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Determinants of Overnutrition Among Secondary and Preparatory School Adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia,2020/21 (Unmatched Case Control Study)

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COLLEGE OF MEDICINE AND HEALTH SCIENCES

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DETERMINANTS OF OVERNUTRITION AMONG SECONDARY AND PREPARATORY SCHOOL ADOLESCENTS IN DEBRE BERHAN TOWN, NORTH SHEWA ZONE, AMHARA REGION, ETHIOPIA,2020/21 (UNMATCHED CASE CONTROL STUDY)

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JULY, 2021

BAHIR DAR, ETHIOPIA

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A THESIS TO BE SUBMITTED TO DEPARTMENT OF PEDIATRICS AND CHILD HEALTH NURSING, COLLEGE OF MEDICINE AND HEALTH SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS IN PEDIATRICS AND CHILD HEALTH NURSING

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DECLARATION SHEET

This is to certify that the thesis entitled "Determinants of Overnutrition Among Secondary and Preparatory School Adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia,2020/21" submitted in partial fulfillment of the requirements for the degree of masters of science in pediatrics and child health nursing, department of pediatrics and child health nursing, Bahir Dar University, is prepared solely by myself and it has not been submitted, in whole or in part, in any previous application for a master's degree. Except where states (BDU) otherwise by reference or acknowledgment, the work presented is entirely my own.

Name of the candidate: Eleni Dagnaw (BSc Nurse)_____ _____

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ADVISOR'S APPROVAL FORM

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Approval of Thesis Report

I here by certify that I have supervised, read, and evaluated this thesis report titled "Determinants of Overnutrition Among Secondary and Preparatory School Adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2020/21" by Eleni Dagnaw prepared under my guidance. I recommend the thesis report be submitted for oral defense.

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Approval of Thesis Report

I hereby certify that I have examined this thesis report entitled "Determinants of Overnutrition Among Secondary and Preparatory School Adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2020/21" by Eleni Dagnaw. We recommend and approve the thesis report for a degree of "Masters of science in Pediatrics and Child Health Nursing".

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Abstract

Background: Overnutrition is defined as abnormal or excessive accumulation of fat in the adipose tissue that may affect the health status of individuals explained by overweight/obesity. Globalization, improving economic conditions, decreased physical activities, urbanization and changing dietary habits in developing countries are reported as some of the factors for the rapid increase in overnutrition for adolescents. Studies on determinants of overnutrition among adolescents are scarce in Ethiopia, specifically in Debre Berhan town.

Objective: The main aim of this study is to identify the determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2021.

Methods: Institutional based unmatched case-control study was conducted among 285 adolescents from March 18 to April 20 2021. The data was collected using interviewer-administered and pretested tools. A survey was conducted to identify cases and controls. The cases and controls were selected using simple random methods. Data was entered using Epi-data 4.2 software and exported to Statistical Package for Social Science version 25. Bivariable and multivariable logistic regression analysis was performed. World Health Organization AnthroPlus software was used to analyze anthropometric data into body mass index for age with z-score. Adjusted odds ratio with 95% confidence interval and p value <0.05 was considered as statistical significance.

Result: Two hundred seventy nine adolescents (93 cases and 186 controls) were participated which made the response rate of 98% for both cases and controls. Significant association was found on earning an average family income of ≥10000 Ethiopian Birr (AOR=2.67; 95% CI: 1.214-5.9), eating habit while reading (AOR=3.87;95% CI:1.95-7.686),sedentary behavior, (AOR =2.52; 95%CI: 1.278-4.97), vigorous type of physical exercise for <75 minutes per week (AOR=2.38; 95%CI: (1.149-4.92) and <6 sleeping hour per day(AOR=5.68;95%CI:2.08-15.48).

Conclusion and recommendation: Determinants of overnutrition were increased family income level, sedentary behavior, reduced physical activity, eating habit while reading and sleeping time. Most of the determinants could be preventable, collaborative health education interventions such as emphasizing on the factors of overnutrition are essential.

Keywords: Determinants, overnutrition, case control, Debre Berhan

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List of Abbreviations and Acronyms

AOR	Adjusted Odds Ratio
BMI	Body Mass Index
CI	Confidence interval
COR	Crude Odds Ratio
CVD	Cardio Vascular Diseases
GPAQ	Global Physical Activity Questionnaire
NGO	Non- Governmental Organization
SD	Standard Deviation
SPSS	Statistical Package for Social Science
VLED	Very Low Energy Diets
WHO	World Health Organization

1. Introduction

1.1. Background

Overnutrition can be defined as abnormal or excessive accumulation of fat in the adipose tissue that may affect the health status of individuals explained by overweight/obesity (1). World Health Organization (WHO) defines overweight as body mass index (BMI) for age, Z-score between +1 and + 2 standard deviation (SD), and obesity as BMI for age and Z-score > +2 SD (2). Nowadays, overweight and obesity are rapidly growing public health problems that our world is facing. Its prevalence is high not only in the developed world but also in developing countries. In the 21st century, overweight and obesity are the most severe public health problems among adolescents and they are a significant predictors of adulthood obesity, morbidity, and mortality (3).

Globally, the magnitude of overweight in children and adolescents is increasing considerably. According to the WHO 2016 report over 340 million children and adolescents were overweight or obese in 2016. The prevalence of overweight and obesity among children and adolescents aged 5–19 years has risen radically from just 4% in 1975 to over 18% in 2016 (4).The rise has occurred similarly among both boys and girls; in 2016, 18% of girls and 19% of boys were overweight. In 1975, the prevalence of obesity among youngsters and adolescents aged 5-19 were less 1 % while in 2016 there were 124 million obese children and adolescents (6% of girls and 8% of boys) (4).

Worldwide, overweight/ obesity is becoming one of the most challenging current health concerns with the troublesome rise in children and late adolescents. The healthcare delivery systems are now focusing on the burden of overweight/obesity in childhood because of its long-term consequences of non-communicable diseases in adulthood. They are main risk factors for several diet-linked non-communicable diseases like dyslipidemia, cancer, cardiovascular diseases (CVD), and type II diabetes mellitus (5).

The adolescent may signify a window of opportunity to prepare nutritionally for a healthy adult life. In addition to reproductive maturity, the stage of adolescence is the basis for growth and development in the lifespan that needs adequate and proper quality food to meet the nutrient requirement for their physical, mental growth and development (6).

Adolescents require particular attention due to their vulnerability to develop overweight/obesity and the fact that adolescents weight tracks strongly into adulthood. Body size during adolescence can be used as an early indicator for nutritional status, with overnutrition manifesting as overweight/obesity. Adolescence is a period of rapid physiological, sexual, neurological, and behavioral changes which lays a foundation to adult role and responsibility. In this period adolescents gain 20% of their final adult height, 45% of increments in bone mass and 50% of adult weight is attained together with changes in body shape and composition and it is the 2nd period of rapid growth next to the first one year following birth (7, 8).

1.2. Statement of the Problem

Worldwide, with preexisting significantly high prevalence of undernutrition, the rise in the magnitude of overnutrition results in double burden of malnutrition, which confers a serious and negative economic impact on individuals and populations as a whole (4). As a result of its effects on health, malnutrition increases health-care costs, reduces productivity and diminishes economic growth, which in turn can perpetuate a cycle of poverty and ill-health. Now a day's overweight/obesity is the 5th leading global risk for mortality, and decreased life expectancy (4, 9, 10).

Adolescents who are overweight /obese are five times more likely to be overweight /obese in adulthood than those who were not overweight /obese, representing a lifelong personal burden and long-term societal impacts. Around 80% of adolescents who are overweight /obese will still be obese in young adulthood, and around 70% will be obese over age 30 (11).

A 39 years follow-up study conducted in Sweden on overweight among late adolescents shows that being overweight in late adolescence is a significant risk factor of severe liver disease later in life (12).

In many Sub-Saharan African countries, research and investment in health has been mainly focused on infectious diseases and undernutrition (13). In the meantime, overweight/obesity is a well-recognized risk factor for various chronic non-communicable diseases and also a strong predictor of future adulthood health status (13, 14).

The study conducted in the seven African countries on the prevalence and associated factors of overweight and obesity among school adolescents shows that overweight ranges from 8.7%

(Ghana) to 31.4% (Egypt). Obesity burdens ranged from 0.6% (Benin) to 9.3% (Egypt). The study also suggesting that the need to explore other potential risk factors for overweight including socioeconomic status (13).

In low income countries, like Ethiopia information is very scarce about middle and late adolescents obesity which is a major risk factors for several diet-linked non-communicable diseases like dyslipidemia, cardiovascular diseases (CVD), hypertension, type 2 diabetes, stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems, and certain cancers (10).

Different studies found that globalization, improving economic conditions, urbanization and changing dietary habits in developing countries are reported as responsible for the rapid increase in overnutrition and foods that are high in fats, sugars, energy-dense foods, and increasing low intensity activity are some of the factors contributing to overweight and continue to dramatic changes in living environments as well as in diets and lifestyles that promote positive energy balance (15, 16).

Interventions such as; family based interventions, including dietary modification, and energy expenditure modification via goal setting, self-monitoring, reward systems, and stimulus control. Lifestyle modifications, consumption of more servings of vegetables and fruits daily, minimizing/eliminating sugar-sweetened beverages, eating breakfast daily, limiting the number of meals eaten outside of the home, Very low energy diets (VLED), which contain ≤ 800 kcal/ day and utilize meal replacements, improving physical activities, initiation of pharmacotherapy for z-score value of ≥2 SD were some of the strategies implemented to decrease the burden of overnutrition among adolescents in the past. Despite the implementation of those strategies, different studies indicate that the burden of overnutrition among adolescents is still a problem as it indicate it's prevalence is increasing from time to time and there is scare studies related to the determinants of overnutrition (17, 18).

The pooled prevalence of overweight/obesity among children and adolescents in Ethiopia is significantly high which is 11.3% and has become an emerging nutrition linked problem (5). Ethiopia is one of the low income countries facing population dynamics in which lifestyle change and urbanization is rapidly growing. The first step in prevention and management of overweight and obesity is identifying risk factors contributing for overweight and obesity and

this identification of risk factors associated with overweight and obesity in school children would help to develop appropriate interventions to reduce the future burden of overweight and obesity among young population.

A case control study conducted in Ethiopia, Hawassa city was primarily focused on private schools, but studying the determinant of overweight only on private schools may not be represent students who found in governmental schools (19). The other related study carried out is a cross-sectional study on double burden of malnutrition among high school female adolescents in Bahir Dar City(20). The problem of overnutrition is not only for female students but also for male adolescents. In particular, determinants of overnutrition among high school adolescents in this study area was not studied yet So, this study was carried out to assess the determinants of overnutrition in Debre Berhan town both in governmental and private high schools involving male and female students.

Additionally, in view of findings of different institutional-based cross-sectional studies conducted on the prevalence of overnutrition among adolescents, the present study aims at filling the existing research gap by assessing multiple risk factors in the research setting, such as dietary habit related factors, food frequency related factors, sedentary behavior related factors and reduced physical activities which may contribute to the development of overnutrition among adolescents.

1.3 Significance of the Study

Identifying determinants of overnutrition among adolescents would be important for different stakeholders. Primarily for adolescents this study would give an important information concerning factors of overnutrition that is used to create awareness and prevent accordingly.

For health care providers: it would increase existing knowledge of health professionals on determinants of overnutrition among adolescents. This would in turn help to provide evidence based preventive strategies to avert overweight/obesity among adolescents.

It is also expected to be important input to heath planners, policy makers, in their end overs to monitor and prevent overnutrition along with associated risk factors.

For police makers and health planners: this study would give a fruitful information concerning overnutrition to middle and late adolescents to designing or redesigning appropriate and cost-effective strategies to halt or reduce factors contributing to the development of overnutrition and preparing school based interventions, promoting physical activity as well as health education. This may be true for governmental as well as Non-Governmental Organizations (NGOs).

For future researchers: as it is the first study that is conducted on determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan town, this study would also give base line data on associated risk factors of overnutrition for the study area and the study would also become baseline data for other investigator who want to search further on related issues.

2. Literature Review

Globally, the prevalence and frequency of overweight in children and adolescents are growing significantly. The number of children and adolescents who are overweight or obese worldwide is in alarming stage. A systematic review between January 2008, and April 2013 to estimate the prevalence of overweight and obesity in children aged 0–19 years in Latin America showed that 16.5–21.1 million adolescents were overweight or obese and overall, between 42.5 and 51.8 million children are affected that is about 20–25% of the population (21).

Different studies in Africa and other developing countries has documented an emerging movement of malnutrition with overweight and obesity increasing at an alarming rate compared to under nutrition. This shifting comes with increased access to high-calorie foods and fewer strenuous jobs leading to many individuals having a positive energy balance and hence becoming overweight or obese (22, 23).

In Ethiopia, the prevalence of overweight/obesity is increasing among high school adolescents. A Cross-sectional study that's conducted among 431 high school adolescents at Bahir Dar town in 2015 shows that the magnitudes of overweight and obesity are 12.3% and 4.4%, respectively, and the combined prevalence of overweight and obesity together is 16.7%.(24). Another school based cross-sectional study that conducted from April 12/2012 to April 30/2012 in Gondar town among 800 students shows that the overall prevalence of overweight and obesity among the adolescents studying in private schools is 10.1% and higher than those studying in government schools (4%) (25).

2.1. Determinants of Overnutrition

Generally, factors contributing to overweight are globalization, improving economic conditions, and changing dietary habits in developing countries are reported as responsible for the rapid increase in overweight and foods that are high in fats, sugars, energy-dense foods, and increasing low intensity activity due to new modes of transportation and rapid urbanization, which still continue to dramatic changes in living environments as well as in diets and lifestyles that promote positive energy balance are some of the factors that contribute for the increments in overnutrition in adolescents (15, 16).

2.1.1. Socio Demographic and Economic Determinants

Research findings across different areas of the world have showed that sex is a risk factor for overweight among adolescent and the likelihood of having overnutrition is high in females than males (19, 26, 27). On other hand, a case control study done in Brazil and Bangladesh revealed that, among adolescents, males were more risk for overweight than females (28, 29).

The case control study from Brazil shows that being first child and last child exposes for overweight and obesity in adolescence(14). And a cross-sectional study from Kenya also reports that effect of birth order, concluding that being first child exposes for overweight and obesity in adolescence (14, 29). Beside this, another cross-sectional study in Finland shows that in 2018, every fifth child in Finland was classified as either overweight or obese (30).

A cross-sectional study among school children in Riyadh, Saudi Arabia shows that having a mother who is more educated are determined to be significant risk factors for overweight/ obesity in children and mothers educated at university level are found to possess a three-fold higher risk of getting obese children compared to mothers with lower education levels) (31) and the case control study in southern Ethiopia also showed that odds of mother's who attended secondary and higher level education are 2.6, and 3.4 folds higher, respectively in cases than odds of mother's who attended secondary and higher education in controls (19).

Different studies agreed that increased monthly income of the households, predicted overweight and obesity in adolescents, for example in Japan (32), in Tanzania (33), in Bangladesh (28) and also in Ethiopia (19, 24, 26, 27). In the contrary a critical review shows that lower income households tend to have higher rates of overweight/obesity in the United States and other developed countries that is the low-income families are more exposed to junk food and other cheap calories including processed sugars (34).

Studies in US on family size and overweight/obesity suggest that family size also has a role in the development of overweight and obesity. The higher the number of siblings the lower the BMI and the lower the chance of overweight and obesity in a family, reduced maternal work and less eating out. Also, children with siblings watch less television and have healthier diets (35).

2.1.2. Dietary Habit and Food Frequency Related Determinants

The dietary factors that can be examined include consumption of vegetables, fruits, breakfast, fast food, sugary beverages, snack food, meal frequency per day, meat and sweets intake (11).

A case control study and a comparative cross-sectional studies in Ethiopia shows that low consumption of fruits and vegetables and having ≤3 meals/day, were significant risk factors for overweight among adolescents (19, 36).

According to a cross-sectional study conducted on socio-demographic, dietary and physical activity determinants of adolescents overweight and obesity in Malaysian frequency of fast food consumption and breakfast skipping were significant risk factors for overweight and obesity(37). But, the case control study in Ethiopia shows that the reverse which is skipping breakfast was not found to be a risk factor for overweight and obesity in adolescents (19).

A cross-sectional study in Ethiopia, Bahir Dar town on double burden of malnutrition on female adolescents and another study on prevalence and associated factors of overweight and obesity among high school adolescents in urban communities of Hawassa city, shows that adolescents who ate meat two times and more per week and who ate fruit at least once a week were more likely to be overweight compared with counterparts (20, 27).

The study in USA on relation between insufficient sleeping time and the body mass index in adolescents shows that in the multivariate model, with >8 hours as the reference category, while both of the insufficient sleep duration categories <6 and 6-8 hours were associated with the presence of overweight (38). Another study which is conducted in China on associations between sleep duration and overweight/obesity shows that both short sleep duration and long sleep duration were risk factors overweight/obesity in Chinese adolescents(39). On the contrary the study in Australia on sleep patterns and quality are associated with severity of obesity and weight-related behaviors in adolescents with overweight and obesity argues that sleep duration was not related to overweight (40).

2.1.3. Physical Activity and Related Determinants

There is a strong relationship between health outcomes and physical activity that persists throughout life, including adolescence. Being a key determinant of energy expenditure, regular and adequate levels of physical activity are essential to energy balance and weight control in adolescents. In addition, they can improve mental health by reducing stress reactions, anxiety and depression, which are becoming common among adolescents (41). Regular participation in physical activity is also recommended for children and adolescents in order to achieve and maintain a healthy lifestyle in general, for North American children and youth, it is recommended that they engage in at least 60 min of moderate to vigorous intensity physical activity each day (42, 43). At the same time health care providers recommend that children and adolescents reduce the time spent being sedentary by limiting screen time to no more than 2 hours a day in Canada(43) and less than one to 2 hours a day in the United States(44). In addition to this different literatures revealed that reduced physical activity was seen as a risk factor for adolescent overweight and obesity (19, 26, 37). Study conducted in Malaysia on Socio-demographic, dietary and physical activity determinants of adolescents overweight and obesity(37) and also in Nepal low physical activity was observed as a public health problem among the middle and late (15-19 years) adolescents(45). The study conducted in Kenya on overweight/obesity and physical activity in school children (46) and another study in Ethiopia, Gondar and Bahir Dar on overweight and obesity factors among high school students show that students who did not do any moderate or vigorous sport activity for at least 10 minutes continuously were at risk of being overweight than those who did moderate or vigorous sport activity (24, 25).

2.2. Conceptual Framework

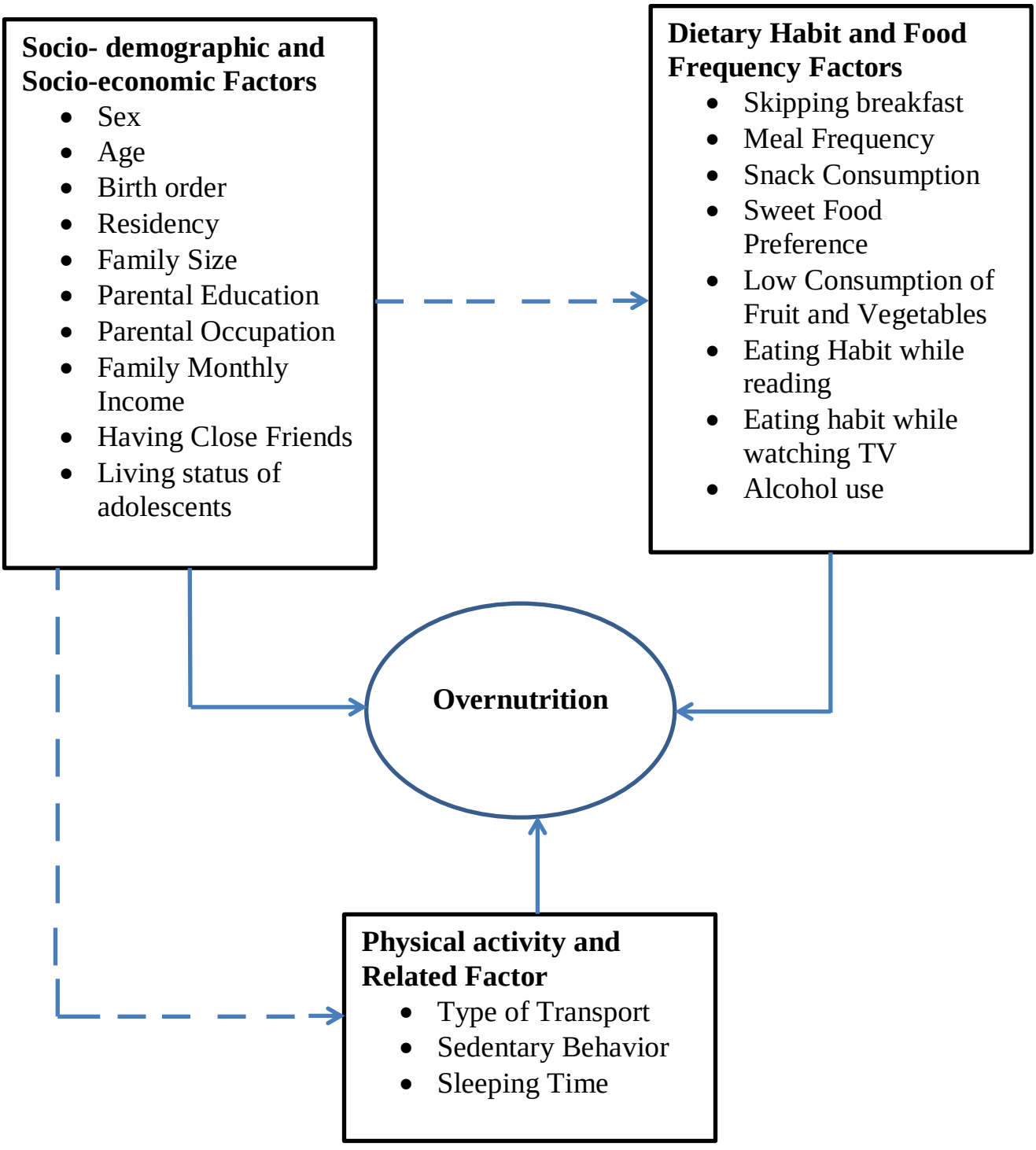

Figure 1, Conceptual framework for determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2020/21 adapted from those studies (19, 26, 38)

3. Objective of the Study

To identify determinants of overnutrition among secondary and preparatory school adolescents in age range of 15-19 years in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2020/21

4. Methods and Materials

4.1. Study Area and Period

The study was conducted from March 18 to April 20 2021in Debre Berhan town which is the capital city of North Shewa Zone. Debre Berhan, is located 130 km north east of Addis Ababa and 694 km from Bahir Dar(47). According to the city administration education office report of 2020/2021, there are two private and three governmental secondary and preparatory schools in Debre Berhan town. The total number of high school adolescents in Debre Berhan town were 5046 (2115 male and 2931 female). Of all, 3692 adolescents were enrolled in government and 1354 were in private high schools (48).

4.2. Study Design

An institutional based unmatched case control study was conducted.

4.3. Population

4.3.1. Source Population

All secondary and preparatory school adolescents in age range of 15 - 19 years old in Debre Berhan town were the source population of the study.

4.3.2. Study Population

All secondary and preparatory school adolescents in age range of 15 - 19 years old attending in randomly selected schools of Debre Berhan town and who satisfy the definition of cases and controls.

4.3.3. Study Subject

The study subject was each individual adolescent.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

Secondary and preparatory school adolescents with sex and age specific BMI above 5^{th} percentile were included in this study.

Cases- Secondary and preparatory school adolescents with sex and age specific BMI ≥+1 z-score were included in the study (2).

Controls- Secondary and preparatory school adolescents with sex and age specific BMI between -2 - +1 z- score were included in the study (2).

4.4.2. Exclusion Criteria

Those female adolescents who are pregnant and those who are on medications for known chronic diseases like antiepileptic medications, ART medications that may result weight gain were excluded from both cases and controls.

4.5. Sample Size Determination and Sampling Procedure

4.5.1. Sample Size Determination

Epi info version 7.2.3.1 was used to calculate sample size by two population proportions with assumptions of 95% Confidence interval, 80% power, and 2:1 controls to cases ratio, by considering major determinant variables from pervious study which is conducted at southern Ethiopia (19).

Finally, by taking the largest sample (180), adding 5% non-response rate and multiplying by1.5 design effect, the total calculated sample size required for this study was **285** (95 cases and 190 controls).

Table 1. The Sample Size calculation to assess determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2020/21

Main predictor Variables	Percent of exposed controls	AOR	Assumptions			Initial sample size
			power	CI	Controls to case ratio	
Maternal education(secondary level)	30.8%	2.6	80%	95%	2:1	180(19)
Vegetable consumption(<1times/wk	4.74%	6	80%	95%	2:1	138(19)
Educational level of mother(higher level)	36.7	3.36	80%	95%	2:1	114(19)

4.5.2. Sampling Technique and Procedure

First, the five schools found in Debre Berhan town were stratified as private and governmental, then two schools (one from private and one from governmental) namely, Millennium Secondary and Preparatory and Debr Eba Secondary and Preparatory School) were selected by lottery method respectively. To identify cases and controls, first mass screening (survey) was carried out by measuring height and weight of each adolescent to know their BMI for age

In private school there were a total of 859 students, of which 3 students were above 20 years old and 92 students were undernourished, so 764 students were eligible for this study and from governmental school there were 1860 students from those 149 are above 20 year and 256 are undernourished. So, 1455 students were eligible for the study. By considering the total number of eligible adolescents attending in each selected school, proportional allocation of cases and controls were used and cases and controls were selected by simple random sampling technique using computer generating numbers. In order to get cases and controls unique identification number was given for each adolescent in each section since their list was used in Excel during

survey. For each case, two controls were sampled from the same school in which cases were drawn (figure 2).

Anthropometric Measurement Procedure for Screening

Weight and height was measured by using calibrated measuring tools. Height was measured to the nearest 0.1cm in standing position at Frankfurt plane with the occipital, shoulder, and the buttock touching the vertical stand using height measuring stadiometer. Weight (in kilograms) was measured in light clothing and barefoot using a calibrated weighing scale to the nearest 0.1kgilogram and weight measuring scale was checked by measuring the standardized measured weights and adjusted at zero level before weighing each adolescents and their bags, books, exercise books and other materials were put away by data collectors and the study participant's stand in the center without any support until the result is recorded(49)

Weight and height was measured by two different measurers and if any variation the average was taken. In addition with any variation which is differed by ≥0.5 kg and ≥0.5 cm for the weight and height, respectively, the final validations was made by supervisor's immediately on site and the record was made to the nearest values. BMI was calculated as the weight divided by height squared (kg/m2) and it was computed by using WHO Anthro-Plus software. Based on the Z-score value, obesity is defined as greater than +2SD, overweight is greater than +1SD, normal weight is between less than +1SD and greater than -2SD (2).

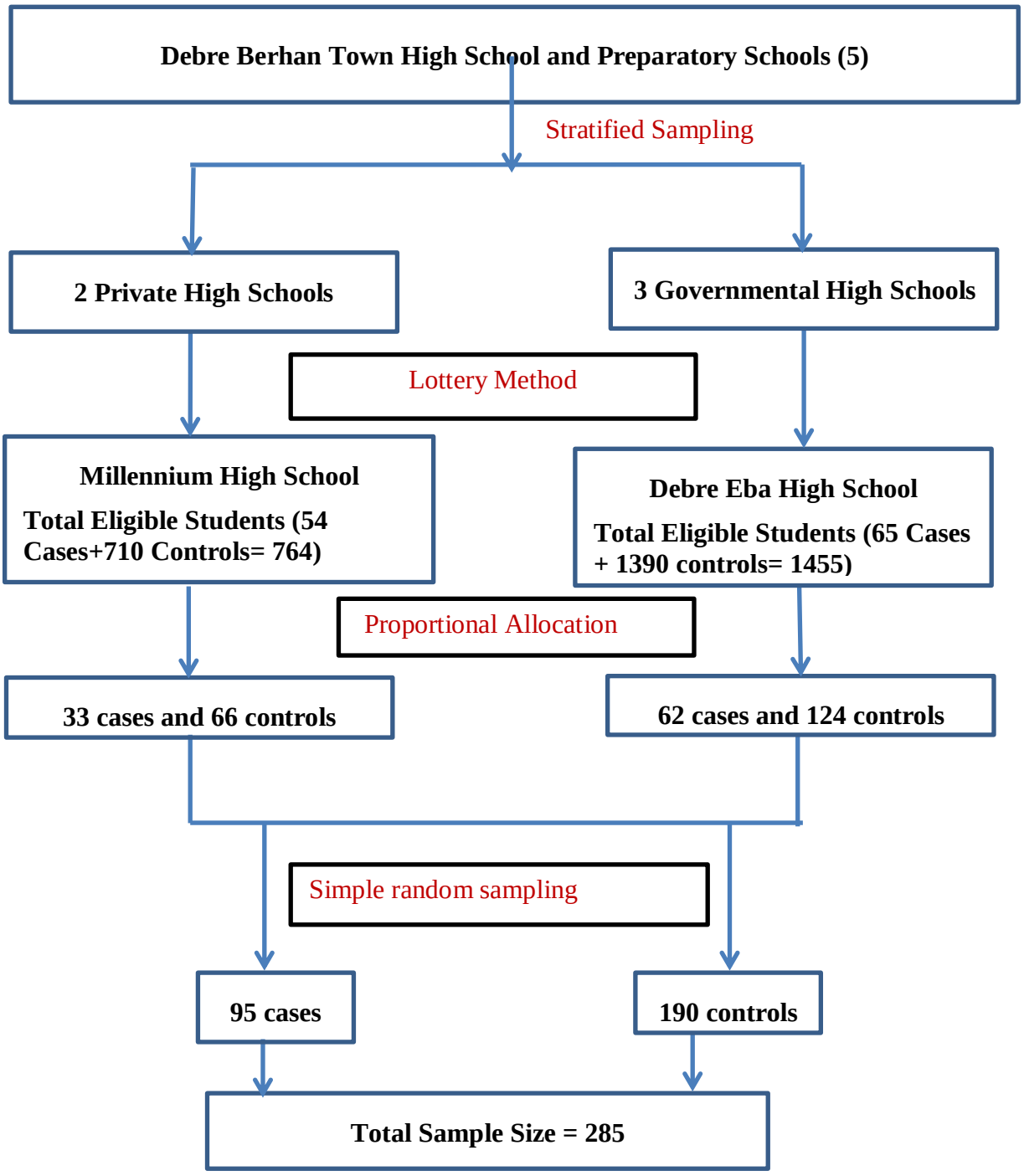

Figure 2 Sampling procedures on determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2020/21

4.6. Variables

Dependent Variable

Overnutrition

Independent Variables

Socio-demographic and Socio-economic Characteristics

Socio demographic characteristics include: sex, age, religion, residency, marital status, adolescent's educational level, parental occupation, family size, parental educational level, monthly income level and birth order

Dietary Habit and Food Frequency Related Factors

Meal frequency, consumption of vegetables, eating habit, snacks consumption, skipping breakfast, consumption of fruits, consumption of soft drink and alcohol consumption

Physical Activity Level Related Factors

Physical activity, transport type, sleeping time and sedentary behavior

Anthropometric Measurements

Height, Weight, BMI

4.7. Operational Definition and Definition of Terms

Overnutrition: Being overweight or obesity was considered as overnutrition

Overweight: According to the WHO Anthroplus software cutoff points BMI for age of ≥+1SD but less than +2 SD (equivalent to BMI 25 kg/m2 at 19 years) (2, 50).

Obesity: According to the WHO Anthroplus software cutoff points BMI for age of ≥+2SD (equivalent to BMI 30 kg/m2 at 19 years) (2, 50).

Late Adolescents: are individual whose age is between 15 and 19 years.

Meal frequency/day: the number or the frequency of eating food in one day.

Skipping breakfast: Not eating food in the morning

Physical Activity: doing different types of physical activities at least 10 minutes continuously(51).

Vigorous-Intensity Activities: are activities that require hard physical effort and cause large increases in breathing or heart rate, like aerobics(51).

Moderate-Intensity Activities: are activities that require moderate physical effort and cause small increases in breathing or heart rate like Walking, carrying light loads (51).

Sedentary Type of Activity: Activities that do not increase energy expenditure much above resting levels. sitting, lying down and sleeping, watching TV and reading (52).

4.8. Data Collection Tools and Procedures

The data was collected by using interviewer-administered semi-structured questionnaires and it was collected by six BSC nurses. The questionnaire contains three parts. The first part Socio-demographic and socio- economic characteristics which was studied using semi-structured questionnaire, the second part was food frequency questionnaire and dietary habit which was used for dietary assessment and the questions were adapted from the previous studies (19, 36), the third part, global physical activity questionnaire (GPAQ) was employed to assess the level of physical activity of the participants, this tool is designed to assess specific types of activity such as walking, moderate and vigorous intensity type of activities done at school, as part of home and yard work, to get place to place, and in spare time for recreation, exercise or sport. Study participants was asked to recall their activities of the last seven days preceding the interview(51).

4.9. Data Quality Assurance

The data collection tool was first prepared in English and then translated in to Amharic version for ease of understanding by participants and then it was translated to English version to ensure its consistency with independent language translators. Before data collection the tool was pre-tested on 5% of the sample size in Basso secondary and preparatory school and pre-test was used to check for language clarity, appropriateness of data collection tools, estimate time required and to make the necessary amendments. Two-days training has been given for six data collectors and two supervisors concerning anthropometric measurement technique, the data collection tool and data collection process. During the data collection time, close supervision was carried out by supervisors and investigator to ensure the quality of the data. Finally, all the collected data was

also checked by supervisor and investigator for its completeness and consistency. Consistency has been examined through random selection of questionnaire.

4.10. Data Processing and Analysis

Before analysis, data was checked for completeness and then each completed questionnaire has been assigned a unique code. Data was entered using Epi Data version 4.2 and exported to a Statistical Package for Social Sciences (SPSS) version 25 for analysis. World health organization anthroplus software was used for computing BMI for age. Socio-demographic profiles of variables frequency distribution, summary statistics such as mean and standard deviation was computed for cases and controls groups. Determinant factors associated with overnutrition were identified using bi-variable and multivariable logistic regression models. Independent variables that demonstrated near to statistically significant association (p value less than 0.25) with the outcome variable in the bi-variable models, were considered as candidate variables for the multivariable logistic regression models. In the ultimate multivariable models, the level of multi-collinearity was checked and fitted using variance inflation factor and tolerance and found within a tolerable range (all variables of variance inflation factor value were < 1.26) and tolerance (all variables value > 0.78).

In the ultimate multivariable model's goodness of fit Hosmer Lemeshow was checked and the assumption was fitted for the data with the p value 0.493. In multi-variable regression P-value less than 0.05 was considered as statistically significant. Finally, results were presented in the form of result statements and tables.

5. Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board of Bahir Dar University College of Medicine and Health Sciences. A formal letter was written from school of health sciences and submitted to Debre Berhan town administration education office and permission letter was written to each selected school. Data collectors were explain the objective and benefit of the study to the study participants to get verbal informed assent and written informed consent was obtained from their families by taking the letter to their home prior to data collection. For those students who had overweight/obesity, medical advices like adolescents maintain a healthy weight by helping them develop healthy eating habits, limiting calorie-rich foods, reduce sedentary time and be physically active have been given and specifically for those adolescents with obesity BMI for age z-score value of ≥+2 were linked to health care institutions for consultation and management. Respondents were informed as they have the right to refuse or decline from the study at any time if they wish so. Study participants were also explained for the attainment of confidentiality and the information they give should not contain their name or any identifiers and not used for any purpose other than the study.

6. Dissemination of the Result

The result of the study would be submitted and presented to Department of Pediatrics and Child Health Nursing, College of Medicine and Health Sciences, Bahir Dar University as partial fulfillment of Masters in Pediatrics and Child Health Nursing. The study result would also be submitted to Debre Berhan Town administration education office, Debre Berhan town health bureau and to the schools. The finding would also be presented in locally or internationally held seminars, workshops, conferences and meetings. An attempt would be made to publish the paper in internationally or nationally recognized peer reviewed journal.

7. Results

7.1 Socio-demographic and Socio-economic Characteristics

In this study, from a total of 285 sampled populations, 279 adolescents (93 cases and 186 controls) were participated which made the response rate of 98 % for both cases and controls. The majority of the cases 65(69.9%) and controls 109(58.6%) were females.

The mean age of cases and controls were 17.05±1.08 and 17.04±1.1 years with the minimum and maximum age of 15 and 19 years old respectively. The majority of the participants in both case and control groups 75(80.6%) and 162(87.1%) respectively were orthodox religion followers. Nearly half of the mothers in case group 50(53.8%) and 61(32.8%) in controls were attended higher level of education and 42(45.2%) of mothers in the case group and 53(28.5%) in control groups were government employees.

The majority 58 (62.4%) of the case group and 110(59.1%) of controls had less than five family members and majority of the participants 77(82.8%) of the cases and 155(83.3%) of controls were from urban areas (table 2).

Table 2. Socio-demographic and socio-economic characteristics of secondary and preparatory school adolescents in Debre Berhan Town, 2021 (N=279)

Variables		Cases (N=93, n(%))	Controls (N=186, n(%))
Sex of the participant	Male	28(30.1)	77(41.4)
	Female	65(69.9)	109(58.6)
Birth place	Urban	77(82.8)	155(83.3)
	Rural	16(17.2)	31(16.7)
Birth order	First	48(51.6)	69(37.1)
	Middle	40(43)	107(57.5)
	Last	5(5.4)	10(5.4)
Religion	Orthodox	75(80.6)	162(87.1)
	Protestant	16(17.2)	16(8.6)
	Muslim	2(2.2)	8(4.3)
Adolescents' educational level	Grade 9	31(33.3)	40(21.5)
	Grade 10	34(36.6)	55(29.6)
	Grade 11	22(23.7)	57(30.6)
	Grade 12	6(6.5)	34(18.3)
Family size	<5	58(62.4)	110(59.1)
	≥5	35(37.6)	76(40.9)
Education of mothers	Higher level	50(53.8)	61(32.8)
	Secondary and pre(9-12)	19(20.4)	62(33.3)
	Primary school(1-8)	8(8.6)	26(14)
	Can read and write	9(9.7)	25(13.4)
	Can't read and write	7(7.5)	12(6.5)
Education of fathers	Higher level	63(67.7)	100(53.8)
	Secondary and pre(9-12)	13(14)	44(23.7)
	Primary school(1-8)	6(6.5)	17(9.1)
	Can read and write	7(7.5)	18(9.7)
	Can't read and write	4(4.3)	7(3.8)
Occupation of mothers	Housewife	33(35.5)	73(39.2)
	Merchant	14(15.1)	39(21.0)

	Government employee	42(45.2)	53(28.5)
	Others	4(4.3)	21(11.3)
Occupation of fathers	Government employee	44(47.3)	70(37.6)
	Merchant	26(28)	54(29)
	Farmer	11(11.8)	21(11.3)
	Pensioner	2(2.2)	6(3.2)
	Others	10(10.8)	35(18.8)
Monthly income	<5000	19(20.4)	73(39.2)
(Birr)	5000-9999	14(15.1)	36(19.4)
	≥10000	60(64.5)	77(41.4)
Transport type	On foot	78(83.9)	163(87.6)
	Bicycle	5(5.4)	3(1.6)
	Automobile	10(10.8)	20(10.8)
Having close friends	Yes	92(98.9)	183(98.4)
	No	1(1.1)	3(1.6)
Living status of the	A lone	1(1.1)	1(0.5)
participant	With family	80(86)	171(91.9)
	With relatives	12(12.9)	14(7.5)

7.2 Study Participants Dietary Habit

In both case and control groups most of the adolescents 74(79.6%) and 113(60.8%) respectively were skipped their breakfast one to three times in the week preceding the survey and two-third of the study participants in both the cases and control groups 65(69.9%) and 128(68.8%) respectively had meal frequency of three times per day. Seventy one (76.3%) of the cases and 70(37.6%) of control groups had a habit of eating while reading and majority of the cases 79(84.9%) and 137(73.7%) of controls had a habit of eating while watching TV (table 3).

Table 3: Dietary habit of secondary and preparatory school adolescents in Debre Berhan Town, 2021, (N=279)

Variables	Cases N=93, n (%)	Controls N=186, n (%)
Skipping breakfast/week		
Never skip	17(18.3)	52(28)
Skipped 1-3 times	74(79.6)	113(60.8)
Skipped ≥4 times	2(2.2)	21(11.3)
Meal frequency/day		
Less than 3 times	3(3.2)	21(11.3)
3 times	65(69.9)	128(68.8)
≥4 times	25(26.9)	37(19.9)
Snack consumption per week		
never eat snack	14(15.1)	32(17.2)
1-3 times per week	40(43)	87(46.8)
4-6 times per week	19(20.4)	35(18.8)
everyday	20(21.5)	32(17.2)
Eating habit while reading		
Yes	71(76.3)	70(37.6)
No	22(23.7)	116(62.4)
Eating habit while watching TV		
Yes	79(84.9)	137(73.7)
No	14(15.1)	49(26.3)

7.3 Food Frequency Pattern

Nearly more than half of the adolescents in both groups 54(58.1%) of cases and 105(56.5%) controls were consumed sweet foods 2-4 times per week.

The majority of adolescents 77(82.8%) in the cases group and 117(62.9) of controls were consumed fast food 2-4 times per week.

In both case and control groups 68(73.1%) and 94(50.5) and 69(74.2%) and (103(55.4) respectively had vegetable and fruit consumption 2-4 times in week.

The large percent of the cases group 79(84.9%) and 140(75.3%) of controls didn't eat at all fat and oil in food the last week preceding the survey (table 4).

Table 4.Weekly food frequency pattern among secondary and preparatory school adolescents in Debre Berhan Town 2021 (N=279)

Variables		Cases N=93, n (%)	Controls N=186, n (%)
Enjera,bread…(cereals or grains) per week	once a day	2(2.2)	27(14.5)
	two times a day	90(96.8)	153(82.3)
	2-4 times per week	1(1.1)	3(1.6)
	≥4 times per week	-	3(1.6)
Sweet foods per week	once a day	28(30.1)	46(24.7)
	two times a day	7(7.5)	5(2.7)
	2-4 times per week	54(58.1)	105(56.5)
	≥4 times per week	3(3.2)	21(11.3)
	not eat at all	1(1.1)	9(4.8)
Fast foods per week	once a day	10(7.5)	14(10.8)
	two times a day	1(1.1)	4(2.2)
	2-4 times per week	77(82.8)	117(62.9)
	≥4 times per week	2(2.2)	24(12.9)
	not eat at all	3(3.2)	27(14.5)
Meat and Egg per week	once a day	8(8.6)	6(3.2)
	two times a day	1(1.1)	4(2.2)

	2-4 times per week	78(83.9)	105(56.5)
	≥ 4 times per week	3(3.2)	41(22)
	not eat at all	3(3.2)	30(16.1)
Milk and milk products per week	once a day	12(12.9)	8(4.3)
	two times a day	2(2.2)	1(0.5)
	2-4 times per week	51(54.8)	81(43.5)
	≥4 times per week	3(3.2)	37(19.9)
	not eat at all	25(26.9)	59(31.7)
Fat and Oil per week	once a day	1(1.1)	5(4.3)
	two times a day	1(1.1)	2(1.1)
	2-4 times per week	8(8.6)	28(15.1)
	≥4 times per week	4(4.3)	11(5.9)
	not eat at all	79(84.9)	140(75.3)
vegetables per week	once a day	7(7.5)	54(29)
	two times a day	1(1.1)	14(7.5)
	2-4 times per week	68(73.1)	94(50.5)
	≥4 times per week	17(18.3)	24(12.9)
Fruits per week	once a day	5(5.4)	49(26.3)
	two times a day	1(1.1)	9(4.8)
	2-4 times per week	69(74.2)	103(55.4)
	≥4 times per week	17(18.3)	21(11.3)
	not eat at all	1(1.1)	4(2.2)
Soft drinks	once a day	43(46.2)	13(7)
	two times a day	3(3.2)	3(1.6)
	2-4 times per week	39(41.9)	85(45.7)
	≥4 times per week	6(6.5)	36(19.4)
	not eat at all	2(2.2)	49(26.3)
Drinking alcohol per week	Yes	-	2(1.1)
	No	93(100)	184(98.9)

7.4 Physical Activities and Sedentary Behavior

The majority of the adolescents in both groups 75(80.6%) in cases and 97(52.2%) in controls did not have a habit of doing regular exercise and more than two third of cases 64(68.8%) and 164(88.2%) of controls did ≥150 minutes per week of moderate type of physical activity which meets the WHO recommendation for health.

Nearly half of the cases 54(58.1%) and 45(24.2%) of controls have sedentary type of life which, they have sat for greater than or equal to 480 minutes per day (table 5).

Table 5. Physical activities and sedentary life of secondary and preparatory school adolescents in Debre Berhan Town 2021 (N=279)

Variables	Cases N=93, n (%)	Controls N=186, n (%)
Regular physical exercise		
Yes	18(19.4)	89(47.8)
No	75(80.6)	97(52.2)
Sum of vigorous physical activity in minutes per week		
<75	72(77.4)	89(47.8)
≥75	21(22.6)	97(52.2)
Sum of moderate physical activity in minutes per week		
<150	29(31.2)	22(11.8)
≥150	64(68.8)	164(88.2)
Setting time in minute per day		
<480	39(41.9)	141(75.8)
≥480	54(58.1)	45(24.2)
Sleeping hour per day		
<6h	41(44.1)	35(18.8)
6-8h	43(46.2)	84(45.2)
≥8h	9(9.7)	67(36)

7.5 Determinants of Overnutrition

In this study bi-variable logistic regression analysis was carried out to see the relation of each independent variable with the outcome variable. Those variables with P-value less than 0.25, such as, sex of participants, educational level of the mother, days of skipping breakfast, meal frequency per day of the participant, adolescent's average family income per month, sleeping hour per day, eating habit while reading, sum of vigorous physical activity in minutes per week, sum of moderate physical activity in minutes per week, sitting time in minute per day were included in multivariable analysis.

These variables with P- value <0.25 in bi-variable analysis were fitted to multivariable analysis to control confounders and to test significant association with the outcome variable. Variables having statistically significant association (P-value <0.05) in multivariable logistic regression were adolescents average family income per month, sleeping hour per day, eating habit while reading, sum of vigorous physical activity in minutes per week and sitting time in minute per day.

The multivariable analysis proved that an odd of adolescents earning an average family income of ≥10000 Ethiopian birr were 2.67 times and between 5000-9999 ETB were 3.16 times more likely to develop overnutrition than those adolescents who earn <5000 ETB with (AOR=2.67; 95% CI: 1.214-5.9) and (AOR=3.16; 95% CI 1.06-9.43) respectively.

Similarly the odds of adolescents eating habit while reading was 3.87 times more likely to develop overnutrition than those adolescents who did not have eating habit while reading (AOR=3.87;95% CI:1.95-7.686).

Likewise, adolescents who had sedentary behavior, whom they sit or recline, more than ≥480 minutes per day were 2.52 times more likely to develop overnutrition than their counterparts (AOR =2.52; 95%CI: 1.278-4.97).

In this study, adolescents who practice vigorous type of physical exercise for <75 minutes per week were 2.38 times more likely to develop overnutrition than those who practice for ≥75 minutes per week (AOR=2.38; 95%CI: (1.149-4.92).

Furthermore, adolescents who sleep for <6 hours per day were 5.6 times more likely to develop overnutrition than from those who sleep greater than or equal to 8 hour (AOR=5.68;95%CI:2.08-15.48) (table 6).

Table 6. Bi-variable and multivariable analysis results for determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town 2021, (N=279)

Variable	Cases N=93,n(%	Controls N=186,n(%	COR (95%)	AOR (95% CI)	p-value
Sex					
Female	65(69.9)	109(58.6)	1.64(0.97-2.787)	1.56(0.77-3.14)	0.214
Male	28(30.1)	77(41.4)	1	1	
Education of mothers					
Higher level	50(53.8)	61(32.8)	1.41(0.52-3.84)	0.59(0.13-2.63)	0.488
Secondary and pre(9-12)	19(20.4)	62(33.3)	0.53(0.18-1.52)	0.38(0.08-1.75)	0.212
Primary school(1-8)	8(8.6)	26(14)	0.53(0.16-1.79)	0.27(0.05-1.4)	0.118
Can read and write	9(9.7)	25(13.4)	0.62(0.19-2.06)	0.49(0.09-2.7	0.412
Can't read and write	7(7.5)	12(6.5)	1	1	
Monthly income (Birr)					
<5000	19(20.4)	73(39.2)	1	1	
5000-9999	14(15.1)	36(19.4)	1.49(0.67-3.32)	**3.16(1.06-9.43)**	**0.038***
≥10000	60(64.5)	77(41.4)	2.99(1.63-5.5)	**2.67(1.21-5.9)**	**0.015***
Skipping breakfast/week					
Never skip	17(18.3)	52(28)	1	1	
Skipped 1-3 times	74(79.6)	113(60.8)	2.03(1.08-3.72)	2.06(0.92-4.57)	0.075
Skipped ≥4 times	2(2.2)	21(11.3)	0.29(0.06-1.37)	0.27(0.05-1.46)	0.129
Meal frequency/day					
Less than 3 times	3(3.2)	21(11.3)	1	1	
3 times	65(69.9)	128(68.8)	3.5(1.02-12.35)	3.16(0.71-14.77)	0.096
≥4 times	25(26.9)	37(19.9)	4.7(1.27-17.56)	3.74(0.8-17.5)	0.094
Eating habit while reading					
Yes	71(76.3)	70(37.6)	5.3(3.05-9.39)	**3.87(1.95-7.69)**	**<0.001***
No	22(23.7)	116(62.4)	1	1	

Sleeping hour per day					
<6h	41(44.1)	35(18.8)	8.7(3.8-19.9)	**5.68(2.08-15.48)**	**0.001***
6-8h	43(46.2)	84(45.2)	3.81(1.74-8.37)	2.56(0.1-6.6)	0.051
≥8h	9(9.7)	67(36)	1	1	
Sum of vigorous physical activity in minutes per week					
<75	72(77.4)	89(47.8)	3.7(2.124-6.57)	**2.38(1.15-4.92)**	**0.020***
≥75	21(22.6)	97(52.2)	1	1	
Sum of moderate physical activity in minutes per week					
<150	29(31.2)	22(11.8)	3.3(1.8-6.31)	2.08(0.91-4.79)	0.084
≥150	64(68.8)	164(88.2)	1	1	
Setting time in minute per day					
≥480	54(58.1)	45(24.2)	4.3(2.55-7.38)	**2.52(1.28-4.97)**	**0.008***
<480	39(41.9)	141(75.8)	1	1	

***Significant at p-value<0.05, 1- reference**

8. Discussion

This study was conducted to determine the determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan town. The variable that have significant association with overnutrition by using multivariable analytic techniques were adolescents average family income per month, sleeping hour per day, eating habit while reading, sum of vigorous physical activity in minutes per week and sedentary behavior/sitting time in minute per day.

In this study, adolescent's average family income per month was a significant determinant of overnutrition. Odds of earning an average family income of ≥10000 birr was 2.67 times higher to develop overnutrition than those who earn <5000 Ethiopian birr. The current finding is in line with the finding done in Japan (32), in Tanzania (33), in Bangladesh (28) and also in Ethiopia, case-control study in Hawassa and cross-sectional studies in Bihar Dar (19, 24, 26, 27) were also consistent with the current result. This might be due to high income levels have higher risk of expose to energy- dense foods and sedentary way of life and also the change in life style, dietary pattern associated with increased income. In the contrary, a critical review in US shows that lower income households tend to have higher rates of overweight/obesity in the United States and other developed countries that is the low-income families are more exposed to junk food and other cheap calories including processed sugars (34).

In the current study adolescents who had sedentary behavior, those who sit/recline for ≥ 480 minutes per day were 2.52 times more likely to develop overnutrition than those adolescents who sit/recline for <480 minutes per day. This finding was supported by a case control study in Bangladesh, sedentary time was a risk factor for overweight/obesity(28) and also a study in New Zealand on the association between BMI and sedentary behavior on female adolescents and relationship between childhood sedentary behavior and biomedical health indicators (53, 54) and also another study on sedentary behavior and health outcome in Brazil found that there is strong evidence for a relationship between sedentary behavior and overnutrition (54, 55). This may be due to low energy expenditure during the sedentary time (56).

Adolescents who practice the vigorous type of physical exercise for <75 minutes per week were 2.38 times more likely to develop overnutrition than those who practice for ≥75 minutes per week. This finding is consistent with the study conducted in Malaysia on socio-demographic, dietary and physical activity determinants of adolescents overweight and obesity (37) and also in Nepal, low physical activity was observed as a public health problem among the middle and late (15-19 years) adolescents(45). This finding was also supported by the study in Kenya on overweight/obesity and physical activity in school children (46) and another study in Ethiopia, Gondar and Bahir Dar on overweight/obesity and associated factors among high school students respectively shows that students who did not do any moderate or vigorous sport activity were at risk of being overweight than those who did moderate or vigorous sport activity (24, 25). This might be due to the fact that regular and adequate levels of physical activity are a crucial determinant of energy expenditure and essential to energy balance and weight control in adolescents (57).

In the current study adolescents who sleep for <6 hours per day were 5.6 times more likely to develop overnutrition than from those who sleep greater than or equal to 8 hour. this finding is in line with the study in USA on the relation between insufficient sleeping time and the body mass index in adolescents and another study in Canada shows that the inadequate sleep duration categories <6 hour was associated with the presence of overweight (38, 58) beside this the study which is conducted in China on the association between sleep duration and overweight/obesity in adolescents shows that both short sleep duration and long sleep duration were found as risk factors for overweight/obesity in Chinese adolescents and optimal sleep duration may prevent overweight/obesity(39).This might be due to increase in snacking or increase in the number of meals consumed per day and more energy needed to sustain extended wakefulness and psychological distress and disrupted meal timing, and increases in sedentary behavior seem to be the most compelling mechanisms linking poor sleep with increased overnutrition risk in adolescents(59-61) and also it might be due to sleep influences energy metabolism. One of its main functions is to conserve energy and the proposed mechanisms that associate insufficient sleep to weight gain is a decrease in energy expenditure. On the other hand the study in Australia argues that sleep duration was not related to overweight (40).

Moreover, this study found that the odds of adolescents eating habit while reading was 3.87 times more likely to develop overnutrition than who do not have eating habit while reading. This finding is comparable with the study in Italy on eating habits and lifestyle in students with obesity during the COVID19 lockdown, which was found with BMI gain (62). This may be due to an increase in meal frequency per day and also overeating of foods that might increase our vulnerability to gain weight.

9. Strength and Limitation of the Study

9.1 Strength

Screening (measurements such as height and weight were taken) and BMI was calculated to identify the total cases (overnutrition) and controls (normal weight) of adolescents in the selected schools

The study was conducted in both private and governmental schools

9.2 Limitation

This study relied on BMI as a widely used screening tool for body weight, but it could not detect changes in percent body fat and some of this increment of BMI might be due to increases in muscle mass.

10. Conclusion and Recommendations

10.1 Conclusion

Overnutrition is a significant emerging public health problem and multiple factors are associated with it. According to the findings of this study the determinants of overnutrition were adolescent's average family income per month, sleeping hour per day, eating habit while reading, sum of vigorous physical activity in minutes per week and sitting time in minute per day.

This finding suggests that promoting active life style, reduced sedentary behavior and healthy eating habit should be a national public health priority; because early interventions on modifiable risk factors are likely to decrease the rate of adolescent's overnutrition. Educational programs about overnutrition and associated health consequences should start early in school to prevent its increasing prevalence in adolescents and also public health programs are needed to increase awareness on risk factors for overnutrition among adolescents in order to reduce the future burden of obesity-associated chronic non communicable diseases.

10.2 Recommendations

For Federal Ministry of Health

Even though the federal ministry of health has developed a national strategic framework on the prevention and control of non- communicable diseases and their risk factors by incorporating in health sector development plan, overnutrition is the problem among adolescents, therefore, ministry of health should better to strengthen services to reduce factors of overnutrition in adolescents. Since most of the determinants could be preventable, collaborative health education interventions such as emphasizing the importance of physical activity, avoiding sedentary life style and eating habit while reading are vital.

For Debre Berhan Town Health Bureau

It is better to have BMI screening program to identify the nutritional status adolescents and to have timely interventions and counseling by health professionals.

For schools

Health and nutritional education should be given through school media and schools need to keep students active for most of physical education class time.

It is recommended that there should be targeted educational intervention programs on sedentary activities, physical inactivity, health and nutrition. Furthermore, youth centers and schools should encourage opportunities for low/no cost physical activities.

Preventive interventions to reduce physical inactivity and sedentary behavior along with other shared risk factors of non- communicable diseases are recommended to tackle the problem.

For researchers

Although this study addressed very important factors of overnutrition, other factors which might impact rates of overnutrition, such as genetic influences and parental BMI should be assed.

BMI could not detect changes in percent body fat, since the increment could be due to increases in muscle mass, so it is better to measure waist circumference

Population-based study design would explore more determinants of overnutrition and prospective cohort to assess cause and effect of overnutrition.

References

1.World Health Organization, Nutrition in the WHO African Region. 2017, https://www.afro.who.int/sites/default/files/2017-11/Nutrition%20in%20the%20WHO%20African%20Region%202017_0.pdf.

2.Onis Md, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World health Organization. 2007;85:660-7.

3.Sorrie MB, Yesuf ME, GebreMichael TG. Overweight/obesity and associated factors among preschool children in Gondar City, Northwest Ethiopia: a cross-sectional study. PloS one. 2017;12(8):e0182511.

4.World Health Organization, The double burden of malnutrition: policy brief 2016.

5.Gebrie A, Alebel A, Zegeye A, Tesfaye B, Ferede A. Prevalence and associated factors of overweight/obesity among children and adolescents in Ethiopia: a systematic review and meta-analysis. BMC obesity. 2018;5(1):19.

6.Patanwar P, Sharma K. Nutritional status of Kurmi adolescent girls of Raipur city Chhattisgarh, India. Int J Sci Res Pub. 2013;3:1-6.

7.Abudayya AH, Stigum H, Shi Z, Abed Y, Holmboe-Ottesen G. Sociodemographic correlates of food habits among school adolescents (12–15 year) in North Gaza Strip. BMC Public Health. 2009;9(1):185.

8.Chulani VL, Gordon LP. Adolescent growth and development. Primary Care: Clinics in Office Practice. 2014;41(3):465-87.

9.Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. Childhood obesity: causes and consequences. Journal of family medicine and primary care. 2015;4(2):187.

10.World Health Organization,Obesity and overweight facesheet number 311; 2011. Avaliable from: http://www who int/mediacentre/factsheets/fs311/en/index html[Last accessed on 2014 Apr, 16]. 2014.

11.World Health Organization: Nutrition. Healthy diet, act sheet No. 394. Updated August 2018

https://www.who.int/nutrition/publications/nutrientrequirements/healthydiet_ factsheet/en/, accessed on Aug. 9, 2019.

12.Hagström H, Stål P, Hultcrantz R, Hemmingsson T, Andreasson A. Overweight in late adolescence predicts development of severe liver disease later in life: a 39 years follow-up study. Journal of hepatology. 2016;65(2):363-8.

13.Manyanga T, El-Sayed H, Doku DT, Randall JR. The prevalence of underweight, overweight, obesity and associated risk factors among school-going adolescents in seven African countries. BMC Public Health. 2014;14(1):887.

14.Kyallo F, Makokha A, Mwangi AM. Overweight and obesity among public and private primary school children in Nairobi, Kenya. Health. 2013;2013.

15.Smetanina N, Albaviciute E, Babinska V, Karinauskiene L, Albertsson-Wikland K, Petrauskiene A, et al. Prevalence of overweight/obesity in relation to dietary habits and lifestyle among 7–17 years old children and adolescents in Lithuania. BMC public health. 2015;15(1):1-9.

16.Malik VS, Willett WC, Hu FB. Global obesity: trends, risk factors and policy implications. Nature Reviews Endocrinology. 2013;9(1):13-27.

17.Johnson VR, Cao M, Czepiel KS, Mushannen T, Nolen L, Stanford FC. Strategies in the Management of Adolescent Obesity. Current Pediatrics Reports. 2020;8(2):56-65.

18.Johnson, V.R., Cao, M., Czepiel, K.S. et al. Strategies in the Management of Adolescent Obesity. Curr Pediatr Rep 8, 56–65 (2020). https://doi.org/10.1007/s40124-020-00214-9.

19.Bereket AH, Beyero M, Fikadu AR, Bosha T. Risk factors for overweight and obesity in private high school adolescents in Hawassa city, Southern Ethiopia: a case-control study. Food Public Health. 2017;7(7):29-34.

20.Taklual W, Baye S, Mekie M, Andualem T. Double Burden of Malnutrition among Female Adolescent Students in Bahir Dar City, Amhara, Ethiopia. BioMed Research International. 2020;2020.

21.Rivera JÁ, de Cossío TG, Pedraza LS, Aburto TC, Sánchez TG, Martorell R. Childhood and adolescent overweight and obesity in Latin America: a systematic review. The lancet Diabetes & endocrinology. 2014;2(4):321-32.

22.Ajayi EO, Elechi HA, Alhaji MA. Prevalence of overweight/obesity among primary school pupils in Urban Centre, Nigeria. Saudi Journal of obesity. 2015;3(2):59.

23.Lozano R, Fullman N, Abate D, Abay SM, Abbafati C, Abbasi N, et al. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable

Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 2018;392(10159):2091-138.

24.Anteneh ZA, Gedefaw M, Tekletsadek KN, Tsegaye M, Alemu D. Risk factors of overweight and obesity among high school students in Bahir Dar city, North West Ethiopia: school based cross-sectional study. Advances in preventive medicine. 2015;2015.

25.Gebregergs G, Yesuf M, Beyen T. Overweight and obesity, and associated factors among high school students in Gondar town, north west Ethiopia. J Obes Wt Loss Ther. 2013;3(2):1-5.

26.Gebreyohannes Y, Shiferaw S, Demtsu B, Bugssa G. Nutritional status of adolescents in selected government and private secondary schools of Addis Ababa, Ethiopia. Adolescence. 2014;10(11).

27.Teshome T, Singh P, Moges D. Prevalence and associated factors of overweight and obesity among high school adolescents in urban communities of Hawassa, Southern Ethiopia. Current Research in Nutrition and Food Science Journal. 2013;1(1):23-36.

28.Bhuiyan MU, Zaman S, Ahmed T. Risk factors associated with overweight and obesity among urban school children and adolescents in Bangladesh: a case–control study. BMC pediatrics. 2013;13(1):1-6.

29.Menezes ICF, Neutzling MB, Taddei JdAC. Risk factors for overweight and obesity in adolescents of a Brazilian University: a case-control study. Nutricion hospitalaria. 2009;24(1):17-24.

30.Laitinen U, Mäntymaa P, Haapala E, Jääskeläinen S, Sundman J, Ruokokoski E, et al. Every fifth child and adolescent in Finland is overweight. European Journal of Public Health. 2020;30(Supplement_5):ckaa166. 923.

31.Al Alwan İ, Al Fattani A, Longford N. The effect of parental socioeconomic class on children's body mass indices. Journal of clinical research in pediatric endocrinology. 2013;5(2):110.

32.Kachi Y, Otsuka T, Kawada T. Socioeconomic status and overweight: a population-based cross-sectional study of Japanese children and adolescents. Journal of epidemiology. 2015:JE20140108.

33.Shayo GA, Mugusi FM. Prevalence of obesity and associated risk factors among adults in Kinondoni municipal district, Dar es Salaam Tanzania. BMC public health. 2011;11(1):365.

34.Hruschka DJ. Do economic constraints on food choice make people fat? A critical review of two hypotheses for the poverty–obesity paradox. American Journal of Human Biology. 2012;24(3):277-85.
35.Datar A. The more the heavier? Family size and childhood obesity in the US. Social Science & Medicine. 2017;180:143-51.
36.Ali MS, Kassahun CW, Wubneh CA. Overnutrition and Associated Factors: A Comparative Cross-Sectional Study between Government and Private Primary School Students in Gondar Town, Northwest Ethiopia. Journal of Nutrition and Metabolism. 2020;2020.
37.Ha S, Ca S-T, Rb R, KPb J. Socio-demographic, dietary and physical activity determinants of adolescents overweight and obesity in Kelantan. Health and the Environment Journal. 2012;3(1):44-53.
38.Shukla A, Orozco T. Does Insufficient Sleep Increase the Body Mass Index in Adolescents? Obesity Facts. 2020;13(5):534-5.
39.Wu, J., Wu, H., Wang, J. et al. Associations between Sleep Duration and Overweight/Obesity: Results from 66,817 Chinese Adolescents. Sci Rep 5, 16686 (2015). https://doi.org/10.1038/srep16686.
40.Hayes JF, Balantekin KN, Altman M, Wilfley DE, Taylor CB, Williams J. Sleep patterns and quality are associated with severity of obesity and weight-related behaviors in adolescents with overweight and obesity. Childhood obesity. 2018;14(1):11-7.
41.World Health Organization: Global Strategy on Diet, Physical Activity and Health.

Physical Activity. https://www.who.int/dietphysicalactivity/pa/en/, on Aug. 7, 2019.

42.Belanger K, Barnes JD, Longmuir PE, Anderson KD, Bruner B, Copeland JL, et al. The relationship between physical literacy scores and adherence to Canadian physical activity and sedentary behaviour guidelines. BMC Public Health. 2018;18(2):1-9.
43.Tremblay MS, Carson V, Chaput J-P, Connor Gorber S, Dinh T, Duggan M, et al. Canadian 24-hour movement guidelines for children and youth: an integration of physical activity, sedentary behaviour, and sleep. Applied Physiology, Nutrition, and Metabolism. 2016;41(6):S311-S27.

44.Gentile DA, Reimer RA, Nathanson AI, Walsh DA, Eisenmann JC. Protective effects of parental monitoring of children's media use: A prospective study. JAMA pediatrics. 2014;168(5):479-84.

45.Adhikari C, Shrestha B, Adhikari L, Timilsina DP, Kunwar LB. PHYSICAL ACTIVITY AND OBESITY PREVALENCE AMONG MIDDLE AND LATE SCHOOL ADOLESCENTS OF POKHARA, NEPAL.

46.Muthuri SK, Wachira L-JM, Onywera VO, Tremblay MS. Correlates of objectively measured overweight/obesity and physical activity in Kenyan school children: results from ISCOLE-Kenya. BMC public health. 2014;14(1):1-11.

47.Aynalem Tesfay F, Dejenie Habtewold T. Assessment of prevalence and determinants of occupational exposure to HIV infection among healthcare workers in selected health institutions in Debre Berhan town, North Shoa Zone, Amhara Region, Ethiopia, 2014. AIDS research and treatment. 2014;2014.

48.DebereBerhan town city adminstration education office report 2013.

49.Rinaldo N, Gualdi E, editors. Anthropometric techniques. INTERNATIONAL COURSE ON HEALTH AND IMMIGRATION; 2015: Università di Ferrara.

50.De Onis M. World Health Organization Reference Curves. The ECOG's eBook on Child and Adolescent Obesity. 2015:19.

51.WHO, Global Physical Activity Questionnaire (GPAQ)(Online) http://www.who.int/chp/steps/GPAQ%20Instrument%20and%20Analysis%20Guide%20v2.pdf, Accessed, 17/12/201.

52.Kastelic K, Šarabon N. Comparison of self-reported Sedentary time on weekdays with an objective measure (activPAL). Measurement in Physical Education and Exercise Science. 2019.

53.Tye LS, Scott T, Haszard JJ, Peddie MC. Physical Activity, Sedentary Behaviour and Sleep, and Their Association with BMI in a Sample of Adolescent Females in New Zealand. International Journal of Environmental Research and Public Health. 2020;17(17):6346.

54.van Ekris E, Altenburg T, Singh AS, Proper KI, Heymans MW, Chinapaw MJ. An evidence-update on the prospective relationship between childhood sedentary behaviour and biomedical health indicators: a systematic review and meta-analysis. Obesity reviews. 2016;17(9):833-49.

55.De Rezende LFM, Lopes MR, Rey-López JP, Matsudo VKR, do Carmo Luiz O. Sedentary behavior and health outcomes: an overview of systematic reviews. PloS one. 2014;9(8):e105620.

56.Bonn SE, Rimm EB, Matthews CE, Troiano RP, Bowles HR, Rood J, et al. Associations of Sedentary Time with Energy Expenditure and Anthropometric Measures. Medicine and science in sports and exercise. 2018;50(12):2575-83.
57.Romieu I, Dossus L, Barquera S, Blottière HM, Franks PW, Gunter M, et al. Energy balance and obesity: what are the main drivers? Cancer causes & control : CCC. 2017;28(3):247-58.
58.Chaput J-P. Sleep patterns, diet quality and energy balance. Physiology & behavior. 2014;134:86-91.
59.Bartel KA, Gradisar M, Williamson P. Protective and risk factors for adolescent sleep: a meta-analytic review. Sleep medicine reviews. 2015;21:72-85.
60.Markwald RR, Melanson EL, Smith MR, Higgins J, Perreault L, Eckel RH, et al. Impact of insufficient sleep on total daily energy expenditure, food intake, and weight gain. Proceedings of the National Academy of Sciences of the United States of America. 2013;110(14):5695-700.
61.Duraccio KM, Krietsch KN, Chardon ML, Van Dyk TR, Beebe DW. Poor sleep and adolescent obesity risk: a narrative review of potential mechanisms. Adolescent health, medicine and therapeutics. 2019;10:117-30.
62.Cipolla, Clelia et al. “Eating habits and lifestyle in children with obesity during the COVID19 lockdown: a survey in an Italian center.” Acta bio-medica : Atenei Parmensis vol. 92,2 e2021196. 12 May. 2021, doi:10.23750/abm.v92i2.10912.

Annex

Interviewer: Name_____ Father's name_____

Respondent's code number_____

Annex I: Information sheet (English version)

Title of the study:" determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2021

Introduction: I, a graduating class student in Bahir Dar university school of medicine and health science with MSc in pediatrics and child health nursing, kindly request you to participate in the study titled as in the above. Before you decide whether or not to participate in this study, I would like to explain to you the purpose of the study, procedure, any risks, benefits and what is expected from you. Your participation in this study is entirely of your own free will. You are under no obligation to participate; you may choose to participate or not to participate. If you decide not to participate, no privileges will be taken away from you. If you agree to participate, you will be asked to sign in the space provided below.

Purpose of the Research: The purpose of this study is to identify determinants of overnutrition among secondary and preparatory school adolescents in Debre Berhan Town, North Shewa Zone, Amhara Region, Ethiopia, 2021

Procedure: In order to achieve the above objective, information necessary for the study will be taken from students in the school and after you have signed the informed consent form, you have a chance to ask questions and you will be requested to answer questions asked by the data collectors.

Risks: No risks are involved apart from the use of your time for answering questions.

Benefits: the research have no direct benefit for students in the school, But the indirect benefit of the research for the participant and other clients in the program is clear. This is because if program planners are preparing predicted plan and there will be benefit for students by preparing factor oriented school based interventions. In all, the research work has a paramount direct benefit for health care planners and managers.

Confidentiality: the information that you provide will be confidential to the data collectors only and it will be used for the purpose of this study only.

Annex II: Informed Consent form (English version)

The purpose of this study has been explained to me and I understand the purpose, the risks, benefits and confidentiality of the study and also taking part in this study is purely voluntary. So, I am agreed to take part/ participate in this study

□ Yes

□ No

If yes, Sign_____

Person to contact for problems or questions: This research work is approved by the institutional review board of college of medicine, and health sciences of Bahir Dar University. If you have any question you can contact the principal investigator by this address.

Eleni Dagnaw (Mobile 0944116612)

Email: elenidagnaw@gmail.com

Data collector Name _____ Signature _____ Date____/_____/____

Annex III: Physical Measurements for Screening Purpose

No	Anthropometry	Reading
	Height (in centimeter)	
	Weight (in kilogram)	
	Body mass index (BMI) for age	

Annex IV: Questionnaires in English Version

Part one: Socio-demographic and Socio-economic data

NO	Questions	**Responses**	**Skip**
101	Sex of respondent	1. Male 2. Female	
102	Age in years	_____years	
103	Birth order	_____	
104	Residency	1.Urban 2. Rural	
105	Adolescents educational level	1. grade 9 2. grade 10 3. grade 11 4. grade 12	
106	Family size in number	_____	
107	Religion	1. Orthodox 2. Protestant 3. Muslim 4. Catholic 5. Other	
108	Education of mother	1. Cannot read and write 2. Read and write 3. Primary (1–8) 4. Secondary and preparatory(9-12) 5. Higher(College/University completed)	
109	Education of father	1. Cannot read and write 2. Read and write 3. Primary (1–8) 4. Secondary and preparatory(9-12) 5. Higher(College/University completed)	
110	Occupation of the mother	1. House wife 2. Merchant 3. Gov.t employee 4. Private 5. Other specify….	
111	Occupation of the father	1. Gov.t employee 2. Farmer 3. Pensioned 4. Merchant 5. Other	
112	Average Family monthly income in birr?	_____birr/month	

113	Transport type	1. On Foot 2. Bicycle 3. Motor 4. Automobile	
114	Having close friends	1. Yes 2. No	
115	With whom do you live now?	1. Alone 2. With Family 3. With Relatives 4. Other Specify_____	

Part Two. Dietary Habit of a study participant

The following questions ask about the Dietary habit of participants (Trends)

No	Questions	Response	Skip
201	Skipping breakfast/weak	1. never skip 2. skipped 1-3 times 3. skipped >=4 times	
202	Meal frequency per day	1. < 3 times 2. 3 times 3. >= 4 times	
203	Snack consumption /week	_____times	
204	Eating habit while watching TV	1. Yes 2. No	
205	Eating habit while reading	1. Yes 2. No	
206	How many hours do you spent in sleeping within a day?	_____hours	

Part Three: Food frequency questionnaire

The following questions ask about the diet. As you answer questions, please think of the foods you consumed last week (trends)

No	Food items	Frequency of consumption				
		Once a day	two times a day	2-4 times/week	≥4times/week	skip
301	Injera, bread, rice(cereals and grains)					
302	Sweet foods (cakes chocolates, sugar, ice cream, honey…)					
303	Fast foods (sandwiches, pasty, pizza,burger,chips…)					
304	Meat, egg					
305	Milk and milk products like chesse…					
306	Oil and fat (oil fat or butter)					
307	Vegetables Like cabbage, carrot, salad or other					
308	Fruits Like banana, avocado, papaya, pineapple, or other fruit					
309	Soft drink					
310	Alcohol drink					

Part Four: Physical activity questionnaire

Next you are requested to respond about the time you spend doing different types of physical activities in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person. Consider all activities, those you do at school, as part of your house and yard work, to get from place to place and in your spare time for recreation, exercise or sport.			
In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate. 'Moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.			
Questions		Response	
1.1.Regular exercise at home or at school			
A. Vigorous-intensity physical activities			
No	Vigorous-intensity physical activities	Response	skip
401	Did you do regular physical exercise or intensive activity at school or at home(aerobics)	1. Yes. 2 No	If no, go to 404
402	Within a week how many days do you do intense physical activities regularly as a part of life?	_____days/week	
403	In each day how much time you spend doing intensive activities in a day?	_____minutes/day	
B. Moderate-intensity physical activities			
404	Does your regular physical exercise or moderate physical activity at school or at home? [Walking, carrying light loading…	1. Yes 2. No	If no go to 407
405	Within a week how many days do you do moderate intensity physical activities regularly as a part of life?	_____days/ week	
406	In each days how much time you spend by doing moderate activities in a day?	_____minutes/day	
1.2. Sedentary behavior questions			
The following questions are about recline or sitting at home and school or during leisure time with friends but do not include time spent during sleeping.			
407	How much time do you spend by recline or by sitting within a day?	_____minutes	

408	In average how much time you spend in a week by reclines or sitting in the school or at home.	_____hours/week	
1.3. Questions for way of transportation			
409	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1. Yes 2. No	
410	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	_____days/week	
411	How much time do you spend walking or bicycling for travel on a typical day?	_____minutes _____hours	
4.4 Recreational Activities			
A. High intensity recreational activities			
412	Do you do any high intensity physical activity like running playing foo ball or swimming dancing continuously during leisure time?	1. Yes 2. No	
413	Within a week how many days do you do vigorous recreational activities?	_____days/ week	
414	Within a day how much time you spend in vigorous recreational activities?	_____minutes	
B. Moderate intensity recreational activities			
415	Do you do any moderate physical activity like playing volleyball during leisure time?	1. yes 2. No	
416	Within a week how many days do you do moderate recreational physical activities?	_____days/week	
417	Within a day how much time you spend in moderate vigorous activity?	_____minutes/day	

Annex V: ለተጠያቂዎች የሚሰጥ መረጃ

የጥናቱ ርዕስ- “በአማራ ክልል ሰሜን ሸዋ ዞን ደብረብርሃን ከተማ ውስጥ የሁለተኛ ደረጃ ት / ቤት ተማሪዎች ከመጠን በላይ ክብደት እንዲኖራቸው የሚያደርጉ ምክኒያቶችን መለየት ነው

መግቢያ: እኔ ተማሪ እሌኒ ዳኛው በባህር ዳር ዩኒቨርሲቲ የህክምና እና የጤና ሳይንስ ትምህርት ቤት በሚገኘው የህጻናት ጤና ነርሲንግ ትምህርት ክፍል የ 2ኛ ዲግሪ ትምህርቴን በመከታተል ላይ ያለሁ ስሆን የመመረቂያ ጥናታዊ ጽሁፌን እየሰራሁ እገኛለሁ። በመሆኑም ከላይ እንደተጠቀሰው በተጠቀሰው ጥናት እንድትሳተፉ በአክብሮት እጠይቃለሁ ። በዚህ ጥናት ውስጥ ለመሳተፍ ወይም ላለመሳተፍ ከመወሰንዎ በፊት የጥናቱን ዓላማ ፣ አሰራሩን ፣ ማንኛቸውም አደጋዎችን ፣ ጥቅሞችን እና ከእርስዎ ምን እንደሚጠበቅ ላብራራላችሁ እፈልጋለሁ ። በዚህ ጥናት ውስጥ ያለዎት ተሳትፎ ሙሉ በሙሉ በራስዎ ፈቃድ ነው። እርስዎ የመሳተፍ ግዴታ የለብዎትም; ለመሳተፍ ወይም ላለመሳተፍ መምረጥ ይችላሉ ። ላለመሳተፍ ከወሰኑ ምንም ዐይነት ጉዳት በእርስዎ ላይ አያስከትልም።

የጥናቱ ዓላማ- የዚህ ጥናት ዓላማ በአማራ ክልል በሰሜን ሸዋ ዞን በደብረብርሃን ከተማ ውስጥ በሚገኙ የሁለተኛ ደረጃ ት / ቤት በጉርምስና ዕድሜ ላይ የሚገኙ ተማሪዎችን ከመጠን በላይ ክብደት እንዲኖራቸው የሚያደርጉ ምክኒያቶችን መለየት ነው ።

የአሠራር ሂደት- ከላይ የተጠቀሰውን ዓላማ ለማሳካት ለጥናቱ አስፈላጊ የሆኑ መረጃዎች በት / ቤቱ ውስጥ ካሉ ተማሪዎች የተወሰዱ ሲሆን በመረጃ የተደገፈ የስምምነት ፎርም ላይ ከፈረሙ በኋላ ጥያቄዎችን የማቅረብ እድል ይኖርዎታል እንዲሁም የሚጠየቁትን ጥያቄዎች እንዲመልሱ መረጃ ሰብሳቢዎቹ ይጠየቃሉ ።

አደጋዎች- ለጥያቄዎች መልስ ለመስጠት ጊዜዎን ከመጠቀም ውጭ ምንም ዐይነት ጉዳት በእርስዎ ላይ አያስከትልም። ።

ጥቅሞች: ጥናቱ በትምህርት ቤቱ ውስጥ ላሉት ተማሪዎች ቀጥተኛ ጥቅም የለውም ፣ ግን በጥናቱ ውስጥ ለሚሳተፉ እና ጥናቱ ለሚመለከታቸው ሰዎች በተዘዋዋሪ ጥቅም ይኖረዋል ። በአጠቃላይ የምርምር ሥራው ለጤና እንክብካቤ እቅድ አውጪዎች እና ሥራ አስኪያጆች ቀጥተኛ ጠቀሜታ አለው ።

የጥናቱ ሚስጥራዊነት፡- የተሳታፊውን ማንነት እና የሚሰጠው መረጃ በሚስጥር ይያዛል። ስለሆነም ከተሳታፊ ስም ይልቅ የሚስጥር ኮድ መረጃ በሚሰበሰብበት ጊዜ እንጠቀማለን።

Annex VI: የጥናቱ ተሳታፊ የፈቃደኝነት ማረጋገጫ ቅፅ

የዚህ ጥናት ዓላማ ተብራርቶልኛል እናም የጥናቱን ዓላማ ፣ አደጋዎች ፣ ጥቅሞች እና ምስጢራዊነት እንዲሁም በዚህ ጥናት ውስጥ መሳተፍ በፍቃደኝነት ብቻ እንደሆነ ተረድቻለሁ ። ስለዚህ ፣ በዚህ ጥናት ውስጥ ለመሳተፍ ተስማምቻለሁ ።

ፊርማ _____ መጠይቁ የተደረገበት ቀን _____

የጠያቂው ስም _____ ፊርማ_____ ቀን _____

ማንኛውም ጥያቄ ካለዎት የጥናቱን ዋና ተመራማሪ በሚከተለው አድራሻ ማግኘት ይችላሉ።

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ኢሜይል: elenidagnaw@gmail.com

ስለትብብርዎ በቅድሚያ እናመሰግናለን !!!!

Annex VII: አካላዊ መለኪያዎች ለማጣራት ዓላማ

ተ. ቁ	አካላዊ መለኪያዎች	የልኬት መጠን
1	ቁመት (በሴንቲሜትር)	
2	ክብደት (በኪሎግራም)	
3	BMI	

Annex VIII: Questionnaires in Amharic version

ክፍል አንድ- .ማህበራዊ ኢኮኖሚያዊ እና ሥነ-ሕዝባዊ መረጃን የተመለከቱ ጥያቄዎች

ኮድ/መለያ	ጥያቄዎች	ምላሾች	ይዝለሉ
101	ፆታ	1. ወንድ 2. ሴት	
102	እድሜዎ ስንት ነው	_____ዓመት	
103	በቤትዎ ውስጥ ስንተኛ ልጅ ነህ/ሽ	_____	
104	የትውልድ ቦታ	1. ከተማ 2. ገጠ ር	
105	የትምህርት ደረጃ	1. ክፍል 9 2. ክፍል 10 3. ክፍል 11 4. ክፍል 12	
106	የቤተሰብ ብዛት	_____	
107	ሃይማኖት	1. ኦርቶዶክስ 2. ፕሮቴስታንት 3. ሙስሊም 4. ካቶሊክ 5. ሌላ_____	
108	የእናት የትምህርት ደረጃ	1. ማንበብና መፃፍ የማትችል 2. ማንበብና መፃፍ የምትችል 3. የመጀመሪያ ደረጃ ት/ት (1-8) 4. 2ኛ ደረጃ ና መሰናዶ ትምህርት (9-12) 5. ኮሌጅ/ዩኒቨርሲቲ ያጠናቀቀ	
109	የአባት ትምህርት ደረጃ	1. ማንበብና መፃፍ የማይችል 2. ማንበብና መፃፍ የሚችል 3. የመጀመሪያ ት/ት (1-8) 4. 2ኛ ደረጃ ና መሰናዶ ትምህርት (9-12) 5. ኮሌጅ/ዩኒቨርሲቲ ያጠናቀቀ	

110	የእናት ሥራ	1. የቤት እመቤት 2. ነጋዴ 3. የመንግስት ሰራተኛ 4. የግል ሰራተኛ 5. ሌላ ይገለጽ-----	
111	የአባት ሥራ	1. የመንግስት ሰራተኛ 2. ነጋዴ 3. ጡረተኛ 4. ገበሬ 5. ሌላ ይገለጽ-----	
112	አማካይ ወርሃዊ የቤተሰብ ገቢ?	---------- የኢትዮድያ ብር/ወር	
113	የትራንስፖርት ዓይነት	1. በእግር 2. ብስክሌት 3. ሞተር 4. አውቶሞቢል	
114	የቅርብ ጓደኞች አለህ/ሽ	1. አዎ 2. አይ	
115	በአሁኑ ሠዐት ከማን ጋር ነው የምትኖረው/ሪው?	1. ብቻዬን 2. ከቤተሰብ ጋር 3. ከ ዘመድ ጋር 4. ሌላ ይገለጽ-----	

ክፍል ሁለት. የአመጋገብ ሁኔታን የተመለከቱ ጥያቄዎች

የሚከተሉት ጥያቄዎች ስለ ተሳታፊዎች የአመጋገብ ልማድ ይጠይቃሉ

የመለያ ቁጥር	ጥያቄዎች	መልስ	ይዝለሉ
201	በሳምንት ውስጥ ቁርስ ሳይመገቡ የቀሩበት ቀን አለ?	1. አወ 2. የለም	
202	አዎ ከሆነ መልስዎ በሳምንት ውስጥ	1. 1-3 ጊዜ ዘልሏል	

	ስንት ቀን ቁርስ ሳይመገቡ ቀሩ?	2. ≥4 ጊዜ	
203	በቀን ምን ያህል ጊዜ ምግብ ይመገባሉ?	1. <3 ጊዜ 2. 3 ጊዜ 3. ≥4 ጊዜ	
204	በሳምንት ውስጥ ለምን ያህል ጊዜ መክሰስ ይመገባሉ?	1. መክሰስ በልቸ አላውቅም 2. 1-3 ጊዜ 3. 4-6 ጊዜ 4. ≥ 7 ጊዜ	
205	ቴሌቪዥን እየተመለከቱ የመመገብ ልማድ አለዎት?	1. አዎ 2. አይ	
206	እያነበቡ የመመገብ ልማድ አለዎት?	1. አዎ 2. አይ	
207	በቀን ውስጥ ምን ያህል ሰአት በእንቅልፍ ያሳልፋሉ?	_____ ሰዓት	

ክፍል ሶስት : የአመጋገብ ሁኔታን የተመለከቱ ጥያቄዎች

ከዚህ ቀጥሎ ያሉት ጥያቄዎች በተለምዶ አዘውትረው ሰለሚመገቡአቸው ምግቦች የተመለከቱ ናቸው።

እባክዎ ጥያቄዎቹን ሲመልሱ ባለፈው ሳምንት ውስጥ አዘውትረው የተመገቡአቸውን ምግቦች ያስቡ።

የመለያ ቁጥር	የምግብ አይነቶች	የተመገቡበት ጊዜ ብዛት (ድግግሞሽ)				
		በቀን አንድ ጊዜ	በቀን ሁለት ጊዜ	በሳምንት ከ2-4 ጊዜ	በሳምንት ≥ 4 ጊዜ	ይዝለሉ
301	እንጀራ ፣ ዳቦ፣ ሩዝ፣ ፓስታ ወይም ሌሎች ምን ያህል ጊዜ ይበላሉ?					
302	ስኳር ፣ማር፣ ስኳር አዘል እና ጣፋጭ ምግቦች እንደ ኬክ፣አይስክሬም፣ቸኮሌት፣ኩኪስ ምን ያህል ጊዜ ይበላሉ?					
303	ፈጣን ምግቦች (እንደ በርገር፣ቺፕስ፣ ፒዛ፣ ሳንድዊች፣ፓስቲ፣ ዶናት፣ አይስ ክሬም ወይም የተጠበሱ ምግቦች) ምን ያህል ጊዜ ይበላሉ?					
304	ስጋ ፣ እንቁላል ፣ ምን ያህል ጊዜ ይበላሉ?					
305	ወተት ፣ አይብ ምን ያህል ጊዜ ይበላሉ?					
306	ጨማ ወይም ቅባት የበዛበት ምግብ ምን ያህል ጊዜ ይበላሉ?					
307	አትክልት ምን ያህል ጊዜ ይበላሉ?					
308	ፍራፍሬ ምን ያህል ጊዜ ይበላሉ?					
309	ለስላሳ መጠጦችን ወይም የታሸጉ የፍራፍሬ ጭማቂዎችን ምን ያህል ጊዜ ይጠጣሉ?					
310	የአልኮል መጠጦችን ምን ያህል ጊዜ ይጠጣሉ?					

ክፍል አራት-የአካል ብቃት እንቅስቃሴ መጠይቅ

አሁን ስለሚያደርጉዋቸው የተለያዩ አካላዊ እንቅስቃሴዎች እጠይቆታለሁ። እነዚህም በት/ቤት ፣ በቤት ውስጥ ስራዎች ወይም ከቦታ ወደ ቦታ ለመሄድ የሚያደርጉአቸውን መደበኛ እንቅስቃሴዎቸ እና በዕረፍት ጊዜዎ ውስጥ ለመዝናኛ ወይም ለስፖርት የሚሰሯቸውን እንቅስቃሴዎች ያጠቃልላል።			
ጥያቄዎቹን በሚመልሱበት ወቅት ጠንካራ የአካላዊ እንቅስቃሴዎች ማለት ከባድ ጥረት የሚጠይቁ **ትንፋሽዎና የልብ ምትዎ ላይ ከፍተኛ ጭማሪ የሚያመጡ ማለትም ቶሎ ቶሎ መተንፈስ ወይም ፈጣን የልብ ምት ሊያስከትሉ የሚችሉ እንቅስቃሴዎች ናቸው። መካከለኛ የአካላዊ እንቅስቃሴዎች ደግሞ መካከለኛ ጥረት የሚጠይቁ ትንፋሽና የልብ ምት ላይ መጠነኛ ጭማሪ ሊያመጡ የሚችሉ አካላዊ እንቅስቃሴዎች ናቸው።**			
ጥያቄዎች		ምላሽ	
4.1.መደበኛ የአካል ብቃት እንቅስቃሴ በቤት ወይም በትምህርት ቤት			
ሀ. ጠንካራ አካላዊ እንቅስቃሴዎች			
የመለያ ቁጥር	ጠንካራ የአካል እንቅስቃሴዎች	ምላሽ	ይዝለሉ
401	በትምህርት ቤት ወይም በቤት ውስጥ መደበኛ የአካል ብቃት እንቅስቃሴን ወይም የተጠናከረ እንቅስቃሴመደበኛ አካላዊ እንቅስቃሴህ/ሽ ወይም የቤት ስራዎችህ/ሽ ከፍተኛ የትንፋሽ ወይም የልብ ምት መጨመር የሚያመጡ ጠንካራ አካላዊ ተግባራትን ያካተተ ነበር? ለምሳሌ፡ ከባድ እቃ ማንሳት ወይም ለ 10 ደቂቃ ኤሮቢክስ ፣ ፑሽ አፕ/ፑል አፕ ፣ ገመድ መዝለል	1. አዎ 2. አይደለም	አይደለም ከሆነ ፣ ወደ 404 ይሂዱ
402	በሳምንት ውስጥ እነዚህን ጠንካራ አካላዊ እንቅስቃሴዎች ለምን ያህል ጊዜ ሰርተው ነበር?	_____ ቀናት / ሳምንት	
403	በቀን ውስጥ ጠንከር ያሉ እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ያጠፋሉ?	በቀን _____ ደቂቃዎች	
ለ. መካከለኛ አካላዊ እንቅስቃሴዎች			
404	መካከለኛ አካላዊ እንቅስቃሴ ወይም	1. አዎ	አይደለም ከሆነ

	የቤት ውስጥ ስራዎች መጠነኛ የትንፋሽና የልብ ምት መጨመር የሚያስከትሉ ተግባራትን ይጨምራል? ለምሳሌ ቢያንስ ለ 10 ደቂቃ ፈጠን ያለ እርምጃ ወይም ቀለል ያሉ እቃዎችን?	2. አይደለም	ወደ 407 ይሂዱ
405	በሳምንት ውስጥ መካከለኛ አካላዊ እንቅስቃሴ ለምን ያህል ጊዜ ይሰራሉ	_____ ቀናት / ሳምንት	
406	በእያንዳንዱ ቀን ውስጥ መጠነኛ እንቅስቃሴዎችን በማድረግ ምን ያህል ጊዜ ያጠፋሉ?	_____ ደቂቃዎች / ቀን	
4.2 Sedentary behavior questions			
የሚከተሉት ጥያቄዎች በቤት ውስጥ እና በትምህርት ቤት ወይም ከጓደኞች ጋር በመዝናኛ ጊዜ ስለ መተኛት ወይም ጋደም ብለው ያሳለፉትን ጊዜ ይመለከታል። (በዴስክ ላይ፣ በመኪና ውስጥ ፣ ከጓደኞችዎ ጋር ወይም ቴሌቭዥን ለመመልከት ተቀምጠው ወይም ጋደም ብለው ያሳለፉትን ጊዜ ይጨምራል። ነገር ግን በእንቅልፍ ያሳለፉትን ጊዜ አያካትትም)።			
407	በአንድ ቀን ውስጥ በመቀመጥ ምን ያህል ጊዜ ያጠፋሉ?	_____ ደቂቃዎች	
4.3 ከቦታ ቦታ መጓጓዝ ዘዴን በተመለከተ			
408	ከቦታ ቦታ ለመጓጓዝ በእግር ወይም ሳይክል በተከታታይ ለ 10 ደቂቃ ያህል ይጠቀማሉ?	1. አዎ 2. አይደለም	
409	በሳምንት ውስጥ ከቦታ ቦታ ለመጓጓዝ ስንት ቀን በእግር ወይም በሳይክል ለተከታታይ 10 ደቂቃ ይጎዛሉ?	በሳምንት _____ ቀናት	
410	ከነዚህ ቀናት በአንዱ በእግር ወይም በሳይክል በመጓጓዝ ምን ያህል ሰአት አጥፍተዋል?	_____ ደቂቃዎች _____ ሰዓታት	
4.4 የመዝናኛ እንቅስቃሴዎች			
U / ከፍተኛ የመዝናኛ እንቅስቃሴዎች			
411	እንደ መዝናኛ/ የትርፍ ጊዜ እንቅስቃሴዎች ከፍተኛ የትንፋሽ ወይም የልብ ምት መጨመር የሚያመጡ ጠንካራ አካላዊ	1. አዎ 2. አይደለም	አይደለም ከሆነ ወደ ጥያቄ ቁጥር415ይሂዱ

	ተግባራትን ቢያንስ ለ ለተከታታይ 10 ደቂቃ ያደርጋሉ? ለምሳሌ፡ ኤሮቢክ ዳንስ ፣ የቅርጫት ኪስ ፣ የእግር ኪስ ጨዋታ ወይም ሩጫ		
412	በሳምንት ውስጥ ስንት ቀናት ጠንካራ የመዝናኛ እንቅስቃሴዎችን ያደርጋሉ?	በሳምንት _____ ቀናት	
413	በጠንካራ የመዝናኛ እንቅስቃሴዎች ውስጥ በአንድ ቀን ውስጥ ምን ያህል ጊዜ ያጠፋሉ?	_____ ደቂቃዎች	
ለ. መካከለኛ የመዝናኛ እንቅስቃሴዎች			
414	መጠነኛ የትንፋሽ ወይም የልብ ምት መጨመር የሚያመጡ መካከለኛ አካላዊ ተግባራትን ለምሳሌ፡ ዋና ፣ የእጅ ኪስ ጨዋታቢያንስ ለ ለተከታታይ 10 ደቂቃ አድርገው ያውቃሉ ?	1. አዎ 2. አይደለም	
415	በሳምንት ውስጥ መጠነኛ የመዝናኛ አካላዊ እንቅስቃሴዎችን ስንት ቀናት ታደርጋለህ?	በሳምንት _____ ቀናት	
416	በአንድ ቀን ውስጥ በመጠኑ ኃይለኛ እንቅስቃሴ ውስጥ ምን ያህል ጊዜ ያጠፋሉ?	_____ ደቂቃዎች / ቀን	