UNIVERSITY OF EDUCATION, WINNEBA

ASSESSING THE PREVALENCE AND DETERMINANTS OF CHILDHOOD OVERWEIGHT AND OBESITY AMONG BASIC SCHOOL PUPILS IN EFFUTU MUNICIPALITY

PATIENCE AMISSAH

MASTER OF PHILOSOPHY

2022

UNIVERSITY OF EDUCATION, WINNEBA.

ASSESSING THE PREVALENCE AND DETERMINANTS OF CHILDHOOD OVERWEIGHT AND OBESITY AMONG BASIC SCHOOL PUPILS IN EFFUTU MUNICIPALITY

PATIENCE AMISSAH

200026824

**A thesis in the Department of Food and Nutrition Education,
Faculty of Home Economics Education, submitted to
the School of Graduate Studies in partial fulfilment
of the requirements for the award of the degree of
Master of Philosophy
(Food and Nutrition Education)
in the University of Education, Winneba.**

NOVEMBER, 2022

DECLARATION

Student's Declaration

I, PATIENCE AMISSAH, declare that this thesis, with the exception of quotations and references contained in published works which had all been identified and acknowledged, is entirely my own original work, and that it has not been submitted, either in part or whole for another degree elsewhere.

Signature: ……..

Date: ……..

Supervisors Declaration

I hereby declare that the preparation and presentation of the dissertation was supervised in accordance with guidelines for the supervision of dissertation laid down by the University of Education, Winneba.

…….. (Principal Supervisor)

Signature: ……

Date: ……

…… (Co-Supervisor)

Signature: ……

Date: ……

ACKNOWLEDGEMENTS

I express my gratitude to the Almighty God for allowing me to do this task. I cannot help but recognise this project as I exhale a sigh of relief and happiness. Without the constant assistance, direction, inspiration, and motivation of Dr. Linda Afriyie Gyimah, Mr. Andrews Acquah and Mr. Guy Eshun, this dissertation would not have been possible. I am very appreciative of their painstaking editing and for pushing me past my comfort zone and lending a sympathetic ear when I needed it. In addition, I place on record a hearty thank you to Madam Comfort Kutum Madah and Mr. Boakye Koffo Kwabena for their support. I want to express my gratitude for being there when things got tough. To my formidable family, I say thank you for your support and encouragement. To God be the glory, great things He has done.

DEDICATION

This work is dedicated to my parents, Mr. John Amissah and Mrs. Victoria Amissah.

TABLE OF CONTENTS

Content	Page
DECLARATION	iii
ACKNOWLEDGEMENTS	iv
DEDICATION	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xi
LIST OF FIGURES	xii
ABSTRACT	xiii
CHAPTER ONE: INTRODUCTION	1
1.0 Overview	1
1.1 Background to the Study	1
1.2 Statement of the Problem	7
1.3 Purpose of the study	9
1.4 Research objectives	9
1.5 Research questions	9
1.6 Significance of the study	9
1.7 Delimitation of the study	10
1.8 Limitation	10
1.9 Organisation of the Study	12
CHAPTER TWO: REVIEW OF RELATED LITERATURE	13
2.0 Overview	13
2.1 Theoretical Framework	13
2.1.1 The Theory of Planned Behaviour	13
2.2 Conceptual Framework	16
2.3 Concept of overweight and obesity	17

2.4 Global prevalence of childhood overweight and obesity 20

2.5 Prevalence of childhood overweight and obesity 23

2.5.1 Prevalence of childhood overweight and obesity in Africa 23

2.5.2 Prevalence of childhood overweight and obesity in Sub-Saharan Africa 24

2.5.3 Prevalence of Obesity among School children 25

2.6 Causes of childhood overweight and obesity 28

2.6.1 Genetic Factors 28

2.6.2 Activity level (Sedentary lifestyle) 29

2.6.3 Environment and behavioral factors 29

2.6.4 Dietary Diversity and Overweight/Obesity 31

2.6.5 Obesity and socio-economic factors 34

2.7 Assessment of child weight status 37

2.8 Dietary assessment in children 41

2.9 Physical activity assessment in children 44

2.10 Prevention and control of childhood overweight and obesity 47

2.11 Consequences of Childhood Overweight and Obesity 48

2.11.1 Medical consequences 48

2.11.2 Socio-emotional consequences 48

2.11.3 Academic consequence 49

CHAPTER THREE: METHODOLOGY 51

3.0 Overview 51

3.1 Research Approach 51

3.2 Research Design 51

3.3 Study location 51

3.4 Research population 53

3.5 Research sample size 54

3.6 Sampling technique 55

3.7 Sampling procedure 55

3.8 Data Collection Procedure 56

3.8.2 Assessment of Anthropometric data 59

3.9 Validity of research instruments 60

3.10 Reliability of research instruments 60

3.11 Data analysis 61

3.13 Ethical consideration 62

CHAPTER FOUR: RESULTS 64

4.0 Overview 64

4.1 Demographic characteristics of pupils 64

4.2 Socio-economic characteristics of pupils 65

4.3 Dietary habits of basic school pupils 67

4.3.1 Frequency of food consumption per day 67

4.3.2 Breakfast consumption 69

4.3.3 Snack consumption 69

4.3.3.1 Snack consumption at the first break 69

4.3.3.2 Snack consumption at Lunch Break 70

4.3.3.3 Snack consumption before bedtime 71

4.3.4 Purchasing food 72

4.3.4.1 Bringing food from Home 72

4.3.4.2 Buy food at School 73

4.3.4.3 Buy food outside School 74

4.3.4.4 Food from the school feeding program 75

4.3.5 Cooking method and Type of Snack Consumptions 76

4.4 24-Hour Dietary Recall 78

4.5 Physical Activity of Pupils 79

4.5.1 Means by which pupils get to school 79

4.5.2 Skipping 80

4.5.3 Walking for exercise 80

4.5.4 Bicycling 80

4.5.5 Jogging /Running 81

4.5.6 Swimming 81

4.5.7 Football 81

4.5.8 Basketball 82

4.5.9 Ampe 82

4.5.10 Screen time and activity during free time 83

4.6 Body Mass Index Status of Pupils 84

4.7 Factors Associated with Overweight/Obesity 85

4.7.1 Overweight versus Socio-Demographic Factors 85

4.6.2 Overweight versus Dietary Habits/Patterns 88

4.6.3 Obesity versus Socio-Demographic Factors 92

4.6.4 Obesity versus Dietary Habits/Patterns 94

4.6.4 Obesity versus Physical activity 98

4.7 Overweight/Obesity versus Dietary diversity 98

CHAPTER FIVE: DISCUSSION 99

5.0 Overview 99

5.1 Prevalence of Overweight and Obesity 99

CHAPTER SIX: SUMMARY OF FINDINGS, CONCLUSIONS RECOMMENDATIONS AND AREAS FOR FURTHER RESEARCH 107

6.1 Summary of finding 107

6.1.1 Prevalence of overweight/obesity 107

6.2 Dietary Habits/Patterns 108

6.2.1 Dietary Diversity 109

6.3 Physical activity 109

6.4 Factors Associated with Overweight and Obesity 110

6.5 Conclusions 111

6.6 Recommendations 112

6.7 Areas for Further Research 113

REFERENCES 115

APPENDICES 126

LIST OF TABLES

Table	Page
4.1: Demographic characteristics of pupils by school type	65
4.2 Socio-economic characteristics of pupils by school type	67
4.3: Dietary diversity score (DDS) measurements of pupils by gender and school type	79
4.4a: Physical Activities of the pupils in the week per school type	83
4.4b: Screen time of the pupils within the week per school type	84
4.5: BMI of pupils by gender and school type	85
4.6a Relationship between overweight and Demographic characteristics	87
4.6b Relationship between overweight and Socio-economic characteristics	87
4.7a Relationship between overweight and dietary habits	90
4.7b Relationship between overweight and dietary habits (continuous)	91
4.8a Relationship between obesity and Socio-demographic characteristics	92
4.8b Relationship between obesity and Socio-demographic characteristics	93
4.9a Relationship between obesity and Food Habits/Patterns	95
4.9b Relationship between obesity and Food Habits/Patterns (continuous)	96
4.10 Relationship between overweight/obesity and physical activities	98
4.11: Relationship between overweight/obesity and Dietary diversity	98

LIST OF FIGURES

Figure	Page
2.1: Conceptual Framework:	16
3.1. Map of Effutu Municipality showing Winneba	53
4.1: Food consumption frequency of Pupils by School type	68
4.2: Breakfast consumption frequency of Pupils by School type	69
4.3: Snack consumption frequency at first break by School type	70
4.4: Snack consumption frequency at lunch break by School	71
4.5: Snack consumption frequency before bedtime by School	72
4.6: Home-cooked meal carried to school by school type	73
4.7: Food purchased on school premises by school type	74
4.8: Food purchased outside school premises by school type	75
4.9: School feeding program by school type	76
4.10: Type of Snack and Cooking Method by school type	77
4.11: Last meal time and Bedtime by school type	78

ABSTRACT

Childhood obesity is one of the serious public health challenges of the 21st century owing to its higher prevalence and the complications that are associated with it. Urban cities in Ghana have experienced a gradual increase in the rate of prevalence in childhood obesity and overweight. The study aimed to assess the prevalence and risk factors of overweight and obesity among basic school pupils in Effutu Municipality. A cross-sectional study was conducted in Effutu Municipality. Multi stage sampling technique was used to select a total of 333 basic school pupils from primary four to primary six. Pre-tested questionnaires and anthropometric data gathering methods were used in data collection. Data were analysed using both inferential and descriptive statistics. The overall combined prevalence of overweight and obesity among the basic pupils in Effutu Municipality was 15.6 %. Findings show that being male or female had no association with being overweight or obese. Combined overweight and obesity prevalence was higher in private schools compared to public schools (21.1 % vs. 9.1 %, $p < 0.001$). Among the various socio-demographic factors which were tested, the age of respondents, number of siblings, family history of obesity, educational attainment of their mothers and occupation of their mothers, and how much money given to pupils were the factors that were significantly associated with overweight/obesity at the bivariate level. Family history of obesity and occupation their mothers were significantly associated with overweight/obesity at the multivariate level. Getting food from the school feeding program, and bedtime had a significant association with overweight at the bivariate level whereas having a snack at lunchtime and buying food in school had a positive association with obesity on the multivariate level. Also, getting food from the school feeding program, and the time the pupils went to bed had a positive association with obesity on the bivariate level while the time the pupil had their last meals and the time, they went to bed had a positive association with obesity at the multivariate level. School-based interventions such as physical education is needed to promote healthy lifestyles among school children. Parents of pupils in private schools need to be educated by the Ghana Health Service about the prevalence of overweight/obesity in their wards, the consequences of overweight/obesity in the life of their wards. This would go a long way to help the parent to reduce the obesogenic environment around their kids as well control the type of food their wards consume.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter presents on the background to the study, statement of the problem, the purpose of the study, research objectives and questions, significance of the study, delimitations and organization of the study.

1.1 Background to the Study

Obesity has become a serious public health concern which has been recognized by health professionals as an increasing worldwide problem. Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. (WHO, 2021). Evidence shows that obesity was rear before the 19th century (Eknoyan, 2006). In any case, within the year 1997, the World Health Organization (WHO) recognized obesity as a universal phenomenon and thus portrayed its expanding predominance across all age bunches within the world as a worldwide plague (WHO, 2006). Worldwide obesity has nearly tripled between 1975 and 2016 (WHO, 2021). Patients with obesity are at major risk for developing a range of comorbid conditions, including cardiovascular disease (CVD), gastrointestinal disorders, type 2 diabetes (T2D), joint and muscular disorders, respiratory problems, and psychological issues, which may significantly affect their daily lives as well as increasing mortality risks (Fruh, 2017).

In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these, over 650 million were obese, 39% of adults aged 18 years and over were overweight in 2016, and 13 % were obese (WHO, 2021). The prevalence of overweight and obesity among children and adolescents aged 5-19 has risen dramatically from just under 1% in 1975 to an average of 7 % in 2016, leading to 124 million cases worldwide (WHO, 2021). The rise in the prevalence of overweight and obesity occurred among both boys

and girls: in 2016, 6 % of girls and 8 % of boys were overweight (WHO, 2021). Overweight and obesity are linked to more deaths worldwide than underweight. Globally there are more people who are obese than underweight – this occurs in every region except parts of sub-Saharan Africa and Asia (WHO, 2021).

Using body mass index (BMI) in defining obesity, an individual is said to be overweight or obese when there is excess weight for a given height, in this instance the BMI value exceeds 30 kg/m^2 (Talat & Shahat, 2016).

Childhood obesity is also referred to as pediatric obesity and it can be defined as a condition in which a child is significantly overweight for his or her age and height (Valenzise, Croll, Neumark-Sztainer, & Story, 2021). According to WHO (2021), overweight and obesity are defined as follows for children aged between 5–19 years: overweight is BMI-for-age >1 standard deviation (SD) above the WHO Growth Reference median; and obesity is <2SD above the WHO Growth Reference median. Generally, the rate of childhood obesity is on the increment, 39 million children under the age of 5 years were overweight or obese in 2020 (WHO, 2021). Over 340 million children and adolescents aged 5-19 years were overweight or obese in 2016. For instance, in the United States, 25% of children are overweight whilst 11% are obese (Dehghan, Akhtar-Danesh, & Merchant, 2005). In Europe, the same increase prevalence can be seen (Franco, Sanz, Otero, Domínguez-Vila, & Caballero, 2010; Livingstone, 2001).

Children become overweight and obese for a variety of reasons. The most common causes are genetic factors, lack of physical activity, unhealthy eating pattern or a combination of these. Only in rare cases is overweight and obesity caused by a medical condition such as hormonal problem.

Globally, the prevalence of childhood obesity is soaring especially in the developing countries (WHO, 2016a). In the same two and half decades (25 years) in the continent of Africa, the region has experienced more than double (that is from 4 million to 10 million) in numbers of children under 5 years living with overweight and obesity (WHO, 2016). And about a quarter (25%) of these global estimates of children with overweight and obesity lives in Africa (UNICEF/WHO/World Bank, 2016).

Though issues of infections and undernutrition are also common in the West Africa Region, studies shows that an estimated 2 million children suffered from overweight and obesity in 2016 (WHO, 2016). Presently, the region is experiencing a rapid rise in non-communicable diseases (NCD) and obesity is implicated as one of the key drivers of non-communicable diseases (NCDs) in the region. For a long time, it has been posited that Africa was all about infectious diseases, malnutrition, and communicable diseases (CD). However, non-communicable diseases (NCDs) are now becoming more important than communicable diseases in terms of attributed deaths and accompanying complications relative to communicable diseases (WHO, 2021b).

Once considered a problem of Western countries, obesity has become a public health problem in low- and middle-income countries too (Robinson, Horacek, & Betts, N 2013). Childhood obesity is of particular concern because it is associated with early onset of risk of diseases such as cardiovascular diseases and diabetes and higher odds of obesity in adulthood (Reilly & Kelly, 2011). In 2016, approximately 41 million children under age 5 years were overweight or had obesity globally, about 25% of them in Africa alone. The global prevalence of childhood obesity has been on the rise over the past decades, increasing from 4.2 % in 1990 to 6.7 % in 2010, this was expected to rise to 9.1% in 2020 (Wang & Lim, 2012). In terms of childhood obesity, prevalence has increased by 47.1 % in the last three decades, and the rate of increase in children

twice that of adults (Amissah, Mensah & Mensah, 2021; Sashindran & Dudeja, 2020). In 2014, the number children under age 5 who were identified as overweight or obese was 41 million (WHO, 2019). In 2016, among children of age 5 years, 41 million children were classified as obese, while in the age range 5-19 years, 340 million children and adolescents were identified as either obese or overweight (Amissah et al., 2021). The public health significance of obesity and overweight in Ghana is well recognized. Obesity and overweight in Ghana are estimated to have increased over the past decades. The Ghana Demographic and Health Survey (Aheto & Dngbe, 2021) reported the increasing prevalence of childhood obesity in Ghana.

Over the past decades, different studies have reported varying prevalence values for childhood obesity and overweight in Ghana, in the range of 0.7%–47.06% for obesity and 0.8%–33.66% for overweight (Amoh & Appiah, 2017). Formerly, in many developing countries, research and investment in health was mostly devoted to infectious diseases, however, due to the 2030 agenda for sustainable development, which is partly aimed at reducing premature mortality from NCDs by one-third in 2030, many resources have been made available to Heads of States to combat NCDs (WHO, 2005; WHO, 2021b). Out of 64 million projected deaths worldwide in 2017, 41 million (64%) will result from NCDs unless serious action is taken (Victora, Lytle, & Story, 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, Edwards, Atanga, Kiawi, Unwin, & Mbanya, 2006). 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 children which has become an emerging health issue for children in developing countries (Popkin, 2006). Generally, the rates of overweight and obesity is increasing across the globe.

Despite the continued problem of under nutrition in Sub-Saharan Africa (SSA) countries, SSA is not insusceptible to the obesity epidemic (Bleich, Chan, & Pence, 2007; Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). 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 food items such as refined carbohydrates, polished grains and frozen meat products by the poor in deprived and low status areas which increases the prevalence of obesity (Dake et al., 2011). Existing evidence show a relation between dietary assessment and increase or decrease in obesity/overweight whereas other researchers find no evidence between dietary recall and obesity/overweight. 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). Karki, Shrestha and Subedi, (2019) stated a 3 times increase in the possibility of a school child becoming obese/overweight when he/she consumed snacks, (potato crisps, and other chips) and confectionaries (sweets and ice creams) twice a week. Talat and Shahat, (2016), also found a significant connection between obesity and recurrent fast-food consumption, this observance was associated with the high fat and calories content of the fast food. 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 children (WHO, 2004).

Obesity in childhood is linked to an increased risk of adult obesity, premature death, and disability. Obese children, on the other hand, face respiratory issues, a higher risk of fractures, hypertension, early signs of cardiovascular disease, insulin resistance, and psychological consequences. Increased BMI is a major risk factor for non-communicable diseases such as: cardiovascular disorders (mostly heart disease and stroke), which were the leading cause of death in 2012; and cancer. Diabetes; musculoskeletal problems (particularly osteoarthritis, a severe degenerative joint disease); and some malignancies (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and a variety of other cancers).

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).

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 as expressed by 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). Prevention is the only viable choice for decreasing this epidemic since current treatment practices for obese children are mainly focused on bringing the problem under control rather than effecting a cure (Cole et al., 2002).

Preventing obesity in the early stages (childhood) will help to prevent diseases that may occur in the future as they grow older. Therefore, if this problem is curtailed, we will not only prevent the transition of childhood obesity to adulthood but also health related problems linked to obesity will be prevented hence increasing the life expectancy of these children.

1.2 Statement of Problem

The prevalence of childhood obesity poses serious health crisis. Childhood 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. Also, multiple database search which was conducted for articles published between January 2001 and October 2019, reported the prevalence of childhood overweight and obesity in Ghana (Akowuah & Kobia-Acquah, 2020). The problem of NCDs has increased in Africa, and was anticipated to rise further (WHO, 2021).

Most African societies associate wealth and prestige to body size (Choukem et al., 2020). The implications of this condition on the health of people seem to be unknown by people especially where it has been linked to other diseases such as hypertension, stroke among others. There is moreover a stressing improvement particularly at the essential care level where mothers whose children are overweight or obese are

commended amid child welfare clinics by wellbeing care labourers for taking great care of them (World Health Organization, 2018). In addition to this, there has been an association between the changing lifestyles in Ghana and the increase in obesity due to urbanization with Effutu Municipality not being an exception. Moreover, childhood overweight is one of the five maternal, infant and young child nutrition (MIYCN) targets which is not making progress globally in achieving the 2025 global nutrition targets (Global Nutrition Report, 2021).

This represents the need of mindfulness on the impact of childhood obesity by health care specialists included in development checking (GHS/USAID/FANTAIII/ FHI360/MCHIP, 2013). Childhood obesity has been indirectly linked to delayed childhood skill acquisition particularly among 2-3 years old, stigmatisation, and discrimination by mates. This is coupled with both health and economic consequences for themselves, relations and the community at large (Cawley & Spiess 2008 and WHO 2016). And this calls for urgent attention to tackle this emerging public health problem in Ghana. To the best of my knowledge, several studies on childhood obesity have been conducted in Ghana but not in Effutu Municipality. Most of such studies are on prevalence and/or determinants of obesity among children (Mohammed & Vuvor, 2012, Mogre et al., 2012; Amidu et al., 2013; Kumah *et al.,* 2015; Obirikorang et al., 2015; Oppong, 2016). Also, dietary diversity which has been predicted to be associated with nutrient intake and anthropometric indices such as BMI (Ruel, 2003) have not been extensively studied in Ghana in relation to childhood obesity. This indicates that, there is still paucity of literature on the determinants of childhood obesity in Ghana relating to micronutrient adequacy. Examining the prevalence and determinants of overweight and obesity among basic school pupils in Effutu Municipality will help to

identify the causal factors of the condition which will help proffer appropriate measures to curtail the problem.

1.3 Purpose of the study

The purpose of this study is to assess the prevalence and determinants of childhood overweight and obesity among basic school pupils in Effutu Municipality and identify the causal factors among primary school pupils in the Effutu Municipality.

1.4 Research objectives

The following are the research objectives:

1. To determine the prevalence of childhood overweight and obesity among basic school pupils in Effutu Municipality.
2. To assess the dietary habit of basic school pupils in Effutu Municipality.
3. To assess the physical activities of basic school pupils in Effutu Municipality.
4. To identify the determinants of childhood overweight/obesity in the Effutu Municipality.

1.5 Research questions

The study was guided by the following research questions:

1. What is the prevalence of overweight/obesity among basic school pupils in Effutu Municipality?
2. What are the dietary habits of basic school pupils in Effutu Municipality?
3. What physical activities do basic school pupils in Effutu Municipality engage in?
4. What are the determinants of childhood overweight and obesity in Effutu Municipality?

1.6 Significance of the study

As a result of the long-term health consequences of childhood obesity, it is paramount that the causes are identified and corrected at this stage. The results from this study is

expected to guide all stakeholders in Effutu Municipality and Ghana as a whole to come up with measures to prevent childhood obesity. Specifically, school authorities, parents and Ghana education service will be enlightened on their roles in the control of the prevalence of childhood obesity from the results of this study. It will also provide a better understanding of the functional linkage between micronutrient adequacy and obesity.

1.7 Delimitation of the study

The scope of the study is delimited to 2020/2021 academic year group of basic school children in Effutu municipality although the problem is seen among other areas and people belonging to different age group. The study covered the specific domain of prevalence and risk factors associated with obesity among pupils in primary one to six in the Effutu Municipality. Dietary habit covered what and when the pupils eat as well as how participant's diets are diversified.

1.8 Limitation

Some parents and school authorities were not cooperative. Planned time allocated for the data collection in some schools extended since some school authorities were not present at the exact time of data collection so the researcher had to wait which affected the time allocated for other schools.

Operational definition of terms

a) Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health (WHO, 2022).

b) Child obesity: This is defined as the BMI of the child at or above the 95th percentile for same age and sex. Also, according to the World Health Organisation (WHO) growth reference for school-aged children, obesity is

equal to two standard deviations body mass index depending on the age and sex of the child.

c) Body Mass Index (BMI): The body mass index (BMI) is a simple weight-for-height index that is often used to identify humans as overweight or obese. It is an appropriate indicator or measure of body fat by calculating the individual's weight in kilograms and dividing by the square of height in meters (Cole, Bellizzi, Flegal & Dietz, 2000). It is universally expressed in units of kg/m2.

d) Prevalence: This refers to the rate at which a particular condition is widespread, of wide extent, common or has a high occurrence ((www.Dictionary .com). It can also mean the percentage of a population that is affected with a particular disease at a given time

e) 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.

f) Anthropometric measurement; it is the measurement of a person's body physical dimensions.

g) Dietary habit: the habitual decisions an individual makes when choosing what foods to eat.

h) Dietary diversity: the number of different foods or food groups consumed over a given reference period.

i) Physical activity: Any movement of the body that requires energy expenditure.

j) Health: World Health organization defines it as the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

k) Chronic disease: A condition that impairs daily living, decreases longevity and quality of life.

Abbreviations

AOR – Adjusted Odds Ratio

BMI- Body Mass Index

CVD – Cardiovascular disease

DDS – Dietary Diversity Score

NACS - Nutrition Assessment, Counselling, and Support

IOTF - International Obesity Task Force

IDF - International Diabetes Federation

SSA- Sub-Saharan Africa

WHO – World Health Organization

1.9 Organisation of the Study

The success of any research work depends on how it is orderly organized. This thesis consists of six chapters. Chapter one involves the introduction and provide background information, and then discuss key research issues such as, statement of the problem, significance of the study, purpose of the study, research questions, objectives, the delimitation as well as the organization of the study. Chapter two emphasizes on the theoretical and conceptual framework and review of the literature encompassing the risk factors of obesity with a focus on children in primary schools. Chapter three comprise of research approach and design, population, sample, sample size, sampling technique, research instrument, data collection method, mode of data analysis and ethical considerations. Chapter four presents the findings of the study in a form of frequencies, percentages and tables. Chapter five involves the discussion of findings obtained from the study. Finally, chapter six which presents a summary, conclusion and recommendations of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

This chapter discusses the study's theoretical and conceptual framework. In addition, this chapter examines the literature on obesity and childhood obesity based on published studies. The literature review was well-structured based on the objectives of the study, and it was reviewed under the following themes:

- Concept of overweight and obesity
- Global prevalence of childhood overweight and obesity
- Prevalence of childhood overweight and obesity in Africa.
- Prevalence of childhood overweight and obesity in Sub-Saharan Africa.
- Prevalence of obesity among school children
- Causes of childhood overweight and obesity
- Dietary diversity and overweight/ obesity
- Obesity and socio-economic factors
- Assessment of child weight status
- Dietary assessment in children
- Physical activity assessment in children
- Prevention and control of childhood overweight and obesity
- Consequences of childhood overweight and obesity

2.1 Theoretical Framework

2.1.1 The Theory of Planned Behaviour (Ajzen, 1988, 1991)

The theory of planned behaviour stated as the Theory of Reasoned Action in 1980 to predict an individual's intention to engage in a behaviour. This theory predicts an individual's intention to engage in a behaviour at a specific time and place. This theory focuses on the specific consumer behavior of interest. Examples in the domain of food consumption are "buying low-fat yoghurt," "eating genetically modified food in the next 6 months," and "ordering vegetarian dishes when eating out." The goal of the

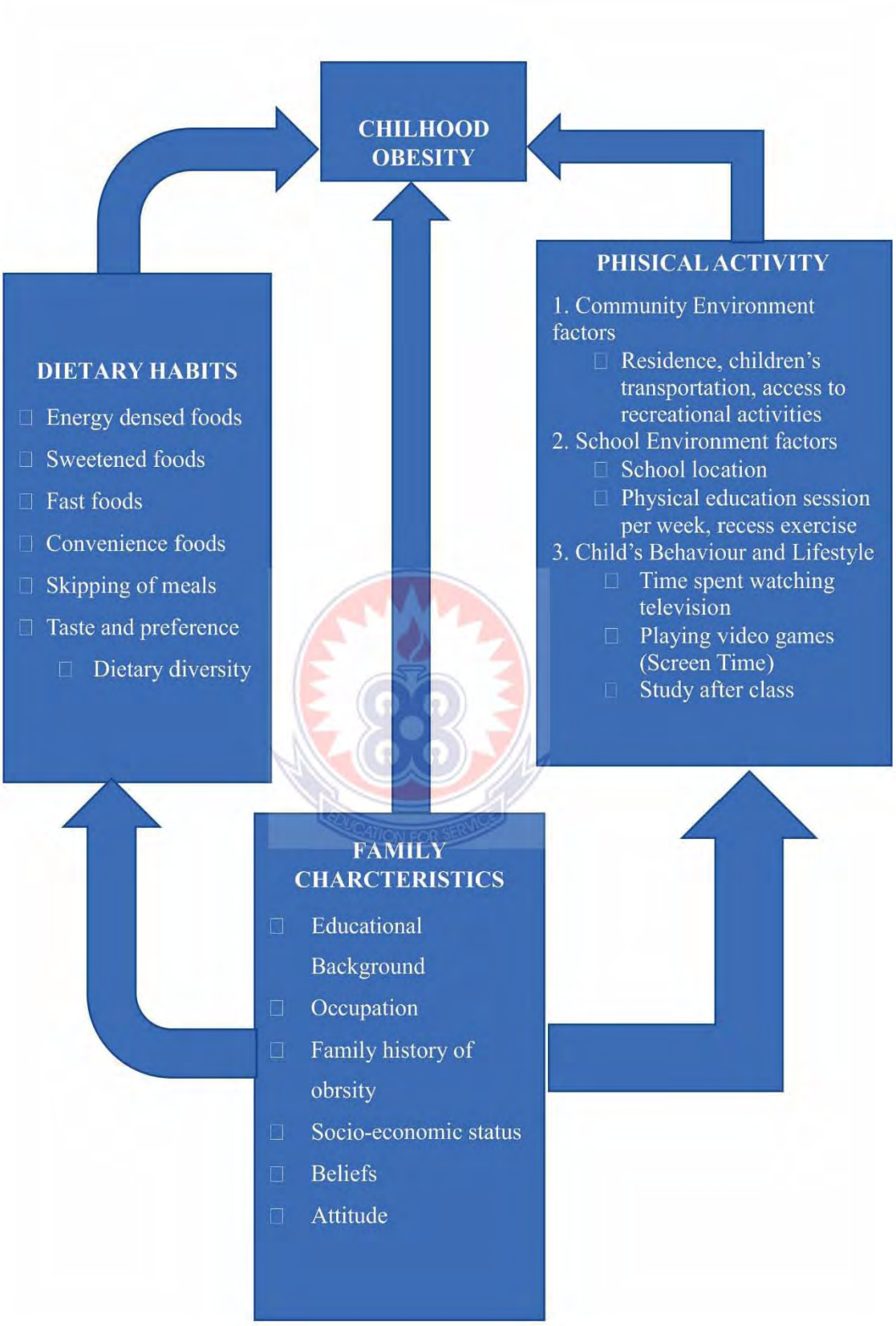
theory of planned behavior (TPB) is to provide a comprehensive framework for understanding the determinants of such behaviors.

First described in 1985 (Ajzen, 1985), the TPB is today one of the most popular social-psychological models for understanding and predicting human behavior. Briefly, in the TPB, the immediate antecedent of a particular behavior is the "intention" to perform the behavior in question. This intention is assumed to be determined by three kinds of considerations or beliefs. The first is termed "behavioral beliefs" and refers to the perceived positive or negative consequences of performing the behavior and the subjective values or evaluations of these consequences. In their aggregate, behavioral beliefs that are readily accessible in memory lead to the formation of a positive or negative "attitude toward the behavior". A second kind of consideration has to do with the perceived expectations and behaviors of important referent individuals or groups, combined with the person's motivation to comply with the referents in question. These considerations are termed normative beliefs, and the normative beliefs that are readily accessible in memory combine to produce a perceived social pressure or subjective norm with respect to performing the behavior. The third type of consideration, control beliefs, is concerned with the perceived presence of factors that can influence a person's ability to perform the behavior. Together with the perceived power of these factors to facilitate or interfere with behavioral performance, readily accessible control beliefs produce a certain level of perceived behavioral control or self-efficacy, (Bandura, 1977) in relation to the behavior. As a general rule, the more favorable the attitude and subjective norm with respect to engaging in the behavior, and the greater the perceived control, the more likely it is that a person will form an intention to perform the behavior in question. Finally, intentions are expected to lead to performance of the behavior to the extent that people are in fact capable of doing so, i.e., to the extent that they have

actual control over the behavior. Actual behavioral control is thus expected to moderate the effect of intention on behavior. However, in many applications of the TPB, it would be difficult or impossible to identify all the factors that influence actual control over performance of the behavior. Ajzen in question. For this reason, investigators typically use the measure of perceived behavioral control as a proxy for actual control under the assumption that perceptions of control reflect actual control reasonably well.

In relation to this study, a person's intention to exercise, limit fat, sugar and other caloric food intake, include fruits and vegetables in diets and the reverse of these is determined by their intention to have a healthy weight. Moreover, people's health choices or decisions are better made by improving their knowledge on the relationship between the health behaviour and the health outcome.

2.2 Conceptual Framework



Source: Researcher's construct

Fig. 2.1 Conceptual Framework

A combination of factors such as parent's and family characteristics, physical activity level, environmental factors, dietary habit, contribute to the development of obesity in children (Ahrens et al., 2011; Shilpi & Satwanti, 2012; Girma & Genebo, 2002; Ziraba et al., 2009; Moore et al., 2010). Parent's and family characteristics such as educational background, BMI, income, health or medical history, taste preference, beliefs, attitudes among others, affects the child's dietary habit and physical activity level, may lead to obesity and also have direct impact on complications of obesity. Physical activity level affects the child's weight. High physical activity level is one of the surest ways of maintaining healthy weight of an individual. It has been noted that, physically active children are less likely to experience symptoms of obesity and it complications.

Dietary habit of an individual is determined by the environment in which the child lives. The environment can promote healthy dietary choices or otherwise. Also, the weight and health of a child depends on the availability and accessibility of a balanced diet in his or her home. Family and parent's characteristics also affect the child's weight and can also directly bring about the complications of obesity.

2.3 Concept of overweight and obesity

Obesity is recognized as a multifaceted global disease occurring in all most every age group. In the past two decades, the prevalence of childhood obesity and overweight has seen a continuous raise in both developing and developed countries (Talat & Shahat, 2016). The increase rate in obesity globally is partly as a result of global life-style changes. Obesity arises when energy accumulation in the body of an individual exceed the energy expended through physical activities (Craig, 2013). Similarly, obesity occurs when an individual consumes more energy than she/he can use. In reality, people of all ages are now exercising less, consuming more calories, and living less active lives

leading to increase weight gain. In fact, weight gained over the years is extremely difficult to lose (Alturki, 2019).

Using body mass index (BMI) in defining obesity, an individual is said to be overweight or obese when there is excess weight for a given height, in this instance the body mass index (BMI) value exceeds 30 kg/m^2. When the BMI value is in the range of 25 – 30 kg/m^2 an individual is considered be overweight (Talat & Shahat, 2016). A healthy individual should then have a BMI range of 18.5 to 24.9. The Centers for Disease Control and Prevention (2010), define overweight as having 95th percentile or higher of body mass index (BMI), while falling between the range of 85th - 95th percentile is considered as being at risk for overweight (Talat & Shahat, 2016).

Obesity in children develops when a child's weight exceeds the usual range for his or her age and height. When a child's weight exceeds the 95th percentile for his or her height, the child is considered obese (Amissah et al., 2021b). According to WHO (2007), childhood obesity is when a child's BMI for his or her age percentile is above the 95th percentile, but when this or her age percentile is between 85% and 95% that child is considered overweight. Clinically, the determination of obesity in children is not solely dependent on BMI, other methods such as body fat measurement, skin fold measures, waist and hip circumference, BMI-z-score, and weight z-scores are used to compliment the body mass index (BMI). Depending on only body mass index (BMI) in determining obesity in children produces inaccurate results, because BMI turns to change with gender and growth, and it cannot be used to distinguish between lean and fat mass in children (Sashindran & Dudeja, 2020). As such, in quantifying childhood obesity, it more practical to use International Obesity Task Force (IOTF) and WHO

percentiles and standard deviations from a median reference point (Choukem, Tochie, Sibetcheu, & Nansseu, 2020).

In adulthood, obesity and overweight is companied by several short- and long-term adverse metabolic complications which include type 2 *Diabetes mellitus*, coronary heart diseases, hypertension, cancer, dyslipidemia and decreased life expectancy (Aryeetey et al., 2017; Talat & Shahat, 2016). In comparison, childhood obesity is mostly accompanied by adverse psychological health issues including depression as well as other social based complication such as low academic performance, low self-esteem, stigmatization, and weight-based teasing from people/children in society and school (Almutairi, Burns & Portsmouth, 2021; Amissah, Mensah & Mensah, 2021). Hence, childhood obesity has a significant direct and indirect economic cost. According to Trasande and Chatterjee (2012), the outpatient visit, prescription drug and emergency room expenditures of an obese child was found to be $194, $114 and $12 higher than a normal weight child; indicating the extra financial burden childhood obesity pose to parent.

Public health organization in developing countries have made prevention of obesity in children a top priority as compared to adult obesity prevention (Chirwa, Musuku & Pandey, 2019). This is due to the fact that correcting childhood obesity is deemed a more successful approach in reducing obesity and its associated risk factors in adulthood. It is easier to instill principles in the young minds and they will take it into adulthood (Terry, 2016). This will produce long-lasting outcome which can be achieved through adherence to correct dietary intakes and physical activities in school programs (Chirwa, Musuku & Pandey, 2019; Alturki, 2019).

2.4 Global prevalence of childhood overweight and obesity

Globally, the incidence of overweight and obesity has nearly tripled since the mid-1970s, and it is now the fifth leading cause of death, accounting for at least 2.8 million deaths each year (Almutairi, Burns & Portsmouth, 2021; Karki, Shrestha & Subedi, 2019). More than 1.9 billion persons aged 18 and over were overweight in 2014, while over 600 million of them were obese, out of this number 39 % were overweight whereas 13 % were obese (WHO, 2019). In terms of childhood obesity, prevalence has increased by 47.1 % in the last three decades, and the rate of increase in children twice that of adults (Sashindran & Dudeja, 2020; Amissah, Mensah & Mensah, 2021). In 2014, the number children under age 5 who were identified as overweight or obese was 41 million (WHO, 2019). In 2016, among children of age 5 years, 41 million children were classified as obese, while in the age range 5-19 years, 340 million children and adolescents were identified as either obese or overweight (Amissah et al., 2021b). In low and middle income countries, childhood obesity increased by 28 % in the last decade, and the rate of increase was 30 % higher than those in the high-income nations (Karki et al., 2019). In 2010, 35 million children under 5 years were identified as either obese or overweight in developing countries (Choukem et al., 2020). In the last thirty years, the number of obese and overweight male and female children and adolescents in developing countries has increased from 8.1 % and 8.4 % to 12.9 % and 13.4 % in males and females respectively (Choukem et al., 2020).

According to Karki, Shrestha and Subedi, (2019), within the last two decades the number of obese children in Asia increased from 12.4 million to 18 million. Following this trend, the number of obese children in Asia were expected to hit around 24 million in 2020. Similar trend was observed in the Caribbean countries, where the countries in the Caribbean were ranked 12 among 24 countries with the highest prevalence in

Childhood obesity worldwide. They recorded the highest mean body mass index (BMI) for the age groups 5–9 and 10–19 years (Rambaran et al., 2021). The researchers attributed the increase in the prevalence of obesity in the Caribbean countries to the over dependency on processed food and beverages with high amount of added sugar, as well decrease levels of physical activities among children in the age bracket (Rambaran et al., 2021).

The Arabian countries has seen an upsurge in the number of obese and overweight individuals, making the Middle East region second to North America as the region with the highest mean body mass index (BMI) among 52 countries (Almutairi et al., 2021). The number of adolescents classified as overweight and obese in the region now surpass the ones classified as normal weight. Comparing the prevalence of obesity and overweight male and female children under age 12 years in the Middle East, females have the highest prevalence of 3-18 % while the male children recorded 5–14 % (Almutairi et al., 2021).

Additionally, examining the data from Saudi Arabia in 2012 and 2015, reveals that the number of obese children increased from 10 % in 2012 to 18 % in 2015, while overweight children decreased from 23 % to 13 %. But the number of children examined in 2012 far exceeded that in 2015. The 2012 research involved 19317 children and adolescents (aged 5–18 years) and reported 23 %, 9 % and 2 %, as overweight, obese and severely obese children respectively, while in 2015 the research examined 7930 children (aged 6–16 years) and reported 13 % and 18 % as overweight and obese children respectively (Almutairi et al., 2021). The researchers identified decreased physical activities, increased indoor games and television time as the factors influencing the increase obesity and overweight prevalence in Saudi Arabia.

Bangladesh is among the middle-income countries with high prevalence of poverty. The country has high incidence of under nutrition yet for the last three decades there has been a gradual increase in the prevalence of overweight among school children; the average increase rate in the prevalence of overweight is from 3.6 % in 1998-2003 to 7.9 % in 2010-2015. On the other hand, the incidence of obesity decreased from 9.7 % in 1998-2003 to 9.0 % in 2010-2015 (Biswas, Islam, Islam, Pervin, & Rawal, 2017). The rate of prevalence of overweight in Bangladesh is as a result of increase sedentary lifestyle, indoor activities and genetics, whereas increased physical activities greater than 30 min. each day may had led to decrease the prevalence of obesity. Furthermore, increased urbanization in Bangladesh has negatively impacted the lifestyle and eating behaviors of people in the urban areas by predisposing them to sedentary behavior and lack of physical activities. This has increased the number of obese children in the urban regions compared to the rural areas (Biswas et al., 2017).

Despite the various interventions to control the increase in obesity and overweight in USA, obesity/overweight has gradually increasing. For instance, there has been 33 % and 18 % prevalence in obesity and overweight in USA, the increase in obesity and overweight is from 14 % to 29 % within the last 25 years (Choukem et al., 2020). The rate of increase of obesity among children age 2-19 years from 13.9 % in 1999-2000 to 18.5 % in 2015-2016. According to WHO (2009), in Europe 20 % of school children overweight and 5% are obese, the values for North America was higher than that of European countries, as the prevalence rate was 30 % and 15 % for overweight and obesity respectively. One out of every ten school children age 5-17 was overweight and this accounted for about 155 million school children in North America. For gender distribution, there is slight difference in prevalence of obesity among males and females, the occurrence in females is slightly higher with prevalence rate at 20.9 % as

compared to 20.4 % in male. Children from poor socio-economic, low education and unemployed homes are more inclined toward been obese or overweight (Se & Greene, 2018). Report of obesity and overweight in Philippines, Myanmar, Laos, and Cambodia was 5 %, 3%, 2% and 2 % respectively. These values indicate the lower prevalence of obese children in Asia between 2012 and 2016. South Korea saw an increase of obese children from 14.3 % to 15.3 %, which was 1 % increase between 2011 and 2013 (Liberali, Kupek, & Alice, 2020).

2.5 Prevalence of childhood overweight and obesity

2.5.1 Prevalence of childhood overweight and obesity in Africa

For three decades, the cases of overweight and obesity has doubled in Africa, increasing from 5.4 million in 1990 to 10.6 million in 2016 (Amissah et al., 2021b). By estimation, the urban population in Africa have 20-50 % of their population either obese or overweight. Egypt have a national levels of obesity and overweight among males at 6.5 % and 11.5 % respectively while the female values are 7.7 % and 15.2 % (Talat & Shahat, 2016).

In 2010, the childhood obesity in Africa was 8.5 % and this number was expected to go up to 12.7 % in 2020 (Adebimpe, 2019). In 2016, the prevalence of obesity or overweight in children age 5-19 in Tunisia, South Africa, and Uganda were 25 %, 24.7 %, and 10.3 % (Klingberg, Draper, Micklesfield, Benjamin-neelon, & Sluijs, 2019). The prevalence of overweight and obesity among schoolchildren aged 7–14 years in Rabat were 5.1% and 3.7%, respectively and in Marrakech the reported prevalence of overweight and obesity was 9.1% in a sample of 1407 schooled adolescents aged 12–18 years (Kabbaoui et al., 2018).

2.5.2 Prevalence of childhood overweight and obesity in Sub-Saharan Africa

The Sub-Saharan Africa is considered one of the poorest regions in the world. The region is mainly known globally for the prevalence of communicable diseases (HIV/AIDS, tuberculosis and malaria). But for the past decades, due to technological advancement, economic growth, urbanization and food behavior modification, obesity and overweight is gradually becoming one of the prominent non communicable diseases in the region (Choukem et al., 2020). This trend has been identified by researchers to continue because it is culturally believed in Sub-Sahara Africa that an individual is considered prosperous and healthy when that individual has excess weight and vice visa when the person financial weak. There is then the social pressure to have excess weight to depict prosperity which then lead to obesity and overweight in both children and adults.

According to Gebremedhin (2015), data from 26 countries in Sub-Sahara countries from 2010 to 2014 reveals that 10.7 million children under 5 years are either overweight or obese. The top 3 Sub-Sahara countries with the leading numbers in the prevalence of childhood obesity and overweight are Sierra Leone (16.9%), Cameroon (15.9%) and Malawi (14.5%) while the countries with the least prevalence was Ethiopia (3.0%), Togo (2.6%) and Senegal (2.0%) (Choukem et al., 2020).

Ghana may not be among the top countries in the Sub-Saharan countries with highest cases of obesity; but over the years the urban cities in Ghana have experience a gradual increase in the prevalence in childhood obesity and overweight. Greater Accra, Central and Volta regions form the top 3 regions with the highest cases of childhood obesity. In 2014, Ghana Statistical Service reported 3.1 % increase in obesity school children in the country. Accessing the rate of obesity in other region Whyte et al. (2020) reported obesity in school children in Cape Coast is 5%, where as those at risk of obesity is 9%.

2.5.3 Prevalence of Obesity among School children

Between countries the cases of obesity and overweight varies, similarly the number of cases differ within the same countries. But over the years, it has been found that among children (males and females) within developing countries females are more predispose to obesity than males, yet the situation is vice versa in developed countries (Amissah et al., 2021b). The difference reported in boys and girls in reference to obesity or overweight is attributed to difference in hormone, rate of weight gain, and body composition; other factors include genetics, ethnicity, social and environmental factors (Amissah et al., 2021b).

In the urban Sharkia Governorate in Egypt, among preparatory school adolescents, females were identified to have slightly higher incidence of obesity than males, incidence in females were 10.9 % and 10.4 % in males among 900 preparatory school students (age 13-15 years) (Talat & Shahat, 2016). This agrees with research by Ganle, Boakye and Baatiema, (2019), but the prevalence weight in the females (27.2 %) and males (19 %) among 287 children (age 5-16) in two basic schools in Tema Metropolitan in Ghana was higher than the one reported by Talat and Shahat, (2016). These report contrast the finding by Karki, Shrestha and Subedi, (2019), the research found more obese females (2.4 %) compared to 10.6 % in males.

Talat and Shahat, (2016), also found that prevalence of overweight was slightly higher in male children than female children. Overweight in females was reported as 19.9 % whereas that of the males was reported as 20.1 % (Talat & Shahat, 2016), similar results was reported by Karki, Shrestha and Subedi, (2019), where occurrence of overweight in males was 19.0 % and 18.2 % in females. This contrary to the reported values by Ganle, Boakye and Baatiema, (2019), where overweight in females was 51.7 % compared to 42.2 % in males in school children in Tema. Ganle, Boakye and Baatiema,

(2019) report agreed with reports by Alangea, (2014), the researcher found that the prevalence of overweight in female school children (age 9-15) in Ga East Municipality (Accra) in Ghana, was almost twice that of male school children in the same age bracket. The females recorded prevalence rate of 23 % compared to 10.9 % for the males (Alangea, 2014). The difference can be attributed to involvement of more male children in physical activities in Ghana than females as compared to those in Egypt.

Among 900 preparatory school students in Egypt, 20 % of the studied participants were found to be overweight, 10.7 % were obese and 69.3 % (624 students) were recognized to be normal and underweight adolescents (Talat & Shahat, 2016). In Nepal, among 575 school children age 6-13, 18.6 % were overweight whereas 7.1 % were obese (Karki et al., 2019). The prevalence of obese and overweight children was twice the result reported by Aryeetey et al. (2017). In Zambia, Chirwa, Musuku and Pandey, (2019) found out that the obese and overweight children among 556 children was 8.8 % and 12.6 %. The difference in reported value can be attributed to sample size, and location of the research.

In research by Aryeetey et al. (2017), prevalence of obesity in school children in Accra and Kumasi in Ghana was 4.6 %, whereas that for overweight children was 12.4 %. The reported values were higher in terms of prevalence in Obesity than a previous work by Kumah et al, (2015), who reported a prevalence rate of 0.80 % obesity and 12.20 % in overweight among children age 12-20. Again, the reported values were twice lesser than he reports by Amoh-Yeboah (2017), in his work found that the prevalence of obesity and overweight in private and public school were 44.5% and 13.9%. Similar to the report Ganle, Boakye and Baatiema, (2019) in terms of rate of overweight in school children. Ganle, Boakye and Baatiema, (2019) reported prevalence rate among 287 school children in Tema municipality in Ghana, as 46.9 % for overweight and 21.2 %

for obesity. There seem to be gradual increase in obesity across Ghana, which calls for revealing of the intervention strategy.

Some researchers have found a relationship between level of education of parent and the levels of obesity/overweight in school children. Talat and Shahat, (2016), stated that children whose parents were less educated were more likely to turnout obese or overweight compared to children whose parent were more educated. Parent with low level of education regularly consumes high amount of unhealthy diets. This trend is more evident in developed countries than developing countries. Contrary to the report by Talat and Shahat, (2016), Aryeetey et al. (2017), Karki, Shrestha and Subedi, (2019), and Ganle, Boakye and Baatiema, (2019) found that school children whose parents are highly educated was likely to turnout obese than children who had parent with low level or no education in Ghana. Ganle, Boakye and Baatiema, (2019), stated that school children whose parent obtained basic, secondary and tertiary education were 1.93, 3.86 and 4.20 more times likely to turnout obese as compared to those whose parent had no education. Parent who are highly educated have jobs which affect their life style as such having less time to monitor the dietary behavior of their wards and also may have access to more disposable income to purchase food outside the home, this predisposes their wards to consume unhealthy food. This is more evident in developing countries. Chirwa, Musuku and Pandey, (2019), found no significant correlation between level of education of parents and obesity of their children.

The type of school (private or public) is able to influence the prevalence of obesity or overweight in school children. In Zambia, Chirwa, Musuku and Pandey, (2019) reported that obese children in private schools were twice that in public school. The obese children in private school was 65.3% as compared to 34.7% in public schools. This was similar to the findings of Alangea, (2014), who also found that the prevalence

of overweight in private schools (24.9 %) in Ga West Municipal (Accra) in Ghana was almost twice that found public schools (13.1 %). Moreover, Ganle, Boakye and Baatiema, (2019), also found a similar trend where more children in the private school (26.8 %) was more obese than public school children (21.4 %). Children in private schools are mostly from rich families and these children are predisposed to buying and consuming high caloric foods, which increases their chance of turning out obese.

2.6 Causes of childhood overweight and obesity

The main underlining cause of obesity and overweight is energy imbalance within the body which results when energy accumulation in the body of an individual exceed the energy expended through physical activities (Craig, 2013). Energy imbalance is just a portion of the numerous causes of obesity as obesity have numerous and complex causes. The cause of obesity is of a major interest and the contributing factors can be sub grouped into personal, environmental and social factors (Se & Greene, 2018). The most predominate factors which influence obesity/overweight include genetics, demographic, child eating behaviors, parenting style, dietary habits, and educational factors.

2.6.1 Genetic Factors

Many research have establish the connection between individual genetic makeup and obesity, some studies have found 25 – 40 % possibility of inheriting BMI from obese parents (Amissah et al., 2021b). However genetic predisposition of individual account for less than 5 % in children. Over the years, gene sequencing has isolated 250 genes associated with obesity among these are the fat mass and the obesity-associated genes. This genes were been found to have a positive correlation with higher BMI, fat mass

index and leptin present in adipose tissue (Endalifer & College, 2020). Genetic predisposition of a child is extremely rare and should be the diagnosis consideration.

2.6.2 Activity level (Sedentary lifestyle)

Increased body metabolism results in energy expenditure which then decrease the amount of fat stored within the body. Increasing inactivity among children has been linked with increase rate of obesity (Perpich, Russ, Rizzolo, & Sedrak, 2011). Children are living more sedentary lifestyle with evident in the easy access to technological gadget within their home or community and this has upsurge the amount of time children spent watching television, playing video games, using smart phones and computers (Omer, 2020). Additionally, modernization has increase affluent parent access to personal vehicles and school transportation systems has drastically decreased the amount of time children walk or ride their bicycles to school and back, again the decreased participation in house chores by children has a link to obesity and overweight. Only a few children participate in after school sports activities and this is mostly the children from poor homes, and it is even low in female than males. Children from such homes have higher BMI than children who are less privileged (Amissah et al., 2021b).

2.6.3 Environment and behavioral factors

Parent practically control the life of their wards, and the environment they setup around them affect how the children behave. Obesogenic environment has been linked with increased obesity. Affluent parents are socio-economically active, having little time to plan the dietary behaviour of their children and even cook home meals, but home meals have a positive effect on the healthful life of children (Larson et al., 2007). Parent food choices has been found to impact children food preference (Birch, 1999), the preference

of high caloric diet in children has been found to be higher in children whose parent do more fast-food, and dieting in restaurant and also those who do home orders. Also, parents who stock more carbonated and non-carbonated drinks turn to have obese or overweight children. These foods have high calories, high added sugar and low nutritional quality (Guthrie et al., 2002).

2.6.3.1 Dietary Behavior

Most obesity in children is as a result of what they eat, and the bad dietary behavior they pick up during childhood is carried throughout their adult life. There is always discrepancy between the amount of calories consumed by a child and the energy expended, the energy expended is always at the lesser end than the one consumed. Excess calories consumed by obese children are in the excess of 1000 calories (Sanyaolu, Okorie, Qi, Locke, & Rehman, 2019). Change in life style in most country has increased the exposure and access to energy-dense foods (sweetened cereals, soft drinks, biscuits, candies and salty crisps) much easier at home, school and the on main stream and online media. Children can now order in their fast food at home either by themselves or through their parent, in schools, school children develop a higher affinity for carbonated or non-carbonated drinks and high energy foods than nutritious foods. According to Amidu et al (2013), children turn to have access and consumption to more energy food in school and this contributed to weight gain when he observed the rate of overweight and obesity in children 6-12 years 67 % and 60 % in Northern Ghana. In Kumasi, consumption of fast food was a significant contributor to obesity than non-fast food, contributing 12.8 % more to obesity than non-fast food (Obirikorang et al., 2015).

2.6.4 Dietary Diversity and Overweight/Obesity

Dietary diversity is the various foods or food groups consumed within a specified period (Ruel, 2003). It has long been associated with quality diet. A child's cognitive and physical development, and also their nutritional status, is dependent on how diverse the foods provided by the family and this is influence by the long-term consumption patterns of the family. A diverse diet increases the probability of nutrient adequacy among in the children. This makes dietary diversity a great indicator of dietary quality and nutritional status in children (Moursi et al., 2008). Nutritional status is based on adequate nutrient intake as a result of biological processes within an individual whereas dietary diversity ensure that the individual obtain the adequate amount of nutrient (Bernal et al, 2003). As such, the consumption of higher numbers of food groups improve the nutritional adequacy of their diet (Sealey-Potts, 2014).

When children grow beyond 6 months, their nutritional requirement exceed the nutritional adequacy of breast milk, therefore for optimal growth, there is the need for consumption of diversified food groups to meet their nutritional requirement (Dewey, 2003). The World Health Organization made recommendation concerning increasing the diversity of foods provided to infants to at least four food groups (minimum dietary diversity) to ensure proper growth and developments during this period (WHO, 2008). As such increasing the diversity of foods provided infants to include foods such as meat, poultry, fish, eggs, fruits and vegetables has the potential to ensure adequate nutrient intake (P.A.H.O, 2003).

Again, the total count of the food groups consumed is referred to as dietary diversity score (DDS). It is used as an indicator of the overall diet, and also used to estimate the nutrient adequacy of ones diets Azadbakht et al. (2006). A highly diverse diet containing different food groups would produce a higher dietary diversity score, and

can used to estimate whether nutrient intake is adequate or not. Diverse diet is linked with longevity and good health, providing protection against many diseases. Higher dietary diversity, can be associated with increased consumption of fibers, fruit and vegetables, other the other hand, it can be associated with increase in take of higher energy products (Jayawardena et al., 2013). Increase in take of high energy diets is linked with increase in overweight/obesity as overweight/obesity is recognized as a complex multifactorial disease developing from an interaction of different factors such as diet, genetics, physical activity, medication, and other factors.

Dietary diversity can be assessed using food frequency questionnaire or 24-hour dietary recall. Food frequency questionnaire evaluate the usual food intake and compared with food records, recalls and histories based on specific days, while 24-hour recall evaluate food groups consumed within a 24-hour interval. The frequently used method in dietary diversity analysis is the 24-hour dietary recall (Akbari, Bellissimo, & Azadbakht, 2015). Food groups considered in the calculating diversity include cereals, vegetables, fruits, meats, dairy foods and fats.

Dietary diversity score is calculated as the sum of scores from the six main groups, producing a score between 0-12. Animal-source foods like meat, milk, eggs and poultry have a variety of micronutrients including vitamin A, vitamin B-12, riboflavin, calcium, iron and zinc that are difficult to obtain in adequate quantities from plant sourced foods alone (Neumann et al., 2002).

FAO uses a reference period of the previous 24 hours. Using one 24-hour recall period does not provide an indication of an individual's habitual diet, but it does provide an assessment of the diet at the population level and can be useful to monitor progress or target interventions (Savy et al., 2005). The recall period of 24 hours was chosen by

FAO as it is less subject to recall error, less cumbersome for the respondent and also conforms to the recall time period used in many dietary diversity studies (Kennedy et al., 2007; Ruel et al., 2004; Steyn et al., 2006; Savy et al., 2005; Arimond et al., 2010). Moreover, analysis of dietary diversity data based on a 24-hour recall period is easier than with longer recall periods.

According to FAO (2011), twelve food groups are proposed for the HDDS, while nine food groups are proposed for the WDDS which includes starchy staples, dark green leafy vegetables, other vitamin A rich fruits and vegetables, other fruits and vegetables, organ meat, meat and fish, eggs, legumes, nuts and seeds and milk and milk products

Many studies have tried to establish the relationship between dietary diversity and excess energy intake. However, research finding from this research has been inconclusive, part of the research finding establish no relationship between dietary diversity and excess energy intake while others have. Azadbakht et al., (2006), reported a relationship between higher dietary diversity and obesity. The researcher reported that people with diverse diet were found to be more obese and this was attributed to higher energy intake from the consumption of vegetables oil, dairy foods and vegetables. Similar results was reported by Jayawardena et al., (2013), who reported a positive association between dietary diversity and obesity among Sri Lankan adults. Participants who were found to be obese tend to have higher dietary diversity than non-obese individuals. This was attributed to increase food consumption as a result of increasing diversity in diet or meal, and this led to increasing body weight and obesity. Consumption of large number of food items may lead to excessive intake of calorie and weight gain. Bezerra and Sichieri, (2011) also reported that obese participants had higher diverse diets than normal subjects. It was suggested that higher dietary diversity

is associated with higher intakes of total energy from fat, and saturated fat leading to obesity.

The increase in dietary diversity to include higher intake of low-energy-dense items such as fruits and vegetables has been linked with decrease in BMI, and the risk for obesity (Azadbakht & Esmaillzadeh, 2011). Again, increasing dietary diversity leads to increase in consumption of food rich in micronutrients, fish, vitamin-A-rich fruits and vegetables, and this help in the fight against disease and also help reduce BMI (Savy et al., 2008). It is important to recommend the increase in dietary diversity in consideration of energy intake.

2.6.5 Obesity and socio-economic factors

Many important modulators of the risk of childhood obesity has been identified and reported, among these environment (cultural and school), socio-economic and lifestyle changes play a major role (Nasreddine, Hwalla, Saliba, Akl, & Naja, 2017). Two distinct direction is known for the effect of socio-economic factor on obesity and overweight and this is evident in either developed or developing countries. In developed countries, childhood obesity is predominating in low-income groups (Mirmiran et al., 2010). This argument changes in developing countries, in developing countries childhood obesity is much more predominant in high income groups (Mirmiran et al., 2010; Kabbaoui *et al.*, 2018). Proposed explanation for the trend observed in developing countries is that low income people suffer from food scarcity and also expend more while the affluent group adequate food supplies (Kabbaoui et al., 2018)

Indicators of socio-economic factors and childhood obesity include parents educational level, monthly income, access to personal transport, and dietary behavior (Kabbaoui et al., 2018). Higher education in developing countries point toward higher paid jobs,

higher paid job is an indication of accessibility to readily available funds (Kabbaoui et al., 2018). High income parents, set up obesogenic environment which contribute to sedentary life style and inactivity in their wards. The purchasing power of the parent help in the acquisition of technologies such as personal vehicles, television, computers, smart phones and games. The use of these gadgets is to making life much easier for the parents, the companioned negative effect is parents tend to be more inactive and spend more time in front of their laptops, phones and TV (Amissah et al., 2021b). Children model this life style they see in their parent. As a child is not in control of his/her own environment, they live in the manner in which the environment dictates resulting in inactivity in their life. Increased screen time, been driven to and from school with little or no walking, participating in no sporting activities at home or school have been found to be the risk factors for obesity/overweight.

Another indicator of socio-economic factors is dietary behavior patterns of parents. Parents with high financial power are associated with higher education (secondary, and tertiary), based on these they should have a better knowledge of good dietary habit, and the effect of high energy dietary consumption on their health and that of their wards. Again, they should be aware of the importance of regular consumption of fruit and vegetables consumption to a healthy living (Armar-Klemesu et al., 2000). As a result of they should be able to do a good dietary plan for the home, but this has been found to be counterintuitive, as parent with strong financial strength have been identified to do more eating out at restaurants and at fast food joint consuming mostly high energy dense foods with little fruits and vegetables, consuming more carbonated and non-carbonated drinks with higher sugar levels. The eating behavior of parents which is consumption of high energy dense food, stocking of drinks with high sugar content at

home and drinking more energy drinks has been linked with obesity in children (Aryeetey et al., 2017).

Basic schools in Ghana are classified as either private or public (Amissah et al., 2021b). The private schools are mostly monetary demanding than their counterpart, for this reason most parent who are socio-economically strong have the tendency of sending their wards to private schools as they can meet the financial obligations, whereas parent who are financial weak are likely to send their wards to the public schools. There has been a link between private school in Ghana and obesity, the link is as a result of the existence of obesogenic environment in private schools with foster conditions for existence of obese children as compared to the public schools. It was found that there exist a high prevalence of childhood obesity and overweight in private schools than public schools (Amissah et al., 2021b).

Nasreddine et al. (2017) reported in their work that socioeconomic and parental characteristics was one of the highest contributing factors in predicting overweight/obesity among their studied participants. The researcher associated the results with children from affluent families may have higher access to energy-rich diets, opportunities for eating out more, and electronic games, this puts them at a higher risk for positive energy balance and weight gain. Kabbaoui et al. (2018) reported a similar finding when 1818 adolescents age 12-18 were surveyed. The researcher found increase in obesity with increasing family income, and increasing time spent on the computer. Adolescents who spent more than 4 hr. using the computer had a higher risk of obesity than those who used computer for less hours. Contrary to other research there was no significant relation between times spent watching TV and obesity in adolescents.

Reasons for this is the benefits of affluent group enjoy from economic growth, and better access to food (Kabbaoui et al., 2018).

2.7 Assessment of child weight status

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health (WHO, 2021). Measuring Body Mass Index (BMI) has been recommended by many authors for evaluation of childhood obesity (Johnson & Ziolkowoki, 2006). The BMI is a simple weight-for-height index that is often used to identify humans as overweight or obese. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m2) (WHO, 2021). It's calculated by multiplying a person's weight in kilograms by the square of his height in meters (kg/m^2). For children and teens, BMI is age- and sex-specific and is often referred to as BMI-for-age.

A child's weight status is different from adult BMI categories. Children's body composition varies as they age and varies between boys and girls. Therefore, BMI levels among children and teens need to be expressed relative to other children of the same age and sex. For example, a 10-year-old boy of average height (56 inches) who weighs 102 pounds would have a BMI of 22.9 kg/m^2. This would place the boy in the 95^{th} percentile for BMI, and he would be considered as being obese. This means that the child's BMI is greater than the BMI of 95% of 10-year-old boys in the reference population.

CDC Growth Charts are commonly used to measure the size and growth patterns of children and teens in the United States. BMI-for-age weight status categories and the corresponding percentiles, based on expert committee BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and

for all ages of adults. However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals (WHO 2021).

For children, age needs to be considered when defining overweight and obesity. For children under 5 years of age, overweight is weight-for-height greater than 2 standard deviations above WHO Child Growth Standards median; and obesity is weight-for-height greater than 3 standard deviations above the WHO Child Growth Standards median. For children aged between 5–19 years, overweight and obesity are defined as follows: Overweight is BMI-for-age greater than 1 standard deviation above the WHO growth reference median; and obesity is greater than 2 standard deviations above the WHO growth reference median.

In other to determine the level of fat deposit in the adiposities, anthropometric assessment methods such as BMI, waist circumference, and skin fold thickness. Among these, BMI is the commonly used method, and BMI is a person's weight divided by the square of body height in meters, mathematically expressed in equation 2.1 below, and the values obtained are rounded up to a single decimal place (Wang & Lim, 2012). BMI reveal the body fat mass and the complications (cardiovascular and metabolic) associated with fat accumulation in the body. BMI gradually increase after a person is born, this increase is not continuous; the BMI will decline until 5-6 years then it will increase again throughout childhood (Sivrikaya, Ziyagil, & Çebi, 2019).

$$\text{BMI} = \text{weight/height } (\text{kg/m}^2)$$

Two schools of thought is around the drop in BMI during a child's growth, some studies indicate the drop in BMI is the stage for increase in body adipocytes while other studies report that BMI is not a true reflection of body fat mass and change in BMI is not an increase in body fat (Sivrikaya et al., 2019). BMI is affected by age and gender, females

naturally have more fat mass than males while males tend to have more free fat mass than females, moreover it cannot not distinguish between fat mass, free fat mass, and abdominal fat which changes with growth (Wang & Lim, 2012).

Determining obesity and overweight status in children is complicated, because of this, there are different methods that is adopted across the globe, and the baseline measurement in classifying obesity in both children and adults is the use of a cut off which is gender-age-specific. In adults BMI of 25 is used as overweight and 30 is obese. When it comes to classifying obesity and overweight in children in USA the most commonly used measure is the gender–age-specific 85th and 95th BMI percentiles, which is based on the Centers for Disease Control and Prevention (CDC) growth charts 2000 (Sanyaolu et al., 2019). Even though the CDC growth chart was not developed as a standard for how children should grow, but because it was carefully crafted using a large data set from children across USA, it present the best reference in percentiles for the growth of children (Sanyaolu et al., 2019).

Expert Committee on Clinical Guidelines for Overweight in Adolescent Preventive Services, in 1994 recommended that overweight is when an adolescent gender-age-specific BMI exceed 30 kg/m^2 or ≥ 95th percentile. To be at risk of overweight the committee expressed that the gender-age-specific percentile should be ≥ 85th percentile but < 95th percentile. This cut off points were chosen because for adolescents 95th percentile to exceed 30 kg/m^2 the child should have an age above 17 years and at this point the child is considered an adult and the adult BMI cut off points can be used (Himes and Dietz, 1994). This definition changed in 2005, when the Institute of Medicine then redefined overweight and risk of overweight for children. A child age 2-18 who had gender-age-specific BMI of >30 kg/m^2 / ≥ 95th percentile was considered

obese, and gender-age-specific BMI of 30 kg/m^2/ ≥ 85th percentile but < 95th percentile was considered overweight. These terms showed urgency for the world to respond to the crisis of this pandemic and also to help parent easily understand the status of the children in relation to obesity and overweight. For determining overweight among children below 2 years the Institute of Medicine recommended that the 2000 CDC growth charts was still applicable since children in that age bracket experience a linear growth rate as such the CDC chart can reveal when the child is overweight but the term obesity cannot be used to describe children below 2 years as it was not applicable at that year. For adults, the BMI cut off point for obesity and overweight then became ≥ 25 kg/m^2 for overweight and 30 kg/m^2 for obese (Krebs et al., 2007). Limitation in determining the health complication associated with BMI ≥ 30 kg/m^2 in children age 16 to 18, has led to classification of severe obesity, in severe obesity a person's BMI ≥120% of the 95th percentile, this corresponds to BMI of ~35 (Sanyaolu et al., 2019)

The WHO in 2007 developed a child growth reference based on BMI as a function of age for measuring obesity/overweight in children aged 5-19 years based on weight-for-height Z-scores corresponding to those values, in their reference overweight is BMI more than >+ 1 SD and obesity is BMI more than >+ 2 SD above the growth reference median (Alqahtani & Scott, 2015; WHO, 2018). The International Obesity Task Force (IOTF) is another accepted measure for determination of overweight in children age 2-18 which is used in many other countries outside USA. In 2000, the IOTF also developed BMI reference standards using sex-age-specific BMI curves, these curves were developed from BMI distribution as a function of age and gender. From the curves the cut-off point was linked to the BMI cut off for adults of which overweight and obesity is at 25 kg/m^2 and 30 kg/m^2 respectively (Wang & Lim, 2012). The limitation in the IOTF reference is that it only provides overweight/obesity without percentile

which makes it difficult to determine the health complication beyond this cut off points. Most researchers compared the sensitivity of the WHO reference to IOTF reference, in their comparison some had found IOTF reference to be less sensitive to WHO reference whereas when it was used in younger respondent it was found to be equally sensitive to the WHO reference (Alqahtani & Scott, 2015).

2.8 Dietary assessment in children

Many researches have aimed at establishing a relationship between the nutritional quality of food consumed by school children and obesity through dietary assessment. By so doing researcher try to quantify the suitable feeding practices for school children that can positively impact obesity. This is very much important in the life of school children because changing the feeding practices of school children is much more difficult. Dietary assessment looks at the diverse food group among diet consumed over a given period (Habte & Krawinkel, 2016). It can also be used to estimate diverse food groups that are available to a particular household, how often a particular food group is consumed, the history and pattern of a diet in relation to an individual in the family (Alangea, 2014). In terms of dietary diversity score, the higher the score the highly diverse the food groups available to a particular household or an individual, the higher score depicts the quality nutritional status of the members/individual. Knowledge about the food variety and dietary patterns of school children is essential since it can be used to determine the nutritional adequacy of the child, the tendency of the child to be obese/overweight and can also be used to map out plans to correct any irregularities in the diet of the child.

Diverse methods are available to researcher for use in dietary assessment, these include dietary observation, 24-hour dietary recall, food frequency questionnaires, diet history,

food record, and dietary patterns (Alangea, 2014). The most commonly used method in dietary assessment in basic school children is 24-hour dietary recall.

The recommendation of use of 24-hour dietary recall in dietary assessment is as a result the high accuracy in obtaining the all the foods consumed by the child, the ease in administration and does not require any specialized tools (Buzzard, 1998). 24-hour dietary recall mostly require information at particular time of the day such as breakfast, lunch or supper, and the time of recall tends to affect accuracy. It solicit information on diet such as food consumed, detailed ingredient of mixed dishes and the type of cooking method used in preparation (smoked, roasted, boiled or fried) (Alangea, 2014).

Ghana, just like many other developing countries, has experienced change in dietary pattern and this has resulted in change in dietary behavior; many homes have stopped the consumption of traditional foods and opted for the consumption of more energy dense foods, drinking more carbonated and non-carbonated drinks high in added sugars, snacking more frequently, and consuming less vegetables and fiber high diets. This behavior leads to people skipping breakfast more frequently and relying more on snacks and fast foods (Dehghan, Akhtar-Danesh, & Merchant, 2005). Children are under the control of their parents, as such have no control over what they eat as what they eat are mostly influenced by their parents and friends (Alangea, 2014). Children tend to prefer snacks, carbonated or non-carbonated sugary drinks, and high energy foods to fruits and vegetable as well as traditional meals. In the home, parent with strong socio-economic strength tend to give these foods to their wards upon request, or as rewards or gifts. Kids mostly skip breakfast or due to the tight schedule of their parent are not able to enjoy home cooked meals. To compensate for these are handed money which are mostly used for buying carbonated or non-carbonated sugar flavored drinks and

other high energy dense foods from the school canteens. The canteen in most schools sell mostly high dense foods, snacks, and drinks with little emphasis on fruit and vegetable. This behavior predispose children to obesity and overweight (Aryeetey et al., 2017).

Existing evidence show a relation between dietary assessment and increase or decrease in obesity/overweight whereas other researchers find no evidence between dietary recall and obesity/overweight. Jumbo-Uzosike, (2017), investigated the dietary diversity among school children within the private and public schools within Port Harcourt in Nigeria. The researcher reported higher dietary diversity score in private schools (4.74) as compared public schools (3.67) among 1694 pupils. The pupil in private schools consumed breakfast, lunch, and fruit more adequately than children private schools. Making the pupil in private schools to be nutritionally adequate than their counterparts in public schools. This is influence by the socio-economic strength of parents of the pupil in the private schools, as they have excess to available capital to buy different types of food as compared to those in public schools whose parents are limited financially by the kind of food they can buy. More children were underweighting in public schools than private schools, this may has occurred as a result of the pupil in public schools consuming higher energy diet and engaging less in physical activities.

Alangea, (2014), dietary assessment in his work in Ga East (Accra) in Ghana, found that pupil in private schools significantly consumed three meals within a day more frequently than pupil in public schools; but in terms of female and males, there was no significant difference. Again, 60 % were found to take breakfast regularly on weekdays, within this number more public school children consumed breakfast more frequently

than private school children, this was contrast to the results by Jumbo-Uzosike, (2017). Male school children on the other hand consumed breakfast many times compared to the female school children (Alangea, 2014). Skipping breakfast has been found to have positive correlation with obesity and overweight, as skipping breakfast leads to school children buying and consuming high caloric fast foods and low nutritious snacks to compensate lost meal during later school hours (Talat & Shahat, 2016), this can be attributed to why there are more obese/overweight females than males.

Drinking of soft drinks is a risk factor for obesity. Ganle, Boakye and Baatiema, (2019), found that chances of children developing obesity and overweight increased by 2.39 and 3.36 more times when they consumed fizzy drinks some days and most days respectively within the week compared to those who didn't consume any fizzy drinks. Furthermore, the maximum snack intake among the pupil was 42 times a week, with the pupil who took 4-5 times within the week forming 27.3 % while 16 % consumed snack more than 5 times a week (Alangea, 2014). Snack intake significantly impact obesity and overweight due to high sugar and fat content which lead to fat accumulation in school children (Talat & Shahat, 2016). Karki, Shrestha and Subedi, (2019), stated a 3 times increase in the possibility of a school child becoming obese/overweight when he/she consumes snacks, (potato crisps, and other chips) and confectionaries (sweets and ice creams) twice a week. Talat and Shahat, (2016), also stated finding a significant connection between obesity and recurrent fast-food consumption, this observance was associated with the high fat and calories content of the fast food.

2.9 Physical activity assessment in children

Regular physical activities increase energy expenditure in the body resulting in reduction of body fat accumulation. Physical activity results in energy expenditure

when there is muscle movement in any part of the body (Mitchell, 2011). This is a great strategy to combat inactivity in children; high inactitivity among school children has been attributed to increase in obesity and overweight.

Different methods that can be employed to determine energy expenditure in children, such as pedometers and accelerometers. These methods are easy to use and gives accurate and reliable baseline energy expenditure results in children. Limitation are that they are costly and difficult to use for field work which involves large population size (Alangea, 2014). In view of this, an easier to use method like a self-report method is mostly employed during field works. In self-report, respondents are made to report on their physical activities over specified time periods using either questionnaires or recalls (Warren et al., 2010). Limitation of this method is the difficulty in estimating the intensity of the physical activity the respondent describes, also the frequency and length of duration of the physical activity is in the same way difficult to estimate. When respondent are children this method is not recommended, due to the it require respondent to use much brain power recall all physical activities they got involved and they may not be able to give accurate responses (Alangea, 2014).

Estimation of physical activity is tedious, as such Ministry of Health, following WHO recommendation, indorsed the various schools in Ghana to involve school children in moderate to vigorous physical activities for at least an hour (Aryeetey et al., 2017). The link between reduction in obesity/overweight and children involvement in physical activities for at least 60 min. has been reported by studies. Over the years, physical education was included in basic school curriculum in the various schools to help nurture the proper environment for childhood involvement in physical activities in the various schools. But this has failed to make effective impact on lowering overweight and

obesity in basic schools because physical education has been centered on training student for active sport competitions and this restrict the total number of students that can benefit from this exercise (Aryeetey et al., 2017).

In Ghana, it easy to find children partaking in moderate to vigorous physical activity, again these children are mostly from poor homes. Children whose parents' have strong social-economic strength are mostly noted for living sedentary life style. And number of children in this category are gradually growing over the years. The obesogenic environment these children find themselves including frequent access to personal vehicles of their parent or transportation vehicles in various schools especially those in private schools has narrow the number of children who walk to and from school during school days. This has contributed to increased childhood inactivity in the country (Ganle et al., 2019).

Furthermore, children from poor homes are more involved in household chores and other strenuous activities after school sporting activities as compared to children from rich homes. In addition, screen time which involves time spent watching television, playing games (play station, computer games, and play station), using computers, laptops, smart phones, and iPads has increased tremendously over the years. These have been predictors and causes of obesity/overweight in children (Chirwa et al., 2019).

Chirwa, Musuku and Pandey, (2019), reported an increase rate of obesity in schools which did not have any health education programs, and most of the children in their survey did not engage in any activity after school sporting activities and this increased the chance of the childen in been obese/overweight. Ganle, Boakye and Baatiema, (2019), also found that children who get involved in sports activities 3 days per week have their chance of reducing obesity by 42 %, as sporting activities leads to enough

energy expenditure and this lean towards reduced fat accumulation in the body. Similar report was stated by Aryeetey et al. (2017) also found a positive correlation between low physical activities among school children in Ghana and the increase prevalence of obesity and overweight The researcher reported that participating in sporting activities at least 3 times a week by school children, was able to decrease the chance of obesity or overweight by 44 % as compared to not participating in sport activities for a week. Similar result was also reported by Talat and Shahat (2016) where the researchers observed a lower incidence of obesity with increase physical activities among school children in Egypt.

2.10 Prevention and control of childhood overweight and obesity

Effective strategy for fighting against childhood obesity is identifying the causes and risk factors associated with childhood obesity and trying to implement interventions that can control or minimize their effect. This will be difficult as treating obesity is much more difficult (Ogden et al., 2014).

Family intervention programs should be centered toward behavioral changes in parent focusing on healthy eating behavior in the parent and children where they encourage the consumption of more fruit and vegetables and limit high caloric and sugary foods, encouraging active lifestyle by help and encouraging their kids' participation in physical activities at least 60 minutes each day and also monitoring the eating pattern of their wards in school and other environment. Parent should provide meal at home where they act as mentor and educator of good health in their kids (Romanelli et al., 2020). For parent to see change in their wards behavior they need to be more available, be more of a model and praise their ward and this will help the parents see a positive change or acceptance by their kids (Yee et al., 2017). Children are easily enticed by

what they watch on TV and see online, moreover most high caloric foods and sugar flavored drinks companies make kids their target market. Exposure of children to unhealthy diets should be restricted both in the traditional media and social media (Van et al., 2016).

Another intervention which can be used to combat childhood obesity is school environment intervention. School environment train, impact knowledge and model the life of the children. Using education on eating intervention, children can be thought how, what and when to eat, this can be aimed at eating more foods, eating less of processed food and not overeating, can help model how children respond to food. Ickovics et al., (2019) observed a decrease in obesity and overweight when similar intervention was used in a school environment. Physical education policies, which was introduced by Ghana Health Service through the recommendation by WHO in basic schools (Aryeetey et al., 2017), should be reviewed to include different varieties of indoor games so that every student will be able engage in one form of activity or the next. This will help meet the 60 minutes physical activity involvement which can increase energy expenditure in school children.

2.11 Consequences of Childhood Overweight and Obesity

Obesity in children has a significant impact on their physical health, social and emotional well-being, and self-esteem. It is also linked to poor academic achievement and a decrease in the child's quality of life (Bhadoria et al., 2015). The following sections delve more into these potential implications (Bhadoria et al., 2015).

2.11.1 Medical consequences

Obesity in children has been linked to a variety of medical issues. Fatty liver disease, sleep apnea, Type 2 diabetes, asthma, hepatic steatosis (fatty liver disease),

cardiovascular disease, high cholesterol, cholelithiasis (gallstones), glucose intolerance and insulin resistance, skin conditions, menstrual irregularities, impaired balance, and orthopaedic problems are examples of these conditions (Niehoff, 2009).

Although the majority of the physical health problems associated with childhood obesity are treatable and can be resolved if a child or adolescent achieves a healthy weight, some of them persist into adulthood (American Academy of Paediatrics, 2014). In the worst cases, some of these health conditions can even result in death. Below, three of the more common health problems associated with childhood obesity are discussed, diabetes, sleep apnea, and cardiovascular disease (Bhadoria et al., 2015).Raised BMI is a major risk factor for non-communicable diseases such as: cardiovascular diseases (mainly heart disease and stroke), which were the leading cause of death in 2012; diabetes; musculoskeletal disorders (especially osteoarthritis – a highly disabling degenerative disease of the joints); some cancers (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon) (Azadnajafabad et al., 2021).

Childhood obesity is associated with a higher chance of obesity, premature death and disability in adulthood (Nethan, Sinha, & Mehrotra, 2017). In addition to increased future risks, obese children experience breathing difficulties, increased risk of fractures, hypertension, early markers of cardiovascular disease, insulin resistance and psychological effects (Amoh & Appiah-Brempong, 2017; Ewald & Haldeman, 2016).

2.11.2 Socio-emotional consequences

Obesity in children and adolescents impacts their social and emotional health, in addition to being linked to a variety of physical issues. Obesity is "one of the most

stigmatizing and least socially acceptable conditions in children," according to experts (Schwimmer et al., 2003).

Children who are overweight or obese are frequently mocked and/or bullied because of their weight. They also confront a slew of other challenges, such as unfavorable preconceptions, discrimination, and social exclusion. Obese children are frequently rejected from activities, especially those that involve physical effort. Obese youngsters find it difficult to participate in physical activities since they are slower than their peers and suffer from shortness of breath (Niehoff, 2009). These negative social issues can lead to low self-esteem, low confidence, and a bad body image in youngsters, as well as affecting academic achievement.

Obesity's social implications may play a role in the difficulty of maintaining a healthy weight. Overweight children prefer to go to secure locations, such as their homes, to protect themselves from unfavorable comments and attitudes. Furthermore, overweight children tend to have fewer friends than children with normal weight, resulting in less social engagement and play, as well as more time spent alone in sedentary activities (Niehoff, 2009).

2.11.3 Academic consequences

Obesity in children has also been shown to have a negative impact on academic achievement. A study found that overweight and obese youngsters were four times more likely than their normal-weight counterparts to report having troubles at school (Schwimmer et al., 2003). They are also more likely to miss school, especially those with chronic illnesses like diabetes and asthma, which can have an impact on academic achievement (Bhadoria et al., 2015).

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter presents the research approach, research design, study area, population, sample, sampling technique, research instrument, validity and reliability of research instrument, data collection procedure, mode of analyses and ethical consideration.

3.1 Research Approach

The study adopted a quantitative research approach. The main purpose of quantitative research, according to Borg and Gall (1989), is the detection of causal relationships between variables. In quantitative research information of observed behaviours of samples is obtained through statistical data collecting of the observed behaviours of the samples. This type of research is more concerned with the objectivity and the validity of what has been observed. The sample size involved is usually large (Babbie, 1989; Bogdan & Biklen, 1989). This approach can be used to help generalize results.

3.2 Research Design

Research design is the framework of research methods and techniques chosen by a researcher. The design allows researchers to hone in on research methods that are suitable for the subject matter and set up their studies for success (Instrate & Chen, 2021). Cross-sectional survey was used in the study. This design collects data at only one point in time as it intends to describe situations. It helps to gather current conditions at a point in time (Kuranchie, 2016). This design has the advantage of measuring current beliefs, opinions, attitudes or practices (Creswell, 2012).

3.3 Study location

The study location was Effutu Municipality (Fig.3.1). Effutu is found 56 km (35miles) west of Accra, the capital city of Ghana and 140 km (90miles) of Cape Coast. Winneba

has a total population of about 60,331(World Gazetteer online). The area lies within latitude 5° 20′ N and longitude 0° 37′along the Gulf of Guinea zone of Ghana. The area is associated with coastal scrub and grassland with few isolated patches of trees (Dadson, 2012). It is a historic fishing port situated in the southern part of the country. A greater percentage of the inhabitants in the community are economically active. In terms of occupation, majority of the inhabitants are employed in the service followed by fishing. This makes fishing the major primary activity of the community. Many of the inhabitants in the Winneba Municipality depend on fishing as their source of livelihoods. The Municipality is made up of 14 suburbs namely; Winneba, New Winneba, Ntakorfam, Atekyedo, Sankor, Gyangyanadze, Gyahadze, Warabeba, Osubonpanyin, Ateitu, Akosua Village, Kojo Beedu, Nsuekyir, and Ansafor.

The Municipality has 98 basic schools (42 Public & 56 Private). The Municipality can also boast of one Nursing Training College. The Effutu Municipality has two (2) government and three (3) private hospitals. There are also two MCH/FP (RCH) clinics at Winneba and three (4) CHP Compounds at Gyangyanadze, Ensuekyir, Ansaful and Winneba Zongo. In addition, there is one Private clinic (Egyir Clinic) and two maternity homes (Bethel and Mercy Maternity Homes) located at Winneba. Auxiliary health service comes from the Community Health Nursing School also located at Winneba. As part of the training students provide health services to the communities in the Municipality and Ghana as a whole. The top five prevalent diseases in the Municipality are: malaria, upper respiratory tract infections, hypertension/heart disease, typhoid and gynecological disorders.

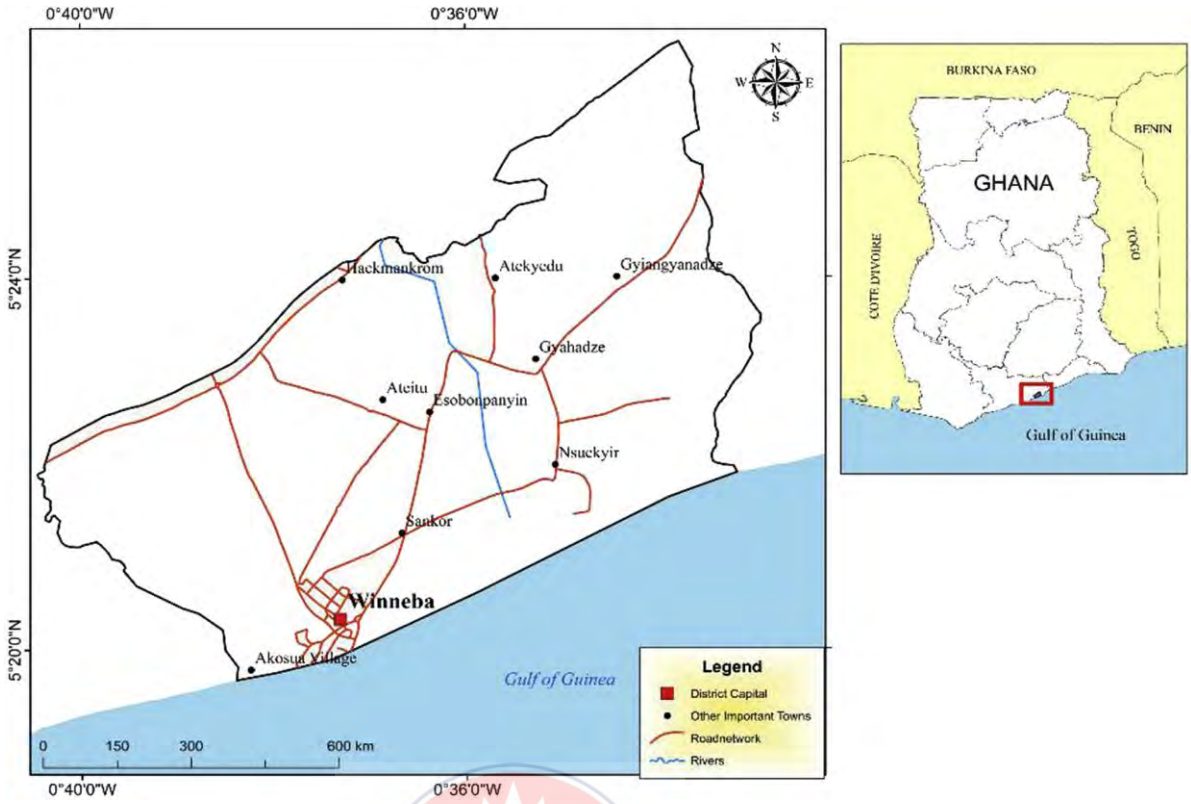


Fig. 3.1 Map of Effutu Municipality showing Winneba. Source: Cartography and GIS Laboratory of the University of Education, Winneba, 2017.

3.4 Research population

Population refers to the entire group of individuals or cases from which a sample may be drawn from for the study or about which the researcher would like to make generalizations or the group that is best suitable to collect data from for drawing conclusions (Kuranchie,2016). The population for this study comprised all pupils (between the ages of 9-12 years) in primary schools in the Effutu Municipality. For the teachers and parents, permission was sought from them to allow the children to participate in the study. All school-aged pupils between the age range 9 – 15 years was targeted. The regular basic school age range in Ghana is 6 – 12 years; however, the highest age limit was raised to 15 years as children in rural regions typically start school late or spend more time in school because they may have to repeat classes owing to academic shortcomings. For this study, pupils from primary four to six were selected

in the schools that were chosen. This is because it is thought that they are old enough and more likely to comprehend the study's requirements. For this study, the population of basic school children who fall within my domain is 13,502, (Effutu Municipal Education Directorate, 2020).

3.4.1 Inclusion criteria

The inclusive criteria for the study were all primary four to six pupils who were available, willing and had their parents/guardians' consent for their participation.

3.4.2 Exclusion criteria

The study excluded pupils who did not have parents' or guardians' consent for their participation and those having physical defects that could compromise the accuracy of the anthropometric measures, for example, cripples or hunchbacks.

3.5 Research sample size

Sample size is a research term used for defining the number of individuals included in a research study to represent a population (Kubuacha, 2021). The sample size for this study was calculated using the Cochran's formula. This will be based on prevalence rate of 19% of overweight and obesity in Ghana with 8.6 % rate of overweight and 10.7% obesity prevalence respectively as documented by Akowuah and Acquah (2020). The Cochran's formula for sample size determination is given by:

$n= (Z^2 pq)/d^2$ where

- n= Sample size
- Z=1.96 at 95% confidence level
- d= margin of error of 5%
- q= 1- prevalence rate
- Prevalence rate of 19%

Addition of 30% minimum sample size (n) to correct the non-response rate.

$n=1.96^2 \times 0.19 \times 0.81/0.05^2$

$n=3.8416 \times 0.1539/0.0025 = 236$

30% minimum sample size to account for non-response = 71.

236+71 = 307.

Therefore, the sample size that should have been used for the study was 307.

After setting a quota of 10% to each of the selected schools, a sample size of 334 was obtained which was greater than the sample size calculated but can still be used because in order to reduce sampling error, a large sample size can be selected from the population as possible. The larger the sample size, the more the participant will be representative of the entire population and reflect attitudes, beliefs and practices (Creswell, 2012).

3.6 Sampling technique

Multistage sampling technique was used in this study. Cluster sampling technique was used to select the schools and purposive sampling was used to select the classes. Simple random sampling technique was used to select the pupils to be used in those selected school, quota sampling technique was used to get the number of people to be selected from each school in order to get a fair representation of each school, purposive sampling was used to select primary 4 to 6 pupils and the lottery method of simple random sampling technique was used to get the pupils to participate in the study.

3.7 Sampling procedure

Multistage sampling technique was used to select qualified pupils for this study. A list of the basic schools in Effutu Municipality was obtained from the office of the Municipal Directorate of Education. Cluster sampling technique was used to select 5 private and 5 public schools from a total of 98 (42 public schools and 56 private schools) registered and accredited basic schools in the Municipality. The schools were randomly

selected based on the suburbs in the Municipality in order to ensure that the schools which were selected were fairly distributed among the suburbs in the Municipality. Using quota sampling technique, a quota of ten percent was set for each school. In each of the selected school, pupils in primary 4, 5 and 6 were used. Almost all public schools had three streams for each grade, A, B, and C, while private schools had two streams, A and B. (Amoh-Yeboah, 2017).

The streams were combined to enable the determination of a representative sample in each school. Balloting was used to choose participants from each school. Pupils from all of the class's streams were grouped together in one classroom to make selection easier. This was done for both classes 4 and 5, as well as class 6. Each student chose from a bowl of pre-labelled (yes and no) voting papers with the projected number of participants in each grade.

Pupils who had assent and parental consent and selected "yes" were given the opportunity to be part of the study and those who did not have the consent forms signed by their parents and those who the consent of their parent but selected “no” were exempted from the study. In each of the five (5) public and private schools, quota sampling technique was used to select 10% of the population in order to ensure a fair representation of their population.

3.8 Data Collection Procedure

To collect data from respondents, permission was sought from the respondents with an introductory letter from the Faculty of Home Economics Education. After this, a date was arranged for data collection based on respondents’ convenience. On the agreed date, respondents were trained and the questionnaires were administered and collected from respondents personally. Data collection was done with assistance from two MPhil

students in the Food and Nutrition Education Department who were trained accordingly.

3.8.1 **Data Collection Instrument**

The data collection instrument was a structured questionnaire. It was used to gather information on socio demographic characteristics, dietary habit and physical activities of the pupils. According to Knowles (1970), a questionnaire is easy to administer, quick to complete and faster to score and therefore takes comparatively less time from both the researcher and the respondents. The items in the questionnaire was structured in such a way that, they will enable the respondents to choose alternative answers against their choice of response and also to provide answers where necessary. Data collection commenced on 1st November and ended on 17th November, 2021.

Assessment of Socio-demographic characteristics

Extracted questionnaire was developed to get respondents characteristics on type of school, child's gender, date of birth, age, number of siblings, type of housing environment, area of residence, family history of obesity, mother's educational background, father's educational background, mother's occupation, father's occupation and school feeding money. Response to these items were reported by respondents on the structured questionnaire.

Assessment of Dietary Habit

Questions were asked to find out whether pupils' dietary habit are healthy or not. Data collected on dietary habit sought to ask questions on the number of times eaten, how often pupils eats breakfast before coming to school, how often pupils take snacks during first break, lunch time and bed time, how often pupils bring food from home, buy food

in school, buy food outside the school and get food from school feeding programme, cooking method that is normally used, last meal time and bed time.

Assessment of Dietary Diversity

The researcher used a reference period of the previous 24 hours to provide an indication on individual's dietary diversity. Pupils provided all food items consumed on the previous day from morning to evening in and outside the home. Respondents provided all foods and drinks consumed in the previous day from morning to evening both in and outside and these were these were recorded in spaces provided in the questionnaire. The foods were grouped according to the 16 food groups (cereals, vitamin A rich vegetables and tubers, white tubers and roots, dark green leafy vegetables, other vegetables, vitamin A rich fruits, other fruits, organ meat (iron rich), flesh meats, eggs, fish, legumes, nuts and seeds , milk and milk products , fats and oils, sweets, spices, condiments, beverages) by FAO which was further classified into 9 (starchy staples, dark green leafy vegetables, other vitamin A rich fruits and vegetables, other fruits and vegetables, organ meat, meat and fish, eggs, legumes, nuts and seeds, milk and milk products (FAO, 2011). The DDS was categorized into low, medium and high when individuals eat from ≤ 3, 4 and 5, and ≥ 6 food groups respectively (FAO, 2006).

The study however, made use of only primary data source. This was obtained through self-administered questionnaire. In this method, the respondents completed all questions on the questionnaire with the help of the researcher. The method enabled the researcher to translate questions into the local dialect (Fante) for some respondents and provide clarification on some questionnaire items to them where it was needed.

Assessment of physical Activity

The physical activity section which sought to find out whether the child had an active lifestyle or not was assessed by asking questions on the means in which pupils used to school, whether the school offer time for physical activity, frequency and duration of physical activity class on field, whether they engage in any physical activity apart from the physical activity time in school and the kind of physical activity they engage in.

The researcher also asked the respondents the duration of the television programme they watch and the number of times they watch the programme in a week. The duration was multiplied by the number of times they watch in a week and the correct time spent was ticked.

Data on what respondents do at home during their free time was also collected.

3.8.2 Assessment of Anthropometric data

This section sought to collect information on the weight and height of the child in order to determine the child's BMI (normal/overweight/obese) The WHO protocol for measuring the anthropometrics of children was followed by the enumerators. The height was measured by a portable stadiometre (Secca 213, Haryana, India) with subjects standing barefooted.

A digital weighing scale (Omron 508, Milton Keynes, MK, UK) was used to measure the weight of the children.

During weighting, the scale was placed on a flat and hard-floor surface, and each participant will stand still on the scale with the body weight evenly distributed between both feet.

Pupils' weight and height were measured and recorded in kilogram and centimetres respectively and heights were converted to metres. The weight in kilogram was divided by height in metres square. The answer which is the BMI was cross checked on the BMI percentile chart for boys and girls. Both the BMI number and its corresponding percentile was used to find out which category child falls in. The BMI percentile ranges (5^{th} percentile, 5^{th} -84^{th} percentile, 85^{th}-95^{th} percentile) and weight status category (underweight, healthy weight, overweight and obese respectively) according Centre for Disease Control was used.

3.9 Validity of research instruments

The instruments were subjected to face validity and content validity. The instruments were given to my supervisor and people who understand the topic to go through the questionnaire. They also checked if the questionnaire has captured the topic under investigation effectively.

3.10 Reliability of research instruments

Reliability means that the scores from an instrument are stable and consistent. Scores should be nearly the same when the researcher administers the instrument multiple times at different times (Creswell, 2012). It is the extent to which that same questionnaire would produce the same results if the study was to be conducted again under the same conditions.

A pilot test was conducted before the actual data collection. Pilot testing can describe this as a test run or rehearsal to help you discover any hitches or gaps in your plan before you begin its execution. To determine this form of reliability, the researcher administered the test items to participants who were not part of the population for the study but have the same characteristics of the main group that was used.

The reliability of the questionnaire was estimated on scale with the help of Statistical Product and Service Solution (SPSS) version 28.0 programme, on the computer. Cronbach alpha values or reliability co-efficient values were obtained for the following sections of the questionnaire. Items on dietary habit of basic school pupils had a Cronbach alpha value of 0.842. Items on physical activity level of basic school pupils had a Cronbach alpha value of 0.734. Thirty fours (34) pupils were use analyzed which yielded a co-efficient of 0.885 when it was subjected to Cronbach Alpha. This was the total reliability coefficient value of the questionnaire. This was supported by (Perneger et al., 2014) who concluded in their study that a default sample size of 30 participants is recommended for pre-testing also cited a flat rule that at least 30 subjects or greater can be used (Brown, 1995).

3.11 Data analysis

Descriptive statistics: univariate analysis on data collected was summarized and described as frequencies and percentages distribution tables and charts. Categorical variables were described and expressed as frequencies and continuous variables were expressed as means (standard deviation). Questionnaire was scored using the Statistical Program for the Social Sciences (SPSS) version 23. SPSS was used for analysis of the data. Data were analyzed using both inferential and descriptive statistics. The inferential statistics were used to make generalization concerning the associations or factors associated with childhood obesity. Logistic regression was used to find the relationship between variables. The descriptive statistics on the other hand was used for describing the background characteristics of the selected pupils. Descriptive analysis was first run to calculate the frequency of occurrence of the variables in percentages. Percentages were calculated for all categorical variables such as the level of demographic characteristics and socioeconomic and dietary habits. Frequency distribution was

summarized in tables and charts for nominal and categorical data. Central tendency measures (mean) for continuous variables were determined. Standard deviation was used to measure the spread of selected key continuous variables (e.g., BMI). Univariate analysis was conducted to determine the prevalence of childhood obesity across socio-demographic characteristics of children. A Chi-square test, Fisher's exact test, and bivariate correlation were run to test for the relationship between childhood obesity, demographic and socioeconomic variables, and dietary risk factors. Furthermore, binary and multivariate logistic regression analyses were conducted and odd ratios were generated to reveal the predictors of childhood obesity. Statistical significance was held at a 95 % confidence interval and p-value less than 0.05 ($p<0.05$).

3.13 Ethical consideration

The following ethical considerations were complied with; informed consent, anonymity and confidentiality. Before any contact with the pupils, an introductory letter was obtained from the Department of Food and Nutrition) of the University of Education, Winneba (UEW) and sent to the Ghana Education Service, Ghana Health Service (Effutu Municipality) and the Heads of the selected schools. Approval letters were given by the Ghana Education Service and Ghana Health Service in the Municipality. Ethical clearance was obtained from the Ethical Review Board of the School of Graduate Studies, University of Education, Winneba. The school children were given consent forms detailing the study's objectives, methods, confidentiality, advantages, and voluntary nature to take home and request parental approval.

Parents and guardians were also requested to sign a supplementary consent form indicating their readiness to allow their children to participate in the study. Before participating, each child was required to sign, thumb print or mark an assent form after parental approval. The study only included children who have parental or guardian

agreement in addition to their assent. This was done because some children may reject participation of the study even if their parents or guardians agree. Although there were no direct benefits to the child from participating in this study, it provided more information to help us understand some of the factors that contribute to unhealthy weight in school-aged children and how best to treat them. There were no hazards to the child as a result of their participation in this research.

When taking part in this study, participants did not miss any classes, class tests, or examinations. Children were able to withdraw from the study at any time when they feel uncomfortable. Participants' personal information was kept private and confidential. Participants were recognized by codes on the questionnaires, which will be saved electronically on a password-protected computer as well as in printed copies with only the researcher's and supervisor's access. The findings of this study were disseminated in such a way that no information about the participants' identities was revealed.

CHAPTER FOUR

RESULTS

4.0 Overview

This chapter focuses on the research findings following the analysis of the data gathered in accordance with the study's objectives. This research aimed to investigate the prevalence of childhood obesity in and identify the causal factors among primary school pupils in the Effutu Municipality. The findings of this study are presented in five sections to include:

- Demographic and socio-economic characteristics of pupils
- Dietary habits and Dietary diversity of pupils
- Physical activity of pupils
- BMI status of pupils
- Factors associated with overweight and obesity.

4.1 Demographic characteristics of pupils

A total of 333 pupils between the ages of 9-15 years (180 from private and 153 from public schools) were engaged in the study (Table 4.1). More than half (61.9 %) of the pupil engaged were females. The mean age of pupils was 11.70 (±1.45) years, with pupils in the public schools significantly older than those in the private schools (73.0 vs 27.0 %, $p < 0.001$). The highest number of pupils recruited were below age 12 years (73.3 %).

Table 4.1: Demographic characteristics of pupils by school type

Variables	Public (N=153) (%)	Private (N=180) (%)	Total (N=333) (%)	p-value
Age (years)				
<12	88 (36.1)	156 (63.9)	244 (73.3)	**<0.001**
≥ 12	65 (73.0)	24 (27.0)	89 (26.7)	
Mean age (years)	12.25±1.59	11.23±1.15	11.70 (±1.45)	**<0.001**
Sex				
Female	98 (47.6)	108 (52.4)	206 (61.9)	0.259
Male	55 (43.3)	72 (56.7)	127 (38.1)	
Mother's education				
None	35 (83.3)	7 (16.7)	42 (12.6)	**<0.001**
Basic	82 (63.6)	47 (36.4)	129 (38.7)	
Secondary	20 (27.4)	53 (72.6)	73 (21.9)	
Tertiary	16 (18.0)	73 (82.0)	89 (26.7)	
Father's education				
None	22 (81.5)	5 (18.5)	27 (8.1)	**<0.001**
Basic	69 (75.0)	23 (25.0)	92 (27.6)	
Secondary	34 (44.2)	43 (55.8)	77 (23.1)	
Tertiary	28 (20.4)	109 (79.6)	137 (41.1)	
Family history of obesity				
Yes	123 (51.5)	116 (48.5)	239 (71.8)	**0.001**
No	30 (31.9)	64 (68.1)	94 (28.2)	
Number of Siblings				
0-5	128 (42.7)	172 (57.3)	300 (90.1)	**0.001**
6-10	22 (75.9)	7 (24.1)	29 (8.7)	
11-13	3 (75.0)	1 (25.0)	4 (1.2)	

p-values are from the Chi-square test

Significantly higher proportions of mothers had attained a basic level of education (38.7 %) whereas 12.6 % had not obtained any form of education. In contrast to the fathers' education, a greater proportion of the fathers had obtained a tertiary level of education (41%) whereas 8.1 % obtained no level of education. Higher proportions of mothers and fathers of pupils in private schools had obtained tertiary and secondary education (82.0 and 79.6 % vs 72.6 % and 55.8 %, p-value < 0.001) compared to mothers and

fathers of pupils in public school who had obtained primary school or had no education (63.6 and 75.0 % vs 83.3 and 81.5 %, p-value < 0.001).

Additionally, with regards to siblings of the pupil, a higher proportion had 5 siblings (90.1 %, p-value = 0.001), 8.7 % of the people have 6 -10 siblings, and 1.2 % 11-13 siblings. Significant higher proportion of pupil in private schools had 0-5 siblings compared to those in public schools (57.3 % vs 42.7 %, p-value < 0.001). In contrast to the pupil having 5 siblings, a higher proportion of the pupil in public schools had 6-10 siblings compared to those in private schools (75.9 vs 24.1 %, p-value = 0.001). A significantly higher number of pupils have families who are obese (71.8 vs 28.2, p-value 0.001) with a greater proportion from families of pupils in public schools as compared to those in private schools (51.5% vs 48.5%).

4.2 Socio-economic characteristics of pupils

Around 43 % of the pupil live in urban settlements compared to 28.5 and 28.2 % who lived in rural and peri-urban settlements. A significantly higher number of the private school pupils lived in urban and peri-urban areas (71.5 % vs 58.5 %, p-value < 0.001), a contrast to the pupils in public schools 76.8 % lived in rural areas. Among the participants, 53.8 % lived in compound/courtyard housing whereas 46.2 % lived in Flat/self-contained housing. Among this number, a significantly higher proportion of pupils in private schools lived in flat/self-contained housing (65.6 %, p-value < 0.001) whereas a higher proportion of students in public schools lived in compound/courtyard housing (55.9 %, p-value < 0.001).

Table 4.2 Socio-economic characteristics of pupils by school type

Variables	Public (N=153) (%)	Private (N=180) (%)	Total (N=333)	p-value
Area of Residence				
Rural	73 (76.8)	22 (23.2)	95 (28.5)	**<0.001**
Peri-Urban	39 (41.5)	55 (58.5)	94 (28.2)	
Urban	41 (28.5)	103 (71.5)	144 (43.2)	
Type of Housing				
Compound/Courtyard	100 (55.9)	79 (44.1)	179 (53.8)	**<0.001**
Flat/Self-contained	53 (34.4)	101 (65.6)	154 (46.2)	
Mother's occupation				
Unemployed	6 (46.2)	7 (53.8)	13 (3.9)	**<0.001**
Self-employed	133 (54.3 %)	112 (45.7)	245 (73.6)	
Government worker	14 (18.7)	61 (81.3)	75 (22.5)	
Father's occupation				
Unemployed	6 (60.0)	4 (40.0)	10 (3.0)	**<0.001**
Self-employed	114 (56.2)	89 (43.8)	203 (61.0)	
Government worker	33 (27.5)	89 (72.5)	120 (36.0)	
Money for School per day				0.083
0 - GH₵5	141 (48.1)	152 (51.9)	293 (88.3)	
GH₵6 - GH₵10	12 (32.4)	25 (676)	37 (11.1)	
≥ GH₵12 - GH₵ 23	0 (0.0)	2 (100.0)	2 (0.6)	

p values are from the Chi-square test.

About 73.6 % of the mothers of the pupil were self-employed, 22.5 % worked in the government sector while 3.9 % were unemployed. There was a significantly higher proportion of mothers of pupils in public schools who were self-employed compared to those in private schools (54.3 % vs 45.7 %, $p < 0.001$). Again, a higher proportion of mothers of pupils in private schools was employed in the government (81.3 %) and also unemployed (53.8 %) compared to those in the public school (18.7 and 46.2 % respectively, $p < 0.001$). About 61.0 % of the fathers of the pupil were self-employed, 36 % were engaged in the government sector while 3.0 % were unemployed. More fathers of pupils in public schools were self-employed (56.2 %) and unemployed (60.0 %) compared to those in private school (43.8 %, and 40.0 % respectively), in contrast,

fathers of pupils in private school were engaged in high in the government sector (72.5 %) compared to those in the public schools (27.5 %).

Averagely, the amount of money given to pupils per day was GH₵3.62 ± 2.48. Though not significant, more pupils in private schools were given between GH₵ 0-5.00, GH₵ 6.00 - GH₵ 10.00, and ≥ GH₵ 12.00 - GH₵ 23.00 more than the counterpart in public schools (51.9, 67.6, and 100 % vs 48.1, 32.4 and 0.0 %, p-value = 0.083).

4.3 Dietary habits of basic school pupils

4.3.1 Frequency of food consumption per day

The majority of the study participants (52.0 %) ate three times daily compared to 36.0 %, 11.1 % and 0.9 % who ate more than thrice daily, twice daily and once daily. Compared to students in public schools, more of the pupils in private schools ate more frequently (twice, thrice and more than thrice) each day (Fig. 4.1). This was not statistically significant, though (p-value = 0.851, 56.8, 54.9, and 52.5 % vs 43.2, 45.1 and 47.5 %)

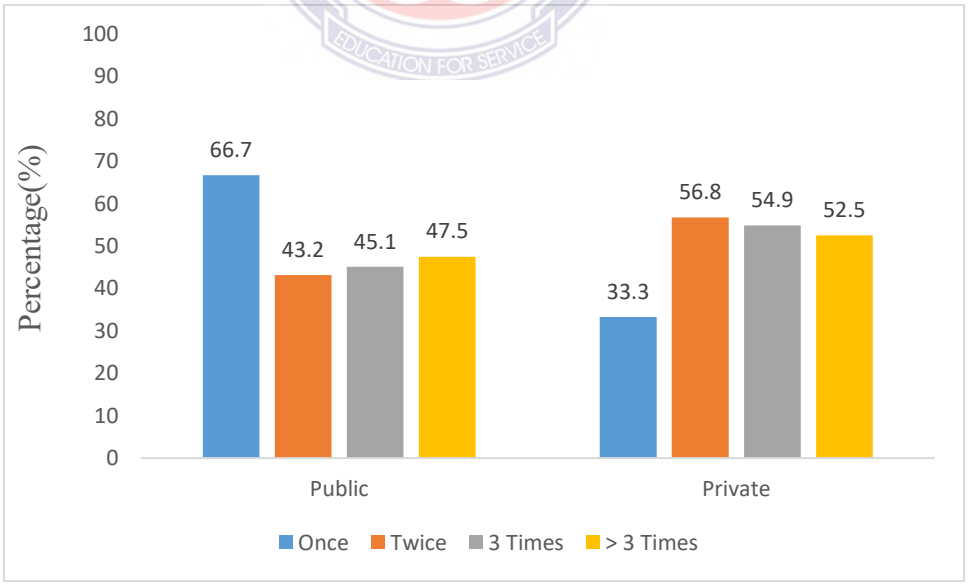


Figure 4.1: **Food consumption frequency of Pupils by School type**

4.3.2 Breakfast consumption

Most of the participants of this study consumed breakfast sometimes (47.4 %), with 21.8 % and 9.4 % of the pupil either consuming breakfast always or often, and 20.9 % never consumed breakfast. Concerning consumption of breakfast among school people, pupils in public schools significantly consumed breakfast sometimes compared to those in the private school (53.2 % vs 46.8 %, p-value = <0.001) (Fig. 4.2). Pupils in private schools consumed breakfast more often and always than those in public schools (61.3 and 75.0 % vs 38.7 and 25.0 %, p-value = <0.001).

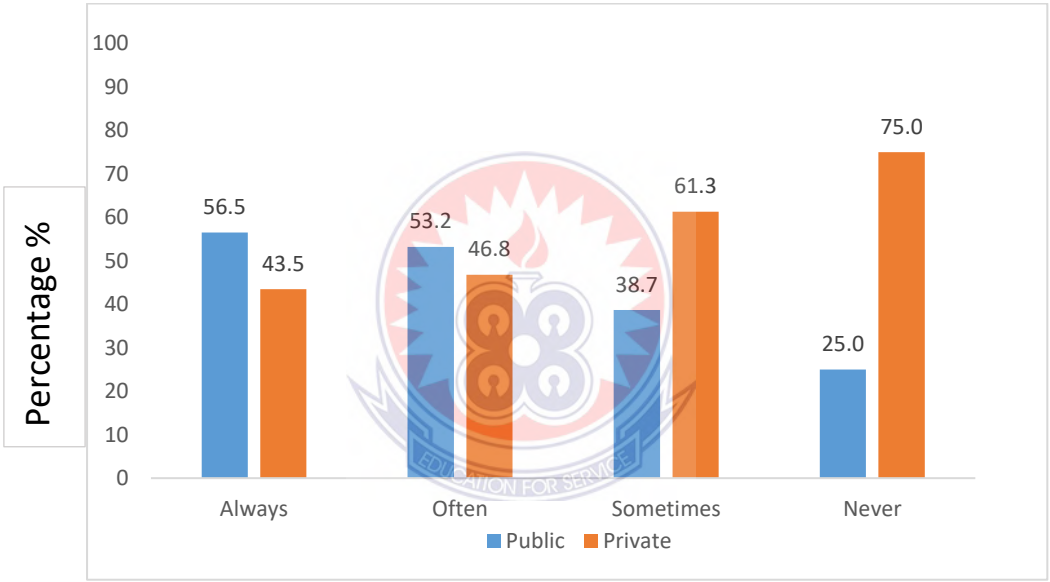


Figure 4.2: **Breakfast consumption frequency of Pupils by School type**

4.3.3 Snack consumption

4.3.3.1 Snack consumption at the first break

More pupils consume snacks at break more sometimes (42.0 %), 35.4% and 14.1 % consumed snacks always and often at break (Fig. 4.3). Less than 8 % of the people did not consume snacks at lunch. Again, consumption of snacks between private and public schools, a higher proportion of pupils in private schools consumed snack sometimes, and often than those in public schools (52.9, and 61.7 % vs 47.1 and 38.3 %). Pupils in

Public and Private schools equally consumed snacks always (50.0 v 50.0 %). The observation was not statistically significant (p-value = 0.62).

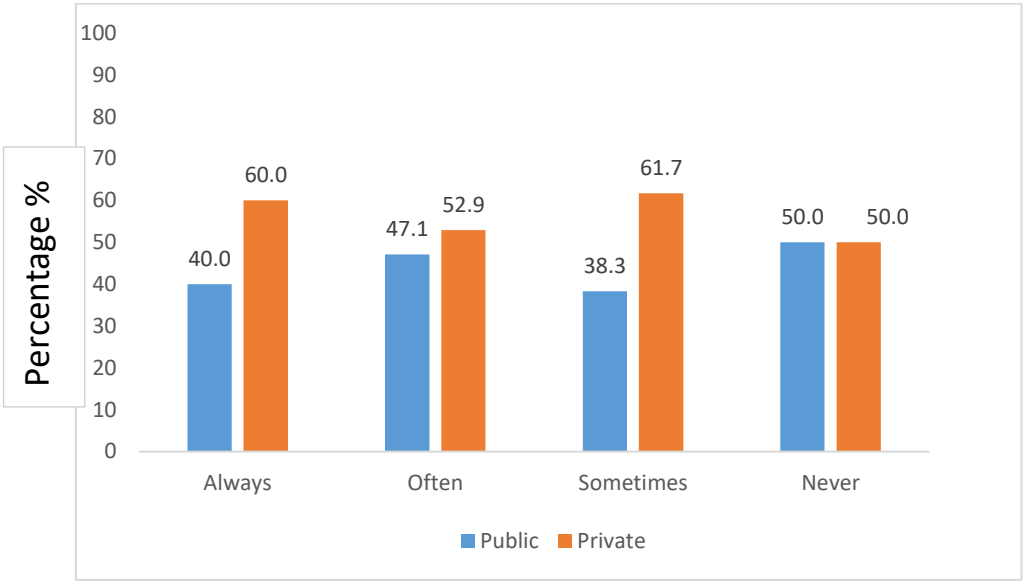


Figure 4.3: **Snack consumption frequency at first break by School type**

4.3.3.2 Snack consumption at Lunch Break

More pupils consume snacks at lunch more sometimes (50.2 %), 19.5 and 14.4 % consumed snacks always and often at lunch (Fig. 4.4). However, 15.0 % of the people did not consume snacks at lunch. Again, consumption of snacks between private and public schools, a higher proportion of pupils in private schools consumed snacks always, and often at lunch compared to those in public schools (64.6, and 56.2 % vs 35.4, and 43.8 %). 51.5 % of people in public schools consumed snacks always than in private schools (48.5 %). However, this observation is not statistically significant (p – value = 0.71).

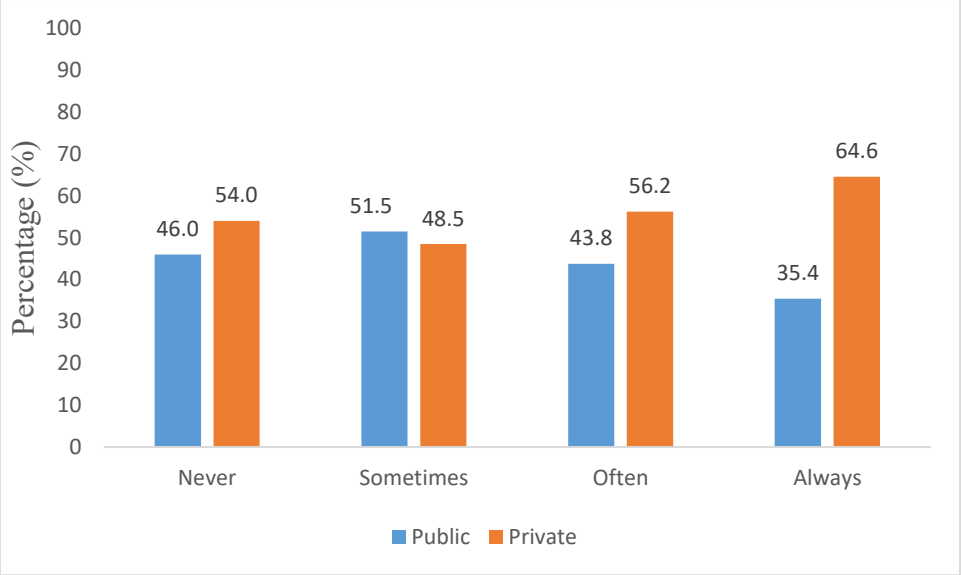


Figure 4.4: **Snack consumption frequency at lunch break by School**

4.3.3.3 Snack consumption before bedtime

More pupils consume snacks before bedtime more sometimes (43.2 %), 21.0 and 9.0 % consumed snacks always and often before bedtime (Fig. 4.4). However, 25.8 % of the people did not consume snacks at lunch. Again, consumption of snacks between private and public schools, a higher proportion of pupils in private schools consumed snack sometimes, often and always before bed than their counterparts in the public schools (54.9, 56.7 and 54.3 % vs 46.0, 43.8 and 45.7 %, p-value = 0.51). However, this observation is not statistically significant (p-value = 0.67).

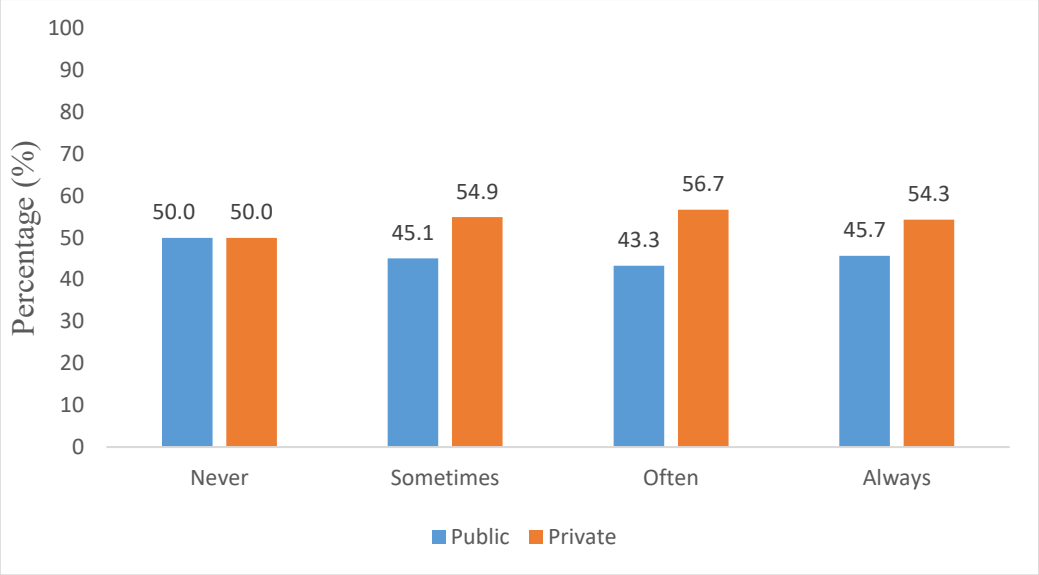


Figure 4.5: **Snack consumption frequency before bedtime by School**

4.3.4 Purchasing food

4.3.4.1 Bringing food from Home

A higher significant proportion of pupils in the private school carried home-cooked meals to school as compared to pupils from the public school (p-value = <0.001). The majority of the pupil sometimes carried home-cooked meals to school (48.5 %), with 18.2 % of the pupil doing this always, 11.1 % doing it often; however, 21.9 % didn't carry home-cooked meals to school. Out of these numbers, 55.0 % of pupils in public schools sometimes carried home-cooked foods to school. For private school pupil, 67.6 % and 75.0 % often and always carried home-cooked foods to school (p-value = <0.001).

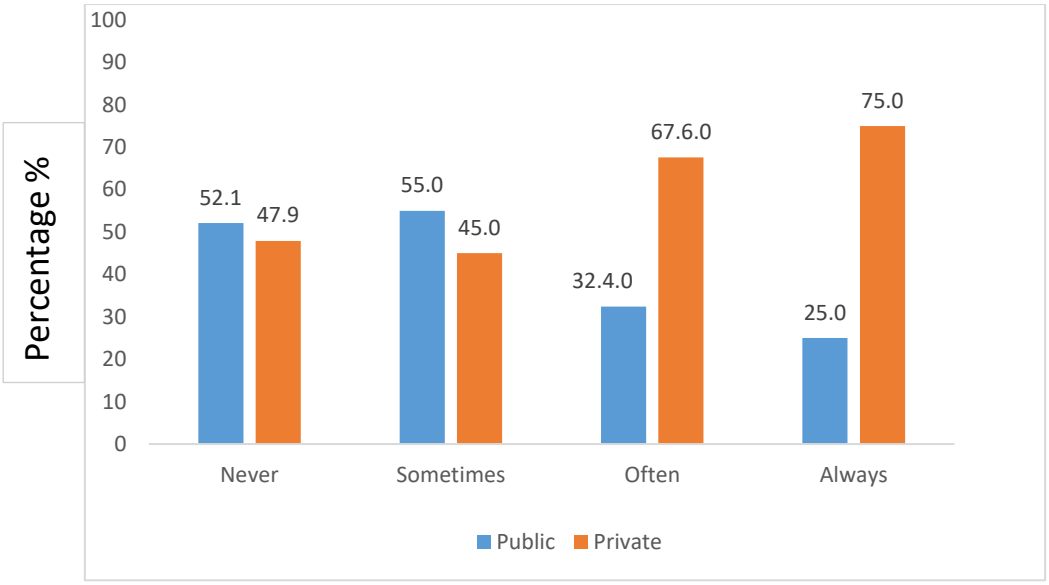


Figure 4.6: **Home-cooked meal carried to school-by-school type**

4.3.4.2 Buy food at School

A higher significant proportion of pupils in the private school purchased food at school as compared to the pupils from the public school (p-value = <0.001). Only 39.1% and 34.8 % of the participants sometimes and always purchased food from school premises, while 6.9 % often did purchase food on school premises. Private school pupils were much more engaged in sometimes and often purchased food sold on school premises (63.6 and 53.7 % vs 36.4 and 46.3 %, p-value = 0.002) (Fig. 4.7). More public school pupils always purchased meals sold on school premises than those in the private school (60.0 vs 40.0 %).

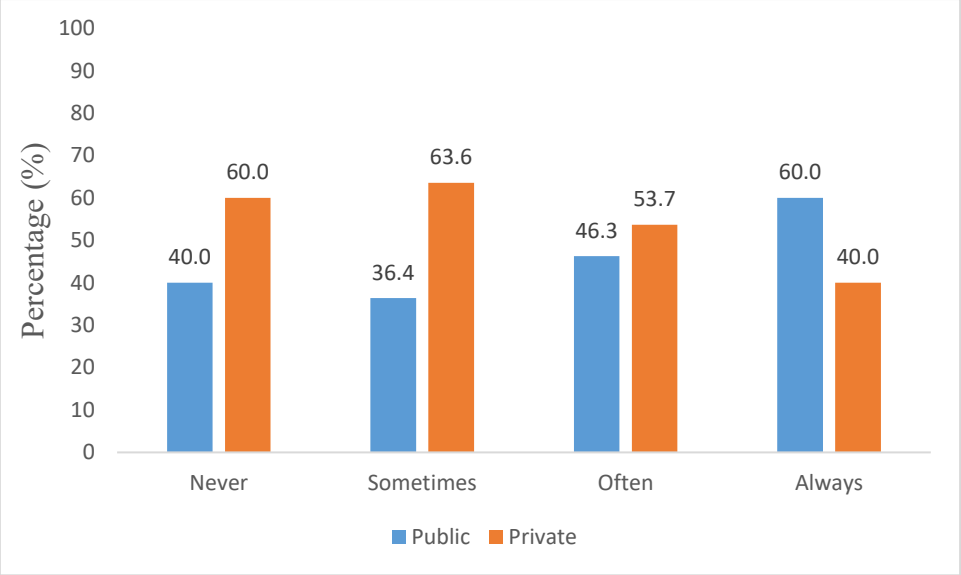


Figure 4.7: **Food purchased on school premises by school type**

4.3.4.3 Buy food outside School

Concerning the number of pupils who bought food outside school premises, higher proportions of pupils in public schools significantly made purchases concerning food mostly from outside). In terms of frequency of purchase, 44.8 % sometimes made food purchases outside the school, while 10.9% and 7 % always and often engaged in purchasing food outside the school premises. 36.9 % never engaged in food purchases outside the school. More private school pupil made food purchases outside school sometimes and often (54.7 and 69.6 % vs, 46.3 and 36.4 %, p-value = <0.001). More public school pupils always made food purchases outside the school (88.9 vs 11.1 %).

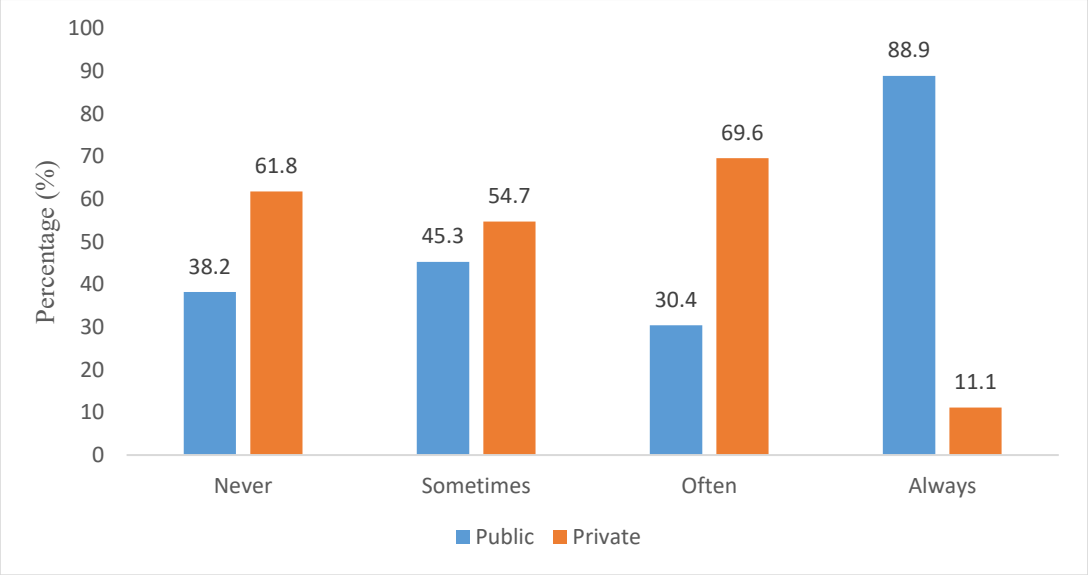


Figure 4.8: **Food purchased outside school premises by school type**

4.3.4.4 Food from the school feeding program

Concerning the number of pupils who ate from the school feeding program, more pupils consumed the meals provided through the school feeding program sometimes and always (44.8 and 10.9 %), while 36.9 % never enjoyed the meals provided through the school feeding program. 90.8 % of pupils in private school never consumed meals provided by the school feeding program, while as 97.4 %, 100 %, and 100 % sometimes, often, and always consume meals provided through the school feeding program (p-value=<0.001).

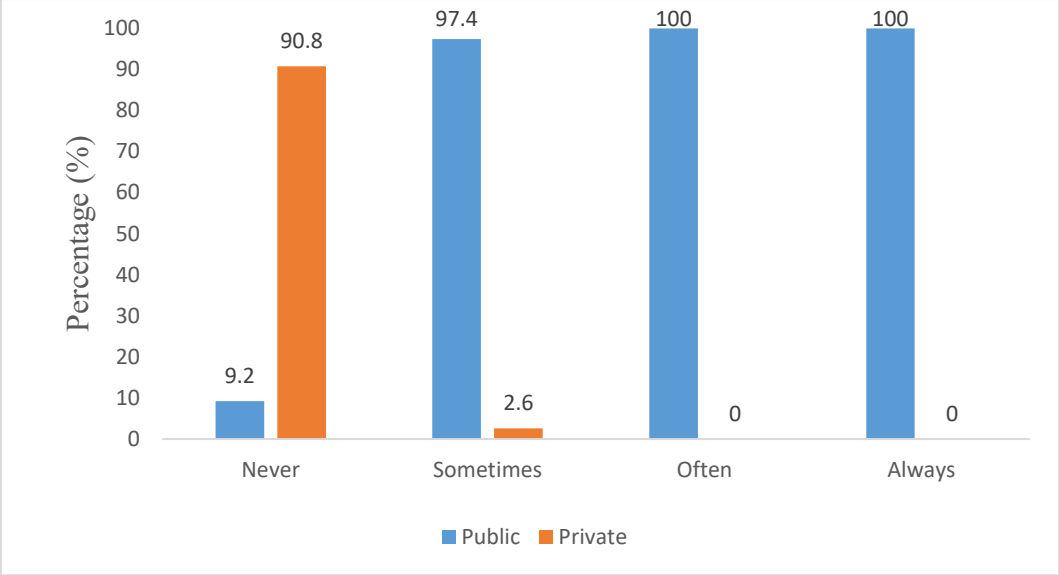


Figure 4.9: **School feeding program by school type**

4.3.5 Cooking method and Type of Snack Consumptions

Figure 4.9 depicts the type of snack and cooking method by school type. The most frequently consumed snack by all the study participants was flour base products and sweets (34 and 29.2 %) with fruit, and carbonated drinks being the next consumed food groups (18.0 and 17.1). 1.5 % stated Bissap drink, plantain chips, and nutritious drinks as other food they mostly consumed as a snack. A higher proportion of pupils in the private schools consumed more flour products, carbonated drinks, fruit, and other food products than those in public schools (55.8, 59.6, 65.0 and 100 % vs 44.7, 44.2, 40.4, 35.0 and 0.0 %, p-value = 0.002). Pupils in public schools only consumed sweets products more frequently than those in private schools (60.8 vs 39.2 %).

The most predominant cooking method employed by mothers of the study participants was boiling (58.3 %), followed by stewing (27.3 %) with frying and roast forming the least predominant methods of cooking (13.3 and 0.9 %) used by the mothers of the participants. Among school types, frying, stewing, and roasting were mostly employed by mothers of participants in the private school (54.5, 68.1, and 100.0 % vs 45, 42.1,

and 0.0 %, p-value = 0.002). Mothers of pupils in public school frequently boiled their foodstuffs s compared to their counterparts in private schools (53.9 vs 46.1 %).

Most study participants consumed their last meal of the day after 6 pm (47.7 %), where 30.6 % and 15.6 % of the pupils also had their last meal at 6 pm and 5 pm respectively. Only a small proportion of the people consumed their last meal at 4 pm. Pupils in private schools dominated in consuming their meals at all the various times considered under this study, for last meals (39.2, 55.8, 59.6, and 65.o vs 60.8, 44.2, 40.4, and 36.8). However, this observation was not statistically significant. Concerning bedtime, most of the people went to bed around 8 pm and 9 pm (42.6 and 27.5 %) whereas others also few of time went to bed after 9 pm (18.4 %) (Fig. 4.10). Only a handful of the pupils went to bed around 7 pm (11.4 %). Higher proportion of the pupil in private school went to bed at all the various times (63.2, 51.1, and 60.7 vs 36.8, 48.9 and 39.3, p-value = 0.307) considered under his study except 9 pm which was dominated by the participants from the public schools (49.5 vs 50.5 %). This observation was not statistically significant.

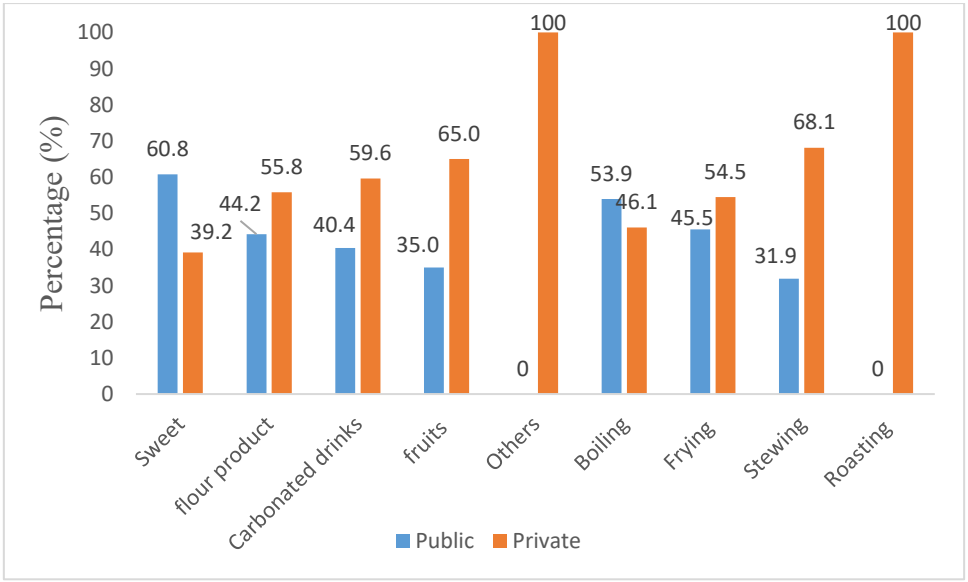


Figure 4.10: **Type of Snack and Cooking Method by school type**

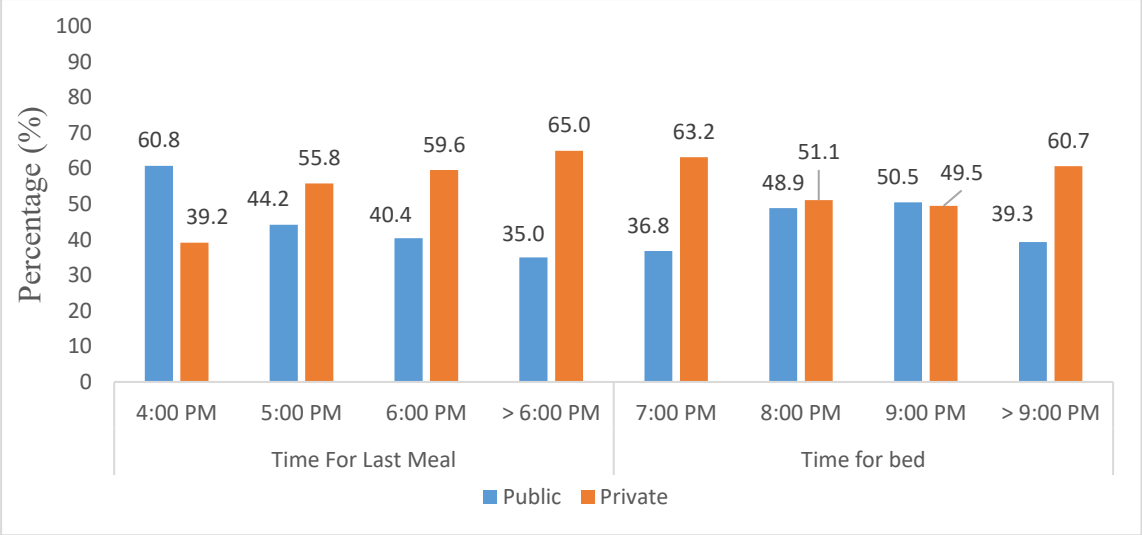


Figure 4.11: **Last meal time and Bedtime by school type**

4.4 24-Hour Dietary Recall

Generally the mean dietary diversity score for the population was 3.65 ± 1.036, 3.73 ± 0.070 for females and 3.51 ± 0.096, 3.57 ± 0.082 for pupil in Public schools and 3.71 ± 0.079. Out of this 47.7 % and 47.4 % of the pupil were categorized into the medium and low dietary diversity group while 4.8 % fall into the higher dietary group. A higher proportion of pupils in the private schools in all three categories was recorded compared to pupils in public schools (53.2, 53.5, and 68.8 % vs 46.8, 46.5, and 31.2 %, p-value = 0.481). More females consumed were found in all the categories of dietary diversity (high, medium and low) compared to males (62.5, 66.7 and 57.0 % vs 37.5, 33.3, and 43.0 %, p = 0.205). However, this was not statistically significant.

Table 4.3: Dietary diversity score (DDS) measurements of pupils by gender and school type

Dietary Diversity	Total (N) (%)	School Type		Gender	
		Public (N=153) (%)	Private (N=180) (%)	Female (N=180) (%)	Male (N=180) (%)
Low	158 (47.4)	74 (46.8)	84 (53.2)	90 (57.0)	68 (43.0)
Medium	159 (47.7)	74 (46.5)	85 (53.5)	106 (66.7)	53 (33.3)
High	16 (4.8)	5 (31.3)	11 (68.8)	10 (62.5)	6 (37.5)

4.5 Physical Activity of Pupils

4.5.1 Means by which pupils get to school

About 52.9 % of the study participants engage in walking to commute to school, whereas 42.9 % commute to school using transport, but only 4.2 % of participants commuted to school using bicycle. More pupil from public schools walked and used bicycles to commute to school (52.3 and 78.6 % vs 47.7 and 21.3 %, p-value = <0.001). More private school pupil commuted to school using transport as compared to the pupil in public school (65.0 % vs 35.0 %). In terms of gender, more females commute to school by walking and transport (67.6 and 60.8 % vs 32.4 and 39.2 %, p-value = <0.001) compared to commuting to school by bicycle which was dominated by the males (100.0 %).

The majority of schools donot have time set aside for physical activity (Yes = 33.6 % (112)) and No = 66.4 % (221)). Private schools outnumbered public schools in whether schools set aside time for physical activities or not (56.2 and 52.9 % vs 43.8 and 47.1 %, p-value = 0.642). Within a week most schools practiced field base physical activities in mostly a day or two (77.0 % and 22.1 %). Most private schools practiced field base

within a day (57.5 % vs 42.5 %, p-value = 0.471) whereas public schools practiced field base physical activities in two or three days. For every week, physical activities lasted for mostly one hour.

4.5.2 Skipping

About 23.7 % of participants engaged in skipping during the week preceding the study (Table 4.3). 18.0 % of the participant engaged in skipping for 1-2 days, while 4.2 and 1.5 % engaged 3-4 and 5-7 days. More pupils from the public school engaged in skipping for 5-7 days within the week preceding the study than those in private school (60 % and 40 %, p-value = 0.006). About half of the participants never engaged in skipping for the 5-7 days within the past week.

4.5.3 Walking for exercise

About 50.7 % of a participants engaged in walking for exercise during the week preceding the study (Table 4.3). 25.8 % of the participant engaged in walking for exercise for 1-2 days, while 8.1 and 16.8 % engaged 3-4 and 5-7 days of walking for exercise. More pupil from the private school engaged more in walking for exercise than those in public school (54.1 % and 45.9 %, p-value = <0.000). Compared to public schools, more pupils in private schools walked for 5-7 days within the week (71.4 % vs 28.6 %, p-value = 0.001).

4.5.4 Bicycling

About 33.3 % of participant engaged in Biking during the week preceding the study (Table 4.3). 17.1 % of the participant engaged in Biking for 1-2 days, while 6.6 and 9.6 % engaged 3-4 and 5-7 days of Biking. More pupils from the private school engaged more in Biking than those in public school (54.1 % and 45.9 %, p-value = 0.038).

Compared to public schools, higher percentage of the pupils in private schools rode bicycles more within 5-7 days (78.1 % vs 21.9 %, p = 0.038).

4.5.5 Jogging /Running

About 58.3 % of participants engaged in Jogging during the week preceding the study (Table 4.3). 36.0 % of the participant engaged in Jogging for 1-2 days, while 10.5 and 11.7 % engaged 3-4 and 5-7 days of Jogging. More pupil from the private school engaged more in Jogging than those in public school (54.1 % and 45.9 %, p-value = <0.000). Higher proportion of pupil in public schools went for jogging for 5-7 day within the week preceding the week before this study as oppose to those in private schools (89.7 % vs 10.3, p-value = < 0.001).

4.5.6 Swimming

About 23.1 % of participants engaged in swimming during the week preceding the study (Table 4.3). 17.4 % of the participant engaged in Jogging for 1-2 days, while 3.3 and 2.4 % engaged 3-4 and 5-7 days of Swimming. More pupils from the private school engaged more in swimming than those in public school (54.1 % and 45.9 %, p-value = 0.560). Oppose to public schools, more pupil in private schools went swimming for 5-7 day per the week (62.5 % vs 37.5 %, p-value = 0.5).

4.5.7 Football

About 40.5 % of participants engaged in football during the week preceding the study (Table 4.3). 20.7 % of the participant engaged in football for 1-2 days, while 6.0 and 13.8 % engaged 3-4 and 5-7 days of football. More pupils from the private school engaged more in football than those in public school (54.1 % and 45.9 %, p-value = 0.462). Higher percentage of pupils in private schools play football for 5-7 day within the week compared to those in private schools (60.9 % vs 39.1 %, p-value = 0.4).

4.5.8 Basketball

About 12 % of participants engaged in basketball during the week preceding the study. 7.2 % of the participant engaged in basketball for 1-2 days, while 2.7 and 2.1 % engaged 3-4 and 5-7 days of basketball (Table 4.3). More pupils from the private school engaged more in basketball than those in public school (54.1 % and 45.9 %, p-value = <0.001). Only pupils in private schools engaged in playing basketball for 5-7 day within the week.

4.5.9 Ampe

About 52.6 % of participants were engaged in playing ampe during the week preceding the study (Table 4.3). 29.1 % of the participant engaged in playing ampe for 1-2 days, while 7.8 and 15.6 % engaged in playing ampe for 3-4 and 5-7 days. More of the pupils from the private school engaged more in ampe than those in public school (54.1 % and 45.9 %, p-value = 0.086). Compared to private schools, more of the pupils in private schools played ampe for 5-7 days within the week (57.7 % vs 42.3 %).

Table 4.4a: Physical Activities of the pupils in the week per school type

	Public (N=153) (%)				Private (N=180) (%)			
Activity	**Never**	**1-2 days**	**3-4 days**	**5-7 days**	**Never**	**1-2 days**	**3-4 days**	**5-7days**
Skipping	129 (50.8)	16 (26.7)	5 (35.7)	3 (60.0)	125 (49.2)	44 (73.3)	9 (64.3)	2 (40.0)
Walking (for exercise)	105 (64.0)	26 (30.2)	6 (22.2)	16 (25.7)	59 (36.0)	60 (69.8)	21 (77.8)	40 (71.4)
Bicycling	109 (49.1)	27 (47.4)	10 (45.5)	7 (21.9)	113 (50.9)	30 (52.6)	12 (54.5)	25 (78.1)
Jogging	80 (57.6)	56 (46.7)	13 (37.1)	4 (10.3)	59 (42.4)	64 (53.3)	22 (62.9)	35 (89.7)
Swimming	115 (44.9)	31 (53.4)	4 (36.4)	3 (37.5)	141 (55.1)	27 (46.6)	7 (63.6)	5 (62.5)
Football	98 (49.5)	29 (42.0)	8 (40.0)	18 (39.1)	100 (50.5)	40 (58.0)	12 (60.0)	28 (60.9)
Basketball	151 (51.5)	0 (0.0)	2 (22.2)	0 (0.0)	142 (48.5)	24 (100.0)	7 (77.8)	7 (100.0)
Ampe	82 (51.9)	42 (43.3)	7 (26.9)	22 (42.3)	76 (48.1)	55 (56.7)	19 (73.1)	39 (57.7)

4.5.10 Screen time and activity during free time

Concerning hours of screen time (Table 4.4), higher proportions of participants (58.9 %) for this study spend less than 24 hours of screen time watching television, playing video and computer games. Also, 7.8 of participants spend more than 24 hours of screen time. Among the participants, a pupil in private schools spends more time on screen time compared to the pupil in public schools (51.3, 58.3, and 65.4 % vs 48.5, 41.7, and 34.6 %, p-value = 0.552). Only 28.0 % of study participants engage in computer games or watch TV during their free time at home (Table 4.5). 32.5 % of pupils engaged in strenuous games which exerted more energy during their free time in the house, and additionally 26.5 % of pupils assisted in household chores. However, 12.9 % prefer to sleep during their free time. Among school type, more private school pupils either play computer games/watch TV or assist with household chores during their free time (59.1 and 65.9 % vs 40.9 and 34.1 %, p-value = 0.008). Pupils in public school are more engaged in either playing games that exert energy consumption or sleeping (54.6 and 58.1 % vs 45.4 and 41.9 %).

Table 4.4b: Screen time of the pupils within the week per school type

	School Type	
Screen Time	**Public (n=153)**	**Private (N=180)**
No computer games	43 (43.9)	55 (56.1)
< 24 hr	95 (48.5)	101 (51.5)
24 hr	5 (41.7)	7 (58.3)
> 24 hr	9 (34.6)	17 (65.4)

Table 4.6c: Free time of the pupils within the week per school type

	School Type	
Free Time	**Public (n=152)**	**Private (N=180)**
Play games/watch TV	38 (40.9)	55 (59.1)
Assist house chore	30 (34.1)	58 (65.9)
Strenuous games	59 (54.6)	49 (45.4)
Sleep	25 (58.1)	18 41.9)

4.6 Body Mass Index Status of Pupils

Table 4.6, depicts the BMI distribution among the pupils who were engaged in this study. The height of the study participants ranged between 124.1 and 169.0 cm, the mean height was 145.31 ± 8.97 cm. No significant difference in height existed between pupils in public and private schools (145.17 ± 7.93 and 145.37 ± 9.46 respectively, p-value = 0.870). However, the weight of the participants ranged from 24.5 - 96.1 Kg, the mean weight was 44.15 ± 12.95 kg. The average weight difference between pupils in public and private schools was not significant (42.73 ± 10.85 and 45.36 ± 14.42 p-value = 0.065). The mean BMI of the pupil in the study was 20.82 ± 4.71 Kg/m^2, ranging between 14.39 and 38.96 Kg/m^2.

Similarly, there was a significant difference in BMI of pupils in public and private schools (20.04 ± 3.62 and 21.48 ± 5.39 kg/m^2, p-value = 0.005). The BMI of a higher proportion of the pupils (46.5 %) was in the normal range as compared to those who were underweight (37.8%) and overweight/obese (15.6%). A higher proportion of the

pupil in private schools was overweight/obese compared to those in the public schools (21.1 % vs 9.1 %). Furthermore, higher proportions of pupils in the public schools were found to be in the underweight and normal ranges than those in private schools (39.9 and 51.0 % vs 36.1 and 42.8 %, p-value <0.001). The difference in BMI between the female and male pupils was not significant (21.05 vs 20.44 respectively, p-value = 0.253).

Table 4.5: BMI of pupils by gender and school type

	School Type		Gender		
BMI Status	Public (n=153)	Private (N=180)	Female (N=206)	Male (N=127)	Total (N=333)
Underweight	61 (39.9)	65 (36.1)	75 (36.4)	51 (40.2)	126 (37.8)
Normal	78 (51.0)	77 (42.8)	99 (48.1)	56 (44.1)	155 (46.5)
Overweight/Obese	14 (9.1)	38 (21.1)	32 (15.5)	20 (15.7)	52 (15.6)

4.7 Factors Associated with Overweight/Obesity

Bivariate and multivariate analysis on factors associated with overweight and obesity was conducted using chi-square tests and regression models.

4.7.1 Overweight versus Socio-Demographic Factors

In determining the association between overweight and socio-demographic factors using the bivariate chi-square analysis, age, school type, several siblings, family history of obesity, Mother's education, and mother's occupation exhibited significant association with overweight/obesity. Being in public school was significantly associated with overweight and obesity (p-value = 0.010) as well as having a family history of obesity (0.016). Moreover, mothers having any form of education (whether basic, secondary, or tertiary) was associated significantly with overweight/obesity (p-value = 0.008). Being self-employed or working in a government establishment was significantly associated with overweight/obesity (p-value = 0.010). Gender, area of

residence, type of housing, fathers' education, fathers' occupation, how much money is given to the pupil, had no association with overweight/obesity. This is depicted in table 4.9a and table 4.9b.

From the multivariate level, age, number of siblings, mothers' education, mothers' occupation, and how much money given to pupils per day, which had significant association with overweight in the bivariate level lost its' significance. Type of school, family obesity, and mothers' occupation sustained their significant association with overweight. Being in a public school as a student was 65 % less likely to be overweight when compared to being in a private school (AOR= 0.65, 95% CI = 0.12 – 1.06, p <0.05). Having a family history of obesity was five times more likely of being associated with overweight compared to the pupil who has no family history of obesity (AOR= 5.33, 95% CI = 1.70 – 16.69, p <0.05). Furthermore, a higher proportion of pupils in the study had self-employed mothers, pupils from these mothers were 69 % less likely to be overweight compared to a pupil whose mothers were employed in the government sector (AOR= 0.69, 95% CI = 0.10 – 0.99, p <0.05).

Table 4.6a: Relationship between overweight and Demographic characteristics

Variables	Bivariate analysis				Multivariate analysis
	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Gender				0.881	
Female	185 (89.8)	21 (10.2)	206 (61.9)		N/A
Male	113 (89.00	14 (11.0)	127 (38.1)		
Age				**0.001**	
<12	218 (89.3)	26 (10.7)	244 (73.3)		0.62 (0.14 -1.06)
≥ 12	80 (89.9)	9 (10.1)	163 (48.9)		1
Type of school				**0.010**	
Public	141 (92.2)	12 (7.8)	153 (45.9)		0.65 (0.14-1.06) *
Private	157 (87.2)	23 (12.8)	180 (54.1)		1
Number of Siblings				**0.043**	
0-5	267 (89)	33 (11.0)	300 (90.1)		0.619 (0.03-5.20)
6-10	28 (96.6)	1 (3.4)	29 (8.7)		0.85 (0.01-3.96)
11-13	3 (75.0)	1 (25.0)	4 (1.2)		1
Mother's education				**0.024**	
None	38 (90.5)	4 (9.5)	42 (12.6)		1.12 (0.17-1.17)
Basic	120 (93.1)	9 (6.9)	129 (38.7)		0.51 (0.13-1.90)
Secondary	66 (90.4)	7 (9.6)	73 (21.9)		0.027 (0.27-3.56)
Tertiary	74 (83.2)	15 (16.9)	89 (26.7)		1
Father's education				0.102	
None	26 (96.3)	1 (3.7)	27 (8.1)		
Basic	82 (89.1)	10 (10.9)	92 (27.6)		N/A
Secondary	71 (92.3)	6 (7.8)	77 (23.1)		
Tertiary	119 (86.8)	18 (13.1)	137 (41.1)		1
Family history of obesity				**0.016**	
Yes	208 (87.1)	31 (13.0)	239 (71.8)		5.33 (1.70-16.69) *
No	90 (95.7)	4 (4.3)	94 (28.2)		1

* - Significant p values (p<0.05)

N/A- Not Applicable

Table 4.6b: Relationship between overweight and Socio-economic characteristics

Variables	Bivariate analysis				Multivariate analysis
	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Mother's occupation				**0.016**	
Unemployed	10 (76.9)	3 (23.1)	13 (3.9)		0.15 (0.14-5.09)
Self-employed	226 (89)	19 (7.8)	245 (73.6)		0.69 (0.10-0.99) *
Government worker	62 (82.6)	13 (17.3)	75 (22.5)		1
Father's occupation				**0.016**	
Unemployed	9 (90.0)	1 (10.0)	10 (3.0)		0.008 (0.08-12.98)
Self-employed	184 (90.6)	19 (5.7)	203 (61.0)		1.29 (0.46-3.50)
Government worker	105 (87.5)	15 (4.5)	120 (36.0)		1
Area of Residence				0.366	
Rural	85 (89.5))	10 (10.5)	95 (28.5)		
Peri-Urban	81 (86.1)	13 (13.8)	94 (28.5)		N/A
Urban	132 (91.6)	12 (8.3)	144 (43.2)		1
Type of Housing				0.277	
					N/A
Flat/Self-contained	135 (87.6)	19 (12.3)	1154 (46.2)		1
Money given a day to school (GH₵)				**0.001**	
0-5	266 (90.8)	27 (8.1)	293 (88.3)		1.52 (0.78-3,56)
6-10	29 (78.3)	8 (21.6)	37 (11.1)		1.54 (0.56-64.02)
>11	2 (100.0)	0 (0.0)	2 (100.0)		1

*- Significant p values (p<0.05)

N/A- Not Applicable

4.6.2 Overweight versus Dietary Habits/Patterns

Table 4.10 depicts the association of studied dietary habits with overweight at bivariate and multivariate levels. Getting food from the school feeding program, and the time pupils went to bed were found to be significantly associated with being overweight at the bivariate level (p-value = <0.05). Factors such as the frequency of food consumption per day, frequency of consuming breakfast before school, taking snacks during the first break, lunchtime, before bed, pupil caring home-cooked meal o school, buying food at school, buying food outside school, the type of snack consumed, cooking methods, and time pupil consumed their last meal was found not to be significant. Though these factors were not significant at the bivariate level with being overweight or not, they

were controlled for and the logistic regression model was used to detect any relationship as some studies have found.

On the multivariate level, getting food from the school feeding program, and the time pupils went to bed lost their significant association with overweight. Eating a snack at lunch and buying food on school premises were found to be significantly associated with being overweight. Pupils who sometimes ate a snack at lunchtime were found to be 9 times more likely to be associated with overweight compared to the pupil who always consumed snacks at lunchtime (AOR= 9.02, 95% CI = 1.61 – 20.05, p <0.05). Also, pupil who often bought food on school premises was 92 % more likely to be overweight compared to those who always bought food on school premises (AOR= 0.92, 95% CI = 1.61 – 20.05, p <0.05).

Table 4.7a: Relationship between overweight and dietary habits

Variables	Bivariate analysis				Multivariate analysis
	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Frequency of Eating per day				0.180	
Once	2 (66.7)	1 (33.3)	3 (0.9)		4.32 (0.03-8.42)
Twice	29 (78.4)	8 (21.6)	37 (11.1)		3.77 (0.82-17.37)
3 times	159 (91.9)	14 (8.1)	173 (52.0)		0.14 (0.285-2.57)
More than 3 times	108 (90.0)	12 (10.0)	120 (36.0)		1
Frequency of Breakfast before School				0.813	
Never	61 (88.4)	8 (11.6)	69 (20.9)		1.141 (0.23-5.60)
Sometimes	141 (89.2)	17 (10.8)	158 (47.9)		0.34 (0.17-2.64)
Often	27 (87.1)	4 (12.9)	31 (9.4)		0.01 (0.17-5.84)
Always	66 (91.7)	6 (8.3)	72 (21.8)		1
Snack at First Break				0.73	
Never	22 (88)	3 (12.0)	25 (7.8)		0.37 (0.092-4.31)
Sometimes	124 (88.6)	16 (11.4)	140 (42.3)		1.07 (0.34-3.34)
Often	43 (91.5)	4 (8.5)	47 (14.1)		1.13 (0.22-4.30)
Always	106 (89.8)	12 (10.2)	118 (35.4)		1
Snack at Lunch Time					
Never	41 (82)	9 (18.0)	50 (15.4)	0.546	9.017 (1.61-20.05) *
Sometimes	150 (89.8)	17 (10.2)	167 (50.5)		1.92 (0.49-7.60)
Often	45 (93.8)	3 (6.2)	48 (14.6)		0.34 (0.10-4.30)
Always	59 (90.8)	6 (9.2)	65 (19.5)		1
Snack before Bed Time				0.995	
Never	77 (89.5)	9 (10.5)	86 (26.1)		1.13 (0.26-5.02)
Sometimes	129 (89.6)	15 (10.4)	144 (43.6)		0.05 (0.27-3.34)
Often	27 (90.0)	3 (10)	30 (9.0)		1.43 (0.228-8.921)
Always	62 (88.6)	8 (11.4)	70 (21.2)		1
Food from Home				0.512	
Never	64 (87.7)	9 (12.3)	73 (22.1)		1.22 (0.21-6.99)
Sometimes	143 (89.4)	17 (10.6)	160 (48.5)		1.41 (0.31-6.34)
Often	33 (89.2)	4 (10.8)	37 (11.2)		1.51 (0.20-11.47)
Always	55 (91.7)	5 (8.3)	60 (18.2)		1

*- Significant p values ($p<0.05$)

N/A- Not Applicable

Table 4.7b: Relationship between overweight and dietary habits (continuous)

	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Buy food in school				0.362	
Never	41 (91.1)	4 (8.9)	45 (13.6)		0.67 (0.055-2.10)
Sometimes	113 (87.6)	16 (12.4)	129 (39.1)		0.33 (0.22-2.1o)
Often	40 (97.9)	1 (2.4)	41 (12.4)		0.92 (0.006-0.97) *
Always	101 (87.8)	14 (12.2)	115 (32.8)		1
Buy food outside the school				0.39	
Never	109 (88.6)	14 (11.4)	123 (37.3)		1.047 (0.054-20.27)
Sometimes	129 (87.2)	19 (12.8)	148 (44.8)		1.39 (0.08-25.26)
Often	22 (95.7)	1 (4.3)	23 (7.0)		0.52 (0.01-22.35)
Always	35 (97.2)	1 (2.8)	36 (10.9)		1
Get food from the school feeding program				**0.028**	
Never	168 (85.7)	28 (14.3)	196 (58.9)		0.43 (0.53-5.21)
Sometimes	72 (92.3)	6 (7.7)	78 (23.4)		1.03 (0.61-4.32)
Often	17 (94.4)	1 (5.6)	18 (5.4)		0.73 (1.01-3.02)
Always	41 (100.0)	0 (0.0)	41 (12.3)		1
Type of Snack				0.643	
Sweets	86 (88.7)	11 (11.3)	97 (29.2)		0.97 (1.05-6.32)
Flour products	105 (92.9)	8 (7.1)	113 (34.0)		0.86 (0.93-4.09)
Carbonated drinks	48 (84.2)	9 (15.8)	57 (17.2)		0.78 (0.82-3.89)
Fruits	53 (88.3)	7 (11.7)	60 (8.1)		0.89 (0.63-3.01)
Other	5 (100.0)	0 (0.0)	5 (1.5)		1
Cooking Method used by the parent				0.202	
Boiling	172 (89.1)	21 (10.9)	193 (58.3)		0.98 (0.01-0.82)
Frying	36 (81.8)	8 (18.2)	44 (13.3)		0.57 (0.05-3.44)
Stewing	85 (93.4)	6 (6.6)	91 (27.5)		0.89 (0.01-9.63)
Roast	3 (100.0)	0 (0.0)	3 (100.0)		1
Last Meal Time per Day				0.082	
4:00 PM	16 (84.2)	3 (15.8)	19 (5.7)		1.17 (0.16-8.68)
5:00 PM	45 (86.5)	7 (13.5)	52 (15.7)		1.43 (0.35-5.84)
6:00 PM	94 (92.20	8 (7.8)	102 (30.8)		0.05 (0.29-3.07)
After 6:00 PM	141 (89.2)	17 (10.8)	158 (47.7)		1
Bed Time				**0.028**	
7:00 PM	35 (92.1)	3 (7.9)	38 (11.5)		0.52 (0.07-3.39)
8:00 PM	128 (90.8)	13 (9.2)	141 (42.6)		0.33 (0.16-2.76)
9:00 PM	78 (85.7)	13 (14.3)	91 (27.5)		3.44 (0.78-15.05)
After 9:00 PM	55 (90.2)	6 (9.8)	61 (18.4)		1

* - Significant p values ($p<0.05$)

N/A- Not Applicable

4.6.3 Obesity versus Socio-Demographic Factors

As depicted in table 4.12a, the age of participants being in public school, the number of siblings a participant had and also having a family history of obesity was significantly associated with obesity ((p-value = < 0.05). Moreover, mothers having any form of education (whether basic, secondary, or tertiary), the mothers' occupation and the amount of money given to children for school was also found to be significantly associated with obesity during the bivariate analysis. Gender, area of residence, type of housing, fathers' education, fathers' occupation, how much money is given to the pupil, has no association with overweight/obesity. This is depicted in table 4.10b.

During the multivariate analysis, the type of school participants attended and participants having a family history of obesity were found to be significantly associated with obesity. The age of participants in the study, number of siblings a participant had, mothers' education, mothers' occupation, and the money was given to pupils or schools lost their significance at the multivariate level. Pupils whose fathers were unemployed were found to be 17 % less likely to be obese (AOR= 0.17, 95% CI = 0.012-2.63 – 20.05, p <0.05). Attending public school was 89 % less likely of being obese whereas having a family history of obesity was almost 4 times more likely of being obese (AOR= 0.89, 95% CI = 0.020-0.635, p <0.05).

Table 4.8a: Relationship between obesity and Socio-demographic characteristics

Variables	Bivariate analysis				Multivariate analysis
	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Gender				0.881	
Female	195 (94.7)	11 (5.3)	206 (61.9)		N/A
Male	121(95.3)	6 (4.7)	127 (38.1)		1
Age				**0.001**	
<12	230 (94.3)	14 (5.7)	244 (73.3)		0.62 (0.088-1.69)
≥ 12	86 (96.6)	3 (3.4)	163 (48.9)		1
Type of school				**0.010**	
Public	151 (98.7)	2 (1.3)	153 (45.9)		0.89 (0.020-0.635) *
Private	165 (91.7)	15 (8.3)	180 (54.1)		1
Number of Siblings				**0.043**	
0-5	284 (94.7)	16 (5.3)	300 (90.1)		0.92 (0.003-1.65)
6-10	29 (100.0)	0 (0.0)	29 (8.7)		0.99 (0.00-3.65)
11-13	3 (75.0)	1 (25.0)	4 (1.2)		1
Area of Residence				0.366	
Rural	93 (97.9)	2 (2.1)	95 (28.5)		
Peri-Urban	89 (94.7)	5 (5.3)	94 (28.5)		N/A
Urban	134 (93.1)	10 (6.9)	144 (43.2)		1
Type of Housing				0.277	
Compound/Courtyard	173 (96.0)	6 (3.4)	179 (53.8)		N/A
Flat/Self-contained	143 (92.9)	11 (7.1)	1154 (46.2)		1
Family history of obesity				**0.016**	
Yes	225 (94.1)	14 (5.9)	239 (71.8)		3.94 (1.01-15.29) *
No	91 (96.8)	3 (3.2)	94 (28.2)		1

*- Significant p values (p<0.05)

N/A- Not Applicable

Table 4.8b: Relationship between obesity and Socio-demographic characteristics

Variables	Bivariate analysis				Multivariate analysis
	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Mother's education				**0.024**	
None	42 (100.0)	0 (0.0)	42 (12.6)		0.73 (0.15-5.11)
Basic	125 (96.9)	4 (3.1)	129 (38.7)		0.47 (0.10-2.79)
Secondary	68 (93.2)	5 (6.8)	73 (21.9)		1.57 (0.37-6.7)
Tertiary	81 (91)	8 (9.0)	89 (26.7)		1
Father's education				0.102	
None	25 (92.6)	2 (7.4)	27 (8.1)		
Basic	92 (100)	0 (0.0)	92 (27.6)		
Secondary	73 (94.5)	4 (5.5)	77 (23.1)		N/A
Tertiary	126 (92.0)	11 (8.0)	137 (41.1)		1
Mother's occupation				**0.016**	
Unemployed	13 (100)	0 (0.0)	13 (3.9)		0.93 (0.001-3.20)
Self-employed	245 (95.5)	11 (4.5)	245 (73.6)		0.50 (0.12-2.1)
Government worker	69 (92.0)	6 (8.0)	75 (22.5)		1
Father's occupation				0.93	
Unemployed	9 (90.0)	1 (10.0)	10 (3.0)		
Self-employed	193 (95.1)	10 (4.9)	203 (61.0)		N/A
Government worker	114 (95)	6 (5.0)	120 (36.0)		1
Money given a day to school (GH₵)					
0-5	282 (96.5)	11 (3.5)	293 (88.3)	**0.001**	0.002 (0.02-0.2)
6-10	32 (86.5)	5 (13.5)	37 (11.1)		0.04 (0.005-0.12)
>11	1(50)	1 (50)	2 (100.0)		1

*- Significant p values ($p<0.05$)

N/A- Not Applicable

4.6.4 **Obesity versus Dietary Habits/Patterns**

Table 4.12 depicts the association of studied dietary habits with obesity at the bivariate and multivariate levels. Getting food from the school feeding program, and the time pupils went to bed was found to be significantly associated with overweight at the bivariate level (p-value = <0.05).

On the multivariate level, getting food from the school feeding program lost its significant association with obesity. Last mealtime and bedtime were found to be

significantly associated with obesity. Pupils who always ate the last meal at 4 pm were found to be 5 times more likely of been associated with obesity compared to the pupil who ate their last meal after 6 pm (AOR= 5.34, 95% CI = 2.34 – 6.10, p <0.05). Likewise, a pupil who slept around 8 pm was 91 % less likely to be overweight when compared to the pupil who slept after 9 pm (AOR= 0.92, 95% CI = 1.61 – 20.05, p <0.05).

Table 4.9a: Relationship between obesity and Food Habits/Patterns

Variables	Bivariate analysis	Multivariate analysis

	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI
Frequency of Eating per day				0.18	
Once	3 (100.0)	0 (0.0)	3 (0.9)		0.40 (0.00-1.34)
Twice	33 (89.2)	4 (10.8)	37 (11.1)		7.08 (0.40-15.01)
3 times	166 (4.0)	7 (4.0)	173 (52.0)		0.17 (0.11-6.13)
More than 3 times	114 (95.0)	6 (5.0)	120 (36.0)		1
Frequency of Breakfast before School				0.813	
Never	67 (97.1)	2 (2.9)	69 (20.9)		3.22 (0.09-8.1)
Sometimes	146 (92.4)	12 (7.6)	158 (47.9)		3.42 (0.32-8.02
Often	31 (100.0)	0 (0.0)	31 (9.4)		0.83 (0.05-0.95)
Always	69 (95.8)	3 (4.2)			1
Snack at First Break				0.73	
Never		1 (4.0)	25 (7.8)		4.38 (0.13-6.23)
Sometimes	131 (93.6)	9 (6.4)	140 (42.3)		1.88 (0.31-3.56)
Often	45 (95.7)	2 (4.3)	47 (14.1)		4.45 (0.33-3.23)
Always	113 (95.8)	5 (4.2)	118 (35.4)		
Snack at Lunchtime				0.546	
Never	47 (94.0)	3 (6.0)	50 (15.4)		2.00 (0.07-3.23)
Sometimes	158 (94.6)	9 (5.4)	167 (50.5)		2.53 (0.19-4.5)
Often	46 (95.8)	2 (4.2)	48 (14.6)		2.54 (0.10-8.34)
Always	62 (95.4)	3 (4.6)	65 (19.5)		1
Snack before Bed Time				0.995	
Never	82 (95.3)	4 (4.7)	86 (26.1)		0.48 (0.04-6.20)
Sometimes	136 (94.4)	8 (5.6)	144 (43.6)		0.26 (0.08-7.15)
Often	28(93.3)	3 (6.7)	30 (9.0)		6.24 (0.27-5.32)
Always	67 (95.7)	3 (4.3)	70 (21.2)		1
Food from Home				0.512	
Never	73 (100.0)	0 (0.0)	73 (22.1)		0.98 (0.01-0.82)
Sometimes	149 (93.1)	11 (6.9)	160 (48.5)		0.57 (0.05-3.44)
Often	36 (97.3)	1 (2.7)	37 (11.2)		0.89 (0.01-9.63)
Always	55 (91.7)	5 (8.3)	60 (18.2)		1

Table 4.9b: Relationship between obesity and Food Habits/Patterns (continuous)

	No (%)	Yes (%)	Frequency (%)	p-value	AOR 95% CI

Buy food in school				0.362	
Never	41 (91.1)	4 (8.9)	45 (13.6)		3.319 (0.31-5.32)
Sometimes	121 (93.8)	8 (6.2)	129 (39.1)		1.65 (0.22-4.310
Often	40 (97.6)	1 (2.4)	41 (12.4)		0.64 (0.01-4.32)
Always	111 (96.5)	4 (3.5)	115 (32.8)		1
Buy food outside the school				0.39	
Never	117 (95.1)	6 (4.9)	123 (37.3)		0.94 (0.002-2.01)
Sometimes	140 (94.6)	8 (5.4)	148 (44.8)		0.92 (0.003-2.180
Often	22 (95.7)	1 (4.3)	23 (7.0)		1.34 (0.013-5.32)
Always	34 (94.4)	2 (5.6)	36 (10.9)		1
Get food from the school feeding program				**0.028**	
Never	181 (92.3)	15 (7.7)	196 (58.9)		0.53 (0.72-5.54)
Sometimes	77 (98.7)	1 (1.3)	78 (23.4)		1.23 (0.47-4.32)
Often	17 (94.4)	1 (5.6)	18 (5.4)		0.93 (1.23-5.43)
Always	41 (100.0)	0 (0.0)	41 (12.3)		1
Never					
Type of Snack				0.643	
Sweets	94 (96.9)	3 (3.1)	97 (29.2)		0.96 (1.23-4.32)
Flour products	108 (95.6)	5 (4.40	113 (34.0)		0.96 (2.34-5.32)
Carbonated drinks	53 (93.0)	4 (7.0)	57 (17.2)		0.94 (0.87-3.43)
Fruits	55 (91.7)	5 (8.3)	60 (8.1)		0.76 (0.95-3.32)
Other	5 (100.0)	0 (0.0)	5 (1.5)		1
Cooking Method used by the parent				0.202	
Boiling	188 (97.4)	5 (2.6)	193 (58.3)		1.13 (0.26-5.02)
Frying	40 (90.9)	4 (9.1)	44 (13.3)		0.05 (0.27-3.34)
Stewing	83 (91.2)	8 (8.8)	91 (27.5)		1.43 (0.28-8.921)
Roast	3 (100.0)	0 (0.0)	3 (100.0)		1
Last Meal Time per Day				0.082	
4:00 PM	15 (21.1)	4 (21.1)	19 (5.7)		5.34 (2.34-6.1) *
5:00 PM	50 (96.2)	2 (3.8)	52 (15.7)		1.69 (0.16-1.75)
6:00 PM	100 (98.0)	2 (2.0)	102 (30.8)		0.65 (0.05-6,02)
After 6:00 PM	149 (94.3)	9 (5.7)	158 (47.7)		1
Bed Time					
				0.028	
7:00 PM	34 (89.5)	4 (10.5)	38 (11.5)		0.28 (0.067-3.72)
8:00 PM	135 (95.7)	6 (4.3)	141 (42.6)		0.91 (0,009-.801) *
9:00 PM	11 (97.8)	2 (2.2)	91 (27.5)		0.92 (0.003-1.72)
After 9:00 PM	56 (91.8)	5 (8.2)	61 (18.4)		1

*- Significant p values ($p<0.05$)

4.6.4 Obesity versus Physical activity

Only physical activities carried out at the various schools were found to be significantly associated with overweight/obesity at the bivariate level, it lost its significance at the multivariate level. All other physical activities were not statistically associated with overweight/obesity at the bivariate and the multivariate level. However, there has been a link between physical activities and BMI status.

Table 4.10: Relationship between overweight/obesity and physical activities

Variable	Underweight (N=126)	Normal (N=155)	Overweight (N=35)	Obese (N=17)	p-value
Physical Activities at school					**0.014**
Yes	31.2 (35)	45.5 (51)	17.9 (20)	5.4 (6)	
No	41.2 (91)	47.1 (104)	6.8 (15)	5.0 (11)	

4.7 Overweight/Obesity versus Dietary diversity

Concerning pupil who consumed low and medium diversified diets, 12.7, 9.4 % and 5.7, 4.4 were overweight and obese, whereas pupil who consumed highly diverse diets had only 1 person (6.2 %) being obese (Table 4.15). However, this was not significant both in the bivariate and multivariate analysis.

Table 4.11: Relationship between overweight/obesity and Dietary diversity

Dietary Diversity Score	Underweight (N) (%)	Normal (N) (%)	Overweight (N) (%)	Obese (N) (%)	P
Low	64 (40.5)	65 (41.1)	20 (12.7)	9 (5.7)	0.492
Medium	56 (35.2)	81 (50.9)	15 (9.4)	7 (4.4)	
High	6 (37.5)	9 (56.2)	0 (0)	1 (6.2)	

CHAPTER FIVE
DISCUSSION

5.0 Overview

This chapter discusses in detail the results of data collected for the study through the questionnaire organized by the objectives of the study:

1. To determine the prevalence of childhood overweight and obesity among basic school pupils in Effutu Municipality.
2. To assess the dietary habit of basic school pupils in Effutu Municipality.
3. To assess the physical activities of basic school pupils in Effutu Municipality.
4. To identify the determinants of childhood overweight/obesity in the Effutu Municipality.

5.1 Prevalence of Overweight and Obesity

The study sought to identify the prevalence and factors associated with childhood obesity among the basic pupils in Effutu Municipality. The combined overweight and obesity prevalence among the respondents was 15.6 %, out of this 10.5 % were overweight and 5.1 % were obese. The reported prevalence of overweight/obesity is similar to the overall prevalence of 15 % which was reported among school children in urban cities in Ghana (Ghana School Survey, 2012). Lower prevalence of overweight and obesity (2.1 and 1.7 %) was however reported in Nigeria (Adebimpe, 2019) and 5% in Cape Coast, Ghana (Amissah, Mensah, & Mensah, 2021). Nevertheless, other studies have also reported of a higher prevalence of 17, 26.7, 29.4 and 43.2 % among Ghanaian children (Aryeetey et al., 2017, Mohammed and Vuvor, 2012, Amoh-Yeboah, 2017, Boakye, 2019); 12.6 and 8.8 % in Zambia (Chirwa, Musuku, and Pandey, 2019) and 20% and 10.7% in Egypt (Talat & Shahat, 2016). The observed

differences in prevalence in overweight/obesity can be attributed to differences in geographical location, lifestyle changes, number of participants for each study, and age variation (Amoh-Yeboah, 2017). Notwithstanding, the reported prevalence and those from other studies signify the need for attention in childhood obesity especially in Ghana where parents are tempted to meet social expectation as people who are fat are deemed to be living good (Choukem et al., 2020). Moreover, childhood overweight is one of the five maternal, infant and young child nutrition (MIYCN) targets which is not making progress globally in achieving the 2025 global nutrition targets (Global Nutrition Report, 2021).

5.2 Demographic characteristics associated with Childhood overweight and obesity

Childhood overweight/ obesity reported among gender had no significant association ($p > 0.05$) with being overweight or obese. The result concurs with studies by Ghana School Survey (2012), and Mohammed and Vuvor (2012), Boakye, (2019), Schultz (2012), and McDonald et al. (2009), who found no significant association between overweight/obesity and gender. However, Almutairi et al. (2021), Amoh-Yeboah, (2017), Talat and Shahat (2016), Aryeetey et al. (2017), and (2019) found an association between overweight and obesity, with females being more predispose to overweight/obesity than males, and having higher prevalence than their male counterparts. The difference in the prevalence of overweight/obesity between the males and females in reference is attributed to the difference in the hormone, rate of weight gain, body composition; and other factors such as genetics, ethnicity, social and environmental factors (Amissah et al., 2021a). Nonetheless, multivariate analysis conducted on gender and overweight and obesity revealed that though not significantly related, being a female presented an increased odd of becoming overweight (AOR =

1.07, 95 % CI = 0.343-3.306 p < 0.881) or obese (AOR = 1.003, 95 % CI = 0.45-2.25 p < 0.881). This may suggest that males are likely to engage in physical activities and involved in outdoor activities more than females, they therefore tend to burn more calories than females, leading to a higher prevalence of overweight/obesity in females than males (Gupta et al., 2012).

Combined overweight and obesity prevalence was higher in private schools compared to public schools (21.1 % vs. 9.1 %, p < 0.001). Overweight and obesity prevalence in private schools was 12.8 % vs. 8.3 % and that of those in the public schools was 7.8 % vs. 1.3 % respectively. The obesity in private schools was almost 8 times that of private schools. Being in public school reduced the odds of becoming overweight (AOR = 0.65, 95 % CI = 0.12 – 1.06, p < 0.05) and obese (AOR = 0.89, 95 % CI = 0.020-0.635, p < 0.05) as compared to being in private school. This is in agreement with the finding by Alangea, (2014), who also found that the prevalence of overweight in private schools (24.9 %) in Ga West Municipal (Accra) in Ghana was almost twice that found public schools (13.1 %). Moreover, Ganle et al. (2019), also found a similar trend where more children in the private school (26.8 %) were more obese than public school children (21.4 %). In Zambia, Chirwa et al. (2019) reported that obese children in private schools were twice that in public schools. Children in private schools are mostly from affluent families, they are usually given a high amount of money for school which is used to patronize empty caloric goods such as high energy snacks and carbonated drinks. Most children from affluent homes are exposed to obesogenic environments and these environments predispose them to consume high caloric foods and also be less active (Ganle et al., 2019; Gupta et al., 2012).

The prevalence of overweight and obesity (10.7 and 5.7 % respectively) presented a significantly high proportion among the pupils aged < 12 years compared to those aged

≥ 12 (10.1 and 3.4 %). This was in agreement with findings by Amoh-Yeboah, (2017), Valen et al. (2009), and Musa et al. (2012) who found the rate of prevalence to be highest in a younger age group compared to the older aged groups. The observed difference may be attributed to the post-pubertal group developing self-awareness about weight gain than the pre-pubertal aged group, leading to pre-pubertal aged children developing extra weight than those in the post-pubertal age (Gupta et al., 2012).

4.3 Socio-economic factors associated with Childhood overweight and obesity

The educational level of the mother was significantly associated with a child being overweight and obesity. The study presented a positive relationship between childhood overweight and obesity and mother's education level. The proportion of obese children whose mothers had tertiary education (9.0%) were thrice that of those who have had basic education (3.1%). A similar observation was seen for overweight children (16.9 vs 6.9 %). This concurs with Talat and Shahat (2016), Aryeetey et al. (2017), Karki et al. (2019), and Ganle et al. (2019) who found that school children whose parents are highly educated were likely to turn out obese than children who had a parent with low level or no education. This may be related to the effects of women joining the workforce; where mothers may not have the opportunity to spend quality time with their children, cook nutritious meals and the affluent lifestyle that comes with it like the use of labour-saving equipment, vehicles, employing house helps which reduces children's contribution to household chores which will ultimately reduce physical activity.

Self-employed mothers had higher proportions of children being overweight followed by mothers engaged in the government work, whereas children whose mothers were unemployed have reduced risk of being overweight/obese. However, self-employed

fathers had children who were at a higher risk of being overweight/obese, as well as children whose parents were working at government work, but unemployed fathers had a reduced risk of being overweight/obese. Mother's occupation was significant at the bivariate level and the multivariate level. Pupils with self-employed mothers were 65 % less likely to be overweight. This may be attributed to the fact that they have enough time to select and prepare healthy meals for their children. This finding may also be attributed to the fact that these parents have higher socio-economic status which enable them select nutritious foods which are not energy dense for their children.

This is in agreement with (Amoh-Yeboah, 2017) who reported that a greater proportion of pupils who were overweight and obese had mothers who had formal occupation. However, this finding contradicts with a survey by Obirikorang et al., (2015) which documented that there was a significant association between informal occupation of parents and the development of central obesity in school children.

Higher education in developing countries point toward higher-paid jobs, higher paid job is an indication of accessibility to readily available funds (Kabbaoui et al., 2018). High-income parents, set up an obesogenic environment that contributes to sedentary lifestyles and inactivity in their wards. The purchasing power of the parent help in the acquisition of technologies such as personal vehicles, television, computers, smartphones, and games. The use of these gadgets is to make life much easier for the parents, the companioned negative effect is parents tend to be more inactive and spend more time in front of their laptops, phones, and TV (Amissah et al., 2021a). Children model this lifestyle they see in their parents. As a child is not in control of his/her environment, they live in the manner in which the environment dictates resulting in inactivity in their life. Increased screen time, being driven to and from school with little

or no walking, participating in no sporting activities at home or school are risk factors for obesity/overweight.

4.4 Dietary habits associated with Childhood overweight and obesity

All of the diet-related factors that were thought to be predictors of childhood overweight and obesity, such as frequency of consumption per day, frequency of eating breakfast before school, eating a snack at the first break, eating a snack at lunch, eating a snack before bed, carrying a home-cooked meal to school, buying food on school premise, the type of snack, and cooking method used by parents, were found to be non-significant at both levels of analysis. However, getting food from the school feeding program, bedtime had a significant association with overweight at the bivariate level whereas having a snack at lunchtime and buying food in school had a positive association with obesity on the multivariate level. Also, getting food from the school feeding program and the time the pupils went to bed had a positive association with obesity on the bivariate level while the time the pupil had their last meals and the time they went to bed had a positive association with obesity at the multivariate level.

According to Rampersaud et al. (2005), breakfast is widely recognized as a significant meal of the day, and its inclusion in a balanced diet has been shown to have a substantial influence on children's health and well-being. Breakfast was consumed by the majority of participants in the research; however, more kids in private schools took breakfast than those in public schools, and this difference was significant among school types at the bivariate level but had no significant association to overweight/obesity. Breakfast intake is believed to help youngsters maintain their weight. Breakfast intake on a regular basis appears to protect against becoming overweight or obese, according to the Ghana Schools Survey (2012).

This study found out that public school pupils mostly consumed meals from the school feeding program, whereas private school pupils rarely consumed meals from the program. This was significantly related with overweight/obesity only at the bivariate level. This can be explained by the fact that the meals offered to students are usually made up of high-energy food components, which students in public schools have little choice but to eat owing to a lack of preferences and poverty. This finding contradicted the findings of Amoh-Yeboah (2017) and Alangea et al. (2014) who showed no link between consuming meals given by the SFP and obesity which was as a result of the child being unsatisfied with the food served and eating it only on rare occasions.

5.5 Dietary Diversity associated with Childhood overweight and obesity

Many studies have tried to establish the relationship between dietary diversity and excess energy intake. However, research finding from this study found no significant association between dietary diversity and overweight/obesity. This finding was contrary to that of Azadbakht et al. (2006) who reported a relationship between higher dietary diversity and obesity. The researcher reported that people with diverse diet were found to be more obese and this was attributed to higher energy intake from the consumption of vegetables oil, dairy foods and vegetables. Similar results was reported by Jayawardena et al. (2013) who reported a positive association between dietary diversity and obesity among Sri Lankan adults. Participants who were found to be obese tend to have higher dietary diversity than non-obese individuals. This was attributed to increase food consumption as a result of increasing diversity in diet or meal, and this led to increasing body weight and obesity. Consumption of large number of food items may lead to excessive intake of calorie and weight gain.

5.6 Physical activity level and association with Childhood overweight and obesity

Regular physical activities increase energy expenditure in the body resulting in reduction of body fat accumulation. Physical activity results in energy expenditure when there is muscle movement in any part of the body (Mitchell, 2011). This is a great strategy to combat inactivity in children. High inactivity among school children has been attributed to increase in obesity and overweight. The obesogenic environment these children find themselves including frequent access to personal vehicles of their parent or transportation vehicles in various schools especially those in private schools has narrowed the number of children who walk to and from school during school days. This has contributed to increased childhood inactivity in the country (Ganle et al., 2019).

In this study, only physical activities in the schools were found to be significantly associated with overweight/obesity at the bivariate level, it lost its significance at the multivariate level. All other physical activity was not statistically associated with overweight/obesity at the bivariate and the multivariate level. The result from this study is similar to the report by Chirwa et al. (2019) who reported an increased rate of obesity in schools which did not have any health education programs. Most of the children in their survey did not engage in any activity after school sporting activities and this increased the chance of being obese/overweight. Contrary to this study, Ganle et al., (2019) also found that children who get involved in sports activities 3 days per week have their chance of reducing obesity by 42 %, as sporting activities leads to enough energy expenditure and this lean towards reduced fat accumulation in the body.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Overview

This chapter presents the summary of key findings, conclusions, recommendations and suggestions for future studies.

6.1 Summary of findings

6.1.1 Prevalence of overweight/obesity

1. Overall combined prevalence of overweight and obesity among the basic pupils in Effutu Municipality was 15.6 %. A total of 155 (46.5 %) pupils had a normal BMI status and 126 (37.8 %) were found to be underweight. Out of the overall prevalence, 35 (10.5 %) were overweight and 17 (5.1 %) were obese.

2. Combined overweight and obesity prevalence was higher in private schools compared to public schools (21.1 % vs. 9.1 %, $p < 0.001$). Overweight and obesity prevalence in private schools was 12.8 % vs. 8.3 % and that of those in the public schools was 7.8 % vs. 1.3 % respectively.

3. Combined prevalence among males (15.7 %) was higher than females (15.5 %), with overweight and obesity prevalence in males 11.0 % vs. 4.7 % and that in females 10.2 % vs. 5.3 %. However, being male or female had no association with being overweight or obese ($p > 0.05$). The mean BMI of the pupils was 20.82 ± 4.71 Kg/m^2. The mean age for the study participants was 11.70 ± 1.46 years, with children from the public schools were significantly much older than those in the private schools (12.25 ± 1.60 years vs. 11.23 ± 1.15 years, $p < 0.001$).

4. The highest proportion of overweight (10.7 %) and obesity (5.7 %) was observed among those aged less than 12 years 40 (9-11). This difference, however, was significant with overweight ($p < 0.05$).

6.2 Dietary Habits/Patterns

8. Majority of the pupil (47.4 %) consumed breakfast sometimes. Significantly, more public school pupils (53.2 %) consumed breakfast sometimes while pupils in private school consume breakfast more often and always (61.3 and 75.0 %).

9. Less than half (48.5 %) sometimes carried home-cooked meal to school, from this 55.0 % of pupils in public schools carried home-cooked meal to school, whereas 67.6 % and 75.0 % of private school pupil often and always carried home-cooked foods to school (p-value = <0.001)

10. Only 39.1 and 34.8 % of the participants sometimes and always purchased food from school premises. Significantly, private school pupils sometimes and often purchased food sold on school premises (63.6 and 53.7 %). More public-school people always purchased meals sold on school premises (60.0 %).

11. Higher proportions of the pupils (44.8 %) sometimes made food purchases outside the school, out of this number more private school pupils significantly made food purchases outside school and often (54.7 and 69.6 %), whereas more public-school pupils always made food purchases outside the school (88.9 %).

12. More pupils consumed the meals provided through the school feeding program sometimes and always (44.8 and 10.9 %). 97.4 %, 100 % and 100 % sometimes, often, and always consume meals provided through the school feeding program (p-value=<0.001).

13. Snack products made from flour and fruit were the two products consumed by participants mostly as snacks (34 and 29.2 %). Significantly, a higher proportion of pupils in private schools consumed more flour products, carbonated drinks, fruit, and other food products than those in public schools (55.8, 59.6, 65.0, and 100 %). Pupils in public schools only consumed sweets products more frequently than those in private schools (60.8 %).

14. More than half of the mothers of the study participants employ boiling as the main cooking method (58.3 %) with stewing serving as the second most used method of cooking (27.3 %). Frying, stewing, and roasting was mostly employed by mothers of participants in the private school (54.5, 68.1, and 100.0 %) whereas mothers of pupil in public school frequently boiled their foodstuff (53.9 %).

6.2.1 Dietary Diversity

15. All the participants consumed one or more of the various food items, only a few of the study participants (4.8 %) consumed food from the higher dietary group, 47.7 % and 47.4 % of the pupil consumed foods from medium and low dietary diversity group.

16. More of the pupil in the private schools consumed diverse food, thus falling within the higher dietary group and medium dietary group (62.5, and 66.7 %), as well, compared to pupils who consumed less diverse food group, more public school pupils consumed less diverse food falling within the low dietary diversity group. This was not statically significant. There was no difference in the dietary diversity between schools and between genders.

6.3 Physical activity

17. Higher proportions of participants (58.9 %) for this study spend less than 24 hours of screen time watching television, playing video and computer games.

18. Among the participants, a pupil in private schools spends more time on screen time compared to the pupil in public schools (51.3, 58.3, and 65.4 % vs 48.5, 41.7, and 34.6 %.

19. Among school type, more private school pupils either play computer games/watch TV or assist with household chores during their free time (59.1 and 65.9 % vs 40.9 and 34.1 %.

20. Pupils in public school are more engaged in either playing games that exert energy consumption or sleeping (54.6 and 58.1 % vs 45.4 and 41.9 %).

6.4 Factors Associated with Overweight and Obesity

21. Age, school type, number of siblings, family history, mother's educational level, mother's occupation, father's occupation, how much money given a child for school, consuming meals provided by school feeding program, and the time a child goes to bed were in a significant relationship with being overweight or obese.

22. Being in a public school as student was 65 % less likely to be overweight compared to being in a private school (AOR= 0.65, 95% CI = 0.12 – 1.06, p <0.05).

23. Having a family history of obesity was five times more likely of being associated with overweight compared to the pupil who has no family history of obesity (AOR= 5.33, 95% CI = 1.70 – 16.69, p <0.05).

24. Having a self-employed mother was 69 % less likely to be overweight compared to a pupil whose mothers were employed in the government sector (AOR= 0.69, 95% CI = 0.10 – 0.99, p <0.05).

25. Eating snacks sometimes at lunch was 9 times more likely to be associated with overweight compared to the pupil who always consumed snacks at lunchtime (AOR= 9.02, 95% CI = 1.61 – 20.05, p <0.05)

26. Buying food on school premises was 92 % more likely to be overweight compared to those who always bought food on school premises (AOR= 0.92, 95% CI = 1.61 – 20.05, p <0.05).

27. Attending public school was 89 % less likely of being obese whereas having a family history of obesity was almost 4 times more likely of being obese.

28. Attending public school was 89 % less likely of being obese whereas having a family history of obesity was almost 4 times more likely of being obese (AOR= 0.89, 95% CI = 0.020-0.635, p <0.05).

29. Pupils who always ate the last meal at 4 pm was found to be 5 times more likely of been associated with obesity compared to the pupil who ate their last meal after 6 pm (AOR= 5.34, 95% CI = 2.34 – 6.10, p <0.05).

30. Pupil who slept around 8 pm were 91 % less likely to be overweight when compared to pupils who slept after 9 pm (AOR= 0.92, 95% CI = 1.61 – 20.05, p <0.05).

6.5 Conclusions

This study was aimed to determine the prevalence of obesity in children (9-15 years) and its associated factors among pupils of two basic schools in the Effutu Municipality of Ghana. A total number of 333 primary school pupils were used for the study. Findings from the study revealed that childhood overweight/obesity in the Effutu Municipality is of public health concern, among respondents 10.5 % were overweight and 5.1 % were obese. The type of school was found to be predictor of childhood

obesity, overweight and obesity prevalence was higher in private schools compared to public schools (21.1 % vs. 9.1 %).

Among the various socio-demographic factors which tested, the age of respondents, number of siblings, family history of obesity, educational attainment of their mothers and occupation of their mothers, and how much money given them were the factors that were significantly associated with overweight/obesity at the bivariate level while family history of obesity and occupation their mothers were significantly associated with overweight/obesity at the multivariate level. It was also observed that pupils getting meals from school feeding program, and the time they went to bed was significantly associated with overweight/obesity at bivariate level where as consuming snack at lunch, buying food on school premises, last meal time and time they went to bed were significantly associated with overweight/obesity at the multivariate level. Out of the various physical activity factors tested, only school activities programs in school were found to be associated with overweight/obesity. With these results, it means that overweight/obesity is a prominent public health issue of concern in the Effutu Municipality, primarily among private and public-school pupils.

6.6 Recommendations

Considering the findings of the study, the following recommendations are made.

1. Parents of pupils in private schools need to be educated about the prevalence of overweight/obesity in their wards, the consequences of overweight/obesity in the life of their wards. This would go a long way help the parent to reduce the obesogenic environment around their kids as well control the type of food their wards consume.

2. The quality of food provided to public school pupil through the school feeding program need to be reviewed by the Ministry of Education, Ministry of Health, Ministry of Agriculture, Local Government, Social Welfare, Poverty Reduction, Gender and Children Committees and the cooks in the various schools, the food needs to meet the nutritional needs of the pupil and also should provide the right quantities of the meal for each pupil.

   ii. The cooks in public schools and parents should be educated on the need and how to select foods from the food groups in order to make sure that a child has diversified diet.

3. Physical activity programs should be enforced in the various schools by Ghana Education Service (GES), especially for children aged below 12 years as they are more likely to be overweight/obese compared to those above 12 years. Physical activities have a positive association with energy expenditure within pupils, building strong culture in engaging in physical activities will go a long way to help the pupil in their adult life to engage in physical activities.

4. Parents are also encouraged to limit children's video, television watching and computer use.

6.7 Areas for Further Research

1. There should be a study on the use of seven days food frequency questionnaire to identify overweight/obese pupil in Effutu Municipality.

2. There should be a qualitative study to assess the obesogenic environment children are exposed to at home, school and other places, and how this obesogenic environment impacts the prevalence of overweight/obesity in school people
3. There should be qualitative study on the use of other sophisticated method to study energy expenditure in school people when in school and at home, and how this impact their chances of being overweight or obese.
4. There should also a study on the nutrient analysis and other clinical methods of determining childhood overweight and obesity.

REFERENCES

Adebimpe, W. O. (2019). Prevalence and knowledge of risk factors of childhood obesity among school-going children in Osogbo, South-Western Nigeria. *Malawi Medical Journal*, *31*(1), 19–24.

Agyei-Mensah, T., & Aikens, A. (2010). Forbidden fruit: does thinking about a prohibited food lead to its consumption? *International Journal of Eating Disorder, 29*(3), 319-327.

Aheto, J. M. K., & Dangne, G. A. (2021). Geostatistical analysis, web-based mapping, and environmental determinants of under-5 stunting: evidence from the 2014 Ghana Demographic and Health Survey. *The Lancet Planetary and Health, 5*(6), e347-e355.

Ahrense, Saarinen, M., Niinikoski, H, & Rönnemaa, T. (2011). Dietary and lifestyle counselling reduces the clustering of overweight-related cardiometabolic risk factors in adolescents. *Acta Paediatrica, 99*(6), 888-895.

Ajzen, I. (1988). *Attitudes, personality, and behaviour*. Dorsey Press.

Ajzen, I. (1991). *Theory of planned behaviour.* Dorsey Press.

Akbari, F., Bellissimo, N., & Azadbakht, L. (2015). Dietary diversity score and obesity: a systematic review and meta-analysis of observational studies', *European Journal of Clinical Nutrition*, *3*(5), 1–9.

Akowuah, P. K., & Kobia-Acquah, E. (2020). Childhood obesity and overweight in Ghana: A systematic review and meta-analysis. *Journal of Nutrition and Metabolism, 6*(6), 1–11.

Alangea, D. O. (2014). *Determinants of obesity among basic school pupils in the Ga-East Municipality*. University of Ghana.

Almutairi, N. S., Burns, S., & Portsmouth, L. (2021). Identifying factors associated with overweight and obesity among intermediate school students aged 12–15 years in school settings: Mixed methodology protocol. *BMJ, 2*(11), 1–8.

Alqahtam, A., & Scott, O. (2015). Overweight in school-aged children and its relationship with demographic and lifestyle factors: results from the WHO-Collaborative Health Behaviour in School-aged Children (HBSC) study. *International Journal of Public Health, 54*(2), 167-179.

Alturki, Q. (2015). Childhood obesity and food intake. *World Journal of Pediatrics, 11*(2), 101-107.

America Academy of Pediatrics. (2014, July). *About childhood obesity.* America Academy of Pediatrics.

Amidu, H., Ibeanu, V., Onuoha, N., & Ejekwu, A. (2012). Prevalence of overweight, obesity, and thinness among urban school-aged children and adolescents in southern Nigeria. *Food and Nutrition Bulletin, 33*(4), 242-250.

Amissah, A. A., Mensah, J., & Mensah, J. V. (2021). Prevalence of childhood obesity and its socio- psychological effects on primary school children in the Cape Coast Metropolis, Ghana. *International Journal of Research Granthaalayah, 9*(2), 216–228.

Amoh-Yeboah, A. B. (2017). *Factors associated with childhood overweight and obesity in school children in Sekondi- Takoradi Metropolis.* University of Ghana.

Arimond, M., Wiesmann, D., Becquey, E., Carriquiry, A., Daniels, M. C., Deitchler, M., & Et al. (2010). Simple food group diversity indicators predict micronutrient adequacy of women's diets in 5 diverse, resource-poor settings. *The Journal of Nutrition*, *140*(11), 2059-2069.

Armar-Klemesu, M., Tatone-Tokuda, F., Pérusse, D., Hjelmborg, J, & Martin, N. G. (2000). Genetic and environmental contributions to weight, height, and BMI from birth to 19 years of age: an international study of over 12,000 twin pairs. *PLOS One, 7*(2), 1-13.

Aryeetey, R. Lartey, A., Marquis, G. S., Nti, H., Esi, C., & Brown, P. (2017). Prevalence and predictors of overweight and obesity among school-aged children in urban Ghana. *BMC Obesity, 4*(38), 1–8.

Azadbakht, L., & Esmaillzadeh, A. (2011). Dietary diversity score is related to obesity and abdominal adiposity among Iranian female youth. *Public Health Nutrition, 14,* 62–69.

Azadnajafabad, S., Mohammadi, E., Aminorroaya, A., Fattahi, N., Rezaei, S., Haghshenas, R., & Et al. (2021). Non-communicable diseases' risk factors in Iran; a review of the present status and action plans. *Journal of Diabetes and Metabolic Disorders*, 1-9.

Babbie, V. K. (1989). *Research in education.* Prentice Hall.

Bernal R. J., Lorenzana, & Albert, P. (2003). Dietary diversity and associated factors among beneiciaries of 77 child care centers: Central Regional, Venezuela. *Arch Latinoam Nutrition, 53,* 52-58.

Bezerra, I. N., & Sichieri, R. (2011). Household food diversity and nutritional status among adults in Brazil. *International Journal of Behaviour, Nutrition, and Physical Activity, 8,* 22-32.

Bhadoria, A. S., Sahoo, K., Sahoo, B., Choudhury, A. K., Sufi, N. Y., & Kumar, R. (2015). Childhood obesity: Causes and consequences. *Journal of Family Medicine and Primary Care, 4*(2), 187-197.

Birch, I. S. (1999). Genetic, molecular and physiological insights into human obesity. *European Journal of Clinical Investigation, 41*(4), 451- 455.

Biswas, K., Buchholz, A., Obeid, N., & Flament, M. F. (2017). Body dissatisfaction, dietary restraint, depression, and weight status in adolescents. *Journal of School Health, 80*(4), 186-192.

Bleich, A., Chan, K., & Pence, D. (2007). Real men do not read labels: The effects of masculinity and involvement on college students' food decisions. *Journal of American College Health, 55*(2), 91-98.

Bogdan, A., & Biklen, A. (1989). *Social research methods* (2nd ed.). Oxford University Press.

Borg, J., & Gall, J. (2006). *Research in education*. Prentice Hall.

Browne, R. H. (1995). On the use of a pilot sample for sample size determination. *Statistics in Medicine, 14*(17), 1933–1940.

Buzzard, J. (1998). The economics of childhood obesity. *Health Affairs, 29*(3), 364-371.

Caballero, J. (2007). Why do kids eat healthful food? Perceived benefits of and barriers to healthful eating and physical activity among children and adolescents. *Journal of American Dietary Association, 103*(4), 497-501.

Campbell, T., & Campbell, A. (2007). Emerging disease burdens and the poor in cities of the developing world. *Journal of Urban Health*, 84(S1), 54–64.

Cawley, R., & Spies, C. (2018). Body mass index, academic achievement, and school context: Examining the educational experiences of adolescents at risk of obesity. *Journal of Health and Social Behaviour, 45*(4), 393-407.

CDC. (2018). *Centers for Disease Control and Prevention*. Centers for Disease Control and Prevention.

Chirwa, U., Musuku, J., & Pandey, V. K. (2019). Prevalence of obesity and associated risk factors among school children in primary schools in Lusaka, Zambia. *Medical Journal of Zambia*, *46*(2), 90–99.

Choukem, S., Moges, Y., & Tilahun, K. (2020). Epidemiology of obesity and overweight in sub-Saharan Africa: A protocol for a systematic review and meta-analysis. *Nutrition and Metabolism, 7*(11), 1-4.

Choukem, S.-P., Tochie, J. N., Sibetcheu, A. T., Nansseu, J. R., & Hamilton-Shield, J. P. (2020). Overweight/obesity and associated cardiovascular risk factors in sub-Saharan African children and adolescents: a scoping review. *International Journal of Pediatric Endocrinology*, *20*(1), 56-87.

Cole, A., Auld, M. C., & Powell, L. M. (2002). Economics of food energy density and adolescent body weight. *Economica, 76*(304), 719-740.

Cole, B., Divers, J, & Liese, A. D. (2002). Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2002. *JAMA, 311*(17), 1778-1786.

Cole, N., Beydoun, M. A. & Wang, Y. (2002). Meat consumption is associated with obesity and central obesity among US adults. *International Journal of Obesity, 33*(6), 621-628.

Cole, T. J. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ, 320*(7244), 1240–1240.

Craig, E., Aide, D., & Didier, A. (2014). Use of mid-upper arm circumference for determining overweight and overfatness in children and adolescents. *Archives of Disease in Childhood, 99*(8), 763–766.

Craig, R. (2013). Gender, obesity, and Education. *Sociology of education, 80*(3), 241-260.

Creswell, J. W. (2012). *Personal copy: Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Pearson Education, Inc.

Dadson, A. (2012). *Population and Housing Census*. Ghana Statistical Service.

Dake, L., St. Laurent, R., & Segal, L. M. (2011). *F as in Fat: How obesity policies are failing in America 2011.* Press.

Daniels, S., Passaro, D., & Hershow, R. (2005). A potential decline in life expectancy in the United States in the 21st century. *Medicine, 352*(11), 1138-1145.

De Almeida, C. A., Del Ciampo, L. A., Ricco, R. G., Silva, Jr. S. M., Naves, R. B., & Pina J. F. (2003). Assessment of mid-upper arm circumference as a method for obesity screening in preschool children. *Journal of Pedriatrics, 79*(5), 455-460.

Dehghar, M., Akhtar-Danesh, N., & Merchant, A. T. (2005). Restricting access to foods and children's eating. *Appetite, 32*(3), 405-419.

Dewey, K. (2003). *Guiding principles for complementary feeding of the breastfed child.* Pan American Health Organization/World Health Organization.

Eknoyan, G. (2006). History a history of obesity, or how what was good became ugly and then bad. *Advances in Chronic Kidney Disease, 13*(4), 421–427.

Endalifer, M., & College, J. (2020). Are fast food restaurants an environmental risk factor for obesity? *International Journal of Behavioural Nutrition and Physical Activity, 3*(1), 1-12.

Ewald, M., & Haldeman, H. B. (2016). A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology, 51*(3), 629-642.

FAO. (2011). Genetic markers of obesity risk: stronger associations with body composition in overweight compared to normal-weight children. *PlosOne, 6*(4), 1-10.

Forrest, K. Y.-Z., Bunker, C. H., Kriska, A. M., Ukoli, F. A. M., Huston, S. L., & Markovic, N. (2001). Physical activity and cardiovascular risk factors in a developing population. *Medicine & Science in Sports & Exercise, 33*(9), 1598–1604.

Frah, K.F. (2017). Reading, writing, and refreshments: Are school finances contributing to children's obesity? *Journal of Human Resources, 41*(3), 467- 494.

Franco, M., Sanz, B., Otero, L., Dominguez-Vila, A. & Caballero, B. (2010). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *JAMA, 291*(23), 2847-2850.

Ganle, J. K., Boakye, P. P., & Baatiema, L. (2019). Childhood obesity in urban Ghana: evidence from a cross-sectional survey of in-school children aged 5–16 years. *BMC Public Health, 19*(1564), 1–12.

Ganle, J. K., Boakye, P. P., & Baatiema, L. (2019a). Childhood obesity in urban Ghana:evidence from a cross-sectional survey of in-school children aged 5–16 years. *BMC Public Health, 19*(1), 89-98.

Ganle, J. K., Boakye, P. P., & Baatiema, L. (2019b). Childhood obesity in urban Ghana: Evidence from a cross-sectional survey of in-school children aged 5–16 years. *BMC Public Health, 19*(1), 78-82.

Gebremedhin S. (2015). Prevalence and differentials of overweight and obesity in preschool children in Sub-Saharan Africa. *Journal of Public Health Research, 5*(12), 1-10.

Ghana Nutrition Assessment. (2013). *Counselling, and Support (NACS) Training Materials for Facility-Based Service Providers*. Ghana Nutrition Assessment

Ghana School Survey (2012). *Nutritional and Obesity report of the Ghana School Survey Results*. Dissemination Workshop.

Girma, B., Nula, S., & Aikins, D. (2020). Performance of mid-upper arm circumference as a screening tool for identifying adolescents with overweight and obesity. *PlusOne, 15*(6), 1–13.

Global Nutrition Report. (2021). *Nutrition Standards for Foods in Schools: Leading the Way Toward Healthier Youth.* The National Academies Press.

Gupta, A., Kambondo, G., & Sartorius, B. (2012). Risk factors for obesity and overfat among primary school children in Mashonaland West Province, Zimbabwe. *International Journal of Environmental Research and Public Health, 15*(2), 249-259.

Guthrie, C. B., Pawlak, D. B., & Ludwig, D. S. (2002). Childhood obesity: public-health crisis, common sense cure. *The Lancet, 360*(9331), 473- 482.

Habte, J. Y., & Krawinkel, S. J. (2016). Childhood obesity and food intake. *World Journal of Pediatrics, 11*(2), 101-107.

Himes, J., & Dietz, S. (1994). *A link between maternal and childhood obesity*. Childhood Obesity Academic Press.

Hossain, Carroll, M., & Flegal, K. (2007). High body mass index for age among US children and adolescents, 2003-2006. *JAMA, 299*(20), 2401-2405.

Ickovics, V., Maes, L., & Vereecken, C. (2019). Risk factors for childhood overweight: A 30-month longitudinal study of 3-to 6-year-old children. *Public Health Nutrition, 17*(9), 1993- 2000.

Istrate, A.-L., & Chen, F. (2021). *Liveable streets in Shanghai: Definition, characteristics and design.* Progress in Planning.

James, W. P., Mascie-Taylor, G. C., Norgan, N. G., Bistrian, B. R., Shetty, P. S., & Ferro-Luzzi, A. (1994). The value of arm circumference measurements in assessing chronic energy deficiency in Third World adults. *European Journal of Clinical Nutrition, 48*(12), 883–894.

Jayawardena, R., Musa, D., & Razak, T. (2013). High dietary diversity is associated with obesity in Sri Lankan adults: An evaluation of three dietary scores. *BMC Public Health, 13*(314), 1–8.

Johnson, A., & Ziolkowski, G. A. (2006). School-based body mass index screening program. *Nutrition Today, 41*(6), 274–279.

Jumbo-Uzosike, H. (2017). *Childhood obesity and academic achievement.* Doctoral Dissertation, University of Wisconsin-Madison.

Kabbaoui, M., Simpson, F., & Mordecai, A. (2018). Prevalence of and risk factors for overweight and obesity among adolescents in Morocco. *EMHJ, 24*(6), 99-108.

Kakri, M., Shrestha, C., & Subedi, K. (2019). Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA, 295*(13), 1549-1555.

Kamadjeu, R. M., Edwards, R., Atanga, J. S., Kiawi, E. C., Unwin, N., & Mbanya, J.-C. (2006). Anthropometry measures and prevalence of obesity in the urban adult population of Cameroon: An update from the Cameroon Burden of Diabetes Baseline Survey. *BMC Public Health, 6,* 228.

Kennedy, G. L., Pedro, M. R., Seghieri, C., Nantel, G., & Brouwer, I. (2007). *Dietary Diversity Score Is a Useful Indicator of Micronutrient Intake in Non-Breast-Feeding Filipino.* Harvard Press.

Kennedy, G., Ballard, T., & Dop, M.-C. (2011). Guidelines for measuring household and individual dietary diversity. FOA

Knowles, J. (1970). *Doing your research project: A guide for first time researchers in education, health and social sciences*. (4th ed.). Maidenhead.

Kreks, M., Blössner, M., & Borghi, E. (2007). Global prevalence and trends of overweight and obesity among preschool children. *The American Journal of Obesity, 3*(9), 65-72.

Kubuacha, H. (2021). *Qualitative research methods for the social sciences.* Pearson.

Kumah, Boniface, D. R., & Wardle, J. (2015). Trends in physical activity and sedentary behaviour in adolescence: ethnic and socioeconomic differences. *British Journal of Sports Medicine, 41*(3), 140-144.

Kuranchie, J. (2016). *Research in education*. Prentice Hall, Inc.

Larson, B. H., Mousoulis, C., Uthman, O. A., & Robertson, W. (2007). Socio economic status and overweight or obesity among school-age children in sub-Saharan Africa–a systematic review. *Clinical Obesity, 6*(1), 19-32.

Liberali, I. G., Kupek, L. D., & Alice, L. (2020). Determinants of takeaway and fast-food consumption: A narrative review. *Nutrition Research Reviews, 31*(1), 16-34.

Livingstone, U. (2001). *School Nutrition Dietary Assessment Study-III: Summary of Findings*. Harvard Press.

Lopez, A. D., Mathers, C. D., Ezzati, M., Jamison, D. T., & Murray, C. J. (2006). Global and regional burden of disease and risk factors, 2001: Systematic analysis of population health data. *The Lancet, 367*(9524), 1747–1757.

Lu Q, Wang, R., Lou, D. H., Ma, C. M., Liu, X. L., & Yin, F. Z. (2014). Mid-upper-arm circumference and arm-to-height ratio in evaluation of overweight and obesity in Han children. *Paediatric Neonatology, 55*(1), 14–19.

Marques, A., Anderson, P. M., & Butcher, K. F. (2013). Childhood obesity: Trends and potential causes. *The Future of Children, 16*(1) 19-45.

McDonald, C. M., Ana, B., Joanne, E., Arsenault, M. M.-P., & Edward, V. (2018). Overweight is more prevalent than stunting and is associated with socio economic status, maternal obesity and snacking dietary pattern in school children from Bogota, Colombia. *The Journal of Nutrition, 139*(2) 370-376.

Mello, M., Fulkerson, J., & French, S. (2010). Factors in the school cafeteria influencing food choices by high school students. *Journal of School Health, 72*(6), 229-234.

Mirmiran, M., Godeau, E., Vignes, C., & Ahluwalia, N. (2010). Sociodemographic and lifestyle factors associated with overweight in a representative sample of 11–15-year-olds in France: results from the WHO-Collaborative Health Behaviour in School-aged Children (HBSC) cross-sectional study. *BMC Public Health, 11*(1), 442-452.

Mitchell, B. (2011). The global epidemic of obesity: an overview. *Epidemiologic Reviews, 29*(1), 1-5.

Mitchell, M. M. (2014). *The influence of weight status on the link between television viewing and food intake in children*. Doctoral Dissertation, University of Ottawa.

Mogre, Bélanger, P., LeBlanc, A. G, & Chaput, J. P. (2013). Independent and combined associations of total sedentary time and television viewing time with food intake patterns of 9-to 11-year-old Canadian children. *Applied Physiology, Nutrition, and Metabolism, 39*(8), 937-943.

Mohammed, F.M., & Vuvor, M. (2012). Childhood obesity and adult morbidities. *American Journal of Clinical Nutrition, 91,* 1499S-1505S.

Moore, B., Karnik, S., & Kanekar, A. (2010). Childhood obesity: a global public health crisis. *International Journal of Preventive Medicine, 3*(1), 1-7.

Moursi, M. M., Arimond, M., & Dewey, K. G. (2008). Dietary diversity is a good predictor of the micronutrient density of the diet of 6- to 23-monthold children in Madagascar. *Journal of Nutrition, 138*(12), 2448–2453.

Muhammad, A., Muhammad, A., & Saima, A. (2018). Use of mid-upper arm circumference in evaluation of overweight and obesity in the Pakistani children and adolescents aged 12-18 years. *Pakistan Pediatric Journal, 42*(1), 42–47.

Musa, D. I., Toriola, A. L., Monyeki, M. A., & Lawal, B. (2012). Prevalence of childhood and adolescent overweight and obesity in Benue State, Nigeria. *Tropical Medicine & International Health*, *17*(11), 1369–1375.

Nasredine, P.R., Keast, D. R., Radcliffe, J. D. & Cho, S. (2017). The relationship of skipping and type of breakfast consumption with nutrient intake and weight status in children and adolescents: The national health and nutrition examination survey 1999-2006. *Journal of the American Dietetic Association, 110,* 869-878.

Nethan, S., Sinha, D., & Mehrotra, R. (2017). Non communicable disease risk factors and their trends in India. *Asian Pacific Journal of Cancer Prevention*, 18(7), 20-25.

Neumann, C., Harris, D. M., & Rogers, L. M. (2002). Contribution of animal source foods in improving diet quality and function in children in the developing world. *Nutrition Research, 22*(1–2), 193–220.

Niehoff, V. (2009). Childhood Obesity: A Call to Action. *Bariatric Nursing and Surgical Patient Care, 4*(1), 17–23.

Obirikorang, C., Anto, E. O., Ngala, R. A., & Gyamfi, E. (2015). The prevalence of childhood obesity and lifestyle-associated risk factors using anthropometric measurements among primary schools in the Kumasi Metropolis, Ghana. *JAMA, 4,* 13–23.

Ogden, K. M., Kit, B. K., & Ogden, C. L. (2014). Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *Jama, 307*(5), 491-497.

Ogunjimi, M., Lowis, C., & Robson, P. (2010). It's good to talk: Children's views on food and nutrition. *European Journal of Clinical Nutrition, 59*(4), 542- 551.

Omer, N. (2015). Dietary Variety. *American Journal of Preventive Medicine, 49*(6), 974–979.

Pan American Health Organization (PAHO) (2003): *Guiding principles for complementary feeding of the breastfed child.* PAHO.

Perpich, M. L., Russ, N., Rizzolo, E., & Sedrak, B. (2011). Engaging intergenerational Hispanics/Latinos to examine factors influencing childhood obesity using the PRECEDE–PROCEED Model. *Maternal and Child Health Journal, 23*(9), 802–810.

Pinhas-Hamiel, N., & Zeith, A. (2005). Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. *Nutrition Reviews, 73*(10), 643-660.

Pollock, L. E. (2006). *Child development* (5th ed.). Boston: Allyn and Bacon.

Popkin, S. R. (2006). The consequences of childhood overweight and obesity. *The Future of Children, 16*(1), 47-67.

Prentice, A. (2006). The role of socio-demographic variables and their interaction effect on obesity. sense of coherence. *SA Journal of Industrial Psychology, 39*(1), 1-9.

Rambaran, N., Goel, K., Shah, P., & Misra, A. (2021). Childhood Obesity in Developing Countries: Epidemiology, Determinants, and Prevention. *Endocrine Reviews, 33*(1), 48–70.

Rampersaud, R., Cowan, M. J., Autenrieth, C. S., Kann, L., & Riley, L. M. (2005). Physical activity and sedentary behavior among schoolchildren: A 34-country comparison. *The Journal of Pediatrics, 157*(1), 43-49.

Reilly, J., & Kelly, V. (2011). Preventing childhood obesity: Health in the balance: executive summary. *Journal of American Dietary Association, 105*(1), 131-138.

Robinson, D., Horacek, T., & Betts, N. (2013). Students cluster into 4 groups according to the factors influencing their dietary intake. *Journal of American Dietary Association, 98*(12), 1464-1467.

Romanelli, A., Sturm, R., & Magnabosco, J. L. (2020). Childhood overweight and academic performance: National study of kindergartners and first graders. *Obesity Research, 12*(1), 58-68.

Ruel MT. (2003) Operationalizing dietary diversity: A review of measurement issues and research priorities. *Journal of Nutrition, 133*(11), 3911S–3926.

Ruel, M., Graham, J., Murphy, S. & Allen, L. (2004). *Validating simple indicators of dietary diversity and animal source food intake that accurately reflect nutrient adequacy in developing countries.* WHO.

Sanyaolu, De Onis, M., & Borghi, E. (2019). Global prevalence and trends of overweight and obesity among preschool children. *The American Journal of Clinical Nutrition, 92*(5), 1257- 1264.

Sashindram, D., & Dudeja, P. (2020). The Role of Food Perceptions in Food Use. *Current Concepts on Nutrition, 16,* 53-78.

Schwimmer, J. B., Burwinkle, T. M., & Varni, J. W. (2003). Health-related quality of life of severely obese children and adolescents. JAMA, 289(14), 1813–1819.

Se, I., & Greene, D. (2018). Comparison of overweight and obesity prevalence in school aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity Reviews, 6*(2), 123-132.

Sealey-Potts, C. (2014). An assessment of Dietary Diversity and Nutritional Status of Preschool Children. *Food Science, 2*(7), 1–5.

Sivrikaya, A., Mandesh, A., & Semahegn, A. (2019). Childhood overweight, obesity and associated factors among primary school children in Dire Dawa, Eastern Ethiopia; A cross-sectional study. *BMC Obesity, 4*(1), 20-30.

Steyn, N., Nel, J., Nantel, G., Kennedy, G., & Labadarios, D. (2006a). Food variety and dietary diversity scores in children: Are they good indicators of dietary adequacy? *Public Health Nutrition, 9*(5), 644–650.

Steyn, N., Nel, J., Nantel, G., Kennedy, G., & Labadarios, D. (2006b). Food variety and dietary diversity scores in children: Are they good indicators of dietary adequacy? *Public Health Nutrition, 9*(5), 644–650.

Talat, M. A., & Shahat, E. E. (2016). Prevalence of overweight and obesity among preparatory school adolescents in Urban Sharkia Governorate, Egypt. *Egyptian Pediatric Association Gazette, 64*(1), 20–25.

Tanner, C. J., Barakat, H. A., Dohm, G. L., Pories, W. J., MacDonald, K. G., & Cunningham, P. R. (2002). Muscle fiber type is associated with obesity and weight loss. *Endocrinology Metabolism, 282*(6), 1191–1196.

Terry, I. (2016). Genetics of obesity. *Journal of Clinical Research in Peadiatric Endocrinology, 1,* 54–57.

Theory of Planned Behaviour (TPB) and Hypertension Prevention. (2021). *Chronic Diseases.* World Health Organization.

Trasande, L. J., & Chatterjee, R. L. (2012). Do neighbourhoods matter? A systematic review of modifiable risk factors for obesity among low socio-economic status Black and Hispanic Children. *Childhood Obesity, 15*(2), 71-86.

Trogdon, C., Flegal, K., Carroll, M., & Johnson, C. (2012). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA, 288*(14), 1728- 1732.

Tunstall-Pedoe, H. (2006). *Preventing Chronic Diseases. A Vital Investment: WHO Global Report.* World Health Organization.

Turton P. (1985). The use of mid upper arm circumference in the assessment of nutritional status: The Mursi. *Midwife Health Visit Community Nurse, 21,* 81-86.

Valean, C, Tatar, S, Nanulescu, M., Leucuta, A., & Ichim G. (2009) Prevalence of obesity and overweight among school children in Cluj-Napoca. *Acta Endocrinological, 5,* 213 – 219.

Valenzise, M., D'Amico, F., Cucinotta, U., Lugarà, C., Zirilli, G., Zema, A., Wasniewska, M., & Pajno, G. B. (2021). The lockdown effects on a pediatric obese population in the COVID-19 era. *Italian Journal of Pediatrics*, *47*(1), 209-216.

Valenzise, U., Croll, J., Neumark-Sztainer, D., & Story, M. (2001). Healthy eating: what does it mean to adolescents? *Journal of Nutrition Education, 33*(4), 193-198.

Van, Y., Zhu, X., & Wu, X. (2016). Overweight, obesity, and screen-time viewing among Chinese school-aged children: national prevalence estimates from the 2016 Physical Activity and Fitness in China. The Youth Study. *Journal of Sport and Health Science, 6*(4), 404-409.

Victoria, M., Lytle, L., & Story, M. (2008). Schoolwide food practices are associated with body mass index in middle school students. *Medicine, 159*(12), 1111-1114.

Villamor, E., Msamanga, G., Urassa, W., Petraro, P., Spiegelman, D., Hunter, D. J., & Fawzi, W. W. (2006). Trends in obesity, underweight, and wasting among women attending prenatal clinics in urban Tanzania, 1995–2004. *The American Journal of Clinical Nutrition, 83*(6),1387–1394.

Wang, Y., & Lim, H. (2012). The global childhood obesity epidemic and the association between socio-economic status and childhood obesity. *International Review of Psychiatry, 24*(3), 99-106.

Warren, G. D., Goryakin, Y., Fumagalli, E., & Suhrcke, M. (2010). Obesity and socioeconomic status in developing countries: A systematic review. *Obesity Reviews, 13*(11), 1067-1079.

WHO. (2004). *Measuring children's height and weight accurately at home.* WHO.

WHO. (2006). *Childhood obesity*. WHO.

WHO. (2008). *Indicators for assessing infant and young child feeding practices: Part 1 Definitions. Conclusions of a consensus meeting held 6–8 November 2007 in Washington D.C*. Geneva World Health Organization

WHO. (2010a). *Nutrition, physical activity and obesity*. WHO.

WHO. (2018). *Measuring children's height and weight accurately at home.* WHO.

WHO. (2021b). *Non-communicable diseases*. World Health Organization

Whyte, E., Jacoby P., & Zubrick S.R (2020). The role of family and maternal factors in childhood obesity. *Journal of Medicine and Community, 186*(11), 591-595.

Yee, J., Hospers, H., & Kok, J. G. (2017). Differences in psychosocial factors and fat consumption between stages of change for fat reduction. *Psychology and Health, 12,* 719-727.

Zariba, L. B., Bull, F. C., Guthold, R., Haskell, W., Ekelund, U., & Lancet Physical Activity Series Working Group. (2009). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *The Lancet, 380*(9838), 247-257.

APPENDICES

APPENDIX A

QUESTIONNAIRES

UNIVERSITY OF EDUCATION, WINNEBA

HOME ECONOMICS FACULTY

DEPARTMENT OF FOOD AND NUTRITION EDUCATION.

ASSESSING THE PREVALENCE AND DETERMINANTS OF CHILDHOOD OVERWEIGHT AND OBESITY AMONG BASIC SCHOOL PUPILS IN EFFUTU MUNICIPALITY.

I am a graduate student from University of Education, Winneba. This questionnaire is designed to enable me collect data for my research work on the topic: **"assessing the prevalence and determinants of childhood overweight and obesity among basic school pupils in Effutu municipality"** as part of the requirement for the Master of Philosophy in Home Economics Education.
Your candid and objective responses will constitute a strong empirical basis for the study. You are kindly requested to respond as objectively as possible to the items in the questionnaire. Confidentiality in respect of whatever information you may give is fully assured.

PART A

Socio-Demographic Characteristics of Participants.

1. **School type**

Public [ ]
Private [ ]

2. **Child's Gender**:

Female [ ]
Male [ ]

3. **Child's date of birth**

Day/month/Year [ ] / [ ] /[ ]

4. Child's Age [ ]

5. Number of siblings [ ]

6. Area of Residence

Rural [ ]
Peri-urban [ ]
Urban [ ]

7. Type of housing

Compound/ courtyard [ ]
Flat/ self-contained [ ]
Others…….

8. Family history of obesity:

Yes [ ]
No [ ]

9. Mother's educational background

None [ ]
Basic [ ]
Secondary [ ]
Tertiary [ ]

10. Father's educational background

None [ ]
Basic [ ]
Secondary [ ]
Tertiary [ ]

11. Mother's occupation

Unemployed [ ]
Self-employed [ ]
Government worker [ ]

12. Father's occupation

Unemployed [ ]
Self-employed [ ]
Government worker [ ]

13. How much money are you given a day to school?

None [ ] < ₵1.00 [ ]
₵ 1.00 – ₵4.00 [ ] ₵ 5.00 and above [ ]

PART B

Dietary habit of basic school pupils in Effutu Municipality?

14. How many times do you eat in a day?

[ ] once [ ] twice
[ ] 3 times [ ] more than 3 times

15. State how often you do the following by ticking always, often, sometimes, or never.

	Always	Often	Sometimes	Never
How often do you eat breakfast before coming to school?				
How often do you take snacks at these times?				
First break				
Lunch time				
Before bed time				
How often do you do the following?				
Bring food from home				
Buy food in school				
Buy food outside the school				
Get food from school feeding programme				

16. Which of the following do you normally take for snack?

[ ] Sweets [ ] Flour products
[ ] Carbonated drinks [ ] Fruits

17. State if any other food is taken as snack……

18. What cooking method do your parent normally use to prepare your food.

[ ] Boiling [ ] Frying
[ ] Stewing [ ] Roasting

19. State if you use any other method…….

20. What time do you eat your last meal of the day?

[ ] 4pm [ ] 5pm
[ ] 6pm [ ] After 6pm

21. What time do you go to bed?

[ ] 7pm [ ] 8pm[ ] 9pm [ ] After 9pm

22. 24-HOUR DIETARY RECALL

Provide all food items consumed on the previous day

Menu	Food
Breakfast	
Mid-morning snack	
Lunch	

Mid-afternoon snack	
Supper	
Evening snack	

Guidelines for measuring individual dietary diversity

S/N	Food group	EXAMPLES	YES=1 NO=2
1	CEREALS	bread, noodles, biscuits, cookies or any other foods made from millet, sorghum, maize, rice, wheat. e.g., bread, porridge or pastes or other locally available grains	
2	VITAMIN A RICH VEGETABLES AND TUBERS	Pumpkin, carrots, squash, or sweet potatoes that are orange inside and other locally available vitamin-A rich vegetables	
3	WHITE TUBERS AND ROOTS	White potatoes, white yams, cassava, or foods made from root.	
4	DARK GREEN LEAFY VEGETABLES	Dark green/leafy vegetables, including wild ones and locally available vitamin-A rich leaves such as cassava leaves, spinach etc.	
5	OTHER VEGETABLES	other vegetables (e.g., tomato, onion, eggplant), including wild vegetables	
6	VITAMIN A RICH FRUITS	ripe mangoes, pawpaw, cantaloupe, dried apricots, dried peaches and other locally available vitamin A-rich fruits and fresh fruit juices from these.	
7	OTHER FRUITS	other fruits, including wild fruits	
8	ORGAN MEAT (IRON RICH)	liver, kidney, heart or other organ meats or blood-based foods	
9	FLESH MEATS	beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
10	EGGS	Eggs from chicken, duck, guinea fowl,	

11	FISH	fresh or dried fish or shellfish	
12	LEGUMES, NUTS AND SEEDS	beans, peas, lentils, nuts, seeds or foods made from these	
13	MILK AND MILK PRODUCTS	milk, cheese, yogurt or other milk products	
14	OILS AND FATS	oil, fats or butter added to food or used for cooking	
15	SWEETS	sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies	
16	SPICES, CONDIMENTS, BEVERAGES	Spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages.	

PART D

Physical activity level of basic school pupils in Effutu Municipality.

23. What means do you use to school?

[ ] walking

[ ] Bicycle

[ ]Transport

[ ] Other ……

24. Does the school offer time for physical activity?

[ ] Yes [ ] No

25.If yes, then in an average week, how many days do you attend physical education class on field?

[ ] 1 day [ ] 2 days

[ ] 3 days [ ] more than 3 days

26.If yes, how long do you engage in the physical activity?

[ ] 30 mins [ ] 45mins

[ ] 1hour [ ]more than 1 hour

27. Apart from the physical education activity in school, do you spend time to engage in any physical activity.

[ ] Yes [ ] No

If yes answer questions 27-28

28. What kind of physical activity do you engage in?

Ampe [ ]

Football [ ]

Athletics [ ]

None [ ]

Other……

29. How long do you engage in that activity in a week?

[ ] 30 minutes
[ ] 1 hour

[ ] 2 hours

[ ] more than 2 hours.

30. How many hours do you spend watching television, playing video and computer games within a week?

[ ] I do not play computer games.

[ ] 24hours

[ ] 48hours

[ ] more than 48hours.

31. What do you do at home during your free time?

[ ] Play with computer or TV

[ ] Assist household chores

[ ] Play games that exert much energy

[ ] Sleep

PART D

Anthropometric measures

32. Weight ……..kg
33. Height ……..m
34. MUAC ……...cm

Form for Parental Consent for Child's Participation

Title: ASSESSING THE PREVALENCE AND DETERMINANTS OF CHILDHOOD OVERWEIGHT AND OBESITY AMONG BASIC SCHOOL PUPILS IN EFFUTU MUNICIPALITY.

RESEARCHER: Patience Amissah (Ms.)

ADDRESS: Department of Food and Nutrition Education, Faculty of Home Economics Education, P.O Box 25, Winneba.

Dear parent/guardian,

Your child has been invited to take part in a study on childhood obesity and overweight. Obesity among children is an issue in most parts of the world, especially in developing countries like Ghana. When children are overweight for their age and height, it is quite likely that they will continue to be overweight into adulthood.

It puts children at risk for noncommunicable diseases including diabetes, hypertension, and other cardiac conditions. We are currently unaware of the scope of the problem in Effutu Municipality. We also don't have a complete knowledge of the elements that contribute to unhealthy weight gain among Effutu Municipal school-aged children. Primary school pupils aged 9 to 15 years will be included in this study, which will take place in both private and public schools.

The goal of this study is to establish the percentage of primary school children who are overweight or obese in the Municipality, as well as the factors that contribute to this

condition. It is believed that the findings of this study will aid in the development of appropriate strategies to assist children in eating healthily and becoming aware of the practices which will help in maintaining a healthy body weight. We will take your child's body weight and height measurements if you agree for them to participate in the study.

The will also ask about the child's dietary habits, as well as his or her degree of physical activity.

Body measurements and questionnaire completion will take place at your child's school within 20 to 30minutes.

This study will only include your child for one day.

RISKS, DISCOMFORTS, AND INCONVENIENT SITUATIONS THAT MAY ARISE

There are no hazards associated with participation in this study because the procedures to be performed are routine. We'll delve into your personal life by asking questions about your date of birth, residence, parents' occupations, educational background, and so on. If you have any concerns, you should speak with the researcher and ask any questions you have.

BENEFITS TO EXPECT

Your child will not benefit directly from this research. However, we believe that taking part in the study will help researchers identify variables linked to overweight and obesity in school-aged children in the municipality as well as develop interventions and strategies to promote healthy eating among them.

CONFIDENTIALITY

Your child's information will be kept strictly confidential and used solely for research reasons. Only the study researcher will have access to your child's identity and/or personal information, which will not be published. The findings of this investigation could be discussed at scientific conferences or published in peer-reviewed journals.

COSTS EXTRA

Your child's participation in this study will not cost you anything.

RIGHT TO WITHDRAW FROM THE STUDY AND VOLUNTARY PARTICIPATION

It is completely voluntary to take part in this study. You or your child can also opt out of your child's involvement in this study.

COMPENSATION

Your child will be given the results of his or her body measurements as well as an interpretation to take home with him or her. In addition, as a thank you for participating in the study, your child will get an exercise book, a pencil, a pen and a ruler.

CONTACT INFORMATION

Please contact the researcher, Patience Amissah on Telephone: 0555710614 or email: amissahpatience93@gmail.com, if you have any questions or concerns concerning this study.

Mrs Linda Gyimah the Supervisor on Tel: 0241810166 or email: lindagyimah17@gmail.com

Mr Guy Eshun the Co Supervisor on Tel: 0245266561.

CONSENT

I declare that I understand everything that has been said regarding the study's objectives and procedures, and that I willingly accept to take part in it.

Signature or thumb print of parent/ guardian ……

Date

……..

Signature of Researcher …….

Date …….

Introduction

Children's obesity is a concern in most regions of the world, particularly in developing countries like Ghana. We want to figure out how to avoid this because it can lead to health issues later in life, particularly in maturity. The duration of your participation in this study will be one day.

General information about the study

If you agree to participate in this study, you will be asked to provide information about yourself and your household, as well as your eating habits and the foods and beverages you have consumed in the previous seven days, your physical activity, and how often you do things like watch television or play video games. We'll measure your height and weight by having you stand on a scale. All information will be collected in your school.

Possible benefits

Your involvement in this study will provide us with more data to help us better understand the factors that contribute to unhealthy weight gain in school-aged children and how we can best avoid it. You will be given the results of your measurements to take home and share with your parents. In exchange for your participation in this study, you will receive an exercise book, a pencil, ruler and a pen.

Risks and Discomforts that Might Occur

Participating in this study poses no risk to you. When you participate in this study, you will not miss any classes, class tests, or exams.

RIGHT TO WITHDRAW FROM THE STUDY AND VOLUNTARY PARTICIPATION

If you are uncomfortable, you can stop participating at any time. If you do not want to participate, no one will be offended.

CONFIDENTIALITY

Your personal information will be kept private. No one will be able to tell how you answered the questions, and your data will be kept anonymous.

CONSENT

I declare that I understand everything that has been said regarding the study's objectives and procedures, and that I willingly accept to take part in it.

Signature or thumb print of parent/ guardian ……

Date

……..

Signature of Researcher …….

Date …….