KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI, GHANA.

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF HEALTH PROMOTION AND EDUCATION

TITLE: Prevalence and risk factors of obesity among senior high school students in the Adansi North District in Ashanti Region of Ghana.

BY

Isaac Amoh

NOVEMBER, 2016

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TITLE: PREVALENCE AND RISK FACTORS OF OBESITY AMONG SENIOR HIGH SCHOOL STUDENTS IN THE ADANSI NORTH DISTRICT IN ASHANTI REGION OF GHANA.

BY

ISAAC AMOH (B.A PSYCHOLOGY)

A thesis submitted to the Department of Health Promotion and Education, College of Health Sciences, School of Public Health, in partial fulfilment of the requirements for the degree of Master of Public Health in Health Education and Promotion.

NOVEMBER, 2016

DECLARATION

I hereby do declare that, except for references to other people's work which have been duly acknowledged, this piece of work is my own composition and neither in whole nor in part has this work been presented for the award of a degree in this University or elsewhere.

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DEDICATION

"*The happiest moments of my life have been the few which I have passed at home in the bosom of my family"- Thomas Jefferson*

This thesis is wholly dedicated to the sweet memories of my dear Mother and Brother, Madam Akua Gyasewaa Forkuo and Martin Addae. Maame and Martin, you have left footprints in my heart which have inspired me to reach this far. May the Almighty God keep your strong and gentle souls safely, till we meet again.

When the roll is called up yonder, I know I shall meet you there.

Also, to Obeng Amponsah Joycelyn my wife-to-be; only God can reward you for your prayers, love, support and patience given to me all this period. I am grateful.

ACKNOWLEDGEMENT

My sincere thanks firstly go to the Almighty God for His grace, strength and wisdom as well as the guidance of the Holy Spirit throughout the whole period of this thesis. To Him alone I give glory and honour. Indeed, I owe my deepest gratitude to the Almighty God.

There are a number of people without whom this work might not have been carried out, and to whom I am greatly indebted. I am sincerely grateful, first and foremost, to you my advisor, for your countless hours of reflecting, reading, encouraging and most of all, your patience throughout this entire process. I am particularly appreciative of the insights and immense knowledge I gained from you. You have inspired me in so many ways. May God richly bless you. I will forever be grateful to you - Mr Emmanuel Appiah- Brempong.

I am also thankful to all the students and the heads of the schools visited especially the students for their tolerance and the willingness with which they answered the questionnaire. My heartfelt gratitude also goes to you- Mr Emmanuel Nakua, Bio- Statistics Lecturer, School of Public Health, KNUST, for helping me with the analysis and Eugene Ansu Tutu for helping me with the data collection.

I extend my heartfelt appreciation to my family, especially Rosemary Ohene Tutu and my siblings (Rev Asare, Kofi Tutu, Amoh Kwabena, Atta Kwabena, Akua Kraa, Nana Ama and Ataa- Abena) and to all my nieces and nephews for their loving kindness and support in my academics (both financially and spiritually). I love you all.

My most important debt is owed to my wife- to- be; Obeng Amponsah Joycelyn. My heartfelt love and appreciation goes to you (Joycelyn) for your depth of understanding, for making the ultimate

sacrifice and tolerating the disruption in your life that enabled me to undertake and complete this work.

There are numerous of you I cannot mention here, but you are always on my mind for your encouragement, care and love.

None of those mentioned above however is responsible for any omission or errors arising from the thesis, for which I accept full responsibility.

OPERATIONAL DEFINITION OF TERMS

a) **Obesity**; An excessive or abnormal accumulation of body fat

b) **Body mass index**; is an anthropometric measurement to assess excess weight or obesity by dividing weight in kilograms by height in meters squared

c) **Non- communicable disease**; is a disease that is not infectious, and may result from genetic or lifestyle factors. Examples include cancer, mental health problems, hypertension etc

d) **Nutrition transition**; is the sequential of changes in dietary patterns and nutrient intake associated with social, cultural, and economic shifts of a country or a region

e) **Nutrition**; a process by which adolescents receive the food essential for them to grow up and be healthy

f) **Anthropometric measure**; it is the measurement of an adolescent's body physical dimensions

g) **Dietary intake**; it is the protein, vitamins, carbohydrates, and minerals in consumption

h) **Food consumption pattern;** it is the frequency with which foods are consumed by the adolescents in a day

i) **Meal**; it is an instance of eating that takes place at a specific time and includes consumption of specific prepared food by the adolescents

j) **Private senior high school**; an institution for educating students which does not receive financial assistance from the government

k) Breakfast; this is the first meal of the day consumed by the adolescent

l) Adolescent; young person either a male or female aged 12-19 years and attending senior high school in the district

m) Snacks; small meals usually eaten between meals by the adolescents

n) Public senior high schools; an institution for educating students which receive financial assistance from the government

o) Cut-off; is a designed limit beyond which a subject or observation is classified according to preset condition.

ABBREVIATION/ ACRONYMS

ABS- Australian Bureau of Statistics

ANGELO- Analysis Grid for Environments Linked to Obesity

BMI- Body Mass Index

CDC- Centre for Disease Control

CHD- Coronary Heart Disease

CVDs- cardiovascular diseases

DF- Degree of Freedom

DNPAO- Division of Nutrition, Physical Activity and Obesity

EDF- Energy dense food

FAO- Food Agricultural Organization

GDHS- Ghana Demographic and Health Survey

GDP- Gross Domestic Product

IOTF- International Obesity Task Force

KG/M^2- Kilogram per meter square

NCDs- Non- Communicable diseases

NHANES- National Health and Nutritional Examination Survey **NIDDM-** Non Insulin-dependent Diabetes Mellitus

PAL- Physical Activity Lessons

PE- Physical Education

P- VALUE- Probability value

SES- Socio- Economic Status

SHS- Senior High School

SSA- Sub Saharan Africa

UK- United Kingdom

UNICEF- United Nations Children's Fund

USA- United States of America

WHO- World Health Organization

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ABSTRACT

Background: Obesity is a multifaceted condition that is caused by a combination of environmental, medical and psychological factors. It is one of today's noticeable yet neglected public health problem with serious health consequences such as hypertension, type 2 diabetes and cardiovascular diseases that affect individuals of all ages globally. Adolescents are particularly prone to obesity owing to their reduction in physical activity, as well as to the greater accessibility of foods void of nutritional value. Additionally, adolescents' susceptible nature and changing bodies also contribute to their increase weights. The life course perspective postulates that, excessive body weight can persist from adolescence to adulthood, and increase the risk of NCDs. Among the adolescents, the school environment is a crucial setting for the development of and, or engagement in unhealthy dietary and physical activity behaviour.

The primary objective of this study was to determine the prevalence and risk factors of obesity among Senior High School Students in the Adansi North District in the Ashanti Region. Also, the study sought to assess the physical activity levels and the food consumption pattern of the students, as well as establishing the relationship between the independent variables and obesity.

A descriptive cross- sectional survey was conducted among 306 adolescents aged 12- 19 years. The adolescents were recruited from the five senior high schools in the district using stratified random sampling technique. Data was collected by the use of structured questionnaire and anthropometric data sheet to calculate for BMI levels. STATA version 11.1, and Microsoft Excel was used to analyze the data collected.

Results from the chi-square test indicated that, there was a significant relationship between leisure activities and obesity such as playing computer games (x^2=7.5086, df=9, p<0.05), and TV watching (x^2=6.3576, df=2, p<0.05). There was no significant relationship between playing and assisting in household chores and obesity (x^2=9.5706, df=7, p>0.05), (x^2=7.2145, df=2, p>0.05)

respectively.

There was also a significant relationship between food consumption pattern and obesity (x^2= 21.6181, df= 9, p< 0.05), a significant relationship was seen between mode of transportation and obesity (x^2=30.6244, df=15, p<0.05) and there was a significant relationship between income level of parents and obesity (x^2=8.3189, df=6, p<0.05).

Overall prevalence of obesity among the adolescents was found to be 47.06%. Factors that were associated with the development of obesity were; physical inactivity levels and consumption of foods that were dense in fats and carbohydrates. Even though majority 62.75% of the respondents ate three times in a day, their meals were mainly energy dense foods and fats. Few of the respondents were found to be physically active and majority of them spent their leisure time watching TV (44.44%), whilst 23.2% spent their time playing computer games or video. Also 65.36% of the respondents consumed snacks in between meals while 54.58% did not consume fresh fruits for a whole week period.

The study concludes that, the prevalence of obesity among the adolescents in the Adansi North District is quite high compared to rates in some developed countries. There is the need to plan for the most efficient and effective interventions not only to ensure food security, but also maintain healthy lifestyles, (thus, improving eating habits and increasing physical activities) so as to reduce the prevalence of obesity among the adolescents in Ghana as a whole.

Keywords: Obesity, Prevalence, Risk factors, Adolescents

CHAPTER ONE-INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Obesity has recently become a serious public health concern which has been recognized by health professionals as an increasing worldwide problem. Obesity refers to as an abnormal or excessive accumulation of body fat which may be harmful to health (WHO, 2009; Callaway et al., 2009). Evidence shows that before the 20th century, obesity was rare. However, in the year 1997, the World Health Organization (WHO) recognized obesity as an international phenomenon and consequently described its increasing prevalence across all age groups in the world as a 'global epidemic'(WHO, 2006). The WHO has also noted that, obesity has contributed to the high rising prevalence of Non-Communicable Diseases (NCDs) such as heart diseases, type 2 diabetes, hypertension, stroke, and certain cancers along the range of life (WHO, 2011). Statistics show that, there are about 1.6 billion people in the world who are overweight whilst about 400 million are found to be obese, with a higher rate among women than men (Rocchini, 2002) . India alone is weighed down by a whopping 97 million obese citizens (WHO, 2010). Generally, the incidence of childhood obesity is also on the increase, 22 million children under age 5 globally have been classified as overweight (Rocchini, 2002). For instance, in the United States, twenty-five percent of children are overweight whilst eleven percent are obese (Dehghan et al., 2005). In Europe, the same increase prevalence can be seen (Franco et al., 2010; Livingstone, 2001).

According to UNICEF, globally, adolescents population is about 1.2 billion among which 88% are living in developing nations (UNICEF, 2011). Yet, since these adolescents have a low incidence of infection compared with under 5 children, and of chronic disease compared with ageing people, they have largely been given little health and nutrition attention, except for reproductive health concerns (Tunstall-Pedoe, 2006). In many developing countries, research and investment in health

have been mostly devoted to infectious diseases, notwithstanding the increasing need to address chronic diseases with extra effort and resources (WHO, 2005). It is estimated that, deaths resulting from infectious diseases, maternal and perinatal conditions and nutritional deficiencies will decline by 3% over the next decade, whilst deaths due to NCDs are projected to increase by 17% with the highest increase in the African Region (27%). Additionally, out of 64 million projected deaths worldwide in 2017, 41 million (64%) will result from NCDs unless serious action is taken (Victora et al., 2008; WHO, 2010a). Obesity was initially linked to only high income countries, but now, it is rampant in low and middle income countries (Campbell & Campbell, 2007) .Currently, there are about 20-50% of urban population in Africa that are classified as either overweight or obese and that by 2025, three quarters of the obese population worldwide will be in non-industrialized countries of which Ghana is of no exception (Kamadjeu et al., 2006). Obesity is one of the top 10 health risks in the world and one of the top 5 in the developed countries (WHO, 2003b). An increased rate of Obesity was originally discovered among adults, but over the last few decades, it has been documented worldwide that, there is a significant increase trend in the prevalence of obesity among adolescents which has become an emerging health issue for adolescents in developing countries (Popkin, 2006). Generally, the rates of overweight and obesity is increasing across the globe. The WHO has estimated that by the end of 2017, about 2.3billion adults will be overweight whilst 700 million adults will be obese (WHO, 2010a)

Despite the continued problem of under nutrition in Sub-Saharan Africa (SSA) countries, SSA is not insusceptible to the obesity epidemic (Bleich et al., 2007; Lopez et al., 2006). A research conducted by Ziraba et al concluded that, the prevalence of overweight and obesity grew by almost one-third between 1992 and 2005 in a sample of women from SSA countries (Bleich et al., 2007;

Ziraba et al., 2009). In Africa, the increasing rate of obesity has been attributed to many factors such as sedentary lifestyles, consumption of more saturated fat foods, salt, sweets and beverages which have high energy value (Caballero, 2007; Prentice, 2006; Agyei-Mensah & Aikins, 2010). High consumption of cheap food items such as refined carbohydrates, polished grains and frozen meat products are mostly consumed by the poor in deprived and low status areas which increases the prevalence of obesity (Dake et al., 2011). Increased sedentary nature of daily activities as well as physical inactivity are serious threats to the body since they increase the risk of overweight and obesity thereby affecting the normal body function and work output (Ogunjimi et al., 2010).

The prevalence of obesity has social and economic implications as well (Wang et al., 2005; Hossain et al., 2007). The total cost attributable to obesity related diseases in the United State of America amounted to over $200 billion (Hammond & Levine, 2010). In Kansas, the total medical expenditures attributable to obesity was estimated to $ 1,327 billion (Trogdon et al., 2012). Chronic diseases usually affect the most economically productive age groups, hence have implications on quality of life of the human resource and consequently the nation's Gross Domestic Product (GDP) and national development (WHO, 2005).

The 1999-2000 National Health and Nutritional Examination Survey (NHANES) revealed that, 10% of children aged 2-5 and adolescents' age 16-19 years in the United States of America were overweight. In the past few decades, the incidence rate of obesity has increased radically and at frightening pace in the developing countries and Ghana in particular. About 30% of the children have been affected with overweight problem (Pearson, 2005). Obesity has adverse effects on mental health such as; stress, low self- esteem, depression and anxiety. Obese children are more likely to remain obese in adulthood (Daniels et al., 2005). Over a few decades, studies that have explored the prevalence of obesity in childhood and adolescents have emphasized its significance

on the basis of its severity in adulthood, because it contributes to increase morbidity and mortality (Mello et al., 2010; Marques et al., 2013).

Vital development occur during adolescence. At this period, physical changes including growth, the onset of menarche for the girls and increase in fat and muscle mass takes place. This contributes to obesity. Adolescent obesity is linked to increase morbidity and mortality in adulthood (Marques et al., 2013; Pollock, 2006). In India, high levels of obesity among the adolescent is as a result of increased consumption of energy dense, nutrient poor foods with more sugar and saturated fats combined with less physical activities (WHO, 2004). Obesity may also be caused by genetic, social, cultural, behaviour and physiological metabolic factors which may be beyond the person's control (Pollock, 2006). Leisure pursuits are suspected as major contributors to rising levels of obesity in adolescents (WHO, 2004).

Studies conducted among the pre-school children from numerous African countries revealed that, South Africa had an incidence rate of 31.9%, Algeria 21.6%, Seychelles 25%, Malawi 8.4%, Mauritius 5.6% and Kenya 4.6% (Ziraba et al., 2009). However, there are inadequate data available from African countries for studying the developments of adolescents' obesity (IOTF, 2002). Prevention is the only viable choice for decreasing this epidemic since current treatment practices for obese adolescents and children are mainly focused on bringing the problem under control rather than effecting a cure (Cole et al., 2002).

Therefore, if this problem is curtailed, we will not only prevent the transition of adolescents' obesity to adulthood but also health related problems linked to obesity will be prevented hence increasing the life expectancy of these adolescents. Availability of data on adolescents' obesity is

inadequate not only in Africa, but in Ghana also. As a result, the study sought to generate knowledge on the prevalence and risk factors of obesity among adolescents' in Senior High Schools in the Adansi North District in the Ashanti region of Ghana.

1.2 STATEMENT OF PROBLEM

Contrary to the previous view that obesity was a condition found in the developed countries, current studies are now reporting that the problem is steadily increasing in developing countries of which Ghana is no exception (Akinkugbe & Oladipo, 1990; WHO, 2013a). Obesity is a condition viewed differently across cultures. Most developed countries, despise obesity but for most African cultures fat women are seen as beautiful (Dake et al., 2011; Holdsworth et al., 2004). Western countries again attach social stigma to obese people (Prentice, 2006). This is missing in African countries (Aikins et al., 2010). In some sub-Saharan African countries (SSA), there is a cultural importance of fatness which is a sign of prosperity, health, beauty and prestige. It even signifies strength and makes one look respectable in society (Renzaho et al., 2012; Puoane et al., 2010; Shaibu et al., 2012; Amoah, 2003). Thinness on the other hand, is mainly associated with poverty and illness and drastic weight loss is presumed to be HIV/AIDS (Kruger et al., 2005; Aikins, 2006; Shaibu et al., 2012).

Though most African societies associate wealth and prestige to body mass or size, the implication of this condition on the health of people seems to be unknown especially where it has been linked to other diseases such as hypertension, stroke and among others. In spite of what several report and data have revealed about the adverse effect of obesity and the possible disease that may be associated with it, the awareness level of the epidemiology and the effect of the phenomenon has not been impressive at all, especially in the developing countries and Ghana in particular.

It is therefore imperative to examine the prevalence and the risk factors as well as adverse effects of obesity among the adolescents. In this light, the study sought to target senior high school students. The focus on senior high school students was significant to study, because as one ages the rate of obesity increases, hence examining the risk factors accounting for the prevalence of obesity will go a long way to tackling the condition. For instance, the work of Amoah (2003a), in both urban and rural Accra revealed that the overall prevalence of overweight and obesity was 23.4% and 14.1% respectively. This was among adults aged 25years and above. The rates were reported to be higher in females than in males. Against this backdrop, a study at the senior high school level was crucial to curtail the prevalence rate of obesity at adult years. Being aware of the risk factors accounting for the prevalence rate of obesity in Ghana will help in finding ways of combating the condition.

1.3 RATIONALE OF THE STUDY

The prevalence rate of adolescent obesity poses serious health crisis. Adolescent obesity due to poor nutrition and lack of exercise causes a huge threat to the life expectancy levels. It is associated with higher chance of premature death and disability in adulthood (Pinhas- Hamiel & Zeith, 2005). Obesity is on the increase in Ghana. The Ghana Demographic and Health Survey (GDHS) shows high prevalence among women and Dake et al (2011), confirmed this on secondary data analysis. The problem of NCDs has increased in Africa, and is anticipated to rise further (WHO, 2011b). The food environment in most urban cities have also changed to include the consumption of energy dense dietary items such as fast foods and sugar sweetened beverages (Dixon et al., 2007). There may be an association between the changing lifestyles in Ghana and the increase in obesity. According to the life course perspective, many of the risk factors of obesity develop early in life and later contribute to NCDs related morbidity and mortality in adulthood (Ben-Shlomo & Kuh,

2002; Kuh & Shlomo, 2004). The results from this study is expected to guide all stakeholders in the Adansi North District, particularly at the senior high school level and policy makers in Ghana, and more so, countries with a high prevalence of obesity, to be able to come up with an appropriate obesity prevention and physical activity and nutrition promotion activities which would help alleviate this problem before it reaches epidemic proportions in the country

1.4 CONCEPTUAL FRAMEWORK

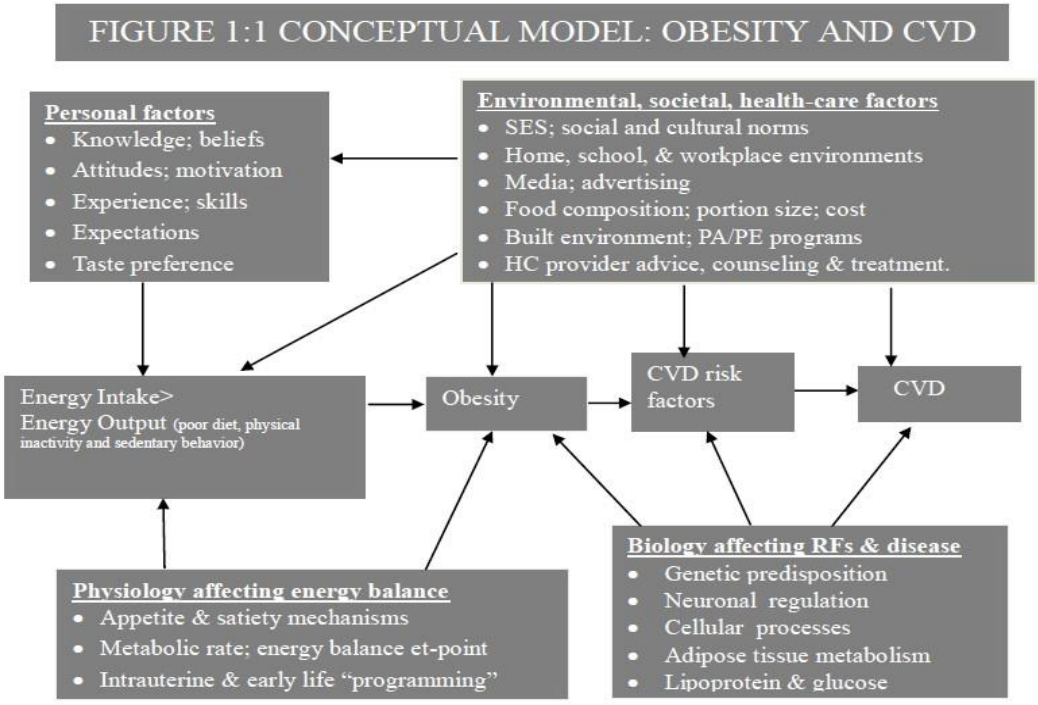


Figure 1.1 Conceptual framework of Obesity Progression adopted from Glanz et al (2008) page 573.

A combination of factors such as personal factors, environmental, health care factors and physiological factors contribute to the development of obesity and health related complications such as sleep disorder, hypertension and certain types of cancers across all stages of life (Ahrens

et al., 2011; Shilpi & Satwanti, 2012; Girma & Genebo, 2002; Ziraba et al., 2009; Moore et al., 2010). The conceptual framework (Figure 1.1) above shows that, the proposed factors are associated with adolescents' obesity. According to Glanz et al (2008), Personal factors such as taste preference, beliefs, attitude etc, may lead to energy output like sedentary behaviour, poor diet and physical inactivity which contribute to obesity. Environmental, societal and health care factors such as home, school and workplace environment as well as media and food composition also contribute to obesity. The biology and physiology also contribute to obesity epidemic among the adolescents. This study however sought to focus on the following possible risk factors physical activity, dietary habit and demographic factors due to the following reasons;

Physical activity; High physical activity level is one of the surest ways of maintaining healthy weight status of an individuals. It has been noted that, physically active adolescent are less likely to experience symptoms of depression, higher life satisfaction and decreased stress level.

Dietary habit; Quality of nutrition consumed by an individual is determined by the environment in which the adolescent lives which therefore help reduce the rate of obesity among them. Also, the weight and health of an adolescent depends on the availability and accessibility of nutritious food in his or her home.

Demographic variables; It has been documented worldwide that, as individual matures in age, their body size increases which predispose an individual to obesity. As a result, obesity management at a tender age has a greater effect than in adulthood because body fat starts to increase at this stage (Muhihi et al., 2012).

To curb this problem, education helps people choose healthier lifestyles by improving their knowledge of the relationships between health behaviours and health outcomes. They will be

capable of making better choices that affect their health (Kenkel, 1991). It is therefore expected that highly educated individuals will have normal BMI compared to those with no formal education.

1.5 RESEARCH QUESTIONS

In the light of the foregoing discussions, the study asked the following research questions:

- What is the prevalence of obesity among the students in the Adansi North District?
- How often do these students engage in physical activities?
- What is the food consumption pattern of these students?
- Is there a relationship between the independent variables and obesity?

1.6 RESEARCH OBJECTIVES

1.6.1 MAIN OBJECTIVE

 The major aim of this work was to determine the prevalence and risk factors of obesity among Senior High School Students in the Adansi North District in the Ashanti Region.

1.7 SPECIFIC OBJECTIVES

- To determine the prevalence of obesity among SHS students in the Adansi North District
- To assess the physical activity levels of SHS students in the Adansi North District
- To assess the food consumption pattern of SHS students in the Adansi North District
- To establish any relationship between the independent variables and obesity

1.8 PROFILE OF THE STUDY AREA

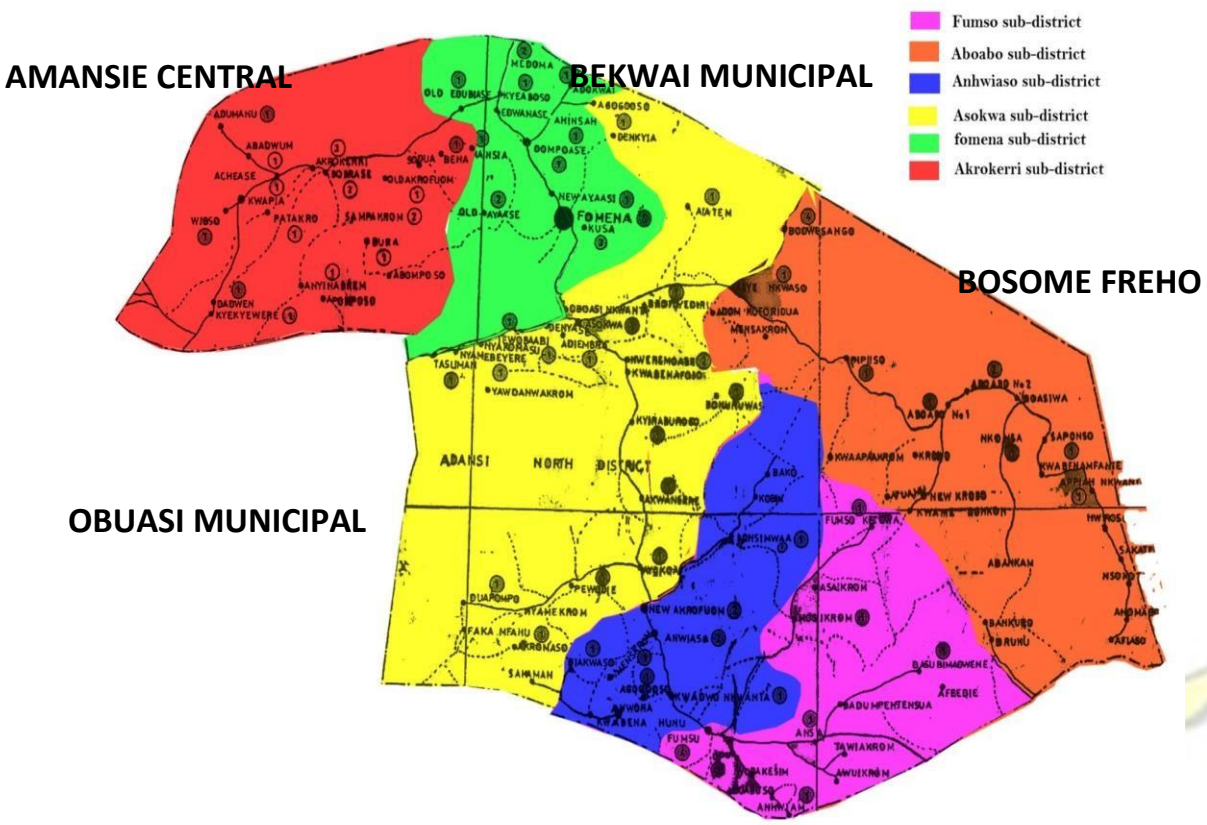
Adansi north district is one of the 30 administrative districts in Ashanti region. It was carved out of the then Adansi East and Adansi West districts, now Adansi South and Obuasi municipality respectively. It was created under legislative instrument (LI) 1758.

The district was inaugurated on the 19th February 2004. It shares boundaries with Bekwai municipality and Bosome Freho on the North East, Adansi South on the South, Obuasi municipality East on the South East and North West with Amansie Central. The Adansi north district covers an area of approximately 1,140 km^2.

The total population of Adansi north district is 119,141. The population is predominantly Akan's with Adansi forming the greater part. However other ethnic groups, such as the Ewes, Fante's, Krobo's, and Akuapim's also reside in the district due to the mining and farming activities. The most common culture/festival in the district is Akwasidae and a festival which has not yet been named but called "Afahye". Most of the people living in the district are Christians, and sizeable numbers of the people are Muslims. Others also practice the African traditional religion. There are 12 health facilities in the district. In addition, the district has four government and one private senior high schools. The district also has one college of Education and a community health nurses' training school.

The district was selected due to the presence of many people with varied social, cultural, economic and religious backgrounds. The study was conducted in all the five senior high schools in the district because the students are exposed to different modern lifestyles and indulge in diversified diets. The diagram below is the map of the district.

THE DISTRICT MAP



MAP OFADANSI NORTH DISTRICT

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Figure 1.2. The Map of the District

Source: District Health Directorate, 2014

1.9 SCOPE OF THE STUDY.

The report mainly targeted the eating pattern of adolescents and also whether or not they engaged in physical activities. The eating pattern focused on the types of foods consumed by the adolescents. The physical activities were aimed at any form of exercise that they engaged in. This helped determined the prevalence of obesity among the students using the anthropometric measurements.

1.10 ORGANIZATION OF REPORT

The success of any research work depends on how it is orderly organized. This thesis consisted of six chapters. Chapter one involved the introduction and provided background information, and then discussed key research issues such as, statement of the problem, rationale of the study, conceptual framework, research questions, objectives, profile of the study area, the scope as well as the organization of the study which was relevant to this research and establishes an understanding as to why this research was undertaken. Chapter two is the review of the literature encompassing the risk factors of obesity with a focus on adolescents. Chapter three comprised of, methodology, limitations and assumptions of the study as well as the ethical considerations. Chapter four showed the description of the characteristics of the study population in a form of frequencies, percentages and tables. Chapter five covered the analysis and discussion which involved the background characteristics with the dependent variable. Finally, chapter six presented a summary, conclusion and recommendations of the study.

CHAPTER TWO- REVIEW OF LITERATURE

2.1 INTRODUCTION

Obesity is rapidly increasing in both developed and some of the developing nations; in the latter it has replaced malnutrition and food security which used to be life threatening. The prevalence of obesity is increasing alarmingly in adolescents owing to reduce leisure time, physical activity, and increased sedentariness. Gradual weight gain is observed with ageing owing to decrease activity levels more time spent indoors as well as the replacement of muscle tissue by adipose tissue. These factors contribute to lowered total energy expenditure and consequently to weight gain. This has been as a result of adopting a Western lifestyle which involve decreased physical activity and over consumption of cheap energy dense foods (Lobstein et al., 2004; WHO, 2002).

For better understanding of adolescents' obesity, this review focused on: global prevalence of adolescents' obesity, causes of adolescents obesity which include, dietary patterns and eating habits, physical activity level, environmental and societal factors and biological factors as well as demographic factors. The economic consequences, treatment and management of obesity were as well reviewed.

2.2 GLOBAL PREVALENCE OF ADOLESCENTS OBESITY

The rate of obese adolescents in western countries currently is very much threatening. Recent systematic review concentrating on obesity among European adolescents revealed that the incidence of obesity ranged from 4% to 28% in men and from 6% to almost 37% in women (Berghofer et al., 2008). According to WHO, the current rate of adolescent obesity has increased ten times higher than it was in the 1970's (WHO, 2003a). Globally, the Prevalence of adolescent obesity is on the increase in both developed and developing countries (Caballero, 2007;

Kurukulasuriya & Sowers, 2007). However, the rate is higher in developed countries such as Europe and North America than in African countries, which are less developed (Lobstein et al., 2004). But, the incidence of excessive accumulation of body fat is apparently on the increase in Africa (Ziraba et al., 2009) and Asia (Yoon et al., 2006). The World Health Organisation global estimates in 2003 showed that, more than one billion adolescents were overweight whilst three hundred million of them were clinically obese. Also, close to seventy-five percent of cardiovascular diseases (CVD) can be linked to high cholesterol, high blood pressure, low fruits and vegetable intake and inactive lifestyle (WHO, 2003a).

2.2.1 Prevalence in USA

The rate of obesity has increased drastically during the last two decades in the United States among both the adolescents and children (Wang & Beydoun, 2007). Statistics shows that, one state in the US (Colorado) had an incidence of obesity not less than twenty percent (CDC, 2008). A research conducted by National Health and Nutritional Examination Survey (NHANES) using measured weights and heights from 2007- 2008 showed that, 17% of children and, adolescents aged 2 to 19 years were obese (CDC, 2008). Additionally, the US had the highest prevalence of overweight among children which ranged from 11% to 15% in a cross sectional school based studies conducted in numerous European countries, Israel and United States (Lissau et al., 2004).

In order to prevent the obesity epidemic and other chronic diseases in US, the Center for Disease Control and Prevention formed a Division of Nutrition, Physical Activity and Obesity (DNPAO) in 1999. Its task was to establish a policy and environment changes to enhance health in places where Americans work, live, learn and play. Twenty five States currently, are receiving a range of nutrition and physical activity strategies (CDC, 2008).

2.2.2 Prevalence in Europe

A survey conducted in seven countries in Northern and Southern Europe on men aged 40-59 years indicated that, between 15-20% of European men were obese (Menotti et al., 2000; Kromhout et al., 2001). The survey further concluded that, they were overweight from adolescent years. The UK Department of Health indicated that, the incidence of obesity in women had almost tripled from 8% to 21% between 1980 and 1998. More than half of the population were found to be obese in a survey conducted in 1998 by the Health survey unit of England (Ashton et al., 2001). Interventions were designed to reduce the risk of obesity associated diseases if body mass index is equal, or more than 22kg/m^2 (Ashton et al., 2001). Also, the mean BMI has increased from 25.1kg/m^2 to 26.9 kg/m^2 among women in Norway over a period of 22 years (Midthjell et al., 2013).

2.2.3 Prevalence in Australia

Data from the National Health Survey from 2004-2005 showed a high prevalence of adolescent obesity between 1995 and 2004-2005. The results showed that, overweight had increased from 29.5% in 1995 to 32.6% in 2004-2005. The prevalence rate of obesity among the adolescents had also increased from11.5% in 1995 to 16.4% in 2004 – 2005 (Australian Bureau of Statistics, 2007)

2.2.4 Prevalence in Africa

Most African societies are facing double burden of over-nutrition and under-nutrition (Rosen &Shapouri, 2008). Its health implications are obesity, stunting or wasting. Obesity is speedily entering the African countries particularly among the adolescents (Mendez et al., 2005; Ng et al., 2011). According to Ziraba et al (2009), between 1992 and 2005 seven sub- Saharan African countries namely; Ghana, Kenya, Malawi, Niger, Senegal, Tanzania and Burkina Faso reported

Five percent rise in overweight and obesity per year. In Nigeria, the rate of obesity was almost six times higher among female than male adolescents (Amole et al., 2011). The incidence of obesity and overweight in Kenya was 43.3% (Steyn et al., 2011). The rate of obesity is high among low socio economic status in developed countries. However, the rate is reported to be high among both affluent and the poor in developing countries undergoing 'nutrition transition' (Rosen & Shapouri, 2008; Jones-Smith et al., 2012; Jones-Smith et al., 2011). The problem of obesity may prevail among population with these two extreme socio economic exposures.

2.2.5 Prevalence in Ghana

The prevalence of obesity continue to increase in Ghana especially among the adolescents (Mogre et al., 2012; Amegah et al., 2011; Abubakari et al., 2008). A research conducted by Addo et al (2009) among a cross- section of civil servants in Accra showed that, obesity has increased rapidly and was almost four times higher in females than in males. Additionally, data from 2008 Ghana Demographic Health Survey (GDHS) and Dake et al (2011) confirmed a high prevalence of obesity among Ghanaian adolescents. Generally, the rate of obesity is increasing across the globe but at different pace.

2.3 CAUSES OF ADOLESCENTS OBESITY

Obesity is a multipart condition that is caused by a number of factors such as genetic, environmental and psychosocial factors (Bouchard, 1991; Jequier, 2002). It is noted that, high prevalence of adolescent obesity is mostly attributed to behavioural factors which is influenced by environmental changes rather than changes in genetic make-up (Jequier, 2002; Spiegelman & Flier, 2001). Unhealthy diets and insufficient physical activities are behavioural risk factors that promote weight gain (Pearson & Biddle, 2011). These factors can be grouped as easily modifiable and those

that cannot be modified. Environmental, behavioural, culture, socio economic status and industrialization are those factors that can be modified whereas genetical factors cannot be modified.

2.3.1 Food Consumption Pattern

Throughout the growing years of a person, food play an important factor in his or her life. Food behaviour and the quality of nutrition is determined by the environment in which the adolescent lives. It is the duty of the parents to provide food for the adolescent. The pattern of obesity usually start from infancy when the mother over feeds the baby with the belief that a fat baby is, a healthy baby. Hence over eating sometimes becomes a habit (Wabitsch, 2002). Obesity is highly linked to continue nibbling of food between meals (Williams, 1998). According to Kossere- Konan (2011), high intake of refined foods is a common practice that predispose an individual to obesity, and to some extent skipping of breakfast (Mozaffarian et al., 2011). High consumption of fast foods is associated with weight gain (Pearson & Biddle, 2011), and sugar sweetened beverages (Hu & Malik, 2010; Olsen & Heitmann, 2009), due to their energy concentration (Prentice & Jebb, 2003), and low satiety property (Hu & Malik, 2010; Jequier, 2002). Some studies have revealed that, eating of fast foods is linked to increase intake of sugar sweetened beverages and fewer intakes of fruits, vegetables, fibre, and milk across all age groups (Bauer et al., 2009; Bowman et al., 2004; Bowman & Vinyard, 2004; St-Onge et al., 2003). Frequent snacking has been associated with a rise in overall dietary intake in affluent societies (Jahns et al., 2001).

Foods consumed as snacks may have impact on the body weight. Majority of the snacks consumed are often high in fat and carbohydrates which predispose an adolescent to obesity. According to

WHO, high consumption of fat and carbohydrates must be discretionary in order to maintain a healthy body weight (WHO, 2004).

2.3.2 Physical Activity

Physical activity is a vital factor for keeping healthy weight status because it potentially influence on body composition, metabolism and increasing energy expenditure (Nowicka & Flodmark, 2007). Regular physical activity puts adolescents at reduced risk of cardiovascular diseases, and metabolic syndrome development by helping to maintain normal blood pressure and insulin sensitivity (Nowicka & Flodmark, 2007; Eisenmann, 2007). Physically active adolescents are unlikely to experience symptoms of depression, experience higher life satisfaction, increased self-esteem and decreased stress (Fraser-Thomas et al., 2005; Sallis et al., 2000).

Obesity is not common in those who lead active lives and follow occupations that requires hard physical exercises. However, it is common in those whose lives are sedentary because of their low energy expenditure (Eleavior, 1998). The WHO has age specific recommendations concerning the frequency, time, strength, type and total amount of physical activity required for good health including the maintenance of a healthy weight. Adolescents and children aged 5-17 years should engage in at least 60 minutes of aerobic activities at a moderate intensity daily (WHO, 2011c). Adults aged 18 years and above, should engage in not less than 150 minutes of aerobic physical activity at an adequate intensity every week (WHO, 2011d; WHO, 2011e). It was also recommended that, additional time spent engaging in aerobic physical activity at moderate to vigorous intensity results in extra health benefits to individuals across all age groups (WHO, 2011c; WHO, 2011d; WHO, 2011e). Studies have suggested that, there is low physical activity across all age groups globally (Tremblay et al., 2011) and is associated with obesity (Te Velde et

al., 2012). Increasing physical activity is commonly recommended to treat adolescent and childhood obesity and improve a healthy weight status (Atlantis et al., 2006).

A research conducted by Atlantis and Bames revealed that, aerobic exercise consisting of nearly 180 minutes per week of moderate to high intensity were effective way of decreasing body fat in overweight adolescents (Atlantis et al., 2006). Physical activity has been proven to reduce fat in at-risk adolescents and can be used to prevent unhealthy weight gain. To maintain a healthy weight status, it is very vital to get adolescents active. Physical activity habits, formed during adolescents are linked to physical activity habits in adulthood (Fraser-Thomas et al., 2005). A longitudinal survey conducted by Gordon-Larsen et al (2004) revealed that, adolescents who fail to meet physical activity recommendations continue this pattern of inadequate activity into adulthood. For these reasons, it is very important to get adolescents physically active early in life.

2.3.3 Environmental and Societal Factors

Under the environmental factors, the review included changing societal structures, economic status, food industry, media and culture.

2.3.3.1 Changing Societal Structures

Globally, studies have shown that, for the past two decades, adolescents spent most of their leisure time on physically inactive electronic devices such as computers, computer games and broad band connections. High weight gain in adolescents have been linked to fewer levels of physical activity owing to large amount of screen time (Tammelin et al., 2007; Kautiainen et al., 2005). The incidence of obesity was consistently high among children aged 2 to17 years who spent an average of 4 to 7 hours per day on screen time (Stettler et al., 2004). In the 2000s, approximately fifty percent of Finnish adolescents went beyond the recommended TV viewing time of two hours a day (Hancox et al., 2004; Tammelin et al., 2007).

The decline in energy expenditure as seen with modernization and other societal changes is associated with sedentary lives such as motorized transport. Increased use of personal vehicles is a vivid indication that many people now travel short distances by car rather than walking or cycling. In Ghana, most adolescents use transport to school. In the work places and schools, the systems have markedly reduced that, for even moderate activity and small proportion of the population now engages in physically demanding manual works. Elevators, escalators and automatic doors are all designed to save substantial amount of energy. Urban residence usually discouraged the adolescents who go out alone, or at night because of fear of their personal security.

2.3.3.2 Economic Status

Obesity is commonly found in poor income families which may be partially owed to the high cost and limited availability of nutritional foods and less physical fitness opportunities (Sinha & Kling, 2009). Adolescents are easily convinced and therefore are impacted by the food choices of their parents. The adolescents are likely to develop unhealthy eating habits if these dietary choices are unhealthy as well. Weight and health of an adolescent depends on the availability and accessibility of nutritious food in his or her home (Sharma &Branscum, 2009). A study focusing on the adolescents in California reported that, in 2007, the incidence of obesity was nearly three times higher in the lowest income group than in the highest income group (Babey et al., 2010). Some studies have again indicated that, high socio economic status (SES) is adversely associated with obesity in advanced countries but, it is positively associated to populations of under developing countries (IOTF, 2002). As a results, slim people are normally seen as poor and obesity as a symbol of wealth. As per capita income rises, the nature of the meals in traditional societies tends to change to a greater consumption of total fat and carbohydrates and decreases vegetable consumption (Food Agriculture Organization, 1997).

There is a sharp contrast to this in recent years, obesity has also been revealed to have increased prominently in economically advanced countries between the 1980s and the 2000s according to Wang and Lobstein (2006). A study by Wang and Lobstein found that, those who reside in cities and, are able to afford a western lifestyle are at-risk of obesity in lower and middle income nations (Wang & Lobstein, 2006). Another study found that, in Russia and China, children from rich families have been reported to be more obese than poor income families (Wang, 2001). In Europe there is also a positive social gradient in some central European countries (Due et al., 2009). The higher the economic status, the more money one has available to spend hence, overeating of foods rich in fats and carbohydrates.

2.3.3.3 Food Industry

Technological advancement in food product such as cultivating, preserving, producing and storing foods have increased the availability of variety of foods to a large number of people all year round. This advancement in developing countries is a clear indication that, the level of globalization has increased food availability from individual societies. It has increased the consumption of diets which are highly processed. Consumers are now losing control over preparation of the foods which they eat. Food composition is being placed in the hands of manufactures (Buisson, 1994).

2.3.3.4 The Media

Television and Radio play an important role in information dissemination. They educate and influence public attitudes. Much money are usually spent in encouraging high fat and energy dense foods than those spent on encouraging healthier foods. In UK for instance, in 1992 $30 million was spent in promoting fruits and vegetables consumption as compared to $ 50 million spent in

promoting chocolate (Wang et al., 2002). The media provides information on the new and prevailing foods to consumers and has a persuasive impact on food choice made by the people. The media have been influential in changing dietary patterns over the few decades. Television in general plays a key role in informing and inducing adolescents. Usually, TV has a negative impact on them. Foods advertised during peak time when adolescents are viewing TV in UK and USA were high in fats, sugar and carbohydrates. This does not influence good eating habits and selection of foods in adolescents (Himes & Thompson, 2007). Such foods high in fats, sugar and carbohydrates are advertised during the peak time when adolescents are watching TV in Ghana.

2.3.3.5 Cultural Factors

Both the food intake and physical activity patterns are affected by culture. Cultural factors are among the powerful determinants of food choices (Brown, 1998). The cultural factors may include peer pressure, social conventions, religious practices, and the status value accorded to the different foods that impact on other members of the household and individual lifestyle. Peers usually influence in the selection of high fat food choices. An increase in weight gain has been seen as a symbol of health and prosperity throughout all human history. This is still the case in many cultures set up particularly where environments make it easy to remain lean (Brown, 1998).

2.4 BIOLOGICAL FACTORS

Genetics, probably influences a person's chance of becoming obese. A study has showed that, increase fat cells numbers were better correlated with increased body weight than with age of an individual (Epstain, 2000). Fat cell theory holds that, the percentage of body fat an individual carries is determined by the number of fat cells in the body which in turn is partially determined

by inheritance and partly by eating habits (Burniat et al., 2006). It is important to realize that nobody is condemned to be overweight because of their genetics (Flodmark & Lissau, 2000).

2.5 DEMOGRAPHIC FACTORS

Demographic factors are related to adolescent health issues. The relationship between obesity and the place of residence has shown disparities in various surveys. In Sweden, obesity rates were higher in children living in rural areas than those living in urban areas (Ekblom et al., 2004; Neovius et al., 2006; Neovius & Rasmussen, 2008). Increased rates of obesity and overweight were reported in Swedish military conscripts from rural areas compared to urban areas. The difference could not be clarified by family related factors like intelligence test scores, parental education or sex of the individual (Neovius et al., 2008). According to Broyles et al (2010) nearly half of the children and adolescents aged 5 to19 years old were at least overweight in Bogalusa in 2008/ 2009. In Russia, the incidence of obesity was higher among the people living in rural areas compared to those living in urban cities (Wang, 2001; Wang & Lobstein, 2006). However, in China and Brazil children living in urban communities had higher rates of obesity than children living in rural communities (Wang, 2001; Wang & Lobstein, 2006). According to Kautiainen et al (2009), higher incidence of overweight was reported in adolescents from less urbanized areas compared to cities, among boys from Lapland and Western Finland, and among girls from Oulu Province and Eastern Finland than other geographic areas in recent decades.

Additionally, obesity has also been reported to have risen remarkably in economically advanced countries between the 1980's and the 2000's (Wang & Lobstein, 2006). It is believed that, those adolescents who are living in urban environment and are able to afford a western lifestyle are also at-risk of obesity in lower and middle income countries (Wang &Lobstein, 2006).

2.6 PHYSICAL, PSYCHOSOCIAL AND ECONOMIC CONSEQUENCES OF OBESITY.

The difficulties of adolescents' obesity are less likely to be clinically obvious. Clinical studies have indicated a wide range of medical circumstances of which obese adolescents are at greater risk (WHO, 2003a). According to WHO, these medical situations are vital because they are potentially serious widely dominant and carry life time consequences for health and wellbeing. Most common health related diseases among adolescents include; CVD, hepatic complications and sleep apnoea (WHO, 2003a).

2.6.1 CVD/ Hypertension

CVD consists of Coronary-Heart-Disease (CHD), stroke, and peripheral vascular disease. The prevalence of CHD, and stroke is on the increase in developing countries whereas in developed countries, CHD and stroke lead to a large proportion of deaths in men and women (Brenner et al., 1988). The CHD risk linked to obesity is more acute in adolescents and it is higher in individuals with abdominal adiposity than in those with additional fat around their hips and thighs. The connection between increased weight gain and blood pressure is unclear. Yet, there is a likelihood that, a higher circulating levels of insulin may increase renal retention of sodium causing increased blood pressure (Brenner et al., 1988).

2.6.2 Certain Types of Cancers

Numerous studies have established a positive relationship between obesity and, the prevalence of cancer especially those cancers which are related to hormone dependent. They include prostate, breast, cervical and ovarian whilst gastrointestinal cancer include colorectal, liver, gallbladder and

pancreatic. Obese women are at greater risk of ovarian, cervical, breast and postmenopausal cancer whereas evidence have shown that men are at an increased risk of prostate cancer. High prevalence of the cancers in the obese people is more prominent for those with abdominal fat distribution at lower degrees of obesity and is thought to be a direct consequence of hormonal change (Burniat et al., 2006).

2.6.3 Type 2 Diabetes

The development of diabetes in adolescent will upsurge the risk of obesity in early adulthood of the advanced complications of the disorder such as CVD, kidney failure, visual impairment and limb amputations. Although factors such as family history and ethnicity are associated with NonInsulin dependent Diabetes Mellitus (NIDDM) in adolescents the most important factors is obesity.

2.6.4 Sleep Apnoea

Obesity damages respiratory function and structure leading to physiological and pathological impairments. Extreme stiffness of the thorax cage increases breathing in obesity due to the accumulation of adipose tissue in and around the abdomen and diaphragm. Sleep apnoea is a sleep associated breathing disorder most obviously seen in severely obese. According to Roland et al (2002) sleep apnoea is a broad spectrum of conditions including increased resistance to air flow through the upper airway, heavy snoring, reduction in air flow (hyperpnoea) and cessation of breathing (apnoea).

2.6.5 Social Consequences

Obese adolescents are stigmatized in westernized cultures. There is a decrease in self-esteem among obese individuals compared to the non-obese. Self-esteem differs and include body appearance, athletic ability, social networking and academic performance. Studies have indicated that, suicidal ideas and suicidal attempts among overweight adolescents have increased in recent years as a result of being teased by peers and family members (Eisenberg et al., 2003).

2.6.6 Economic cost of obesity

The economic cost of obesity is an essential concerns to health care providers and policy makers. The economic cost of obesity have been evaluated from numerous advanced nations and ranges from two percent to seven percent of the total health care cost. Hence obesity represents one of the biggest expenditures in national health care budgets (Levy, 1995). The real costs of therapy in under developed nations are higher than those in developed countries due to additional burden linked to importing expensive equipment with limited foreign exchange and the need for specialized training of many staff. Therefore, it would be cost effective if money spent on obesity and other non-communicable diseases go towards prevention than on expensive treatment during the advanced stage of the diseases (Levy, 1995).

2.7 MANAGEMENT AND TREATMENT OF ADOLESCENT OBESITY

The principles of public health is promoting and protecting health of the citizenry which involves a unified approach including technical, economic, education, environmental and legislative measures (Flodmark & Lissau, 2000). The effective management of obesity in adolescent has proved obscure. Pediatric methods are largely aimed to reduce increase weight status and alleviate the co-morbidities. Management of obesity at a younger age can have a greater impact than in adulthood. This is because, the behaviour of younger individuals can be easier to regulate and

modify than in adulthood. Their resistance to treatment may be less, stigmatization and greater influence of the family on the adolescent. There may be frequent opportunities for medical observation during childhood compared with later years (Caroli & Burniat, 2002).

2.7.1 Diet Management

It is recommended that a small reduction in energy intake should be made to the meals of the obese adolescent as an adequate intake of both energy nutrients is required by adolescent to ensure that normal growth and development are not compromised. The appropriate means of reducing energy intake in obese adolescent is limiting the portion size of energy dense foods. Free consumption of fruits and vegetables should be promoted so that energy density may be reduced without imposing dietary restrictions. Adolescents should be motivated to consume less high fat snacks as crisps, biscuits and sweetened beverages (Caroli & Burniat, 2002). Generally, it is important to encourage all adolescents to adopt healthy eating habits from infancy and continue to adulthood. Increasing physical activity and the reduction of dietary energy intake will minimize relative body weight gain in adolescents. A study conducted by Caroli and Burniat concluded that numerous profits can be attained through dietary controls (Caroli & Burniat, 2002).

2.7.2 Physical Activity

Increasing physical activity can improve the effectiveness of the obesity therapy. Interventions that target energy expenditure are particularly successful when reductions in sedentary behaviour are targeted rather than increases in the level of exercise. Measures use to limit adolescent's TV, video tape and video game can significantly contribute to decreasing obesity in adolescents. These adolescents should be motivated to choose activities that they enjoy most and which are likely to be more sustainable (Robinson, 2001). A study by Epstein reviewed that, involvement of

adolescent in an exercise programme during treatment of obesity is poor, but those who complied are likely to maintain long term weight control. The support of schools and family are vital in continued success of physical activity interventions (Epstain, 2000). It must be noted that, success is not measured in terms of weight gain and fat loss but in terms of benefits like increased skills and, or capacities.

CHAPTER THREE- METHODOLOGY

3.0 INTRODUCTION

This section describes the ways in which the work was done and how data was collected. It focus on the following sub- headings; study methods and design, data collection techniques and tools, study population, sampling procedures, pre-testing and data analysis.

3.1 METHODOLOGICAL APPROACH AND DESIGN.

The study adopted a quantitative research methodology. According to Trochim and Land (1982) cited in Creswell (2013), quantitative research method is a glue that holds the research project together. It is a method use to structure the research, to show how all of the major parts of the research project such as samples work together, to try to address the main research questions. Therefore, quantitative method attempt to maximize objectivity, reliability, replicability and generalizability of findings and are typically interested in prediction (Creswell, 2013; Bryman, 2004; Mugenda, 1999). Additionally, quantitative research method help establish relationship between variables and often reduces and restructure a complex problem to a limited number of variables (Creswell, 2013). Descriptive cross- sectional design was used in the study. With a cross-sectional design, participants are assessed at a single point in time. Its significance is that, it is less time consuming since it involves testing several groups at the same point in time hence a large number of subjects can be tested at a little cost (Thomas et al., 2005). It was used to determine the prevalence and risk factors of obesity among adolescents in a Senior High Schools in the Adansi North District in the Ashanti Region.

3.2 DATA COLLECTION TECHNIQUES AND TOOLS

3.2.1 Questionnaire/ Methods of Data Collection

A number of instruments for collecting data could have been used, a questionnaire was considered most suitable for the study. According to Knowles (1970), a questionnaire is easy to administer, quick to complete and faster to score and therefore take comparatively less time from both the researcher and the respondents. The items in the questionnaire were structured in such a way that, they enabled the respondents to choose alternative answers against their choice of response. Data sought to include; demographic characteristics, types of foods consumed by the students, dietary patterns, levels of physical activity and factors influencing eating habits.

The study however, made use of only primary data source. This was obtained through selfadministered questionnaire. In this method, the respondent completed the survey questionnaire themselves. It was used because, it allowed the respondents to complete the questionnaire at their convenience. The method also enabled the researcher to translate questions into Asante Twi for some students and provided clarification on some questionnaire items to them where it was needed

3.2.2 Anthropometric data sheet.

The heights and weights of the adolescents were taken and recorded on the anthropometric data sheet. Each adolescent or student's height was taken using height board. In this regard, adolescent removed shoes and excessive clothing, stood on a flat surface against the wall and the measurement was read. The weight measurements were taken by the use of bathroom scale which was highly reliable. Before the scale was used, the investigator checked the scale by weight a standard weight. During weighting, the scale was placed on a hard-floor surface, and each participant was stand still on the center of the platform of the scale with the body weight evenly distributed between both feet. The research assistant helped the researcher to take the measurements. Each measurement

was entered twice in order to cater for any error and ensure accuracy. This enabled the researcher to calculate for the BMI levels to ascertain the prevalence of obesity among the students.

3.3 STUDY POPULATION

The study population comprised of adolescents from Adansi North Senior High Schools, including both males and females. From the population, adolescents aged 12- 19 years formed the target population. It was chosen because several studies conducted globally have revealed that, obesity management at a tender age has greater effect than in adulthood because body fat starts to increase at this stage (Muhihi et al., 2012; Amoah, 2003a).

3.3.1 Inclusion criteria.

a) Students whose parents consented
b) Students who were in the age bracket 12- 19 years at the time of the study
c) Students who have been in that school for at least 2 academic terms.

3.3.2 Exclusion criteria

a) Students whose parents never gave their consent.
b) Students who were above 19 years at the time of the study
c) Students who have been in that school in less than 2 academic terms

3.4 STUDY VARIABLES

Independent variables as well as dependent variable were analyzed. Socio demographic variables include age, sex, place of residence and the income level of parents. Diet was assessed by fruit,

vegetable, fluid and energy dense food intake. Physical activity levels were estimated by hours or minutes of physical activities per day or per week.

3.4.1 Independent variables

These variables include; age, sex, place of residence, income level of parents, height, weight, physical activity, and the food consumption pattern of the selected adolescents. Place of residence, was classified as urban and rural. Income level consisted of three categories; poor, middle and rich.

3.4.2 Dependent variable.

The dependent variable for this study was obesity defined as Body Mass Index (BMI) equal to or more than 30kg/m^2 (CDC, 2008; WHO, 2013a).

3.5 SAMPLING PROCEDURE.

According to Mugenda (1999), Sampling procedure is a method used to select a sample from the target population which may include snow ball, purposive, simple random, systematic sampling, stratified etc. The district has only five senior high schools. One private school and four public schools. All the schools participated in the study. Permission to conduct the study was sought from the various school heads and scheduled an appointment with them after an approval letters from the District Education and the Assembly had been given.

A multi-stage method involving stratified and simple random sampling techniques were used to select the participants since their classes constituted specific strata. Precisely, Probability Proportionate to Size (PPS) was used in order to get proportional sample size for each school. Only the Form 1s and the Form 2s were sampled for the study since the Form 3s had completed school at the time of the study. In all, a total of 306 students were recruited to participate in the study. The

Table below summarizes how it was done.

Table 3.1 Summary of the Sampling Procedure for each School

Name of the School	Total enrolment	Procedure	Required number from each school
1) Dompoase SHS	433	433/1924*306	69
2) T.I Amass SHS	728	728/1924*306	116
3) Asare Bediako SHS	377	377/1924*306	60
4) Bodwesango SHS	345	345/1924*306	54
5)Hwiremoase SHS(Private)	41	41/1924*306	7
Total	1924*		306

*is the summation of the 5 schools' population.

After knowing the representative number required from each school, the same procedure was used to determine the number needed from each class. The Table below summarizes how it was done

Table 3.2 Summary of Sampling Procedure for each School's Class.

Name of the school	Total enrolment	Procedure	Required number from each class
1) Dompoase			
SHS 1	295	295/433*69	47
SHS 2	138	138/433*69	22
Total	433		69
2) T. I Amass			
SHS 1	382	382/728*116	61
SHS 2	346	346/728*116	55
Total	728		116
3) Asare Bediako			
SHS 1	167	167/377*60	27
SHS 2	210	210/377*60	33
Total	377		60
4) Bodwesango			
SHS 1	198	198/345*54	31
SHS 2	147	147/345*54	23

Total	345		54
5) Hwiremoase			
SHS 1	15	15/41*7	3
SHS 2	26	26/41*7	4
Total	41		7

After determining the number needed from each school's class, simple random sampling was however, used to select the respondents who participated in the study. This was done by writing Yes and No on a sheet of paper, folded and mixed them together, and the students were asked to pick either Yes or No randomly. In each class, those students who picked the Yes were recruited to participate in the study. This method was appropriate because it allowed each adolescent to have equal chance of being included in the sample (Mugenda, 1999). The large sample size also, give a fair representative of the population.

3.5.1 Determination of sample size

The study's sample size was calculated using the formula used by Fisher et al (1983). N

$$= \frac{(Z)^2 pqD}{(d)^2}$$

Where;

N- the desired sample size

Z- normal deviate 1.96 which correspond to 95% confidence interval

P- proportion of the population estimated to have desired characteristics

Q = 1-P

d = Degrees of freedom= 0.5 D

= the desired effect.

Thus; $N = \frac{(1.96)^2 \times 0.5 \times 0.5 \times 1}{(0.06)^2}$

N = 266.

3.5.2 Non- response rate

Non- response rate of 15% was calculated as

15/100× 266 = 40

Sample size was 306.

3.5.3 Prevalence of obesity among the students

BMI is a sign of obesity, which is calculated using the formula below;

$$BMI = \frac{\text{Weight in Kg}}{\text{Height in meters (squared)}}$$

BMI is a recognized standard of measurement for obesity among all age groups and has strong association with body fatness and health risk (WHO, 2013a). The table below shows WHO classification of obesity.

Table 3.3 BMI Classifications by WHO

Underweight	< 18.5 kg/m^2

Normal Weight	18.5- 24.99 kg/m^2
Overweight	25-29.99kg/m^2
Obese	> 30 kg/m^2

Notes, Obesity Classes: 30-34.99 kg/m^2 (Class one), 35-39.9 kg/m^2 (Class two), 40+kg/m^2 (Class three)

Source, WHO (2013).

3.6 PRE-TESTING

A pre-test was conducted among 20 adolescents with similar characteristics as the expected study participants. Consent was obtained from the school head. Simple random sampling was used to select 20 science students who participated in the pre-test. In this case, they were grouped into two; the form 1s and the form 2s. The researcher wrote Yes and No on a sheet of paper, folded and mixed them together. The students were then asked to randomly pick from either Yes or No. Those students who picked the Yes in each group (the form 1s and the form 2s) were selected to participate in the pre-test. Participants completed the questionnaire and were allowed to provide comments and suggestions for revising any vague items. The study's final instrument was produced after subsequent revision in the wording of a few items. Pre-test was conducted at New Edubiase Senior High School. The school was purposively chosen by the researcher.

3.7 DATA HANDLING

The field data was collated, sifted through and edited in order to address questions that have been answered partially or not answered. After editing, the data was then entered into Microsoft Excel worksheet and imported into a statistical software called STATA version 11.1. Database was

created on a password-protected on the researcher's laptop to prevent third party access. Before performing the desired data transformation, the data was cleaned by running consistency checks on every variable. Corrections were then made after verification from the questionnaire. The BMI was calculated from the anthropometric data.

3.8 ANALYSIS OF DATA

The data analysis was done using statistical software called STATA version 11.1. The data was analyzed using basically descriptive statistics involving mainly frequency distributions and cross tabulations, and bar graph. Microsoft Excel was used to analyze the anthropometric data in order to determine the BMI which was graded according to IOTF (2002), age specific cut-off points for adolescents; they were classified as either normal, underweight, overweight or obese.

To guard against drawing unjustified conclusions in some stages, Chi square statistical test was carried out to consider whether the relationship between the independent variables which included; the adolescent's socio demographic characteristics, types of foods consumed and level of physical activity and dependent variable, which was obesity, was statistically significant. All relationships were tested at 0.05 level of significance.

3.9 ETHICAL CONSIDERATION

Permission to collect data was sought from the committee on human research publication, and ethics, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana Education Service, Adansi North District and The District Assembly- Adansi North. Consent of the school heads were also obtained from all the schools. Participation was voluntary through informed

consent from the participants. The purpose of the study was however, clarified by the researcher to the participants and assured them of confidentiality and anonymity.

3.10 LIMITATIONS OF THE STUDY

Obesity is a multifaceted problem and many environmental, genetic and behavioural factors can have impact on one's weight status. As a result, all factors that can influence one's weight status could not be addressed in this study. Hence, the study has some limitations that are outlined below.

1) Only, some of the modifiable risk behaviours linked to obesity were identified in the study and were analyzed.
2) Sedentary, physical activity, and dietary data were all self-reported measures.
3) Owing to the cross sectional nature of the study design only associations, and not causal effects can be reported.
4) As a result of limited logistics and time the survey was limited to adolescents attending senior high schools excluding out of school adolescents.

3.11 ASSUMPTIONS OF THE STUDY.

Assumptions made regarding data collected from the adolescents was that they answered the study questions truthfully and that, their responses accurately reflect their real physical activity, sedentary and dietary behaviours.

Another assumption was that, the trained research assistants recorded the height and weight of the respondents correctly. Additionally, the sample size was a true representative of the study population and 100% response rate was recorded.

CHAPTER FOUR-RESULTS

4.1 INTRODUCTION

The study sought to investigate the prevalence of obesity and possible risk factors that contribute to its occurrence among adolescents in Ghana specifically in the Adansi North District. This section presents the outcomes of the study. The respondents used for the study were adolescents attending second cycle institution in the Adansi North District. The chapter is based on data obtained from 306 adolescents.

The data was analyzed using simple percentages, frequency distributions and cross tabulations. To guard against drawing unjustified conclusions, statistical test using Chi square statistic (x^2) was used to check whether relationships between independent variables and obesity were statistically significant. The results were grouped based on the research objectives under the following headings: Demographic characteristics, the prevalence of obesity among the students, level of physical activity and the dietary practices of the respondents. Finally, establishing any relationship between the independent variables and obesity.

4.2 THE RESULTS

4.2.1 Demographic characteristics of the respondents

The total sample size was 306 as presented in Table 4.1 below. Out of this, 147 respondents representing 48.06% were females whilst 159 representing 51.96% were males. The mean age of

the respondents was 17.288 with standard deviation of ±1.129. The age distribution showed that, all the respondents were of school going age. 169 (55.23%) of the participants were in Form 2 whilst 137 (44.77%) were in Form 1. The study shed some light on the number of siblings of the respondents. This was because, it is assumed that, a household of 7 or greater siblings is considered heavy or rich and adolescent is likely to be obese due the money or due to genetic. The findings of the study indicate that, 64 (20.92%) of the respondents had siblings of 7 or greater whilst 83 (27.12%) had siblings of 1-3 which was considered normal household. Place of residence was categorized into rural and urban.

As indicated in the Table 4.1 below, 115 (37.58%) of the respondents were living in rural areas while 191(62.24%) were from urban communities. The income level of participants' parents were grouped into three categories namely; poor, middle and rich. Most of the participants' parents were middle income earners. 63.73% of the respondents' described their parents as a middle income earners. Only 5.88% of the respondents' described their parents as being rich. 30.9% of the respondents described their parents as being poor as shown in Table 4.1 below.

Table 4.1 Demographic Characteristics of the Respondents.

Variable	(n=306) Total% 100	Mean age/ SD
Sex		
Female	147(48.08)	
Male	159(51.96)	
Age		
14	2(0.65)	17.288 ±1.129
15	18(5.88)	
16	49(16.0)	
17	106(34.64)	

18	83(27.1)
19	48(15.69)
Class	
Form 1	137(44.77)
Form 2	169(55.23)
Number of siblings	
Normal 1-3	83(27.12)
Moderate 4-6	159(51.96)
Heavy/ Rich 7>	64(20.92)
Residence	
Rural	115(37.58)
Urban	191(62.24)
Income level of parents	
Poor 1-3	93(30.39)
	195(63.73)
Middle 4-6	18(5.88)
Rich 7-9	

Source, Author's Field Data, 2015.

4.2.2 Weight perception of the respondents

Weight of Respondents	(n=306)Total%=100
about the right weight	115(37.58)
slightly overweight	69(22.55)
slightly underweight	87(28.43)
very overweight	18(5.88)
very underweight	17(5.56)

Weight is one of the anthropometric measures used to determine how heavy an individual is. The results of Table 4.2 below showed that, 115 (37.58%) of the respondents perceived their weights as normal while 18 (5.88%) perceived their weights as very overweight. The least number of respondents 5.56% also perceived their weights as very underweight.

Table 4.2 Weight Perception of Respondents

Source, Author's Field Data, 2015.

4.3 Prevalence of obesity among the students

BMI is a recognized standard of measurement for obesity among all age groups and has strong association with body fatness and health risk (WHO, 2000). Microsoft Excel was used to calculate the BMI levels of the respondents. The results were categorized based on the WHO standard as indicated in Table 4.3 below. Majority 47.06%, of the participants were obese. Even though, most of the participants were obese they were in class one obesity range 30-34.99 kg/m^2. Also 33.66% of them were overweight whilst 13.40% of the respondents were normal. Few respondents thus, 5.88% were underweight as shown in Table 4.3 below.

Table 4.3 Prevalence of Obesity among the Adolescents

BMI	**(n=306) Total%= 100**
Underweight	18(5.88)
Normal	41(13.40)
Overweight	103(33.66)
Obese	144(47.06)

Source, Author's Field Data, 2015.

4.3.1 BMI across the various class levels.

Most of the respondents were obese as shown in Table 4.4 below. In Form 1, 70 representing 48.61% of the adolescents were obese. It further increased to 74 (55.23%) in Form 2. For overweight in Form 1, it was 42.72%, this was again increased to 57.28% in Form 2. Normal and underweight 36.59% and 44.44% in Form 1, and 63.41% and 55.56% in Form 2 respectively. The researcher found that majority of these obese and overweight adolescents who were in Form 2, were older than those found in Form 1.

Table 4.4 BMI Prevalence Across various Classes.

BMI	**CLASS**				
	FORM 1		FORM 2		TOTAL
	count	Percent %	count	Percent %	
Underweight	8	44.44	10	55.56	18
Normal	15	36.59	26	63.41	41
Overweight	44	42.72	59	57.28	103

Obese	70	48.61	74	55.23	144
TOTAL	137		169		306

Source, Author's Field Data, 2015.

4.4 Dietary practices of the respondents

Eating Occasions by the Respondents

Food remains the main factor for the development of a person throughout his or her growing years. The environment in which a person lives can also determine the food behaviour and quality of nutrition. As indicated in Table 4.5 below, most of the respondents 62.75% consumed food three times in a day whilst 18.63% consumed food twice a day. 17.32% ate anytime in a day and 1.31% ate only once in a day.

Meals skipped by respondents

As indicated below, 34.31% of the respondents skipped either breakfast, lunch or supper whilst 65.69% did not skip meals in a day. Reasons for skipping meals were given by respondents as; no food at home, no time to eat, lack of appetite and illness.

Snacks Consumed in between Meals by Respondents

Snacks included; refined fruit juice, soda, and non-alcoholic drinks. Majority of the respondents 65.36% consumed snacks in between meals whilst 34.64% did not consume snacks in between meals as indicated in the Table below. This was an indication that, majority of the respondents were not keen on the nutritive value of snacks that they consumed. In all the schools visited, it was observed that, most of the snacks sold were predominantly sugar in nature.

Table 4.5 Dietary Practices of the Respondents

Variable	(n=306) Total% 100
Eating Occasions	
Anytime	53(17.32)
Once	4(1.31)
Three	192(62.75)
Twice	57(18.63)
Meals skipped	
No	201(65.69)
Yes	105(34.31)
Snack consumption in between meals	
No	106(34.64)
Yes	200(65.36)

Source, Author's Field Data, 2015

4.4.1 Frequency of food consumption in a week

Results from Table 4.6 below shows that, the frequency of food consumption from three food sources were not impressive. The frequency levels were as follows; for 100% fresh fruits juice, 54.58% of the respondents consumed none a week before the research was conducted. Only 1.63% consumed 2 times per day and 30.07% consumed between 1-3 times in a week. Concerning fruits, half of the respondents thus, 50% did not eat fruit in a whole week, a few 1.63% ate fruits 2 times in a day whilst 37.58% ate fruits between 1-3 times during the week. Overwhelming majority of the respondents 77.45% did not eat carrot in a week, 0.33% ate 2 times in a week while 16.67% ate between 1-3 times during the week. For milk consumption, 44.12% did not take milk for a

week, only 0.33% took milk 2 times a day whereas 36.93% of the respondents took between 1-3 times in a week period.

Table 4.6 Frequency of Food Consumption

Variable	Category	(n=306)Total %100
100% fresh fruit juice	1 time per day	20(6.54)
	1-3 times during the past 7 days	92(30.07)
	2 times per day	5(1.63)
	4-6 times during the past 7 days	22(7.19)
	I did not drink 100% fruit juice during the past 7 days	167(54.58)
Taking fruits	1 time per day	13(4.25)
	1-3 times during the past 7 days	115(37.58)
	2 times per day	5(1.63)
	4-6 times during the past 7 days	20(6.54)
	I did not eat fruit during the past 7 days	153(50.0)
Taking milk	1 time per day	23(7.52)
	1-3 times during the past 7 days	113(36.93)
	2 times per day	1(0.33)
	4-6 times during the past 7 days	34(11.11)
	I did not drink milk during the past 7 days	135(44.12)
Taking vegetables	1 time per day	36(11.76)
	1-3 times during the past 7 days	122(39.87)
	2 times per day	1(0.33)

3 or more times per day	1(0.33)
4-6 times during the past 7 days	53(17.32)
I did not eat vegetables during the past 7 days	93(30.39)

Source, Author's Field Data, 2015.

4.5 Level of Physical Activity of Respondents

Energy expenditure such as energy intake is a vital factor for protection against obesity. The level of participation in various activities may affect food consumption and basal metabolic rate of an individual. The study did not deploy any standard measure of level of physical activity, however, particular key aspects were used; these include, number of sports team played in the past 12 months, number of times respondents attended physical education lessons and how they spent their leisure time.

Number of Sport Teams Respondents Play in the Past 12 months.

Majority of the respondents did not participate in any of the sporting activities both at home and in the school. As indicated in Table 4.7 below, 50% representing half of the respondents did not play any sport teams. Very few of them thus, 6.86% were involved in 3 or more sporting activities. 33.33% of the respondents played only one team. The sporting activities included; athletics, football and volleyball.

Number of Times Respondents attended Physical Activity Lessons

Vast majority 78.43% of the respondents attended physical exercise lessons once a week, 12.75% attended twice a week while 3.59% attended three times a week. Also 5.23% stated that, they do not attend physical exercise lessons as indicated below in the Table below. Reasons some

respondents gave were that, they have so many extracurricular activities incorporated in their school programmes hence, no time has been allocated for physical activity.

How Respondents Spent their Leisure Time

As indicated below, majority of the respondents, 44.44% spent their time watching television, whilst 23.2% assisted in household chores, playing with computer games was represented by 19.61% and 12.75% played other games. Most of the respondents from the affluent homes spent their time watching television and playing with computer games. The reasons being that, their parents can afford to employ a househelp; who does all the household chores whilst they sit and watch television or play computer games which predispose them to gradual increment of body weight and eventually develop obesity.

Table 4.7 Level of Physical Activities

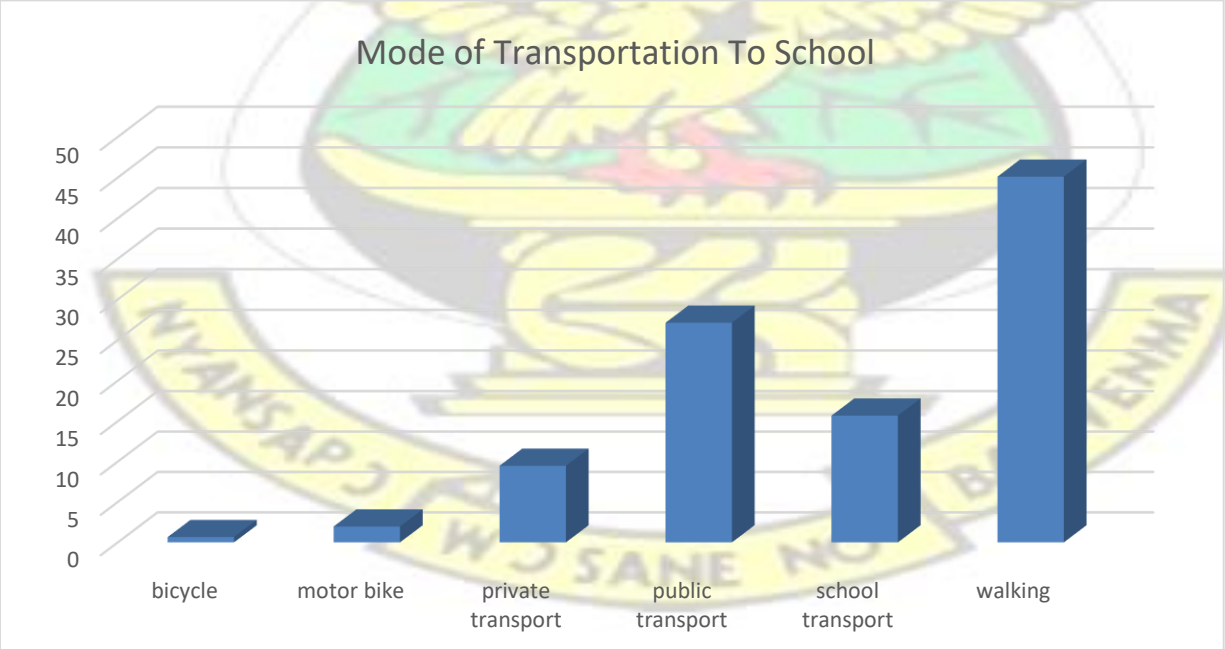
Variable	**(n=306)Total%= 100**
Number of sport teams played in 12 months 0 teams	153(50.0)
1 team	102(33.33)
2 teams	30(9.8)
3 or more teams	21(6.86)
Number of times for physical activit 1 day	240(78.43)
2 days	39(12.75)
3 days	11(3.59)
0 days	16(5.23)

Leisure activity at home assisting in household chores	71(23.2)
Playing	39(12.75)
Playing with computer > 4 hours	60(19.61)
Watching TV >4 hours	136(44.44)

Source, Author's Field Data, 2015.

4.5.1 Mode of Transport to School.

The respondents were asked to state their means of transportation to school as shown in the bar graph below. Most of the respondents walked to school 45.1%, followed by those who used public transport 27.12%. Those who use school transport were 15.69%, then 9.48% of the respondents use private transport to school on daily basis whilst 0.65% use bicycle. It was observed that, most of the respondents from rich homes used either school bus, public transport or private transport to school. Majority of those who walked to school were those from poor socio economic background. Thus, they could not afford to pay school transport or public transport.



Source, Author's Field Data, 2015.

4.6 RELATIONSHIP BETWEEN OBESITY AND THE INDEPENDENT VARIABLES

4.6.1 Relationship between Leisure Activity and Obesity

A Chi square test of association was performed to check whether the relationship between leisure activity and obesity was statistically significant. A Chi square statistic(x^2) value of 7.5086, with degree of freedom (df) of 9, which has associated probability of 0.029 was obtained for computer playing. Thus, the associated probabilty of 0.029 was less than the preselected significance of 0.05, indicating that, there was a significant relationship between obesity and leisure activity of computer playing ($p< 0.029$). There was also a significant relationship between obesity and TV watching ($x^2= 6.3576$; $df=2$; $p< 0.011$). However, there were no significant relationship between playing and assisting in household chores. The results agreed to WHO (2004), which stated the adoption of a sedentary type of lifestyle are among the major contributors that have led to the increase in the levels of obesity.

From the Table 4.8 below, it was observed that, 42.36% of the adolescent who spent their time watching TV were obese and 25.69% who assisted in the household chores were also obese. 21.53% of the adolescents who played computer games were obese. Very few who spent their leisure time on these activities were either normal or underweight as indicated in the Table below.

Table 4.8 Cross Tabulation and Chi square Analysis between Leisure Time and Obesity

Leisure activity at home	Underweight	Normal	Overweight	Obese	P-value

Variable	Weight Status				
Assisting in Household Chores	2(11.11)	8(19.51)	24 (23.3)	37(25.69)	0.751
Playing	2(11.11)	5(12.2)	17(16.5)	15(10.42)	0.932
Playing with computer > 4 hours	2(11.11)	7(17.07)	20(19.42)	31(21.53)	0.029*
Watching TV > 4 hours	12(66.67)	21(51.22)	42(40.78)	61(42.36)	0.011*
Total	18	41	103	144	306

Notes; Significance level= 0.05 ; Significance level $p< 0.05$, Not significance $p> 0.05$.

Source, Author's Field Data, 2015.

4.6.2 Relationship between Socio Economic Status (place of residence) and Obesity

A Chi square test of association was used to test relationship between socio economic variable (place of residence), and obesity. The results showed a Chi square ($\times^2$) value of 9.3025, with degree of freedom (df) of 3, and probability or significance value of 0.026 were obtained which was smaller than the preselected significance of 0.05. Thus, there was a significant relationship between socio economic status (place of residence) and obesity ($p< 0.026$). It was indicated that, the number of adolescents who were obese, majority of them were living in urban communities. A high proportion 67.36% of them were obese as shown in Table 4.9 below. This was as a result of their dietary behaviour and levels of physical activity. It was observed that, they eat foods that were dense in fats and engaged in less physical activities hence easily prone to development of

obesity. According to Latham (1997), in an industrialized nation, the incidence of obesity is higher in persons with low socio economic status (rural areas) as this study's finding did not agree to that.

It is also in contrast with the situation in developing countries where fewer obese rates are seen in low SES populations. Nevertheless, further researches have shown that, high SES is clearly linked to obesity in developing countries.

Table 4.9 Cross Tabulation and Chi square Analysis between Socio Economic Status (place of residence) and Obesity.

Variable	**Weight Status**				
Place of Residence	Underweight	Normal	Overweight	Obese	P- value
Rural	11(61.11)	21(51.22)	36(34.95)	47(32.64)	
Urban	7(38.89)	20(48.78)	67(65.05)	97(67.36)	0.026
Total	18	41	103	144	306

Notes; $(\times)^2$ (df)= 9.3025 (3) P-value =0.026, Significance level= 0.05 significance level P< 0.05, Not significance P> 0.05.

Source, Author's Field Data, 2015

4.6.3 Relationship between Socio Economic Status (income level of parents) and Obesity

From the data displayed in Table 4.10 below, 64.60% of the respondents who came from middle income families were obese whilst 63.04% were overweight. Only 30.09% of the respondents from

the poor families were obese. A Chi square test of association was performed to ascertain whether the relationship between socio economic status (income level of parents) and obesity was statistically significant. The results showed a Chi square statistic of 8.3187, with degree of freedom of 6, and a significance of 0.0216 which was significant at 0.05 level.

In other words, the relationship between socio economic status (income level of parents), and obesity was significant (p< 0.0216). Most of the adolescents who were obese came from good homes. As a results of that, they consumed high energy dense and fats foods which easily predispose them to obesity. The better the socio economic status of parents, the more to spend and hence, over eating of foods rich in fats and carbohydrates. Some studies have also shown that, high SES is clearly associated with obesity in developing countries.

Table 4.10 Cross Tabulation and Chi square Analysis of Socio Economic Status (income level of parents) and Obesity.

Variable	**Weight Status**				
Income Level of Parents	**Underweight**	**Normal**	**Overweigh**	**Obese**	**P- value**
Poor 1-3	1(50.0)	13(40.63)	11(29.91)	68(30.09)	
Middle 4-6	1(50.0)	19(59.38)	29(63.04)	146(64.60)	
Rich 7-9	0(0.00)	0(0.00)	6(13.04)	12(5.31)	0.0216
Total	2	32	46	226	306

Notes; $(\times)^2$ (df)= 8.3187 (6) P-value =0.0216, Significance level= 0.05 Significance level p< 0.05, Not Significance P> 0.05

Source; Author's Field Data, 2015.

4.6.4 Relationship between Dietary Practices (food consumption pattern) and Obesity.

At every age level, it is important to get good nutrition for healthy and quality of life. A normal healthy adolescent grows at a biologically pre-determined rate that can be compromised or accelerated by nutrition imbalance; under nutrition or over nutrition. A Chi square test of association found the relationship between dietary practices and obesity to be statistically significant. The results showed a chi square statistic of 21.6181, with (df) of 9 and associated probability of 0.010 which was significant at 0.05 significance level indicating that, there was a significant relationship between dietary practices and obesity.

The results however showed that, the relationship between obesity, and meals consumed was significant ($p<0.010$). Majority of the adolescents 67.36% who were obese consumed meals three times a day whilst 65.05% of those who also consumed meals three times a day were overweight. Those meals were either imbalance diet or were of high energy dense or rich in fats. 17.36% of obese adolescents took meals twice a day and 15.28% of them who ate anytime in a day were obese. This was an indication that, obesity levels were high with the increase in the number of meals consumed in a day. Obesity levels also increased with an increase in the amount of carbohydrates consumed as indicated in Table 4.11 below.

Table 4.11 Cross Tabulation and Chi square Analysis of Food Consumption pattern and Obesity

Variable	Weight Status				
Eating occasions	**Underweight**	**Normal**	**Overweigh**	**Obese**	**P-value**
Anytime	8(44.44)	7(17.07)	16(15.53)	22(15.28)	
Once	1(5.56)	0(0.00)	3(2.91)	0(0.00)	
Three	6(33.33)	22(53.66)	67(65.05)	97(67.36)	
Twice	3(16.67)	12(29.27)	17(16.50)	25(17.36)	0.010
Total	18	41	103	144	306

Notes; $(\times)^2$ (df)= 21.6181(9) P-value =0.010, significance level= 0.05

significance level P< 0.05, Not significance P> 0.05

Source, Author's Field Data, 2015**.**

4.7 Relationship between mode of transport and obesity.

A chi square shown below indicates that, there was a significant relationship between mode of transport and obesity (x^2=30.6244, df= 15, p< 0.010). Majority of the adolescents who were obese or overweight used either public transport or private car to school. This predispose the adolescents further to weight gain for those who were using either the public transport or the private transport. It was observed that, most of the adolescents who watched television or played computer games at

their free time were either using public or private transport to school and as such were either obese or overweight as shown in Table 4.12 below

Table 4.12 Cross Tabulation and Chi square Analysis of Mode of Transportation and Obesity

Variable Mode of Transportation	Weight Status				p-value
	Underweight	Normal	Overweight	Obese	
Bicycle	0(0.00)	0(0.00)	1(0.97)	1(0.69)	
Motor bike	1(5.56)	1(2.44)	1(1.97)	3(2.08)	
Private transport	0(0.00)	3(7.32)	10(9.71)	16(11.11)	
Public transport	1(5.56)	7(17.07)	29(28.16)	46(31.94)	
School transport	8(44.44)	9(21.95)	21(20.39)	10(6.94)	
Walking	8(44.44)	21(51.22)	41(39.81)	68(47.22)	0.010
Total	18	41	103	144	306

Notes; $(\times)^2$ (df)= 30.6244(15) P-value =0.010, significance level= 0.05 significance level P< 0.05, Not significance P> 0.05

Source, Author's Field Data, 2015

CHAPTER FIVE- DISCUSSIONS

5.1 INTRODUCTION

Central to this thesis is the rationale, well supported by literature review in chapter two, that a lifestyle characterised by physical inactivity and food consumption that is typical of the 'Western' dietary pattern is linked to increased risk of negative health outcomes such as weight gain and

increased risk of NCDs. Among adolescents, dietary intake characteristic of the 'western' dietary pattern consumption is linked to increased risk of weight gain and, NCDs growth at an unsually young age. In general, obese adolescents might remain obese in adulthood and increase their risk of diseases associated with excess weight.

Increase in weight gain has been regarded as being healthy and prosperous in most human history particularly in developing nations. As a result, obesity continues to pose a serious risk to health of people globally as standard of living continue to increase. Urban communities are experiencing higher rates of obesity, because of nutritional transition. For instance, food prepared away from home and at lower price, use of private transport has increased, portion size of energy dense foods and drinks have also increased and are more readily available. Most women are too busy such that, they do not have time to plan and prepare food for their families and have good time with their family.

In general, a good proportion of them have delegated their responsibilities to their caregivers whom in most cases, do not have any knowledge on nutrition. According to the life course perspective, it is necessary to investigate risk factors of NCDs such as unhealthy dietary practices and physical inactivity, and obesity among adolescents because these can persist across the life course into adulthood (Kuh & Shlomo, 2004). It was against this background that, this study sought to find out the prevalence of adolescent obesity and factors that influence its occurance among adolescents in Adansi North District.

5.2 PREVALENCE OF OBESITY AMONG THE ADOLESCENTS

The study recorded a high prevalence of obesity among the adolescents. This may be owing to both hormonal changes and cultural predisposition of Ghanaians to see obesity as a symbol of prosperity, well-being, and beauty (Amoah, 2003). As a result, Parents therefore do not make any conscious effort to improve their wards' obesity status, but rather encouraging its worsening. The overall prevalence rate in this study was 47.06% (see Table 4.3). This rate was higher than earlier study done by Abachinga (2001), which reported 19.3% prevalence in Legon and Achimota school going children. The rate is very high and confirms the literature explanation of an increasing prevalence of obesity in unindustrialized nations (Abubakari et al., 2008; Amegah et al., 2011; Mogre et al., 2012; Ziraba et al., 2009). This shows an increased tendency of worsening future trends of adolescent obesity with its associated problems making it an essential public health concern in the study participants.

In addition, the high prevalence may have been resulted because adolescents by their physiology, deposit fat more than lean mass (Shi & Clegg, 2009; Taylor, 2012), and with the possibilty of engaging in sedentary lifestyles. The results is also in agreement with IOTF (2002) which indicated that, obesity is increasing rapidly in developing countries. Additionally, people with Body Mass Index (BMI), standard of 30kg/m^2 and above are obese according to BMI standard and WHO classification. The prevalence of obesity among the adolescents in the District was high. The result was statistically significant than expectation. This result agreed with the findings of Ogunjimi and Yusuf (2006), Labib (2004) and Aldair (2005), which recorded high prevalence of obesity in the world today. Though, their studies findings were based on the data collected from Pacific Islands, Europe and two African countries (South Africa and Morocco), their work still remain significant in this context. However, data obtained in this present study was significantly different from data

recorded by Ogunjimi and Yusuf (2006), Labib (2004) and Aldair (2005), because of the differences in the research methods in all these surveys.

The researcher's personal reflection on the weight attitudes of the adolescents showed that most of them perceived themselves as being obese but, see their weight as a symbol of good living. The finding was in agreement with the work of Ntui (2000), who recorded that, certain societies thought and still think that fatness is an index of beauty and prosperity.

5.3 FACTORS ASSOCIATED WITH OCCURRENCE OF OBESITY

5.3.1 Physical Activity and Leisure time Activities

Physical activity not only uses up stored energy but also helps to stimulate muscle development. According to Murray et al (2013), it is essential to nurture skills in organised sports particularly at a tender age as they easily mastered at a younger age than in adulthood. Murray further reckons that, sports should not be gender specific. It was however observed that, high proportion of adolescents had physical education lessons at least once in a week. 78.43% of the adolescents reported having it once a week making the activities they engaged in an enjoyment whilst to others, it only gave them a break to that of monotony of being in class for long hours. The WHO recommends that, adolescents should engage in at least 60 minutes of aerobic actitivites at a moderate intensity daily other than school holidays (WHO, 2011c). Fifty percent of the adolescents in this study reported that they rarely participate in sporting activities investigated. However, overall the adolescents surveyed in this study are more likely to participate in team sports than individual sports. What was surprising was that, the proportion of adolescents who reported that they frequently engaged in each of the selected physical activities were low. The gender differences were such that, boys were more likely to participate in team sports than girls. The possible explanation for this gender differences in participation in sport activities could relate to culture, in

that physical exertion during participation in these activities are associated with masculinity, and therefore females are less likely to engage in sport activities that involved more physical exertion.

Comparing the findings of this study with two other studies that did not objectively measure physical activity is limited due to the use of varied study design. Doku et al (2013), investigated the levels of physical activity among adolescents in Ghana using a four point Likert- type scale where responses were combined into two categories; physically active and not physically active. They found that 69% of the adolescents in Ghana were physically active and the boys were more likely to report that, they were physically active than girls. Peltzer and Pengpid (2011), also investigated physical activity among the youth in Ghana and Uganda, and defined physical activity as any activity that increases heart rate and makes one get out of breath such as running, fast walking, biking and dancing apart from physical education. They found that, 78.5% of males and 84.9% of females engaged in less than sixty minutes of physical activity on at least 5 days.

Concerning the means of transportation to school, 52.29% of the respondents either used public transport, school transport or private transport. This was a clear indication of poor attitude or lack of motivation and emphasis of always being physically fit. Parents and teachers have the responsibility to encourage and help their adolescents develop positive attitude towards engaging in physical exercises. They as guardians must use themselves as an example by exercising regularly, watch their wards as they play sports, include them in a joint family outing where everybody participates in physical activity and assist them nurture their favorite, to identify sport talent in them if possible take them to professional matches so that they can get inspired by watching their sporting heroes in action.

Adolescent should be taught both at home and in school the benefit of being physically fit. 44.44% of the respondents spent their time watching TV, whilst 19.61% also spent their time playing computer games. It was observed that, majority of the adolescents who spent their time watching TV and playing computer games were boys whilst the girls spent their time carrying out household activities. This can be associated to the proportion of girls who were obese being low in this study. There was a significant association between those who watched TV; played computer games and those who were obese. There was also a significant relationship between leisure and comsumption of snacks. Results from this study indicate that adolescents who spent their time playing computer or video games and watching TV highly consumed snacks. This was shown by the frequency in which they took the snacks which was rated as thrice or frquently. However, adolescents who were actively involved in household chores consumed snacks less.

Numerous surveys have reported that, TV watching, and playing computer games and, or video for a longer periods of time, or not partaking in sports outside of school promotes obesity (O'Loughlin et al., 2000). The association between TV watching and weight gain may also be influenced by other social factors for instance, the use of TV as an adolescent care substitute (Jakes et al., 2003).

Some of the adolescents complained of lack of field where they could play comfortably whilst others did not just like to interact with other people in their neighborhood. Others had to resort to watching TV or play computer games just because they have been restricted by their parents not to leave the house. When adolescents concentrate on TV for long hours they don't only get to learn of food stores, but also they learn of the new products in the market. In most cases heavy marketing of energy dense foods often target adolescents who are unable to distinguish between

programme content and persuasive intent of advertisements. Modifiable sedentary behaviours including TV viewing and spending long hours behind the computer are related to reduced physical activity, and the risk of obesity, cardiovascular diseases and diabets in the adolescents (Jakes et al., 2003; Tucker & Tucker, 2011). Reports from other qualitative studies suggest that often obese individuals are burdened with disabiliities (Peeters et al., 2004) and thus are unable to indulge in physical activity because they are self-conscious, feel pressure from their weight (Schmalz, 2010; Nantel et al., 2010), feel pains and aches, and lack self-discipline (Hoebeke, 2008; Napolitano et al., 2011).

Parents should discourage eating and watching TV as this increases their chances of taking more calories than what the body needs. Additionally, they should restrict time spent on sedentary activities and involve them in physical activity in the house. For example, cleaning windows, gardening, cleaning the car and tidying up their rooms. This particular stage in adolescent's life provides a perfect time for the adolescent to learn about healthy foods as they start a busy social life, being responsible and accountable for their actions and begin to choose their own lifestyle. They learn faster, therefore good habits are best encouraged at this level. It seems that, majority of the adolescents surveyed in this study are unlikely to meet the WHO suggested level of physical activity particulary when school is in session. Further research is needed to objectively determine the physical activity levels of adolescents in the school environment.

5.3.2 Consumption of Energy dense Foods (EDF)

It was noted by Wabitsch (2002) that, food remains the main factor for the development of a person throughout his or her growing years. The environment in which a person lives can also determine the food behavoiur and quality of nutrition. The respondents in this study were in the age category

of 12-19 years. This shows that, they were still in the stage of growth and development. They required nutrients from all the five groups of food sources. Regarding the consumption of energy dense foods, the finding of the study saw that, majority of the adolescents reported the consumption of energy dense food at least once in the course of the previous school day (62.75%).

Another interesting finding was that there was a positive association, which was statistically significant between the reported consumption of energy dense foods and obesity. There was no significant gender differences in the consumption of energy dense foods. This was not surprising because the actual foods consumed and their respective portion sizes was not investigated, and was beyond the scope of this study.

The findings of this study can be compared to those of Temple et al (2006), nevertheless direct comparison is limited due to differences in study design. Temple et al (2006), studied the food and beverage purchased by South African (SA) adolescents on a previous school day and concluded that the consumption of energy dense foods might be common among the adolescents. The information on the dietary choices of the adolescents in this study, and the food purchased by adolescents in the study of Temple et al (2006) gave an insight into possible dietary behaviour of adolescents within the school environment. Investigation of a single school day's consumption led to meaningful findings. It was observed that, energy dense foods were accessible and thus consumed by the adolescents who were studied. In general, this finding seem to corroborate with the ideas of Popkin (1998), that the lifestyle in most developing countries increasingly includes the consumption of energy dense foods (EDF) and beverages that are more in sugar, fat, salt, and less of staple foods and drinks. Furthermore, the findings suggest that, the consumption of energy dense foods might have displaced the consumption of dietary items such as water and vitamins which

have a lower energy content (Prentice & Jebb, 2003). The displacement of healthier dietary options by energy dense ones is characteristic of nutrition transition (Popkin, 1998). The WHO (2004), in its global strategy for diet, physical activity and health recommends the discretionary consumption of foods high in fat, salt and, or sugar.

Similar recommendations are provided in the South African food guidelines for adults and children (South Africa Food and Nutrition Guidelines, 2004), and are generally applicable to Ghana which has no such national dietary guidelines. This study was concerned with the frequent consumption of dietary items likely to promote obesity among adolescents. Finding from the assessment of consumption of energy dense foods suggests that most of the adolescents frequently consumed sugar sweetened foods and pastries such as biscuits. High consumption of sweet energy dense foods were difficult to explain, but it may be related to more opportunities in the school environment to purchase sweet foods, most of which need not to be heated prior to consumption. The study's finding is also in agreement with Ma et al (2003), which pointed out that, majority of westernized societies have adopted having three meals in a day however, there is rising tendency in those westernized socities for further regular but, less well defined eating occurrences.

According to the ANGELO framework, the socio cultural environment which comprises attitudes, perceptions and beliefs regarding dietary items determines what are defined as healthy or unhealthy foods (Swinburn et al., 1999). This thesis assessed the frequency of energy dense dietary items, thus these findings should be viewed as estimates of intake than absolute values.

5.3.3 Poor eating habits among the Adolescents

As noted by Prentice and Jebb (2003), snacking and consumption of foods dense in fat are the common practices that predispose adolescents to obesity. The influence of attitudes on health behaviour such as diet among the adolescents has been widely researched (Gordon_Larsen, 2001; Sallis et al., 2000). It is thought that, health behaviour is linked to attitudes. As a results, it was very vital to find out whether respondents take snacks in between meals in order to determine if there was an association between snacking and increased BMI. In this study, most of the respondents reported that, they consumed snack in between meals, these food items were dense in fat content which if consumed in excess will have an adverse effect on their health. 65.36% of the adolescents consumed snacks because they could easily afford to buy those snacks. Majority of the adolescents who were obese highly consumed snacks, whilst those who had normal weight and underweight mostly consumed less snacks. An analysis done on the food of preschool children in USA showed a positive relationship between dietary fat and energy density and the reciprocal relationship with carbohydrates (Gibson, 2005). The frequency with which snacks were consumed by these school adolescents was rated as three times in a day or frequently.

All the schools visited had canteens in their compounds but with limited variety of snacks food items. A study of snacking carried out by Tiggemann and Anesbury (2000), found irregular snacking to be associated with high risk of obesity among adolescents in Japan. The effect of snacking on body weight could be influenced by the type of meal consumed as snack. Outside home most of the meals consumed as their snacks are usually more of fats or high in carbohydrates, which can be in the form of sugar or starch. Marmonier et al (2002), acknowledged that, snacks are effective in delaying a demand for a later meal according to the principal macro nutrient in the snack. High consumption of fats and carbohydrates as snacks, delayed meal by about thirty five

minutes while protein snacks delayed meals by about sixty minutes. Good habits are best started early therefore, guardians should encourage their adolescents to consume healthy snacks such as whole fruits, fresh vegetables, fresh fruit juices and sugar free biscuits. Consumption of water should also be highly encouraged. Allow adolescents to adapt a regular eating pattern and avoid random eating as this could make them to consume large amounts of junk foods and soft drinks that are dense in sugar and fats. According to Jahns et al (2001), there is an increasing habit emerging mainly in industrialized countries for more regular and less well defined eating occurrences in both adults and adolescents with increased consumption of snacks at a more regular and, or irregular intervals.

Skipping meals can generally affect the eating behaviour of an individual, which could result in less food intake or excessive food consumption. As noted by Bertone et al (2003), diets are essential and every diet in a day must be taken, however breakfast which is the first diet in the day should not be skipped because it is linked to decreased fat intake and decreased snacking later in the day. There was a significant relationship between meals consumed and obesity. Breakfast is a very important meal in a day and should not be skipped because it helps the adolescents to stay active and concentrate at school. Thus, parents should ensure that, this first meal of the day is well balanced.

Multiple factors influence adolescents food choice. High availability of variety of foods are indicated by the increased vending machines and canteens in schools, fast foods are sold everywhere providing a variety of food choices at a low prices. There is an increased advertisement and marketing of snacks and other foods and also eating places mainly put in an attractive manner to capture adolescents attention thus luring them to purchase. Usually depression, anxiety,

boredom and, stress lead to unhealthy eating habits which an adolescent can resort to anorexia nervosa or bulimia. Also, most of the adolescents do not have adequate knowledge on matters regarding nutrition and their health (Westenhoefer, 2001). The adolescents usually make an independent decision on what snacks they would eat, and as indicated high proportion of them consumed them. This is a clear indication of negligence among parents. They live their adolescents to learn and make wrong food choices, which later will impact on their health.

According to the ANGELO framework, the available opportunities to purchase or consume food and drinks influence individuals' dietary choices (Swinburn et al., 1999). An "obesogenic" environment promotes unhealthy dietary practices and increases the risk of weight gain (Swinburn et al., 1999).

Most of the parents are not being good role models to their adolescents. Repeated exposure to certain foods influences an adolescent's preference for that food. Thus, if parents like buying ice-creams, there is a high chance that the adolescent will make the same choice. An adolescent's preference for snacks is related to what parents do or do not allow. There is a marked improvement in standards of living; both parents are working thus most of the roles for the woman is delegated to the house helps whom in most cases might not be relating well with the adolescents. In most cases, the food choices made may not meet the nutritional standards. Despite the mothers having busy schedules they should try and at least have time for their wards; plan and prepare meals together, go for shopping together with their adolescents and let them make choices of food with guidance, eliminate unhealthy foods from the house and avoid preparing high fat and convenient foods. This will not only enable them to attain knowledge but also skills. This also enables them to grow up into a responsible individuals who value a healthy lifestyle.

5.3.4 Demographic characteristics of the Respondents

Regarding the place of residence, it was categorized into rural and urban communities. Between these two communities, the differences lie in the economic levels, social and cultural factors (Owusu & Agyei-Mensah, 2011), which define the sociodemographic characteristics of inhabitants and thus affect their nutritional status. The study also found that, obesity was common among adolescents who come from high income homes and this was in agreements with other research findings (Steyn et al., 2011; Uthman, 2009; Abdulai, 2010). Households with high income tend to purchase food in bulk spending more on both healthy and unhealthy foods (French et al., 2010), and are more likely to overconsume food. According to Hanson et al (2007) and Rolls (2009), obesity is not always confined to households with high income but affects low income households as well. This is because, low income households compared to high income ones tend to buy and consume foods of low quality (Kaufman et al., 1997; Drewnowski & Darmon, 2005; Drewnowski & Specter, 2004), like sugar sweetened beverages (French et al., 2010) and large portions of high energy staples and cheaper parts of meat since they are less costly.

The study's finding generally supports the existing literature (Koch et al., 2008; Ertem et al., 2008; Chu et al., 2009; Cohen et al., 2009; Luoto et al., 2011; Shilpi & Satwanti, 2012; Bobrow et al., 2013) that high number of siblings increases the likelihood of obesity. This was not surprising because majority of the respondents had more than three siblings. This was in agreement with Steyn et al (2011) who found that obesity was common among those with three siblings in their household.

With regard to income and number of siblings, there was a trend towards an increase in the likelihood of being obese. This means that, as household income or number of siblings increased, obesity also increased. A study by Mendez et al (2004), among women in Jamaica reported that, the prevalence of obesity increase with income and number of children. However, Sutherland et al (2013), found that obesity was significantly linked to lower household income levels but with increasing number of siblings. It is not surprising therefore that, area of residence, income level of parents and number of siblings significantly predict obesity among the adolescents.

CHAPTER SIX -CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

The main aim of this thesis was to investigate prevalence of obesity and the possible risk factors that contribute to obesity among adolescents attending second cycle institutions in the Adansi North District. Overall, the findings of the study provided insight into the dietary and physical activity behaviour among the school aged adolescents in the District.

6.2 SUMMARY OF THE FINDINGS

The respondents were adolescents aged between 12- 19 years. A sample of 306 was used for the study. The number of times the respondents attended physical activity both in school and at home varied. Majority of the respondents reported that, they attend physical activity lessons (PAL) at least once in a week. The reasons given for this trend were; teachers had a lot to cover from the school's syllabus whilst others sometimes used the play ground thus limiting the number of times students attended physical activity lessons.

The researcher observed that, most of the teachers appreciated the importance of Physical Education (PE) lessons to the adolescents, since they are still young and growing hence required enough time to play and rest, however, they have few equipment and sports facilities.

The respondents spent their leisure time indulging in various activities. Some of the adolescents from affluent homes in most cases were enclosed in their homes and are not permitted to mingle with the rest and play and therefore would spend their time playing computer games or be watching TV.

The food consumption patterns of the adolescents were found not to be good. Eventhough, majority of the respondents consumed food three times in a day, while a third of them consumed once in a day which consituted the three major food sources, it was observed that, the snacks and the foods consumed contained too much fats and carbohydrates.

The prevalence rate from both the affluent families and the low socio economic class were high.

6.3 CONCLUSIONS

On the basis of the outlined findings, the following conclusins were made based on the study's specific objectives.

Objective 1) to determine the prevalence of obesity among SHS students in the Adansi North District. The study concludes that, the prevalence rate of obesity among the adolescents was significantly high which was 47.06%. This predispose the adolescents to certain chronic diseases such as type 2 diabetes whose rate among the adolescents is going up. This means that, a rise in the prevalence rate of obesity, also means a rise in the incidence of comorbidities linked to obesity. The rate was high among both the low and high income classes.

Objective 2) to assess the physical activity levels among SHS students in the Adansi North District. A predominance of physical inactivity was found to be one of the major contributors of obesity among the adolescents. It was observed that, majority of the adolescents do not engage in any exercise for a whole month. They only used their leissure time playing computer games or watch TV. Even some of the parents restrict their adolescents to go out and play with their neighbours hence the child being forced to frequent playing of computer games or watching TV. It is recommended by WHO (2011c) that, adolescents and children aged 5-19 years should engage in

at least 60 minutes of aerobic activities at a moderate intensity daily. This is because, the more the amount of time spent on exercise, the lower the rate of obesity among the adolescents and vice-versa.

Objective 3) to assess the food consumption pattern of SHS students in the Adansi North District. The study concludes that, dietary habit of diet skipping, greater accessibility of foods void of nutritional value as well as less dietary intake of fruits and vegetables were also found to be major contributors of obesity among the adolescents. Most of the adolescents consumed snacks and foods which contain too much fats and carbohydrates. It has been established by WHO (2011c) that, the more the amount of carbohydrates and fats meals consumed in a day, the higher the rates of obesity and the more the amount of fruits and vegetables consumed in a day, the less the rates of obesity across all ages.

Objective 4) to establish any relationship between the independent variables and obesity. The study concludes that, physical activity and leisure time, consumption of energy dense foods, poor eating habits as well as place of residence were all having positive association with high occurance of obesity among the adolescents in the District.

The District as well as the country should however take advantage of this knowledge and mount a serious educational campaign about the need for adopting healthy lifestyles, improving the eating habits and increasing physical activities among the adolescents. This would inform them about the health risks associated with obesity.

6.4 RECOMMENDATIONS

Based on the findings of the study a number of recommendations arise from this thesis for both research and health promotion opportunities.Two sets of recommendations were made from the findings of the study. It included recommendation for practice and further studies

6.4.1 RECOMMENDATION FOR PRACTICE

6.4.1.1 Improving Physical and Leisure time Activities.

Factors that accounted for physical inactivity among the adolescents were; inadequate physical education lessons in their cirriculum, indaequate equipment and sports facilities, frequent watching of TV and playing of computer games. It is recommended that;

- The schools should make physical education a priority. This can be achieved through increasing the number of times they have physical education period in a week, and also promote the physical activity by integrating a range of recreational events during their physical education time.
- The Ghana Education Service, should provide the schools with sporting equipment, so as to improve and make the PE actractive for the students. This is because, school setting was identified as an important setting where adolescents might develop health risk behaviours and therefore improving the physical education would go a long way to help reduce the prevalence rate of obesity.
- Parents should also be educated about the adverse effect of excessive TV watching and playing of computer games and restrict the number of hours their children spent in watching TV and playing computer games, and encourage them to engage in rigorous exercises daily. They should use themselves as an example for their children to learn
- The chiefs and other stakeholders in the District should help to promote physical activity among the students by providing sporting equipments to the schools.

6.4.1.2 Improving Food Consumption Pattern

It was observed that, the food consumption pattern of the students were not impressive. Most of the foods consumed were energy dense foods. It is recommended that;

- Intensive education on good nutrition should be provided to both parents and adolescents so that, prudent choices of foods will be made when selecting meals and snacks.
- Regular consumption of fruits and vegetables should be well encouraged by parents to their children daily.
- The Ghana Education Service should include nutrition education in the curriculum of SHS to provide students with right information and advice, which will enable them to understand the consequences of obesity so as to eat healthy diets.
- Concerted efforts involving all stakeholders (Chiefs, Parents, Ministry of Health, Ghana Education Service, Individuals etc) should be made to decrease the incidence of obesity among the adolescents by educating them on the need to adopt a healthy lifestyle. They also consider the concerns put forward by the adolescents, as that could be beneficial in reducing obesity in the District and in Ghana as a whole.
- Education for the adolescents should also be channeled through radio, television and hospitals as they are the main sources of information for the adolescents to create an awareness.
- The Ghana Health Service specifically Adansi North District Health Directorate under the Ministry of Health should pay regular visits to the schools to educate them on the causes of obesity and its complications, and place posters throughout the schools showing foods rich in various nutrients.

- Policy makers in the country should deliberately increase the prices of unhealthy foods (chocolates, cakes, fried rice etc) in order to put adolescents off from buying them since they usually prefer those foods.

6.4.1.3 Improving Quality Eating Habit

Majority of the adolescents were found to consume snacks in between meals a habit which predispose adolescents to obesity since these snacks were dense in fats content. Obesity is highly linked to continue nibbling of snacks in between meals. In order to improve on healthy eating habits of the adolescents, it is recommended that;

- The Ghana health service in collaboration with the Ghana Education Service in the District, should give intensive education on taking snacks in between meals to the development of obesity as well as other chronic diseases associated with obesity.
- Parents and teachers should also educate the adolescents on the right foods to eat and at the right time to eat them so as to reduce the occurance of obesity
- Parents and teachers should highly encourage adolescents to drink water frequently

6.4.1.4 Socio Economic background

It was observed that, place of residence, income levels of parents and mode of transportation to school have strong association with the development of obesity. It is recommended that,

- High income parents should educate their wards to exercise daily since over reliance in cars and indoors predispose them to development of obesity. Parents and teachers must be an example for the adolescents to learn from.

- Parents (both high and low income) should be educated to buy healthy food stuffs into their homes because adolescents are likely to develop unhealthy eating habits if food choices made by their parents are unhealthy
- Their homes should also be exercise friendly for their children to exercise daily.

6.4.2 RECOMMENDATION FOR FURTHER RESEARCH

It is recommended that, a subsequent research be done on a national level which may be used to develop national dietary guidelines for adolescents in the District and Ghana as a whole, and a national school policy for diet and physical activity.

Additionally, a similar study can also be conducted both in rural and urban settings so a to offer a basis for comparison.

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APPENDIX I

SURVEY

QUESTIONNAIRE.

I am AMOH ISAAC, from Kwame Nkrumah University of Science and Technology, pursuing a Master's Degree in Public Health (Health Education and Promotion option). I'm interested in learning more about nutrition among adolescents. I will ask you several questions. The information you provide will be used to develop better health education programs for young people like yourself.

DO NOT write your name on this questionnaire. The answers you give will be kept strictly confidential; they will only be used for statistical analysis. No one will know what you write.

Answer the questions based on what you really do and to the best of your ability.

Completing the survey is voluntary. If you don't want to answer a question, just leave it blank.

DEMOGRAPHIC INFORMATION

1) What is your sex?

□ □

Male Female

2) How old are you? (In completed years)

□ 12 years old

□ 13 years old

□ 14 years old

□ 15 years old

□ 16 years o ld

□ 17 years old

□ 18 years old

□19 years old

3) In which Form are you?

□ Form 1

□ Form 2

□ Form 3

□ Father

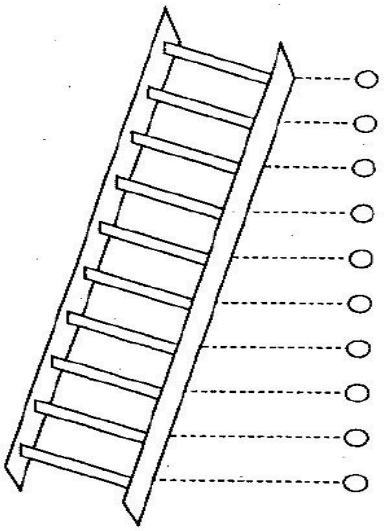
□ Mother

□ Guardian

4) What is your parent's occupation? (Write against the name)

5) How many children do your parents have?

6) Where do you reside? (Place of residence)

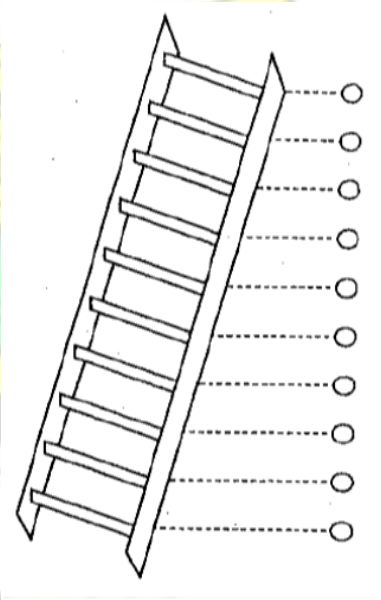


7) Imagine that this ladder pictures how **Ghanaian society** is set up…

At the top of the ladder are the people who are the best off –they have the most money, the highest amount of schooling, and the jobs that bring the most respect.

At the bottom are people who are the worst off – they have the least money, little or no education, no job or jobs that no one wants or respects.

Now think about your family. Please tell us where you think your family would be on this ladder. **Fill in the circle that best represents where your family would be on this ladder.**



8)Now assume that the ladder is a way of picturing your school.

At top of the ladder are the people in your school with the most respect,the highest grades and the highest standing.

At the bottom, are the people who no one respects, no one wants to hang around with, and have the worst grades. Where would you place yourself on this ladder? **Fill in the circle that best represents where you would be on this ladder**.

THE NEXT 7 QUESTIONS ASK OF WHAT YOU DO ABOUT YOUR WEIGHT

9) How do **you** describe your weight?

□ Very underweight

□ Slightly underweight

□ About the right weight

□ Slightly overweight

□ Very overweight

10) Which of the following are you trying to do about your weight?

□ **Lose** weight

□ **Gain** weight

□ **Stay** the same weight □ I am **not trying to do anything** about my weight

11) During the last 30 days, did you exercise to lose weight or to keep from gaining weight?

□Yes □No

12) During the last 30 days, did you eat less food or foods low in fat to lose weight or keep from gaining weight?

□Yes □No

13) During the last 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or to keep from gaining weight?

□Yes □No

14) During the last 30 days, did you take any diet pills, powders or liquids without a doctor's advice to lose weight or to keep from gaining weight? (Do not include meal replacement products such as slim fast)

□ Yes □No

15) During the last 30 days, did you vomit or take laxatives to lose weight or to keep from gaining weight?

□Yes □No

THE NEXT 11 QUESTIONS ASK ABOUT FOOD YOU ATE OR DRANK DURING THE PAST 7 DAYS. THINK ABOUT ALL THE MEALS AND SNACKS YOU HAD FROM THE TIME YOU GOT UP UNTIL YOU WENT TO BED. BE SURE TO INCLUDE FOOD YOU ATE AT HOME, AT SCHOOL, AT RESTAURANTS OR ANYWHERE ELSE.

16) How many times do you eat in a day?

□ Once

□ Twice

□ Three

□ Anytime

17) Do you eat snacks in between meals?

□ Yes □No

18) During the past 7 days, are there times you go without a meal in a day?

□Yes □No

19) If yes, how many times?

20) During the past 7 days, how many times did you drink 100% fruit juices such as orange juice or apple juice?

□ I did not drink 100% fruit juice during the past 7 days
□ 1 to 3 times during the past 7 days
□ 4 to 6 times during the past 7 days
□ 1 time per day
□ 2 times per day
□ 3 or more times per day

21) During the past 7 days, how many times did you eat fruit? (Do not count fruit juice)

□ I did not eat fruit during the past 7 days
□ 1 to 3 times during the past 7 days
□ 4 to 6 times during the past 7 days
□ 1 time per day
□ 2 times per day
□ 3 or more times per day

22) During the past 7 days, how many times did you eat green salad?

□ I did not eat green salad during the past 7 days
□ 1 to 3 times during the past 7 days

□ 4 to 6 times during the past 7 days

□ 1 time per day

□ 2 times per day

□ 3 or more times per day

23) During the past 7 days, how many times did you eat carrots?
□ I did not eat carrots during the past 7 days

□ 1 to 3 times during the past 7 days
□ 4 to 6 times during the past 7 days

□ 1 time per day

□ 2 times per day

□ 3 or more times per day

24) During the past 7 days, how many times did you eat **other vegetables**? (Do not include green salad or carrots)

□ I did not eat other vegetables during the past 7 days

□ 1 to 3 times during the past 7 days

□ 4 to 6 times during the past 7 days

□ 1 time per day

□ 2 times per day
□ 3 or more times per day

25) During the past days, how many times did you drink a canned or bottle such as Coke, Pepsi or sprite?

□ I did not drink canned or bottle during the past 7 days

□ 1 to 3 times during the past 7 days

□ 4 to 6 time s during the past 7 days
□ 1 time per day

□ 2 times per day

□ 3 or more times per day

26) During the past 7 days, how many glasses of milk did you drink? (Include the milk you drank in a glass or cup, from a carton or with cereal.)

□ I did not drink milk during the past 7 days
□ 1 to 3 times during the past 7 days

□ 4 to 6 times during the past 7 days

□ 1 time per day

□ 2 times per day

□ 3 or more times per day

THE NEXT 8 QUESTIONS ASK ABOUT YOUR PHYSICAL ACTIVITY

27) What means do you use to school?

□ Public transport
□ Private transport

□ School transport

□ Walking

□ Motor bike/ Bicycle

28) Does the school offer time for physical activity?

□ Yes □No

29) If yes, then, in an average week when you are in school, on how many days do you go for physical education (PE) classes?

□ 1 day

□ 2 days

□ 3 days

□ 4 days

□ 5 days

30) On an average school day, how many hours do you watch TV?

□ I do not watch TV on an average school day

□ Less than 1 hour per day

□ 1 hour per day

□ 2 hours per day

□ 3 hours per day

□ 4 hours per day

□ 5 or more hours per day

31) During the past 7 days, on how many days were you physically active for a total of at **least 60 minutes per day?** (Add up all the time you spend in any kind of physical activity that increases your heart rate and makes you breathe hard some of the time)

□ 0 days

□ 1 day

□ 2 days

□ 3 days

□ 4 days

□ 5 days

□ 6 days
□ 7 days

32) On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as internet)

□ I do not play video or computer games or use a computer for something that is not school work

□ Less than 1 hour per day

□ 1 hour per day

□ 2 hours per day

□ 3 hours per day

□ 4 hours per day

□ 5 or more hours per day

33) During the past 12 months, on how many sports teams did you play? (Include any teams run by your school or community groups)

□ 0 teams

□ 1 team

□ 2 teams

□ 3 or more teams

34) What do you do at home during your free time/ weekends/ holidays?
□ playing with computer

□ watching TV

 assisting in household chores

 playing

The End! Thank you for your time.

APPENDIX II

ANTHROPOMETRIC DATA SHEET

MEASUREMENTS	1ST READING	2ND READING	AVERAGE
HEIGHT(CM)			
WEIGHT(KG)			

APPENDIX III

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICAL SCIENCES / KOMFO ANOKYE TEACHING HOSPITAL
COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

Our Ref: CHRPE/AP/379/15

20th November, 2015.

Mr. Amoh Isaac
Post Office Box AE 98
Atomic Energy Commission
ACCRA.

Dear Sir,

LETTER OF APPROVAL

Protocol Title ***"Prevalence and Risk Factors of Obesity among Senior High School Students in the Adansi North District in Ashanti Region."***

Proposed Site: ***Adani North District, Ghana.***

Sponsor: ***Principal Investigator.***

Your submission to the Committee on Human Research, Publications and Ethics on the above named protocol refers.

The Committee reviewed the following documents:

- A notification letter of 16th July, 2015 from the Adansi North District Assembly (study site) indicating approval for the conduct of the study in the District.
- A notification letter of 21st July, 2015 from the Adansi North District Education Office indicating approval for the conduct of the study in the District.
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Proposal.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, renewable annually thereafter. The Committee may however, suspend or withdraw ethical approval at anytime if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you Sir, for your application.

Yours faithfully,

Osomfuor Prof. Sir J. W. Acheampong MD, FWACP
Chairman

Room 7 Block J, School of Medical Sciences, KNUST, University Post Office, Kumasi, Ghana
Phone: +233 3220 63248 Mobile: +233 20 5453785 Email: chrpe.knust.kath@gmail.com / chrpe@knust.edu.gh

APPENDIX IV

ADANSI NORTH DISTRICT ASSEMBLY

Tel: 03220 91373 DCE
03220 91255 DCD

Our Ref. NL 11/3/GIA/68

Your Ref.....

REPUBLIC OF GHANA

P. O. Box 21
Fomena-Adansi
Ashanti Region
Ghana

Date: 16TH JULY, 2015

LETTER OF INTRODUCTION

I have instructions to introduce to you, **Mr. Isaac Amo**, an MPH student in the Department of Health Promotion and Education of the School of Public Health, KNUST.

Mr. Amo is working on a study entitled "*Prevalence and risk factors of obesity among Senior High School students in the Adansi North District.*" He is therefore seeking permission to access some information and related literature from the relevant schools in the District.

Kindly assist him in this regard.

SILAS BOADU
(ASSISTANT DIRECTOR IIB)
for: DISTRICT CHIEF EXECUTIVE

THE DISTRICT DIRECTOR
GHANA EDUCATION SERVICE
ADANSI NORTH

APPENDIX V

GHANA EDUCATION SERVICE

Incase of reply the number and date of this letter should be quoted

Our Ref: GES/ASH/AND/PG.8/32/VOL. 1/

Your Ref: .....

Tel: 0322-420910

GOVERNMENT OF GHANA

ADANSI NORTH DISTRICT
P. O. BOX 21
FOMENA

21ST JULY, 2015

INTRODUCTORY LETTER
MR. ISAAC AMO

The person whose name appears above is an MPH student in the Department of Health Promotion and Education of the school of pupil Health, KNUST.

He is working on a study entitled ''Prevalence and risk factors of obesity among Senior High School students in the Adansi North District.

Permission has been granted to enable him visit the four (4) public and the one (1) private Senior High School for some information and related literature to assist his thesis work.

We would be grateful if the needed assistance is offered.

Find attached a copy of the letter from Kwame Nkrumah University of Science and Technology, Kumasi for your perusal and action, please.

(PAUL ANTWI OPPONG)
DISTRICT DIRECTOR

HEADS OF S.H.S
ADANSI – NORTH DISTRICT

CC:
HEAD OF INSPECTORATE
G. E. S.
ADANSI – NORTH DISTRICT

THE S.H.S COORDINATOR
G. E. S.
ADANSI NORTH DISTRICT

MRS. ROSE O. ADJEI
AG. HEAD OF DEPARTMENT
HEALTH PROMOTION & EDUCATION
SCHOOL OF PUBLIC HEALTH
K.N.U.S.T - KUMASI