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Determinants of Overweight/Obesity Among High School Adolescents in Bahirdar City, Ethiopia

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BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCE, SCHOOL OF
PUBLIC HEALTH, DEPARTMENT OF NUTRITION AND
DIETETICS
DETERMINANTS OF OVERWEIGHT/OBESITY AMONG HIGH SCHOOL
ADOLESCENTS IN BAHIRDAR CITY, ETHIOPIA

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DEPARTMENT OF NUTRITION AND DIETETICS
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STUDY AREA.....BAHIRDAR CITY

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ABSTRACT

Background: Adolescent overweight/obesity is increasing worldwide at alarming rate in both developed and developing countries. The prevalence of overweight among adolescents was become an emerging problem in Ethiopia. In Bahir Dar city the overall prevalence of overweight and obesity was 16.7%. Although some studies were conducted on prevalence and associated factors of overweight in Ethiopia, still there is limited data on determinants of overweight among high school adolescents in Ethiopia including the study area.

Objective: To identify determinants of overweight/obesity among high school adolescents in Bahir Dar City, Ethiopia.

Methods: School based unmatched case-control study design was employed from March 01-13/2020. Sample size of 297 was calculated by using Epi info and multistage systematic sampling technique was used for sample selection. Data was collected through pre tested self-administered questionnaires by trained data collectors. Data was coded and entered into Epi Data version 3.1. Then it was exported to SPSS version 23 for analysis. Bivariable and multivariable logistic regression analysis were employed for Crude and Adjusted odds Ratio. The goodness of fit of the final logistic regression model was checked using the Hosmer-Lemeshow technique that p -value >0.05 indicates a good model.

Result: Mother education level (AOR=5.58, 95%CI:1.35-23.12), Screen viewing (AOR=5.64, 95%CI:2.5-12.7), Sleep duration (AOR=6.59, 95%CI:1.8-23.7), vehicle transport (AOR=5.2 95%CI:2.18-12.5), meal frequency (AOR=5.63, 95%CI:2.37-13.38) were positively associated with the likelihood of having overweight, whereas vegetable intake (more than once per day (AOR=0.061, 95%CI:0.01-0.3), once per day (AOR=0.084, 95%CI:0.01-0.66), 5-6 times per week (AOR=0.117, 95%CI:0.024-0.56) and 1-4 times per week (AOR=0.127, 95%CI:0.022-0.73)) and parental monitoring (AOR=5.59, 95%CI:2.4-12.89) were negatively associated with the likelihood of having overweight.

Conclusion and recommendation: The study showed that, mother education level, screen viewing, sleep duration, Vehicle transport, meal frequency, vegetables and parental monitoring were important determinants of overweight in adolescents. preventive intervention Strategies that address these determinant factors of overweight should be designed by concerned bodies and implemented at every setting to prevent overweight/obesity and related chronic diseases.

Key Words: Adolescents, overweight/obesity, determinant factors, Bahir Dar City

LIST OF ABBREVIATIONS AND ACRONYMS

AOR.....	Adjusted Odds Ratio
BMI.....	Body Mass Index
CI.....	Confidence Interval
COR.....	Crude Odds Ratio
DM.....	Diabetes Mellitus
EDHS.....	Ethiopian Demographic Health survey
FFQ.....	Food Frequency Questionnaires
NCD.....	Non-Communicable Disease
SD.....	Standard Deviation
SES.....	Scio-Economic Status
SPSS.....	Statistical Package for Social Sciences
TV.....	Television
USA.....	United States of America
WHO.....	World Health Organization

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1. INTRODUCTION

1.1. Background

Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrient. These including under nutrition, micronutrient-related malnutrition and overweight (1). Overweight/obesity is one form of malnutrition and defined as abnormal or excessive fat accumulation in adipose tissue that may impair health. The fundamental cause for this is an energy imbalance between calories consumed and calories expended through physical activity (2).

The adolescent period of human life is one of the vital times when most of the body growth and development occur. It is the transitional phase of growth and development between childhood and adulthood (3). Next to infancy, it is the only period that there is rapid physical growth resulting in an increase in calorie and nutrient demand. This sudden growth is associated with hormonal, cognitive, and emotional changes that make adolescence an especially vulnerable period of life. First, there is a greater demand for calories and nutrients due to the dramatic increase in physical growth and development over a relatively short period of time. Second, adolescence is a time of changing lifestyles and food habits that affect both nutrient needs and intake. Third, adolescent drive for individualization means more opportunity to assert food choices and expand or narrow healthy options (4).

World Health Organization aims for a world free of all forms of malnutrition, where all people achieve health and wellbeing (2016–2025) and developed the "Global Action Plan for the prevention and control of noncommunicable diseases 2013-2020" with Global Strategy on Diet, Physical Activity and Health (1). The overall goal of this Plan of Action is to halt the rise of the rapidly growing overweight and obesity epidemic in children and adolescents (5).

By the World Health Assembly in 2004 adopted the "WHO Global Strategy on Diet, Physical Activity and Health" describes the actions needed to support healthy diets and regular physical activity. The Strategy calls upon all stakeholders to take action at global, regional and local levels to improve diets and physical activity patterns at the population level to prevent overweight/obesity and NCDs (6). This will be accomplished by implementing a set of effective policies, laws, regulations and interventions, which will take into account the priorities and context of member states, in the following strategic lines of action: a) primary health care and

promotion of breastfeeding and healthy eating; b) improvement of school food and physical activity environments; c) fiscal policies and regulation of food marketing and labelling; d) other multisectoral actions; e) surveillance, research and evaluation (5).

According to government of Ethiopia National Nutrition Program (NNP II, 2016–2020) and Seqota declaration plan to end child undernutrition by 2030 rather than overnutrition (overweight and obesity) (7).

1.2. Statement of the problem

Adolescent overweight is increasing worldwide at alarming rate in both developed and developing countries (8). Previously once considered a high-income country problem, now overweight is rising in low- and middle-income countries, including Ethiopia, particularly in urban areas where people are more prone to sedentary lifestyles. This is due to emerging economy and expanding of urbanization (9, 10).

Overweight is one of the most serious chronic public health challenges of the 21st century, as it significantly increases the risk of another chronic non-communicable disease such as cardiovascular disease, type-2 DM, hypertension, coronary heart diseases, respiratory disease and certain cancers. This in turn is associated with loss of 12 to 19 healthy life years by higher chance of premature death and disabilities (6, 11). And also have an important impact on the psychological state of adolescents with their self-image (around one fifth (137/693) of adolescents with obesity also had high levels of emotional distress (12).

Most of the world's population lives in countries where overweight and obesity kills more people than underweight (9). Overweight and obesity are the fifth leading risk factor for global deaths. At least 2.8 million adults die each year as a result of being overweight or obese and an estimated 35.8 million (2.3%) of global disability adjusted life years are caused by overweight or obesity (10, 13, 14).

In 2016, an estimated 41 million deaths occurred due to NCDs, accounting for 71% of the overall total of 57 million deaths. The majority of such deaths were caused by the four main NCDs, namely: 17.9 million deaths due to cardiovascular disease; 9.0 million deaths due to cancer disease; 3.8 million deaths due to chronic respiratory disease and 1.6 million deaths due to diabetes (15). Besides excess health care expenditure, overweight/obesity also imposes costs in the form of lost productivity and foregone economic growth as a result of lost work days, lower productivity at work, mortality and permanent disability (16). In 2017 economic impact

of obesity was estimated that US\$2 trillion of the global gross domestic product (GDP) per year (17).

Overweight is influenced by a complex interplay of individual, environmental and socio-economic factors, which provides an opportunity to target interventions at multiple levels (18). Rapid social and economic development has resulting high consumption of processed foods, high energy dense foods, frequent consumption of fast foods, sweetened beverages, low intake of fruits and vegetables, transportation (driving for transportation rather than walking and bicycling) and good marketing of unhealthy food options is an important factor for development of adolescents' overweight. And also, an increase in sedentary lifestyles from watching television and playing video games rather than outdoor sports has led to develop overweight and obesity among adolescents (2, 11).

The world has seen more than ten-fold increase in the number of obese children and adolescents aged 5-19 years in the past four decades from just 11 million (0.8%) in 1975 to 124 million (6.8%) and additional 213 million were overweight in 2016. Or almost one in every five (18.4%) were overweight or obese (6, 15) and in 2019 the magnitude of overweight among adolescents was 207 million globally (19).

Demographic health survey (DHS) data on adolescent nutrition 2000-2017, the prevalence of overweight/obesity was 11% in 2018 (20) and another meta-analysis in 2014 indicated that the prevalence of overweight/obesity was 13.1% in Sub-Saharan Africa (21).

In Ethiopia according to Ethiopia Demographic Health survey (EDHS) report prevalence of overweight and obesity among women & men with the age between 15-49 years was 8% & 3% respectively in 2016 (22). The prevalence of overweight/obesity among children and adolescents was substantially high and has become an emerging problem in Ethiopia, 11.3% in 2018 (23).

In Bahir Dar 2015, indicated that the overall prevalence of overweight and obesity was 16.7%, separately overweight and obesity were 12.3% and 4.4%, respectively (24).

Although WHO aims for a world free of all forms of malnutrition including overweight and obesity from 2016 to 2025 (1), currently there is a high prevalence of overweight among adolescents (207 million) in 2019 (19) and the Guardian predict 250 million children and adolescents worldwide to be obese by 2030 (25). Even if Sustainable development goals (SDGs) plan to reduce premature deaths from NCDs by one third in 2030 through prevention of adolescents overweight/obesity which is a leading risk factor for NCDs later in life, there is high

prevalence of deaths (41 million) occurred due to NCDs accounting for 71% of the overall total of 57 million deaths (15).

Even if some studies were conducted on the prevalence and associated factors of overweight and obesity among adolescents in Ethiopia, there is limited data on determinant factors of overweight/obesity among high school adolescents in Ethiopia including the study area. Therefore, this study was designed to identify determinant factors of overweight among high school adolescents in Bahir Dar City, North-West Ethiopia.

1.3. Significance of the study

The study is important for high school adolescents and community at large for the prevention and control of their overweight/obesity and related chronic noncommunicable disease. It is important for policy makers and strategy designers to design or modification of strategies based on the recommendations for appropriate interventions to reduce the future burden of overweight/obesity among adolescents. It is also important for Regional Health Bureau to develop appropriate programs for control and prevention intervention of overweight/obesity. Lastly it is important for researchers as a source of evidence for further study.

2. LITERATURE REVIEW

2.1. Determinants of overweight/obesity

2.1.1. Socioeconomic and demographic determinants

Multiple factors associated with adolescent's overweight are categorized as modifiable and non-modifiable risk factors. Modifiable causes include physical inactivity, sedentary life style, unhealthy eating habits, family socioeconomic status, and environmental factors. The common non-modifiable cause is genetics, with greater risk of overweight and obesity found in children of obese and overweight parents, even though, moderated by other factors (8). The studies conducted in south India, Ethiopia, Nigeria and Nepal showed that the prevalence of overweight and obesity was high among adolescents who belonged to higher socioeconomic class compared to those who belonged to the lower socioeconomic class. Consequently, adolescent students from families with higher socioeconomic background have more purchasing power for calorie-dense and nutrient-poor fast foods (26-30). In other studies, conducted in Bangladesh, Serbia and India indicated that there was no significant association between overweight and socioeconomic status (31-33). Studies conducted in Ethiopia and India showed an evidence for high school adolescent girls had significantly higher prevalence of overweight when compared to their controls and boys (27, 34, 35). The study conducted in Morocco and Bangladesh (2013 and 2019) indicated that sex was not significantly associated as determinant factors for overweight and obesity among high school adolescent students (31, 36, 37). The studies conducted in Addis Ababa (2014 & 2018) and Tanzania showed that higher age of adolescents was significantly associated with high school adolescent's overweight as positive determinant factors (33, 38-40). Study done in Turkey indicated that family pressure on their children in the direction of eating had positive significant association with overweight/obesity and chronic disease had no association overweight/obesity in 2018 (41). A case-control study done in India revealed that maternal employment was positive significantly associated with overweight and obesity (33). But in a cross-sectional study done in eastern Turkey, employment of fathers and mothers was not significantly associated with adolescent's overweight and obesity (42). Studies conducted in Hawassa Ethiopia and Morocco showed that secondary and above educational level of the mother and father was significantly associated with overweight and obesity among high school adolescent students (27, 36). Whereas other studies conducted in Nepal, Bangladesh and Saudi

Arabia showed that there was no significant association between parental educational status and overweight and obesity among high school adolescent students (30, 37, 43).

The studies carried out in Bahir Dar & Dire Dawa Ethiopia, Nigeria, India and revealed that students who were attending private owned schools had higher risks of overweight and obesity compared to those in governmental schools (24, 29, 33, 44). Study done in Bangladesh showed that school type was not significantly associated with high school adolescent's overweight/obesity in 2019 (37). Study conducted in Addis Ababa revealed that small family size was positive significantly associated with overweight/obesity (38). But other study conducted in Saudi Arabia showed that family size was not significantly associated with overweight and obesity among high school adolescent students (27, 43). Studies conducted from 25 schools/ in Stockholm and Sweden and from three sites USA showed that parental monitoring was significantly associated with overweight as preventive factors (45, 46).

2.1.2. Behavior related determinants

2.1.2.1. Dietary habit

Adolescent are the most common age groups which commonly experience unhealthy eating habits. They spend a good deal of time away from home and many consume fast foods, which are convenient, but are often high in calories and fat. It is common for adolescents to skip at least one from three regular meals per day and snack frequently (4, 47).

The study conducted in Addis Ababa and Gondor Town showed that risk of overweight/obesity was higher among adolescents who consumed three and more than three meals per day than adolescents who consumed less than three meals per day (48, 49). Whereas in other study conducted in Hawassa city and Dibrugarh Town revealed that risk of overweight/obesity was higher among adolescents who consumed three and less than three meals per day than adolescents who consume more than three meals per day (35, 37). Study conducted in Hawassa, Addis Ababa, and Siri Lanka that showed Skipping of regular meal was associated with low diet quality mainly low vegetable and fruit, high intake of food which is rich in calorie and sodium, fast foods (meat, fish, and other see foods), sweetened foods and drinks were more significantly associated and contributed for developing overweight and obesity among adolescents (37, 50, 51). The study conducted in Brazil showed that frequent consumption of meals revealed a significant inverse association with overweight and obesity, adolescents who had more than three meals per day were less likely to be overweight and obese than the others

(52). However, the study conducted in Morocco showed that no significant association between frequent or regular meals (breakfast, lunch and dinner) and adolescents overweight (36). Study conducted in Dibrugarh Town, Sri Lanka and Nigeria showed that significantly more overweight adolescents were having three or more extra snacks in between meals. This might be because of skipping meals lead to more snacks and junk food intake whenever they were hungry (35, 53-55). Study carried out in Hawassa showed that Skipping breakfast was not found to be a risk factor for overweight and obesity in adolescents (27). The studies conducted in Bahir Dar, Hawassa Ethiopia and Sri Lanka revealed that Consumption of vegetables was inversely or protective associated with overweight /obesity among school children or high school adolescents (27, 51, 56). Studies conducted in Dire Dawa and Gondor Town showed that there was no significant association between overweight and consumption of snacks, vegetables, fruits and number of meals per day (44, 48).

2.1.2.2. Physical activity

Physical activity is a cost-effective method of preventing and managing a wide range of non-communicable diseases including overweight. Increased physical activity, in the form of active transport has also been identified as a climate change mitigation strategy (57). Studies conducted in North Chennai India, Bangla dish, South India, Hawassa and Addis Ababa Ethiopia showed that physical inactivity was significantly associated and positively contributed to develop overweight/obesity among high school adolescents (27, 33, 34, 37).

Studies conducted in Addis Ababa in different years showed that doing extensively vigorous physical activity and playing in any recreation area around residence were found to have strong association with overweight. At the same time walking or riding bicycle for at least 10 minute per day and doing medium energy work was found to protect overweight (38, 39, 51). Whereas the study carried out in Hawassa Ethiopia, Bangla dish, Saudi Arabia and Brazil revealed that the absence or presence of physical activity at the school or outside the school was not found to be a factor associated with overweight/obesity in high school adolescents (27, 43). Studies conducted in Morocco and Turk among urban high school adolescents indicated that students who were used vehicle transport from and to the school have been more overweight/obese than students who were not used vehicles (36, 41). Whereas other studies conducted in Hawassa Ethiopia and Abhay city Saudi Arabia indicated that traveling from and to schools was not risk factor for adolescents' overweight/obesity (27, 43).

2.1.2.3. Sedentary behavior (screen viewing)

Sedentary behavior of adolescents was one of the variables that indicated amazingly strong association with overweight. It is any waking activity which is characterized by energy expenditure less than 1.5 metabolic equivalents performed at reclining or sitting position (57). Studies conducted in Nepal, Bangla dish, North Chennai India and Addis Ababa showed that sedentary activity like spending more time in watching television and sitting position was significantly associated positively with overweight/obesity among high school adolescents (30, 31, 34, 49). However, study conducted in Morocco and Saudi Arabia showed that watching television and video games were not determinant factors for overweight/obesity among high school adolescents (36, 43). Sleeping time found to be one of the significant environmental predisposing factors towards accumulating body weight in adolescents. Studies carried out in India, Saudi Arabia, Addis Ababa Ethiopia and United States revealed that less than 8 hours per day sleep duration was determinant factor for overweight and obesity among high school adolescents (33, 39, 43, 58). But in studies conducted in Servia and Bangla dish showed that no significant association between sleep duration and adolescents' overweight/obesity (32, 37).

3. CONCEPTUAL FRAME WORK

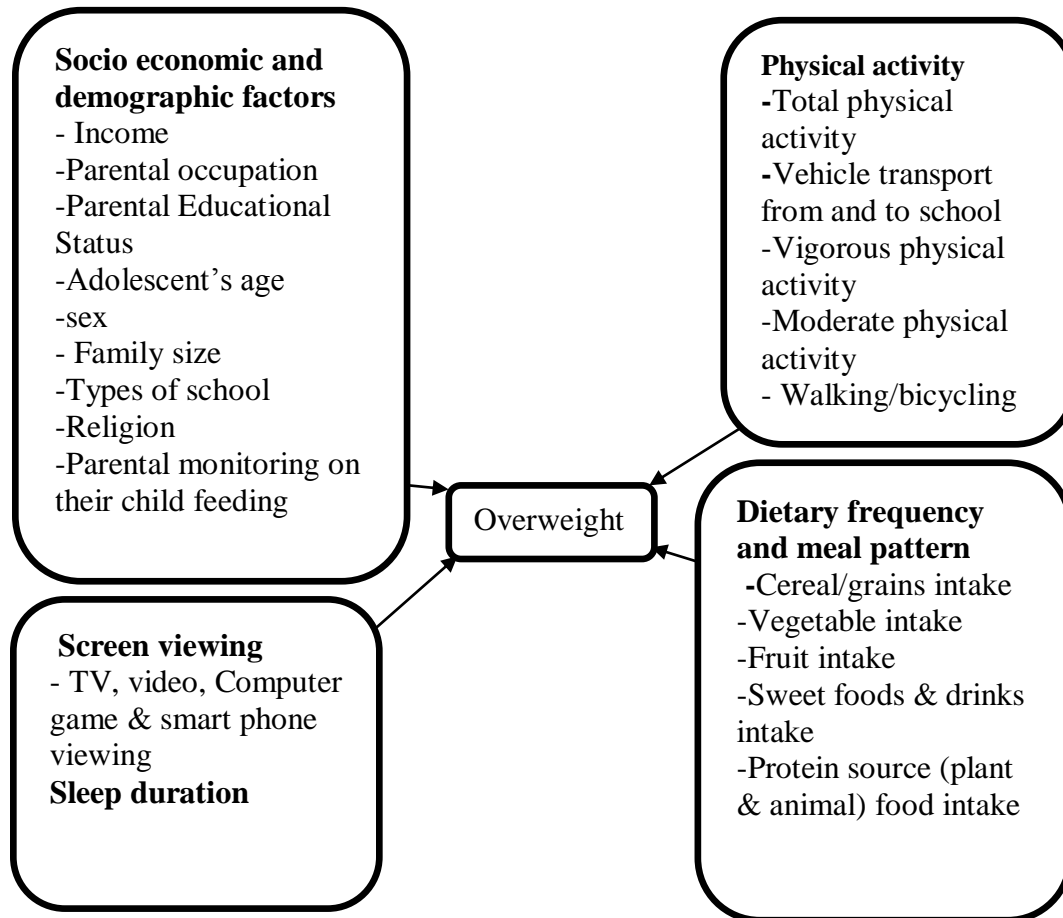


Figure 1: Conceptual Frame-work was adapted from different literatures and modified for determinants of overweight/obesity among high school adolescents in Bahir Dar City North West Ethiopia 2020

4. OBJECTIVE

To identify determinants of overweight/obesity among high school adolescents in Bahir Dar City, North West, Ethiopia, 2020

5. MATERIALS AND METHODS

5.1. Study design and period

School based unmatched case-control study was employed from March 01-13/2020

5.2. Study Area

The study was conducted in high schools of Bahir Dar City. According to the Amhara Regional bureau of finance and economic development plan report 2020, the population of Bahir Dar city was 348529 (173,569 females and 174,960 males). It is the capital of the Amhara regional state and it is popular with national tourists for its lake and comfortable climate and located at North West at a distance of 565 kilometers away from Addis Ababa. It has estimated area of 213.43 km² and lies on 1797 meter above sea level. According to 2020 plan report of Bahir Dar city Administration of Educational Bureau, there are total of 97 schools with 21 secondary's, 26 primaries, 50 kindergarten with 41 governmental while the rest 56 are nongovernmental. The total number of adolescents were 20152 (9769 males and 10383 females) in government high schools and 2740 (1233 males and 1507 females) in private high schools.

5.3. Source population

All school going adolescents found in Bahir Dar City high schools

5.4. Study population

- Study population for cases- All selected adolescents with BMI for age greater than or equal to +1 SD from selected high schools in Bahir Dar city (59)
- Study population for controls- All selected adolescents with BMI for age greater than -1 SD and less than +1 SD from selected high schools in Bahir Dar city (59)

5.5. Inclusion and exclusion criteria

5.5.1. Inclusion criteria

All selected adolescents with BMI for age greater than -1SD and less than +1SD as controls and greater than or equal to +1SD as cases found in Bahir Dar City high schools were included (59).

5.5.2. Exclusion criteria

High school adolescents with evidence of physical disability (such as physical defects or a grossly deformed), with edemas, female adolescents with pregnancy and high school adolescents with BMI for age less than or equal to -1 SD were excluded.

5.6. Variables

5.6.1. Dependent variable

- Overweight/obesity

5.6.2. Independent variables

- Socio economic and Demographic factors- Family income, parental occupation, parental educational status, sex, religion, family size, adolescent age
- Types of School
- Having vehicle for transport from and to school
- Parental monitoring
- Food frequency and meal pattern: consumption of grains, Protein source food (plant and animal sources), vegetable, fruit, sweetened foods and drinks, dairy products, fat/oil & roots/tubers.
- Physical activity—walking, moderate and vigorous physical activity
- Screen viewing—Watching TV, computer/videogame& smart phone screens
- Sleep duration

5.7. Operational and term definitions

Overweight: BMI for age greater than or equal to +1 SD but less than +2 SD (59)

Obesity: BMI for age greater than or equal to +2 SD (59)

Normal weight: BMI for age greater than -1 SD but less than +1 SD (59)

Underweight: BMI for age less than or equal to -1 SD (59)

Vigorous intensity physical activity: Running, fast cycling, football, volleyball and basketball(60)

Moderate intensity physical activity: Brisk walking, gardening, games and sports with children(60)

Screen viewing: Time spent in electronic screen which include watching TV, playing e-games and using tablets, computer and smart phones.

5.8. Sample size determination

Sample size was calculated using Epi-Info version-7 statistical software by considering two population proportion with an assumption of 95% confidence level, power of 80%, 5% level of significance (two-sided) and proportion of exposure to an important factor to be studied (Sedentary activities) among controls of 11.7% and among cases 29 %. To increase the precision by reducing the sampling error an additional 10% was also added for non-response, design effect was 1.5, odds ratio was 4.84 and with control to cases ratio of 2:1 was used to determine the minimum sample size. Accordingly, 297 sample size, assumed logistically possible and reasonably large enough (37).

Table1:Sample size calculation for the first specific objectives from significant variables of different literatures,2020

S.no	Factor identified	categories	Cases exposed (%)	Controls exposed (%)	Sample size using (Epi info7) (a)	Design effect = a*1.5	Non-response rate =b*10%	Total Sample size =b+c (d)	Reference
1	Having at least one overweight parent	Yes	56	32	147	221	22	243	(31)
2	Sedentary activities	>4 hours.	29	11.7	180	270	27	297	(37)
3	Attained puberty	Yes	39.7	19	164	246	25	271	(33)
4	Daily intake of breakfast	Regular	37.2	59.9	170	255	26	281	

5.9. Sampling technique

Multistage sampling technique was employed to select the study populations. First from the total of 21 high schools in Bahir Dar city, four high schools were selected by using simple random sampling (lottery) method. Then, all students who were eligible have been screened to know a total number of controls (normal weight) and cases (overweight) in four high schools with 9- 12 grade level adolescents. Among all screened adolescents, 4954 were controls (normal weight) and 226 were cases (overweight). The number of sampling units from each grade level (9-12) were determined by using proportionate allocation to the population. The final sample

size of 297 (controls=198 and cases=99) were selected from each grade levels by using systematic sampling method every k^{th} units.

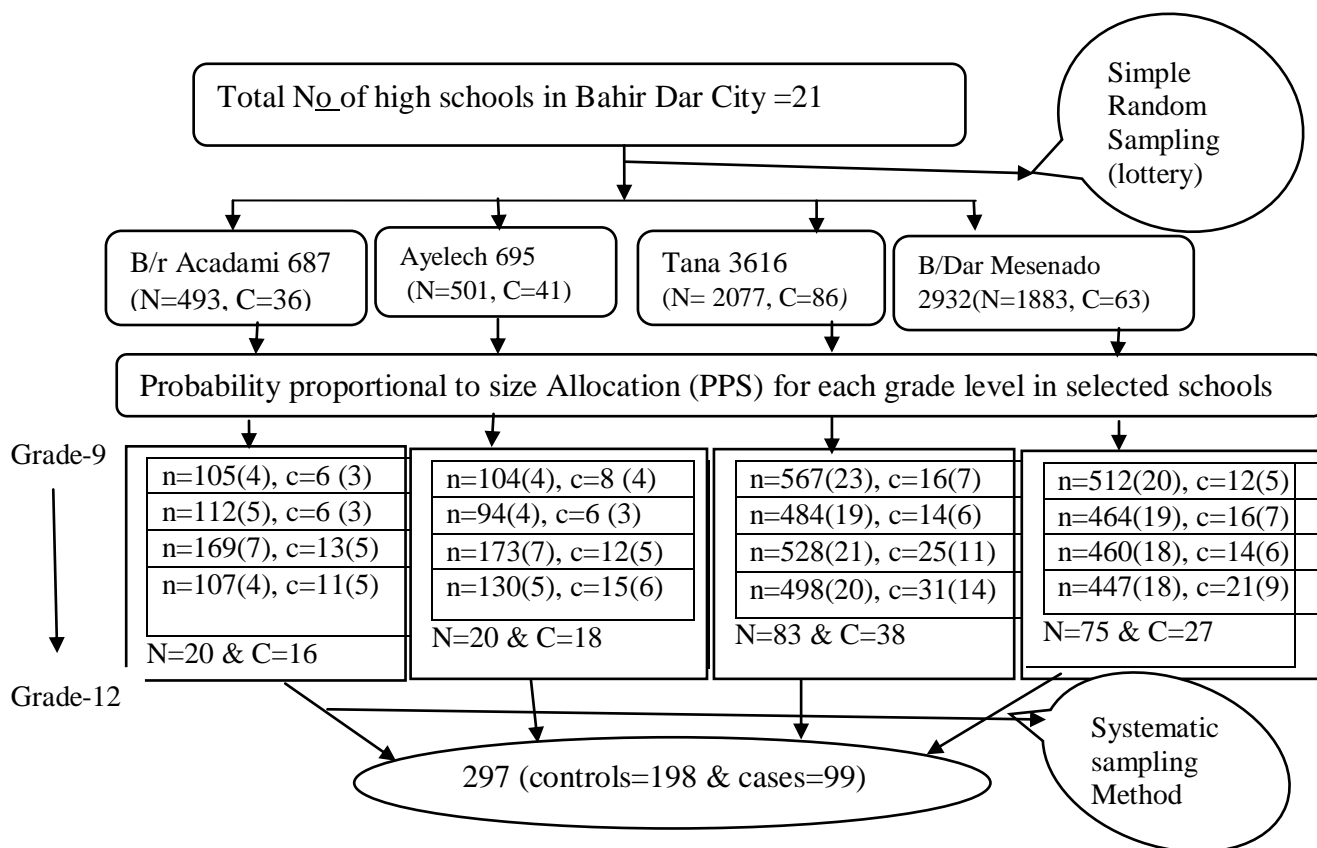


Figure 2: Schematic presentation of the sampling procedure and technique to select high school adolescents in Bahir Dar City, Amhara Region, Ethiopia, 2020

Where: - N is representing normal weight or controls
 -C is representing case (overweight/obesity)

5.10. Data collection tools and procedures

Self-administered questionnaires were used to collect data. The questioner consists of information on socioeconomic and demographic characteristics were adapted from EDHS and other literatures (22, 24, 27).

Food frequency questionnaires (FFQs) are designed to assess habitual diet by asking about the frequency with which food items or specific food groups are consumed over a reference period. This method can be used to gather information on a wide range of foods or can be designed on a particular group of foods e.g. fruit and vegetables. Therefore dietary intake questionnaires were assessed by using food frequency questionnaires (FFQ), meal pattern and practice which was

adapted from Helen Keller International FFQ that used previously in Ethiopia dietary practices of adolescents (61) and from other deferent literatures (24, 27, 38).

Sedentary behavior among adolescents was assessed by questionnaires adapted from validated adolescent sedentary activity questionnaires (49). Physical activity questionnaires were adapted from global physical activity questionnaires (GPAQ) (62) which are validated in study conducted in Bahir Dar by Zelalem Alamrew et al.(24) and sleep duration questionnaire were adapted from centers for disease control and prevention (CDC) (63) which was validated in study conducted in Addis Ababa (39).

Lastly height and weight anthropometric measurements were assessed by data collectors. Measurement of height has been carried out using stadiometer or portable height measurement. The study adolescents were asked to stand straight on leveled surface with shoes off, heels together, eyes looking straight ahead (Frankfurt plane), and hands freely by the side, head, shoulder blades and buttocks were against the wall. The moving head piece of the stadiometer has been lowered to rest flat on the top of the head and reading has been noted to the nearest 0.1cm (64).

Measurement of weight has been done by using a battery powered an electronic personal weighing measurement to the nearest 0.1kg. It has been calibrated against known weight regularly and error of the weighing scale has been checked before taking the weight and has been corrected when required before each measurement. The same measurement has been employed for given anthropometric measurement to avoid variability. All measurements have been taken twice; when necessary, any discrepancies have been resolved by a third measurement and measurement scales have been handled carefully and has been calibrated daily before data collection. The data collectors checked whether the scales were at zero reading before each measurement and all measurements have been recorded in the questionnaire (64).

BMI: Body weight in kilograms divided by height in meters squared. Underweight, normal weight, overweight & obese adolescents have been classified based on BMI for age WHO2007 Reference (59).

5.11. Data management and analysis

The data were checked for completeness, consistency and coding. It was entered into Epi data software version 3.1 and exported to SPSS version 23 for analysis. All Statistical tests were performed using SPSS version 23 software. Descriptive statistical analysis was performed using

frequency, percentage, and mean (SD). Tables were used for summarized data presentation. Bivariable and multivariable logistic regression were employed to identify candidate and significant variables respectively. First bivariable analysis was done for each independent variables with dependent variable and to determine crude odds ratio (COR) with 95% confidence interval to identify candidate variables which were associated with the outcome variable (overweight), then significant variables observed in the bivariable analysis with p-value <0.2 were subsequently included in the multivariable logistic regression analysis. Backward stepwise likelihood ratio method of the multiple logistic regressions was used to select variables with significance level of less than 0.05. Finally, adjusted odds ratio (AOR) with 95% Confidence Interval at p-value < 0.05 were considered as statistically significant variables.

5.12. Data quality assurance

First the questionnaire was developed in English version and translated in to local language (Amharic version). To check consistency, the questionnaire was translated back to English by another language expert. Three days training was given for four data collectors about the objectives, process of the data collection and how to taking anthropometric measurements. Five percent of the total sample sizes was pretested in randomly selected high school adolescents that were not included in the main study and the necessary adjustment was done accordingly. Continuous checkup of scales has been performed for their reliability. The principal investigator has supervised and reviewed every data collection procedure, questionnaire for completeness and logical consistency and correction were made. The principal investigator has collected the completed questionnaires every day and has been responsible for the coordination and on spot supervision of overall data collection process.

5.13. Ethical considerations

Ethical approval letter was obtained from the research and ethics review board at Bahir Dar University College of medicine and health science and school of public health and Amhara public health institute (APHI). A formal letter was given to the Regional educational bureau. All the study high school adolescents were informed about the purpose of the study and finally verbal informed consent was obtained before data collection. Written assent from parents was obtained for age of high school adolescents less than 18 years. Respondents have the right whether to participate or not and they can withdraw at any time from the study for any inconveniency. All information obtained from the study high school adolescents were kept

private and confidential. Names and other personal identification of adolescents were eliminated throughout the study process and final report.

5.14. Dissemination and utilization of the result

The result of the study will be disseminated to the relevant organization; like, policy makers, Bahir Dar city administration of health and selected high Schools, college of medicine and health sciences of Bahir Dar University & community at large in the City. The findings will be presented in different seminars, meetings and workshops and also attempt to make for publication of the research on reputable Journal. Hard and soft copies of the thesis will be available in library of Bahir Dar University for readers.

6. RESULT

6.1. Socioeconomic and demographic characteristics

In this study a total of 297 (99 cases and 198 controls) high school adolescents were participated which is response rate of 100%. Females accounted 57 (57%) in cases, and 123 (62.1%) in controls. Mean age of the adolescents in cases was 17.15 (± 1.4), and 17.197 (± 1.23) in controls. Above three fourth, (227 (76.4%)) of adolescents were Orthodox religion followers. About 40 (40.4%) of the mothers in cases, and 50 (25.3%) in controls attended diploma and above educational level respectively. More than half of fathers 56 (56.6%) attended diploma and above educational level and 46 (46.5%) government/private employment in cases. About 45 (45.5%) of mothers in cases and 89 (44.9%) controls were housewives. Mean family size in the adolescent's family was 3 (± 0.89) in cases and 4 (± 1.165) in controls. Based on the adolescent self-report, greater number of parents 146 (73.7%) monitor their child feeding in controls, while in cases only 29 (29.3%) parents monitor their child feeding (Table2).

Table 2: Socioeconomic and demographic characteristics among high school adolescents in Bahir Dar City, Ethiopia (N=297), 2020

Explanatory variables	Cases		Controls		Explanatory variables	Cases		Controls	
	n	%	n	%		n	%	n	%
Age					Monthly income (ETB)				
Middle adolescent (14-16)	32	32.5	56	28.3	<5000	30	30.1	79	39.9
Late adolescent (17-19)	67	67.7	142	71.7	5000-9000	21	21.2	56	28.3
Sex					10000-19999	24	24.2	48	24.2
Male	42	42.4	75	37.9	>20000	24	24.2	15	7.6
Female	57	57.6	123	62.1	Mother education				
Educational level/Grade					No formal education	12	12.1	42	21.2
Grade9	19	19.2	53	26.8	Primary grade level	21	21.2	66	33.3
Grade10	17	17.2	46	23.2	Secondary grade level	26	26.3	40	20.2
Grade11	27	27.3	47	23.8	Diploma and above	40	40.4	50	25.3
Grade12	36	36.4	52	26.3	Mother occupation				
School type					Government/private employee	32	32.3	40	20.2
Governmental	64	64.6	133	67.2	Merchant	19	19.2	54	27.3
Non-governmental	35	35.4	65	32.8	Housewife	45	45.5	89	44.9
Religion					Others	3	3	15	7.6
Orthodox	65	65.7	162	81.8	Father education level				
Muslim	25	25.3	30	15.2	No formal education	3	3	15	6.7
Others	9	9.1	6	3	Primary grade level	24	24.2	65	32.8
Family size					Secondary grade level	16	16.2	48	24.2
2-3	23	23.2	26	13.1	Diploma and above	56	56.6	70	35.4
4-5	40	40.4	99	50	Father occupation				
>5	36	36.4	73	39.9	Government/private employee	46	46.5	79	39.9
Parental monitoring on child feeding					Merchant	42	42.4	79	39.9
Yes	29	29.3	146	73.7	Others	11	11.1	40	20.2
No	70	70.7	52	26.3					

6.2. Physical activity and sleep duration characteristics

Of the total respondents, 135 (68.2%) of controls and 48 (48.5%) of cases were engaged in a total physical activity for greater than or equal to 60 minutes per day. Majority of controls 156 (78.8%) were spending sitting by watching TV, video, computer game less than three hours. Whereas, majority of cases 74 (74.4%) were spending sitting by watching TV, video, computer game greater than or equal to three hours per day. From the total respondents, 66 (66.7%) cases and 54 (27.4%) controls had vehicle for transport from and to school. Among the total of

respondents, 123 (62.1%) controls had WHO recommended sleep duration (8-10 hours per day) for adolescents. Whereas 71(71.7%) cases had short sleep duration (less than 8 hours) per day (Table3).

Table 3: Physical activity, screen viewing and sleep duration characteristics among high school adolescents in Bahir Dar city (N=297), 2020

Explanatory variables		Cases (99)		Controls (198)	
		n	%	n	%
Total physical activity	>=60 minutes per day	48	48.5	135	68.2
	<60 minutes per day	51	51.5	63	31.8
Vigorous physical activity	<=3 Days per week	71	71.7	144	72.7
	4-6 days per week	18	18.2	42	21.2
	Equal to 7 days per week	10	10.1	12	6.1
Moderate physical activity	<=3 Days per week	65	65.7	85	42.9
	4-6 days per week	24	24.2	86	43.4
	Equal to 7 days per week	10	10.1	27	13.6
Walking/cycling at least 30 minutes	<=3 Days per week	36	36.4	64	32.3
	4-6 days per week	34	34.3	42	21.2
	Equal to 7 days per week	29	29.3	92	46.5
Vehicle transport	Yes	66	66.7	54	27.4
	No	33	33.3	143	72.6
Screen viewing	<3hours	25	25.3	156	78.8
	>=3hours	74	74.7	42	21.2
Sleep duration	<8hours	71	71.7	42	21.2
	8-10hours	18	18.2	123	62.1
	>10hours	10	10.1	33	16.7

6.3. Seven-day dietary frequency and meal pattern characteristics

Among total adolescents, cases 21(21.2%) were never consumed vegetables and controls 80 (40.4%) were consumed vegetables for 5-6 times per week. About 35 (35.4%) cases were consuming fruits 1-4 times per week. And about 68 (34.3%) controls were consuming fruits once per day. Greater number of cases 40 (40.4%) were consuming sweetened foods and drinks 5-6 times per week. And about 80 (40.4%) controls were consuming sweetened foods and drinks more than once per day. Majority of controls 112 (56.6%) had meal frequency >=4 times per day, whereas majority of cases 74 (74.7%) had meal frequency <=3 times per day. Body mass index ranged, 26.09-36.13 (mean=28.3, SD=1.55) for cases and 18.52-23.23 (mean=19.73, SD=0.82) for controls (Table 4).

Table 4: Dietary frequency, practice and meal pattern characteristics of high school adolescents in Bahir Dar City, Ethiopia (N=297), 2020

Exposure Variables	Cases (99)		Controls (198)		Exposure Variables	Cases (99)		Controls (198)	
	n	%	n	%		n	%	n	%
Cereal intake					Meal frequency				
More than once per day	64	64.6	112	56.6	<=3times per day	74	74.7	86	43.3
Once per day	13	13.1	30	15.2	>=4times per day	25	25.3	112	56.6
5-6 times per week	15	15.2	43	21.7	Breakfast				
1-4 times per week	7	7.1	13	6.6	Daily	35	35.4	107	54
Never use per week	0	0	0	0	5-6 times per week	16	16.2	33	16.7
Legume intake					3-4 times per week	8	8.1	16	8.1
More than once per day	33	33.3	80	40.4	1-2 times per week	26	26.3	32	16.2
Once per day	13	13.1	30	15.2	Never use per week	14	14.1	10	5.1
5-6 times per week	42	42.4	67	33.8	Lunch				
1-4 times per week	5	5.1	17	8.6	Daily	44	44.4	103	91.9
Never use per week	6	6.1	4	2	5-6 times per week	33	33.3	44	2.5
Vegetable intake					3-4 times per week	4	4	24	3
More than once per day	19	19.2	69	34.8	1-2 times per week	18	18.2	27	2.5
Once per day	4	4	14	7.1	Never use per week	0	0	0	0
5-6 times per week	45	45.5	80	40.4	Dinner				
1-4 times per week	10	10.1	30	15.2	Daily	64	64.6	153	77.3
Never use per week	21	21.2	5	2.5	5-6 times per week	11	11.1	18	9.1
Fruit intake					3-4 times per week	14	14.1	9	4.5
More than once per day	5	5.1	63	31.8	1-2 times per week	9	9.1	15	7.6
Once per day	25	25.3	68	34.3	Never use per week	1	1	3	1.5
5-6 times per week	33	33.3	53	26.8	Fat/oil intake				
1-4 times per week	35	35.4	6	3	More than once per day	37	37.3	62	31.3
Never use per week	1	1	8	4	Once per day	41	41.4	20	10.1
Dairy product intake					5-6 times per week	4	4	72	36.4
More than once per day	19	19.2	86	43.4	1-4 times per week	14	14.1	33	16.7
Once per day	11	11.1	32	16.2	Never use per week	3	3	11	5.6
5-6 times per week	33	33.3	61	30.8	Roots consumption				
1-4 times per week	33	33.3	15	7.6	More than once per day	30	30.3	63	31.8
Never use per week	3	3	4	2	Once per day	9	9.1	15	7.6
Flesh food/meat					5-6 times per week	39	39.4	61	30.8
More than once per day	18	18.2	73	36.9	1-4 times per week	11	11.1	44	22.2
Once per day	6	6.1	68	34.3	Never use per week	10	10.1	15	7.6
5-6 times per week	38	38.4	43	21.7	Sweet food intake				
1-4 times per week	36	36.4	11	5.6	More than once per day	20	20.2	80	40.4
Never use per week	1	1	3	1.5	Once per day	20	20.2	42	21.2
Egg consumption					5-6 times per week	40	40.4	42	21.2
More than once per day	33	33.3	33	16.7	1-4 times per week	10	10.1	19	9.6
Once per day	11	11.1	14	7.1	Never use per week	9	9.1	15	7.6
5-6 times per week	26	26.3	87	43.9	Meal skipping				
1-4 times per week	23	23.2	22	11.1	Yes	52	52.5	88	44.4
Never use per week	6	6.1	42	21.2	No	47	47.5	110	55.6
Fish consumption					Eat food when studding				
More than once per day	19	19.2	48	24.2	Yes	48	48.5	73	36.9
Once per day	25	25.3	53	26.8	No	51	51.5	125	63.1
5-6 times per week	33	33.3	61	30.8	Regular meal schedule				
1-4 times per week	15	15.2	15	7.6	Yes	34	34.3	84	42.4
Never use per week	7	7.1	21	10.6	No	65	65.7	114	57.6

6.4. Bivariate and multivariate logistic regression analysis

In logistic regression bivariate analysis, variables which had significant associations with outcome variables were selected for the multivariable analysis.

Any variable whose bivariate test has p-value <0.2 was a candidate for multivariable model along with all variables of known significant importance. The majority of the variables which showed significant associations with adolescents' overweight in the bivariate analyses could not persist in having such associations in the multivariable analyses. Backward stepwise likelihood ratio method of the multiple logistic regression was used to identify variables with significance level of 0.05.

The most important covariates identified were: mother education level, screen viewing (watching TV, video and computer game), sleep duration, vehicle for transport from and to school, meal frequency was shown statistically positive significant association with adolescents' overweight/obesity. Whereas vegetable intake and parental monitoring on their child feeding were shown statistically negative significant association with overweight (Table5).

The present study revealed that adolescents born from mothers who attended Diploma and above were 5.58 times more likely to be overweight/obese to compared their control groups born from mothers who had no formal education (AOR=5.58, 95%CI:1.35-23.12, P=0.018). Odds of watching TV, video, computer game/play greater than or equal to three hours per day were 5.64 times higher (AOR= 5.64, 95%CI: 2.5-12.7, $p<0.0001$) in cases than odds of watching TV, video, computer game/play less than three hours per day in controls.

This study revealed that adolescents having sleep duration less than eight hours per day were 6.59 times more likely being overweight compared to those having sleep duration between eight and ten hours per day (AOR=6.59, 95%CI: 1.8-23.7, $p=0.004$). Whereas, long sleep duration did not show statistically significant association with overweight/obesity (>10 hours per day).

Odds of having vehicle for transport from and to school were 5.2 times higher (AOR=5.2, 95%CI: 2.18-12.5, $p<0.0001$) in cases than odds of having no vehicle for transport from and to school in controls. The current study showed that adolescents having ≤ 3 meals/day were 5.63 times more likely being overweight/obese compared to those having ≥ 4 meals/day (AOR=5.63, 95%CI: 2.37-13.38, $p<0.0001$).

Odds of consuming vegetables (more than once per day (AOR=0.061, 95%CI:0.01-0.3, P=0.001), once per day (AOR=0.084, 95%CI: 0.01-0.66, P=0.019), 5-6 times per week

(AOR=0.117, 95% CI:0.024-0.56, P=0.007) and 1-4 times per week (AOR=0.127, 95% CI: 0.022-0.73, P=0.022) were 93.9%, 91.6%, 87.3% and 88.3% reduced overweight/obesity compared to odds of never consuming vegetables respectively.

In a multivariable Logistic regression analysis, odds of having no parental monitoring on their feeding practice and sedentary activity were 5.59 times higher (AOR=5.59, 95% CI:2.4-12.89, $p<0.0001$) in cases than odds of having parental monitoring on their feeding activity in controls.

Table 5: Bivariable and multivariable logistic regression predicting COR and AOR for overweight/obesity among high school adolescents in Bahir Dar City, Ethiopia (N=297), 2020

Exposure Variables		Cases (99)	Control (198)	COR (95%CI)	AOR (95%CI)
Monthly income (ETB)	<5000	30 (30.1)	79 (39.9)	1	1
	5,000-9999	21 (21.2)	56 (28.3)	0.988(0.5 – 1.9)	1.45(0.429-4.9)
	10000-19999	24 (24.2)	48 (24.2)	1.32(0.69 –2.5)	1.15(0.31-4.22)
	>=20000	24 (24.2)	15 (7.6)	4.2(1.95-9) *	3.03(0.81-11.35)
Mother education level	No formal education	12 (12.1)	42 (21.2)	1	1
	Primary school	21 (21.2)	66 (33.3)	0.357(0.17-0.78) *	1.74(0.423-7.16)
	Secondary school	26 (26.3)	40 (20.2)	0.398(0.21-0.757) *	1.43(0.319-6.45)
	Diploma and above	40 (40.4)	50 (25.3)	0.813(0.426-1.55)	5.58(1.35-23.12) *
Mother occupation	Housewife	45 (45.5)	89 (44.9)	1	1
	Merchant	19 (19.2)	54 (27.3)	1.1(0.496-2.498)	0.56(0.16-1.88)
	Gov.t/private employee	32 (32.3)	40 (20.2)	2.28(1.01-5.1) *	0.58(0.148-2.29)
	Others	3 (3)	15 (7.6)	2.8(1.3-6) *	0.998(0.53-18.9)
Father education level	No formal education	3 (3)	15 (7.6)	1	1
	Primary school	24 (24.2)	65 (32.8)	0.25(0.069-0.91) *	3.14(0.387-25.43)
	Secondary school	16 (16.2)	48 (24.2)	0.46(0.26-0.83) *	3.15(0.304-32.63)
	Diploma and above	56 (56.6)	70 (35.4)	0.42(0.21-0.81) *	4.34(0.45-41.75)
Screen viewing	<3 hours	25 (25.3)	156 (78.8)	1	1
	>=3 hours	74 (74.7)	42 (21.2)	11(6.235-19.385) *	5.64 (2.5-12.7) *
Sleep duration	<8 hours	71 (71.7)	42 (21.2)	5.58(2.49-12.463) *	6.59 (1.8-23.7) *
	8-10 hours	18 (18.2)	123 (62.1)	1	1
	>10hours	10 (10.1)	33 (16.7)	0.483(0.204-1.14) *	0.779 (0.21-2.85)
Having vehicle	Yes	66 (66.7)	54 (27.4)	5.296(3.14-8.92) *	5.2 (2.18-12.5) *
	No	33 (33.3)	143 (72.6)	1	1
Total physical activity	>=60 minutes per day	48 (48.5)	135 (68.2)	1	1
	<60 minutes per day	51 (51.5)	63 (31.8)	0.44 (0.27-0.72) *	1.07(0.46-2.53)
Walking/ cycling at least for 30 minutes	<=3 days per week	36 (36.4)	64 (32.3)	1.78(0.99-3.2) *	1.6(0.57-4.45)
	4-6 days per week	34 (34.3)	42 (21.2)	2.57(1.39-4.75) *	1.88(0.65-5.43)
	Equal to 7 days per week	29 (29.3)	92 (46.5)	1	1
Meal frequency	<=3 times per day	74 (74.7)	86 (43.3)	3.86(2.26-6.57) *	5.63 (2.37-13.38) *
	>=4 times per day	25 (25.3)	112 (56.6)	1	1
Snack consumption	>=7 times per week	22 (22.2)	56 (28.3)	1.94(1.06-3.55) *	2.03(0.76-5.4)
	4-6 times per week	54 (54.5)	71 (35.9)	0.83(0.417-1.63)	0.595(.202-1.75)
	<=3 times per week	23 (23.2)	71 (35.9)	1	1
Vegetable intake	More than once per day	19 (19.2)	69 (34.8)	0.066(0.022-0.19) *	0.06 (0.01-0.3) *
	Once per day	4 (4)	14 (7.1)	0.068(0.016-0.29) *	0.08 (0.01-0.66) *
	5-6 times per week	45 (45.5)	80 (40.4)	0.134(0.047-0.38) *	0.12(0.02-0.56) *
	1-4 times per week	10 (10.1)	30 (15.2)	0.079(0.024-0.27) *	0.13(0.02-0.73) *
	Never use per week	21 (21.2)	5 (2.5)	1	1
Parental monitoring	Yes	29 (29.3)	146 (73.7)	1	1
	No	70 (70.7)	52 (26.3)	6.78(3.694-11.58) *	5.59 (2.4-12.8) *

*= Statistically significant at p-value <0.2 and < 0.05 for bivariable & multivariable analysis.

7. DISCUSSION

The present study found that children born from mothers who attended diploma and above educational level were 5.58 times more likely overweight/obesity to compared their control groups who born from mothers who had not formal education. This might be attributable to the busy schedule of educated mothers for instance with office works so that could not make healthy food choices for their adolescents and family. In addition, the observed high educational level might have helped mothers to be employed and increased their household income level and consequently they bought energy dense foods for their child. This finding was in line with study in Southern Ethiopia (27) and Morocco (36).

The odds of being overweight/obesity were 5.64 times more likely in adolescents (AOR=5.64, 95%CI: 2.5-12.7, P<0.0001) who spent time by watching TV, video and computer game more than or equal to 3 hours per day compared to their control groups. Support the current result from Hawassa (28), Addis Ababa (49) and Dire Dawa (44). Similarly, the prevalence of overweight was higher among children who were involved in sedentary activities such as spending >3 hours/day on television viewing (33). In contrast results from Saudi Arabia revealed that watching TV was not significantly associated with overweight (43). This inconsistency with the present findings might be due to genetic, socioeconomic and geographical discrepancy. Watching television could be contributing to the increased incidence of overweight among adolescents in many ways including: (a) the increase in sedentary behavior and decrease in physical activity; (b) increased snacking while watching television; (c) disturbance of normal sleeping pattern caused by watching television; and (d) increasing trends towards unhealthy eating patterns influenced by advertisements of junk/fast foods (65-67).

In both crude and adjusted binary logistic regression, short sleep duration was strongly associated with overweight/obesity. The present study showed that there was involvement of adolescents with insufficient sleep according to the minimum recommendation (8 hours/day) of CDC (63). Such behaviors are due to increase in social, hormonal changes and use of caffeine or stimulants and can lead to a serious damage to health and quality of life as well as the emergence and worsening of diseases including overweight (68). This study also showed that students having short sleep duration (<8 hours/day) were 6.59 times more likely to develop overweight/obesity (AOR=6.59, 95%CI:1.8-23.7, P<0.004) than their control groups who having recommended sleep duration (8-10 hours/day). This finding was in line with result in

cross-sectional study from Addis Ababa, where reduced sleep duration among adolescents was strongly associated with a greater risk for overweight/obese (39). Supporting result from Saudi Arabia revealed that short sleep duration significantly increased the risk of being overweight among adolescents (43). Similar report from case-control study in South India showed that short sleep duration was significantly associated with overweight for high school adolescents (33). The explanation for higher prevalence of overweight among adolescents having short sleep duration might be due to staying long at night with academic reading, watching TV, video and electronic/computer game. In contrast short sleep duration was not significantly associated with overweight in case-control study from Bangladesh (37).

Students from family having vehicle were 5.2 times more likely to report overweight/obesity compared to their control groups, this indicates that adolescents from family owning vehicle had more risk of overweight. This finding was similar with result from cross-sectional study conducted in Bahir Dar (24) and (56), Dire Dawa (44) and Morocco (36). Additionally consistent result from Turkey was found that transport to school by vehicle increased the development of overweight/obesity by 3-fold (41). Overweight high school students were arrived at school by walking short distance rather than long distance. This finding revealed that transported by vehicle was an important factor for the development of overweight by reducing physical activities, including walking, which can be performed by everybody. Therefore, it is considerably important to encourage adolescents to walk from and to school rather than using vehicle for transport.

The present study revealed an inverse relationship between meal frequency and body weight, which suggests that the habit of having major meals less than or equal to 3 times per day was positive significant factor to develop overweight/obesity. This is supported by Anjulo H. Bereket *et al* (2017) who showed that increased eating frequency is linked to decreased overweight and improved metabolic outcomes (27). However, reports from Addis-Ababa noted that children consumed ≥ 3 meals were more likely to develop overweight compared to those were consumed meals < 3 per day (49). According to Taylor and Garrow, meal frequency has no major impact on energy intake or expenditure but energy expenditure is delayed with a lower meal frequency compared with a higher meal frequency. This might be attributed to the thermogenic effect of food, continuing into the night when a later, larger meal is given (69).

The odds of consuming vegetables (more than once per day (AOR=0.061, 95%CI=0.01-0.3), once per day (AOR=0.084, 95%CI=0.01-0.66), 5-6 times per week (AOR=0.117, 95%CI=0.024-0.56) and 1-4 times per week (AOR=0.127, 95%CI=0.022-0.73) were 93.9%, 91.6%, 88.3% and 87.3%) less likely being overweight/obese of cases compared to odds of never consuming vegetables per week in their counterparts respectively. The finding was in agreement with the previous studies from Hawassa (27) Bahir Dar (56), Addis Ababa (51) and Sri Lanka (53). This could be due to the fact that their bulk and low energy density of vegetables (with high amount of water and fiber) are believed to reduce energy dense food consumption and helps to easily attain satiety (feeling of fullness and suppression of hunger).

Result of this study showed that parental monitoring was inversely associated with adolescents' overweight. Parents with overweight/obese adolescents used less monitoring score 29 (29.3%) than those with normal weight adolescents 146 (73.7%). This result was in line with other study which shown the parental monitoring over a two-years period showed a reduced overweight (45) and suggest that teaching positive parenting values and skills as part of overweight and obesity prevention and reduction programs may enhance their effects. Efforts at improving weight status of adolescents could benefit from addressing parent general monitoring with their children (46). Possible explanation for this, since adolescence is a time of changing lifestyles and food habits that affect both nutrient needs and intake and drive for individualization means more opportunity to assert food choices and expand or narrow healthy options (4). As a result of this parental monitoring on their child feeding might be important for healthy feeding practices.

8. STRENGTHS AND LIMITATIONS

8.1. Strengths

The second case control study design in country which focus on determinant factors of adolescents' overweight/obesity by including comparison groups. Increased strength of comparison by using two healthy study adolescents for each case to compare (control to case ratio=2:1). Although it is difficult to collect primary data at school after the emergency declaration of school closing on March 13, 2020 due to COVID-19 pandemic, complete primary data were collected at school before school closing.

8.2. Limitations

This study had some limitations, which might have influenced the findings. Since the responses were based on self-recall, there might be a potential for recall and social desirability bias. The study did not assess some other determinant factors that influence the adolescents weight status, such as genetic factors, food portion, birth order and birth weight.

9. CONCLUSIONS

The study demonstrated that several risk factors including mother educational level, sleep duration, screen viewing (TV, video and computer game/play watching), vehicle transport from and to school, parental monitoring on their child feeding practice, meal frequency and consumption of vegetables were significantly associated with overweight/obesity. Parents should limit their child screen viewing time and monitor their child feeding to prevent overweight and related NCDs. Strategies which focus on collaboration among health sectors and education sectors, increasing awareness on adolescent adequate duration of sleep at night through mass media. Generally, preventive intervention Strategies that address these determinant factors of overweight/obesity should be designed by concerned bodies and implemented at every setting including community at large.

10.RECOMMENDATIONS

Based on the findings of this study, the following recommendations are included:

- ✓ Parents should encourage healthful eating habits at home by increasing the number of consumption of vegetables.
- ✓ Mothers with higher educational level (diploma & above) give attention for their child weight status.
- ✓ Health workers should give health education on diet for adolescents and their families.
- ✓ Parents and teachers should encourage active transport rather than vehicle transport from and to school and limiting their screen viewing.
- ✓ Parents should advice their child to sleep for recommended sleep duration (8-10hrs per day).
- ✓ Public health strategies are warranted to increase awareness on these risk factors among adolescents in order to reduce the future burden of overweight and associated chronic NCDs.
- Among different settings, schools should be the priority setting to target adolescents because it offers opportunities for prevention of overweight.
- Ministry of health should develop strategies and enforce its implementation to help fight the rising epidemic of overweight in high school adolescents.
- Since Mass Medias and Social Medias are common sources of information next to family and peer, attention should be given on advertisements and information transmitted on determinant factors of overweight among high school adolescents.
- Community based longitudinal studies and qualitative studies will better to further investigate including the remaining determinant factors of overweight/obesity among adolescent populations.

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12.APPENDIX

Appendix I Written consent/assent form for parents of adolescents (English version)

Bahir Dar University, School of Public Health, Department of Nutrition and Dietetics

Good morning/afternoon? My name is. Currently; I am a graduate student at Bahir Dar University, College of Medicine and Health sciences, school of public health, department of Nutrition and Dietetics. And now I am conducting a research on determinant factors of overweight among high school adolescents in Bahir Dar City.

Objective: To assess determinant factors of overweight among High school adolescent Students in Bahir Dar City, North Western Ethiopia in 2020.

Your children is selected randomly as a possible participant in this study.

Potential risks: There is no potential risk that may cause any harm on study participants.

Benefits: There is no financial benefit related with this study. But by participating in this study, your offspring will contribute to improve the prevention and control method of Overweight among adolescent students.

Confidentiality: You and your child name will not be written in this form and will never be used in connection with any information your child will tell us. All information given by your child will be kept strictly confidential. Your child participation will be voluntary and not obligate to answer any question which, he/she do not wish to answer. If your child fills discomfort to respond to the question, he/she will be fill free to drop it. The questionnaire will take about 30 minutes.

For further explanation use the Principal Investigator's name and address

Name: Sewyalew Birhanu E-Mail: sewyalew@gmail.com

Cell –Phone: +251-9 20-271284

Written assent form from child parents

Bahir Dar University, School of Public Health, Department of Nutrition and Dietetics

I have read and understand all about the objective and the process of the study. My child participation is voluntary and not obligate to answer any question; he/she/ they do not know or do not wish to answer. I also understood that all information given by my child will be kept strictly confidential. Therefore, I allowed my child to participate in this study.

Child parents sign _____ date _____

Data collector sign _____ date _____

Appendix II: Participant information sheet (English version)

Good morning/ afternoon.

My name is _____ and I am here on behalf of Sewyalew Birhanu, student of Bahir Dar University, school of public health, department of Nutrition and dietetics.

You are selected to participate in this study because you are currently attending in one of the selected schools for the study purpose. Your participation is purely based on your Willingness& you have the right to choose not to take part in this study. You are not obligate to answer any question which you do not wish to answer. Your name will not write in this form and will never be use in connection with any information you will tell us. All information given by you will be kept strictly confidential. If you fill discomfort with self-administer questionnaire, no matter how, drop it any time you want.

If you agree to participate in the study, I would like to ask you a few questions about your family socio-economic and demographic characteristics, your feeding frequency and meal pattern physical activity, screen viewing, parental monitoring on your feeding and sleep pattern. This will be important for prevention and control of overweight among high school adolescents in Bahir Dar City based on the information you will provide us. Answering of the question will take about 30minutes.

Data collector name _____ sign _____ date ____/____/____

Appendix III: Survey Questionnaire (English Version)

Name of the school _____

Identification number _____ Date ____/____/____ signature _____

Part 1. Questionnaires about socioeconomic and demographic characteristics

Please carefully read and circle the number with the correct answer for the following questions.		
No	Questions	Responses
101	How old are you?	___year___ Month___ Day
102	What is your sex?	1. Male 2. Female
103	Which grade are you now?	1. 9 th 2. 10 th 3. 11 th 4. 12 th
104	What type of School you learn?	1. Governmental 2. Non-governmental
105	What is your religion?	1. Orthodox 2. Muslim 3. Catholic 4. Protestant 5. Other (Specify) _____
106	What is the size of your family? (total number of individuals living in the house including you)	1. 2-3 2. 4-5 3. >5
107	What is the average estimated monthly earning of the family in Ethiopian birr?	1. <5,000 2. 5,000-9,999 3. 10,000-19,999 4. >20,000
108	What is your mother educational level?	1. No formal Education 2. Primary Level 3. Secondary Level 4. Diploma and above
109	What is your Mother occupation?	1. Government/private employee 2. Merchant 3. Housewife 4. Other (specify)_____
110	What is your father's educational level?	1. No formal Education 2. Primary Level 3. Secondary Level 4. Diploma and above
111	What is your father's occupation?	1. Government/private employee 2. Merchant 3. Other (specify)_____

Part 2. The following questionnaires focus on dietary related habits, practice and food frequency.

2.1. Please select and circle the correct answer from the number listed in the table.		
	Questions	Responses
201	How many times do you usually eat your meal per day?	1. ≤ 3 times per day 2. ≥ 4 times per day
202	How often do you eat Breakfast?	1. Daily 2. Three to four times per week 3. Five to seven times per week 4. One to two times per week 5. Never
203	How often do you eat lunch?	1. Daily 2. Three to four times per week 3. Five to seven times per week 4. One to two times per week 5. Never
204	How do you get your lunch?	1. From home 2. Buy from school cafeteria 3. Buy from nearby food service 4. I did not use lunch
205	How often do you eat dinner?	1. Daily 2. Three to four times per week 3. Five to seven times per week 4. One to two times per week 5. Never
206	How often do you take snacks per week?	1. ≥ 7 times per week 2. 4-6 times per week 3. ≤ 3 per week
207	Do you have a habit of skipping meals?	1. Yes 2. No
208	Do you eat While you Watch television?	1. Yes 2. No 3. I did not watch television
209	Do you often buy foods when you go to movies or cinema?	1. Yes 2. No 3. I did not go movies or cinema
210	Do you eat food, when you study?	1. Yes 2. No
211	Do you have a regular meal schedule?	1. Yes 2. No

2.2. For each food item listed below, indicate with a checkmark (✓) the category that best describes the frequency which usually you will eat that particular food item. Thinking about the last three months, how frequently did you eat the following food item.

No	Food item	More than once per day	Once per day	5-6 times per week	1-4 times per week	Never use
214	Cereals/ Grains					
	Teff (Enjera)					
	Wheat (Bread, Pasta, Mecomroni)					
	Barley (Kollo, Porridge, Bread)					
	Maize					
	Rice					
215	Vegetables					
	Tomato					
	Cabbage					
	Pumpkin					
	Kosta					
	Selata					
	Chili					
216	Roots/Tubers					
	Beetroot					
	Carrot					
	Sweet potato					
	potato					
217	Fruits					
	Orange					
	Avocado					
	Banana					
	Mango					
	Lemon					
	Papaya					
	Apple					
218	Dairy products					
	Milk					
	Cheese					
	Sorghum					
219	Flesh foods/Meat					
	Beef					
	lamb					
	Chicken					
	Goat/Mutton					
	Organ meat					

	(liver, heart, kidney)					
220	Egg					
221	Fish					
222	Legumes					
	Bean (Kollo, Nifro, shiro)					
	Pea					
	Soya bean					
	Chickpea					
	Lentil					
	Nut/ peanut					
223	Fats/Oils					
	Butter/Oil					
224	Sweets/ calorie rich Foods and drinks					
	Soft drinks (Coca, Pepsi, Mirinda)					
	Fast foods (Burger, Chips), cakes & cookies					
	Sugar, marmalade, Chocolates & candies					

Part 3: Below this you will be asked about time you spend doing physical activities in a typical day, Week. Please read carefully the following questions and write the correct answer.

No	Questions	Response
301	How many minutes do you do total physical activity per day?	1. <60 minutes 2. >=60 minutes
302	How many days do you do at least for 10 minutes in vigorous intensity physical activities per week?	1. <=3 times per week 2. 4-6 times per week 3. 7 times per week
303	How many days do you do moderate –intensity physical activity at least for 10 minutes?	1. <=3 times per week 2. 4-6 times per week 3. 7 times per week
304	How many days do you walk or use a bicycle for at least 30 minutes continuously per week?	1. <=3 times per week 2. 4-6 times per week 3. 7 times per week
305	Do you have a car or vehicle for transport from and to school?	1. Yes 2. No

Part 4: Sedentary behavior and sleep duration related questionnaires.

Please read carefully the following questions and circle the correct one that considering you.

	Question	Response
401	How much times do you usually spend sitting by watch TV, video and computer game plays, per day?	1. Less than 3 hours 2. Greater than or equal to 3hours
402	Average Sleep duration in particular day	1. Less than 8hours 2. 8-10hours 3. Greater than 10 hours

Part 5: Questionnaire for Physical Measurements to be filled by data collectors

Please cooperate for physical measurement of your height and weight to answer the following questions

501	Height in centimeters (cm)	cm: _____
502	Weight in kilograms (kg)	kg: _____
503	BMI	_____

Name of data collector _____ date ____/____/____ sign _____

Amharic Version:

Appendix IV በጽናቱ ከሚሳተፉ ልጅ ወላጆች ፈቃድ ወይም ስምምነት የሚወሰድበት ቅፅ (Amharic version)

ባህር ዳር ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የስነ-ምግብ ትምህርት ክፍል ከጤና ጋር የተያያዘ ጥናታዊ ፅሁፍ የተሳታፊዎች መረጃ መስጫ ቅጽ

እንደምን አደሩ/ዋሉ? እባላለሁ። በባህር ዳር ዩኒቨርሲቲ የህክምናና ጤና ሳይንስ ኮሌጅ የስነ-ምግብ ትምህርት ክፍል የ2ኛ ዓመት የማስትሬት ድግሪ ተመራቂ ተማሪ/ች። በአሁኑ ሰዓት በባህር ዳር ከተማ ከዘጠነኛ እስከ አስራሁለተኛ ክፍል ለሚማሩ ተማሪዎች ለክብደት መጨመር ተያያዥነት ያላቸውን ነገሮች ለመለየት በማጥናት ላይ እገኛለሁ።

የጥናቱ አላማ፡ ለልጆች ክብደት መጨመር ተያያዥነት ያላቸውን ነገሮች ለመለየት ነው።

የጎንዮሽ ጉዳት፡ በዚህ ጥናት መሳተፍ በልጅዎ ላይ ምንም አይነት ጉዳት አያመጣም።

ጥቅማጥቅም፡ በዚህ ጥናት መሳተፍ ምንም አይነት ገንዘብ አያስገኝም። ነገር ግን ከልጅዎ የምናገኘው መረጃ ከልጆች ክብደት መጨመር ጋር ተያያዘው የሚመጡ የልጆችን የጤና ችግሮች ቀድሞ ለመከላከል እና እቅድ ለማወጣት ይረዳል። ስለዚህ ይህንን አስመልክቶ ልጅዎን የተወሰኑ ጥያቄዎችን ልጠይቅ እወዳለሁ። የልጅዎ በእውነት ላይ የተመሰረተ መልስ ለዚህ ጥናት መሳካት አስተዋፅኦ ያደርጋል። የእርስዎ ልጅ የሚሰጠው/የምትሰጠው መረጃ ከአጥኚውና ቃለመጠይቅ አድራጊው በስተቀር በማንኛውም መልኩ ለሌላ 3ኛ ወገን ተላልፎ አይሰጥም። በሙሉ ፈቃደኝነት እንዲሳተፉ እየጠየቅሁ ያለመሳተፍ ወይም በማንኛውም ጊዜ ራሳቸውን ከጥናቱ የማግለል ሙሉ መብት አላቸው። በማንኛውም ጊዜ ጥያቄ ካለዎት በሚከተለው አድራሻዬ ማግኘት ይችላሉ።

ለበለጠ መረጃ የሚከተለውን አድራሻ መጠቀም ይቻላል

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ከወላጆች ስምምነት መጠየቂያ/ማረጋገጫ ቅፅ

ባህርዳር ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የስነምግብ ትምህርት ክፍል ከጤና ጋር የተያያዘ ጥናታዊ ፅሁፍ የስምምነት ማረጋገጫ ቅፅ ስሜ ከዚህበታች የተገለፀው፤ የዚህጥናት ዓላማ በደንብ የተብራራልኝ ሲሆን የጥናቱንም ዓላማተረድቻለሁ። ልጄ በዚህጥናት ላይ ለመሳተፍ በሙሉ ፈቃደኝነት ላይ የተመሰረተ መሆኑን በሚገባ የተረዳሁ ሲሆን በማንኛውም ጊዜ ከጥናቱ ራሱን/ራሷን የማግለል መብት እንዳለው/እንዳላት አውቄ አለሁ። ስለሆነም የሚሰጠው/የምትሰጠው መረጃ እስከ ተጠበቀ ድረስ በዚህ ጥናት እንዲሳተፍ/እንድትሳተፍ ተስማምቻለሁ። በዚህ ጥናት እንዲሳተፍ/ እንድትሳተፍ ስምምነቴን ስገልፅለሁ ሚጠየቀው/ ለምትጠየቀው ጥያቄ በእውነት ላይ የተመሰረተ መልስ እንዲሰጥ/እንድትሰጥ የተስማማሁ መሆኔን አረጋግጣለሁ።

የወላጅ ፊርማ _____ ቀን ____/____/____

የአጥኚው ፊርማ _____ ቀን ____/____/____

Appendix V ክልሎች ስምምነት የሚወሰድበት ቅፅ (Amharic version)

ባህርዳር ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የስነ-ምግብ ትምህርት ክፍል ከጤና ጋር የተያያዘጥናታዊፀሁፍየተሳታፊዎች ስምምነት ፎርም

ጤና ይስጥልን እንደምን ነዎት _____ እባላለሁ። የመጣሁበት ምክኒያት በባህር ዳር ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የስነ-ምግብ ትምህርት ክፍል ሁለተኛ ዲግሪን ለማግኘት የምርምር ጥናቱን እየሰራባለዉ ተማሪ ሰዉያለዉ ብርሃኑን ወክዬ የጥናቱን መረጃ ከእናንተ ለመሰብሰብ ነዉ።

በዚህ ጥናት ላይ የሚሳተፉ ተማሪዎች በእጣከተመረጡት ትምህርትቤቶችመካክሌ በአንዱ ውስጥ የሚማሩሲሆኑ እርስዎም እድሉደርስዎት አንዱ/አንዷለመሆን በቅተዋል።በዚህ ጥናት ላይ መሳተፍ በእርስዎ ሙሉፍቃደኝነት ላይየተመሰረተ ነዉ።ያለፈቃደኝነት መረጃዉን እንዲሰጡ ግዴታ የለዉም።እርስዎ የምትሰጡት መረጃ ከአጥኚውና ቃለ መጠይቅ አድራጊው በስተቀር በማንኛውም መልኩ ለሌላ 3ኛ ወገን ተላልፎ አይሰጥም። በሙሉ ፈቃደኝነት እንድትሳተፉ እየጠየቅሁ ያለመሳተፍ ወይም በማንኛውም ጊዜ ራስዎን ከጥናቱ የማግለል ሙሉ መብት አለዎት። ከእርስዎ የመገኘዉ መረጃ ክልሎች ክብደት መጨመር ጋር ተያይዘዉ የሚመጡ የልጆች ጤና ችግሮች ለመከላከል እቅድ ለማዉጣትይረዳል።በመሆኑም የእርስዎ ተሳትፎ ለዚህ ጥናት ከፍተኛ አስተዋፅዖ ስለሚያደርግ መልካም ፈቃዶዎ ሆኖ በጥናቱ እንደሚሳተፉተስፋ-አደርጋለሁ።ፈቃደኛ ከሆኑ በዚህመጠይቅ የቤተሰብዎን ማህበራዊና ኢኮኖሚያዊ ሁኔታ፣የአመጋብዎን ልምድ፣ ሰለ አካላዊ እንቅስቃሴ እና በመቀመጥ እና በመተኛት የምታሳልፉትንጊዜበተመለከተእጠየቅዎትአለሁ።ከዚህበተጨማሪ የርስዎን ክብደትና ቁመት መጠን እንለካለን። የእርስዎን በእውነት ላይ የተመሰረተ መልስ ለዚህ ጥናት መሳካት አስተዋፅኦ ያደርጋል። በማንኛውም ጊዜ ጥያቄ ካለዎት በሚከተለው አድራሻዬ ማግኘት ይችላሉ። ጥያቄዎችን ለመመለስ 30 ደቂቃ ያህል ጊዜ ይሰጣል።

መረጃዉን የሚሰበስበዉ ስምና ፊርማ

ስም _____ ቀን _____ / _____ / _____ ፊርማ _____

Appendix VI መረጃ የሚሰጡበባቸው መጠይቆች (Amharic version)

የት/ቤቱ ስም _____ መጠይቁ የተካሄደበት ቀን ____/____/____

የተጠያቂው መለያ ቁጥር _____

ክፍሌ 1: ማህበራዊ እና ኢኮኖሚያዊ መረጃዎችን የሚመለከቱ ጥያቄዎችን እጠይቅዎታለሁ።

እባክዎ ለቀረቡት ጥያቄዎች መልስ የሆነውን በመልስ ሳጥን ውስጥ ያሉትን ቁጥሮች በማክበብ ይመልሱ።

ተ.ቁ.	ጥያቄ	መልስ
101	ዕድሜዎ ስንት ነው?	_____ ዓመት ከ _____ ወር ከ _____ ቀን
102	ፆታዎ?	1. ወንድ 2. ሴት
103	ስንተኛ ክፍል ነዎት?	1. 9ኛክፍል 2. 10ኛክፍል 3. 11ኛክፍል 4. 12ኛክፍል
104	የሚማሩበት የት/ቤቱ አይነት	1. መንግስታዊ 2. መንግስታዊ ያልሆነ
105	ሃይማኖትዎ ምንድን ነው?	1. ኦርቶዶክስ 2. ሙስሊም 3. ካቶሊክ 4. ፕሮቴስታንት 5. ሌላካለ ይጠቀስ _____
106	የቤተሰብዎ ብዛት ከእርስዎ ጋር በቁጥር ስንት ነው?	1. 2-3 2. 4-5 3. >5
107	የቤተሰብዎ አማካይ ወረሃዊ ገቢ ምን ያህል ነው?	1. <5,000 2. 5,000-9,999 3. 10,000-19,999 4. >20,000
108	የእናትዎ የትምህርት ደረጃ ምንድን ነው?	1. መደበኛ ትምህርት የሌላት 2. 1ኛ-8ኛ ክፍል 3. 9ኛ-12ኛ ክፍል 4. ዲፕሎማ እና ከዚያ በላይ
109	የእናትዎ የስራ ዘርፍ ምንድን ነው?	1. የመንግስት/የግል ተቀጣሪ 2. ነጋዴ 3. የቀን ሰራተኛ 4. የቤት ዕመቤት/ስራ የሌላት 5. ሌላካለ ይጠቀስ _____

110	የአባትዎ የትምህርት ደረጃ ምንድን ነው?	<ol style="list-style-type: none"> 1. መደበኛ ትምህርት የሌለው 2. 1ኛ-8ኛ ክፍል 3. 9ኛ-12ኛ ክፍል 4. ዲፕሎማ እና ከዚያ በላይ
111	የአባት የስራ ዘርፍ ምንድን ነው?	<ol style="list-style-type: none"> 1. የመንግስት/የግሉተቀጣሪ 2. ነጋዴ 3. የቀን ሰራተኛ 4. ስራ የሌለው 5. ሌላ ካለ ይጠቀስ_____

ክፍል 2: የአመጋገብ ልምድዎን እና የምግብዎን ፍሪኬንሲ የሚመለከቱ ጥያቄዎችን እጠይቅዎታለሁ::

2.1. እባክዎ የአመጋገብ ልምድዎን ለሚመለከቱ ጥያቄዎች መልስ የሆነውን በመልስ ሳጥን ውስጥ ያሉትን ቁጥሮች በማክበብ ይግለጹ::		
ተ.ቁ	ጥያቄ	መልስ
201	መደበኛ ምግብዎን በቀን ስንት ጊዜ ይመገባሉ?	<ol style="list-style-type: none"> 1. ሶስት እና ከዚያ በታች 2. አራት እና ከዚያ በላይ
202	ቁርስዎትን ሁልጊዜ ይመገባሉ?	<ol style="list-style-type: none"> 1. በየቀኑ 2. በሳምንት ከሶስት እስከ አራት ጊዜ 3. በሳምንት ከአምስት እስከ ሰባት ጊዜ 4. በሳምንት ከአንድ እስከ ሁለት ጊዜ 5. በልቼ አላወቅም
203	ምሳዎትን ሁልጊዜ ይመገባሉ?	<ol style="list-style-type: none"> 1. በየቀኑ 2. በሳምንት ከሶስት እስከ አራት ጊዜ 3. በሳምንት ከአምስት እስከ ሰባት ጊዜ 4. በሳምንት ከአንድ እስከ ሁለት ጊዜ 5. በልቼ አላወቅም
204	ምሳዎትን እንዴት ያገኛሉ?	<ol style="list-style-type: none"> 1. ከቤት በማምጣት ወይም ቤት-በመሄድ 2. ከትምህርት-ቤት ካፍቴሪያ በመግዛት 3. በትምህርት-ቤቱ አቅራቢያ 4. በሚገኝ ምግብ ቤት በመግዛት 5. ምሳ አልጠቀምም
205	እራትዎን ሁልጊዜ ይመገባሉ?	<ol style="list-style-type: none"> 1. በየቀኑ 2. በሳምንት ከሶስት እስከ አራት ጊዜ 3. በሳምንት ከአምስት እስከ ሰባት ጊዜ 4. በሳምንት ከአንድ እስከ ሁለት ጊዜ 5. በልቼ አላወቅም
206	ከመደበኛ የምግብ ፕሮግራም ውጭ በሳምንት ምን ያህል ጊዜ መክሰስዎን	<ol style="list-style-type: none"> 1. በሳምንት 7 እና ከዚያ በላይ 2. በሳምንት ከ 4-6 ጊዜ

	ይመገባሉ?	3. በሳምንት <=3
207	ምግብዎን የመዝለል ልምድ አለዎት?	1. አዎ 2. የለም
208	ቴሌቪዥን በሚያዩበት ጊዜ ምግብ ይመገባሉ?	1. አዎ 2. አልመገብም 3. ቴሌቪዥን አላይም
209	ፊልም /ሲኒማቤት በሚሄዱበት ጊዜ ምግብ ገዝተው ይመገባሉ?	1. አዎ 2. አልመገብም 3. ፊልምቤት አልሄድም
210	ጥናት በሚያጠኑበት ጊዜ ምግብ ይመገባሉ?	1. አዎ 2. አልመገብም
211	የምግብ ስዓተዎን ያሳልፋሉ?	1. አዎ 2. የለም

2.2. ከዚህ ቀጥሎ ያሉት ጥያቄዎች በተለምዶ አዘውትረው ስለሚመገቡአቸው ምግቦች የተመለከቱ ናቸው። እባክዎ ጥያቄዎቹን ሲመልሱ ባለፈው ሦስት ወር ውስጥ አዘውትረው የተመገቡአቸውን ምግቦች እያስታወሱ የራይት ምልክቱን (✓) በተመለከተው ቴብል ላይ ተክ ያድርጉ።

ተ. ቁ	የምግብ አይነቶች	በቀን ከአንድ ጊዜ በላይ	በቀን አንድ ጊዜ	በሳምንት ከ5- 6 ጊዜ	በሳምንት 1- 4 ጊዜ	በልቺ አላውቅም	በሳምንት 3 እና
214	ሰብሎች እና ጥራጥሬ						
	ጤፍ(እንጀራ)						
	ስንዴ(ዳቦ፣ ፓስታ፣ መከሮ ኒ)						
	ገብስ (ዳቦ፣ ገንፎ፣ ቆሎ)						
	በቆሎ(ቂንጨ፣ ጥብስ፣ ቅቅል)						
	ሩዝ						
215	አትክልቶች						
	ቲማቲም						
	ጎመን						
	ዱባ						
	ቆስጣ						
	ሰላጣ						
	ቃሪያ						
216	ፍራፍሬ						
	ብርቱካን						
	አጆካዶ						
	ሙዝ						

	ማንጎ					
	ሎሚ					
	ፓፓያ					
	አናናስ					
217	ስራስሮች					
	ቀይ ስር					
	ካሮት					
	ስኳር ድንች					
	ድንች					
218	የወተት ውጤቶች					
	ወተት					
	አይብ					
	እርጎ					
219	ስጋ					
	የበሬ ስጋ					
	የበግ ስጋ					
	የደሮ ስጋ					
	የፍየል ስጋ					
	ከላሊት ፣ ጉበት ፣ ልብ					
220	እንቁላል					
221	አሳ					
222	አልሚ ምግቦች					
	ባቄላ(ሽሮ ፣ ቆሎ ፣ ንፍሮ)					
	አተር ክክ					
	ሽምብራ					
	አኩር አተር					
	ምስር ክክ					
	ለውዝ/አቾሎኒ					
223	የቅባት ውጤቶች					
	ቅቤ/ዘይት					
224	ጣፋጭ መጠጦችና ምግቦች					
	ለስላሳ መጠጦች					
	ስኳር ፣ ማርማራታ					
	ቸኮሌት ከረሚላ,					
	ብስኩት					
	ድንች ጥብስ (ቸጥስ)					
	በርገር ፣ ኬክ ፣ ኩኪስ					

3. እባክዎ ከዚህ ቀጥሎ የተለያዩ የአካል እንቅስቃሴ በማካሄድ የሚያሳልፉላቸውን ጊዜ በተመለከተ እጠይቅዎታለሁ። የሚመለከትዎትን ብቻ መርጠው ያክብቡ።

ተ.ቁ	ጥያቄ	መልስ
301	በቀን ለምን ያህል ደቂቃ አጠቃላይ የአካል እንቅስቃሴ ያደርጋሉ?	1. ቀን ከ60 ደቂቃ ያነሰ 2. ቀን 60 ደቂቃ እና በላይ
302	አብዛኛውን ጊዜ ብርቱ ጉለበት የሚጠይቅ የአካል እንቅስቃሴ ቢያንስ ለ10 ደቂቃ በሳምንት ስንት ቀን ይሰራሉ?	1. በሳምንት <=3 ቀን 2. በሳምንት ከ 4-6 ቀን 3. በሳምንት 7 ቀን
303	አብዛኛውን ጊዜ መጠነኛ ጉለበት የሚጠይቅ የአካል እንቅስቃሴ ቢያንስ ለ10 ደቂቃ በሳምንት ስንት ቀን ይሰራሉ?	1. በሳምንት <=3 ቀን 2. በሳምንት ከ 4-6 ቀን 3. በሳምንት 7 ቀን
304	በሳምንት ለምን ያህል ቀን ከቦታ ቦታ ያለማቋረጥ ቢያንስ ለ 30 ደቂቃ በእግረዎ ወይም በብስክሌት ይሄዳሉ?	1. በሳምንት <=3 ቀን 2. በሳምንት ከ 4-6 ቀን 3. በሳምንት 7 ቀን
305	ት/ቤት የምትሄዱበት እና የምትመለሱበት መኪ/ተሸከርካሪ አለ?	1. አዎ 2. የለም

ክፍል4: በመቀመጥ እና በመተኛት የሚያሳልፉትን ስዓት በተመለከተ የሚጠየቁ ጥያቄዎች ናቸው። እባክዎ በቀን ለምን ያህል ጊዜ በመቀመጥ እና በመተኛት እንደሚያሳልፉ መልሱን ከተሰጡት አማራጮች የሚመለከትዎትን ብቻ ይምረጡ።

401	በቀን ለምን ያህል ጊዜ ተቀምጠው ፣ ቴሌቭዥን ወይም ሺዲዮ እና ኮምፒዩተር ጌም በማየት ያሳልፋሉ?	1. ከሶስት ስዓት ያነሰ 2. ሶስት ስዓት እና ከዚያ በላይ
402	በአብዛሃኛው በአንድ ቀን ለስንት ሰአት በእንቅልፍ ተኝተው ያሳልፋሉ?	1. ከ 8 ስዓት ያነሰ 2. ከ 8 ስዓት-10 ስዓት 3. ከ 10 ስዓት የበለጠ

ክፍል 5: መረጃውን በሚሰበሰበው ባለሙያ ተለክተው የሚሞሉ ጥያቄዎች
እባክዎ ቁመትዎን እና ክብደትዎን ለመለካት እንዲተባበሩን እንጠይቅዎታለን

501	ቁመት	በሴንቲ ሜትር _____
502	ክብደት	በኪሎግራም _____
503	BMI	_____

መረጃውን የሰበሰበው ባለሙያ ስም _____ ቀን ____ / ____ / _____ ፊርማ _____

ስለትብብርዎ ከልብ እና መሰግናለን!!

Declaration form

I, the under signed, declared that this is my original work and that all the resources and materials used for the research, have been fully acknowledged.

principal investigator

Name: SEWYALEW BIRHANU WORKINEH (BSc in Nursing)

Signature: _____

Date: ____/____/____

Advisors

Name: Mr. OMER SEID (MSc, ASST. PROFESSOR)

Signature: _____

Date: ____/____/____

Name: Mr. BERHANU ABEBAW (BSc, MPH)

Signature: _____

Date: ____/____/____