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(CAES)**

**SCHOOL OF FOOD TECHNOLOGY, NUTRITION AND BIO-ENGINEERING
(SFTNB)**

DEPARTMENT OF FOOD TECHNOLOGY AND NUTRITION

**RISK FACTORS ASSOCIATED WITH CHILDHOOD OVERWEIGHT AND
OBESITY AMONG URBAN SCHOOL CHILDREN AGED BETWEEN 8-13 YEARS
IN KAMPALA**

BY

NAKAGGWA DOROTHY

REGISTRATION NUMBER: 16/U/8471/PS

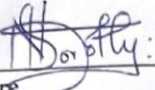
SUPERVISOR: MR. LUKWAGO FRED BRANY

**A SPECIAL PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF BACHELORS OF SCIENCE DEGREE IN
HUMAN NUTRITION AT MAKERERE UNIVERSITY**

AUGUST, 2019

DECLARATION

I NAKAGGWA DOROTHY hereby declare that this is my own original work and has never been submitted before to any institution for academic purposes.




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APPROVAL

This project has been submitted for examination and award of Bachelors of Science degree in Human Nutrition at Makerere University, with the approval of the Supervisor

Signature  Date 19/8/2019

Mr. Lukwago Fred Brany

Supervisor

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DEDICATION

This report is dedicated to my parents Mr. Godfrey Kibirige and Mrs. Ruth Kibirige, and to the Mastercard Foundation Scholars Program at Makerere University.

Thank you for believing in me.

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ACRONYMS

AHA	American Heart Association
BAZ	BMI for Age Z-scores
CVDs	Cardiovascular diseases
EUFIC	European Food Information Council
FANTA	Food and Nutrition Technical Assistance
HBSC	Health Behaviour in School aged Children
LMIC	Low and Middle Income Countries
NCDs	Non Communicable Diseases
P.E	Physical Education
SPSS	Statistical Package for Social Scientists
WHO	World Health Organisation

ABSTRACT

Background: Childhood overweight and obesity has become an issue of concern in both developing and developed countries. Developing countries such as Uganda are faced with a double burden of under nutrition and over nutrition. The issues of overweight and obesity are currently increasing in urban centres compared to the rural areas. This study was conducted to find out the risk factors associated with childhood overweight and obesity among urban school children aged between 8 – 13 years in Kampala.

Methods: The current study employed a cross sectional study design. It involved a sample of 100 participants from randomly selected urban primary schools. Anthropometric measurements of age, weight, height of the selected children were measured according to a standard protocol. The nutrition status of the children was determined by Body-Mass-Index-for-Age Z-scores according to the World Health Organisation (WHO) cut offs points, using WHO AnthroPlus Software. The data was analysed using SPSS V.16 software. The chi-square tests were used to determine the relationship between variables and a statistical significance was set at 95% confidence interval, with a p-value ≤ 0.05 .

Results: The overall prevalence of overweight/obesity was 28%, more girls (20%) were found to be overweight compared to the boys (8%). The private school had a higher prevalence (19%) of overweight/obesity compared to (9%) in the government school. The risk factors significantly associated with overweight/obesity were gender ($p= 0.027$), attending a private school ($p=0.005$), and leisure time activities ($p= 0.05$).

Conclusion: The prevalence of overweight and obesity among urban school children in Kampala is high, with girls being at a higher risk compared to the boys.

Keywords: School-age children, Overweight, Obesity, urban

CHAPTER ONE

1.1 INTRODUCTION

Childhood obesity is one of the most serious public health challenges of the 21st century with far-reaching and enduring adverse consequences (Rankin et al., 2016). Obesity and overweight was previously associated with affluence and the developed world (Biadgilign et al., 2017). This is currently changing as many low and middle income countries (LMICs) are facing the challenge of an increasing trend, in particular urban settings of Sub Saharan African countries (World Health Organisation, 2016).

The prevalence of overweight and obesity among children and adolescents globally has risen dramatically from just 4% in 1975 to 18% in 2016, which is over 340 million children (World Health Organisation, 2018). According to the WHO, it was projected that the prevalence of overweight and obesity in Africa would reach 12.7% in 2020 from 8.5% in 2010 (World Health Organisation, 2018).

Uganda is one of the many countries undergoing an epidemiologic shift (Manyanga, El-Sayed, Doku, & Randall, 2014), which is catalysed by demographic and nutritional transitions (Schwartz, Guwatudde, Nugent, & Kiiza, 2014). The country is experiencing a “double burden” of over-nutrition related issues – both obesity and overweight, and associated non-communicable diseases (NCDs) alongside the under nutrition that has long plagued the country (Ngaruiya, Hayward, Post, & Mowafi, 2017). Childhood Obesity and overweight are associated with multiple health risks that often continue into adulthood (Ben-Sefer, Ben-Natan, & Ehrenfeld, 2009).

Children with obesity are likely to have a number of health complications such as high blood pressure and high cholesterol, which are risk factors for cardiovascular diseases (CVDs), type 2 diabetes, breathing problems such as asthma and sleep apnea, musculoskeletal discomfort and many other complications (Centre for Disease Control and Prevention, 2016). Childhood obesity is also related to psychological problems such as anxiety and depression, low self-esteem and lower self-reported quality of life in addition

to social problems such as bullying and stigma (Centre for Disease Control and Prevention , 2016).

There are several factors associated with overweight and obesity which include; socioeconomic factors, environmental factors, psychosocial factors, demographic factors, medical conditions, genetics and lifestyle habits (Tapera et al., 2017). The on-going globalization, improving economic conditions and changing dietary habits in developing countries have championed the rapid increase in obesity among school children (Desalew, Mandesh, & Semahegn, 2017).

Research studies have shown that school children are at an increased risk of overweight and obesity due to physical inactivity including lack of participation in sports at school or at home, and use of a less active mode of transport to and from school (Pradinuk, Chanoine, & Chanoine, 2011). It is also reported that some school age children spend more time away from their parents thus, influence from friends and media which affects the formation and stabilization of their dietary and behavioral practices (Kigaru, et al, 2015). Many Children have reported poor eating habits including skipping breakfast, a low intake of fruits and vegetables, and a high consumption of high energy foods and beverages compared to the recommended amounts (Habib-Mourad et al., 2014). Furthermore, the increase in time spent watching television and playing computer games has partially contributed to the increasing rates of obesity among children (Mwaikambo, Leyna, Killewo, Simba, & Puoane, 2015).

Studies have shown that schools can serve as a potential setting to target both children and adolescent population for obesity prevention (Wright, Norris, Newman Giger, & Suro, 2012), however, there is paucity of information on obesity and overweight and the associated risk factors in Uganda (Ngaruiya, Hayward, Post, & Mowafi, 2017). The main purpose of the study is to identify the risk factors associated with overweight and obesity among urban schoolchildren. The findings will help develop appropriate interventions to establish effective strategies to reduce the burden of overweight and obesity among school children.

1.2 RESEARCH PROBLEM

Uganda is experiencing a “double burden” of malnutrition with high levels of under nutrition co-existing with a growing prevalence of overweight and obesity (Ngaruiya et al., 2017). The demographic and nutritional transitions taking place in Uganda, just as in other low and middle income countries (LMIC), have led to an accelerating rise of obesity and overweight (Schwartz, Guwatudde, Nugent, & Kiiza, 2014).

Childhood obesity is often under recognized as a public health issue in many developing countries. This is because culturally, an overweight or obese child is often considered to be healthy. In Uganda, nutrition strategies and interventions are mainly geared towards addressing under nutrition, and progress in tackling childhood obesity has been slow and inconsistent. The country is currently experiencing a rapid rise in childhood obesity and overweight especially in urban areas. According to the analysis of the nutrition situation in Uganda, 5.3% of Ugandan school children were reported to be at risk of overweight (FANTA-2, 2010).

Childhood obesity and overweight has adverse effects on not only the child, but the community as well. Obesity can affect a child’s health, educational attainment and quality of life. Consequently, overweight or obese children are more likely to remain obese in adulthood, and thereby further at risk of chronic illnesses, increased cost of health care, and limiting total population productivity.

Childhood and adolescence are very critical periods in one’s life course. Therefore, it is expedient that strategies to address overweight and obesity start among school children and adolescents. Furthermore, a better understanding of the magnitude and determinants of overweight and obesity among school going children will provide the basis for comprehensive interventions to address this challenge.

1.3 OBJECTIVES OF THE STUDY

The main objective is to determine the factors associated with obesity and overweight among urban school children aged between 8 to 13 years in Kampala.

1.4 SPECIFIC OBJECTIVES

- a) To assess the nutritional status of urban school children aged 8-13 years.
- b) To determine dietary behaviours of urban school children.
- c) To determine the physical activity and sedentary life style patterns of urban school children

1.5 Research questions

1. What is the nutritional status of urban school children aged between 8 -13 years?
2. What is the association between the dietary behaviours, physical activity, and sedentary lifestyle with obesity and overweight?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of obesity and overweight

Overweight and Obesity are defined as abnormal or excessive fat accumulation in the adipose tissue of the body, leading to adverse health risks and implications (EUFIC, 2017). The Body Mass Index (BMI) is used to assess obesity and overweight. BMI is defined as weight in kilograms divided by height in meters squared (kg/m^2) (Centre for Disease Control and Prevention, 2018). According to the World Health Organization (WHO), overweight and obesity are defined as BMI values equal or above 25 and 30 kg/m^2 , respectively (World Health Organisation, 2018).

According to the Centre for Disease Control and Prevention, BMI in children is age- and sex-specific and is often referred to as BMI-for-age. The child's weight status is determined using an age- and sex-specific percentile for BMI rather than the BMI categories used for adults. This is because children's body composition varies as they age and it also 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. (Centers for Disease Control and Prevention, 2018).

Overweight is defined as a BMI at or above the 85th percentile and below the 95th percentile for children and teens of the same age and sex. Obesity is defined as a BMI at or above the 95th percentile for children and teens of the same age and sex (Table 1) (Centers for Disease Control and Prevention, 2018).

Table 1: BMI for Age weight status categories and the corresponding percentiles

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Normal or Healthy Weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	95th percentile or greater

Source: Adapted from CDC <https://www.cdc.gov/obesity/childhood/defining.html>

According to the World Health Organisation, BMI-for- Age Z-scores are used to define overweight and obesity among children aged 5–19 years. Overweight is defined as greater or equal to +1SD, which is equivalent to BMI 25 kg/m² at 19 years. Obesity is defined as greater or equal to +2SD, which is equivalent to BMI 30 kg/m² at 19 years (Table 2) (World Health Organisation, 2007). The study by Onis & Lobstein, (2010) suggests that the WHO Reference 2007 provides a suitable definition for overweight and obesity among school age children and adolescents aged 5-19 years.

Table 2: BMI for age z scores and weight status categories

Weight Status Category	BMI-for-age Z scores
Obese	>+2S.D
Overweight	>+ 1SD
Normal	> -1 to < +1 SD
Thinness	<-2SD
Severe Thinness	<-3SD

Source: Adapted from WHO https://www.who.int/growthref/who2007_bmi_for_age/en/

2.2 PREVALENCE OF CHILDHOOD OBESITY AND OVERWEIGHT

Overweight and obesity is a serious problem posing as one of the most difficult public health challenges of the 21st century globally (Habib-Mourad, et al., 2014). Childhood obesity is steadily affecting many low and middle-income countries, particularly in urban settings (World Health Organisation, 2018). In 2010, 43 million children (35 million in developing countries) were estimated to be overweight and obese; 92 million were at risk of overweight (Onis & Blössner, 2010).

The worldwide prevalence of childhood overweight and obesity increased from 4.2% in 1990 to 6.7% in 2010 and this trend is expected to reach 9.1% or 60 million, in 2020 (Onis & Blössner, 2010). The estimated prevalence of childhood overweight and obesity in Africa in 2010 was 8.5%, and is expected to reach 12.7% in 2020 (Onis & Blössner, 2010). The prevalence is lower in Asia (4.9% in 2010) than in Africa (8.5% in 2010), although the number of affected children is higher in Asia (Onis & Blössner, 2010).

Peltzer & Pengpid, (2011) reported a prevalence of 0.9% and 0.5% among school going girls and boys respectively in Uganda. According to the analysis of the nutrition situation in Uganda, overweight/obesity was found to be higher in urban areas (6.5%) than in rural areas (4.6%) (FANTA-2, 2010). Furthermore, 5.3% of Ugandan school children were reported to be at risk of overweight (FANTA-2, 2010).

2.3 FACTORS ASSOCIATED WITH OBESITY AND OVERWEIGHT

Over weight and obesity have greatly been associated with energy imbalances between intake and expenditure, with an increase in positive energy balance being closely associated with the lifestyle adopted and the dietary intake preferences (Sahoo et al., 2015). This means that more energy from food and drinks than the body uses has been consumed over a period of time (Weichselbaum & Buttriss, 2011). And in order to halt weight, gain or lose weight, either less energy from food and drinks needs to be eaten or more energy needs to be used by increasing the level of physical activity, or a combination of both (Weichselbaum & Buttriss, 2011).

The ecological system theory, as described by Davison *et al* (2001), suggests that child risk factors for obesity include dietary intake, physical activity, and sedentary behaviour. The impact of such risk factors is moderated by other factors such as age, gender, and genetics. The development of child risk factors is shaped by parenting styles and family characteristics, for example parents' dietary intake and activity patterns, nutritional knowledge, child feeding practices, and peer interactions. Environmental factors such as school policies, demographics, ethnic background and the availability and accessibility of recreational facilities further influences the child's eating and activity behaviour (Davison & Birch, 2001).

2.3.1 Nutrition transition

Nutrition transition refers to changes in dietary patterns and nutrient intakes when populations adopt modern lifestyles during economic and social development, urbanization and acculturation (Vorster, Kruger, & Margetts, 2011). Many countries in Sub Saharan African Countries (SSA) are currently experiencing changes associated with the advancing nutrition transition (Abrahams, McHiza, & Steyn, 2011).

The nutrition transition is fueled by urbanization characterized by increased access to supermarkets, accessibility of multinational low-priced food chains, increase in street food vendors selling energy dense processed foods in urban areas (Steyn & Mchiza, 2014). The transition is further governed by political, technological, and political factors. These include globalization, governance, and the impact of the food industry (Amuna & Zotor, 2008).

The changes in dietary patterns over time have been part of man's history (Vorster et al., 2011) , although, studies have emphasized that these changes are currently occurring at a very rapid rate in developing countries and at earlier stages of economic and social development (Popkin & Gordon-larsen, 2004, Steyn & Mchiza, 2014). These dietary changes include; decreases in staple foods rich in starch and dietary fibre, increases in foods from animal origin rich in total fat and saturated fatty acids. In addition, there has been

decreases in plant protein sources such as legumes, and increases in energy-dense snack foods. Other dietary changes also involve consumption of carbonated sweetened beverages, commercially available alcoholic beverages, as well as added sugar, fats and oils in preparation of food (Vorster et al., 2011).

There have been drastic shifts in physical activity from high energy- expenditure activities such as farming, mining, and forestry, towards the service sector and sedentary activities such as sitting in front of a computer. The reduction in energy expenditure within an occupation has constituted a further change, linked to altered modes of transportation and increased patterns of low activity during leisure hours (Popkin & Gordon-larsen, 2004).

The nutrition transition is also characterized by a shift in disease burden from under nutrition to over nutrition-related chronic diseases, which have been widely reported in Latin America, Africa, Middle East, and Asia (Tzioumis & Adair, 2014). Studies have assessed trends in the nutritional status of children in LMICs as markers of overall population health; the trends in each country reflected its progression through the nutrition transition (Tzioumis & Adair, 2014). For example, comparisons of the nutrition status trends in South African school children (ages 8–11 year) from 1994 to 2004 indicate that mild and moderate stunting levels have decreased, whereas overweight and obesity have increased (Armstrong, Lambert, & Lambert, 2011). The paradox of under nutrition and over nutrition among children, often referred to as the “double burden of malnutrition” coexisting is largely attributed to nutrition transition in LMICs (Ngaruiya et al., 2017).

2.3.2 Genetic factors

Genetics play a big role in obesity and it accounts for less than 5% of cases of childhood obesity. Studies have found that about 25–40% of the BMI is heritable, although differentiating clearly between the extent to which nature or nurture is responsible for the strong correlation between parent and child BMI can be difficult (Anderson & Butcher, 2006).

Genes give the body instructions for responding to changes in its environment, however, not all people will have the same response to the environmental changes (Anderson & Butcher, 2006). Certain people may have a higher genetic susceptibility to weight gain compared to others. It is also possible that parents may pass along to their children a susceptibility to overweight in the presence of energy imbalance (Anderson & Butcher, 2006). Genetic susceptibility often needs to be coupled with contributing environmental and behavioral factors in order to affect weight gain (Sahoo et al., 2015).

There is evidence that weight gain in early life, particularly during catch-up growth in low-birth-weight babies, is associated with a higher risk of overweight and obesity in later life (Jebb, Kopelman, & Butland, 2007). Studies have reported that adiposity rebound in childhood (the period when the bodyweight for height falls and then rises again) predicts a higher BMI later on as the child grows (Jebb et al., 2007).

2.3.3 Dietary factors

The school going age forms the foundation of life in terms of physical, emotional and mental aspects and these strongly influence the child's health in her/his adult life (Weichselbaum & Buttriss, 2011). Eating a balanced and varied diet as well as establishing healthy eating habits among children can promote optimal health, growth and development (HBSC, 2010). An unbalanced diet with a reliance on energy-dense, nutrient poor foods is one of many contributing, but important factors to the obesity epidemic among children (HBSC, 2010). The energy cost of growth is a minor component of total caloric requirements, however, growth rate is a sensitive indicator of overall dietary adequacy (Weichselbaum & Buttriss, 2011).

The nutritional requirements of children and adolescents are high in relation to their size because of the demands for growth, in addition to requirements for maintenance and physical activity (Weichselbaum & Buttriss, 2011). The food patterns in childhood, particularly adolescence, can set the scene for future dietary preferences and eating behaviour in adult life (Mukherjee & Chaturved, 2017).

2.3.4 Dietary requirements of school children

The general dietary recommendations for children stress a diet that primarily relies on fruits and vegetables, whole grains, low-fat and nonfat dairy products, beans, fish, and lean meat (American Heart Association et al., 2006). These general recommendations are similar to other public health dietary guidelines. They emphasize low intakes of cholesterol, saturated and trans-fat, salt and added sugar. The recommendations encourage appropriate energy intake and physical activity for the maintenance of a normal weight for height; and adequate intake of micronutrients (American Heart Association et al., 2006). The main recommended healthy foods include fruits, vegetables, whole grains, legumes, low-fat dairy products, fish, poultry, and lean meats. Table 3 provides daily estimated calorie and serving recommendations for grains, fruits, vegetables, and milk/dairy products for children by age and gender.

Table 3: Daily Estimated Calories and Recommended Servings for Grains, Fruits, Vegetables, and Milk/Dairy for children by age and Gender.

	1 y	2-3 y	4-8 y	9-13y	14-18y
Kilocalories ^a	900	1000			
Female			1200	1600	1800
Male			1400	1800	2200
Fat % of total fat	30-40	30-35	25-35	25-35	25-35
Milk/dairy, cups	2	2	2	3	3
Lean meat/beans, oz.	1.5	2		5	
Female			3		5
Male			4		6
Fruits, cups	1	1	1.5	1.5	
Female					1.5
Male					2
Vegetables, cups	3/4	1			
Female			1	2	2.5
Male			1.5	2.5	3
Grains , oz.	2	3			
Female			4	5	6
Male			5	6	7

Adapted from 'Dietary choices made by the children and their families' influence their health and may contribute towards both malnutrition and 'over nutrition' (Mukherjee & Chaturved, 2017).

The dietary habits of individuals, families and communities vary according to socioeconomic factors, regional customs, traditions, seasonal availability of food items etc. (Mukherjee & Chaturved, 2017).

Environmental factors such as the ready availability of energy dense foods and drinks and limited opportunities for being physically active can contribute to the development of overweight and obesity; this is often referred to as an ‘obesogenic environment’ (Weichselbaum & Buttriss, 2011).

Diet has been studied extensively for its possible contributions to the rising rates of obesity (Sahoo et al., 2015). Several studies have reported poor eating habits including skipping breakfast, a low intake of fruits and vegetables, and a high consumption of high energy foods and beverages, these risk factors help explain the increased prevalence of overweight and obesity (Habib-Mourad et al., 2014; Kigaru et al., 2015). The available data indicates an emerging trend of consumption of high-calorie foods which is increasingly becoming popular among school children and adolescents in developing countries especially urban areas (Ochola & Masibo, 2014). Studies have reported that excess energy intake will result in weight gain, however, it is difficult to single out specific dietary factors that are related to weight gain (Weichselbaum & Buttriss, 2011).

2.3.5 Fast food consumption

Fast food refers to food that can be served ready to eat (Kaushik, Narang, & Parakh, 2011). The terms fast food and junk food are often used interchangeably. Most of the junk foods are fast foods as they are prepared and served fast, but not all fast foods are junk foods, especially when they are prepared with nutritious content (Kaushik et al., 2011). Fast foods are usually energy dense foods with high sugar, fat, salt content with a low nutrient value in terms of protein, fiber, vitamin and mineral (Desalew et al., 2017).

Fast food culture is an emerging trend among children and adolescents, this is due to its easy availability, taste, low cost and marketing strategy (Das, 2015). Children in urban centers have easy access to numerous fast food outlets, restaurants and supermarkets that increase the chances of fast food consumption (Kigaru et al., 2015). Junk foods are also available in schools through variety of outlets such as the school cafeterias and canteens, which offer chips and many other foods of low nutritional value (Kaushik et al., 2011).

A study among children and adolescents aged 6-7 years and 13-14 years, respectively, reported that frequent fast-food consumption is associated with a higher BMI in children and adolescents (Braithwaite et al., 2014). On the contrary, another study among school aged adolescents aged 13-16 years, did not find any association between frequency of fast food consumption and childhood obesity (Pengpid & Peltzer, 2015).

The most common consumed beverages by school children include regular soda and sugar sweetened juices (Kigaru et al., 2015). A typical 20-oz soda contains 15 to 18 teaspoons of sugar and which is of 240 calories and a 64-oz fountain cola drink could have up to 700 calories (Tapera et al., 2017). Increased or frequent consumption of these sugar sweetened beverages is more likely to increase a child's caloric intake. Li et al., (2015) reported that regular sweetened sugar beverage consumption was positively related to obesity, children who regularly consumed these beverages were more prone to becoming obese compared to those who regularly drank milk.

2.3.6 Snacking

Snacking has been studied as a possible contributing factor of childhood obesity (Sahoo et al., 2015). The snacks consumed could either be “healthy” snacks such as fruits and nuts or “Energy dense, nutrient poor” snacks such as cookies, chocolate, candies, cake, biscuit, ice cream (Desalew et al., 2017).

A study among school children in Chile reported that intake of snacks rich in fat and sugar was very high and on average boys consumed more snacks than the girls (Olivares et al., 2004). This study also showed that French fries, sweet and salty snacks, soft drinks and fast foods were the products most often remembered and purchased by the children (Olivares et al., 2004). According to Kigaru et al., (2015), children did not engage much in healthy snacking but consumed unhealthy snacks mainly because of the sweet taste. This study also reported that children while away from home they would tend to buy snacks, which were usually not found at home. Mogre et al., (2013) reported that children mostly snacked between breakfast and lunch however, snacking was lower before going to bed,

and there was no significant association between the snacking time and overweight/obesity.

2.3.7 Media influence

Media advertising has been associated with the increasing incidence of obesity and overweight in childhood (Hewitt-Taylor, Alexander, & McBride, 2004). Advertising on television targets children, with visual and auditory messages that encourage the consumption of unhealthy food, which is primarily high in fat and sugar (Ben-Sefer, Ben-Natan, & Ehrenfeld, 2009).

It is easy for children to be drawn into the influence that marketing communication has on society. Marketing communications are so powerful and impactful at what they do in that they have mastered a way to make unhealthy foods more appealing to children (Anasuri, 2016). Apart from advertising via television, other media like posters, magazines, billboards, radio and cinemas favor fast food marketing (Das, 2015).

A trend that has been noted is that children tend to eat more such food items after being exposed to these adverts (Ben-Sefer et al., 2009). Kigaru et al., (2015), reported that most of the children ate food in front of the TV at home, either daily or at least 2–3 times in a week. Studies have also shown that the amount of advertising of unhealthy food to children is strongly associated with overweight and obesity (Shah et al., 2010).

Therefore although recommendations may be made that children should be encouraged to eat a healthy diet, parents may be torn between attempting to encourage a healthy lifestyle and a battle against media pressure and children's exposure to unhealthy messages (Hewitt-Taylor et al., 2004).

2.3.8 Sedentary behaviour

The decreased energy expenditure with increased caloric intake is a major contributor to childhood obesity and overweight (Ben-Sefer, Ben-Natan, & Ehrenfeld, 2009). Physical activity and exercise among children has become less of a priority and it has been displaced by other behaviours and activities (Hills, King, & Armstrong, 2007).

A number of factors for example rapid urbanization, decreased number of playgrounds, and easy access to new technological devices such as hand-held computer toys and devices have led to physical inactivity among children, especially in affluent families (Bhuiyan, Zaman, & Ahmed, 2013). Children and their parents often report safety issues, heavy traffic, lack of bicycle lanes, unmarked intersections, and poor street connectivity as barriers to physical activity in urban areas (Pradinuk et al., 2011).

Children on the other hand spend their leisure time sleeping, reading books, watching television, and playing computer games which are sedentary behaviours. (Desalew et al., 2017). The WHO recommends 60 minutes of daily total physical activity for children. This is a more realistic and attainable goal, however, a number of children in the urban centres usually don't attain the minimum required time due to sedentary behaviours (Habib-Mourad et al., 2014).

2.3.9 Family factors

The role of family provides another significant risk factor of childhood overweight and obesity. Parents and other family members play a direct role in children's eating patterns through their behaviours, attitudes, and feeding styles (Patrick & Nicklas, 2013). The type of food available in the house, food preferences of family members and the family meal times can influence the type of food and the amount consumed by the child (Sahoo, et al., 2015).

Children's dietary intake is often guided by their parents and siblings, and are often influenced in their own food choices, exercise and leisure time activities by the approaches engaged in by other family members (Hewitt-Taylor et al., 2004). Studies have shown that having an overweight mother and living in a single parent household are also likely to increase the risk of overweight and childhood obesity (Moens, Braet , Bosmans , & Rosseel, 2009).

2.4 CONSEQUENCES OF OBESITY

Childhood obesity can have profound effects on children's physical health, self-esteem, social and emotional wellbeing. It is also associated with poor academic performance and lowers quality of life experienced by the child (Schwarzkopf, 2008). Many of these consequences are far reaching and last into adulthood.

2.4.1 Health consequences

Multiple health risks are associated with childhood overweight and obesity. These conditions tend to have a lasting impact on health throughout adulthood (Xu, Hardy, Guo, & Sarah P Garnett, 2018). Cardiovascular diseases continue to be the major cause of death in adults, although, atherosclerotic plaque has been observed in children as young as 3 years of age (Ben-Sefer et al., 2009). This is similar to the dramatic increase of insulin resistance, type 2 diabetes and hypertension in children, which were previously considered adult diseases (Sahoo et al., 2015). The other conditions include; hyperlipidaemia, gallstones, skin conditions with poor wound healing, menstrual irregularities, metabolic syndrome, severe headaches with visual disturbances and many other problems. (American Academy of Pediatrics, 2006). Childhood obesity is also associated with increased morbidity and mortality worldwide (Tapera et al., 2017). Studies have shown that any improve in the child's weight could be a possible measure to prevent the physical health conditions associated with obesity and overweight.

2.4.2 Social and psychosocial consequences

Childhood obesity may have social and psychosocial consequences that may contribute to continuing difficulty in weight management. A study by Rankin et al.(2016), reported that overweight/obese children had significantly lower self-esteem, an increased child body dissatisfaction, lower perceived self-worth and self-competence than normal-weight peers.

Childhood obesity has also been found to negatively affect academics (Ben-Sefer et al., 2009). Sahoo et al., (2015) reported that overweight and obese children were four times more likely to have problems at school than their normal weight peers. This is attributed to chronic health conditions such as diabetes and asthma, which may affect their school attendance.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

The study was carried out in Kampala, which is the capital and largest city of Uganda. The city is divided into five major divisions, which include Kampala Central, Kawempe Division, Makindye Division, Nakawa division and Rubaga Division.

The schools selected were from Kampala Central division and these included Buganda Road Primary School (government- aided) and Lohana Academy (Private).

3.2 Study population

The study included male and female children aged between 8 to 13 years in the upper primary section.

3.3 Study design

The study implied a cross sectional design in nature.

3.4 Sample size determination

The sample size was determined according to (Cochran, 1977), and the following formula was used.

$$n = \frac{z^2 P(1 - P)}{D^2}$$

Where:

- n is the sample size
- P is the prevalence, which is 0.065, according to (FANTA-2, 2010)
- D is the desired level of precision, standard deviation of 5% (0.05) with a 95% confidence interval
- Z value is 1.96

Therefore $n = ((1.96)^2 * 0.065 * 0.935)/(0.05)^2$

n= 94

The calculated sample size was 94 and a total of 6 children was added to cater for refusal or non-response, hence the overall sample was 100 participants

3.5 Sampling technique

Two primary schools were randomly selected from a list of primary schools within Kampala Central. A Random sampling technique based on age criteria was used to select the study participants from each class. A total of fifty children were selected from each of the schools.

3.6 Data collection

The pre- tested questionnaires were administered to the school children, individually. The data collected included; socio-demographic characteristics, dietary habits, physical activity, and sedentary behaviours.

3.6.1 Anthropometric measurements

Body weight was measured to the nearest 0.1 kg using the Tanita Digital Scale (model THD-305, Tanita Corporation, Japan). Height measurements were taken to the nearest 0.1 cm using a height board (model: RI Woonsocket, Short Productions, Rhode Island, USA). All measurements were taken and recorded in duplicate.

3.7 Assessment of Nutrition status

The weight and height measurements were converted to Body Mass Index-for-age z-score (BMIZ) based on the WHO Child Growth Standards. Overweight was defined as Body Mass Index-for-age z-scores greater than one standard deviation; obesity was determined as Body Mass Index-for-age z-scores greater than two standard deviations as shown in (Table 2) chapter 2. The overall prevalence of overweight/obesity was classified as BMI-for-age Z-scores greater than +1SD.

3.8 Data analysis

The data was entered and analysed using into SPSS version 16.0. The Body-Mass-Index-for-age Z-scores were determined using WHO AnthroPlus Software version 1.0.4. The chi-square tests were used to determine the relationship between variables and a statistical significance was set at 95% confidence interval, with a p-value ≤ 0.05 .

3.9 Ethical considerations

Ethical clearance was obtained from the school administrations.

3.10 Limitations of the study

There was limited time and financial constraints during the study period.

CHAPTER FOUR

RESULTS

4.0 Socio demographic characteristics

A total of 100 children were selected for the study, 57% were female and 43% were male. The mean age of the participants was 10 years. The practiced religions were Christianity (78%), followed by Islam (15%), and others 5%. The male and female headed households were 68% and 32% respectively (Table 5).

Table 4: Socio demographic characteristics of the participants (n = 100)

Variable	Variable characteristics	Percentage (%)
Respondent's gender	Male	43
	Female	57
Age	8-10 years	38
	11- 13 years	62
Type of school	Government	50
	Private	50
Religion	Christian	78
	Islam	15
	Others	5
Household head	Father	68
	Mother	32
Mother's level of education	Primary	23
	Secondary	27
	Tertiary	50
Family size	More than 5	62
	Less than 5	38

4.1 Dietary behaviour of the participants

The results of the study show that more than half (56%) of the children were always having breakfast before coming to school. The consumption of fruits and vegetables was low, with 50% and 49% of the participants consuming fruits and vegetables once in a week respectively (figure 1). In addition, 63% of the children always had school meals for lunch, 21% carried a lunch box from home and 16% bought lunch from the canteen (Table 6).

Figure 1: Fruits, vegetables and fast food consumption of the participants in the past seven days

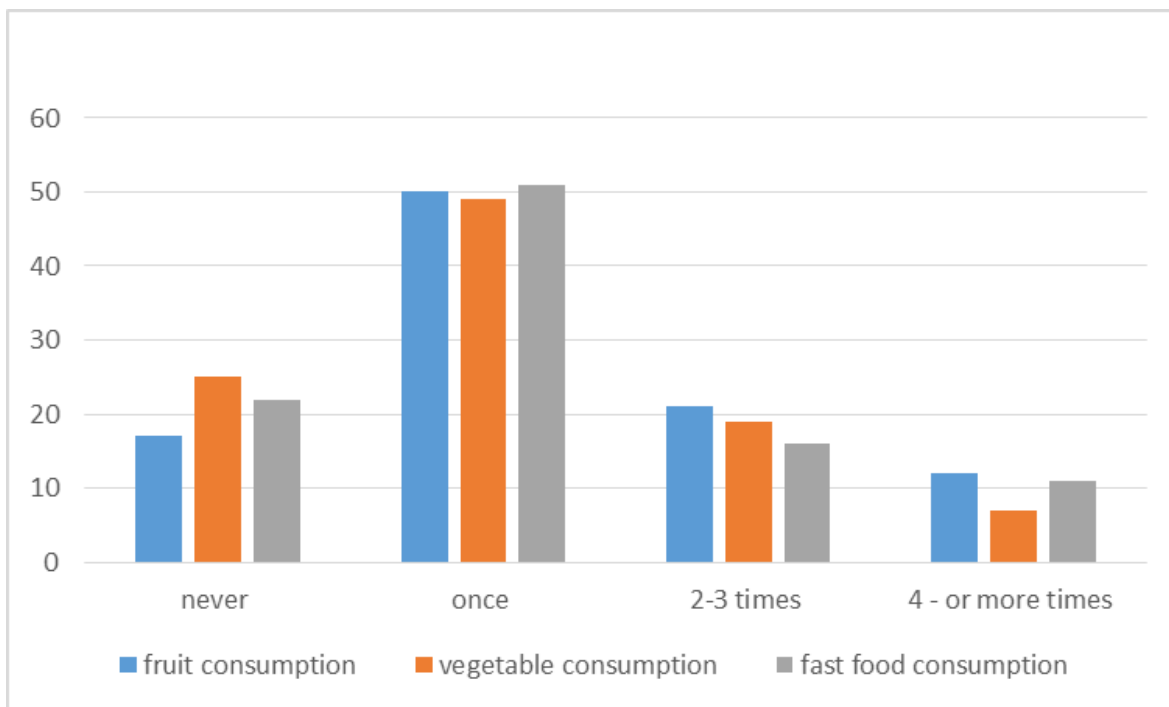


Table 5: Percentages for specific dietary behaviours of the study population (n= 100)

Variable	Variable characteristics	Percentage (%)
Soft drink consumption	Never	22
	One soda a day	51
	2-3 soda a day	16
	4 or more sodas a day	11
Hunger because of no food at home	Yes	93
	No	0
	Sometimes	7
Where the child gets lunch from	School meals	63
	School canteen	16
	Lunch box from home	21
Eating while watching TV	Yes	55
	No	19
	Sometimes	26
Having meals with family	Yes	54
	No	3
	Sometimes	43
Breakfast before school	Yes	56
	No	20
	Some times	24
Snacking habits	between breakfast and lunch	43
	Snacks between lunch and supper	28
	before going to bed	29

4.2 Physical activity and sedentary lifestyle.

The study found that 63% of the children used a car as transport means while 37% of them walked to school every day. It was also observed that 55% of the participants spent more than five hours watching television during weekends compared to 19% who watched during week days. The involvement of participants in physical activities after school was low, about a quarter of the children were engaged in a sport for four or more days in the past seven days (Table 7).

Table 6: Percentage of specific physical activity and sedentary behaviour of the participants (n =100)

Variable	Percentage (%)
Means of transport to school	
Car	63
Walk	37
Physical education	
Never	15
Once	22
Sometimes	31
Always	32
Physical activity after school	
Never	23
Once	34
2-3 days	16
4 or more days	27
T.V weekend	
Never	3
Less than 1 hour	13
1-2 hours	11
3-4 hours	18
More than 4 hours	55
T.V weekdays	
Never	20
Less than 1 hour	27
1-2 hours	19
3-4 hours	16
More than 4 hours	19

4.3 Nutritional status of the participants.

The overall prevalence of overweight and obesity was 28% among the children, with 10% being obese (figure 2). A higher proportion of females (20%) were overweight and obese compared to the males (8%). Furthermore, the private school had a higher percentage of overweight and obesity (19%) compared to the government school (9%) (Table 8).

Figure 2: Nutrition status of Urban schoolchildren aged 8-13 years, in Kampala (n = 100)

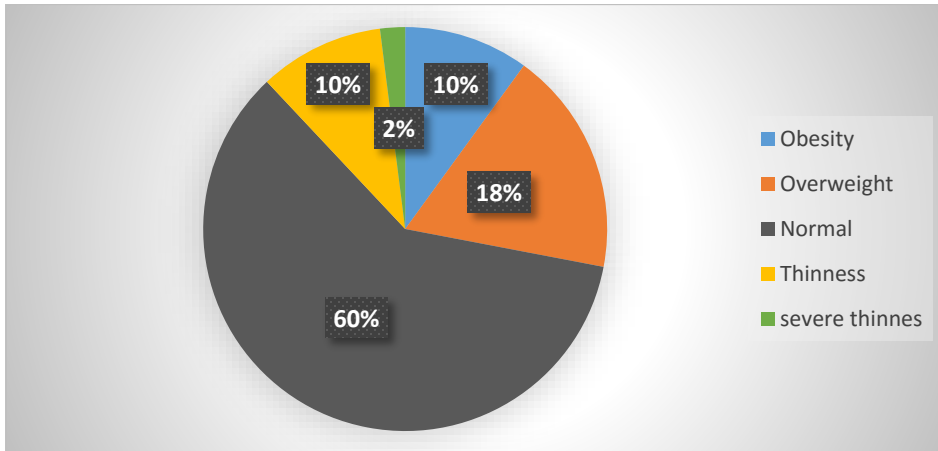


Table 7: The nutrition status of the participants based on school category and gender (n=100)

Variable	Overweight (%)	Obesity (%)	Normal (%)	Thinness (%)	Severe thinness (%)
Type of school					
Government	8	1	30	9	2
Private	10	9	30	1	0
Gender					
Females	15	5	34	3	0
Males	3	5	26	7	2

4.4 Association between social demographic characteristics and overweight/obesity

The results show that more females were overweight/obese (71.4%) than males (28.6%). In addition, more than half (57.1%) of the participants whose mothers had attained tertiary education were more overweight/obese compared to 25% and 17% of those whose mothers' had attained secondary and primary school education respectively. The type of school the participants attended and gender were significantly associated with overweight/obesity (Table 9).

Table 8: Association between social demographic characteristics with BMI-for-age status of the participants

Variable	Overweight obesity (n=28)	and Normal (n=60)	P- value
Gender			
Females	71.4%	56.7%	0.027
Males	28.6%	43.3%	
Type of school			
Private	67.9%	50%	0.005
Government	32.1%	50%	
Maternal level of education			
Primary	17.8%	26.7	0.173
Secondary	25%	25%	
Tertiary	57.1%	48%	

4.5 Association between dietary factors and overweight/obesity

In regards to dietary behaviour, three quarters (75%) of overweight/obese participants had school meals for lunch, 14.3% bought lunch from the canteen and 10.7% carried a lunch box from home. It was also observed that more than half (53.6%) of overweight/obese children snacked between breakfast and lunch, and a quarter of them snacked before going to bed (table 10).

Table 9: Association between Dietary habits and BMI-for-age status

Variable	Overweight/Obese (n=28)	Normal (n=60)	p- value
Where does the child get lunch from?			
School meals	75%	58.7%	0.366
Canteen	14.3%	13.3%	
Home (Lunch box)	10.7%	25%	
Snacking Time			
Between breakfast and lunch	53.6%	46.7%	0.201
Between lunch and supper	21.4%	28.3%	
Before going to bed	25%	25%	
Breakfast consumption before coming to school			
Yes	42.9%	58.3%	0.130
No	32.1%	16%	
Sometimes	25%	26.7%	

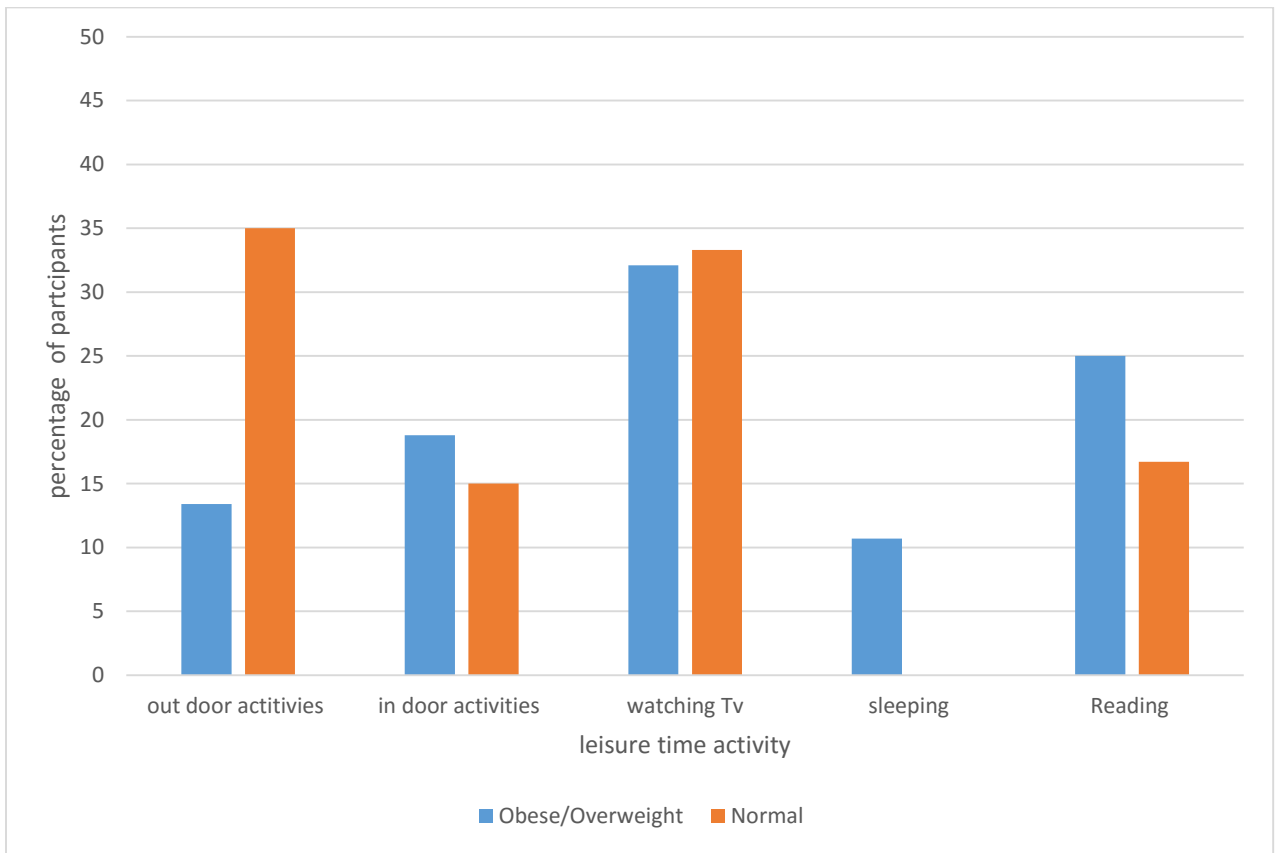
4.6 Association between physical activity patterns and sedentary life style with overweight/obesity

The results from the study showed that 67.9% of overweight/obese participants went to school by means of a car and 32.1% walked to school (Table 11). Overweight/obese participants were engaged in different leisure activities, 32.1% watched television, 25% read a book, 18.7% played indoor games, 13.4% played out door games and 10.7% were sleeping (figure 3). There was a significant association between leisure time activities with overweight/obesity ($p=0.05$)

Table 10: Association between Physical activity and BMI-for-age status

Variable	Overweight and obese (n=28)	Normal (n=60)	p-value
Means of transport to school			
Car	67.9%	61.6%	0.97
Walk	32.1%	38.3%	
Physical Activity Class			
Always	28.6%	31.7%	0.29
Never	14.3%	16.7%	
Once	25%	18.3%	
Sometimes	32.1%	33.3%	
Total physical activity time			
4 or more days	17.8%	8.3%	0.78
2-3 days	21.4%	20%	
Once	21.4%	40%	
Never	32.1%	31.7%	
Physical activity after School			
4 or more days	17.9%	30%	0.43
2-3 days	21.4%	10%	
Once	21.4%	38.3%	
Never	32.1%	21.7%	

Figure 3: Comparison of leisure time activities between overweight/obese and normal participants.



CHAPTER FOUR

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 DISCUSSION

The overall prevalence of overweight and obesity was 28%. The findings of this present study are comparable with other developed countries, for example Australia and China that reported an overall prevalence of overweight and obesity as 26.8% among children aged 5-15 years and 6-12 years respectively (Li et al., 2015; Schultz, 2012). The prevalence of the current study is higher than the findings by Peltzer & Pengpid (2011) in Uganda and Ghana. Peltzer & Pengpid, (2011) reported the prevalence of overweight and obesity among school children aged 13 -15 years as 0.9% and 0.5% among Ugandan girls and boys respectively.

The disparity in the findings could be because the Ugandan and Ghanaian study measured the heights and weights of the participants based on self-report. In addition, there are variations in the age group and the genetic composition of the body. The use of self-reported weight and heights may lead to underestimation of overweight and obesity (Elgar, Roberts, Tudor-smith, & Moore, 2005).

Furthermore, Kyallo et al., (2013) reported a prevalence of 19.0% among urban school children aged 9-14 in Kenya, while Mwaikambo et al., (2015) reported a prevalence of 14.7% among primary school children aged 6-12 years in Tanzania. According to Kyallo et al., (2013), overweight/ obesity was associated with the type of school ($p=0.00$) where children in private schools were more overweight/obesity compared to those in public school. In addition, maternal occupation was significantly associated with overweight/obesity, and children whose mothers owned a business were more overweight/obese compared those who were unemployed ($p=0.023$).

Mwaikambo et al., (2015) reported that the means of transport to school was significantly associated with overweight/obesity ($p=0.001$), where children who used a car were more

overweight/obese compared to those who walked to school.

Furthermore, the use of computer/video games was associated to overweight/obesity ($p=0.03$), where children who played computer/video games were more overweight/obese compared to those who did not play any of these games. These findings are similar to the current study (Table 11) where overweight and obesity was associated with type of school ($p= 0.005$) and leisure activities ($p =0.05$).

In addition, Mwaikambo et al., (2015), Kyallo et al., (2013) and Peltzer & Pengpid., (2011) reported that females had a higher prevalence of overweight and obesity compared to males. The findings of these studies are consistent with the results of the current study. By percentage reporting, more males were engaged in physical activities compared to the females. The girls were mainly involved in sedentary activities such as sleeping, reading and watching TV during their leisure time compared to the boys who were often engaged in outdoor activities.

According to Aryeetey et al., (2017) and Kyallo et al., (2013), the trend of increasing childhood overweight and obesity with increasing levels of maternal education has been reported in developing countries. The present study found that children whose mothers had attained tertiary education had a higher percentage of overweight and obesity compared to those with lower maternal education levels. Mothers with higher education levels are likely to earn higher income and therefore feed their children on junk foods.

Further studies have established a strong association between diet and overweight/obesity in both developed and developing countries (Desalew et al., 2017; Mogre et al., 2013; Xu, Hardy, Guo, & Garnett, 2018). In our current study, by percentage reporting, overweight /obese children had a lower consumption of fruits and vegetables with a higher consumption of carbonated soft drinks and fast foods compared to normal children. Amin et al., (2008) and Sahoo et al., (2015) reported the contribution of the above dietary factors to childhood overweight and obesity.

Mishra et al., (2017) and Desalew et al., (2017) found a significant association between leisure time activities and overweight/obesity, which is consistent with the findings of the present study. By percentage reporting, more than half of the children were engaged in watching television, playing indoor games and reading during leisure time compared to those who played outdoor games. Peltzer & Pengpid, (2011) reported that children who spent their free time watching television and playing indoor games for more than three hours were more likely to be overweight and obese. This may be because of the advancement in technology which has tremendously changed the life style of children. In addition, watching television and playing indoor games may decrease the amount of time spent on playing outdoor games which might result in weight gain

In addition, Aryeetey et al., (2017), Pengpid & Peltzer (2015) and Mogre et al., (2013) generally observed that the participation of school children in physical activity is low irrespective of the nature of the school category. This is consistent with the present study, which found that less than a quarter of the participants accumulated a total of 60 minutes of daily physical activity in a week as recommended by the World Health Organization. It was also observed that the children were less active during physical education classes although this is part of the primary school curriculum. Desalew et al.,(2017) reported that low physical activity patterns may increase the risk of overweight and obesity among urban school-going children. Therefore, physical inactivity and sedentary behavior may have a great contribution to childhood obesity/overweight.

5.1 CONCLUSIONS

The prevalence of overweight and obesity among urban schoolchildren in Kampala is high, with girls being at a higher risk compared to the boys. This is a public health concern and therefore strategies are needed to prevent the increasing rate of overweight and obesity among schoolchildren. This study identified gender, type of school and leisure time activities as factors significantly associated with overweight and obesity among urban school children.

5.2 RECOMMENDATIONS

The following recommendations are suggested based on the findings of the current study:

- Parents should encourage their children to engage in outdoor activities after school for example playing soccer and cycling.
- There should be a limitation on the amount of time the children spend on sedentary activities such as watching television and playing indoor games while at home.
- Schools should develop tailored programmes to encourage more children to regularly participate in physical activities. These could include both competitive and non-competitive activities that can attract children to actively participate during Physical Education classes.
- School feeding guidelines should be implemented and monitored within the schools.

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APPENDICES

QUESTIONNAIRE

CHILDHOOD OVERWEIGHT, OBESITY AND ASSOCIATED RISK FACTORS AMONG URBAN SCHOOL CHILDREN IN KAMPALA BETWEEN 8-12 YEARS

My name is Nakaggwa Dorothy. I am collecting information on what your children eat, how they spend their free time and their physical activity. I would like you to participate in this study, and the discussion will take about 10 minutes.

Your participation in this survey is voluntary and all answers will be kept confidential. If there is a question that you do not wish to answer, you can skip it and move on to the next question. Please be as honest as you can. **This is not a test**

Name of the school

Name of the pupil

Class

A. DEMOGRAPHIC INFORMATION

Sex: Male Female

AGE:

RELIGION: ANGLICAN CATHOLIC MOSLEM PENTECOSTAL SDA
OTHER

TRIBE

HOUSEHOLD HEAD: FATHER MOTHER

MOTHER'S LEVEL OF EDUCATION.

PRIMARY SECONDARY TERTIARY

MOTHER'S OCCUPATION

FAMILY SIZE. Less than 5 people More than 5 people

B. DIETARY HABITS

In this section we are interested in what you eat and how often you eat certain foods.

1. In the past 7 days, how many times per day did you eat fruits such as mangoes, oranges, pineapples, watermelon, apples, jackfruit and others?

Never.....

Once a day

2-3 times per day.....

4 or more times per day.....

2. In the past 7 days, how many times per day did you eat vegetables such as cabbages, nakati, Spinach, Sukuma wiki and others?

Never

Once a day.....

2-3 times per day.....

4 or more times per day.....

3. During the past 7 days how many Carbonated soft drinks did you drink in a day? (such as Coca cola, Fanta, Pepsi, Sprite, Riham soda etc.)

Never

One soda a day

2-3 sodas

4 or more sodas a day

4. During the past 7 days, how times did you eat food from a fast food restaurant, such as (KFC Chicken, French fries (chips), pizza, burgers, hotdogs sandwiches any other?

Never

Once

2- 3 times

- 4 or more times
5. During the past 7 days, how often did you go hungry because there was not enough food in your home?
- Never
- 1-3 days
- 4-6 days
- Always
6. Where do you usually get lunch from?
- Canteen
- School meals
- Home (carries lunch box)
7. When do you eat snacks such as (popcorn, cookies, chocolate, candy and others)?
- Between breakfast and lunch
- Between lunch and supper.....
- Before going to bed

PUPILS' EATING ENVIRONMENT AT HOME.

8. Do you have meals as a family?
- Yes No Sometimes
9. Do you consume breakfast at home before coming to school?
- Yes No Sometimes
10. Do you have meals while watching TELEVISION?
- Yes No Sometimes

C. SEDENTARY LIFE STYLE AND PHYSICAL ACTIVITY

We want to find out about your physical activity. This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, fast walking, biking, dancing, swimming, football. We also want to know how you spend your free time.

11. During the past 7 days, how did you spend most of your leisure time? (choose one)

Sleeping.....

Watching television.....

Reading.....

Playing out door games (like football)

Playing in door games.....

12. In the last 7 days, what time did you usually go to bed? (Tick only one)

Between 7:00 pm - 8:00pm.....

Between 8:00pm - 9:00pm.....

After 9:00pm

13. What means of transport do you usually use to come to school?

Walk.....

Ride a bicycle.....

Car/motorcycle.....

14. During your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (tick one only.)

I don't do PE

Hardly ever (Once)

Sometimes (2-3 times)

Always.....

15. How many hours do you spend watching TELEVISION from Monday to Friday?

Never.....

Less than 1 hr.

1-2 hrs.

3-4 hrs.

More than 5 hours

16. How many hours do you spend watching TELEVISION on a weekend (Saturday and Sunday)?

Never

Less than 1 hr.

1-2 hrs.

3-4 hrs.

More than 5 hours

17. During the past 7 days, how many times did you engage in physical activity such as (running, jumping, jogging, bicycle riding, or playing soccer) after school?

Never

Once

2-3 days

4 or more days

18. During the past 7 days, on how many days were you physically active for a total of at least 60 min. per day?

