, risk factors, signs and symptoms, complications and prevention of diabetes.
2. To identify factors associated with knowledge on diabetes.

1.7 CONCEPTUAL FRAMEWORK



Source: **Author's Construct , 2014**

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews existing knowledge on Diabetes and researches that have been conducted in relation to the study. Literature search dwelt on adults and was limited to published works.

2.1 Definition and prevalence of Diabetes Mellitus (DM)

2.1.1 Definition of Diabetes Mellitus

Diabetes Mellitus (DM0 describes a group of metabolic diseases of multiple aetiology, which is characterized by chronic hyperglycaemia (high blood sugar). It is caused by either defects in insulin production, insulin action or both. These defects in insulin results in disturbances in carbohydrate, protein and fat metabolism (Alberti and Zimmet, 1998).

2.1.2 Global Prevalence of diabetes Mellitus (DM)

The prevalence of diabetes mellitus worldwide is currently estimated to be 8.3% with about 50% undiagnosed cases (IDF, 2011). Rapidly developing low and middle-income countries make up about 75% of the total diabetes prevalence (IDF, 2011). Most of the increase in diabetes epidemic is expected to occur in the Indian and Asian subcontinents due to genetic, environmental and social factors, such as rural-urban migration and industrialisation (IDF, 2009). The prevalence of diabetes in men and women are similar globally but slightly higher in men <60 years of age and in women at older ages. Diabetes Mellitus prevalence increases with age for both males and females. The majority of people with diabetes in developing countries are within the ages of 45 – 64

years (King et al., 1998; Wild et al., 2004) while those in developed countries are > 64 years of age.

2.2 Classification of Diabetes Mellitus

Criteria for the diagnosis and classification of diabetes has been revised several times over the years. The current classification system according to the World Health Organization (1999) identifies four types of diabetes namely;

1. Type 1 Diabetes
2. Type 2 Diabetes
3. Gestational Diabetes
4. Other specific types

Type 1 and Type 2 diabetes are the two major occurring categories of diabetes. Type 2 diabetes accounts for 90-95% of all cases whilst type 1 comprises about 5-10% (WHO, 1999).

2.2.1 Type 1 Diabetes

Type 1 Diabetes, (previously known as Insulin-Dependent Diabetes (IDDM), Type I or Juvenile-Onset Diabetes), is characterized by beta (β) cell destruction caused by an autoimmune process in people with genetic susceptibility that usually leads to absolute insulin deficiency (Report of the Expert Committee on the diagnosis and classification of Diabetes Mellitus, 1997). A combination of genetic susceptibility, immune factors (autoimmune diseases), and environmental factors (such as viruses and chemicals) are thought to provoke this autoimmune process. The rate of destruction of (β) beta - cells is quite variable. It is rapid in some individuals and slow in others (Zimmet et al., 1994). The rapidly progressive form is commonly observed in children, but also may occur in

adults (Humphrey et al., 1998). The slowly progressive form generally occurs in adults and is sometimes referred to as Latent Autoimmune Diabetes in Adults (LADA).

Individuals with LADA are often not overweight and have little or no insensitivity to insulin. They are found to have antibodies- especially GAD65 antibodies that attack their (β) beta cells. About 15% to 20% of people diagnosed with type 2 diabetes in fact have LADA (Lawson and Muirhead, 2001).

The onset of Type 1 diabetes is usually acute, developing over a period of a few days to weeks. 95% of persons with Type 1 DM develop the disease before the age of 25. Type 1 Diabetes Mellitus can be further classified as Immune-Mediated or Idiopathic. The majority of Type 1 Diabetes is of the Immune-Mediated nature. In both subclasses, there is absolute insulin deficiency which puts them at risk of ketoacidosis (Lawson and Muirhead, 2001).

Immune-Mediated Diabetes commonly occurs in childhood and adolescence, but it can occur at any age. It results from an inflammatory autoimmune and T-cells mediated destruction of the insulin-producing β-cells of the pancreas. Insulin resistance is not known to play a major role in its pathogenesis (Atkinson and Maclaren, 1994). Majority of individuals with Type 1 Immune-Mediated Diabetes are lean, young and with autoimmune markers associated with Diabetes Mellitus and most have susceptibility HLA haplotypes (Nepom, 1993; Scott et al., 1997). Individuals with this subclass of Diabetes Mellitus are often dependent on insulin for survival (Willis et al., 1996).

The Type 1 Idiopathic Diabetes has no known aetiology but similar clinical manifestation as immune-mediated. Patients usually have permanent insulinopenia, and they are prone to Ketoacidosis, but have no evidence of autoimmunity (McLarty et al., 1990). Idiopathic Type 1 Diabetes Mellitus has been described mostly in African-Americans (African origin) and Asians as well as other ethnic groups (Tan et al., 2000; Imagawa et al., 2000; Umpierrez et al., 1997). In most patients with Idiopathic Type 1 Diabetes, long-term Glycaemic control is better maintained with insulin therapy than either oral hypoglycaemic agents or diet therapy alone (Pinero-Pilona et al., 2001).

2.2.2 Type 2 Diabetes

Type 2 Diabetes Mellitus, previously referred to as Non-Insulin-Dependent Diabetes (NIDDM), Type II or Adult-Onset Diabetes, is a term used for individuals who have insulin resistance with relative (rather than absolute) insulin deficiency. There are two identifiable defects in Type 2 Diabetes Mellitus. There is predominantly insulin resistance in peripheral tissues (Defronzo et al., 1992; Lillioja et al., 1993) and insulin secretory defect of the (β) beta cell. Insulin resistance is however the primary defect preceding the derangement in insulin secretion and clinical diabetes by about 20 years (Khan, 1994., Sacks and McDonald, 1996). Insulin resistance and hyperinsulinemia leads to impaired glucose tolerance (IGT). The defective beta cells become exhausted and further leads to the cycle of glucose intolerance and hyperglycaemia. The specific aetiologies of Type 2 diabetes are unknown but believed to have strong behavioural components. However, autoimmune destruction of β-cells of the pancreas is not associated with its aetiology.

Type 2 is associated with older age, obesity (Campbell and Carlson, 1993; Bogardus et al., 1985), family history and lack of exercise. It is more common in women with a history of gestational diabetes, in blacks, hispanics and native Americans. Those not obese by weight criteria may have increased percentage of body fat distributed predominantly in the abdominal region (Kissebah et al., 1982). Ketoacidosis is not frequent in Type 2 diabetes, however if it arises, it results from the stress of another illness such as infection (Banerji et al., 1994; Umpierrez et al., 1995).

2.2.3 Gestational Diabetes

Gestational Diabetes Mellitus (GDM) is defined as any degree of glucose intolerance resulting in Hyperglycaemia of variable severity with onset or first recognition during pregnancy (Metzger, 1991). Hormones produced by the placenta to sustain the pregnancy makes cells more resistant to insulin. The insulin resistance becomes worse during the second and third trimesters when more of these placenta hormones are released. The pancreas responds by producing enough extra insulin to overcome the insulin resistance but sometimes the pancreas fails to keep up to task resulting in high blood glucose (American College of Obstetricians and Gynecologists, 2012).

GDM accounts for nearly 90% of all pregnancies complicated by diabetes (Coustan, 1995). In the majority of cases of GDM, glucose regulation will return to normal after delivery but may predispose the mother and the baby to developing Type 2 diabetes later in life. Individuals at high risk for Gestational Diabetes include older women, those with history of large for gestational age babies, women from certain high risk ethnic groups, and any pregnant woman who has elevated fasting or casual blood glucose levels (Berkowitz et al., 1992).

2.2.4 Other Specific Types

The other specific types of diabetes refer to types of Diabetes Mellitus of various known aetiologies that have been grouped together to form this classification. It includes those in which the underlying defect or disease process can be identified in a relatively specific manner. They may be due to genetic defects of β-cell function (formerly called Maturity-Onset Diabetes of the Young (MODY)), defects of insulin action; diseases of the exocrine pancreas (such as pancreatitis or cystic fibrosis), endocrinopathies (for instance, acromegaly); and pancreatic dysfunction caused by drugs, chemicals or infections (WHO, 1999). Uncommon forms of immune-mediated diabetes and other genetic syndromes sometimes associated with Diabetes Mellitus also belong to this group.

2.3 Diagnosis of diabetes

Diagnosis of diabetes is based on abnormalities of the following test; Fasting Plasma Glucose (FPG), Random Plasma Glucose (RPG) with symptoms, Oral Glucose Tolerance Test (OGTT) and Glycated haemoglobin Test (HbA1c) test.

2.3.1 Fasting Plasma Glucose (FPG) Test

The FPG test measures venous blood glucose in a person who has fasted for at least 8 hours. FPG level of 6.1 mmol/l (110mg/dl) to 6.9mmol/l (124 mg/dl) indicates Impaired Fasting Glucose (IFG), or Prediabetes (people at risk). Prediabetes is a condition in which a person's blood sugar level is above normal range but below values diagnostic of diabetes. A FPG level of 7mmol/l (126 mg/dl) or above (WHO, 2006), confirmed by repeating the test on another day, indicates diabetes.

2.3.2 Oral Glucose Tolerance Test (OGTT)

This is done after eight to ten hours fast. Venous blood glucose levels are taken in the fasting state and at 1 and 2 hours after drinking 75 grams of glucose dissolved in water. 2-hour postprandial plasma glucose (2hrPPG) or blood glucose level which is ≥7.8mmol/l to 11mmol/l indicates Impaired Glucose Tolerance (IGT) or prediabetes. 2-hour glucose level of 11.1 mmol/l (200mg/dl) (WHO, 2006) or above confirmed by a second test indicates diabetes.

2.3.3 Glycohemoglobin Test (HbA1c or A1C Test)

The A1C test is used to detect type 2 diabetes and prediabetes but is not recommended for diagnosis of type 1 diabetes or gestational diabetes. The test checks the amount of glucose bound to haemoglobin in the blood. HbA1c test reflects the average blood glucose over the past 2-3 months in percentages. A normal A1C level is below 5.7 %. An A1C of 5.7 to 6.4% indicates prediabetes while A1C ≥ 6.5% indicates diabetes (ADA, 2010).

2.3.4 Random Plasma Glucose (RPG) Test

RPG test is sometimes used to diagnose diabetes during screening. RPG ≥ 11.1 mmol/l (200mg/dl) with other symptoms of diabetes is suggestive of diabetes.

2.4 Complications of Diabetes Mellitus

DM can result in various complications. 4.8 million people died from diabetes in 2012 and half of deaths were people under the age of 60 years. 471 billion US Dollars were spent due to diabetes in 2012. This is a result of the serious acute and chronic complications that can develop in untreated diabetes (IDF, 2011).

2.4.1 Acute complications of diabetes

Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycaemic State (HHS) are the two most serious acute metabolic complications of Diabetes Mellitus. HHS used to be called hyperosmolar hyperglycaemic non-ketotic syndrome (HHNS or HONK) (Kitachi et al, 2009). These disorders can occur in both Type 1 and Type 2 Diabetes. The prognosis of both conditions is substantially worsened at the extremes of age and in the presence of coma and hypotension (Malone et al., 1992).

DKA occurs when absolute or relative insulin deficiency prevents glucose uptake by the cells, leading to increasing hyperglycaemia. Counter-regulatory hormones (glucagon, epinephrine, growth hormone and cortisol) are secreted and result in massive release of glucose from the liver which further contributes to the hyperglycaemia. This is followed by the uncontrolled breakdown of adipose and muscle tissues (catabolism). Fatty acids are released from the breakdown of fat stores (lipolysis). This is rapidly metabolized into ketones (alternative fuel in the absence of glucose and insulin) which have strong acidity. The excessive production of ketones lowers the blood's pH and leads to metabolic acidosis (Kitabchi et al, 2009). DKA consists of biochemical triad involving:

- Hyperglycaemia – usually blood glucose higher than 11mmol/L (191 mg/dL)
- Excessive ketoacids in blood and urine
- Metabolic acidosis – pH below 7.3.

The degree of Hyperglycaemia in DKA is quite variable and may not be a determinant of the severity of DKA.

Hyperosmolar Hyperglycaemic State (HHS) is another complication of steadily increasing hyperglycaemia and polyuria. It is more of a state of altered consciousness when coma is not present. In HHS, there is more severe hyperglycaemia and hyperosmolality than DKA. The hyperosmolality dehydrates the brain markedly and causes major changes in mental function. Ketosis may or may not be present to some degree in HHS. HHS is less common than DKA but the rate of mortality is much higher (Kitabchi et al. 2009).

2.4.2 Chronic complication of diabetes

Some chronic complications of diabetes include macrovascular and microvascular diseases with progressive development of conditions. Macrovascular disease is a very serious complication of diabetes and is the most common cause of premature death. Coronary heart disease, cerebrovascular disease, Peripheral Vascular disease (PVD) are the three main macrovascular diseases associated with diabetes (Gerstein, 2002).

Other chronic complications resulting from diabetes are: retinopathy (that results from damage to network of capillaries that supply blood to the retina) which leads to blindness, nephropathy that leads to renal failure, peripheral neuropathy with risk of foot ulcers, amputation, charcot joints and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction (Stratton et al., 2000; McCance et al.,1994).

2.5 Risk factors for diabetes

A risk factor according to WHO (2013), is any attribute, characteristic or exposure that increases the likelihood of an individual developing a disease. Risk factors are either modifiable or non-modifiable. With modifiable risk factors, measures can be taken to change them while non-modifiable risk factors cannot be changed.

2.5.1 Modifiable risk factors for diabetes

2.5.1a Obesity

Obesity has long been recognized as one of the strongest risk factors for development of diabetes. It has been estimated to account for 60% to 90% of the risk variance (Wolf and Colditz, 1998). Greater weight means a higher risk of insulin resistance, because fat interferes with the body's ability to use insulin. Colditz and colleagues (1995) found that the risk of diabetes was increased by nearly 90-fold among female nurses who were morbidly obese (BMI) ≥35 at ages 30 to 55 years and had normal weight at age 18 (BMI <22).

Work done by Eyre et al (2004) at the Harvard School of Public Health also showed that the single best predictor of Type 2 diabetes is being obese or overweight. The findings revealed that each kilogram (2.2 pounds) of weight gain over 10 years can increase risk of developing diabetes by 4.5%.

Several studies from sub-Saharan Africa have also confirmed the association between the prevalence of diabetes and a surrogate of obesity, Body Mass Index (BMI). Reports from Nigeria (Cooper et al, 1997) and Tanzania (McLarty et al, 1989) have shown that the prevalence of diabetes increases with increasing BMI.

2.5.1b Physical inactivity

Being more active lowers blood sugar levels by helping insulin to be more effective thereby decreasing insulin resistance. Also, exercising helps build muscle cells which have more insulin receptors than fat cells. The importance of sedentary lifestyle as a risk factor for diabetes and of the protective effects of physical activity has been studied by King et al., (1987). In the study, it was hypothesized that physical activity results in a higher rate of insulin-stimulated glucose disposal at a defined insulin dose. In addition, physically trained persons may have a smaller increase in plasma insulin concentrations in response to a glucose load than do sedentary persons (Seals et al., 1984). In prospective cohort studies, persons who maintain a physically active lifestyle develop impaired glucose tolerance and Type 2 Diabetes Mellitus less often than do those with a sedentary lifestyle (Hu et al., 2001).

Helmrich and others (1991) examined leisure-time physical activity and development of diabetes among 5,990 male alumni of the University of Pennsylvania over 14 years. They discovered that men who exercised regularly, at moderate or vigorous intensity, had a 35% lower risk of developing Type 2 Diabetes Mellitus than men who were sedentary. Manson and colleagues (1991) observed similar findings by analyzing data from the Nurses Health Study and the Health Professionals' Follow-up Study.

2.5.1c Dietary intake

Unhealthy eating comprising too much fat, not enough fibre and too many simple carbohydrates contribute largely to obesity which is a risk factor for diabetes. Decades of research have indicated that diets with high saturated fat content and low fibre content may increase the risk of insulin resistance and lead to development of Type 2 diabetes

(Hu et al., 2001). A study conducted on carbohydrates, dietary fibre, and incident of Type 2 diabetes in older women revealed that there is a protective role for grains (particularly whole grains), cereal fiber, and dietary magnesium in the development of diabetes in older women (Meyer et.al, 2000). In addition, a low-fibre diet with a high glycemic index has been associated with an increased risk of diabetes (Salmeron, 1997).

Few epidemiologic studies have examined the role of type and amount of carbohydrates in relation to the development of hyperglycemia or Type 2 Diabetes Mellitus. Persons with a diet at the highest level of the glycemic index or glycemic load were significantly more likely to develop Type 2 Diabetes Mellitus than those at the lowest levels (Salmeron et al., 1997). Similarly, in the Health Professionals' Follow-up Study, the relative risk of developing Type 2 Diabetes Mellitus was 1.37 (95% CI, 1.02 to 1.83) for comparison of the extreme quintiles of dietary glycemic load (salmeron et al., 1997). However, two large prospective studies found no relationship between dietary glycemic index or glycemic load and risk of developing Type 2 Diabetes Mellitus (Stevens et al., 2002). The lack of association in these studies may have been related to the methods of diet assessment used.

A new study has found that consuming large amounts of sugar may cause diabetes independently from weight problems. The researchers compared the availability of sugar and diabetes rates in 175 countries. The researchers found out that an additional 150 calories from sugar per person per day (equivalent to one 12-ounce soda drink) increased the prevalence of diabetes by 1% in that population. The longer the exposure to the higher amount of sugar lasted, the more pronounced the diabetes risk became (Basu et al., 2013).

2.5.1d Smoking

Cigarette smoking may increase risk of diabetes in several ways. Smoking has been shown to cause elevations in blood glucose concentration and may increase insulin resistance (Ronnemaa et al, 1996). Current smokers also tend to have higher blood concentrations of glycosylated hemoglobin (HbA_{1c}) than do nonsmokers *(*Nilsson et al., 1995*).*

Cigarette smoking was first pointed out as a risk factor for diabetes in men in the late 1980s and later confirmed in large cohort studies by MONICA/ KORA Augsburg cohort study , in both men and women and most prominently amongst heavy smokers (Meisinger et al, 2006). A large Swedish cross-sectional study showed that the prevalence of Type 2 diabetes, diagnosed by an Oral Glucose Tolerance Test (OGTT), was equally increased for smokers and users with high tobacco consumption compared with non -tobacco users.

Several large prospective cohort studies suggest that smoking is associated with development of diabetes. Among participants of the Nurses' Health Study, women who smoked more than 25 cigarettes per day had a 42% greater risk (95% CI, 1.18 to 1.72) of developing diabetes than those who had never smoked, after adjustment for obesity and other risk factors (Rimm et al., 1993). A prospective study of 7,124 British men who had follow-up for an average of 16 years reported similar findings. In that study, men who smoked cigarettes had a 74% higher risk (95% CI, 1.24 to 2.43) of developing diabetes than those who had never-smoked, after adjustment for age and BMI. (Wannamethee et al., 2001).

2.5.1e Alcohol consumption

Epidemiological studies of alcohol intake and risk of Type 2 Diabetes Mellitus have produced conflicting results. In a study conducted by Wei and colleagues (2000) an elevated risk of developing Type 2 diabetes was observed in nondrinkers and men with high alcohol intakes, when compared with men who reported moderate alcohol intake. Systematic and metanalysis on Alcohol as a Risk Factor for Type 2 Diabetes confirmed previous research findings that moderate alcohol consumption is protective for Type 2 diabetes in men and women (Baliunas et.al, 2009).

Mechanisms by which alcohol may act to increase or decrease risk of diabetes are multifold. Several studies suggest that low-to-moderate amounts of alcohol intake may decrease development of diabetes by increasing insulin sensitivity and slowing glucose uptake from a meal (Facchini et al., 1994). Excessive alcohol intake may contribute to excess energy intake and obesity, induction of pancreatitis, disturbance of carbohydrate and glucose metabolism, and impairment of liver function (Perry et al., 1998).

2.5.2 Non modifiable risk factors

2.5.2a Increase age

The risk of developing diabetes increases as one gets older which may be due to physical inactivity associated with old age. Also, the pancreas may not pump insulin efficiently as one age. The increase in prevalence of diabetes has also accelerated due to aging population structures in developed countries and increasing obesity globally. Muni (2008), found that the prevalence of diabetes increases with advancing age to the point where more than half of people 60-69 years of age and approximately three-fourths of those 70 years of age and older are affected.

2.5.2b Sex/Gender

The MONICA Augsburg Cohort Study , was the first prospective population-based study to assess the sex-specific incidence of diabetes mellitus in a middle European population characterized by a relatively low risk of cardiovascular morbidity and mortality. The Augsburg study identified age, BMI, a parental history of diabetes, and low HDL cholesterol values as independent determinants of Diabetes Mellitus in both sexes (Meisinger et al, 2006) . High systolic blood pressure, regular cigarette smoking, and high daily alcohol intake predicted diabetes in men only, whereas high uric acid values and physical inactivity during leisure time were associated with a higher risk of diabetes in women only.

2.2.2c Family history and genetics

Having an immediate or extended family member with diabetes increases ones chance of diabetes. African Americans, Hispanic-Americans and Native Americans all have a higher than normal rate of Type 2 Diabetes. This is partly due to higher rates of high blood pressure, obesity and diabetes in these populations. There is evidence that type 1 diabetes is, in part, a genetic disorder. Siblings of a person with type 1 diabetes are about 15 times more likely to develop diabetes than the general population. This translates into a risk of approximately 6% up to age 35 years. Children in families with a mother with type 1 diabetes have a lower risk (~3%) than children in families with a father who has type 1 diabetes; the reasons for this are unknown (ADA, 2008). The genetic susceptibility is determined by the Histocompatibility leucocyte antigen (HLA) class II DR3/DR4, DQB non asp 57 and DQA arg 52 that increases the sensibility of the beta cell to damage by the autoimmune process triggered by environmental factors (ADA, 2008). Identical (monozygotic) twins are more likely to both have type 1 diabetes than

non-identical (dizygotic) twins. But concordance rates in identical twins are 25-50%, supporting the hypothesis that environmental factors are also important in the development of type 1 diabetes (ADA, 2008).

Several prospective studies conducted in men—the Honolulu Heart Program (2007), the Pennsylvania Alumni Health Study, (2007) observed a high impact of parental history on diabetes incidence. However, having a genetic disposition towards Type 2 is not a guarantee of a diagnosis because lifestyle plays an important part in determining who gets its.

2.6 Prevention of diabetes

Several clinical trials that have been conducted over the years have shown that Type 1 diabetes cannot be prevented. However, trials have demonstrated that type 2 diabetes can be delayed or prevented. The Da Qing study in China involving 577 people that lasted for six years had reductions in risk as follows (Pan et al, 1997).

- 31% in the diet only group
- 46% in the exercise only group
- 41% in the diet and exercise group.

The Finnish Diabetes Prevention Study lasted for 3.2 years and it involved 522 people with IGT. The researchers found out that those in the diet-and-exercise intervention had a 58% decreased incidence of Type 2 diabetes (Tuomilehto et al, 2001). Similar findings were observed in the Diabetes Prevention Program compromising 3234 respondents with IGT who were followed for 2.8 years. The researchers recorded 31% risk reduction in the metformin group and 58% in the diet and exercise group (The Diabetes Prevention Program Research Group, 2002).

The Diabetes Prevention Program (DPP) proved that people with prediabetes were able to sharply reduce their risk of developing diabetes during the study by losing 5 to 7 percent of their body weight through dietary changes and increased physical activity. A follow-up study, the Diabetes Prevention Program Outcomes Study (DPPOS), showed losing weight and being physically active provide lasting results. Ten years after the DPP, modest weight loss delayed onset of type 2 diabetes by an average of 4 years.

2.7 Management of Diabetes Mellitus

Type 1 and 2 diabetes are chronic conditions that cannot be cured but managed (ADA, 2008). The ultimate goal of diabetes management is to keep blood glucose levels within the normal range without causing hypoglycaemia. Diabetes management also involves measures to control blood pressure and cholesterol levels. Management of diabetes includes diet, exercise, and use of appropriate medications (insulin in the case of type 1 diabetes, oral medications, as well as possibly insulin, in type 2 diabetes). Pancreas transplants have been tried with limited success in Type 1 diabetes. Gastric bypass surgery has showed to reverse type 2 diabetes in high proportion of patients but the disease recurs in approximately 21% of patients within three to five years after the surgery. Gestational diabetes usually resolves after delivery.

2.8 Researches on knowledge on Diabetes

Numerous quantitative studies have described the knowledge on diabetes. Knowledge about the nature, symptoms, complications, and treatment of diabetes was assessed among Europeans and Asians with and without diabetes in United Kingdom in the Coventry Diabetes Study using open questionnaire. The nature of diabetes was unknown in 30% of Europeans and 44% of Asians with diabetes. Knowledge Index was highest in

Europeans, increasing with increasing educational achievement, and was lowest in non-diabetic subjects without a family history of diabetes (Simmons et al., 1991).

A similar study on knowledge of diabetes in South Auckland revealed that Pacific Islands patients knew least, and Europeans most, about diabetes from both open and closed diabetes knowledge questions. The study found out that majority of Pacific Islands' patients could not name the nature, symptoms or complications of diabetes. This was unaffected by duration of diabetes, place of birth or time in New Zealand, although insulin treated Pacific Islands patients knew more than noninsulin treated patients (closed score 71 SD (4)% vs 61 SD (2)% $p < 0.05$) (Simmons et al,, 1994).

Work by Mohan et al., (2005) on knowledge of diabetes in the Chennai Urban Rural Epidemiology Study (CURES) using a systematic sampling method on a representative population in Southern India revealed that only 75.5% (19642/26001) of the whole population knew about a condition called diabetes. However, only 22.2% (5764/26001) of the whole population and 41.0% (627/1529) of the known diabetic subjects were aware that diabetes could be prevented. Knowledge of the role of obesity and physical inactivity in producing diabetes was very low, with only 11.9% (3083/26001) of study subjects reporting these as risk factors for diabetes, and only 19.0% (4951/26001) of the whole population knew that diabetes could cause complications. Even among the self-reported diabetic subjects, only 40.6% (621/1529) were aware that diabetes could produce some complications.

Mean knowledge score on diabetes was however fair in a survey conducted in the central region of Thailand. Respondents performed best in the risk factor section with a mean

(%) score of 2.88 of 4(72%) and worst in the section on diabetes in women: mean (%) score was 0.82 of 3(27.8%). Factors such as education level, older age, own self having diabetes, and having a family member/relative/friend with diabetes were significantly associated with knowledge of diabetes (Pongmesa et al., 2009).

The authors in a study involving Saudi women had 56.14 % of respondents scoring 100% in the questions related with knowledge. However, 17.58% scored 100% in the attitude questions and 15.78% scored 100% in practice questions. The overall Knowledge, Attitude and Practices (KAP) score had a mean of 16 and standard deviation (SD) of 6.066. Results revealed good knowledge but poor attitude and Practices toward diabetes (Saadia et al., 2010).

Knowledge and perceptions of diabetes study using questionnaire in a semi-urban Omani population revealed suboptimal results. Percentages of correct responses to questions on diabetes definition, classical symptoms, and complications were 46.5%, 57.0%, and 55.1% respectively. Only 29.5%, 20.8% and 16.9% identified obesity, physical inactivity and a positive family history, respectively, as risk factors for diabetes. A higher level of education, a higher household income, and the presence of a family history of diabetes were found to be positively associated with more knowledge (Al Shafee et al., 2008).

A survey by Baptiste-Roberts et al., (2007) to examine the role of family history of diabetes in awareness of diabetes and health behaviour in African Americans revealed that respondents with a family history of diabetes were more aware than those without such a history of having a family member with the disease. Also, those with a family

history of diabetes were more likely to consume five (5) or more servings of fruits and vegetables per day and to have been screened for diabetes.

Ulvi et al., (2009) work in investigating the awareness level about Diabetes Mellitus and associated factors in Tarlai (Rural Islamabad), found out that only 129 (43%) adults had any awareness of Diabetes Mellitus. Awareness of risk factors was present in 42 (14%) while awareness of the complications associated with the disease was 65 (22%).

Knowledge of diabetes risk factors and preventive measures among attendees of a primary care center in eastern Saudi Arabia had fewer than 50% of participants knowing about Diabetes Mellitus risk factors and preventive measures. In a regression model that included age, sex and education, education had a statistically significant positive association with knowledge of risk factors (odds ratio 12.5, 95% CI 6.26-25.2, P<.001) and preventive measures (odds ratio 7.6, 95% CI 4.01-14.2, P<.001), and age had a statistically significant negative association with knowledge of DM risk factors (odds ratio 0.377, 95% CI 0.207-0.685, P=.001) and prevention (odds ratio 0.407, 95% CI 0.231-0.717, P=.001). The main risk factor stated by participants was obesity (35.8%), while the main preventive measure mentioned was weight reduction (37.9%) (Aljoudi and Taha, 2009).

In another quantitative research to assess public knowledge of diabetes in Karen ethnic rural residents, Lorga et al., (2012) found that half of the participants knew diabetes was a noncommunicable disease needing lifelong treatment. In all, one-third of the community participants could correctly answer the knowledge assessment questions regarding risk factors and common features of diabetes. The remaining two-thirds either

gave a wrong answer or were "not sure". Female participants had poorer diabetes knowledge than the males.

Qualitative data on knowledge on diabetes are few. Knowledge and perceptions of diabetes was limited in the Appalachian region where thirteen (13) focus groups were conducted in 16 counties in West Virginia. Findings showed that among the population there was lack of knowledge about diabetes before and after diagnosis and little perception that a risk of diabetes exists (unless there was a family history of diabetes). Social interactions were negatively affected by having diabetes and cultural and economic barriers to early detection and care created obstacles to the early detection of diabetes and education of those diagnosed (Tessaro et al., 2005)

Rosal et al., (2011) also used qualitative research design to assess awareness of diabetes risk factors and prevention strategies among a sample of low-income Latinos with no known diagnosis of diabetes. The participants had basic knowledge of diabetes and many perceived family history of diabetes, poor diet, emotional distress, and stress associated with the United States as risk factors for diabetes.

In Africa, a cross-sectional study in Kenya on knowledge, attitude and practices related to diabetes among community members in four provinces had only 29% of respondents having good knowledge of signs and symptoms of diabetes while 71% of respondents had poor knowledge on what diabetes is. 26.1% of the respondents could correctly identify the probable causes of Diabetes Mellitus while 73.4% had very little or no knowledge of complications of diabetes (Maina et al., 2010).

Knowledge, attitude and practice of patients with Diabetes Mellitus before and after educational intervention in Jos, Nigeria had 30.2% correct pre-education score which improved to 100% correct answers post-education. (Puepet et al., 2007).

Diabetes awareness in general population in Cameroon had eighty percent of the respondents scoring more than the total mean score. The highest score obtained by participants (0.10%) was 28/30. The mean total score was higher in men ($p < 0.02$) and in subjects with a relative having a chronic condition ($p < 0.001$). In multivariate analyses, age classes ($p < 0.01$), educational level ($p < 0.001$) and relatives with a chronic condition ($p < 0.001$) were associated to the global diabetes awareness score (Fezeu et al, 2010). In a qualitative study in four urban health districts in Cameroon, awareness of diabetes and knowledge of its causes, clinical course, and complications were limited. Many participants believed diabetes was caused by excessive sugar consumption rather than excessive energy intake, obesity, or physical inactivity. Obesity, particularly in men, was largely perceived positively as a sign of ‘‘good living.’(Kiawi et al, 2006).

CHAPTER THREE

METHODOLOGY

3.1 Study methods and design

A community based cross-sectional and descriptive study was employed to evaluate the knowledge on diabetes among adults living with and without diabetes in the Kwahu South District.

3.2 Data collection techniques and tools

Data was collected using a structured questionnaire and administered to consented people during data collection. The questionnaire, which was in English, was rendered in twi (the most widely spoken and understood language in the district) as required.

The first section of the questionnaire included questions on participant's demographics. The second section looked at general knowledge on diabetes; definition, its risk factors, signs and symptoms, complications and the prevention.

3.3 Study area

The study was conducted in February and March, 2013 at the Kwahu-South district, which is one of the administrative districts in the Eastern Region of Ghana. It has an estimated population of 89,813 with 3.1% growth rate at the beginning of the year 2011. Topographically, majority of the communities in the district are located on the Kwahu ridge which rises up to an elevation of 2,586 feet above sea level. It covers a total land area of 781 km^2.

The district shares boundaries with Kwahu North and Fanteakwa districts to the east. The Kwahu West district to the south, the Kwahu East district to the north and the Asante Akyem district to the west (Source: Kwahu South District Profile, 2012). The district is made up of 14 health facilities with a total population of 89,813 inhabitants. It is divided into 6 operational Sub-districts which are Mpraeso, Kwahu Praso, Bepong, Nkyenenkyene, Asakraka and Kwahu Amanfrom. The predominant occupation in the district is subsistence agriculture, which employs about 54.4% of the total labour force, the proportion being much higher (71.8%) in the rural areas compared to the urban settlements (42.3%) (Source: Kwahu South District Profile, 2012).

The district annual health reports of 2009 to 2011 indicated that diabetes accounted for a significant proportion of OPD attendance. Diabetes accounted for 7.8% of OPD cases (6886/ 88323) in 2009 and 7.4% (7022/93948) cases in 2010. In 2011, 7.5% (6239/82209) of OPD cases was also attributed to diabetes (Source: Kwahu South Health Administration Annual Report, 2011).

3.4 Study population

Kwahu Praso, Mpraeso and Asakraka were randomly selected from the six (6) sub-districts. Adults aged 18 years and older resident in the sub-districts of Kwahu Praso, Mpraeso, and Asakraka constituted the study population. Four hundred and twenty-three (423) households were selected based on the sample size estimation from a total of 4000 households in the three sub-districts. An adult aged 18 years and over residing in the selected household was interviewed.

The eligibility criterion for the study was adults aged 18 years or older who gave informed consent and resident in the communities. An exclusion criterion was individuals below 18 years.

3.5 Sample size

A sample size of 423 people was calculated by using a general proportion of 50% with 95% Confidence level and 5% allowable margin of error.

Using the sample size formula:

$N= z^2pq/d^2$,

Where:

N= sample size

Z= is a constant, using 95% confidence level

From statistical distribution table 95% = 1.96

P= estimated prevalence of adults with the characteristics under study

q= (1-p)

Using a general proportion of 50%, then

Pq = (0.5) (1- 0.5)

d = statistically tolerated error (0.05)

By substituting the values into the formula

$N = (1.96)^2 (0.5) (0.5) / (0.05)^2$

= 0.9604 / 0.0025

= 384.16

N (sample size estimated) is 384

10% non-response is 38.4

384.16 + 38.4= 422.56

Therefore total sample size is approximately 423 respondents.

3.6 Sampling procedure

The participants were selected from Kwahu Praso, Mpraeso and Asakraka (Health Sub-Districts). In each street in the selected community, the first (1st) house was chosen and one adult in that house interviewed. The subsequent house after the first house was skipped and the next two houses surveyed. The houses were surveyed in that order till a particular road ends. The diabetes status of the respondents was determined by the respondents answering yes or no when asked if he or she has diabetes.

3.7 Pre-testing

The survey questionnaires were pre-tested from 21st to 25th January, 2013 in the Upper Manya Krobo District to determine the reaction of 10 respondents to the questions. Questions on the risk factors and prevention of diabetes were revised accordingly for the purpose of the study.

3.8 Data collection and handling

To facilitate data collection, five (5) survey workers with at least a diploma in any health related field were employed. These survey workers were trained on the purpose of the study and the process of administering the questionnaire to avoid bias.

After data collection, all questionnaires were stored in files and assessed restricted to the research team. Questionnaires were giving codes for archiving. Data from the questionnaires were double-checked and cleaned before entered onto a computer by the

investigator. Data was then entered onto excel spreadsheet and then transferred to STATA/IC version 11-Stata Corp., College Stations, TX- (software for analysis).

3.9 Data analysis

Results were expressed in descriptive analysis for quantitative variables such as age. Frequencies (percentages) were reported for categorical variables such as gender and educational status. The association between study variables such as knowledge score and age, sex, those having family/friend or those who themselves were living with diabetes were determined by estimating the difference in proportions, using Pearson's chi-square analysis

Multivariate logistic regression technique was used to investigate for confounders for knowledge on diabetes among respondents. All significance tests were two-tailed, and a probability value of less than 0.05 was considered statistically significant.

The answers to the questionnaire were scored and analyzed as follows:

One mark was attributed to each correct answer for questions on; risk factors, cure, signs and symptoms, complications and prevention of diabetes. Knowledge on what diabetes is was graded as follows;

- Answers relating to hyperglycaemia (high blood sugar) due to defects in insulin were graded as 3(maximum score).
- 2 marks were allocated to answers having only hyperglycaemia.
- 1 mark was allocated to answers having sugar disease.

Incorrect answers were graded 0 for all the questions. and knowledge score was computed.

The total mark for each respondent was divided by 26 (maximum mark) and then multiplied by 100% to get a percentage score (knowledge score). The knowledge score was categorized as below;

- Below 50%
- 50% to 75%
- Above 75%

Based on the researcher's own discretion, an individual was considered knowledgeable (good) in diabetes if a knowledge score above 75% was obtained. Knowledge score from 50% to 75% was considered as average knowledge and that below 50% considered poor.

3.10 Ethical consideration

Ethical clearance for commencement of the study was sought from the Ethical Review Committee of the Kwame Nkrumah University of Science and Technology, School of Medical Sciences (KNUST-SMS), Kumasi, Ghana. Study participants were adequately informed of the purpose, nature, procedures, risks and hazards of the study. Verbal and informed consent was obtained from them during the data collection.

3.11 Limitations of the Study

A limitation of this study was the use of a non-standardized questionnaire to assess knowledge on diabetes which may have underestimated or overestimated knowledge on the condition.

3.12 Assumptions

It was assumed that the sample size was a true representation of the study population and that responses from the respondents will be the true situation in the district.

3.13 Study variables

Table 3. 1: Study variables

VARIABLE	OPERATIONAL DEFINITION	HOW TO MEASURE	SCALE OF MEASUREMENT	OBJECTIVE ADDRESSED
Independent Variable				
Sex	Based on what the respondents say	Male or female	Binary	Objective 2
Age	Age as at interview	Age in completed years	Discrete	Objective 2
Marital Status	Expressed in terms of legal status	single, married,	Binary	Objective 2
Educational Level	Highest level of education attained	None/basic, Secondary, Tertiary	Ordinal	Objective 2
Occupation	The work or job of respondent	Unemployed Employed	Binary	Objective 2
Religion	As reported by Informant	Christian, Muslim, Others	Nominal	Objective 2

Independent Variable	**OPERATIONAL DEFINITION**	**HOW TO MEASURE**	**SCALE OF MEASUREMENT**	**OBJECTIVE ADDRESSED**
Family/friend with diabetes	Whether the respondent has a family/friend with diabetes	Yes, No, Do not know	Nominal	Objective 2
Having Diabetes	Whether the respondent has diabetes	Yes, No	Nominal	Objective 2
Source of information on diabetes	Where respondent had information on diabetes	Poster/sticker/leaflet Church/mosque/ School Friend/relative Health facility TV/radio	Nominal	Objective 2
Dependent variable Knowledge score	Answer correctly questions on definition, signs and symptoms, risk factors, complications, cure, prevention of diabetes	Respondents knowledge scored as follows: -Below 50% is poor, -50% to 75% is average, - Above 75% is good.	Ordinal	Objective 1

Table 3. 1(cont.): Study variables

CHAPTER FOUR

RESULTS

4.1 Introduction

Chapter four summarizes the results of the analyzed data. A total of 423 respondents were interviewed in the study, but responses were received from 409 participants. The response rate to the questionnaires was 96.69%. The results of the study are presented in tables and charts.

4.2 Socio-demographic characteristics of respondents

Table 4.1 shows the socio-demographic characteristics of the respondents. 23% (96) of the respondents reported that they had diabetes. As depicted in Table 4.1, a greater percentage (77%) of the respondents lived without diabetes. Those living with diabetes had had the disease for approximately 30 months and were mostly found in men. Respondents' age ranged from 18 to 84 years with majority being females. Most of the respondents have had their education up to the senior high school level with single marital status. In addition, the results showed significant differences in the age distribution of diabetes with high prevalence among respondents who were at least 45 years of age.

Table 4. 1: Demographic characteristics of respondents

Variable	People with Diabetes (n=96)	People without Diabetes (n=313)	Total (n=409)	P-Value
Age group (years)	**No. (%)**	**No. (%)**	**No. (%)**	
< 45	30(31.25)	181(57.83)	211(51.59)	0.00
≥ 45	66(68.75)	132(42.17)	198(48.41)	
Sex				
Male	54(56.25)	142(45.37)	196(47.92)	0.062
Female	42(43.75)	171(54.63)	213(52.08)	
Marital Status				
Single	45(46.88)	174(55.59)	219(53.55)	0.134
Married	51(53.13)	139(44.41)	190(46.45)	
Occupation				
Not Employed	21(21.88)	65(20.77)	86(21.03)	0.816
Employed	75(78.13)	248(79.23)	323 (78.97)	
Religion				
Christian	84(87.50)	263(84.03)	347(84.84)	0.424
Muslim	9(9.38)	29(9.27)	38(9.29)	
Traditionalist/ Other	3(3.13)	21(6.71)	24(5.87)	
Educational Level				
None/Basic education	60(62.50)	165(52.72)	225(55.01)	0.197
Senior Secondary	21(21.88)	77(24.60)	98(23.96)	
Tertiary	15(15.63)	71(22.68)	86(21.03)	

4.3. Awareness on diabetes

Of the 409 respondents surveyed, 315 adults representing 77% of the study population were aware of diabetes. 219 (70%) of those aware of the condition reported that they did not have diabetes. All 96 (30%) respondents who said they had diabetes reported to be aware of the condition.

4.3.1 Source of first information on diabetes

As shown in the third cluster of bars in Figure 4.1, most of the respondents aware of diabetes first heard about the condition either on TV or radio. However, majority of those living with diabetes heard about the condition the first time from a health facility.

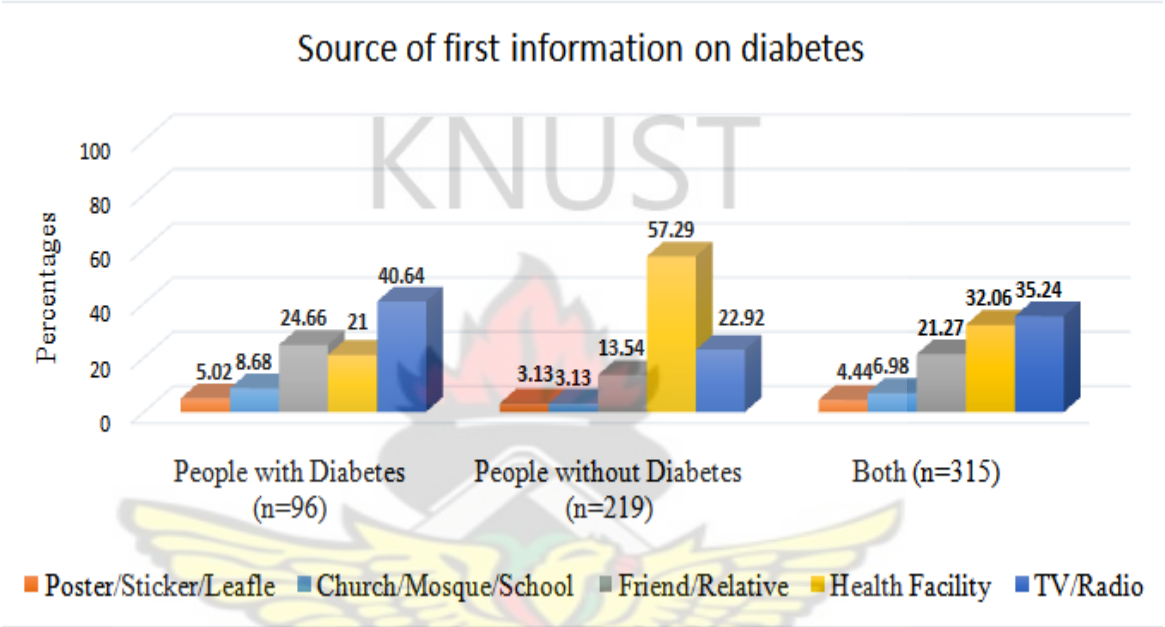


Figure 4. 1: Source of first information by respondents who were aware of diabetes

4.3.2 Family/Friend with diabetes

Among those living with diabetes, majority knew a family/friend living with diabetes. A greater percentage of those without diabetes did not know a family member or relative with diabetes.

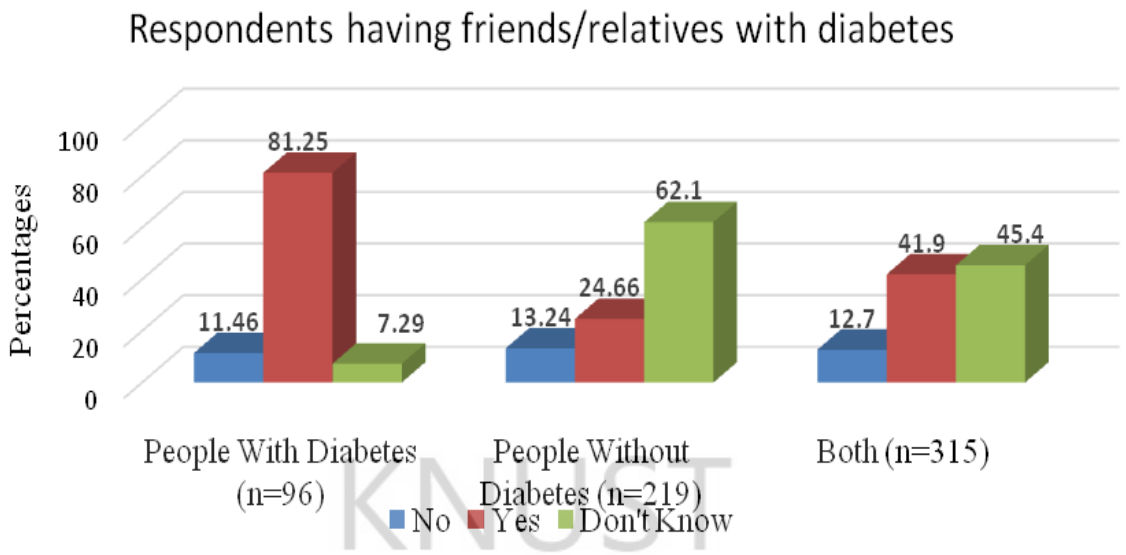


Figure 4. 2: Family/friend with diabetes by those aware of diabetes

4.4 Knowledge on; definition, risk factors, signs and symptoms, cure, complications and prevention of diabetes

4.4.1 Knowledge on definition of diabetes

Although most respondent (77%) had heard of diabetes, 24.13% of those aware of the condition could not say anything related to the definition of diabetes. Majority of those living with diabetes associated diabetes to high blood sugar. Respondents without diabetes mainly referred to diabetes as a sugar disease. Only 6% of the participants knew diabetes was associated with defects in insulin leading to high blood sugar, as shown in Figure 4.3.

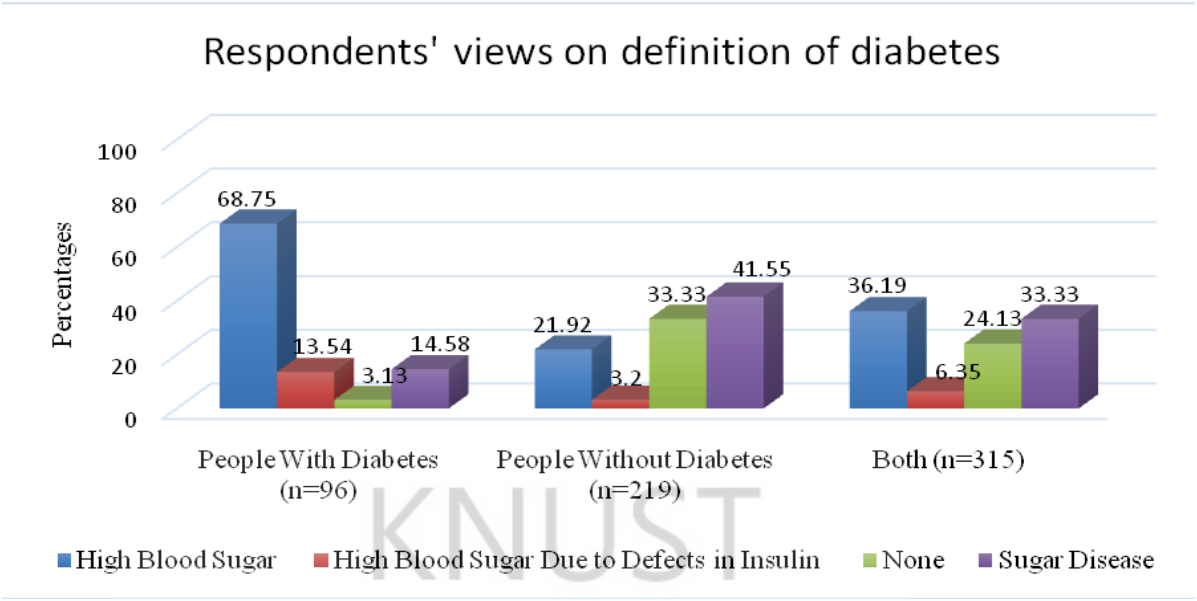


Figure 4. 3: Definition of diabetes among respondents aware of diabetes

4.4.2 Knowledge on risk factors of diabetes

The main risk factor stated by the respondents was high intake of sugar (79%). The respondents knew little about lifestyle risk factors for the disease as few answered yes for risk factors such as excessive intake of alcohol, not being physically active, overweight and smoking.

Table 4. 2: Awareness on risk factors for diabetes among respondents

	People with Diabetes (n=96)	People without Diabetes (n=219)	Total (n=315)	p-value
Risk factor	**No. (%)**	**No. (%)**	**No. (%)**	
High intake of sugar				
No	26(27.08)	41(18.72)	67(21.27)	0.095
Yes	70(72.92)	178(81.28)	248(78.73)	
Age above 45				
No	50(52.08)	118(53.88)	168(53.33)	0.768
Yes	46(47.92)	101(46.12)	147(46.67)	
Excessive alcohol intake				
No	54(56.25)	147(67.12)	201(63.81)	0.065
Yes	42(43.75)	72(32.88)	114(36.19)	
Family history of diabetes				
No	41(42.71)	97(44.29)	138(43.81)	0.794
Yes	55(57.29)	122(55.71)	177(56.19)	
Not being physically active				
No	64(66.67)	165(75.34)	229(72.70)	0.112
Yes	32(33.33)	54(24.66)	86(27.30)	
Smoking				
No	79(82.29)	195(89.04)	274(86.98)	0.101
Yes	17(17.71)	24(10.96)	41(13.02)	
High intake of fat/cholesterol diet				
No	60(62.50)	129(58.90)	189(60.00)	0.549
Yes	36(37.50)	90(41.10)	126(40.00)	
Excess weight				
No	55(57.29)	122(55.71)	177(56.19)	0.794
Yes	41(42.71)	97(44.29)	138(43.81)	

4.4.3 Knowledge on signs and symptoms of diabetes

Table 4.3 generally depicts poor knowledge on the signs and symptoms of diabetes as majority answered no for the signs and symptoms listed. However, those with diabetes tend to have better knowledge on the signs and symptoms of the disease than those without the condition ($p<0.005$). Frequent urination was the commonest symptom mentioned by respondents. 10% of the participants also gave sweet urine as a symptom of diabetes.

Table 4. 3: Awareness of signs and symptoms among respondents

	People with Diabetes (n=96)	People without Diabetes (n=219)	Total (n=315)	p-value
Sign/symptom	**No. (%)**	**No. (%)**	**No. (%)**	
Excessive thirst				
No	16(16.67)	147(67.12)	153(51.75)	0.000
Yes	80(83.33)	72(32.88)	152(48.25)	
Tiredness and weakness				
No	45(46.88)	174(79.45)	219(69.52	0.000
Yes	51(53.13)	45(20.55)	96(30.48)	
Frequent urination				
No	7(7.29)	112(51.14)	119(37.78)	0.000
Yes	89(92.71)	107(48.86)	196(62.22)	
Unexplained weight loss				
No	20(20.83)	135(61.64)	155(49.21)	0.000
Yes	76(79.17)	84(38.36)	160(50.79)	
Wounds that heal very slowly				
No	61(63.54)	109(49.77)	170(53.97)	0.024
Yes	35(36.46)	110(50.23)	145(46.03)	
Blurred vision				
No	62(64.58)	187(85.39)	249(79.05)	0.000
Yes	34(35.42)	32(14.61)	66(20.95)	

4.4.4 knowledge on cure for diabetes

4.4.4a Perception of cure for diabetes

Table 4.4 shows the percentage distribution of respondents' views on the cure of diabetes.

Over 50% of respondents (irrespective of diabetes status) thought the condition could be cured.

Table 4. 4: Respondents' views on whether people with diabetes can be cured

	People with Diabetes (n=96)	People without Diabetes (n=219)	Total (n=315)	p-value
Can people with diabetes be cured?	**No. (%)**	**No. (%)**	**No. (%)**	
No	23(23.96)	45(20.55)	68(21.59)	0.187
Yes	54(56.25)	108(49.32)	162(51.43)	
Don't Know	19(19.79)	66(30.14)	85(26.98)	

4.4.4b Respondents' views on how diabetes can be cured

Majority of the respondents (51.23%) of the respondents, (irrespective of diabetes status) thought the condition could be cured medically as shown in Figure 4.

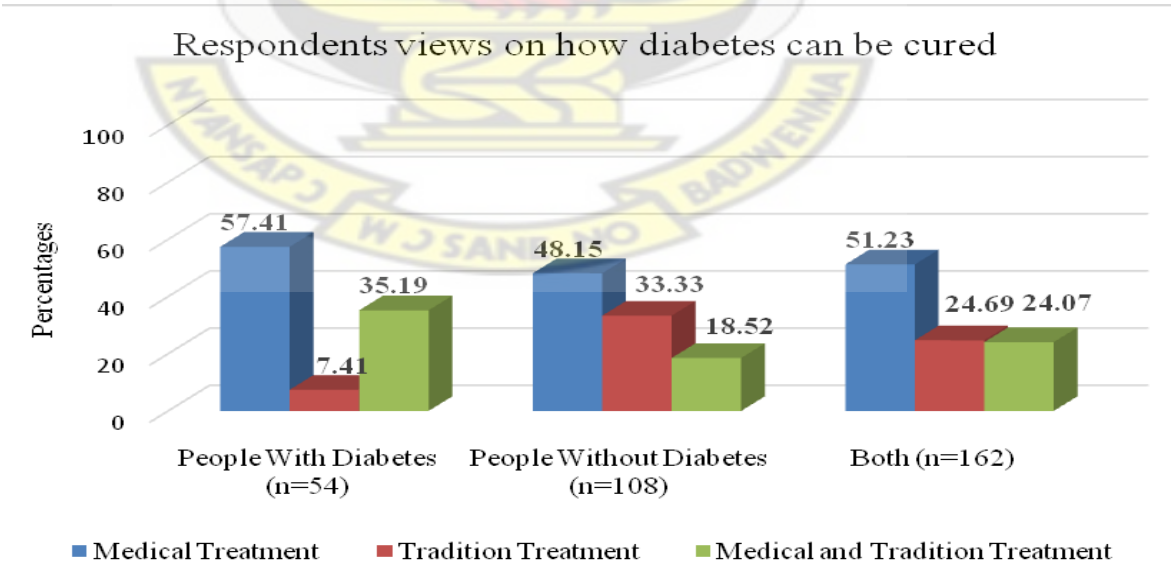


Figure 4. 4: Respondents' views on how Diabetes can be cured

4.4.5 Knowledge on complications of diabetes

Table 4.5 shows the examples of complications mentioned by the respondents. Although 148 reported that diabetes could cause complications, only 116 (78%) could correctly give a single complication of diabetes.

Table 4. 5: Examples of complications of diabetes given by respondents

	People with Diabetes (n=83)	People without Diabetes (n=65)	Total (n=148)	p-value
Examples of complications	**No. (%)**	**No. (%)**	**No. (%)**	
None	21(25.30)	11(16.92)	32(21.62)	<0.00
Slow healing of wounds	12(14.46)	10(15.38)	22(14.86)	
Eye disease	15(18.07)	14(21.54)	29(19.59)	
Kidney disease	9(10.84)	3(4.62)	12(8.11)	
Heart disease	14(16.87)	8(12.30)	22(14.86)	
Amputation	6(7.23)	12(18.46)	18(12.16)	
Impotence	6(7.23)	7(10.77)	13(8.78)	

4.4.6 Knowledge on prevention of diabetes

4.4.6a Awareness on whether diabetes can be prevented

As shown in Figure 4.5, over 50% of respondents who knew about diabetes thought it could be prevented. Few respondents (5.08%) thought the condition cannot be prevented.

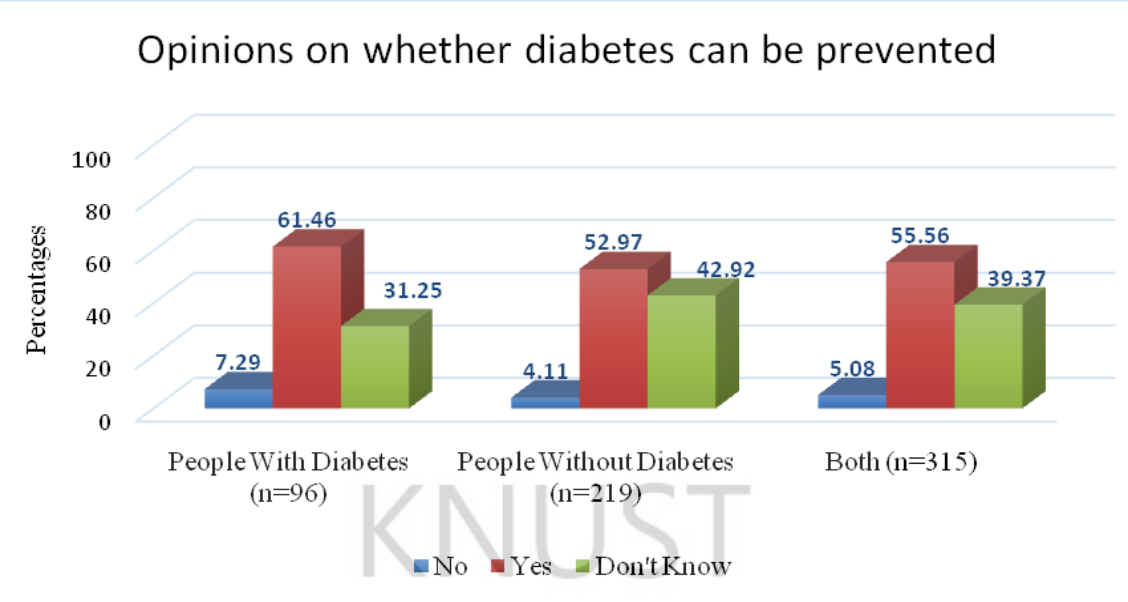


Figure 4. 5: Respondents view's on whether diabetes can be prevented

4.4.6b Awareness on how diabetes is prevented

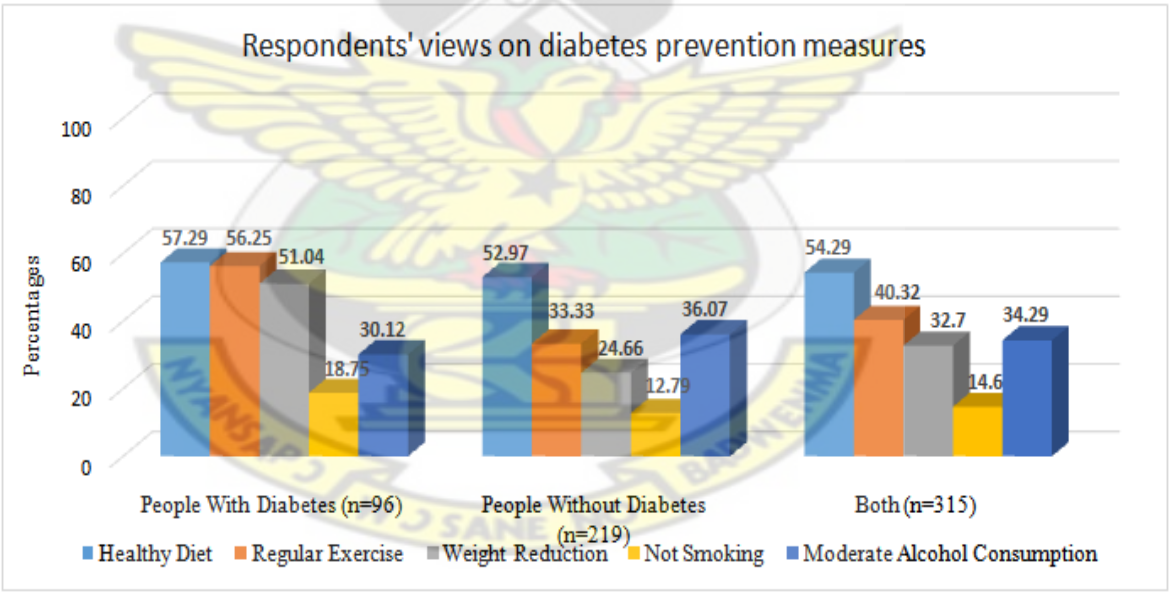


Figure 4.6: Diabetes preventive measures stated by respondents

The main preventive measure mentioned was healthy diet as shown in Figure 4.6. Avoiding smoking(less than 20%) was the least mentioned preventive measure stated by respondents.

4.5 Factors associated with knowledge on diabetes

4.5.1a Association between knowledge on diabetes and selected factors

Table 4.6 shows the association between knowledge on diabetes and variables such as age, sex, educational level, having family/friend and living with Diabetes or not. Only educational level and a person's diabetes status was statistical significant ($p<0.05$).

Table 4. 6: Factors associated with knowledge on diabetes among respondents

	KNOWLEDGE SCORE					
	Poor (< 50%)	**Average (50-75%)**	**Good (>75%)**	**Total (n=409)**	**X^2 Value/ (df)**	**p-value**
Age (Years)						
Below 45	169(80.09)	23(10.90)	19(9.00)	211(100.00)	5.559	0.0602
45 and above	143(45.83)	38(62.30)	17(47.22)	198(48.41)		
Sex						
Male	154(78.57)	25(12.76)	17(8.67)	196(100.00)	1.442	0.486
Female	158(74.18)	36(16.90)	19(8.92)	213(100.00)		
Educational level						
None/Basic Education	192(85.33)	27(12.00)	6(2.67)	225(100.00)	71.11	0.000
Senior Secondary	82(83.67)	9(9.18)	7(7.14)	98(100.00)		
Tertiary	38(44.19)	25(29.07)	23(26.74)	86(100.00)		
Family/friend with diabetes						
No	29(72.50)	8(20.00)	3(7.50)	40(100.00)	2.257	0.689
Yes	86(65.15)	28(21.21)	18(13.64)	132(100.00)		
Don't know	103(72.03)	25(17.48)	15(10.49)	143(100.00)		
Do you have diabetes?						
Yes	54(56.25)	23(23.96)	19(19.79)	96(100.00)	30.69	0.000
No	258(82.43)	38(12.14)	17(5.43)	313(100.00)		
Duration of being diagnosed with diabetes						
< 2 years	35(60.34)	14(24.14)	9(15.52)	58(100.00)	1.791	0.408
≥ 2 years	19(50.00)	9(23.68)	10(26.32)	38(100.00)		

4.5.1b Regression analysis

When the association was examined in a multivariate logistic regression, the association was found significant ($P < 0.05$) for educational level and a person's diabetes status.

Table 4. 7: Regression Model of Knowledge against Selected Factors

Factors	Odds Ratio	95% Confidence Interval	P-value
Age	0.615	0.359 – 1.052	0.076
Sex	1.524	0.917 – 2.531	0.104
Family/friend living with diabetes	0.922	0.491 – 1.733	0.801
Educational Level	0.223	0.129 – 0.385	0.000
Living with diabetes	0.262	0.120 – 0.570	0.001
Duration of being diagnosed with diabetes	0.719	0.294 – 1.758	0.469

4.6 General knowledge on diabetes

Overall, respondents had poor knowledge on diabetes as majority scored below 50% (Poor) as can be seen in Table 4.8. Only a small fraction (9%) had good knowledge on the disease. The knowledge score, good (75% and above), was highest among people living with Diabetes (20%) as compared to only 5% among those without diabetes. Similarly, the percentage of people with diabetes with poor knowledge was low (56.25%) compared with the people without diabetes (82.43%). This suggests that diabetes status is a predictor of diabetes knowledge.

Table 4. 8: General knowledge score according to diabetes status

Knowledge Score	People with diabetes No. (%)	People without diabetes No. (%)	Total	P-value
Poor (below 50%)	54(56.25)	258(82.43)	312(76.28)	<0.000
Average (50-75%)	23(23.96)	38(12.14)	61(14.91)	
Good(above 75%)	19(19.79)	17(5.43)	36(8.80)	
Total	**96(100.00)**	**313(100.00)**	**409(100.00)**	

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The study was driven by the rapid rise in prevalence of diabetes in the Kwahu South District of Ghana and the world as a whole. The study sought to evaluate the knowledge on diabetes among adults in the district. The findings of this study revealed poor knowledge (76%) among the respondents. The knowledge on diabetes was significantly associated with the person living with diabetes and having a higher educational level. The selection process was purely by randomization hence gave every adult in the district the chance of being interviewed. The sample size in this study was also large enough to take care of random error thereby given a true reflection of the knowledge on diabetes in the district.

5.2 Awareness of diabetes

The study results showed most of the respondents (77%) had heard of diabetes, which confirms the prevalence of diabetes in Ghana (Amoah et al., 2002). This finding is consistent with the findings of Mohan et al., (2005) whose work in Chennai, showed that 75.5% of the study population knew about a condition called diabetes. Whilst it was evident majority of the respondents were not living with diabetes, they knew of someone with the disease. In addition, the mass media and information from hospitals had contributed to the awareness on diabetes. According to the survey results, 35% of the respondents heard of diabetes from the media (TV/radio) and 32% from the hospital. Almost everyone watches/listens to TV/Radio, and normally goes to the hospital whenever they are sick. These assertions therefore attest to the increased awareness of diabetes in the study area.

Meanwhile, general knowledge on diabetes was poor. The findings of this study revealed only 9% had good knowledge on diabetes and which is not consistent with the findings of Puepet et al., (2007) who found 30% of the respondents as knowledgeable in diabetes. Respondents with poor knowledge generally showed lack of awareness on: the definition, risk factors, signs and symptoms, prevention and complications of diabetes. Knowledge on diabetes even in a developed country was found to be low by Baradaran and Knill-Jones (2004) among ethnic groups in Glasgow. The lack of knowledge on diabetes in the study supports a growing number of reports that suggest that knowledge on diabetes is poor (Saleemet et al., 2009; Taha and Aljoudi, 2009; Tessaro et al., 2005; Rosal et al., 2011; Maina et al., 2010).

The poor knowledge on diabetes in this study implies low or lack of exposure to education on diabetes in the district. This will be attributed to a number of factors such as poor health education on non-communicable diseases and also low literacy level in the district.

Again, health promotion activities on non-communicable diseases have not been given equal attention like communicable diseases in the country. The little health education on disease conditions is usually held at hospitals for individuals suffering from a particular condition such as diabetes thereby neglecting the whole public.

Also, most of the diabetes health promotion efforts are uncoordinated and messages are not standardized due to lack of clear guidelines regarding diabetes education (Baradaran and Knill-Jones, 2004). Hospitals do not have structured educational programmes for educating clients on the condition. Educational modules provided by the IDF are not

followed for lack of time and health personnel. There is also the issue of poor knowledge on diabetes among health care workers who are expected to deliver health education in communities (Trepp et al., 2010).

The lack of knowledge on diabetes regarding; risk factors, its signs and symptoms, prevention and complications could increase the number of people living with diabetes in the country in the next coming years. These people are likely to engage in unhealthy lifestyles since they are not aware of the risk factors and may also report late with complications since they know little on the clinical manifestation of the condition.

Also, education on diabetes is also not intensive and not properly structured due to busy clinic schedule and lack of diabetes educators in hospital facility. Communication between doctors, nurses, other health workers and patients are not the best. As a result patients are not educated on their conditions as they are rendered services at health facilities.

5.3 Knowledge on; definition, risk factors, signs and symptoms, cure, complications and prevention of diabetes

5.3.1 Knowledge on definition of diabetes

Diabetes is defined as a metabolic disorder characterized by chronic hyperglycaemia (high blood sugar), that is caused by either defects in insulin production, insulin action or both. In this study, only 6.35% could identify diabetes as a disease associated with defects in insulin). Knowledge on definition of diabetes was found to be poor. The result is not consistent with a study in Kenya where 40% of the respondents identified lack of insulin as causing diabetes (Unadike and Chineye, 2009). Another study in

Pakistan recorded different findings from this study with 49% associating defects in insulin with diabetes (Nisan et al, 2008). 33% of the respondents referred to diabetes as a sugar disease, which is the literal name given to diabetes in Ghana. This was observed in a study by Osman et al., (2009), where majority knew the condition as a sugar disease.

5.3.2 Knowledge on risk factors for diabetes

Factors such as excessive alcohol consumption, smoking, obesity are associated with risk of developing diabetes. Respondents performed poorly in the risk factor section (63.57% scoring below 50%). This was not consistent with a study conducted in Thailand where respondents performed best in the risk factor section (Pongmesa et al., 2009). In this study, 78.73% of the respondents indicated high intake of sugar as a risk factor for diabetes.

The common definition of diabetes as a sugar disease among the respondents misleads them to think that diabetes is as a result of high sugar intake. This makes the people feel that they are not at risk of diabetes once they avoid taking in too much sugar. Although a new study has found correlation between high sugar intake and the diabetes epidemic (Basu et al., 2013), lifestyle risk factors such as excessive alcohol intake, physical inactivity, obesity and smoking are considered to be the main risks driving the prevalence of diabetes (Lieberman, 2003). What the people do not know is that high sugar intake may result in obesity which is associated with developing Type 2 Diabetes especially if the individual has a family history of diabetes.

The poor knowledge on risk factors may explain why there has been an increase in risky behaviours in Ghana over the years because the populace do not have an idea of the

implication of such acts on their health. Prevalence of negative lifestyle behaviours like alcohol consumption is reported to have increased over the years and also fewer people are reported to take the recommended amount of fruit and vegetables servings per day in 2008 as compared to 2003 (Tagoe and Dake, 2011).

The low knowledge on obesity (3.81%) as a risk factor for diabetes is worrying since 23% Ghanaian adults are reported to be overweight (Amoah, 2003). The rising prevalence of obesity has also been associated with increased risk of morbidity, disability and mortality in Ghana (Agyemang et al., 2009).

The study has showed that the people may not know that these risky behaviours predispose them to diabetes and other non-communicable diseases. Although the act of smoking is reported to have decreased over the years (Tagoe and Dake, 2011), people should be educated on the need to avoid smoking as only 13% of the respondents knew smoking as risk factor for diabetes.

5.3.3 Knowledge on signs and symptoms of diabetes

Only 33% of the respondents had good knowledge on the signs and symptoms of diabetes. This was similar to a finding by Maina et al., (2010) where 29% had good knowledge on the signs and symptoms of diabetes. Frequent urination, unexplained weight loss and excessive thirst were the most mentioned since these are easily seen and respondents may have experienced it or may have common across someone who was experiencing these and later diagnosed of diabetes. Few respondents stated sweet urine as a sign because they may have heard that people with diabetes urine taste sweet.

The significant gaps in knowledge of signs and symptoms could contribute to delayed presentation of diabetes in the community (Al-Khaldi, 2000) since the people might not be able to notice early symptoms because they do not know how the condition presents.

5.3.4 Perception on cure for diabetes

The perception of cure for diabetes in this study raises a serious concern in the country. More than half of the respondents (51.43%) in the study thought diabetes could be cured. This is a serious deficiency since there is no known cure for diabetes in the human population (ADA, 2007). This result was consistent to findings by Gulabani and colleagues (2008) where 50.5% of the respondents also thought that diabetes could be cured. 35.19% of persons with diabetes said it could be cured by traditional and medical treatment. It implies that these people are likely to be adding herbs to their medical treatment. They may also ignore their medical treatment totally for traditional treatment if they find that their medical regimen is not working. These individuals could also feel cured once the glucose is controlled for some time and may even stop adhering to their treatment regimen. This could result in complications as a result of poor glucose control. Education on the lack of cure for diabetes should be intensified since this would heighten the need to live healthy lifestyle to prevent a disease that has no cure. Education on this section should be mentioned to persons with diabetes in other to encourage them to adhere to their treatment regimen since education has showed a more effective self-care among persons with diabetes (Tham et al., 2004).

5.3.5 Knowledge on complications of diabetes

Respondents' poor performance on knowledge on diabetes-related complications draws attention to the need to increase awareness on this section. Cardiovascular diseases is the

major cause of morbidity and mortality among persons with diabetes (Gerstein, 2002), yet, only 15% of the respondents knew heart diseases as a complication of diabetes in this study. 12.16 % and 8.11% of the respondents reported amputation and kidney respectively as complications in diabetes. A study by Gulabani and colleagues (2008) in India recorded similar results with 57.4%, 4%, 26.7% reporting diabetic foot, cardiovascular disease and kidney disease respectively as diabetes-related complications. Amputation occurs every 30 seconds due to diabetes and diabetes is said to be the commonest cause of non-traumatic lower limb amputation (IDF, 2005). Eye disease (19.59%) was the commonest complication mentioned and this could be influenced by the 23.94% background retinopathy cases recorded among persons with diabetes in the district (Novo Nordisk, 2008). The respondents may have come across someone with diabetes and have eye problems as a result of that.

The poor knowledge on diabetes complications can result in low perceived severity of diabetes in the district and it may not encourage the people to make conscious effort to live healthy lifestyle towards prevention of the condition. Education on complications among persons with diabetes could help them adhere to their treatment regimen which will consequently help reduce morbidity and health cost (Hassan and Maracy, 2004).

5.3.4 Knowledge on prevention of diabetes

Only 47 (46.5%) correctly said that diabetes is preventable and this was consistent with a study where 41% were aware that diabetes could be prevented (Mohan et al., 2005). This reveals poor knowledge of primary prevention of diabetes that would help avoid the suffering and cost of treatment of a chronic disease. Less than half of the respondents knew that diabetes could be prevented by weight reduction, avoiding smoking, moderate

alcohol consumption and being physically active. Work by Tuomilehto et al., 2001 and Pan et al., 1997 has showed that Type 2 diabetes can be reduced by diet and physical exercise. The findings require that stringent measures should be put in place so that people engage in physical activity and eat healthy meals to reduce their risk of diabetes in the community.

5.4 Factors associated with knowledge on diabetes

The study showed that those living with diabetes and educated ones had good knowledge on diabetes. Educational level was positively associated with more knowledge on diabetes. The relationship between education and knowledge on diabetes has been observed in similar studies in Cameroon (Fezeu et al., 2010), Thailand (Pongmesa et al., 2009), Omani (Al Shafee et al., 2008), and Eastern Saudi Arabia (Aljoudi and Taha, 2009) where those with higher education had more knowledge on diabetes. The fact that respondents with higher level of education generally scored higher could mean they are able to read and understand materials on diabetes better or perhaps conduct their own research on the internet.

Knowledge on diabetes even among those with the condition was poor (56%) although living with diabetes was positively associated with knowledge on condition. This poor knowledge on diabetes among those with diabetes in this study is consistent with findings by other investigators. Dinesh et al., (2008) in a study in western Nepal, noted a lack of awareness of diabetes even in patients who had had the disease for a long time. The poor knowledge among people with diabetes may mean that the condition is not properly understood although they have been exposed to some level of education on the condition.

Sex was also not significantly associated with knowledge score in the study. This was consistent with studies by Gunay et al., 2006; and Yun et al., 2007. Both genders may not have had adequate education on diabetes in the district.

In this study, age was not associated with knowledge on diabetes. This was in agreement with several studies that found no association between age and knowledge of diabetes (Gunay et al., 2006; Yun et al., 2007 and Murugesan et al., 2007).

Having a family member or friend with diabetes was equally not significantly associated with knowledge on diabetes in this study. This is because current health practices in Ghana do not integrate family/friends in the management of clients. Clients and their relatives are not well informed about ones condition due to lack of time, inadequate health staff and lack of interest on the parts of patients/relatives on their health status.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study aimed at assessing the knowledge on diabetes among adults at Kwahu South District using a cross-sectional survey.

Generally, knowledge on diabetes in the study was poor (76% scoring below 50%). Even though most of the respondents had heard of the condition, they seemed to know very little about the; definition, risk factors, signs and symptoms, prevention and complications of diabetes. Majority of those who knew more on diabetes were those living with the condition and those with a higher educational level.

The lack of knowledge on diabetes could be a contributing factor that would increase the number of people living with diabetes in the country in the coming years. This is because people are less likely to engage in healthy practices that could prevent diabetes. Also, people may report late with diabetes-related complications since they know little of how the condition presents. A serious deficiency identified in the study was the fact that more than half of the respondents (51.43%) thought that diabetes could be cured (either by medical or traditional treatment) although there is no known cure for it.

The poor knowledge on diabetes in the district is attributed to low public education on the condition, illiteracy and poor quality of information available from media. Also, available information of the disease may be insufficient or complicated for the ordinary Ghanaian.

The findings of this study has brought to the fore the wide knowledge gap on diabetes among adults in the district. Immediate action is therefore required to provide the people with the necessary information to prevent its occurrence or delay the onset of complications among those with the condition.

6.2 Recommendations

The results of the study have revealed inadequate knowledge on diabetes among adults in the district. Considering the number of people projected to have the condition coupled with the poor knowledge on diabetes in the district, the following are recommended;

6.2.1 District Health Management Team

Community knowledge on diabetes is crucial to enable individuals take action to control the disease since the knowledge on the condition affects their attitude and uptake of health services, including health education (Baradaran and Knill Jones, 2004). Therefore, the district health management team should promote diabetes health education programs in all communities. The education should factor the differences that exist between communities, gender, age and regions. Efforts should be channelled to finding out barriers in the communities that promote negative lifestyle behaviour.

The findings of the study reflecting poor knowledge on diabetes among the respondents requires that diabetes educational materials and programmes in Ghana need to be looked at as most of the respondents first heard of diabetes either from television/radio or from the hospital. Methods of educating people on diabetes and way of making messages available to them should be critically evaluated. There should also be continuous monitoring of diabetes education program so that changes could be made over time to

suit the people. Diabetes education should be part of school health to increase the students/pupils awareness on the condition. This is important because knowledge and understanding of diabetes at such early years could influence their lifestyle towards prevention.

6.2.2 Hospital

Patient education on diabetes should be incorporated into the routine care of patients both in the hospital and in the community. Diabetes health education should not only be limited to diabetes clinic days so that the general population could benefit. Time must be allotted during health education sections to enable people ask mind-boggling questions on diabetes. Diabetes educators should ensure that people with diabetes are properly thought the principles and management of diabetes. Diabetes health education should also target health providers so they could provide accurate information to the populace. A good knowledge on diabetes among health providers will reflect in the quality of care rendered to those living with diabetes and those at risk. Because of the high illiteracy level in the country, TV/ Radio programmes should be developed for hospitals so clients watch/listen to them during their waiting hours at the hospital.

6.2.3 Media

Information provided by the media should be screened since majority of the people got to know of diabetes from television or radio. Diabetes Health talks on TV/Radio should be used as avenues to reach those who cannot read and write. Leaflet and pamphlets on diabetes should be developed and disseminated to the general public.

6.2.4 Further Research

This study has made contributions in the area of knowledge on diabetes in Ghana but the results may have been influenced by the study design therefore a different study design is recommended for future research. There should be research studies that would evaluate diabetes health education programmes in Ghana. Additional research should also attempt to explain the impact of knowledge on diabetes on the lifestyle of the people.

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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

KNOWLEDGE ON DIABETES AMONG ADULTS IN THE KWAHU SOUTH DISTRICT

QUESTIONNAIRE

INTRODUCTION

Please read carefully and indicate your answers in the provided boxes.

CODE.....
COMMUNITY.....

SECTION 1: DEMOGRAPHIC CHARACTERISTICS

1. Sex of Respondent ☐
   1. Male
   2. Female

2. Age of respondent (Completed years) ☐

3. Marital status ☐
   1. Single
   2. Married

4. Educational Level ☐
   1. None/Basic
   2. Senior Secondary
   3. Tertiary

5. Occupation ☐
   1. Employed
   2. Not employed

7. Do you know about diabetes?
   1. Yes (**If yes, move to 8**)
   2. No ☐

8. Where did you first hear about diabetes?
   1. Health facility ☐
   2. TV/radio ☐
   3. Poster/sticker/ leaflet/ Newspaper ☐
   4. Friend/relative ☐
   5. Church/mosque/ School ☐
   6. Other (specify).....

6. Religion ☐
   1. Christian
   2. Muslim
   3. Traditionalist/other

9. Do you have diabetes? ☐ 1. Yes (**If yes, move to 10**) 2. No (**If no, move to 11**) 11. Do you have a relative/friend with diabetes? ☐ 1. Yes 2. No 3. Do not know	10. How many years/months have you had diabetes? Number of years ☐ or Number of months ☐
GENERAL KNOWLEDGE ON DIABETES	
12. What is diabetes?	
13. What are some risk factors you think could contribute to the development of diabetes in people? (Tick all that apply(√)) 1 High intake of sugar ☐ 2. Age greater than 45 ☐ 3. Excessive alcohol consumption ☐ 4. Family history of diabetes ☐ 5. Not being physically active ☐ 6. Smoking ☐ 7. High intake of fat or cholesterol diet ☐ 8. Excess weight ☐ 9. Other (specify).....	14. Is Diabetes curable? ☐ 1. Yes (**If yes, move to 15**) 2. No (**If no, move to 16**) 3. Do not know 15. How can diabetes be cured? 1. Medical Treatment ☐ 2. Traditional Treatment ☐ 3. Medical and Traditional treatment ☐ 4. Other (specify).....

16. What are the signs and symptoms of diabetes? (Tick (√) all that apply)

- Excessive thirst ☐
- Tiredness and weakness ☐
- Frequent urination ☐
- Unexplained Weight loss ☐
- Headache ☐
- Wounds that heal very slowly ☐
- Blurred vision ☐
- Other (specify) .....

17. Can diabetes cause complications in other parts of the body? ☐

1. Yes
2. No
3. Do not know

If yes, give one (1) example

1.....

18. Can Diabetes be prevented? ☐

1. Yes **(If yes, move to 19)**
2. No

19. How can it be prevented? (Tick (√) all that apply)

1. Healthy diet ☐
2. Regular exercise ☐
3. Taking herbs ☐
4. Weight reduction ☐
5. Not smoking ☐
6. Moderate alcohol consumption ☐
7. Do not know ☐
8. Other (specify) .....

THANK YOU FOR YOUR TIME!