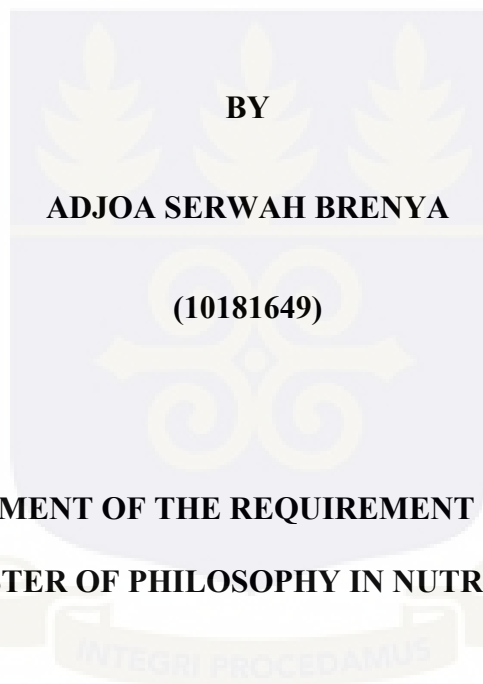


**ADHERENCE TO TREATMENT PROTOCOL AMONG DIABETICS AND THE  
IMPACT ON NUTRITIONAL STATUS**

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF  
MPHIL NUTRITION DEGREE**



**IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF  
MASTER OF PHILOSOPHY IN NUTRTION**

**JULY, 2013**

## DECLARATION

I, Adjoa Serwah Brenya do declare that with the exception of cited references all information in this document was produced by me through research under the supervision of Prof. Matilda Steiner-Asiedu and Dr. W.B. Owusu of the Department of Nutrition and Food Science, University of Ghana.

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## ABSTRACT

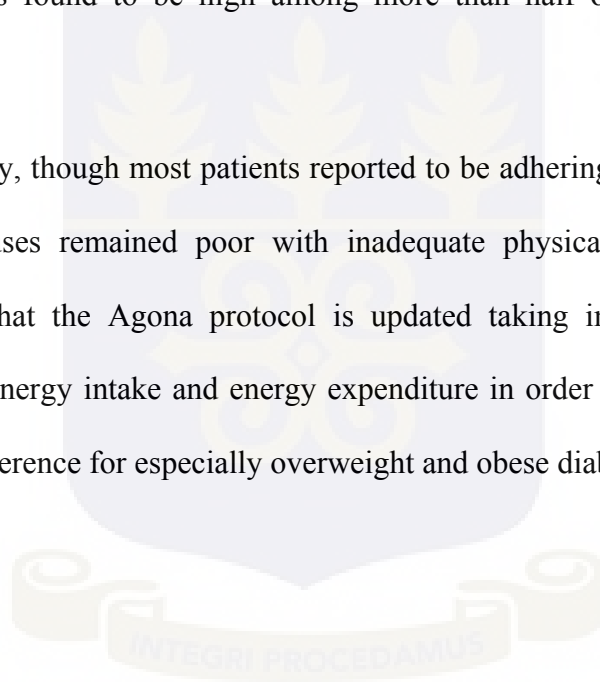
**Background:** Diabetes is a chronic disease and has been found to be the fourth or fifth leading cause of death in most developed, developing and newly industrialized countries. The growing middle class and ever changing lifestyle in developing countries have led to the rapid increase in the burden of diabetes (Type 2) even among the poor. The epidemiological trend has caught up with Ghana. Medical research has found that dietary treatment is the best control for type 2 diabetes. However, little is known about patients' adherence to treatment protocol and the management of the disease in Ghana.

**Aims:** This research therefore sought to identify and evaluate the nutritional management procedures for diabetics in the Agona Swedru municipal and to assess the adherence to treatment protocol by diabetic patients as well as the effect of adherence on their nutritional status.

**Methods:** There was an enquiry about the nutritional protocol for diabetics at the hospital and this was compared to the GHS protocol for evaluation. A total of 90 diabetics who were 40 years and older attending review at the Agona Swedru hospital were enrolled in the study. Questionnaire was used to collect data under the following sections; socio-demographic characteristics, nutritional knowledge, lifestyle practices, dietary habits and measurement. The data collected under the measurement section, represented the nutritional status of the diabetics. To describe the socio-demographic characteristics, descriptive analysis was employed, while all of the other various sections of the questionnaire were scored. Correlations were used to find out if the scores from nutritional knowledge, dietary and lifestyle practices had associations with the nutritional status score. Adherence was measured by looking at patients' scores on both their lifestyle and dietary habits. Person's correlation was used to find out if adherence had an association with nutritional status.

**Results:** The nutritional management procedures for the diabetics at Agona Swedru protocol was identified and found to be in need of updating as there were lapses when compared to the GHS protocol. More than half of the patients had a poor nutritional knowledge of diabetes though this did not have any association on nutritional status. More than half (82%) of total patients reported to be adhering to protocol; however more than half (71%) of total patients had poor nutritional status. Reported adherence for treatment did not improve the nutritional status of most of the diabetics in this study. Poor nutritional and health status was found to be high among more than half of sedentary group of patients.

**Conclusion:** Generally, though most patients reported to be adhering to standard protocol, their nutritional statuses remained poor with inadequate physical activity level. It is therefore important that the Agona protocol is updated taking into consideration, the association between energy intake and energy expenditure in order to cause some weight loss (10%) during adherence for especially overweight and obese diabetics.



**DEDICATION**

*To the Glory of the most High God.  
To my parents, Siblings and Husband  
You are my inspiration*



## **ACKNOWLEDGEMENT**

I thank the Almighty God for the opportunity and strength he gave me to undertake this project. My supervisors have been wonderful and have been of tremendous help to me. I could not have done this project without the guidance and support of Professor Matilda Steiner-Asiedu and Dr. W.B. Owusu. Special thanks also go to Dr. Ebo Daadzi and his entire diabetic unit staff at Agona Swedru Municipal hospital. I wish to express my gratitude also to Dr. Saalia (for his encouragement). Again I say a big thank you to my family for their support. I say God richly bless you all for your assistance during the execution of this project.



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## LIST OF ABBREVIATIONS AND ACRONYMS

ADA- American Diabetes Association

ASH- Agona Swedru Hospital

BMI- Body Mass Index

BP- Blood Pressure

CHD- Coronary Heart Disease

CM- Centimeter (s)

DALYs- Disability Adjusted Life Years

FAO- Food and Agriculture Organization of the United Nations

FBS- Fasting Blood Sugar

GHS- Ghana Health Service

GI- Glycaemic index

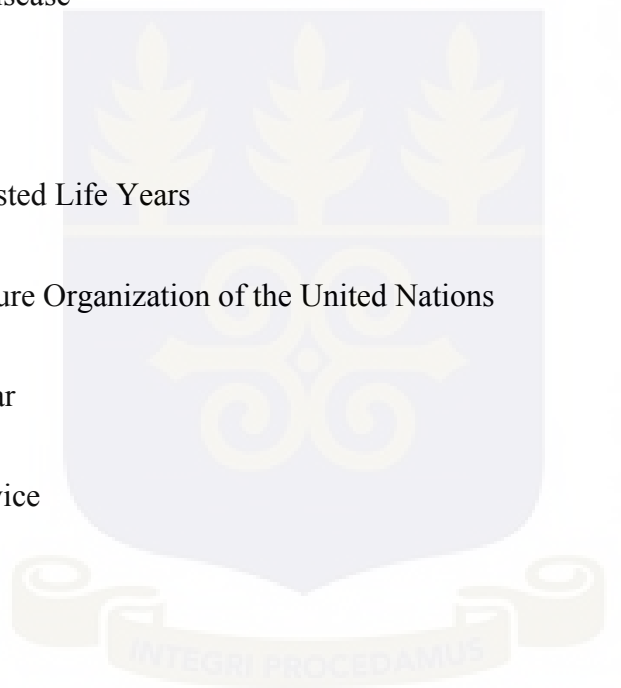
H- Hours

HbA1c -Glycated hemoglobin

IDF- International Diabetes Federation's Diabetes

IDDM- Insulin Dependent Diabetes Mellitus

KM- KILOMETER (s)



KG/M<sup>2</sup>-Kilometer per Meter Squared

LDL- Low Density Lipoprotein

LTPA- Leisure Time Physical Activity

M<sup>2</sup>- Meter (s) Squared

MG/DL- Milligram per Deciliter

MM Hg- Millimeters Mercury

MMOL/L- Millimol per Liter

NCDs- Non-Communicable Diseases

NICE- National Institute for Clinical Excellence

NIDDM- Non-Insulin Dependent Diabetes Mellitus

OR- Odds Ratio

SA- South Africa

SPSS- Statistical Package for the Social Sciences

SQ- Squared

T2D- Type 2 Diabetes

UK- United Kingdom

UKPDS- United Kingdom Prospective Diabetes Study

USDA- United States Dietary Allowance

WHO- World Health Organization



## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background information

Diabetes mellitus is the most common of the endocrine disorders in both developed and developing countries (Wild *et al*, 2004). Diabetes mellitus is defined by the World Health Organization as a metabolic disorder characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (WHO, 2004). The disease is due to the inability of the pancreas to secrete sufficient insulin for the metabolism of glucose (American Diabetes Association, 2004). This disturbance results in partial or complete inability of the body to utilize carbohydrate normally (Wild *et al*, 2000). The glucose which is not completely metabolized then accumulates in the blood stream, a condition known as hyperglycemia (American Diabetes Association, 2004).

Globally, diabetes represents the 3rd and 10th leading cause of loss of years of potential life among women and men, respectively (Hennis *et al*, 2006). In 2000, diabetes mellitus was the 3rd leading cause of mortality in the Caribbean region, accounting for approximately 10% of all deaths. Those aged 45-64 years are particularly affected (Mbanya and Ramiya, 2006). The global burden of disease study of the World Health Organization (WHO) estimated that about 177 million people (2%) in the world had diabetes in the year 2000 (WHO, 2003). In the second edition of the International Diabetes Federation's Diabetes Atlas, it is estimated that 194 million people had diabetes in the year 2003, and about two-thirds of these people lived in developing countries (IDF, 2003). By 2030, the number of people living with diabetes is expected to



increase to 440 million, 54% more than in 2010 (Winter and Yorston, 2011). Estimates suggested that the number of persons with diabetes reached 250 million in the year 2010 and will reach 300 million in the year 2025. This means that, for every two people with diabetes in 2010, there would be three in 2030. There will be a far greater increase in some of the world's poorest regions. In sub-Saharan Africa, for example, the expected increase is 98%, which means the number of people with diabetes there would double (Winter and Yorston, 2011).

There are two main types of Diabetes Mellitus; type 1 which occurs in young people under 40 years of ages who are usually underweight and type 2 which occurs in people over 40 years and are usually overweight and respond to dietary treatment ([www://en.wikipedia.org/wiki/Diabetes\\_management](http://en.wikipedia.org/wiki/Diabetes_management)). Approximately 90% of patients with diabetes are categorized as having type 2 diabetes and 10% are diagnosed with type 1 diabetes (Osei, 2003). Studies suggest that lifestyle modification at the stage of impaired fasting glycaemia or impaired glucose tolerance (i.e. pre-diabetes) may reduce the risk of developing diabetes by as much as 60% (Hennis *et al*, 2006). Achieving diabetes control is therefore eminently possible through lifestyle change and therapeutic interventions.

Type 2 diabetes (T2D) is the commonest form of diabetes world-wide having its main causes derived from aging and urbanization which has resulted in changes in diets and decreased physical activity (Spollett 2006 and Wild *et al*, 2000). While family history is also a risk factor for T2D, this type most often occurs in people who are overweight or obese, and who engage in little or no physical activity ([www.graphic.com.gh/](http://www.graphic.com.gh/)). The presence of coronary artery disease

and/or hypertension (blood pressure  $\geq 140/90$  mm Hg) is also another risk factor. So is it also with a prior gestational diabetes or history of delivering a baby  $>4$  kg (Spollett, 2006).

The symptoms of marked hyperglycaemia include polyuria, polydipsia, weight loss which may sometimes be associated with polyphagia and blurred vision (Young and Mustard, 2001). Diabetes is a major health problem which causes early death and prolonged ill health from severe health complications such as heart, kidney and eye disease (Young and Mustard, 2001). T2D is commonly associated with raised blood pressure, a disturbance of blood lipid levels (NICE, 2008). Complications of T2D have been found to set in long before clinical manifestation of the disease (Young and Mustard, 2001). The onset of complications of diabetes mellitus can be reduced if the diagnosis is made early and appropriate treatment is commenced promptly. T2D has a serious impact on those affected and their families, hence the need for early detection and prompt and adequate management. Early detection can be enhanced by screening people for the disease on an incidental basis when consulting for other reasons. The glucometer has been found to have a precision similar to that of routine laboratory systems (Ajala *et al*, 2003). In addition, an estimation of fasting blood glucose alone has been found to be adequate for diabetes screening (Amoah, 2002). American Diabetes Association (ADA) defines fasting blood sugar as no caloric intake for at least 8 hours (Moebus *et al*, 2011). The normal value should be  $<126$  mg/dL ( $<7.0$  mmol/L) (International Diabetes Federation, 2005).

T2D is considered largely preventable and can be controlled (Wojtaszewski *et al*, 2000). Medical research has found that dietary treatment is the best control for T2D and it is in fact the cornerstone of the management of the disease (Hennis *et al*, 2006). This is based on the fact that

the body is unable to metabolize glucose properly. Since adequate nutritional knowledge is a necessary step in improving dietary behaviour, the nutritional knowledge of the patients, the dietary counseling given to diabetics from health facilities as well as their adherence to regimen (practices) are critical in the management of diabetes. There is the need to therefore carry out this extensive study and find out how adherence to nutritional management protocol affects the health statuses of diabetics.

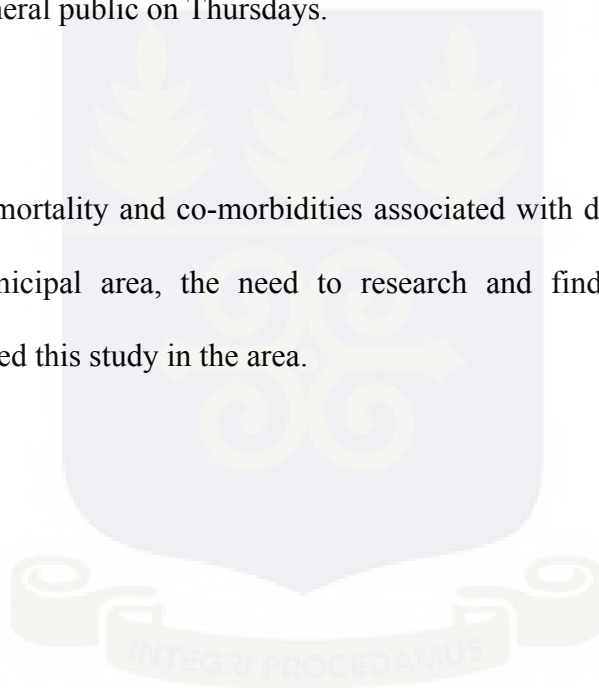
## **1. 2 Rationale of Study**

Diabetes remains a public health concern for health service providers. Previously diabetes was not given much attention, as the disease was noted to affect the wealthy. Over the past half-century, it has become abundantly clear that one of the major medical problems facing the modern world is diabetes mellitus. The growing middle class and ever changing lifestyle in developing countries have led to the rapid increase in the burden of T2D even among the poor; the epidemiological trend has caught up with Ghana.

Amoah, (2003) have reported a high rate of 6.3 percent of T2D in urban Ghana. The prevalence rate of T2D in the Agona West Municipal, for the year 2009 was 64%. According to the 2009 Annual Report of the Municipal Health Directorate, T2D had increased compared to the previous years and is a source of worry for the municipality (Adjetey *et al*, 2009) (unpublished data). There is therefore the likelihood of future increases of the disease burden in the district if no intervention is implemented. The District annual health reports for diabetes cases showed a rise in trend with time. In 2003, 110 cases of diabetes were recorded in the District. This increased to 127 cases in 2004. A continuum of increases occurred from 215 cases in 2005 to 258 cases in

2007 and 404 cases in 2008. In this district, this disease is among the leading causes of morbidities and accounts for about 20% of deaths since 2005. It is therefore necessary to assess the management protocol put in place for people attending diabetic clinic in this district and to elucidate if the protocol agrees with standards set by the Ghana Health Service, and the challenges faced by patients to adhering to the management protocol. Furthermore little is known about the patients' knowledge and lifestyle behaviors as diabetics and how this disease is managed at the Agona Swedru municipal hospital, the only hospital in the district which runs a diabetic clinic for the general public on Thursdays.

In view of the fact that mortality and co-morbidities associated with diabetes are on the rise in the Agona Swedru municipal area, the need to research and find some solutions to the observations, has prompted this study in the area.

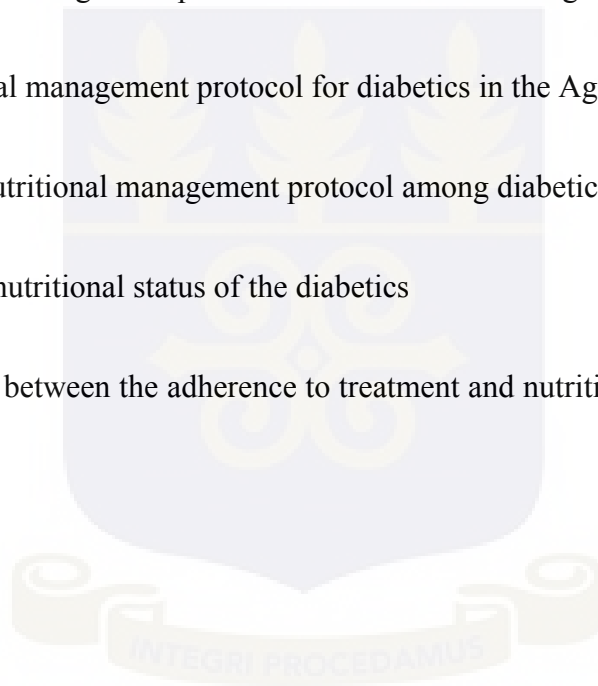


### **1.3 Aim**

To identify and evaluate the nutritional management procedures for diabetics in the Agona Swedru municipal hospital and to assess the adherence to treatment protocol by diabetic patients as well as the effect of adherence on their nutritional/health status

#### **1.3.1 Specific Objectives were to:**

1. Identify the nutritional management protocol for diabetics in the Agona Swedru hospital
2. Evaluate the nutritional management protocol for diabetics in the Agona Swedru hospital
3. Assess adherence to nutritional management protocol among diabetics
4. Assess the health and nutritional status of the diabetics
5. Assess the association between the adherence to treatment and nutritional status (BP, FBS and BMI) of diabetes



## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Epidemiology of Diabetes in Ghana

There is a recognized trend of increasing prevalence of diabetes worldwide (King and Rewers, 1993 and Amos *et al*, 1997). The WHO has cited that the greatest increase in the prevalence of T2D is expected from developing countries as a direct result of increasing urbanization (Unwin *et al*, 2001 and WHO, 2003). A review of studies on the prevalence of diabetes in adults in Africa by Unwin *et al*, (2001), demonstrated a rising prevalence across the continent. This is made evident with prevalence rates ranging from 0.7% in Cameroon to 8.8% in South Africa among rural dwellers, and from 1.7% in Cameroon to 10.4 in Sudan among urban dwellers. In a recent review among Ghanaians and Nigerians, diabetes seemed rare in urban Ghana in 1963 (0.2%) and in urban Nigeria in 1985 (1.65%). However, in 1998, the prevalence of diabetes among Ghanaians was 6.3% and 6.8% among Nigerians (Agyemang *et al.*, 2009). It is therefore important to then take a look at the risk factors associated with these rise in prevalence.

#### 2.2 Risk Factors of Diabetes

##### 2.2.1 Race/Ethnicity

High prevalence of diabetes is associated with race or ethnicity especially among persons of Asian and African descent. Populations of African descent have an increased risk of T2D compared with their European counterparts. In the Health Survey for England, the age-standardized risk ratio for diabetes was 2.5 for African Caribbean men and 4.2 for African Caribbean women (Erens *et al* 1999). According to Diabetes UK, estimates for prevalence rates

indicated that 17% of the African Caribbean community in the UK had T2D compared with 3% of the UK general population (Harwood *et al*, 2004)). The Dutch data also showed a higher prevalence of T2D in African Surinamese (12.7%) than in the White- Dutch group (6.8%) (Michels *et al*, 2008). The difference was more pronounced in the older age group.

### 2.2.2 Age and Sex

Prevalence of T2D increases with age (Wild *et al*, 2004). T2D is a disease that appears at any age from infancy to adulthood, but 80% of cases occur after the age of 50 years and the highest incidence of new patients is in the 60-70 year group (Spollett, 2006). Principally it is a disease of the middle-aged and the elderly (Hennis *et al*, 2006). The incidence of T2D increases with age in both males and females (American Diabetes Association, 2005). A peak at about 45-55 years and thereafter a decline has been noted among Pima Indians (Drug Info Committee, 1990).

The incidence may vary between the sexes from one population to another, but in general men and women are afflicted equally (American Diabetes Association, 2005 and Spollett, 2006). Sex-related differences in lifestyle may lead to differences in the risk of developing T2D and, in consequence, to differences in the prevalence of this condition in women and men (BeLue *et al*, 2009). However, the relationship between a known risk factor for T2D such as obesity and the development of symptomatic T2D may not be simple. For example, in many countries of sub-Saharan Africa, women are more likely to be obese or overweight than men and might therefore be expected to have higher prevalence of T2D (BeLue *et al*, 2009 and Imoisili and Sumner, 2009). Compared with the corresponding men, women in Cameroon (Mbanya *et al*, 1997) and

Uganda (Lasky *et al*, 2002) were indeed found to have higher prevalence of T2D. However, women in Ghana, (Amoah *et al*, 2002) Nigeria, (Ejim *et al*, 2011) and Sierra Leone (Ceesay *et al*, 1997) were found to have lower prevalence of T2D than the men in the same study areas. No significant differences between men and women in the prevalence of T2D were detected in studies in Guinea (Baldé *et al*, 2007), Sudan (Elbagir *et al*, 1996) and urban areas of the United Republic of Tanzania (Njelekela *et al*, 2009) or in a meta-analysis of data collected in several studies in West Africa (Abubakari *et al*, 2009). Although wide variations in the distribution of T2D by sex have been documented in several review articles (BeLue *et al*, 2009, Tuei *et al*, 2010, Gill *et al*, 2009, Imoisili *et al*, 2009 and Mbanya *et al*, 2010) the possible causes of this heterogeneity have never been examined in detail.

### 2.2.3 Body Size

Body mass index (BMI) has also been shown to have an important correlation with diabetes, blood pressure and hypertension prevalence. A BMI greater than  $28\text{kg/m}^2$  in adults, is associated with a three to four-fold greater risk of morbidity due to T2D and cardiovascular diseases than in the general population (Scottish Intercollegiate Guidelines Network, 2007). Data from the Nurses' Health Study indicates that the risk of T2D increases progressively from a BMI of  $> 20\text{kg/m}^2$  (Gillett *et al*, 2012). Obesity is highly prevalent among populations of African descent in Europe, particularly among women. In Signorello and colleagues' study (2007), the excess risk of T2D in African Americans relative to White Americans increased with increasing level of obesity, particularly for African American women. In a study by Roberta *et al* (2008), more than 25% of women are overweight and obese nearly double the number of underweight women



(13.9%), and in Ghana's largest city, the Accra Women's Health Study reported that more than 70% of women were overweight or obese (Biritwum *et al*, 2005).

Obesity is an important contributing factor to increased insulin concentrations and decreased insulin sensitivity. Insulin resistance has been found to be higher in African Caribbean than in Whites (Zoratti *et al*, 2000). Insulin resistance has been shown to increase the risk of both T2D (Steinberger *et al*, 2003) and cardiovascular diseases in adults. Data from the Framingham study have established an increased incidence of cardiovascular events with increasing weight in both men and women (Steinberger *et al*, 2003). Body weight and mortality were directly related in the Harvard Alumni Health Study and weight gain was a significant risk factor for development of T2D in women (Lee *et al*, 1993). Studies in obese adults have shown sustained improvement in cardiovascular risk in association with a 10% to 15% weight loss maintained over time (Wing and Jeffery, 1995).

The relationship between average weight of a population and the prevalence of the disease was shown many years ago in cross-sectional studies in Pima Indians of Arizona and Nauru Micronesians. In this study a strong relationship was found to exist between obesity and T2D with a high prevalence of 30-50% (Knowler *et al*, 2002). Changes in lifestyle between rural and urban regions include a number of factors favouring the development of obesity and thus T2D. These factors comprise a reduction in energy expenditure, intake of high energy, low fibre diets containing saturated fat and refined carbohydrates (Popkin, 1999 and Steyn *et al.*, 2001). The influence of these factors varies from population to population depending on different degree of genetic susceptibility. At present the strongest precipitating factor is adiposity, whether

abdominally localized or not (Baridalyne *et al.*, 2003). Where traditional rural models of life, diet and physical activity persists, for example in Wallis island, the prevalence of diabetes is low (1.9% in men and 3.5% in women) compared to the crude prevalence figure of 24% of T2D in Nauru (Taylor *et al.*, 1993). Sufficient physical activity was defined as at least 150 minutes per week of walking, moderate activity or vigorous activity (Frantz *et al.*, 2003).

#### **2.2.4 Genetics**

Genetic researchers have been trying to find precise locations on the chromosomes for numerous gene variations that make people susceptible to diabetes (Leahy, 2005). Whilst there is a hereditary factor at work in diabetes, it is still possible to have the condition and have no family history of it. However, it's not enough just to have the genes. People also need to come into contact with environmental triggers that push the action of the genes one way or another. With T2D lifestyle factors such as being physically active and eating a healthy balance diet can significantly reduce the risk of developing the condition (Leahy, 2005).

#### **2.2.5 Sedentary Lifestyle, Obesity and High Blood Pressure**

Physical activity may reduce risk for diabetes. Studies among people from different racial and ethnic backgrounds in US, China and Finland, with impaired glucose tolerance showed a decrease in the incidence of diabetes as a result of interventions that included physical activity (Kriska *et al.*, 2008). Total sedentary time is associated with obesity, abnormal glucose metabolism and the metabolic syndrome (Healy *et al.*, 2008). Growing evidence shows that sitting for long hours leads to risk factors for chronic diseases as well as premature death.

Information from the 2001 community health needs assessment shows that poor nutrition and lack of physical activity are responsible for an estimated 300 000 to 600 000 preventable deaths each year (Cavill *et al*, 2006). The association between sitting for long hours and risk for chronic diseases has been consistent in women (Thorp *et al*, 2010).

Sitting time is an independent risk factor for obesity (Thorp *et al*, 2010). Authors of a recent prospective study among Australian women reported that sitting time was a significant predictor of weight gain (Owen *et al*, 2009). In another prospective study among women, Hu *et al*, (2003) recorded 7.5% obesity prevalence after six years of follow-up. Watching TV (which involves sitting) was associated with obesity and risk for diabetes. Consequently, the authors emphasize the need to reduce prolonged sedentary behavior. For sedentary work, occupational sitting time, overweight and obesity were investigated among Australian workers by Mummery *et al*, (2005). Occupational sitting time was found to be independently associated with overweight and obesity in men who worked full-time. After adjusting for age, occupation and physical activity, the OR for overweight and obesity ( $BMI \geq 25 \text{ kg/m}^2$ ) was 1.92 in men who reported sitting for more than 6 hours daily compared to men who sat for less than 45 minutes daily (Mummery *et al*, 2005).

Sugiyama *et al*, (2008) in their investigation of how a combination of multiple leisure-time sedentary behaviors and physical activity may contribute to obesity, found that odds of being overweight or obese was higher ( $OR=1.54$ ) in participants who had low sedentary time and sufficient physical activity and 1.55 for participants who had high sedentary time and insufficient physical activity. The researchers concluded that, reducing leisure-time sedentary behavior may be as beneficial as increasing physical activity in fighting the obesity epidemic.

Physical activity and sedentary behavior are independently associated with blood glucose in adults without known diabetes (Healy *et al*, 2008). Breaks in sedentary lifestyle were investigated by Healy *et al*, (2008). The authors found that independent of total sedentary time, interruptions in sedentary time with physical activity was beneficially associated with metabolic variables particularly adiposity measures, triglycerides and 2-h plasma glucose. In another study (Healy *et al*, 2007) that included 67 and 106 healthy men and women, sedentary time was positively associated with 2-h plasma glucose. However, light and moderate intensity times were negatively linked.

In a study by Kriska *et al*, (2008) that involved black women, brisk walking for at least 150 minutes per week was associated with reduced T2D risk. Weight loss and exercise may reduce insulin resistance. This enables the reduction of risk of developing CHD among others in diabetics. Sundquist *et al*, (2005) conducted a longitudinal study in 1988 and 1989 among the Swedish population. A national random sample of men and women aged 35-74 years old were interviewed and followed for 12 years. The researchers found that when Leisure Time Physical Activity (LTPA) directly increased, the risk of Coronary Heart Disease (CHD) decreased.

In a high risk population of 1728 Pima individuals aged 15-59 years old, Kriska *et al*, (2008), studied the relationship between obesity, physical activity and the development of T2D. After six years of follow-up, 346 participants developed diabetes. Adjusting for age, the researchers found that total activity was related to diabetes. After adjusting for BMI, the relationship was weakened. When age-adjusted incidence diabetes was examined by levels of activity stratified by

tertiles of BMI, the incidence rate was lower in more active participants than the less active participants with the exception of the middle BMI tertile group. The findings of this study suggest that engaging in physical activity could reduce risk for T2D. Dunstan *et al*, (2004) also examined physical activity and television viewing in relation to risk of undiagnosed abnormal glucose metabolism in adults. Men and women who engaged in LTPA were at about 40% and 30% reduced risk of having abnormal glucose metabolism than the sedentary. Watching television for fourteen or more hours per week was associated with increased risk for T2D.

Among South Africans, available data shows that women who did not complete their schooling, as well as the elderly are less likely to engage in physical activity. In urban communities of Western Cape, 30-40 percent of women reported low levels of activity at work and leisure (Kruger *et al*, 2005). In the study, men were more physically active than women. High levels of Low Density Lipoprotein (LDL), High Blood Pressure (HBP) and total serum cholesterol were most common in the inactive. Inactivity in the peri-urban area was associated with diabetes mellitus. Physical activity index was inversely associated with BMI among African women in the North West province of South Africa (SA).

## **2.3 The Management of Diabetes**

### **2.3.1. Nutrition Knowledge and Health Awareness of Diabetes management**

Few studies have examined the average patient's nutritional knowledge. In a study conducted in the USA by Larzelere and Patterson (2005), only 28% of the 232 patients involved could correctly answer 80% or more of questions administered. Between 40 to 50% of the participants could answer at least 40% of the questions. Only two out of the total of 24 questions could be answered by over 80% of respondents; the first asked question was to identify the food highest in cholesterol from a list of four foods (bacon, banana, oatmeal, Popsicle) to which 85% of the sample responded correctly. The second asked question was relative healthiness of animal fat versus vegetable fat (83% of sample responded correctly); only one participant achieved a perfect score on the measure. Although the literature investigating American's knowledge of general nutrition is sparse, studies related to particular aspects of nutrition have been conducted (Cotugna *et al*, 1992). Existing research shows that large percentage of Americans have a firm grasp on knowledge of basic nutrition such as the fact that nutrition has a long and short term effects on the health and knowing that intake of fat and salt is related to various heart and arterial problems (Wunderlick, 1999).

A group of people have documented significant differences in nutritional knowledge. Nutritional knowledge increases with education (Cremer and Kessler, 1992) and socioeconomic status (Bruttis, 1997). However, even physicians, nurses and nurse-practitioners (presumably among the highest in education and socioeconomic status) have been shown to have deficits in nutritional knowledge (Temple, 1999). In the study conducted by Larzelere and Patterson, (2005) on the nutritional knowledge of health care givers, only 13% of physicians believed they

possessed adequate nutritional knowledge and skills to effectively counsel their patients on matters of nutrition. A majority of physicians (80%) believed that they should be giving more nutritional counseling than they did now.

Some studies have examined the average patient's nutritional knowledge and practices. Among these studies, nutritional knowledge has been reported to be lower than desired. For example, the Larzelere and Patterson, (2005) survey study revealed that most patients given written nutritional information did not fully understand the presented materials and proposed that nutrition counseling be given a higher priority in the care of patients with diabetes. It has also been shown that women usually outperform men on test of nutritional knowledge (Bruttis, 1997). The relationship of age to nutritional knowledge has varied across studies (Shikani and White, 2000) although generally, middle aged adults perform better on tests of nutritional knowledge than those who are older and younger (Shikani and White, 2000).

One difficulty in discussing the nutritional knowledge of patients is the lack of a standard nutrition questionnaire. Most of the instruments developed to examine nutritional knowledge have not been validated (Steenhuis *et al*, 1996), they only test a particular sub topic within the field of nutrition (i.e. Knowledge of food fat content, fibre and cholesterol) (Resnicow *et al*, 1997). Many questionnaires have been developed for international populations and thus employ questions about food items or terms not common in the American South (Hawkes and Norvak, 1998). An example is the '2011 IFIC Foundation Food & Health Survey done by the International Food Information Council Foundation' (Edge *et al*, 2011). Other questionnaires appear to have a reading level too advanced for the local population (Hansbro *et al*, 1997).

Additionally, issues in the development of current questionnaire have been focused on nutritional information likely to be related to dietary advice given by dieticians in the management of diabetes. Limiting calories and fat to achieve a 5-10% weight loss, consuming less salt and watching how many carbohydrates are eaten are all important in the nutritional management of T2D (Mahan *et al*, 2004).

### **2.3.2 Dietary Management of Diabetes**

The importance of diet in the management of diabetes is well recognized, yet many do not follow their diets (Centers for Disease Control and Prevention, 2011). Over the last 10 years several assessments of health care services for diabetes have been done, particularly in South Africa (Whiting *et al*, 2003). The findings from these studies were as follows: patients' attendance were poor; consultation times were short resulting in little or no time for patient education, staffing levels were inadequate, staff were poorly or inadequately trained, or both, and there existed hardly any continuous education programmes, monitoring and evaluation of complications of diabetes were lacking, the control of blood glucose and blood pressure was poor and inadequate, referral systems were almost nonexistent, education of people with diabetes was lacking, overall organization of the clinics was not satisfactory, record keeping was poor, even if treatment guidelines were available, they were hardly used and were not up to date and health care systems in Sub-Saharan Africa varied widely (Mbanya and Ramiaya, 2006).

Charles and Clark, (1998) studied the reasons for poor control in a group of diabetic patients and concluded that ineffective dietary therapy was responsible in most cases. Coulter and Ellins (2006) studying dietary policy and management in British diabetic clinics showed that there was



great variation in the view of the ideal dietary policy for diabetics and in the best way of helping patients it was to follow the prescribed regimen.

In a study at a London teaching hospital by Eakin *et al*, (2002), the food intake of over hundred well established insulin dependent diabetics of varying duration were ascertained by a dietary diary method. It was observed that on the average, carbohydrate consumption was approximately 26% in excess of prescription. This observation indicated that the patients were not adhering to their diet prescription. In trying to provide evidence to the effect that diabetics do not adhere to their dietary advice in British diabetic clinics, (NICE, 2008) carried out a week's weighed food intake of 63 diabetics. They found that less than one-third of them ate within 10% of their prescribed diet.

Strict adherence to dietary prescription, self-discipline as well as honesty go a long way in making the patient lead a normal healthy life (American Diabetes Association, 2006). The study reported that some patients who could not keep to the dietary regimen resorted to telling lies to the doctor when their conditions did not improve or started to get worse. Surveys show that many people with diabetes are not on modified diets and many more do not follow the diets they have been given. This is because in a number of instances, instructions have been given inadequately or the individuals' dietary pattern has not been considered (American Diabetes Association, 2004)

### 2.3.3 Nutritional and Dietary Habits management

The normal diet of a diabetic patient is one consisting of sufficient energy for activity and the maintenance of ideal body weight. It should be adequate in carbohydrate, protein, fat, minerals and vitamins. The planning of any diet however requires consideration of general but important factors such as emotional, social, economic and cultural factors. These factors influence the formation of food habits or the formation of dietary pattern. The food habit of an individual is thus defined as the culturally standardized set of behavior with regard to food, manifested by individuals who have been reared with a given cultural condition (Karmeen and Kulkarni, 2004).

Nutritional status on the other hand is an indication of a short-term or long term food intake and the utilization of the available nutrients (Mahan *et al*, 2004). A diabetic's food habit therefore gives an idea of his nutritional status and thus effect on his health status (fasting blood glucose and blood pressure).

Customs and social pressure normally determine when and how food is eaten and what is eaten. Advertisements as well as socio-economic status of the people are also contributing factors to what people eat (Marion, 1990). Food marketing to children and adolescents is a big business. The Federal Trade Commission (FTC) estimated that, in 2006, food, beverage, and quick-serve restaurant companies would spend more than \$1.6 billion to promote their products to young people (Federal Trade Commission, 2008). Children and adolescents are an important demographic for marketers for several reasons as they are customers themselves, they influence purchases made by parents and caregivers; and they are also the future adult market (Escobar-Chaves and Anderson, 2008).

For many years, public health experts and others have argued that the marketing of energy-dense, low-nutrient food products to children and adolescents is one of many factors contributing to the obesity epidemic. While a causal link between marketing and increasing childhood obesity rates has yet to be firmly established (Institute Of Medicine, 2006), research indicates that advertising can have a strong influence on children. Young children in particular have difficulty distinguishing between television programming content and advertising, or comprehending the purpose of advertising (Institute Of Medicine, 2006). Older children, and even adults, are influenced by advertising too.

The marketing of food products has a powerful tool to drive the purchase of healthy products and to communicate important information about healthy eating choices. For example, one study found that children ages 3years to 5years preferred the taste of the same foods if they thought they were from McDonald's, rather than another source (Robinson *et al*, 2007). Key actors from food and beverage companies, to restaurants, food retailers, trade associations, the media, government and others all have an important role to play in creating a food marketing environment that supports, rather than undermines, the efforts of parents and other caregivers to encourage healthy eating among children and prevent obesity.

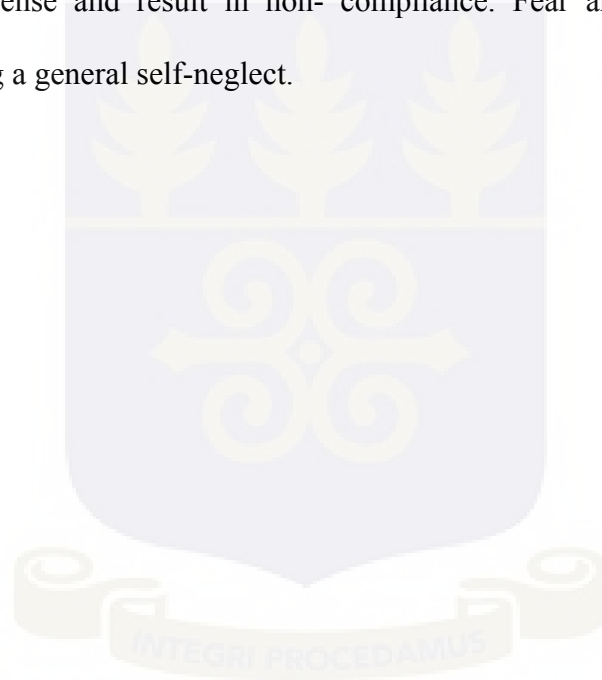
For socioeconomic factor influencing what one eats, among adults, obesity rates are sometimes associated with lower incomes, particularly among women. Women with higher incomes tend to have lower BMI, and the opposite is true, those with higher BMI have lower incomes (Chang and Lauderdale, 2005) A study in the early 2000s found that about 38% of non-Hispanic white women who qualified for the Supplemental Nutrition Assistance Program (known then as food

stamps), were obese, and about 26% of those above 350% of the poverty line were obese (Ogden *et al*, 2007).

Another recent study of American adults found lower rates of obesity among individuals with more education (Gannon and Nuttall, 2006). Specifically, the study found that nearly 35% of adults with less than a high school degree were obese, compared to 21% of those with a bachelor's degree or higher. A diet prescription is useless if the patient cannot afford to buy the suggested foods (Gannon and Nuttall, 2006). Studies made by the United States Department of Agriculture (Tabatabai, 1993) showed that nutritional adequacy of household diets in the United States is solely dependent on the size of the income. Allen *et al*, (2001) in 25 years of studies of dietary change in Sirbu Province, Papua-New Guinea, found out that with more money could buy protein rich foods. People therefore tend to eat foods that are readily available and affordable.

Religious and other beliefs (superstition) have a powerful influence over what food is considered permissible and because beliefs tend to be strict and lasting, they have an important influence on the people's nutrition (McLaren, 1992). Consumption of certain foods may symbolize past major events in the history of religion. A case example is the Braham people of India who are vegetarians by virtue of their philosophical and religious beliefs. They would fast rather than touch cows which throng their towns and villages (Reddy *et al*, 2002). Food pattern is important with preference for small more frequent meals than large infrequent meals being an advantage (Snitker *et al*, 1997). To the adherent of any religion therefore, the prescriptions regarding food and eating practices have deep meaning and have great influence and acceptability.

The growing independence, increased participation in social life and general busy schedules of people also influence people's eating habits. Physical disabilities and varying degrees of visual impairment can hinder the preparation of food and force the elderly to rely on ready-to-eat foods (pies, cakes, doughnuts etc.) if support services are not available. This elderly diabetic patient becomes apathetic (often aggravated by poor nutrition and reluctance to prepare meals and losing the ability to prepare meals for themselves (WHO, 2003). According to Kesson (1990), inappropriate dietary advice is invasive since it can disrupt the routines of the diabetic patient and cause needless expense and result in non-compliance. Fear and loneliness can affect compliance by producing a general self-neglect.



## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 Study design and setting**

The study was a hospital-based cross-sectional study of diabetic patients attending clinic for review. This hospital was chosen because it is the only facility in the Agona West district that runs diabetic clinics for a large number of patients coming from all over the district.

Swedru is the District Capital of the Agona Swedru district which is a major commercial centre in the region. The Agona District can be found in the eastern portion of the Central Region. It has a total land area of 540-sq. km. and a population of 160,000. The district is divided into eleven zones. The area is bounded to the East and West by Awutu/Effutu/Senya and Asikum/Odoben/Brakwa districts respectively. The district shares a border to the northeast with Akim West District, to the northwest with Brim-South District and to the South, with Gomaa District. It lies to the north of Winneba and is about 40 km. off the main Accra-Takoradi highway. The location of the township makes it the commercial centre of the region and a nodal point from which roads radiate to the rich cocoa growing countryside of the Region ([www.wikipedia.org/wiki/Agona\\_West\\_Municipal\\_District](http://www.wikipedia.org/wiki/Agona_West_Municipal_District)).

### **3.2 Ethical Clearance**

The study was approved by the Institutional Review Board (IRB) of the Noguchi Memorial Institute for Medical Research (NMIMR), University of Ghana. Informed consent was obtained from the District Health Management Team and the Medical Superintendent at Agona Swedru for the study. Informed consent was obtained from participants before enrolling them into the study. The diabetics who were unwilling to participate in the study were excluded.

### **3.3 Study population, sample size and sampling**

The criteria for inclusion in this study was being a male and female diabetic patient aged 40 years and above and attending diabetic clinic for review. The patients from this age group attending review on visiting diabetic days (Thursdays) at the Swedru Municipal hospital were selected for the study. The sample size was ninety diabetics > 40 years. The criterions for exclusion were being a pregnant woman and a non-diabetic.

### **3.4. Data Collection**

This involved collecting information on the diabetes management protocol from the Agona Swedru Municipal hospital and a questionnaire was used to solicit information from diabetic patients and anthropometric measurement of participants was also taken.

### **3.4.1 Diabetic management protocol**

An enquiry was made at the Agona Swedru Municipal hospital about the nutritional management protocol that diabetic patients were supposed to follow from the health personnel in charge of the diabetic unit. The Health Care Provider in charge of the diabetic clinic was interviewed one on one on their nutritional management protocol as there was no documented protocol that patients were supposed to follow. The protocol was documented. The various components of the nutritional management protocol collected from Agona Swedru were compared to the Ghana Health Service (GHS) standard protocol (Appendix I).

### **3.4.2 Socio-Demographic Information**

A pretested questionnaire was used to collect background information on socio-demographic characteristics. Data included age, sex, marital status, level of education and work status. Clinical observations made on the eyes, skin and feet of diabetics by the doctor or nurse were recorded.

### **3.4.3 Knowledge and Lifestyle practices**

Participants' knowledge and lifestyle practices were also examined. For knowledge on diabetes they were required to show or indicate by a yes and no response whether or not they had heard or knew what diabetes was. For example, if participants knew that diabetes was a sugar disease and could list foods that were good and bad for diabetics, they were considered to have an idea about the disease. In order not to give clues on knowledge of diabetes, open-ended questions were asked. For lifestyle practices associated with diabetes, they were required to also indicate by a yes or no response whether they were into certain lifestyles and practices. For example, if



participants were not smoking, not drinking alcohol and exercising regularly, they were considered as adopting a good lifestyle practice.

### **3.4.4 Assessment of Nutritional status**

#### **3.4.4.1. Dietary Assessment**

Food intake patterns/ dietary habits of diabetics were assessed. This part of the questionnaire helped ascertain the frequency and the kind of food groups eaten in a week. The food groups were made up of carbohydrates, proteins, fats and oils.

#### **3.4.4.2. Anthropometric Measurement:**

This involved height and weight: measurements which were then used to determine the BMI.

- (a) **Weight:** The weights of subjects were taken using the seca scale (GL-D1K1 model). The subjects were made to remove any heavy clothing, jewelry and footwear after which the subject stood on the scale and the displayed weight was recorded to the nearest 0.1kg.
- (b) **Height:** A portstad portable stadiometer was used for measuring the height of bare footed subjects. With the subjects' feet slightly apart, arms relaxed by sides while looking straight ahead so that his or her eyes and ears were in parallel horizontal plane, the pointer of the stadiometer was placed on the crown of the head of the subject to take the reading on the pointer. Readings were taken to the nearest 0.1cm.

#### **3.4.4.3. Biochemical test:**

This involved biochemical test on blood. All diabetics included in the study were tested for their blood sugar before meals (Fasting Blood Sugar) which was done using the blood glucose meter (On Call® Plus Blood Glucose Meter) and test strip. The test was carried out in a government accredited hospital (Agona Swedru Municipal Hospital) by qualified laboratory technicians who followed the user's manual that come along with the test kit as shown below. The results of these tests were recorded as secondary data for this study.

#### **To determine the Fasting Blood Sugar (FBS) from the user's manual;**

*Preparation of subject for FBS test:-* The hands of the subject was thoroughly washed with warm water and soap to rinse off any bacteria, lotion, oils or other contaminants from the skin. The area of the skin to be punctured was further cleansed with a piece of cotton wool dipped into 70% alcohol. Subjects were made to massage their hands from the wrist up to the finger tips a few times to increase blood flow in the fingers if necessary.

*Conducting the FBS test using the glucometer:-* The test strip was put into the meter with the printed side of the strip facing up (this was where the blood was placed for testing). The meter automatically turned on displaying all segments when the strip was inserted properly. The screen flashes two icons: a blood droplet and a picture of a test strip. This indicated that the meter was ready. Laboratory technicians, using a lancet, collected blood samples from the tip of subjects' fingers. A "hanging drop" from the fingertip of the subject was guided to touch the sample tip at

the end of the test strip. The meter begins to count down from 9 to 1 and then display the measurement/test result. The test result was displayed in mmol/l.

### **Blood Pressure Measurement:**

The measurement on blood pressure of the patients was carried out by qualified nursing officers. A standardized sphygmomanometer was used for measuring blood pressure by wrapping the instrument around the left upper arm of the patient. This was done after 15 minutes of the patient resting (sitting). Classification of blood pressure was done based on categories in the seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure (HBP) (Chobanian *et al*, 2003). Readings  $\geq 140/90$  mmHg were classified as HBP. The target blood pressure was be  $<130/80$  mm Hg. However, attaining blood pressures of  $<120/80$  mm Hg was desirable.

### **3.5. Data Capture and Analyses**

Documented data from the protocol at Agona Swedru and that of the standard protocol from Ghana Health Service together with lapses found were tabulated. Both of these nutritional management protocols had various components on how carbohydrate, protein and fatty foods should be consumed within a week as well as lifestyle practices. These various components of the Agona Swedru protocol were put side by side (one column) in the table to almost similar components of the GHS protocol (another column) for comparison and any lapses found in the Agona protocol compared to the standard were documented at the side (another column) in the table.

Data from the questionnaires were analyzed with computerized software Microsoft Excel Version 8.0 and SPSS computer software (version 16). Statistical analysis carried out in this study employed descriptive for continuous variables e.g. anthropometric indices (BMI) and frequency and proportion for categorical data (e.g. marital status) and associations.

### **Body Mass Index:**

Body Mass Index (BMI) was calculated as the ratio of the weight (Kg) and the square of height ( $m^2$ ) {BMI=weight (Kg)/height<sup>2</sup> ( $m^2$ )}. The BMI was then compared to WHO standards which is divided into four categories, underweight ( $<18.0kg/m^2$ ), normal (18 to  $24kg/m^2$ ), overweight (25 to  $30kg/m^2$ ) and obese ( $30kg/m^2$ ) (WHO, 2004).

Educational level and work status from the demographic data were used to group participants into three status groups to assess socio economic status. The first group (class 1) consisted of participants who had no formal education and were engaged in menial or no work. The second group (class 2) consisted of participants who had some primary or secondary education with a less laborious work and better pay than class 1. The third group (class 3) consisted of participants who had attained tertiary education with a less laborious and better paid job than classes 1 and 2.

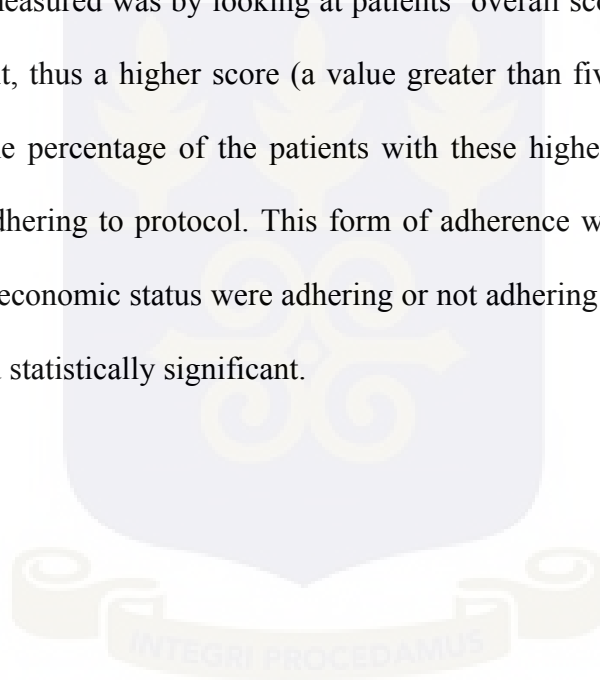
All of the various sections of the questionnaire: knowledge of diabetes, lifestyle practices, dietary habits and measurements/health status (BMI, fasting blood sugar (FBG) and blood pressure (BP) were scored on a scale of high, medium and low. High scores were values greater than five out of a total mark of ten. Low scores were values lower than five out of ten and a

medium score was five out of ten. Correct answers were scored high, somehow correct answers were scored medium and incorrect answers were scored low. The various questions asked under the sections for knowledge, lifestyle practices, and dietary habits were scored separately before each overall section score determined. So, if more than half of the questions answered under a section had higher scores than medium scores, then it was scored high. If more than half of the questions answered under a section had higher scores than low scores, then it was scored medium. If it was a balance of high, medium and low scores, the overall score was medium. If there were more low scores than high scores, the overall score was low. So also were more low scores than medium scores, a low score. More medium scores than high scores was a medium score and more medium score than a low score was also a low score.

The anthropometric (BMI), biochemical (Fasting Blood Sugar) as well as blood pressure measurement were the outcome variables for assessing adherence to protocol. These outcome variables were first scored separately before their scores were put together. A good health status was given a high score. A not too good not too bad health status was a medium score while a poor health status was given the lowest score. Again high scores were values greater than five out of a total mark of ten. Low scores were values lower than five out of ten and a medium score was five out of ten. Two high scores and a low score was equal to a high score measurement. A high score, a medium score and a low score was equal to a medium score measurement. A high score and two low score variable was equal to a low score measurement. Two medium scores and a high variable score was also equal to a medium score measurement. Two medium score and a low score variable was also equal to a low score measurement. So also was two low score variable and a medium score also equal to a low score measurement.

Lifestyle/ practices, dietary habits, nutritional knowledge and background characteristics of the respondents were explored using descriptive statistics. To investigate the association of nutritional knowledge, lifestyle practices and food intake pattern on the health and nutritional status (fasting blood sugar, blood pressure and body mass index) Pearson's correlation technique was used to find the association of scores of adherence on the measurement overall score (nutritional and health status score).

Adherence, which was measured was by looking at patients' overall score on both their lifestyle practice and dietary habit, thus a higher score (a value greater than five out of ten) were those adhering to protocol. The percentage of the patients with these highest scores represented the percentage of patients adhering to protocol. This form of adherence was also looked at to find out which class of socio-economic status were adhering or not adhering to protocol.  $P < 0.05$  and  $P < 0.01$  were considered statistically significant.



## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1. Identification of the nutritional management protocol for diabetics in Agona Swedru hospital

The nutritional management protocol for the diabetics in Agona Swedru was identified after enquiry was made about it from the personnel in charge of the diabetic clinic. The protocol was documented into details on food groups and lifestyle in table 1.

**Table 1: The identified nutritional management protocol from Agona Swedru hospital**

Yam, cocoyam, millet, bread and all flour products, ripe plantain, rice, sorghum, corn and all corn products can be eaten.
Sugary fruits like sugar cane, pineapple, orange and banana should be eaten in very small quantities but the other not very sugary fruits like mango can be eaten more
All green leafy vegetables especially kontomire and cabbages should be more in foods.
Dried fish, snails, bush meat and mushrooms should be eaten more than beef, chicken skin, turkey tail, and eggs
All fats and oils including palm oil from palm soup should be limited in food
Soft drinks, sugar, honey and other sweets should be totally avoided.
A patient should eat as often as anytime he or she feels hungry
Daily exercise especially walking exercise is recommended

#### **4.2. Evaluation of the nutritional management protocol of the diabetics**

After identification of the Agona Swedru nutritional management protocol it was evaluated by comparing it to a standard protocol, the Ghana Health Service protocol. This evaluation was carried out by comparing the various components of the Agona Swedru protocol to that of the Ghana Health Service (GHS) protocol to find out if there were any lapses. The observations made are reported in table 2.





**Table 2: Similarities and differences between the nutritional management protocol for diabetics of the Ghana Health Service and that of the Agona Swedru hospital**

<b>The Ghana Health Service (GHS) nutritional management protocol</b>	<b>Nutritional management protocol at Agona Swedru Hospital (ASH)</b>	<b>Deviations in nutritional management protocol at ASH from that of the GHS</b>
-Protein foods e.g. meat, fish, eggs, snails, bush meat, lobsters} Can be taken in normal quantities 2-3 times daily	Protein foods e.g. dried fish, snails, bush meat, mushrooms} to be eaten more than the meats (beef, chicken skin, turkey tail, and eggs)	Specifications on the type of protein food to be eaten as found in the ASH but the frequency of its consumption was not stated in the ASH.
Fresh fruits} Amount to be eaten should be controlled. 2-3 times daily.	Sugary fruits like sugar cane, pineapple, orange and banana should be eaten in very small quantities but the other not very sugary fruits (mango) any quantity a day is allowed.	There was a distinction among fruits that some were more sugary than others in the ASH. Amount and frequency of consumption was not stated in the ASH
All green leafy vegetables, beans at least one serving spoon a day} Any amount desired allowed 2-3 times daily	All green leafy vegetables especially kontomire and cabbages should be more in foods. Any amount desired allowed	The number of times to consume this food group in a day was not specified in the ASH.
Yam, cocoyam, millet, bread and all flour products, unripe plantain, rice, sorghum, corn and all corn products} To be eaten 3-4 times daily	Yam, cocoyam, millet, bread and all flour products, ripe plantain, rice, sorghum, corn and all corn products can be eaten.	The consumption of ripe plantain was not permitted in the ASH
All fats and oils including palm oil, margarine and butter. Small amount for cooking one meal a day. 2-dessert spoons oil per cooking. 2-3 times daily	All fats and oils including palm oil from palm soup, margarine and butter. limit the amount	No specifications were made on the quantity and frequency to be used in cooking in a day in the ASH
Soft drinks, sugar, honey, lucozade, glucose} To be avoided	Soft drinks, sugar, honey, lucozade, glucose} should be totally avoided.	The foods to be eaten were the same for both protocols
Eat 3 meals a day about the same volume at the same time every day. Snacks small meals may be added if necessary)	Frequency of eating; anytime one feels hungry	The number of times to eat in a day including snacks was not specified in the ASH
150 minutes per week of walking, moderate activity or vigorous activity	Exercise- mainly walking daily but duration not known	The duration for carrying out any form of exercise in a week was not stated in the ASH
Avoid excessive drinking of alcohol and smoking	No idea	Alcohol intake and smoking is not specified in the ASH

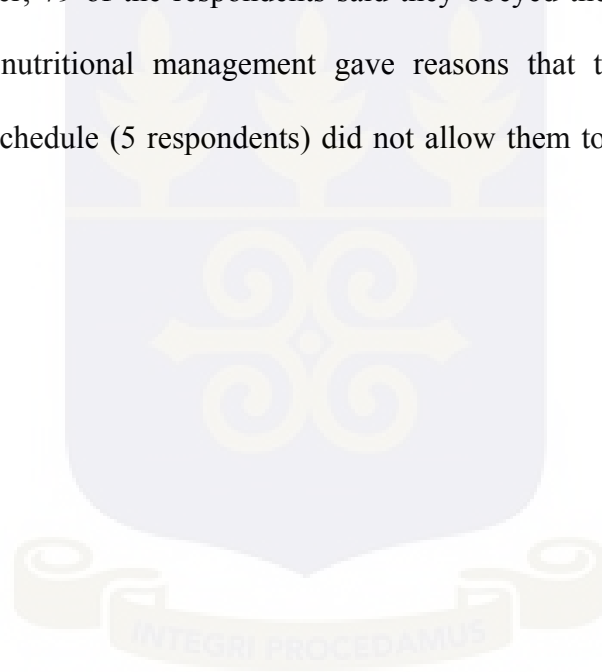
In the table above all except for the alcohol intake and smoking row had very wide differences between the nutritional protocol for the Ghana Health Service and that of the Agona Swedru hospital. For the Agona Swedru protocol, there was no mention of avoiding excessive drinking of alcohol and smoking as a way of managing T2D. All the other components were almost similar for both protocols.

#### **4.3 Assessing adherence to the nutritional management protocol**

Lifestyle practices and dietary habit were used to assess patients' adherence to protocol in this study. A total of ninety diabetic patients aged 40 years and above were recruited for the study. In the study, 35 of the respondents were males and 55 were females. Majority of the diabetics in the study fell within the age group of 50-60 years and the minority was more than 70 years. The respondents were mostly laborers (53); the minority (8) office workers and some (19) unemployed. The laborers were mainly men engaged in driving commercial vehicles or some menial job as well as women who carried out petty trading. Most of the respondents had primary (26) and secondary (32) education with a few of them having tertiary education (15). Out of the ninety respondents, 17 of them however had never been to school.

Respondents reported good lifestyles practices after their diagnosis as diabetics. Fifty one out of the ninety respondents said they changed their lifestyle after being diagnosed of diabetes. Many of the respondents (47) did not add salt to their cooked foods while the rest (43) did. All the participants engaged in one form of exercise or the other. Walking according to 74 respondents was the most predominant exercise that they carried out in the day. Within a week, 36 respondents exercised for less than the 150 minutes of exercise required while the rest of the 54

respondents exercised the recommended 150 minutes. Eighty three respondents had never smoked in their lifetime. Out of seven respondents who smoked, only one person was still smoking. Alcohol drinking was common among 22 out of the ninety respondents. There was an association between sex of the respondents and their alcohol intake at  $p < 0.05$ . Males were more likely to consume alcohol than their female counterpart. About forty-six percent of the male population consumed alcohol. All the respondents who participated in the study admitted that they were given advice on nutritional management of diabetes by their doctors, nurses and other health personnel, however; 79 of the respondents said they obeyed the advice. The others who did not adhere to the nutritional management gave reasons that their taste preference (6 respondents) and work schedule (5 respondents) did not allow them to adhere to advice (Table 3).



**Table 3: The lifestyle practices of respondents (N=90)**

<b>Lifestyle practices</b>	<b>Frequency</b>	<b>Percent (%)</b>
<b>Have you ever smoked?</b>		
Yes	7	7.8
No	83	92.2
<b>If yes, do you still smoke?</b>		
Yes	1	14.3
No	6	85.7
<b>Do you take alcohol?</b>		
Yes	22	24.4
No	68	75.5
<b>Do you exercise?</b>		
Yes	90	100
No	-	-
<b>How long do you exercise in a day?</b>		
<45mins	36	42.9
≥ 45mins	48	57.1
<b>Do you go with the advice given to you by the Doctor/Nurse/other health personnel?</b>		
Yes	79	87.8
No	11	12.2
<b>If no, why?</b>		
My work doesn't allow me	3	27.3
My taste preference doesn't allow me	6	54.5
My family doesn't allow me	2	18.2
<b>How often do you eat in a day?</b>		
1	1	1.1
2	17	18.9
3	66	73.3
>3	6	6.7
<b>Those who ate about 3 meals a day about the same time every day with snacks included sometimes</b>	24	26.7
<b>Those who ate about the same amount of food at each meal</b>	8	8.9
<b>Those who took Insulin injections and diabetes tablets</b>	42	50

Participants in the study were asked about their frequency of consumption of carbohydrate-rich foods, beverages and sugary foods, fruits, vegetables, protein-rich foods, fatty acids and oils within a week. Carbohydrate rich foods consumed comprised of cereals, roots and tubers like bread, cassava, unripe plantain and maize. Foods in the protein-rich group consumed comprised of plant and animal products like milk and milk products, egg, meat, fish, and all beans type. Fatty foods and oils consumed comprised of cakes, pies, biscuits, spring rolls, oils and butter. Vegetables comprised of onions, cabbage, garden eggs and cassava leaves. Fruits comprised of banana, pineapple, mango and pawpaw. Beverages and sugary foods comprised of soft drinks, chocolates, candies and sweets. Carbohydrate-rich foods were consumed by fifty one (51) out of the ninety (90) respondent everyday while two (2) persons said they rarely ate carbohydrate rich foods within a week. The other 37 respondents ate carbohydrate food twice or thrice a week.

None of the ninety respondents reported ever eating foods in this group within a week. The protein-rich food group was eaten by 60 respondents everyday while 7 respondents said they rarely ate foods in this group. The other 22 respondents ate protein –rich foods twice or thrice a week. Only one respondent said that he never consumed foods from this group. Thirty nine out of the ninety respondents consumed fatty foods and oils daily while twenty three respondents rarely ate from this food group. Twenty four respondents ate foods in the fats and oils group twice or thrice a week. None of the ninety respondents reported ever eating foods from this group within a week. Vegetables were consumed by 66 respondents daily while 4 respondents said they rarely consumed foods in this food group. Nineteen respondents ate foods from this group twice or thrice a week with only one person reporting never eating any food from this group. Fruits were consumed by 35 respondents daily while 7 respondents said they rarely

consumed fruits. Forty seven respondents ate fruits twice or thrice a week with only one person reporting never eating fruits within a week. Beverages and sugary foods were consumed by only three (3) out of the ninety respondent everyday while forty three (43) respondents said they rarely ate beverages and sugary foods. The other 27 respondents ate a beverage and sugary food twice or thrice a week. Seventeen respondents never consumed a beverage and sugary food.

**Table 4: The Dietary pattern of respondents (N=90)**

	Once week	a 2-3 times a week	Everyday	Rarely	Never
<i>Carbohydrate-rich foods.</i> E.g. bread, cassava, plantain, potatoes	6 (6.7%)	31 (34.4%)	51 (56.7%)	2 (2.2%)	-
<i>Beverages and Sugary foods.</i> E.g. soft drinks, chocolates, candies, sweets	15 (16.7%)	12 (13.3%)	3 (3.3%)	43 (47.8%)	17 (18.9%)
<i>Fruits.</i> E.g. banana, pineapple, mango, pawpaw	25 (27.8%)	22 (24.4%)	35 (38.9%)	7 (7.8%)	1 (1.1%)
<i>Vegetables.</i> E.g. onions, cabbage, garden eggs	10 (11.1%)	9 (10%)	66 (73.3%)	4 (4.4%)	1 (1.1%)
<i>Protein-rich foods.</i> E.g. milk and milk products, egg, meat, fish	6 (6.7%)	16 (17.8%)	60 (66.7%)	7 (7.8%)	1 (1.1%)
<i>Fatty foods and oils.</i> E.g. cakes, pies, biscuits, spring onions, red palm oil, any oil, butter, fried foods	8 (8.9%)	16 (17.8%)	39 (43.3%)	23 (25.6%)	-
Nutrient supplement	13 (65%)	1 (5%)	4 (20%)	2 (10%)	-

The responses from patients on lifestyle practices and dietary habits from the questionnaire were scored to find out how many respondents were adhering to protocol. A good lifestyle and dietary habit was given a higher score compared to a poor lifestyle and dietary habit. Good lifestyle

practices that were assessed for adherence comprised of respondents who reported doing all of the following; not smoking, not drinking alcohol, watching out for salty foods and carrying out exercises for at least 150 minutes in a week. Good dietary practices that were assessed comprised of respondents who reported consuming the right food nutrient at the right time and frequency. The number of respondents who had high and low scores for each lifestyle or dietary practice was shown in table 5.



**Table 5: The frequencies of diabetics adhering to and those not adhering to dietary and lifestyle practices (N=90)**

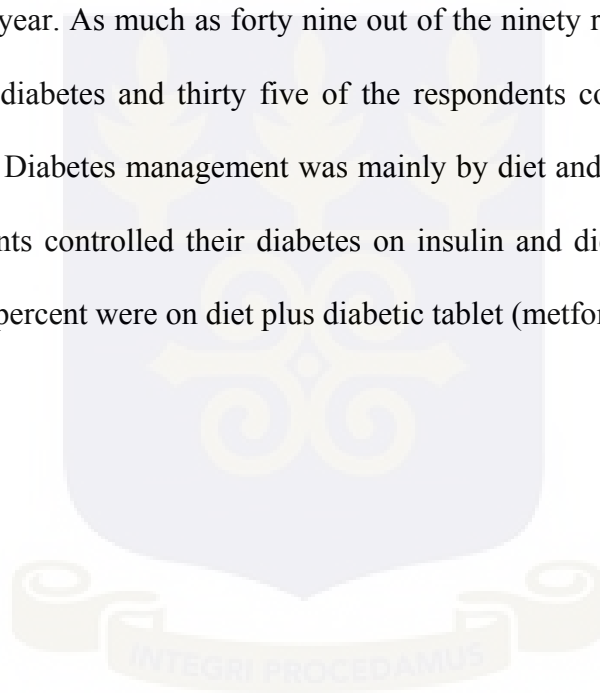
Dietary and lifestyle practices	Frequencies of diabetics with high and low scores	
	Number of diabetics with High score (adherents)	Number of diabetics with Low score (non adherents)
Protein foods e.g. meat, fish, eggs, snails, bush meat, lobsters} Can be taken in normal quantities 2-3 times daily	82	8
Fresh fruits} Amount to be eaten should be controlled. 2-3 times daily.	55	35
All green leafy vegetables, beans at least one serving spoon a day}Any amount desired allowed 2-3 times daily	85	5
Yam, cocoyam, millet, bread and all flour products, unripe plantain, rice, sorghum, corn and all corn products} To be eaten 3-4 times daily	84	6
All fats and oils including palm oil, margarine and butter. Small amount for cooking one meal a day. 2-dessert spoons oil per cooking. 2-3 times daily	86	4
Soft drinks, sugar, honey, lucozade, glucose} To be avoided	75	15
Eat 3 meals a day about the same volume at the same time every day. Snacks small meals may be added if necessary)	66	24
150 minutes per week of walking, moderate activity or vigorous activity	54	36
Avoid excessive drinking of alcohol	67	23
Avoid smoking	89	1
Mean score=total score/number of scored values	743/10= 74.3	157/10=15.7



Overall adherents were 74 patients (82%) and 16 patients (18%) for non-adherents. The rest of the sixteen (16) respondents who reported not adhering to the protocol either fell short of a correct lifestyle practice or a dietary habit.

#### **4.4 Assessment of the health and nutritional status of the diabetics**

The medical history of the respondents suggested that most of them had been diagnosed as diabetic for more than a year. As much as forty nine out of the ninety respondents said that they had a family history of diabetes and thirty five of the respondents could trace this history of diabetes to their parents. Diabetes management was mainly by diet and medication. Ten percent of the diabetic respondents controlled their diabetes on insulin and diet; seven percent on diet alone while eighty three percent were on diet plus diabetic tablet (metformin) (table 6).



**Table 6: Medical history of respondents**

Medical history	Sex			P-value <sup>χ</sup>
	Male (n=35) n (%)	Female (n=55) n (%)	Total (N=90) N (%)	
<b>How long have you had diabetes?</b>				
<1 yr	4 (11.4)	11 (20)	15 (16.7)	0.22*
1-2 yrs	10(28.6)	5 (9.1)	15 (16.7)	
2-3yrs	6 (17.1)	10 (18.2)	16 (17.8)	
3-4 yrs	5 (14.3)	7 (12.7)	12 (13.3)	
4-5 yrs	1 (2.9)	4 (7.3)	5 (5.6)	
>5yrs	9 (25.7)	18 (32.7)	27 (30.0)	
<b>Is there any history of diabetes in your family?</b>				
Yes	20 (57.1)	29 (52.7)	49 (54.4)	0.68*
No	15 (42.9)	26 (47.3)	41 (45.6)	
<b>If yes, what is your relationship to the person(s)?</b>				
Sibling	0	6 (21.4)	6 (12.8)	0.11*
Parent	16 (84.2)	17 (60.7)	32 (68.1)	
Cousin/Niece/Nephew/ Aunt/Uncle	3 (15.8)	5 (17.9)	8 (17.0)	
<b>How do you control your condition?</b>				
Insulin plus diet	4 (11.4)	5 (9.1)	9 (10.0)	0.78*
Diet alone	3 (8.6)	3 (5.5)	6 (6.7)	
Diet and diabetes tablet	28 (80.0)	47 (52.2)	75 (83.3)	

□ Pearson chi-square; \*Difference not significant at  $P < 0.05$

Majority of the respondents had a poor knowledge of what diabetes was and its causes. It was evident from the responses that 63 out of the total patients thought that diabetes was a sugar disease whiles 9 respondents and a respondent thought that it was a high blood pressure and stress disease respectively. Nonetheless, 17 respondents said that they were not aware of what diabetes was about at all. Among the causative factors sugar, according to 44 respondents, was

responsible for diabetes. There was no significant difference ( $p > 0.05$ ) between knowledge of diabetes with respect to sex of the respondents (table 7).

**Table 7: Patient's knowledge of diabetes**

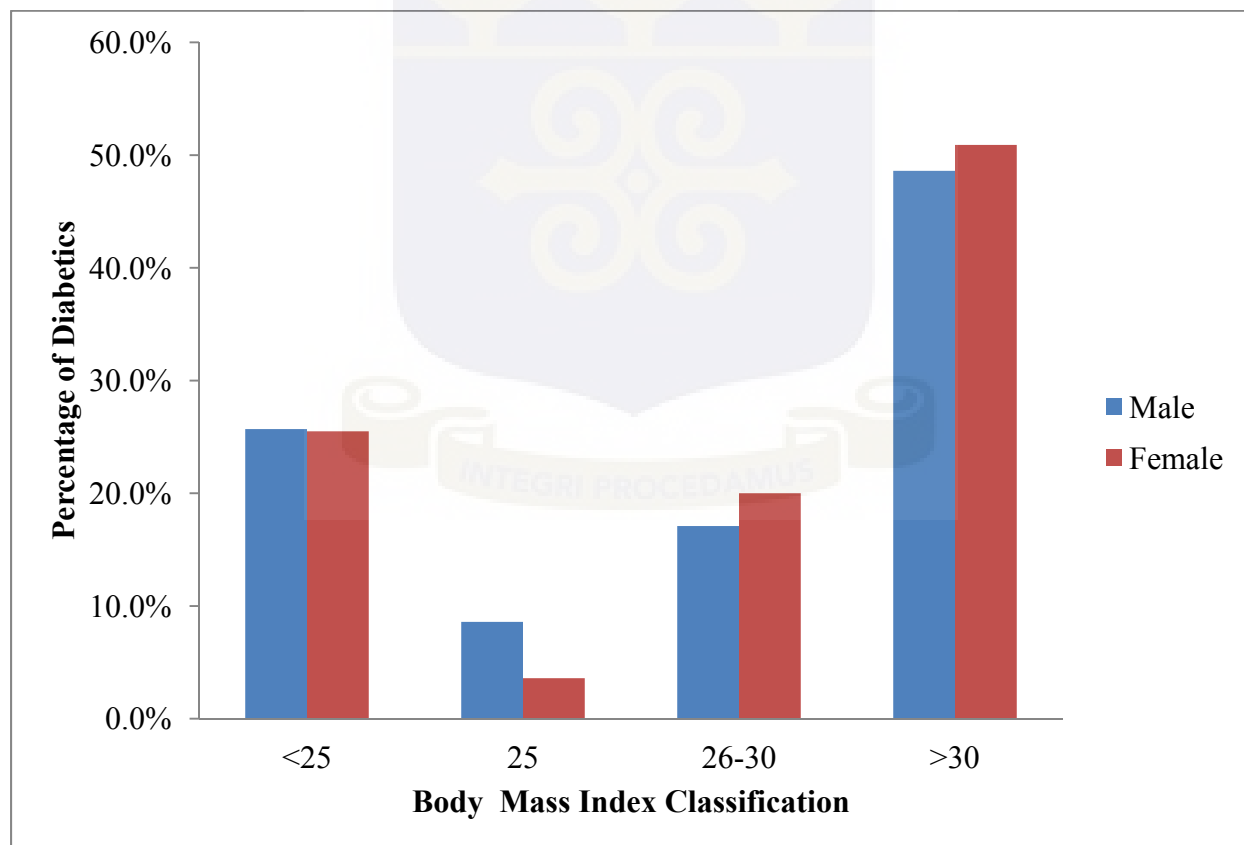
Knowledge	Sex			P-value <sup>y</sup>
	Male (n=35) n (%)	Female (n=55) n (%)	Total (N=90) N (%)	
<b>In your own understanding, what is diabetes?</b>				
Sugar disease	24 (68.6)	39 (70.9)	63 (70)	0.24*
Stress disease	0	1 (1.8)	1 (1.1)	
High blood pressure	3 (8.6)	6 (10.9)	9 (10.0)	
Pancreas malfunction	5 (14.3)	1 (1.8)	6 (6.7)	
Age & family history	0	1 (1.8)	1 (1.1)	
Don't know	3 (8.6)	7 (12.7)	10 (11.1)	
<b>What cause(s) it?</b>				
Stress	2 (5.7)	4 (7.3)	6 (6.7)	0.70*
Sugar	17 (48.6)	27 (49.1)	44 (48.9)	
Fertilized foods	2 (5.7)	5 (9.1)	7 (7.8)	
Bad eating habits	4 (11.4)	6 (10.9)	10 (11.1)	
Pancreas malfunction	2 (5.7)	2 (3.6)	4 (4.4)	
Age & family history	2 (5.7)	0	2 (2.2)	
Don't know	6 (17.1)	11(20.0)	17 (18.9)	
<b>Do you think diet/nutrition is important in the management of diabetes?</b>				
Yes	34 (97.1)	48 (87.3)	82 (91.1)	0.27*
No	0	1 (1.8)	1 (1.1)	
Don't know	1 (1.1)	6 (10.9)	7 (7.8)	

<sup>y</sup> Pearson chi-square; \*Difference not significant at  $P < 0.05$

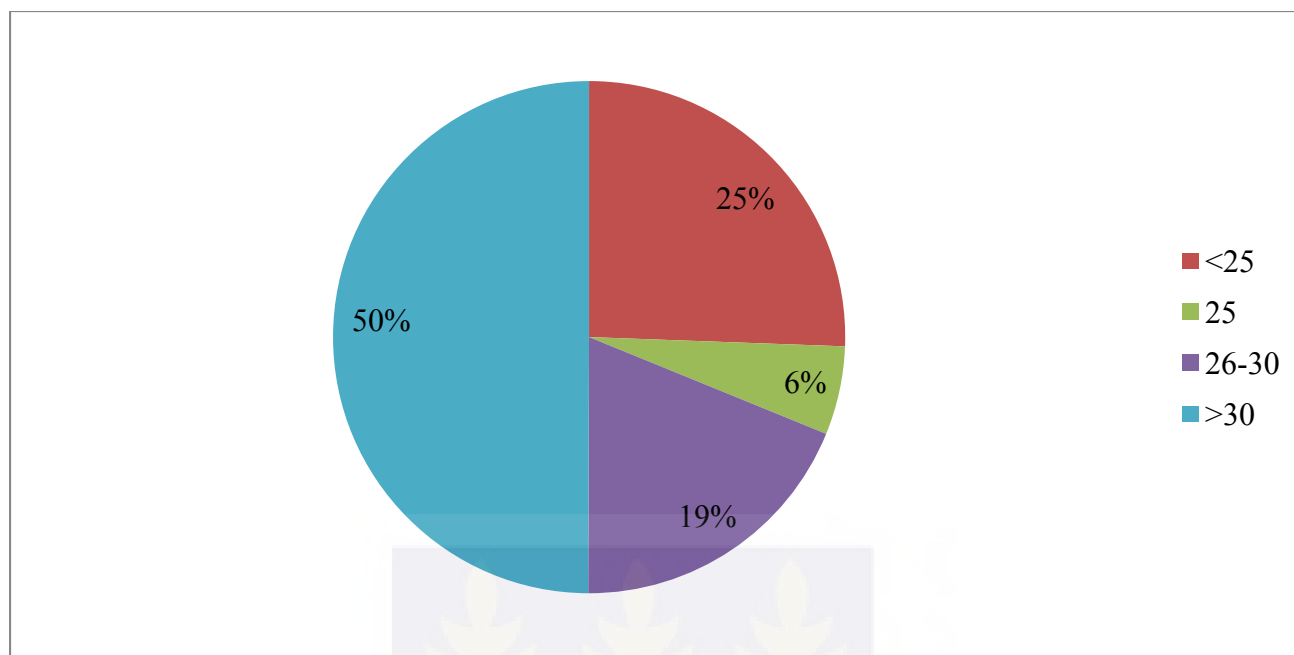
The health and nutritional status of the diabetics was assessed with the body mass index, clinical signs, fasting blood sugar and blood pressure readings for this study.

#### 4.4.1 Body mass index (BMI)

BMI was used to assess body fatness and the nutritional status in this study. Adjusting for age and sex, 50% of the respondents had BMI greater than  $30\text{kg/m}^2$  as shown in figure 2 below. BMI less than  $25\text{kg/m}^2$  were registered by 26% of the study population. The respondents with BMI greater than  $30\text{ kg/m}^2$  were twice the number of respondents with BMI of  $25\text{ kg/m}^2$  and below (figure 2). Nineteen percent had BMI between  $26 - 30\text{kg/m}^2$ . The data showed that almost 70% of the respondents were overweight and obese while the remaining 30% were either normal or underweight. More females were overweight and obese than their male counterparts (figure 1)



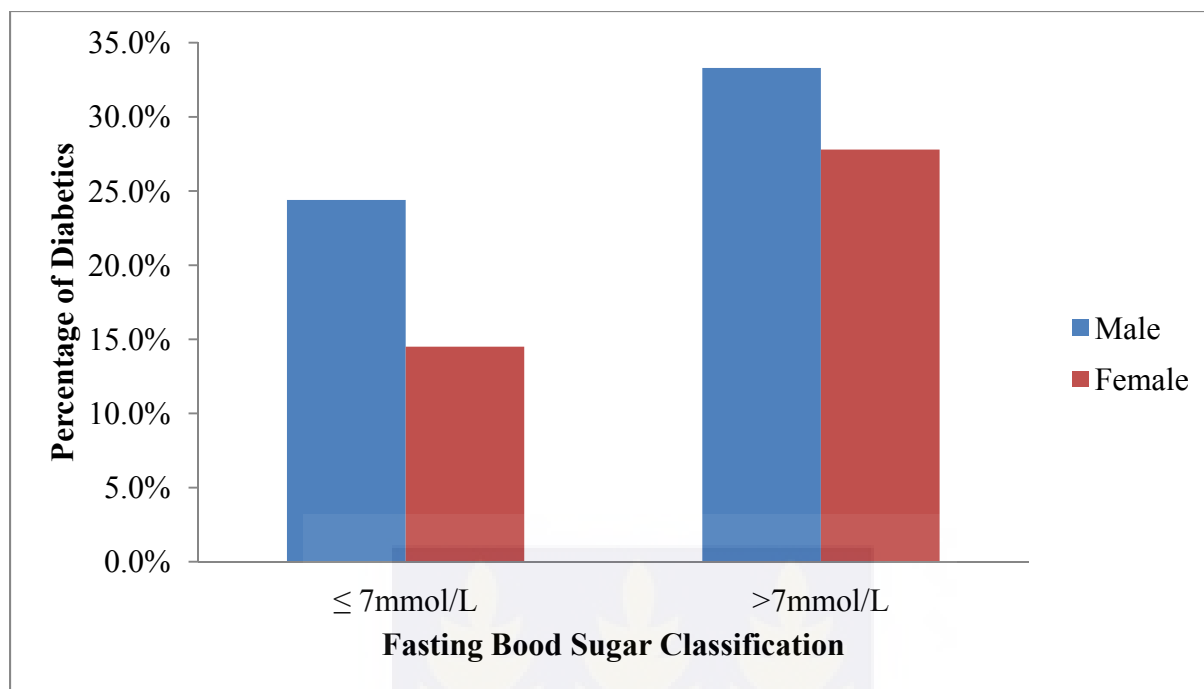
**Figure 1: The Distribution of Body Mass Index of Diabetics by Sex**



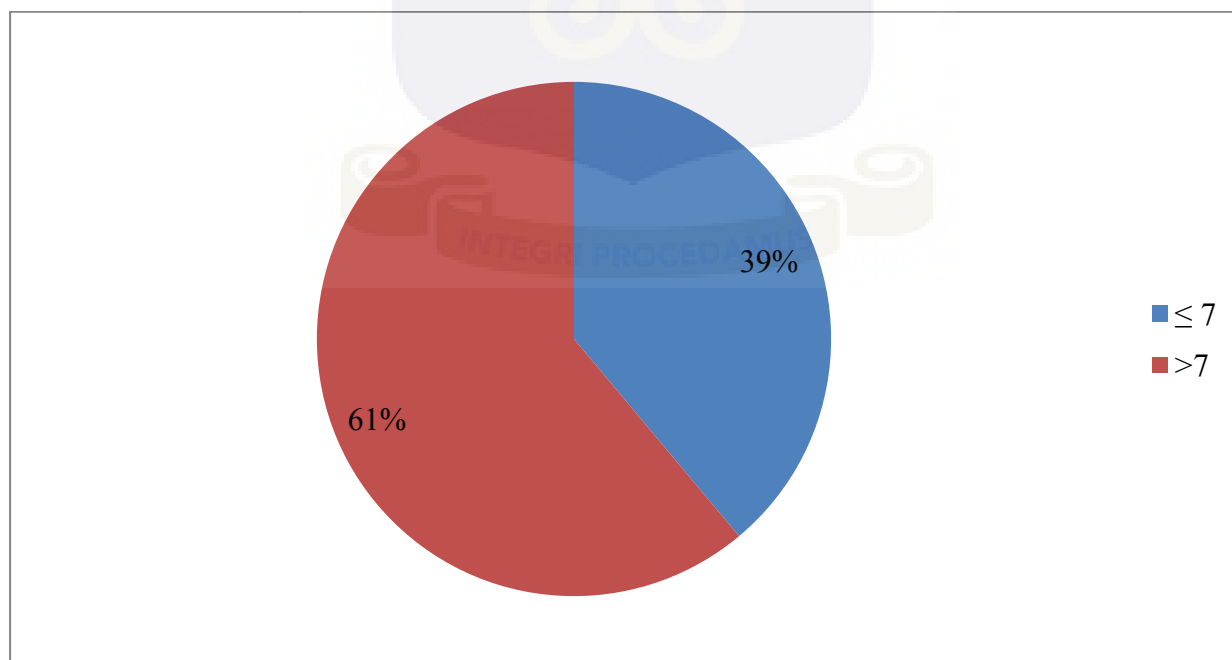
**Figure 2: Respondents' BMI Distribution**

#### **4.4.2 Fasting blood sugar of respondents**

Fasting blood sugar levels of patients were taken early in the morning before breakfast and were categorized into; less than or equal to 7mmol/L, and greater than 7mmol/L. About 40% had blood glucose levels less than or equal to 7mmol/L while 60% had high blood sugar levels greater than 7mmol/L (figure 4), indicating that majority were above the reference cut off. Out of the people who participated in the study, 24% males and 15% females had blood sugar levels less than or equal to 7mmol/L (figure 3). As many as 33% males and 28% females had blood sugar levels greater than 7mmol/L (figure 3).



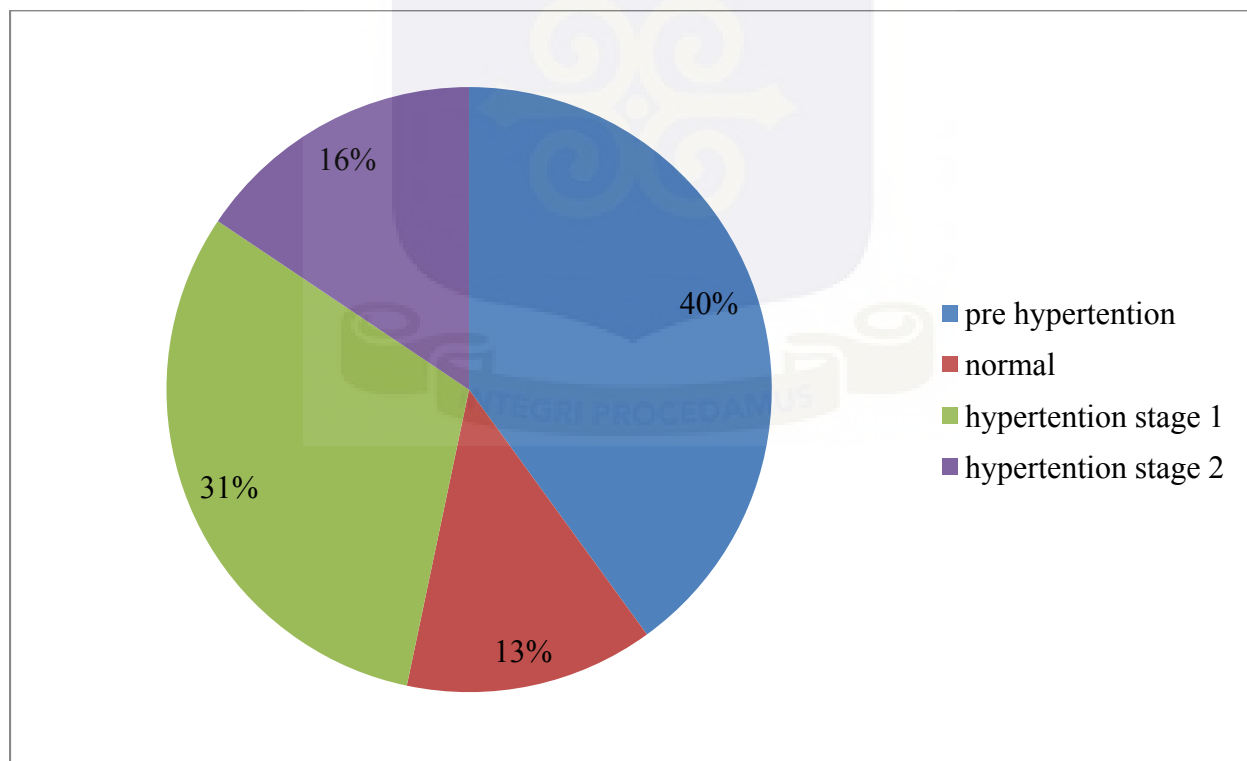
**Figure 3: Distribution of Fasting Blood Sugar of Diabetics by Sex**



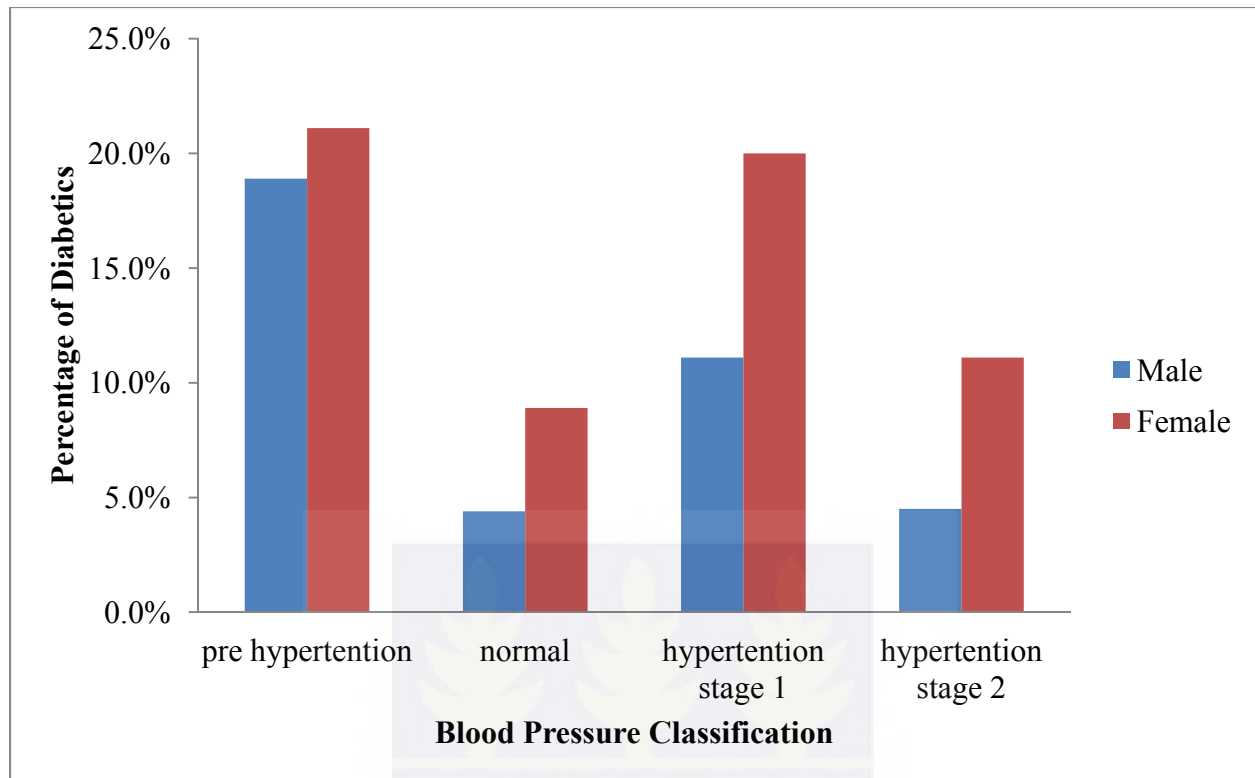
**Figure 4: Respondents' Fasting Blood Sugar Reading Distribution**

#### 4.4.3: Blood pressure of respondents

The blood pressure of respondents have been demarcated as <120/80 (pre hypertension), 120-139/80-89 (normal), 140-159/90-99 (hypertension stage 1) and >160/100 (hypertension stage 2). Just 40% of the diabetics were within the normal range for blood pressure. Blood pressure was low among 40% of the population studied (figure 5). Almost 60% of respondents were hypertensive or pre-hypertensive with majority of them being females. Thirty-one percent of the hypertensive diabetics were females while about 16% were males (figure 6). The diabetics' fasting blood sugar and blood pressure readings were high above the normal cut-offs despite the fact that more of these respondents were adhering to protocol.



**Figure 5: Respondents' Blood Pressure Reading Distribution**



**Figure 6: Distribution of Blood Pressure Readings of Diabetics by Sex**

#### **4.5 Correlation between the adherence to treatment on nutritional/health status (BP and FBS)**

A two tailed Pearson correlation was used to assess the degree of association among these variables and the observations made are reported, table 8.



**Table 8: Correlation between nutritional knowledge, lifestyle practice and dietary habit on fasting blood sugar, blood pressure and nutritional/health status (N=90)**

Characteristics	Fasting blood glucose	Blood pressure	Nutritional/Health status
<b>Nutritional knowledge</b>	1.00*	0.29*	0.78*
<b>Lifestyle practice</b>	0.90*	0.25*	0.21*
<b>Dietary habit</b>	0.24*	0.21*	0.37*

\*Correlation not significant at the 0.05 level (2-tailed)

There were no association between of nutritional knowledge, lifestyle practice and dietary habit on fasting blood sugar readings, blood pressure readings and ultimately the health status of diabetics. The association of nutritional knowledge on the diabetics' health status was not significant at ( $p > 0.05$ ). The association of diabetics' lifestyle practices and dietary patterns on their health status was also not significant at ( $p > 0.05$ ) as shown in table 8. There was a significant difference however on the association of body mass index (BMI) and fasting blood sugar (FBS) on health status at p-value  $< 0.01$  as shown in table 9.

**Table 9: Correlation between BMI and nutritional/health status (N=90)**

<b>Characteristics</b>	<b>Nutritional/Health status</b>
<b>BMI</b>	-0.49*
<b>FBS</b>	-0.51*
<b>BP</b>	0.42*

\*Correlation is significant at the 0.01 level (1-tailed)

#### **4.5.1 Obesity and Health Status by socioeconomic classes**

Most sedentary workers (class 3) were obese while the active workers (class 1 and 2) were not. As many as 78% of the patients in the sedentary class, 46% in the more active class 2 and 49% of the patients in the very active class 3 were obese respectively. Overall the sedentary workers (class 3), had poor health status than the active workers (class 1 and 2). As many as 78% of the patients in the sedentary class, 73% in the more active class 2 and 69% of patients in the very active class 3 had poor health status respectively, table 10.

**Table 10: Body mass index distribution by classes of socioeconomic status (N==90)**

<b>Variable</b>	<b>Class 1</b>	<b>Class 2</b>	<b>Class 3</b>
	<b>(n), (n %)</b>	<b>n), (n %)</b>	<b>n), (n %)</b>
<b>Body mass index</b>			
<b>thin &lt;25</b>	18(32.7%)	9(34.6%)	1(11.1%)
<b>normal</b>	5(9.1%)	3(11.5%)	0(0%)
<b>overweight</b>	5(9.1%)	2(7.7%)	1(11.1%)
<b>obese &gt;30</b>	27(49.1%)	12(46.2%)	7(78%)
<b>Health Status</b>			
<b>Poor health</b>	38(69.1%)	19(73.1%)	7(77.8%)
<b>Good health</b>	17(30.9%)	7(26.9%)	2(22.2%)

## **CHAPTER FIVE**

### **5.0 DISCUSSION**

#### **5.1 Introduction**

Management of T2D concentrates on keeping blood glucose levels in normal range without presenting undue patient danger (Diabetes Control and Complications Trial/Epidemiology of Diabetes Intervention and Complications Research Group, 2005). This can usually be with close dietary management, exercise, and use of appropriate medications (Nathan, 2005). Patient education, understanding, and participation are vital since the complications of diabetes are far less common and less severe in people who have well-managed blood sugar levels (Venurajuet, 2010). Wider health problems such as smoking, elevated cholesterol levels, obesity, high blood pressure, and lack of regular exercise may accelerate the deleterious effects of diabetes (Nathan, 2005).

#### **5.2 Assessing the nutritional management protocols for diabetics**

The Ghana Health Service protocol which is among the standard protocols in Ghana for managing T2D is expected to have similar recommendations in all hospitals, health centers and related facilities all over the country. After comparing the Agona Swedru' hospital protocol to that of the GHS, however, it was observed that, some important parameters were missing out in the Agona Swedru' protocol from the results obtained, table 2. The Agona Swedru protocol was not up to standard. This can be attributed to the fact that Agona Swedru hospital did not have the updated version of the GHS nutritional management protocol for proper management of the disease and for complete adherence as the GHS protocol had undergone some changes in 2006.

This inadequacy in protocol at the Swedru hospital could naturally have had an impact on the knowledge; adherence in terms of dietary and lifestyles patterns and ultimately affect the nutritional/health status of these diabetics. Most of the respondents, however, reported adhering to good dietary and most lifestyle practices similar to the GHS standard protocol though that of the Agona protocol had not yet been revised. One reason may be due to the widespread knowledge of T2D management, such that though their own protocols were deficits in some areas, respondents still carried out correct practices. For instance table 2, after evaluating the two protocols, it was found out that all the other components except for the alcohol intake and smoking rows were different between the GHS protocol and the Agona Swedru hospital protocol.

The above is in line with similar research done by Collins and Lewis, 2013, where they stated that within the changing dynamic of health care, health care professionals were no longer the sole sources of health information. Recent estimates suggest that 83% of internet users with chronic conditions such as diabetes went online to look for health information (Collins and Lewis, 2013). People with diabetes would therefore seek online information about the condition, treatment options, practical strategies and tools for managing diabetes in their daily lives, scientific breakthroughs, and advocacy efforts (Powers, March and Evert, 2008) So therefore, patients maybe following correct practices for management from various media even like the televisions and radio stations which may not be necessarily from a health professional from a health facility.

Though all the other components were almost similar for both protocols, for the Agona Swedru protocol, there was no mention of avoiding excessive drinking of alcohol and smoking as a way of managing T2D, but most patients were not drinking alcohol excessively nor were they smoking.

Comparatively it can be said that more of the respondents were found to be adhering to the GHS protocol than to the Agona Swedru protocol as patients reported not to be involved in excessive drinking and tobacco use exclusive only to the GHS protocol in this study. Comparing the GHS and Agona protocol however, most patients reported adhering to more similar dietary and lifestyle practices, common to the two protocols. More patients could be said to be deductively, adhering to protocol from the high adherence score, table 5. There is also enough reason to speculate that dietary adherence to the Swedru protocol was, however, inadequate due to poor glycaemic control and poor nutritional status of BMI from the patients. There may be various reasons why T2D patients did not comply with some dietary therapy of the Agona protocol. Matsushita and his colleagues in 2005 hypothesized that, “diabetics needed the ability to recognize their energy intake and energy expenditure for the good control of diabetes and for adequate compliance with their therapy schedules”. Physicians and dieticians may advise diabetics about dietary intake and physical exercise, but the patient may not understand and comply with the advice. Even when diabetic patients tried to comply, their inability to recognize how many calories they actually consumed and expended, resulted in errors (Matsushita *et al*, 2005).

In fact, one study regarding the estimation of caloric intake in T2D patients reported that 30% of the subjects were able to accurately estimate their food energy, 20% of them overestimated it, and 50% of them underestimated their caloric intake (Hagura, 2000). It will be more effective to improve the patients' ability to comprehend their energy intake and energy expenditure through an educational program.

### **5.3 Assessing adherence, health and nutritional status of the diabetics**

Out of the ninety diabetics who participated in this study, 61% were females and 39% were males. Thus, this study demonstrates that most of the diabetics who were sampled were females. This finding is consistent with similar work done by Legato *et al*, (2006); they reported a higher incidence of diabetes among females in most countries. Eldemire and Hagley in (1996), also found a similar trend and hypothesized that high prevalence of diabetes among females can be attributed to genetics and environmental factors. More women than men were found to be more overweight and obese in the Agona study. The observed higher gender prevalence of women with diabetes has been previously reported for diabetic admissions to a public sector hospital in North Trinidad (Gulliford, 2005). Women with diabetes had a higher risk of developing coronary artery disease than their male counterparts regardless of menopausal status (Legato *et al*, 2006) and had to be keenly followed up for optimal care.

The prevalence of diabetes among female respondents could be attributed to either a sibling or a family member having had or being diabetic. Out of the 54% of respondents who reported family history of the diabetes, 53% of them were female respondents. In this study, 21% of these female diabetics had a sibling being diabetic compared to their male counterparts who had no sibling

being diabetic except for another family member like parents and aunts/uncles. In 1994, Moy and colleagues found a similar association and reported that, the risk of incidence of diabetes among females was 10% by age 50 years if a sibling was diabetic. Female diabetics in the Agona study comprised of 41% and 10% saying that a parent and aunts/uncles respectively had family history of diabetes. A 1-2% risk for the incidence of T2D was postulated again by Moy *et al*, (1994) assuming that one's mother had the disease and about 6% risk in cases for fathers.

It is interesting to note that about 46% diabetic respondents had no family history of the disease. This could be due to other underlying factors like aging or infectious agents which could have increased one's risk for diabetes (Eisenbath and Thai 1993). According to Eisenbath and Thai (1993), age is one of the strongest risk factors that predispose one to the development of non-communicable diseases (NCDs) such as diabetes, hypertension and cardiovascular diseases. Most of the diabetics in this study were from ages 40-60 years after 60 years, only a small number were diabetics. This finding is in concordance with a report by the Drug Info Committee of Indian (1990). In that report, the incidence of Non-Insulin dependent diabetes mellitus (most preventable type of diabetes) increased with age peaking between 45-55 years and then declines for those beyond 60 years. The prevalence of diabetes among the elderly could be attributed to malfunctioning of various organs such as the pancreas (Gong and Muzumdar, 2012). It is the cells of the islet of Langerhans of the pancreas that also play the role in the secretion of insulin, a satiety hormone that converts simple sugars into glycogen.

Lifestyles which have been established for many years are not easy to change and health care professionals cannot expect immediate adherence to the plan of management. Assessing the



lifestyle risk factors for T2D (smoking, poor nutrition, alcohol and lack of physical activity) and establishing a long term lifestyle plan weight reduction is often difficult. A combined program of healthy eating, physical activity and education directed at behavioral changes is often successful (Macera, 2010).

Increased physical activity is particularly important in maintaining weight loss. In this present study, lifestyle modification and pharmacological approaches were used as intervention measures for the management of the disease. It was however observed that physical activity was not able to improve the weight for height status (BMI) of the patients. Most of the patients were found to be overweight and obese despite them reporting adoption of healthy eating practices, healthy lifestyles and intake of their correct medications.

Loss of body weight has been found to result in near normal glycaemic, normal blood pressure and normal lipid profiles (Barclay *et al*, 2010). In this present study however, because most patients had poor nutritional status in terms of BMI, most of them did not also have the normal glycaemic and blood pressure profiles as expected. The correlation statistics results revealed that a significant difference existed on the association of BMI with fasting blood sugar (FBS) and blood pressure (BP) at p-value <0.01. This meaning that a poor body mass index status could have caused the poor status of glycaemia and blood pressure among the patients. Often an ideal body weight is not achievable and setting this as a goal discourages patients to attempt any dietary change. Many studies suggest that a weight loss of 5 to 20% will improve glycaemic control (Bantle *et al*, 2006 and Barclay *et al*, 2010). Therefore it is important to encourage any

degree of weight loss. A medium term goal for overweight patients is 5–10% body weight loss (Harris and Linn, 2010 and Barclay *et al*, 2010).

In this present study most of the respondents said that their form of physical activity was mainly walking which was done within the recommended 150 minutes a week. It is assumed that this form of walking exercise was however not the brisk form of walking to be described as aerobic enough for a minimum of 30 minutes 3 or 4 times per week. It is assumed that this form of physical activity, mainly walking which patients said they carried out was not able to improve their BMI status as majority of them were still obese and overweight. The class of people whose physical activity can be deduced as not being aerobic enough should be patients who fell in the sedentary class of people. The population size of people who constituted this sedentary class was also more than half of the total sample of respondents, if not the same as the sample size of respondents who were obese and overweight. Only a few of the respondents were found to be very active enough to perform aerobic exercise that caused their BMI to be kept normal or underweight.

Losing weight increases the body's sensitivity to insulin. In recent years, researchers have found that even a modest weight loss usually defined as 10% of the patient's pretreatment weight is enough to control or at least improve insulin resistance and other health complications of obesity. Weight reduction is usually accomplished by a combination of reduced calorie intake and increased physical activity (Anderson *et al*, 2003) of which increased physical activity was not assessed in this study. Majority of patients reported reducing their caloric intake alright but that

was also not assessed in this study. Therefore we were not able to determine the association between energy intake and energy output that can help in calculating weight loss.

Among the lifestyle related factors, smoking makes the largest contribution to the absolute risk of macrovascular complications for people with diabetes (Zwar *et al*, 2004). The added risk from smoking is greater than in people without diabetes. The diagnosis of diabetes is often a crisis for people with T2D and offers an opportunity to bring about cessation of smoking (Ding, 2007). Giving up smoking lowers the risk of heart disease, stroke, or lung cancer as well as increasing the body's sensitivity to insulin (Ding, 2007). For this study, most respondents said they did not engage in smoking. This indicates that for this study smoking had no association with diabetes. This could be due to an insignificant number of patients who smoked. On the contrary, Kawakami and colleagues in their longitudinal study (1999) reported that, those who were currently smoking had about 3.27 times higher risk of developing diabetes than non-smokers. This is because smoking is associated with insulin resistance. Nicotine and carbon monoxide from cigarette has adverse health effects on the body's metabolism. Prevalence rate of smoking in this study was 7.8% but in another study by Maty *et al*, (2001) higher prevalence was documented. This difference could be due to cultural and geographical differences between the study participants in these two separate studies.

As many people with T2D that are overweight or obese, alcohol should be minimized (Nicholas *et al*, 2000). The link between alcohol consumption and the related risk of T2D is established by many Western studies (Avogaro *et al*, 2004; Baliunas *et al*, 2009; Beulens *et al*, 2005; Carlsson *et al*, 2003; Seike *et al*, 2008). Risk of T2D is associated with frequency and quantity of weekly

alcohol consumption (Carlsson *et al*, 2003). Australian guidelines at the time of publication recommend  $\leq 2$  standard drinks (20 g) per day for men and women. Low alcohol beers are a better choice than ordinary or diet beers (Baghurst and Binns, 2002). Alcohol intake by the diabetics in this study was also reported to be low. In 1996, Wilkes *et al* reported that alcohol consumption has a long term effect on insulin regulated glucose uptake and thus might be an independent risk factor in the development of diabetes. Excessive alcohol causes pancreatitis. In this study, there was no correlation between alcohol intake and BMI. This is because, those involved in the drinking might be occasional drinkers. In an effort to adhere to the advice given those by health professionals, these once habitual drinkers may have become occasional drinkers and upon diagnosis of the disease settled to that drinking state. Occasional drinking may not increase BMI but can induce glucose intolerance and hence diabetes mellitus (Linda Kao *et al*, 2001).

The low consumption of alcohol and smoking among the diabetics in this study is commendable since these two activities have negative effects on optimal health achievement. Adherence to good diet plan coupled with regular exercise and low consumption of alcohol as reported by respondents has been beneficial in the management of diabetes since it has no cure. Age and changes in energy metabolism due to insufficient glucose uptake by the cells of the body may have decreased the diabetic patient's ability to expend energy; inevitable symptom of the disease and so the resultant more obese and overweight patients.

Healthy eating resulting in good nutrition is also important in the disease management. It was observed from this present study that complex carbohydrates made up of mostly leafy

vegetables, whole grain cereals, roots and tubers were consumed more by patients in a week than other food groups. These complex carbohydrates were rich in fiber and low in energy density. These complex carbohydrates, formed about half the portion size of meals eaten by the diabetic patients. Examples of such meals were boiled unripe plantain and kontomire sauce and steamed cabbage stew and boiled rice.

Carbohydrate foods which are rich in fiber and have a low energy density are the basis of the eating plan and it is recommended that they contribute up to 50% of the total energy intake ([www.nhmrc.gov.au/publications/synopses/dietsyn.htm](http://www.nhmrc.gov.au/publications/synopses/dietsyn.htm)). Meals containing carbohydrate should be spread evenly throughout the day. Both the quantity of carbohydrate and the quality of carbohydrate will affect blood glucose levels (Holman *et al*, 2008). The amount of carbohydrate has a larger effect on glycaemia than the quality (Holman *et al*, 2008). The glycaemic index GI classifies carbohydrates as slow acting (low), moderate (medium) and quickly absorbed (high) (Baghurst and Binns, 2002). In practice it is recommended that people with diabetes have one high fiber, low GI carbohydrate food at each meal (Baghurst and Binns, 2002).

Sugar does not need to be eliminated for diabetic diets. Including a small amount of sugar as part of a mixed meal or food, e.g. breakfast cereal, does not adversely affect the blood glucose level. Allowing small amounts of sugar as part of a high fiber, low fat meal plan increases the choice of foods available and may aid adherence (Patel *et al*, 2008). In this current study, more beverages and sugary foods were reported to be consumed by only a small number of respondents every day while most people said they rarely ate such foods. However, a small segment of the respondents too were also consuming these beverages and sugars twice or thrice weekly. The

assumption of the diabetic patients in this study was that since the disease was acquired from taking sugary foods, total avoidance of such foods would help improve their disease condition, hence the reason for few people not taking in any low sugared beverages as recommended. Care needs to be taken rather to prevent hypoglycemia. Low carbohydrate, high protein diets may predispose the person to hypoglycemia if they are taking a sulphonylurea or insulin (Patel *et al*, 2008).

Less than half of the total respondents reported consuming fatty foods daily while most said they rarely ate from this food group or consumed such foods twice or thrice a week and in small quantities. The reasons for sometimes eating such foods were due to the availability of these foods and the availability of funds to purchase such foods and also because such foods were tastier, easier and faster to prepare (Bray and Popkin, 1998). In this case most patients were found to be adhering to the recommendation of low intake of fatty foods stipulated in the two Ghanaian protocols.

The selection of the type of protein depends on patients' preferences taking into consideration the fat content of each source. Vegetable sources of proteins such as beans and pulses are very low in fat. The results of this present work revealed that more than half of the respondents reported consuming protein foods such as beans and other vegetable protein foods everyday while a small number of respondents said they rarely ate foods in this group because of a reason being lack of knowledge on what to eat. Quite a number of respondents also said that they ate such foods twice or thrice a week because such meals were not always available to them. In terms of adherence to protein foods, patients can be said to have adhered to protocol.

Many of the respondents in this study, however, said they did not add salt to their cooked foods or were not taking these salty foods. Only one or two people said they were still adding salt to their cooked foods or were taking these salty foods despite their diagnosis. More than half (60%) of the respondents however had high blood pressure after diagnosis even though most of the respondents said they were not taking salty foods. The problem could be that these respondents were not actually adding salt to their foods at the table but they were consuming salty foods. Since the 1970s, the amount of sodium in foods has increased, and everyone is eating more salty foods (more than the recommended 2300mg) each day than in the past (Centers for Disease Control and Prevention, 2009). The vast majority of the sodium consumed is from processed and restaurant foods; only a small portion is used in cooking or added at the table.

Salt added during cooking and in foods need to be minimized. It is recommended to use 'low salt' or 'no added salt' products for diabetic patients (Australian Diabetes Educators Association 2000). Examples of such salty foods include bacon, sausage, cheese or prepared snack foods like potato chips. Diabetes can put patients at increased risk of hypertension and cardiovascular complications (Legato *et al*, 2006). The USDA recommends that the average person should eat no more than 2300 mg. of salt a day, which is about a teaspoon. Blood pressure control is important for people with diabetes for many reasons. Diabetes increases a person's risk for various conditions, including heart disease, stroke, and kidney damage and eye problems (Legato *et al*, 2006). High blood pressure itself increases these risks, too. Unfortunately, the two diseases often go hand-in-hand. As many as two-thirds of people with diabetes also have high blood pressure, meaning they have a compounded risk of these various other conditions (Legato *et al*, 2006).

Overall, more patients, eighty two percent had high scores for adherence while only eighteen percent of the patients were found not to be adhering to protocol for this study. Majority of the patients adhering to protocol is evident from the above discussion that most patients were following good dietary and lifestyle practices. The few that said were not adhering to protocol may have had no idea of the management protocol put in place at the hospital or decided not to follow any guideline. Though most patients reported adhering to protocol, their nutritional and health status remained poor.

#### **5.4 The association of adherence to treatment protocol on nutritional and health status**

There was no association between the nutritional knowledge, the lifestyle and dietary pattern of diabetics on their nutritional and health status. Majority of the respondents had a poor nutritional knowledge of diabetes. This is consistent with studies conducted to examine the average patient's nutritional knowledge. Among these studies, nutritional knowledge has been reported to be lower than desired. For example, Larzelere and Patterson (2005), survey study of diabetic patients revealed that most patients given written nutritional information did not fully understand the presented materials and proposed that nutrition counseling be given a higher priority in the care of patients with diabetes. Several studies in T2D patients have shown inconsistent findings about the relationship between the status of glycaemic control and the patient's knowledge of lifestyle-related factors: glycaemic control improves as knowledge increases (Lo *et al*, 1996), improvements in glycaemic control can be achieved even without changes in knowledge (Agurs-Collins *et al*, 1997) and improvements in blood sugar control may not occur even with increased knowledge of lifestyle-related factors (Campbell *et al*, 1996). Most patients in this study also attributed the cause of the disease to sugary foods instead of an endocrine disorder. Most



patients' inability to also use energy intake and expenditure to improve glycaemic control by weight reduction also tells of their poor nutritional knowledge.

Adherence to treatment protocol did not give a good nutritional status to the diabetic patients as expected. The usual question is, can a diabetic patient adhering to protocol, have a poor nutritional status? The answer is most likely to be no (Lucas and Fayh, 2012, Van den Broek, 2009). In this study however, the opposite occurred. For example fasting blood sugar was not associated with changes in lifestyle and dietary habit. The goal of optimal blood glucose control is to achieve  $FBS \leq 7.0\text{mmol/L}$  (American Diabetes Association, 2003). Another underlying factor such as the duration of the disease could have also accounted for the elevations in the blood sugar readings of diabetics. Medical report of many patients showed that the majority of them had been diagnosed with the disease for more than a year. According to Wallace and Matthews (2000), optimal glycaemic control is difficult to obtain on a long-term basis due to complex reasons. Rhee *et al* (2005) hypothesized that patient- and health care provider related factors may account for one of the complex reasons for poor glycaemic control in T2D.

In this study longer duration of diabetes may have accounted for the poor glycaemic control among the diabetic patients. This is consistent with what other studies have reported (Benoit *et al*, 2005; Verma *et al.*, 2006). Again in 2010, Khattaba and his colleagues showed that longer duration of diabetes was associated significantly with poor glycaemic control (Khattaba *et al*, 2010). In the UK Prospective Diabetes Study (UKPDS) Group (1998), Longer duration of diabetes was also associated with poor control, possibly because of progressive impairment of insulin secretion with time because of  $\beta$ -cell failure, which makes the response to diet alone or

oral agents unlikely. The lack of a relationship between age and poor glycaemic control in this present study is not consistent with the findings of EL-Kebbi *et al*, (2003) and Nichols *et al*, (2000) which reported that younger age was associated with poor glycaemic control. However this current study is consistent with what Khattaba and his colleagues reported (2010).

Another reason why blood sugar and blood pressure readings were high despite reported adherence to protocol could be due to patients' inability to use their dietary and lifestyle practices to reduce their overweight and obese state. Using BMI as a means of classification for nutritional status, more than half (69%) of the diabetics were obese and overweight. Obesity and weight gain are established causes of T2D (Yang *et al*, 2006). Matsushita and his colleagues in 2005 hypothesized that, "diabetics needed the ability to recognize their energy intake and energy expenditure for the good control of T2D and for adequate compliance with their therapy schedules".

Van-Itallie reported from a Nutrition and health examination survey in USA, the relative risk of developing diabetes was 2-9 times greater in obese people than in normal or underweight people (JoAnn *et al*, 1995). A strong correlation of 0.89 ( $p < 0.05$ ) was also found between weight and prevalence of diabetes when Hawkes and Novak (1998) examined diabetes prevalence in relation to income, diet, obesity and race in ten regions by using a standardized diagnostic criteria.

In this current study, more females were overweight and obese as compared to their male counterparts may be due to the fact that males performed regular exercise when compared with females. About 72% of the male population exercised within the recommended 150 minutes per

week as against 52% of the female population. The fewer number of females who performed regular exercise could account for the increasing prevalence of obesity and hence diabetes among the female population as regular exercising has been reported by Ferrara (2009) to increase the rate of weight loss among obese people. Differences in BMI could be due to height differences among males and females. According to Sabah *et al*, (2002), females tend to be shorter and weigh less than their male counterparts, hence their BMI shifts rapidly to the overweight and obesity class. Females generally have more fat and less muscle, but the opposite is true for males. Thus a difference in physiology may be a necessary factor that affects BMI. Most females in developing countries put on weight during lactation because they consume a lot of calories and most likely do not return to their pre-pregnancy BMI after lactation. This predisposes more females who have had children diabetics later in life as shown in this study.

The relationship between diabetes complications and hypertension has consistently been well established in several studies (Grundy *et al*, 2002). One in every four adults older than 60 years of age has hypertension (Grundy *et al*, 2002; Whelton *et al*, 2002). Elevated BP is a major independent risk factor for multiple cardiovascular problems including coronary heart disease, stroke, chronic renal failure, and heart failure (Grundy *et al*, 2002). Hypertension is a major health concern worldwide because there is a direct positive relationship between blood pressure (BP) and cardiovascular risk. Hypertension is associated with increased risk of nephropathy, retinopathy, and cardiovascular disease mortality and morbidity in diabetic patients (Grundy *et al*, 2002; Whelton *et al*, 2002; Artinian *et al*, 2004).

The correlation between hypertension and age was significant for this study. The inverse correlation is an indication that hypertension was more prevalent among the diabetics in the lower age range than those in the higher age range. In the Pima Indian adult study published by De-Courten (1996), of the 50% diabetics studied, 40% were hypertensive. The high prevalence of hypertension could be attributed to aging.



## **CHAPTER SIX**

### **6.0 CONCLUSION AND RECOMMENDATION**

#### **6.1 Conclusion**

It can be concluded from the study that the nutritional management protocol for diabetics which was identified from the Agona Swedru hospital needed to be updated after it was compared to the GHS protocol. In assessing adherence to the nutritional management protocol, most patients reported adhering to protocol. The health and nutritional status of most of the diabetics in this study were found to be poor. Most of the patients were overweight and obese with higher fasting glucose levels and blood pressure readings above the cut off values. Generally, though most patients reported to be adhering to standard protocol, their nutritional and health statuses remained poor; thus, the need for enquiry and intervention cannot be overemphasized.

#### **6.2 Recommendation for Research**

The present study is perhaps among the few in Ghana to investigate diabetics' adherence and its effect on their nutritional and health status, there is a lot more work needed to be done even at other urban, peri-urban and even some rural places to fully understand the situation in Ghana.

The following areas need to be researched into:

The present study did not directly measure the total energy intakes (carbohydrates, fats and protein) of patients' diet. In subsequent studies, it is recommended that specific quantities of meals measured with household equipment should be used as a guide for quantities of meals that a diabetic should eat at a sitting and the total energy intakes of carbohydrates, proteins and fats of the diet that the diabetic ate determined.

The association between energy intake and energy expenditure of the patients adhering to protocol should also be investigated in subsequent studies to inform that there were some weight losses during adherence for overweight and obese diabetics and to find out how achievable the 10% reduction in weight is in Ghana.

### **6.3 Recommendation for Policy**

In this present study, most patients had poor knowledge of the disease, its causes and comorbidities. Booklets on the importance and dietary sources of nutrients and recommended exercises and other good lifestyle practices should therefore be developed and made available to patients and their caregivers to improve their nutritional knowledge and reinforce good dietary and lifestyle practices.

In the study, Agona Swedru hospital did not have the updated version of the nutritional management protocol for diabetics. It is recommended therefore that all hospitals and health centers should always have available copies of the updated nutritional protocol for the management of diabetes at their facilities.

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## **APPENDICES**

### **Appendix I**

The Ghana Health Service nutritional management protocol

Protein foods e.g. meat, fish, eggs, snails, bush meat, lobsters- can be taken in normal quantities, 2-3 times daily.

-All fresh fruits-amount to be eaten should be controlled, 2-3 times daily

-All green leafy vegetables (beans at least one serving spoon a day) - any amount desired allowed, 2-3 times daily

-Yam, cocoyam, millet, bread and all flour products, plantain, rice, sorghum, corn and all corn products- amount should be controlled, 3-4 times daily

-All fats and oils including palm oil, margarine and butter- small amount should be used for cooking one meal a day. 2-dessert spoons oil per cooking, 2-3 times daily

-Soft drinks, sugar, honey, lucozade, glucose, pies, pastries, cakes should be avoided totally

Eat 3 meals a day about the same quantity at the same time everyday. Snacks or small meals may be added if necessary

150 minutes per week of walking, moderate activity or vigorous activity.

Avoid excessive drinking of alcohol and smoking

The Nutritional management protocol at Agona Swedru hospital

Protein foods e.g. dried fish, snails, bush meat; mushrooms should be eaten more than the meats (beef, chicken skin, turkey tail, and eggs)

Very sugary fruits like sugar cane, pineapple, orange and banana should be eaten in very small quantities but the other not very sugary fruits (e.g. mango) any quantity is allowed.

All green leafy vegetables especially kontomire and cabbages should be more in foods. Any amount desired allowed

Yam, cocoyam, millet, bread and all flour products, ripe plantain, rice, sorghum, corn and all corn products can be eaten. Any amount is allowed

All fats and oils including palm oil from palm soup, margarine and butter, cakes and pastries - the quantity in every meal should be limited.

Soft drinks, sugar, honey, lucozade and glucose should be totally avoided.

Frequency of eating in a day; anytime one feels hungry

Exercise- mainly walking exercise daily but duration not known

## Appendix II

### Questionnaire

#### Background information about the diabetic

Respondent name: .....

Age (yrs.):    a. 40-50        b. 50-60        c. 60-70        d. >70

Sex: M [ ]    F [ ]

Occupation:    a. None        b. Laborer        c. Office worker        d. Other  
(specify).....

Level of education:    Nil [ ]    Primary [ ]    Secondary [ ]    Tertiary [ ]

Are you married?        Yes [ ]        No [ ]

How many children do you have?    a. 0    b. 1    c. 2    d. 3    e. >3

Are you a vegetarian    Yes [ ]        No [ ]

#### Medical history

How long have you had diabetes?    a. <1 yr.        b. 1-2 yrs.        c. 2-3 yrs.        d. 3-4 yrs.  
e. 4-5 yrs.        f. >5 yrs.

Is there any history of diabetes in your family?    Yes [ ]        No [ ]

If yes, what is your relationship to the person(s)?    a. Sibling        b. Parent        c. Cousin  
d. Niece/Nephew        e. Aunt/Uncle        f. other (specify).....

Clinical observation made by doctor:.....

How do you control your condition? Insulin plus diet [ ]      Diet alone [ ]      Diet and diabetes tablet [ ]

If diet therapy, briefly describe the type of diet you are put on

**Patient's knowledge of diabetes and lifestyle practices**

In your own understanding, what is diabetes?      a. Sugar disease      b. Stress disease  
c. Other (specify) .....

What cause(s) it?      a. Stress      b. Sugar      c. Fertilized foods      d. Other (specify)  
.....

Do you think diet/nutrition is important in the management of diabetes? Yes [ ]      No [ ]; Give reason(s).....

What foods (5) are good for diabetics? Give reasons.

Food

Reason

What foods (5) are not good for diabetics? Give reasons.

Food

Reason

Has your lifestyle changed ever since you were diagnosed a diabetic? Yes [ ] No [ ]

If yes, in what way? .....

Has your eating habit changed? Yes [ ] No [ ]

If yes, in what way? a. I don't fast b. I eat about 3 meals a day about the same time every day  
with snacks included sometimes c. I eat about the same amount of food at each meal

d. I take my Insulin injections and diabetes tablets except metformin 30 minutes before I eat my meals. Metformin is taken with meals.

Do you add salt to your cooked food? Yes [ ] No [ ]



Do you take any nutrient supplement? Yes ☐ No ☐

How many hours do you work in a day? .....

Do you exercise Yes ☐ No ☐

If yes what type(s) of exercise do you perform? .....

How long do you exercise in a day/week? .....

Have you ever smoked? Yes ☐ No ☐

If yes, do you still smoke? Yes ☐ No ☐

If yes, how many sticks do you smoke in a day? 1-2 ☐ 3-5 ☐ 6-10 ☐ >10 ☐

Do you take alcohol? Yes ☐ No ☐

If yes, tick from the list below as many as applicable

☐ Liquor (e.g. Gin, local gin)      b. ☐ Stout (e.g. Guinness, Castle Milk Stout)      c. ☐

Lager (e.g. Star, Club)      d. ☐ Wine      e. ☐ Pito/ Palm wine

Do you go with the advice given to you by the Doctor/Nurse/other health personnel? Yes ☐

No ☐

If no, why?    a. My work doesn't allow me      b. My religion/ belief doesn't allow me

c. My taste preference doesn't allow me      d. My family doesn't allow me      e.

Other (specify) .....

### Food Intake Patterns/ Dietary Habits

How often do you eat in a day? 1 ☐ 2 ☐ 3 ☐ >3 ☐

I would like to please ask you about all the foods and drinks you have had **yesterday** during the day or at night. I would like to know everything that you ate, whether at home or someplace else.

#### Food

Breakfast

Snack

Lunch

Snack

Supper



Are you on any special foods or sweetening agents for diabetics? Yes ☐ No ☐

If yes, list them .....

How often do you take in the following foods?

Foods Types	Once week	a week	2-3 times a week	Everyday	Rarely	Never
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*Carbohydrate-rich*

*foods.* E.g. bread,  
cassava, plantain,  
potatoes

*Beverages and Sugary*

*foods.* E.g. soft drinks,  
chocolates, candies,  
sweets

*Fruits and vegetables.*

E.g. banana, pineapple,  
mango, pawpaw,  
onions, cabbage, garden  
eggs

*Protein-rich foods.* E.g.

milk and milk products,

egg, meat, fish

*Fatty foods and oils.*

E.g. cakes, pies,

biscuits, spring onions,

red palm oil, any oil,

butter, fried foods

Others/

Nutrient

supplement

### Measurement

Weight (kg): .....

Height (m): .....

BMI: a. <25 b. 25 c. 26-30 d. >30

Fasting Blood Sugar (FBS) reading: .....

Blood pressure reading: .....

**Thank you**

**Appendix III BMI categories as proposed by WHO (1998)**

Risk of co-morbidities	BMI Category (kg/m <sup>2</sup> )
Low risk	<18.5
Average risk	18.5-24.935
Increased risk	25-29.9
Moderate risk	30-34.9
Severe risk	35-39.9
Very severe risk	≥40

Obesity was classified as BMI 30 and above

**Appendix IV Classification and blood pressure for adults**

BP classification	SBP mmHg	DBP
Normal	<120	<80
Pre-hypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥160	≥100

