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Prevalence of Overweight and Obesity and Associated Factors among School-Aged Children in Bonga Town, Southwest Ethiopia, 2023

Sintayehu Bezabih Bekele[1,*], Alemayehu Keto[2] and Abel Girma Tilahun[3]

[1]Department of Midwifery, College of Health Sciences, Bonga University, Bonga, Southwest Ethiopia
[2]Kaffa zone Health Department, Kaffa zone, Bonga, Southwest Ethiopia
[3]School of Public Health, College Medicine and Health Sciences, Mizan-Aman, Mizan-Tepi University, Southwest Ethiopia

[*]**Corresponding Author:** Sintayehu Bezabih Bekele, Department of Midwifery, College of Health Sciences, Bonga University, Bonga, Southwest Ethiopia, Tel.: 0917881034, E-mail: sbezabih407@gmail.com

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Abstract

Background: Overweight and obesity is defined as the accumulation of excessive fat in the body of children. Even though childhood overweight and obesity are not yet supposed to be an emerging health issue in Ethiopia, their prevalence increases. The magnitude of overweight and obesity in the Southwest region, particularly in Bonga town is unknown. Hence, the study aimed to assess the prevalence of overweight and obesity among school-aged children in Bonga town, Southwest Ethiopia.

Methods: A school-based cross-sectional study was conducted from March 15th to April 30th, 2023, and multistage sampling was used to select 738 school-age children. Data were collected by the interviewer-administered pretested structured tool and anthropometric measurement. The collected data were checked, coded, and entered into Epidata version 4.6.0 and WHO AnthroPlus and exported to SPSS version 23 for analysis. Descriptive analyses like frequency, percentage, and means were done. Both bivariable and multivariable binary logistic regression analyses were applied, and a binary logistic regression model was fitted. Variables with p-values of <0.25 were taken into multivariable analysis to control the confounder effect. To determine the strength of the association an Adjusted odds ratio (AOR) with 95% confidence interval (CI) was calculated and statistical significance was declared at p-value < 0.05.

Results: A total of 724 school-aged children participated in the study, with a response rate of 98.10 %. The overall prevalence of overweight and obesity was 12.80 % with a 95 % CI (8.40, 12.70). Low physical activity (AOR=5.54, 95% CI:1.13, 27.04), two or more snacks per day (AOR:3.28, 95 % CI: 1.43, 7.52), use of transportation (AOR: 4.96, 95% CI:2.34, 10.51) were found to be significantly associated with overweight/obesity of school-aged children.

Conclusion: Overweight and obesity in school-aged children was high. Therefore, respective schools, education, and

health departments should intervene by promoting healthy lifestyles in school-age children.

Keywords: School age; Children; Overweight/obesity; Bonga town; Southwest Ethiopia

Abbreviations: AOR: Adjusted Odds Ratio; BMI: Body Mass Index; CI: Confidence Interval; COR: Crude Odds Ratio; DHS: Demographic and Health Survey; ETB: Ethiopian Birr; HSTP: Health Sector Transformation Plan; UNICEF: United Nations International Children's Emergency Fund; WHO: World Health Organization

Background

Overweight and obesity are defined as the accumulation of excessive fat in the body of children [1]. They are serious global health problems and major risk factors for several diet-linked non-communicable diseases like dyslipidemia, cardiovascular diseases (CVD), and type II diabetes mellitus and psychological effects as well as social stigma, which can have serious consequences for mental and physical health [2, 3].

Globally, the prevalence of overweight and obesity among children is rising and the number of obese children has risen tenfold in the past four decades, with more than two-thirds of overweight children now living in low-and middle-income countries (LMICs) [4, 5].

According to, the World Health Organization (WHO) 2020, regional report an estimated 7.4% of school-age children were overweight in Southeast Asia [6]. Overweight/obesity in Sub-Saharan African (SSA) children is rising at an alarming rate and emerged as a public health concern. [7, 8].

According to WHO, while age, sex, and genetic susceptibility are non-modifiable risk factors, many of the risk factors are modifiable. Such risks include behavioral factors (e.g. diet, physical inactivity) biological factors (e.g. Dyslipidemia, hypertension, overweight, hyperinsulinemia), and finally societal factors which include a complex mixture of interacting socio-economic, cultural, and other environmental parameters [9].

Overweight and obesity are leading nutrition and lifestyle-related disorders of clinical and public health concern of the 21st century and a significant burden of low- and middle-income countries, particularly in urban settings. (2, 10, 11) Children's overweight and obesity is a serious problem that is increasing at an alarming rate; one in three or five children are overweight or obese. [2, 12-24].

Ethiopia is currently facing a triple burden of diseases (communicable and non-communicable diseases or NCDs, mental health, and injuries) that affects all age groups, with a disproportionately higher burden among children in which lifestyle-related risk factors for chronic illnesses tend to be more prevalent [2, 15].

Childhood overweight/obesity is not yet supposed as an emerging health issue in Ethiopia [16]. But, according to the United Nations International Children's Emergency Fund (UNICEF) annual report, there is an overall increment in the prevalence of overweight/obesity among children from 1.7 to 3.6% in Ethiopia [17].

In Ethiopia, the pooled prevalence of overweight and obesity was significantly high which is 8.92 % and 2.39 % respectively [2] and it has become an emerging nutrition-associated problem in the country [2, 18]. Even though there are studies on childhood overweight and obesity in different parts of Ethiopia, its magnitude in the Southwest region, particularly in Bonga town is unknown. Hence, this study aims to assess the prevalence of overweight and/or obesity and its associated factors among school-age children in Bonga town, Southwest, Ethiopia.

Methods

Study Design, Setting, and Period

A school-based cross-sectional study was conducted in Bonga town public and private primary schools from March 15th to April 30th, 2023. Bonga is the administrative town of Kaffa Zone and the capital city of Southwest Ethiopia's people's region, which is located 465 (km) Southwest of Addis Ababa. The town has seventeen primary schools, three high schools, One teacher's education, and One TVET college and University. Of the seventeen elementary schools, fourteen schools are public and three are private schools, with a total of 9061 students. Of the total students, 2083 students are attending private schools while 6978 are studying at public schools.

Population

All school-aged children attending primary education both in private and public schools in the study period were included and taken as the study population. However, those students having edema, with body deformity such as kyphosis and scoliosis, and critically ill (unable to communicate) were excluded.

Sample Size Determination

The sample size was determined by using single population proportion formula through stat calc Epi info version 7.2.4.0 considering the following assumptions: 95 % level of confidence, 3 % margin of error, and taking 11.9 % hypothesized proportion of overweight and obesity 11.9 % from previous study done in Bahir Dar, Amhara region, Ethiopia [19]. By adding 10% non-response rate and 1.5 design effect, the final sample was 738.

Sampling Technique

Multistage sampling technique was used to select study participants. First, the schools were stratified into public and private schools. The primary sampling units were the selected private and public schools in Bonga town. Twenty percent of both public and private school was included in the study. The lottery method was used to select schools, for each selected school, the samples were allocated proportional to the number of students with respect to grade level. The secondary sampling units were randomly selected students from each selected grade and section. Proportional allocation of the sample to the total number of students in each public and private was made and a total of 738 students were included in the study using a systematic random sampling technique. Skipping interval was calculated by dividing a total population for the sample size (k = N/n). Finally, study subjects were selected by skipping the skipping interval "k." (Figure 1)

Study Variables

The dependent variable was overweight and obesity.

The independent variables were family and children socio-demographic characteristics such as age, sex, marital status, living status, residence, religion, educational status of the mother, educational status of the father, mothers' occupation, fathers' occupation, family size, birth order, family owing car, type of school, average family monthly income. Dietary related characteristics like frequency of fruits per week, frequency of vegetables per week, use of snacks, frequency of snacks per day, meal frequency per day, fast food consumption, eating while watching TV, eating while studying, missing meals, Dietary diversity score. Physical activity related characteristics includes transportation to school, sports activities, time for sport, extra home activity, time for extra home activity, way of spending free time (reading books, playing games, watching TV), sitting, sleeping habit. Knowledge of overweight/obesity.

Operational Definitions

Overweight: defined as BMI for age greater than or equal to +1 SD [20].

Obesity: considered as BMI for age greater than or equal to +2 SD [20].

School-aged children: Children aged 6-12 years were considered school-age [19].

Knowledge Status: Those who scored above the mean were taken as having good knowledge while those who scored less than or equal to the mean were considered as having poor knowledge about overweight and obesity [21].

The dietary diversity score (DDS) was ranked into three subgroups: if the child consumed: 0 to 2 food groups classified as "poor", 3 to 5 food groups classified as "medium", six and above food groups classified as "high" in the previous day preceding the survey [22].

Sedentary behaviors: Time spent while reading books, and/or watching TV, and/or video playing computer games for more than 2 h/day or sleeping for greater than 8 h [23].

Physical activity was assessed by the WHO STEPwise approach to chronic disease riskfactor surveillance instrument [24] and the global physical activity questionnaire (GPAQ) [25] which was developed by WHO for physical activity surveillance the level of total physical activity was categorized as sedentary activity (low activity), moderate activity, and high activity.

Vigorous-intensity activities were activities that require hard physical effort and cause large increases in breathing or heart rate while 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate [25].

Data Collection Instrument and Procedure

The height of the children was measured using a portal stadiometer. Enumerators strictly followed appropriate height-measuring procedures. Height was measured to the nearest 0.1 cm in standing position at Frankfurt plane with the occipital, shoulder, and buttock touching the vertical stand using a stadiometer seca (Germany). Height measurement values were read and recorded to the nearest 0.1 cm. The children's weight was measured using weight measurement balance by wearing only light clothing and barefoot. Children's bags, books, exercise books, and other playing materials were put away by data collectors. Weight was measured to the nearest 0.1 kg using the electronic weighing scale while wearing light clothes. Both the weight and height of the children were measured barefoot.

Data were collected using both structured and semi-structured questionnaires developed by reviewing different literatures. The questionnaire was comprised of socio-demographic characteristics; physical activity, sedentary lifestyle factors, and dietary habits-related questions. The internal consistency of the tools for overweight and obesity were also checked in present study with (Cronbach's alpha =0.978) In addition, anthropometric measures (weight and height) were conducted by a weight-measuring scale, height-measuring board, and the 24-hour' recall with face-to-face interview was used. Three clinical nurses who can fluently communicate in the local language (Amharic) and two BSc Public health officers who had experience in supervision and fluently communicate with local language were recruited as data collectors and supervisors, respectively. Knowledge level of children about overweight/obesity was conducted by six questions and the overall knowledge score was calculated by adding up the scores for each respondent across all the questions.

Data Quality Assurance

To keep data quality the questionnaire (English version) was translated into Amharic (local language) and translated back to English by language experts. One day training was given to the data collectors and supervisors on the objective, relevance of the study, confidentiality of information, respondent's rights, informed consent, and techniques of interview and how to measure anthropometric indices of school age children. A week before the actual data collection, the questionnaire was pre-tested among school-age children in Awrada town, which has similar socio-cultural and economic characteristics with the study population of 5% (n=38) of school-age children, and necessary modification was done for the questionnaire according to the gap identified. The supervisors and principal investigator had frequent checks on the data collection process to ensure the completeness & consistency of the gathered information and errors found during the process were corrected. The collected data were reviewed and checked for completeness before data entry. A data entry format template was produced and programmed on the Epi data version 4.6.0.

Data Processing and Statistical Analysis

After data collection, filled questionnaires were coded. The data were entered using Epi data version 4.6.0 statistical software and exported to Statistical Package for Social Science (SPSS) version 23 and WHO 2005 Anthroplus software was done to determine the overweight and obesity status of the study participants. The Percentile values for BMI-for-age (BAZ) of children were generated from WHO AnthroPlus software [19]. Data cleaning was performed to check for frequencies, missed values and variables, and outliers. Descriptive analysis such as proportions, percentages, means, tables, and graphs were used to describe the data. Bivariable logistic regression was used to assess the association of each independent variable with the prevalence of overweight and obesity and variables with a p-value of less than 0.25 in the bi-variable analysis were included in the backward stepwise logistic regression procedure. In multivariable binary logistic regression analysis, AORs with corresponding 95% CIs were calculated, and statistical significance was declared at P-value <0.05. The model fitness was checked by Hosmer and Lemeshow fitness of test and it was good fit and multicollinearity was checked by using variable inflation factor (VIF). Finally, the results were presented in the form of texts, tables, and graphs.

Results

Socio-Demographic and Economic Characteristics

A total of 724 school-aged children participated in the study, with a response rate of 98.64%. The median age of school-aged children was 10 years with IQR: 9-10. Of them, 372 (51.40 %) were females. About two-thirds attending public schools (Table 1).

Dietary Habit-Related Characteristics

Concerning the dietary habit of school-aged children, about (98.20) consumed fruits. About two-thirds use snacks, and of them only 34 (6.30) use more than two snacks per day (Table 2). Regarding dietary diversity score more than two-thirds (70.58) were in medium dietary diversity score (Figure 2).

Physical Activity and Sedentary Behavior-Related Factors

Regarding the physical activity-related factors of school-aged children, only 5.10 % used transportation as a means of transport for going to school. Less than one-fourth (5.10%), were doing sport (Table 3).

Anthropometric Measurements and Prevalence of Overweight and Obesity

The current study showed that the mean weight (±SD) and height (±SD) of school-aged children were 36.77 (±19.34) and 137.13 (±8.96) respectively. The overall prevalence of overweight and or obesity was 12.80 with 95 % CI (8.40, 12.70), out of which 10.50 % and 2.30 % respectively.

Factors Associated with Overweight and or Obesity of School-Aged Children

Both bivariable and multivariable binary logistic regression analyses were computed to determine factors associated with overweight and or obesity of school-aged children. In bivariable binary logistic regression analysis snacks per day, fruits per week, knowledge, fast food intake, physical activity, means of transport, and missing meals had a p-value less than 0.25 and were considered for multivariable binary logistic regression analysis to control the possible effects of confounders.

In multivariable logistic regression, school-aged children with low physical activity [AOR=5.54 (1.13, 27.04)], School-aged children who had two and more snacks per day [AOR:3.28 (1.43, 7.52)], Those who used transportation were 4.96 times more obese than their counterparts [AOR: 4.96 (2.34, 10.51)] were found to be significantly associated factors with overweight/obesity (Table 4).

Discussion

This study assessed the prevalence of overweight or obesity among school-aged children in Bonga town. It showed that the overall prevalence of overweight and or obesity was 12.80 with a 95 % CI (8.40, 12.70).

This finding was in line with the studies conducted in Bahirdar tow 11.9 % [19]. Addis Ababa 12.7% [26] the Democratic Republic of Congo 9 % [27] and Pakistan 11.2%. [28]. The possible justification for this consistency of findings could be, Similarity in the study population, Socio-demographic characteristics, and study setting. For instance, the study populations of the study conducted in Bahirdar [19] and Addis Ababa [26] were school-aged children attending public and private schools in urban settings.

Similar to the study done in Bahirdar [19], the majority of school-aged children were attending public school and used walking as a means of transport for going to school. This could be due to, the fact that walking is one of the sports activities used for a healthy lifestyle, and the use of transportation in return predisposes them to a sedentary way of life, which increases the risk of overweight and obesity [21, 26].

However, the study finding was lower when compared to studies conducted in Gujarat 15.61 % [29], Jordan 33% [30] Karanka-ta, India 16.13% [12] and Saudi Arabia 21.5% [13]. The possible justification for this variation may be the clear difference in the lifestyle, socio-cultural and economic differences in the study populations, and study setting.

School-aged children who consumed two and more snacks/day were 3.28 times more likely to be overweight/obese than those who consumed less than two snacks/day. This study finding agreed with the study conducted in Addis Ababa, Indonesia, and Bangladesh [26, 31-34]. This could be due to snacking predisposes for high calorie intake by disrupting the homeostatic control of eating behavior leading to overeating which in turn predisposes for overweight and obesity [35, 36]. However, this finding was not in agreement with other study findings [37, 38]. This could be due to the differences in the definition of snacks.

School-aged children who used transportation as a means of transport for going to school were five times 4.96 more likely to be overweight/obese than those who were walking to the school. This finding was in agreement with the study conducted in Bahirdar [19] and Addis Ababa [26, 29]. This could be due to the fact that the use of transportation decreases energy expenditure

and leads to sedentary ways of life. Thus, physical activity including walking regulates the number of calories stored in the body as fat and maintains healthy body weight status [19].

The odds of overweight/obesity were 5.54 times higher among school-aged children with low physical activity compared to those who perform high physical activity. This is supported by previous studies [3, 19]. This could be because maintaining healthy body weight requires a balance between energy intake and energy expenditure. Thus, physical inactivity predisposes children to overweight/obesity. Less expenditure of energy in physically inactive children increases the accumulation of energy in the body which in turn leads to overweight/obesity [40, 41].

As limitation in the present study, recall bias might have affected the quality of data collected because study subjects might face difficulty in responding to dietary diversity indices. However, to minimize the bias the data used local events and clarification. Temporal relations of cause-effect were not inferred due to the cross-sectional nature of the study.

Conclusion

The study finding revealed that the prevalence of overweight and obesity was high. School-aged children not performing sports activities, missing meals, use of transportation, two and or more snacks per day were more likely to be overweight/obese. Therefore, respective schools, education, and health department should intervene by promoting healthy lifestyle in school-age children and giving health education and the researchers better to do longitudinal follow-up study to investigate the relationship of sedentary behavior and overweight/obesity.

Ethical Consideration

The postgraduate Coordination Office Ethics Committee of the College of Medicine and Health Sciences at Mizan-Tepi University approved ethical permission for the research with the reference number PGC/0106/2023. The Bonga Town Education Office sent a formal letter of cooperation to the respective schools. All study participants and their legal guardians provided written informed consent and assent respectively, after being fully informed of the goals, risks, and benefits of the research to protect the participant's privacy and confidentiality, and the anonymity of patient data were achieved by coding, avoiding the use of personal identifiers, locking the data, and not disclosing names or exposing it to the third parties. All techniques were performed in compliance with the Helsinki Declaration.

Consent for Publication

Not applicable

Availability of Data and Materials

All relevant data are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contribution

SBB: Advised on the data analysis and interpretation and commented on successive drafts. **AK:** Designed and participated in the data collection, conducted the data analysis and interpretation, developed the first draft and revised subsequent drafts. **AGT:** advised on the conception of study area, data analysis and interpretation reviewed and commented on successive drafts. All authors reviewed and approved the final manuscript.

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