Global Scientific JOURNALS
GSJ: Volume 10, Issue 4, April 2022, Online: ISSN 2320-9186
www.globalscientificjournal.com

Addis Continental Institute of Public Health

PREVALENCE OF CHILDHOOD OBESITY & RISK FACTORS AMONG PRIVATE SECOND CYCLE PRIMARY SCHOOL STUDENTS IN GULELE SUB CITY, ADDIS ABABA

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A THESIS SUBMITTED TO ADDIS CONTINENTAL INSTITUTE OF PUBLIC HEALTH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER'S IN PUBLIC HEALTH PROGRAM

APRIL/2018

ACKNOWLEDGMENTS

First, I gratefully thank Addis Continental Institute of Public Health for giving me the chance and support to develop this research thesis.

Second, my sincere and deepest gratitude goes to my advisors Prof. Yemane Berhane and Miss. Dagmawit Tewahido for their unreserved concern, help and devotion to realize this research thesis.

Lastly, I would like to thank Gulele sub city education office head, schools directors, staffs & students' parents as well as students for their unreserved cooperation during data collection.

My gratitude also goes to the almighty GOD, Family and colleagues too heart fully.

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ABBREVIATIONS

ACIPH	**Addis Continental Institute of Public Health**
BMI	**Body Mass Index**
EDHS	**Ethiopia Demographic Health Survey**
IOTF	**International Obesity Task Force**
MOH	**Ministry of Health**
SPSS	**Statically Package For Social Science**
WHO	**World Health Organization**

ABSTRACT

Background: In recent years, childhood overweight and obesity has emerged as a global epidemic. Obesity during childhood predisposes them to non-communicable diseases in adulthood. However, information and health education regarding obesity is still scarce for primary prevention. Thus, this study aims to assess the prevalence of childhood overweight and obesity and risk factors associated; especially in urban settings.

Objectives: To determine the prevalence of childhood obesity & risk factors among private second cycle primary school students in Gulele sub city, Addis Ababa.

Methods: Institution based cross-sectional study was used. The participants were 568 private second cycle primary school students selected using multi stage sampling technique. Weight & height was measured to calculate the body mass index (BMI) which used for determining the prevalence of overweight & obesity of students.

Result: The overall prevalence of overweight and obesity in this study was 10.7% and 8.9% respectively. The multivariate regression analysis depicted that female students [AOR=2.232; 95%CI: 1.388, 3.589], students with household members of less than four [AOR=4.579; 95%CI: 2.824, 7.425] and students who watched TV for more than two hours [AOR=1.864; 95%CI: 1.008, 3.447] have higher chance of being obese and overweight as compared to the reference category. Those who did regular physical exercise [AOR=0.395; 95%CI: 0.243, 0.641] had lower chance of having obesity and overweight while students who consume processed food items have higher chance of being overweight and obese (AOR=5.618; 95%CI: 1.841, 17.147) as compared to the reference category.

Conclusion and recommendations: This study revealed that the prevalence of overweight and obesity are relatively higher. Early age during childhood, having lower family size, watching TV for long period, not doing regular physical exercise and consuming proceeded foods were risk factors for the occurrence of overweight and obesity among school children. As a result, designing and promoting active lifestyles and healthy dietary system at schools should get emphasis as public health concern.

1. INTRODUCTION

1.1. BACKGROUND

Overweight and obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health (1). During the past decades, the prevalence of overweight and obesity in children has risen greatly worldwide. Obesity in childhood causes a wide range of serious complications, and increases the risk of premature illness and death later in life, raising public-health concerns. Historically, a fat child meant a healthy child, one who was likely to survive the rigors of undernourishment and infection. In the past decade, however, excessive fatness has arguably become the primary childhood health problem in developed nations and, to some degree, in other parts of the world (2). Childhood obesity is associated with both proximate immediate and long-term health risks, as well as an economic burden to the health care system (3).

Previously, it was assumed that global hunger and malnutrition were the dominant concern in low and middle income countries, it was very difficult to give attention to the importance of how dietary and physical activity shifts were increasing the threat of overweight and obesity(4).

Childhood obesity and physical inactivity is increasing in both developing and developed countries although at different rates (5). According to the report of the International Obesity Task Force (IOTF), about 10% of the young people aged 5–17 years globally were overweight; among whom 2–3% was obese (6). Further research findings show an increasing trend worldwide in the number of overweight and obese children, not only in the developed countries but also in the developing countries (7). This increase in child obesity and overweight means an increase in lifestyle-related chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension and stroke, and certain forms of cancer among the affected children (8).

Despite this, the understanding of the problem, especially in Africa, is hampered by lack of data as well as socio-cultural beliefs in which overweight and obesity is revered. Previous studies on adolescents indicated that in the Ethiopian context the same thing is happen too.

1.2. STATEMENT OF THE PROBLEM

Obesity is affecting virtually both developed and developing countries of all socioeconomic groups including all age groups thereby posing an alarming problem, described by the World Health Organization (WHO) as an “escalating global epidemic”(9).

In recent decades, childhood and adolescent overweight and obesity have become a worldwide concern (10).WHO had decided overweight as one of the top ten health risks in the world and one of the top five in developed nations (11).In USA overweight and obesity is affecting 1 in 3 youth (12). The prevalence of overweight and obesity among children and adolescents has shown a remarkable increase not only in developed but also in many low- and middle-income countries including Ethiopia, especially in urban settings. The rate of increase is substantially higher for youth than adult(13).As WHO estimated in 2008 in Ethiopia the prevalence of death due to overweight and obesity was 7.4% and 1.1% respectively(14).According to 2016 EDHS report, 1% of children below age five years were overweight or obese; in Addis Ababa, about 5-6% of children was found to be Obese & lower found from mini EDHS report 2014(15,16**).**Obesity in childhood and adolescent is a known risk factor for cardiovascular disease (including hypertension and coronary heart disease), type-2 diabetes, and some types of cancer. Obese children are at increased risk of mortality and morbidity due to cardiovascular diseases in adulthood .Increased sedentary activity, lack of regular physical activity, and poor eating habits, especially junk food consumptions are risk factors for obesity (17).

1.3. Literature review

1.3.1. Magnitude of childhood overweight and obesity

Obesity is a global public health concern and the World Health Organization (WHO) has estimated that it affects 500 million people worldwide with this burden projected to increase to one billion obese globally by 2030 [18]. The prevalence of childhood obesity has now reached alarming and concerning levels across the world and seems to be rising in low-income and middle-income countries. Worldwide obesity has more than doubled since 1980. In 2014, more than 1.9billion adults aged 18 years & older were overweight. Of these over 600 million adults were obese. An estimated 41 million children under the age of 5 years were overweight or obese.

Once considered a high income country problem, overweight& obesity are now on the rise in low & middle income countries, particularly in urban settings. In Africa, the number of children who are overweight or obese has nearly doubled from 5.4million in 1990 to 10.6 million in 2014. Nearly half of the children under 5 who were overweight or obese in 2014 lived in Asia. Overweight & 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 & Asia [19]. Despite obesity being declared by the World Health Organization (1979) and by the American Medical Association (2013) as a disease, it is not recognized as such in children in the majority of countries (20).

The prevalence of obesity has reached alarming levels, with more than 1 billion overweight adults of which 300 million are considered as clinically obese. Worldwide, over 22 million children under the age of 5 are severely overweight, as are 155 million children of school age. This implies that one in 10 children worldwide is overweight (21). This global average reflects a wide range of prevalence levels, with the prevalence of overweight in Africa and Asia averaging will below 10% and in the Americas and Europe above 20% (22).

The proportion of school-age children affected will almost double by 2010 compared with the most recently available surveys from the late 1990s up to 2003 (23). In the European Union, the number of children who are overweight is expected to rise by 1.3 million children per year, with more than 300,000 of them becoming obese each year without urgent action to counteract the trend. By 2010 it is estimated 26 million children in EU countries will be overweight, including 6.4 million who will be obese (23). A potential deluge is evident across the globe with obesity rates increasing more than twofold over the past 25 years in the U.S., almost threefold in the past 10 years in England, and almost fourfold over a similar time frame in Egypt (24). Moreover, in the USA the prevalence of obesity in adolescents has increased dramatically from 5% to13% in boys and from 5% to 9% in girls (25).

Until recently, Sub-Saharan Africa (SSA) was minimally affected by the obesity epidemic due to under-nutrition and a major burden of HIV and tuberculosis (26). However, in recent years, the African continent has seen a rapid rise in overweight and obesity prevalence as well as associated co-morbidities (27). Within Sub Saharan Africa, the prevalence of obesity varies greatly from country to country. Eritrea (3.5 %), Democratic Republic of Congo (5.7 %), Kenya (7.7 %), Central African Republic (8.0 %), and Rwanda (8.1 %). Women in general have higher

prevalence of overweight than men in all countries with the prevalence rates ranging from 3.7 % in Ethiopia to 74 % in Seychelles (28, 29).

Ethiopia is one of the low income countries located in sub-Saharan-Africa which is experiencing a shift from underweight to overweight and obesity particularly in urban settings. The dietary pattern of the society is changing to processed, low nutrient and energy dense foods especially children and adolescents consume a lot of fast foods around their school environments, which is a precondition for childhood obesity. According to mini EDHS 2014 overall 3% of children under the age of 5 were overweight or obese .Relatively higher prevalence (5-6%) was found in Addis Ababa, SNNP and Benishangul-Gumuz. Children of mothers with more than secondary education were found to be more likely to be overweight than children of mothers with lower levels of education (16, 30, 31).

Different studies carried out in some regions of Ethiopia among school children adolescent students and found a combined prevalence of overweight/obesity.

The study done in Gondar in 2013 showed the overall prevalence of overweight and obesity was 5.4% and 0.5% respectively. The prevalence of overweight among the adolescents studying in private schools was 10.1% and was higher than those studying in government schools (4%). Overweight was 4.47 times higher among girls and 2.53 times higher among Students of private school (32). At the same year in Hawassa other study showed that the prevalence of overweight was 12.9% and the prevalence of obesity was 2.7% based on age and sex specific BMI classification respectively (33). Another study done in Bahir Dar in 2014 showed the magnitudes of overweight and obesity were 12.3% and 4.4%, respectively, and the combined prevalence of overweight and obesity together was 16.7%(34).

There are also studies done in Addis Ababa among adolescents in 2014. The one showed that the prevalence rates of overweight, obesity & over all overweight/obesity among high school adolescents were 9.7%, 4.2% & 13.9% respectively (35). The other study showed that the overall prevalence of overweight and/or obesity was found to be 75 (9.4%) (36).

Even though these studies are evidences on the prevalence of overweight and obesity among adolescents in Addis Ababa, the prevalence has slight variation with the result found in EDHS. There is a need to study overweight and obesity with respect to the risk factors with giving special emphasis to school children of pre-adolescent to create awareness about obesity which could be a risk factor for non-communicable chronic diseases. Because this age group is the land

mark for adolescent age and assumed to be a base for behavioral changes for preventing childhood overweight and obesity.

1.3.2. Conceptual frame work

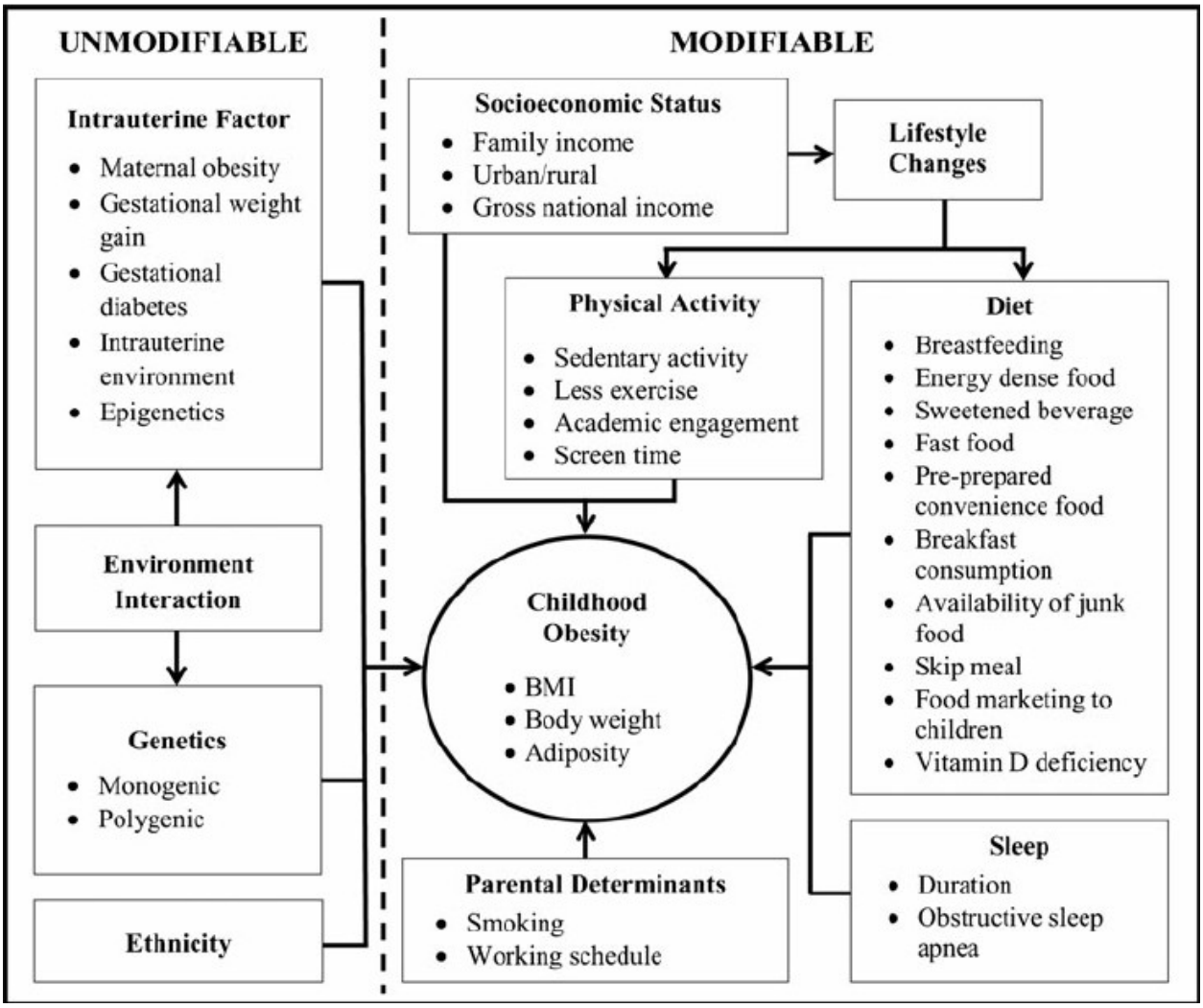


Figure 1: Conceptual framework of risk factors for childhood obesity. (Adapted from WHO; this study will focus on the modifiable risk factors.

1.4. RATIONALE OF THE STUDY

As a developing country the prevalence of under nutrition in Ethiopia is higher for a long period of time but, now a day due to Epidemiological, nutritional transition and other factors the country fall under double burden of both under nutrition and over nutrition. In turn over nutrition, physical inactivity, socio economic changes and other factors is becoming a risk factor for many health problems; especially overweight and obesity related health problems. This is due to change in lifestyle and nutritional pattern of the society; especially children, who may attribute to the new epidemic of childhood obesity and in, turn leads to different non communicable diseases.

Childhood and adolescent overweight and obesity have become a worldwide concern; especially African continent has seen a rapid rise in overweight and obesity.

Obesity in childhood causes a wide range of serious complications; Immediate and long-term health risks and create an economic burden to the health care system makes raising public-health concerns.

Currently, Ethiopia falls under double burden of both under nutrition and over nutrition; due to epidemiological, nutritional transition and other factors.

No study was conducted in the targeted study population specifically in primary school children.

2. Objectives

2.1 General objective

To assess the prevalence of childhood obesity and risk factors among private second cycle primary school students in Addis Ababa, Ethiopia.

2.2. Specific objectives

- To determine the prevalence of childhood obesity in private second cycle primary school students
- To identify the risk factors for childhood obesity in private second cycle primary school students

3. METHODS

3.1. Study area and period*:* This study was conducted in Addis Ababa Gulele sub city among private second cycle primary schools from September/2017 up to May/ 2018.Gulele sub city is located in the northern part of Addis Ababa bordered in the northern oromiya region, southern arada sub city, eastern yeka sub city& western kolfe sub city. Structurally Gulele sub city has 10 administrative woredas and a population size of 335,319. There are 15 public and 36 private primary schools in the sub city and on average around 50 numbers of students in each class.

3.2. Study design*:* School based cross sectional study design was used.

3.3. Source & study population*:* The source population was all private second cycle primary school students in Gulele sub city, Addis Ababa whereas the study population was all students who learn in the selected schools.

3.4. Inclusion criteria

All the selected second cycle primary school students who give assent during data collection were included.

3.5. Exclusion criteria

Those students who are chronically ill, students whose parents were not volunteer to participate in the study were excluded. The status of the above conditions was determined through observation or asking the students, classroom teachers & parents.

3.6. Variables of the study

3.6.1. Dependent variable

Overweight and Obesity

3.6.2. Independent variables

Nutritional factors, physical activities, socio demographic & economic factors

3.7. Sample size Determination

The sample size was determined using single population proportion formula assuming prevalence of overall childhood overweight & obesity was 9.4% which was found in a study conducted in Addis Ababa in 2014(36),then $Z_{\alpha/2}$=1.96,d=5%(0.05), p=9.4%(0.094).

$$n = \frac{Z_{\alpha/2}^2\, p\,(1-p)}{d^2}$$

$$= \frac{(1.96)^2\, 0.094(1-0.094)}{(0.05)^2}$$

=131

Since there was school based clustering of the outcome variable, design effect of 2 and non-response rate of10% making the final sample size N.

N= (131) (2) + (10%) =288

To determine the required sample size for the second specific objective of this study various factors significantly associated with the outcome variables were considered with confidence level of 95% and power of 80%, and using Epi info 7 software. After calculating the required sample size for those selected variables, the maximum sample size was taken.

Table 1: Sample size determination for a study on prevalence of childhood obesity & risk factors among private second cycle primary students in Gulele sub city, Addis Ababa Ethiopia, 2017

S/No	Associated Factors(35 & 36)	cases exposed	OR	Sample Size
1	Physical activities	28	1.8	568
2	Dietary factors	38	2.5	210
3	Income	63	2.4	186
4	Eating out of home	23	2.13	428
5	TV watching	53	2.15	243

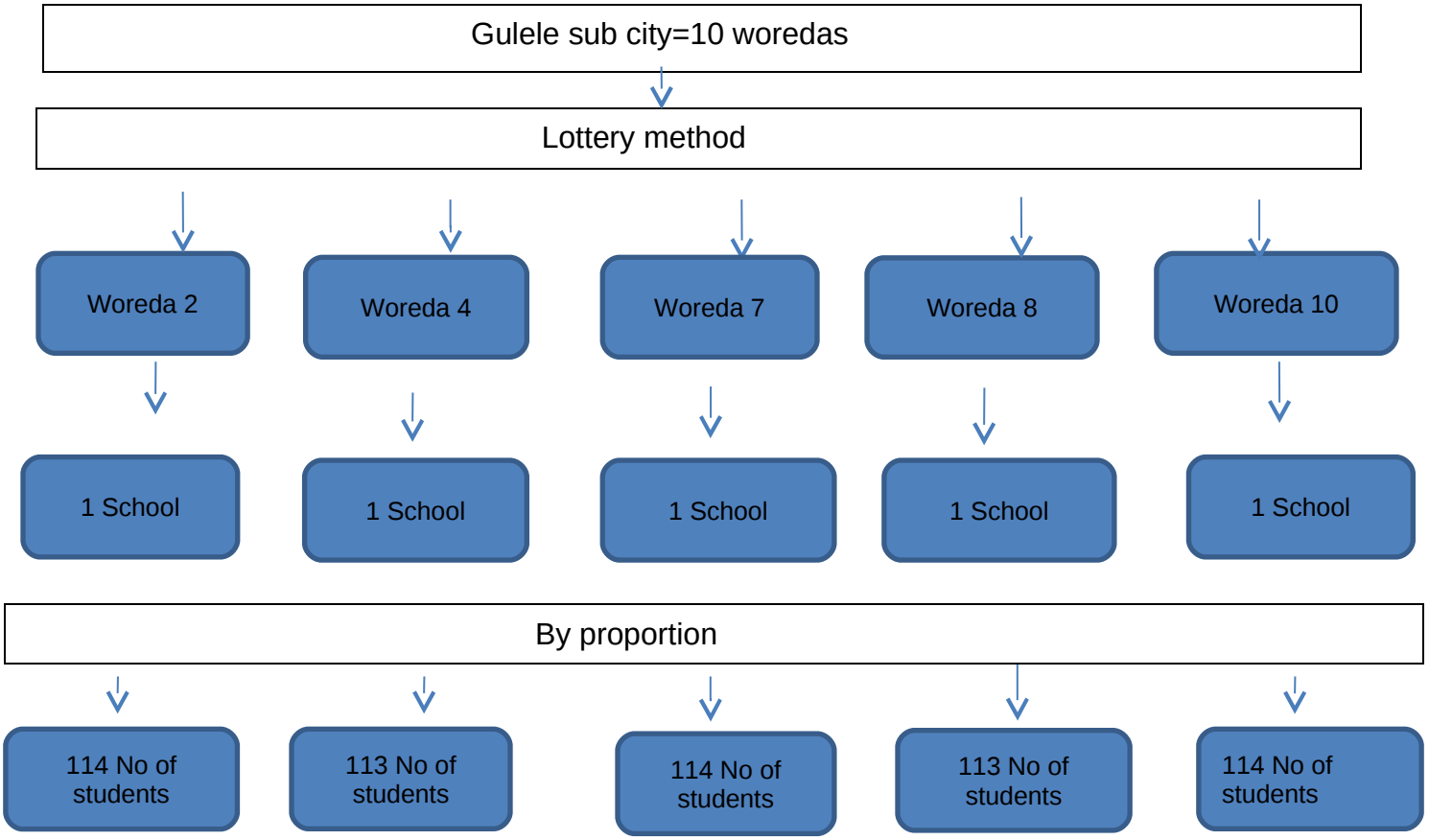
Finally, the required sample size for this study was decided by taking the maximum from the first (288) and the second (568) objective sample size calculation results which was 568.

3.8. Sampling procedure

In Gulele sub city 10 administrative woredas, 15 Public and 36 private primary schools were found. For this study five representative woredas: woreda 2, woreda 4, woreda 7, woreda 8 and woreda 10 were selected randomly using lottery method. These selected woredas had 22 private

primary schools. From these 5 schools were selected randomly. The participants were 568 private second cycle primary students selected using multi stage sampling technique. All private schools which are now giving formal education from grade 5 up to grade 8 found in the chosen woredas were selected for the study. The calculated sample size was distributed proportional to the number of students in each woreda private second cycle primary schools as well as within each class level. Then Students from each grade level was further recruited by using systematic simple random sampling technique from the students' attendance/roster/. The number of schools and students in each of the selected woredas was obtained from the woreda's educational and training administrative office. Recruited students of grade 5-8 in the selected schools were filled the questionnaire and their anthropometric measurements such as weight and height were measured.

Measuring instruments like weight scale for measuring weight and portable meter was used for height measurement after checking the appropriateness of the calibration and standardization of the instrument.



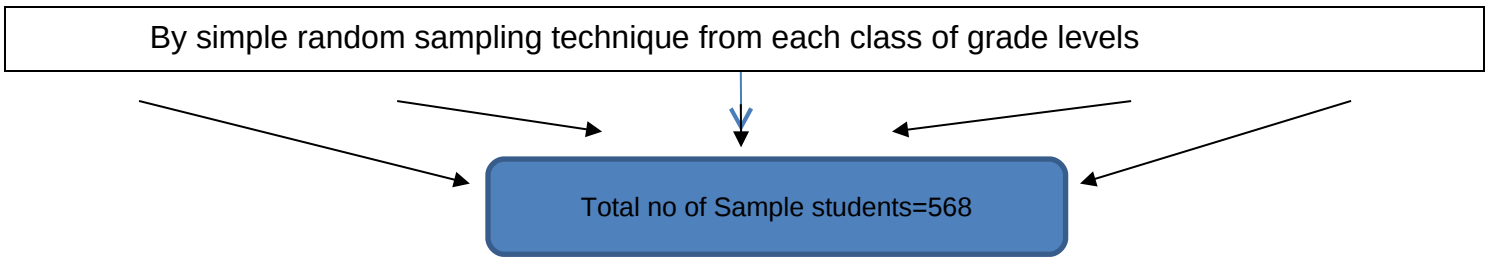


Figure 2: Sampling procedure diagram

3.9. Data collection technique

Data was collected using self-administered questionnaire after a full explanation of the study objectives and obtaining written & verbal assent from students and consent from their parents and permission from the school director. The questionnaire had three parts, the first part contained socio-demographic characteristics, the second part of the questionnaire contained associated factors for overweight and obesity and the third part was contain anthropometric measurement of respondents. Four diploma level nurses for data collection and one degree holder for supervision were employed for the indicated time frame of data collection. The weight and height anthropometric measurements of each student was measured & recorded in the space provided of the questionnaire lastly. The questionnaire was developed by adopting variables from different relevant literatures.

It was contextualized or modified to the study objectives and translated from English to Amharic language. Students who wanted to discontinue the interview at any moment or refused to be measured of their weight or height or both, was given more information about the importance of the research and the procedure, but students who continued their refusal, they were recorded as non respondent.

3.10. Operational definition

Processed Foods-Foods with a high content of sugar, protein, salt, saturated fats and low content of nutrients, and in this study it includes the following four groups;

1-salty snacks: potato-chips

2-sweets (biscuits, cakes, chocolate, and candies),

3-sweetened beverages (soft drinks like; coke, sprite, mirinda) and

4) Fast foods such as hamburgers, cheeseburgers & pizzas

Regular exercise- students who were done physical exercise at least 3 days per week for a minimum of 30 minutes.

Overweight/Obese=Students whose BMI was fitted under WHO recommendation for the specific age group of the study. (Annex A)

NB. Both prevalence (overweight & obesity) was calculated in this study.

3.11. Data quality control

Prior to data collection, training was given to data collectors focus on questionnaire filling technique, ethical issues, rights of the participants, reading through all the questions and understanding them and ways of decreasing under-reporting and maintaining confidentiality. Pretest was done on some students in one of the schools in the sub city that were not selected for the study area; and necessary corrections were taken on the questionnaire that was not clear for data collectors and respondents as appropriate. The instrument to be used for measuring weight and height was checked for its accuracy. During the actual data collection, close supervision was made by the principal investigator and the supervisor. The collected data was cross checked on each day of activity for consistency and completeness.

3.12. Data management and analysis

Data was checked for incompleteness, inconsistency & coded. Then entered using Epi Info, exported to SPSS (statically package for social science) to be cleaned and analyzed. Binary logistic regression was applied to determine the risk factors for overweight & obesity of childhood. Independent variables that have P value less than 0.2 in the bivariate logistic regression analysis was included in multivariate logistic regression analysis. The results was presented using odds ratio with their 95% confidence intervals.

3.13. Ethical consideration

Ethical clearance was obtained from Ethical review committee of Addis Continental Institute of Public Health and permission letter was obtained from Gulele sub city education and administrative office. Then the selected school students was informed about the purpose of the study, the importance of their participation and they were told that they have the right to discontinue the study or refuse anthropometric measurement at any time during data collection period. Then data was collected after getting assent from students and ethical consent from

parents' .Confidentiality of information given by each student was kept appropriately and names of respondents was not registered.

4. Results

4.1. Socio -demographic characteristics of the respondents

A total of 550 students participated in the study with a response rate of 96.8%. More than half of the respondents 295 (53.6%) were males while the remaining 255(46.4%) were females. Two hundred ninety (52.7%) of the respondents were in the age range of 13-15 years and 260(47.3%) between ages of 10-12 years. Majorities (82.9%) of the respondents were Orthodox Christian in religion & 8.7% were Muslims. Pertaining to educational status, majority (58%) were grade 7 and 8. Besides, 406 (73.8%) of respondents have more than four family members in the house hold (See Table 1).

Table 1: Socio demographic characteristics of Gulele Sub- city private second cycle primary school students, Addis Ababa Ethiopia, 2017/18

Variables		Frequency (N)	Percent (%)
Age group	10-12	260	47.3
	13-15	290	52.7
Sex	Male	295	53.6
	Female	255	46.4
Religion	Orthodox	456	82.9
	Muslim	48	8.7
	Protestant	37	6.8
	Catholic	9	1.6
School grade level	5-6	231	42.0
	7-8	319	58.0
Family size in the house hold	Less than 4	144	26.2
	4 & above	406	73.8

4.2. Prevalence of overweight and obesity

The prevalence of overweight among private second cycle primary school students in Gulele Sub-city was found to be 10.7% with 95%CI (8.0, 13.4) whereas the prevalence of obesity was 8.9% with 95% CI (6.7, 11.6). Therefore, the overall prevalence of overweight and obesity was found to be 19.6% with 95%CI (16.5, 23.1). Overweight & obesity was higher in female students than male and majority of overweight & obese students fall in the age range between 10 to12 (Figure 1).

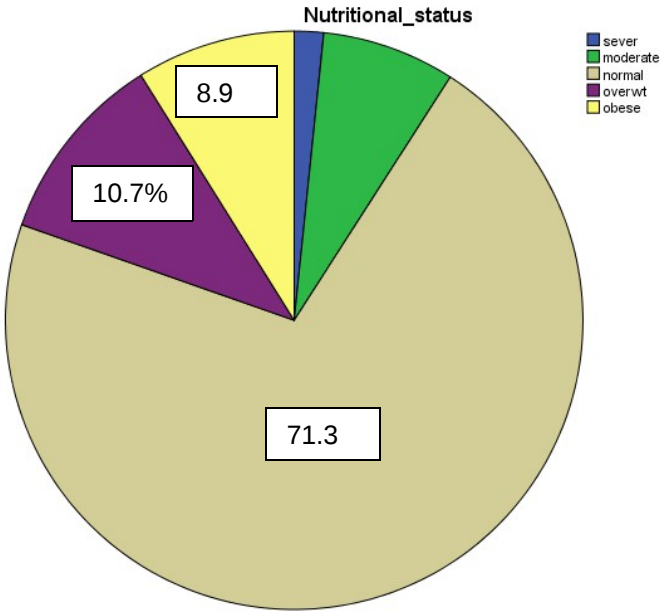


Figure 3: Nutritional status of Gulele sub-city private second cycle primary school children students, Addis Ababa Ethiopia, 2017/18

4.3. Food consumption characteristics of respondents

Among total respondents, 76 (13.8%) responded that they did not consume potato-chips, 357 (64.9%) consume potato-chips less than three days per week and 117 (21.3%) consume potato-

chips four and more days per week. 259(47.1%) did not consume meat, 165 (30%) consume meat 1-2 days per week and 126 (22.9%) consume meat three and more days per week.

Majority, 440 (80%) of participants did not consume cheeseburger frequently and the rest (20%) consume cheeseburger frequently. On the other hand, 124 (22.5%) of the students responded that they did not consume any soft drinks, 170(30.9%) consume soft drinks at least one day per week, and 256(46.5%) consume soft drinks two and more days per week.

One hundred seventy one (31.1%) of participants did not consume sweet fruits, 190 (34.5%) consume sweet fruits one to two days per week, 131 (23.8%) consume sweet fruits three to four days a week and 57 (10.4%) consume sweet fruits five and more days a week. Among the total respondents, 256(46.5%) primarily preferred to consume these foods b/c of their taste, color & odor while 152(27.6%) of the respondents preferred b/c of their habitual habit to consume. Majority of the respondents, 347(63.1%) accessed these foods from home & around school.

Table 2: Dietary habits among Gulele sub-city private second cycle primary school children students, Addis Ababa Ethiopia, 2017/18

Variables		Frequency (N)	Percent (%)
Consume Potato-chips	Yes	474	86.2
	No	76	13.8
Consume potato-chips	Less than 3 days/week	357	64.9
	4 and more days/week	117	21.3
Cheese burger	Yes	110	20.0
	No	440	80.0
Consume cheese burger	Less than 3 days/week	105	19.1
	4 and more days/week	5	0.9
Pizza	Yes	126	22.9
	No	424	77.1
Consume pizza	Less than 3 days/week	118	21.5
	4 and more days/week	8	1.5
Meat	Yes	291	52.9
	No	259	47.1
Consume meat	Less than 3 days/week	230	41.8
	4 and more days/week	61	11.1
Bonbolino	Yes	316	57.5

	No	234	42.5
Consume bonbolino	Less than 3 days/week	278	50.5
	4 and more days/week	38	6.9
Soft drinks	Yes	426	77.5
	No	124	22.5
Consume soft drinks	Less than 3 days/week	362	65.8
	4 and more days/week	64	11.6
Sweet fruits	Yes	379	68.9
	No	171	31.1
Consume sweet fruits	Less than 3 days/week	269	48.9
	4 and more days/week	109	19.8
Candies	Yes	351	63.8
	No	199	36.2
Consume candies	Less than 3 days/week	257	46.7
	4 and more days/week	95	17.3
Preference to consume	Because of habitual habit	152	27.6
	Because of availability around school	101	18.4
	Because of parent's influence	31	5.6
	Because of taste, color & odor	256	46.5
	Because of peer influence	10	1.8

4.4. Physical activity characteristics of respondents

Of the total respondents, 278 (50.5%) were engaged in physical exercises out the school, but 272 (49.5%) did not exercise any regular physical activities at least 30 minutes per week. Eighty eight (16%) of the respondents do exercise less than 3 days per week, 87 (15.8%) do more than 3 days per week and 95 (17.3%) of participants responded that they spent greater than30 minutes per day for exercising activities. Among the respondents, 253(46%) had been watching TV for greater than 2 hours per day and similarly 251(45.6%) responded that they slept less than 8 hours & 8-14 hours per day (Table 3).

Table 3: Physical activity among Gulele Sub-city private second cycle primary school children students, Addis Ababa Ethiopia, 2017/18

Variables		Frequency(N)	Percent (%)
Regular exercise	Yes	278	50.5
	No	272	49.5
Exercising days per week	Less than 3 days	88	16.0
	3 days	73	13.3
	Above 3 days	87	15.8
Exercising time per day	Less than 30 minutes/day	60	10.9
	30 minutes/day	93	16.9
	Greater than 30 minutes/day	95	17.3
Availability of exercising areas	Yes	290	52.7
	No	260	47.3
Watching TV	Less than 2 hrs/day	144	26.2
	2 hrs/day	153	27.8
	Greater than 2 hrs/day	253	46.0
Sleeping pattern	Less than 8 hrs/day	251	45.6
	8-14 hrs/day	251	45.6
	Greater than 14 hrs/day	48	8.7

4.4. Bivariate and Multivariate Logistic Regression Analysis Results

The Bivariate analysis result showed that age, sex, grade level, family size of household, regular physical exercise, watching TV and consuming processed food have statistically significant association with overweight and obesity at significance level of 0.05. After including all significant variables in the final multivariate logistic regression analysis model; the variables sex, family size, regular physical exercise, watching TV and consuming processed food were found to have statically significant association with overweight and obesity(Table 4).

The multivariate regression analysis depicted that females were 2.2 times more likely to have overweight and obesity as compared to males [AOR=2.232; 95%CI: 1.388,3.589] after keeping other factors constant. With regard to family size, those students with household members of less than four were found to have a 4.5 times higher chance of being overweight and obese [AOR=4.579; 95%CI:2.824,7.425] as compared to those having four and above family members after holding other factors constant (Table4).

Pertaining to physical exercise, those who did regular physical exercise had a 61% [AOR=0.395; 95%CI: 0.243,0.641] lower chance of having obesity and overweight as compared to those who didn't exercise regularly after keeping other factors constant. Similarly, students who watched TV for more than two hours have 85% [AOR=1.864; 95%CI: 1.008,3.447] higher chance of being overweight and obese as compared to those who saw less than two hours after keeping other factors constant (Table 4).

In terms of food consumption, students who consume processed food items have 5.6 times higher chance of being overweight and obese (AOR=5.618; 95%CI: 1.841, 17.147) as compared to those who didn't consume processed foods after keeping other factors constant (Table 4).

Table 4: Bivariate and multivariate logistic regression analysis of variables with overweight and obesity among Gulele sub-city private second cycle primary school children students, Addis Ababa Ethiopia, 2017/18

Variables		Obesity and Overweight		COR [95%CI]	AOR [95%CI]
		No	Yes		
Age	10-12	195	65	1.915 (1.247, 2.939)	1.591(0.887,2.604)
	13-15	247	43	1.00	1.00
Sex	Male	252	43	1.00	1.00
	Female	190	65	2.005 (1.306, 3.078)	**2.232(1.388,3.589)**
Religion	Orthodox	369	97	1.00	
	Muslim	39	9	0.979(0.457,2.096)	
	Protestant	26	11	1.794(0.854,3.771)	
	Catholic	8	1	0.530(0.065,4.295)	
Grade level	5 and 6	168	63	1.00	1.00
	7 and 8	274	45	0.438 (0.285,0.672)	0.632(0.369,1.083)
Family size	Less than 4	86	58	4.802 (3.075, 7.497)	**4.579(2.824,7.425)**
	4 and above	356	50	1.00	1.00
Do regular Physical exercise	No	200	72	2.420 (1.556,3.764)	**0.395(0.243,0.641)**
	Yes	242	36	1.00	**1.00**
Exercising area around	No	214	46	1.00	
	Yes	228	20 62	1.265(0.827,1.934)	
Watching TV	<2hrs	124	20	1.00	1.00
	2hrs	122	31	1.575(0.582,2.915)	1.723(0.874,3.399)

	>2hrs	196	57	1.803(1.033,3.147)	**1.864(1.008,3.447)**
Sleep	<8hrs	194	57	0.723 (0.466,1.123)	
	8-14hrs	207	44	0.581(0.247,1.365)	
	>14hrs	41	7	1.00	
Consumed processed food	No	60	4	1.00	1.00
	Yes	382	104	4.084(1.451,11.497)	**5.618(1.841,17.147)**

5. Discussion

The study showed that the prevalence of overweight in the study participants was 10.7% and the prevalence of obesity was 8.9% respectively indicating that to some extent there was high prevalence of overweight and obesity in children living in Addis Ababa. The combined prevalence of overweight and obesity was 19.6 %. The prevalence of overweight and obesity in this finding was almost the same as that of developed countries such as USA & Europe having the prevalence of above 20% [22]. However, this finding was higher than the findings of the study conducted five years back in Addis Ababa which was 9.4% [36]. This could be explained by the change in the behavioral and life style factors of the society. In addition, the present study used BMI classification for further analysis of the problem of overweight and obesity, as this method has been increasingly accepted as the most popular indirect measure of adiposity in childhood for survey purposes.

The results of this study indicated a significant sex difference in having overweight & obesity among school children which could be explained by variability *in* eating competence and preference of food items. The findings also depicted that, as family size increases the chance of having obesity and overweight decreases. These could be related with the socioeconomic status of the household in food consumption where households with less number of children may exercise junk food consumption behaviors which are risk factors for obesity and overweight[16,17].

Doing regular physical exercise have also an inverse association with overweight and obesity where those who did regular physical activity has lower risk of overweight and obesity. Evidences also showed that increased sedentary activity and lack of regular physical activity increases the risk of obesity and overweight which in turn has a risk of developing chronic diseases [17]. Those watching TV for long periods has also shown increased risk of developing obesity and overweight which is directly linked with physical inactivity.

The results also revealed that those students who consumed proceed food have increased risk of being obese and overweight. Studies also showed that children and adolescents consume a lot of fast foods around their school environments, which is a precondition for childhood obesity [16, 30, 31]. This is linked with the dietary pattern change where processed food could have preservatives with low nutrient and energy dense foods that can contribute for obesity and overweight.

6. Conclusion

This study revealed that the prevalence of overweight and obesity are relatively higher and becoming major public health problem in private second cycle primary schools of Gulele Sub city of Addis Ababa, Ethiopia.

Early age during childhood, having lower family size, watching TV for long period, not doing regular physical exercise and consuming proceeded foods were risk factors for the occurrence of overweight and obesity among school children.

7. Strength of the Study

- The study used relatively an appropriate study design
- To assure the quality of the data, standardized data collection tool was used
- Pre test was done on 5% of the sample
- Good response rate of the respondents

8. Limitations of the Study

Even though this study addressed important variables that are factors for overweight and obesity, skin fold measurements were not done, and variables on behavioral factors, biochemical factors, parental weight status, and nutritional knowledge of the respondents were not covered.

9. Recommendations

This study indicated that the prevalence of obesity and overweight is increasing which alarms the sub city health office and other stakeholders to design and implement prevention strategies at school level. In addition, designing and promoting active lifestyles and healthy dietary system at schools should get emphasis as public health concern. Moreover, creating awareness for parents

in promoting physical exercise at early ages and controlling the dietary condition of their children is important.

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Declaration

I, the undersigned declare that this thesis is my original work in partial fulfillment of the requirement for the degree of Master of Public Health. I also declare that it has never been presented in this or any other university and that all resources and materials used in the thesis have been duly acknowledged.

Student Name: _____ _____

Signature: _____ _____ _____

Place of submission: _____ _____

Date of submission: _____ _____

This thesis has been submitted with my approval as a university advisor.

Advisor Name: _____

Signature: _____ _____ _____

Date of submission: _____ _____

Annex A:

BMI-for-Age Table, GIRLS 5–18 Years (WHO 2007)

Age (years: months)	Severe malnutrition < –3 SD (BMI)	Moderate malnutrition ≥ –3 to < –2 SD (BMI)	Normal ≥ –2 to ≤ +1 SD (BMI)	Overweight > +1 to ≤ +2 SD (BMI)	Obese > +2 SD (BMI)
5:1	less than 11.8	11.8–12.6	12.7–16.9	17.0–18.9	19.0 or higher
5:6	less than 11.7	11.7–12.6	12.7–16.9	17.0–19.0	19.1 or higher
6:0	less than 11.7	11.7–12.6	12.7–17.0	17.1–19.2	19.3 or higher
6:6	less than 11.7	11.7–12.6	12.7–17.1	17.2–19.5	19.6 or higher
7:0	less than 11.8	11.8–12.6	12.7–17.3	17.4–19.8	19.9 or higher
7:6	less than 11.8	11.8–12.7	12.8–17.5	17.6–20.1	20.2 or higher
8:0	less than 11.9	11.9–12.8	12.9–17.7	17.8–20.6	20.7 or higher
8:6	less than 12.0	12.0–12.9	13.0–18.0	18.1–21.0	21.1 or higher
9:0	less than 12.1	12.1–13.0	13.1–18.3	18.4–21.5	21.6 or higher
9:6	less than 12.2	12.2–13.2	13.3–18.7	18.8–22.0	22.1 or higher
10:0	less than 12.4	12.4–13.4	13.5–19.0	19.1–22.6	22.7 or higher
10:6	less than 12.5	12.5–13.6	13.7–19.4	19.5–23.1	23.2 or higher
11:0	less than 12.7	12.7–13.8	13.9–19.9	20.0–23.7	23.8 or higher
11:6	less than 12.9	12.9–14.0	14.1–20.3	20.4–24.3	24.4 or higher
12:0	less than 13.2	13.2–14.3	14.4–20.8	20.9–25.0	25.1 or higher
12:6	less than 13.4	13.4–14.6	14.7–21.3	21.4–25.6	25.7 or higher
13:0	less than 13.6	13.6–14.8	14.9–21.8	21.9–26.2	26.3 or higher
13:6	less than 13.8	13.8–15.1	15.2–22.3	22.4–26.8	26.9 or higher
14:0	less than 14.0	14.0–15.3	15.4–22.7	22.8–27.3	27.4 or higher
14:6	less than 14.2	14.2–15.6	15.7–23.1	23.2–27.8	27.9 or higher
15:0	less than 14.4	14.4–15.8	15.9–23.5	23.6–28.2	28.3 or higher
15:6	less than 14.5	14.5–15.9	16.0–23.8	23.9–28.6	28.7 or higher
16:0	less than 14.6	14.6–16.1	16.2–24.1	24.2–28.9	29.0 or higher
16:6	less than 14.7	14.7–16.2	16.3–24.3	24.4–29.1	29.2 or higher
17:0	less than 14.7	14.7–16.3	16.4–24.5	24.6–29.3	29.4 or higher
17:6	less than 14.7	14.7–16.3	16.4–24.6	24.7–29.4	29.5 or higher
18:0	less than 14.7	14.7–16.3	16.4–24.8	24.9–29.5	29.6 or higher

BMI-for-Age Table, BOYS 5–18 Years (WHO 2007)

Age (years: months)	Severe malnutrition < –3 SD (BMI)	Moderate malnutrition ≥ –3 to < –2 SD (BMI)	Normal ≥ –2 to ≤ +1 SD (BMI)	Overweight > +1 to ≤ +2 SD (BMI)	Obese > +2 SD (BMI)
5:1	less than 12.1	12.1–12.9	13.0–16.6	16.7–18.3	18.4 or higher
5:6	less than 12.1	12.1–12.9	13.0–16.7	16.8–18.4	18.5 or higher
6:0	less than 12.1	12.1–12.9	13.0–16.8	16.9–18.5	18.6 or higher
6:6	less than 12.2	12.2–13.0	13.1–16.9	17.0–18.7	18.8 or higher
7:0	less than 12.3	12.3–13.0	13.1–17.0	17.1–19.0	19.1 or higher
7:6	less than 12.3	12.3–13.1	13.2–17.2	17.3–19.3	19.4 or higher
8:0	less than 12.4	12.4–13.2	13.3–17.4	17.5–19.7	19.8 or higher
8:6	less than 12.5	12.5–13.3	13.4–17.7	17.8–20.1	20.2 or higher
9:0	less than 12.6	12.6–13.4	13.5–17.9	18.0–20.5	20.6 or higher
9:6	less than 12.7	12.7–13.5	13.6–18.2	18.3–20.9	21.0 or higher
10:0	less than 12.8	12.8–13.6	13.7–18.5	18.6–21.4	21.5 or higher
10:6	less than 12.9	12.9–13.8	13.9–18.8	18.9–21.9	22.0 or higher
11:0	less than 13.1	13.1–14.0	14.1–19.2	19.3–22.5	22.6 or higher
1:6	less than 13.2	13.2–14.1	14.2–19.5	19.6–23.0	23.1 or higher
12:0	less than 13.4	13.4–14.4	14.5–19.9	20.0–23.6	23.7 or higher
12:6	less than 13.6	13.6–14.6	14.7–20.4	20.5–24.2	24.3 or higher
13:0	less than 13.8	13.8–14.8	14.9–20.8	20.9–24.8	24.9 or higher
13:6	less than 14.0	14.0–15.1	15.2–21.3	21.4–25.3	25.4 or higher
14:0	less than 14.3	14.3–15.4	15.5–21.8	21.9–25.9	26.0 or higher
14:6	less than 14.5	14.5–15.6	15.7–22.2	22.3–26.5	26.6 or higher
15:0	less than 14.7	14.7–15.9	16.0–22.7	22.8–27.0	27.1 or higher
15:6	less than 14.9	14.9–16.2	16.3–23.1	23.2–27.4	27.5 or higher
16:0	less than 15.1	15.1–16.4	16.5–23.5	23.6–27.9	28.0 or higher
16:6	less than 15.3	15.3–16.6	16.7–23.9	24.0–28.3	28.4 or higher
17:0	less than 15.4	15.4–16.8	16.9–24.3	24.4–28.6	28.7 or higher
17:6	less than 15.6	15.6–17.0	17.1–24.6	24.7–29.0	29.1 or higher
18:0	less than 15.7	15.7–17.2	17.3–24.9	25.0–29.2	29.3 or higher

Annex B:

Questionnaires designed to collect data on prevalence of childhood overweight and obesity & the risk factors.

Part I. **Socio-demographic characteristics of the students**

1.1 Age (years): ---------

1.2 Sex: 1) male 2) female

1.3 Religion: 1) Orthodox 2) Muslim 3) protestant 4) catholic 5) other (specify)…

1.4 Grades level: 1) Grade 5 2) Grade 6 3) Grade 7 4) Grade 8

1.5. How many people are living in the household? 1) 2 2) 3 3) 4 4) more than 4

Part II. Food consumptions questionnaires

2.1. Have you ever consumed processed foods in the last 7 days? 1/yes 2/ no

2.2. If ‘’yes’’ for the above question which one & frequency of the following lists you consumed/week? (You can reply More than one type)

Processed food type	**Frequency of consumption/week**	**Processed food type**	**Frequency of consumption/week**

1) salty snacks: Chips(potato) Cheese curls, Bonbolino, Donat Others…… **2)sweets** Biscuits … Cookies, Cakes, Chocolate, Ice cream, Candies), Others….		**3)sweetenedbeverages** soft drinks coke, pepsi, mirinda Others… **4)fast foods & others** Hamburgers, Cheeseburgers, Pizzas, Meat Others**……**		

2.3. Why did you preferred to eat those foods? 1) Because of personal habit on those foods 2) because of its availability around the school 3) because of the parents' interest to eat it 4) because of its attractive color/taste/odor 5) because of peer influence to eat it 6) others (specify)……

2.4. Where is your frequent access to eat these foods? 1) School 2) home 3) restaurant 4) other (specify)…

Part III. Physical Activities

3.1. Did you have a regular physical exercise out of school? 1) Yes 2) No

3.2. If your answer for the above Q is 'yes' how many days per week do you do these activities?

1) Less than 3 days/week 2) 3 days/week 3) greater than 3 days/week

3.3. How much time do you spend for doing the exercise?

1) Less than 30 minutes/day 2) 30 minutes/day 3) greater than 30 minutes/day

3.4. Is there exercising areas (Gymnasiums, stadiums, youth centers…) around your home?

1) Yes 2) No

3.5. How much time do you usually spend sitting a day at home?

1) less than 2hours per day 2) 2hours per day 3) greater than 2hours per day

3.6. How much time do you usually spend watching television in average?

1) Less than 2hours/day 2) 2hours/day 3) greater than 2hours/day

3.7. How much time do you usually sleep per day? 1) Less than 8hrs/day 2)8-14hrs/day 3) greater than 14hrs/day

Part IV-Anthropometric measurement

1. Weight in kilogram……...
2. Height in meter**…….**

THANK YOU!

[illegible] /[illegible] /[illegible]

[illegible]

[illegible]!

1. [illegible]

1.1. [illegible]--------

1.2. [illegible] [illegible] [illegible]

1.3. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

1.4. [illegible] 5 [illegible] 6 [illegible] 7 [illegible] 8 [illegible]

1.5. [illegible] 2 4 [illegible]

2. [illegible]

2.1. [illegible] ([illegible]) [illegible]? 1) [illegible] 2) [illegible]

2.2. [illegible].[illegible].2.1 [illegible]([illegible]) [illegible] ([illegible])?([illegible])

[illegible].[illegible]	[illegible]	[illegible]([illegible])
1	[illegible]	
2	[illegible]	
3	[illegible]	
4	[illegible]	
5	[illegible]	
6	[illegible]	
7	[illegible]	
8	[illegible]	
9	[illegible]/[illegible]…	
10	[illegible]	
11	[illegible]	
12	[illegible]	
13	[illegible]([illegible])	

2.3. [illegible]([illegible]) [illegible]([illegible])?

1. [illegible] 2. [illegible]/[illegible] 3. [illegible] 4. [illegible]
5) [illegible] 6. [illegible]…

2.4. [illegible]([illegible])? 1. [illegible]/[illegible] 2. [illegible] 3. [illegible] 4. [illegible]…

3. [illegible]

3.1 □□/□□ □□ □□□□ □□□ □□□□□ □□□□□(□)? 1.□□ 2.□□□□□

3.2. □□□□(□) □□ □□□ □□□□□ □□□ □□ □□□□□(□)?

1. □ 3 □□ □□□ 2. 3 □□ 3. □ 3 □□ □□□

3.3. □□□ □□□ □□□□ □□□□□(□)? 1. □ 30 □□□ □□□ 2. 30 □□□ 3. □ 30 □□□ □□□

3.4. □□□□□ □□□□ □□□□□ □□□□□□□□ □□□□? 1. □□ 2. □□□

3.5. □□□ □□ □□□ □□□ □□□ □□□ □□□□□(□)? 1.□ 2 □□□ □□□ 2. 2 □□□ 3.□ 2 □□□ □□□

3.6.□□□ □□□□□ □□□ □□□ □□□ □□□(□)? 1. □ 2 □□□ □□□ 2. 2 □□□ 3. □ 2 □□□ □□□

3.7.□□□ □□ □□□ □□□ □□□□(□)? 1. □ 8 □□□ □□□ 2. □ 8 □□□ 14 □□□ 3. □ 14 □□□ □□□

4. <u>□□□□ □□□□□ □□□□</u>

4.1. □□□□ (□.□)……

4.2. □□□ (□)……

□□□□□□□!

Annex C: Information sheet and informed consent form for school directors (English version)

My name is Aklog Getinet attending my MPH study in Addis Continental Institute of Public Health. I am here to conduct a study in your school. I conduct this study under Addis Continental Institute of Public Health, for partial fulfillment of master of General public health. It will also have a paramount importance for your organization to know the problem under study and act accordingly. So I kindly request you to give me time to explain about the study importance, ethical issues and how the study will be conducted. First I would like to thank you for your time and help.

Study Title:

Prevalence of childhood obesity & risk factors among private second cycle students in Gulele sub city, Addis Ababa

Study purpose:

The findings of this study can be important for the Education office, Health office, parents & children to plan and implement activities that can decrease childhood obesity & their consequences. It can also provide important baseline information for further studies. Moreover, the aim of this study is to write a thesis as a partial fulfillment of a masters' program in General public health for the principal investigator.

Procedure and duration:

My data collectors will have an interview with the students who are learning in your school. The student who have present in the last weeks/months will be a candidate for interview. The interview will be held using a questionnaire mainly focusing on dietary pattern & used a measuring scale for weight & height. This will take about 30 minutes.

Risk and benefit:

The risk of conducting in this study is very minimal but taking few minutes from students' time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health & school planners concerning childhood obesity.

Confidentiality:

The information gathered from this study will not be disclosed to others. There will be no information that will identify the study participant in particular. The findings of the study will be general for the study area and will not reflect anything particular of individual persons. The

questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the study.

Rights:

Participation in my study is fully voluntary. The participants have the right to declare to participate or not in the study.

If they decide to participate, they have the right to with draw from the study at any time and this will not label them for any loss of benefits which you otherwise are entitled. They do not have to answer any question that you do not want to answer.

Contact address:

Contact address: If you have any questions about the study, the procedure or anything else related to the study, please contact through the following address:

Mobile phone of investigator: +251913886453 (Aklog Getinet)

Email address of investigator: aklog_getnet@yahoo.com

Declaration of informed voluntary consent of school directors:

I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participants and the contact address for any requires. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that the participants have the right to with draw from the study at any time or not to answer any question that they do not want. I am also informed that the school has the right to stop the study from being conducted in the institution if any unethical procedures are reported during the data collection process in the institutions premises. Also I understand that the school has the right to use the result of study as public property. Therefore; I declare my voluntary consent on behalf of the institution to allow this study to be conducted in the institution with my initials (signature).

Name and signature of school director: _____

Signature of data collector: _____

N.B

This is signed face to face in the presence of data collector

Thank you for your cooperation!

Annex D: Participant parents' information sheet and informed consent form (English version)

My name is Mr Aklog Getinet I am studying my masters' degree at Addis Continental Institute of Public Health. I am conducted my thesis school children.

The study title:

Prevalence of childhood obesity & risk factors among private second cycle students in Gulele sub city, Addis Ababa

Purpose of the study:

The findings of this study can be important for the Education office, Health office, parents & children to plan and implement activities that can decrease childhood obesity & their consequences. It can also provide important baseline information for further studies.

Moreover, the aim of this study is to write a thesis as a partial fulfillment of a masters' program in General public health for the principal investigator.

Procedure and duration:

I will be interviewing your child using a questionnaire of 16 main questions & measurement of 2(weight & height) to provide me with pertinent data that is helpful for the study. The procedure will take about 30 minutes. So, I kindly request your child to give me this time.

Risk and benefits:

The risk of participating in this study is very minimal, only taking few minutes from their time. There would not be any direct payment for participating in this study. But the findings from this study may reveal important information for the sub city health & education office to fill the gaps identified through this study.

Confidentiality:

The information your child provide for us will be confidential. There will be no information that will identify him/her in particular. The findings of the study will be general for the study area and will not reflect anything particular of individual child. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the study.

Rights:

Participation for this study is fully voluntary. You have the right to your child to participate or not in the study. If you decide to participate, the child has the right to with draw from the study at any time and this will not label you for any loss of benefits which you otherwise are entitled. He/she does not have to answer any question that he/she does not want to answer.

Contact address:

If you have any questions or enquire at any time about the study or the procedure, please contact through the following address:

Mobile phone of investigator: +251913886453 (Aklog Getinet)

Email address of investigator: aklog_getnet@yahoo.com

Declaration of informed voluntary consent of parents:

It was read to me (I have read) the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights if participating and the contact address for any requires. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that my child has the right to withdraw from the study at any time or not to answer any question that he/she does not want. Therefore, I declare my voluntary consent to my child to participate in this study with my initials (signature).

Name and Signature of participant parent: _____.

Name and Signature of data collector: _____.

N.B

This is to be signed face to face in the presence of data collector

Thank you for your cooperation!

Annex E: Participant parents' information sheet and informed consent form (Amharic version)

aklog_getnet@yahoo.com
0913886453

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