

**PREVALENCE OF OVERWEIGHT AND OBESITY AND ASSOCIATED
FACTORS AMONG SCHOOL ADOLESCENTS IN JIMMA TOWN, JIMMA,
ETHIOPIA**

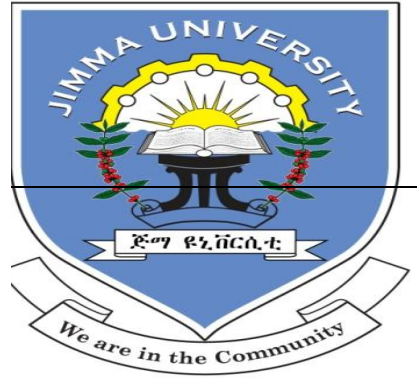


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Department of Population and Family Health for Partial Fulfilment of the requirement
for Masters of Science in Human Nutrition.

Jimma, Ethiopia
May, 2014.

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May, 2014

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ABSTRACT

Background: Obesity in early life has a greater tendency to follow through adulthood and it will end up with serious medical problems, lower educational attainment and higher rates of poverty. However there is paucity of available information regarding the adolescents' overweight and obesity in Ethiopia, particularly in the study area.

Objective: To determine prevalence of overweight and obesity and associated factors among school adolescents in Jimma town.

Methods: School based cross-sectional study was conducted from March to April/2015 among 546 adolescents selected using multi stage stratified random sampling. An interviewer administered questionnaire was used to collect socio demographic, dietary intake, health risky behaviour, and physical activity characteristics of the participants and weight & height were measured using calibrated equipment's and standardized techniques. Data were analysed using SPSS v20 and WHO Anthro Plus. Multivariable logistic regression was used to isolate independent predictors of overweight and obesity at 95% confidence intervals.

RESULTS: The prevalence of overweight/obesity was 13.3% (overweight (11.8%) and obese (1.6%)). Girls are 3.57(Adjusted odd ratio(AOR=3.57 [95%; CI:1.28-9.9] times more likely to be overweight/obese, additional year in age of the adolescents lowers the odds of overweight by 28.9% (AOR=0.71[0.53-0.95]), private school adolescents are 7.53 times(AOR=7.53[2.51-22.3]) more likely to be overweight/obese, Adolescents whose father did not attend formal education are 5.57 times(AOR=5.57[1.53-20.26]) more likely to be overweight/obese than whose father attended college & above. Those from high wealth quintile households (HH) are 3 times (AOR=3[1.094-8.26]) more likely to be overweight/obese than those from lower wealth quintile HHs. Adolescents who did not consume fruit are 5 times(AOR=5.08[1.57-16.38]) and who did not consume vegetables are 9 times(AOR=9.23[1.68-50.8]) more likely to be overweight/obese as than who consume 5-7x/wk. and adolescent who did not consume animal source foods(ASF) had 96.2%(AOR=0.038[0.006-0.24]) lower odds than who consume 5-7x/wk. Those who are physically inactive are 3.7 times (AOR=3.7[1.06-13.02]) and those involved in sedentary behaviour for ≥ 3 hr in day are 3.64[1.39-9.5] more likely to be obese/overweight than their counter peers.

Conclusion and recommendation: Prevalence of overweight/obesity among Jimma town school adolescent is considerably high. Being female, younger age, learning in private school, lower paternal education, high HH wealth, limited fruit and vegetable consumption and frequent ASF consumption, physical inactivity and sedentary behavior were significantly associated with overweight/obesity and early interventions strategies that address certain socioeconomic and life style related factors needs to be established.

Keywords: Overweight; Obesity; adolescents; Jimma town

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ABBREVIATION AND ACRONYM

AOR	Adjusted odd ratio
BAZ	BMI-for –age Z scores
BMI	Body Mass Index
CDC	Centre for Disease Control and prevention
COR	Crude odd ratio
DALYs	Disability Adjusted Life Years
EDHS	Ethiopian Demographic and Health Survey
FAO	Food and agriculture organization
FMOH	Federal ministry of Health
GPAQ	Global physical activity questionnaire
HDL	High Density lipoprotein
HH	House hold
IDDS	Individual dietary diversity score
LDL	Low Density Lipoprotein
IOTF	International Obesity Task Force
MET	Metabolic equivalent
NCDs	Non-communicable diseases
NCHS	National Centre for Health Statistics
NGO	Non-Governmental Organization
NNP	National nutritional program
UNICEF	United Nations Children's Fund
SPSS	Statistical package for social science
VIF	Variance inflation factor
WFP	World Food Program
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1. Background

Adolescence is a pivotal period of development which represents the age between 10-19 years(1). Adolescent`s accounts about one fourth (25.1%) of the total world`s population, in which majority of them lives in developing countries. Greater than one third(38.6%) of Ethiopian population were found in this age group making Ethiopia third country in the world following Swaziland and Zimbabwe (2).

During this crucial period, dietary patterns have lively role on lifetime nutritional status and health. However, adolescents face a series of serious nutritional challenges which would affect this rapid growth spurt as well as their health as adults. The main nutritional problems affecting adolescent populations are under nutrition and overweight/obesity which is an emerging public health problem currently(3, 4).

Overweight and obesity are both chronic conditions that are the result of an energy imbalance over a period of time. An energy imbalance arises when the number of calories consumed is not equal to the number of calories used by the body. The cause of this energy imbalance can be due to combination of several different factors and varies from one person to another (5).

Obesity is defined as a situation by which there is excess body fat leading to health impairment. Clinically, it's defined for adults as Body Mass Index (BMI) ≥ 30 (5). For many years, establishing an international definition of overweight and obesity among children and school adolescents based on pooled international data for BMI linked with adult obesity cut-off-point remained a big challenge. In 2007, world health organization (WHO) established new growth references for children and adolescents 5-19 years depending on multicultural Growth Reference Study (MGRS) in 2007. Based on this criteria overweight and obesity is defined as the proportion of children with a sex- and age-specific BAZ value greater than +1 Z-score and +2 Z-scores of the 2007 WHO recommended Growth Reference respectively (6).

1.2. Statement of the problem

The increasing prevalence of overweight and obesity in adolescents has become a public health concern worldwide and reached epidemic levels over the last few decades. According to recent report in 2010, worldwide, 10% of 5 to 17 years old children are overweight. About 30-45 million (2-3%) children are classified as obese and it's also estimated that the global prevalence of overweight / obesity among children and adolescents will reach approximately 60 million by 2020(7).

In Northern America particularly in USA over the past three decades, childhood obesity have tripled, and nowadays, the country partakes some of the highest obesity proportion in the world: about 60% of children is obese whereas, 30% of children is overweight or obese(8). In Europe, overweight and obesity was worryingly high for adults and young people. The prevalence of adolescent obesity has more than tripled in many European countries since the 1980s and with this rise conveyed a concomitant increase in rates of associated non-communicable disease(9).

Although high prevalence of adolescent obesity has been often associated with developed countries, the same trend has been observed in developing countries in recent years. According to a recent report, out of an estimated 43 million obese children worldwide in 2010, 35 million (81.4%) were from developing countries, half of which (18 million) were reported to be living in Asia(7).

In Africa, despite of huge deep rooted under-nutrition a study conducted in seven countries (Burkina Faso, Ghana, Kenya, Malawi, Niger, Senegal and Tanzania) reported that 8.5% of children were overweight/obese in 2010 and it's anticipated to reach 12.7% in 2020(10). In Ethiopia, there is no national level data but studies from Addis Ababa, Gondar and Hawasa town revealed significant prevalence of obesity/obesity in adolescents 8.6%, 5.9% and 15.6 % respectively(11-13).

Obesity is assigned as the fifth leading risk for deaths globally. It accounts for nearly three million deaths and 35.8 million of global DALYs. Likewise, 44% of the diabetes , 23% of the ischemic heart disease and between 7% to 41% of certain cancer burdens of the globe were also attributed to overweight and obesity(9, 14). According to NCD country reports of 2014, NCDs are estimated to account for 30% of all Ethiopian deaths which can be directly or in directly attributable to obesity(15).

Bodyweight is regulated by numerous physiological mechanisms that maintain balance between energy intake and energy expenditure. The factors for obesity are not fully understood but the results of different literatures have associated overweight/obesity with certain environmental factors, nutritional behaviours, sedentary life styles, genetic and psychosocial factors (3, 14).

Adolescent obesity is a multisystem disease with potentially devastating consequences, as with adults, obesity in adolescent hood causes serious medical problems, including high blood pressure, adverse lipoprotein profiles, diabetes mellitus, atherosclerotic cerebrovascular disease, coronary heart disease, certain cancer types, premature death and disability. Additionally, the care of overweight individuals is associated with increased health care costs to the society. The impact also extends to the psychological side such as decreased self-esteem, depression, lower educational attainment and higher rates of poverty(16, 17).

To avert this devastating problem non communicable disease (NCD) was incorporated in the National nutrition programme(NNP) and tobacco free & physically active initiative was launched(18, 19). However, these efforts are not specifically targeted adolescents and based on limited systematic evidence into possible factors of overweight & obesity in early stages of life. Moreover, all most all limited studies in Ethiopia were conducted using US-CDC growth reference which provides inaccurate estimation of magnitude of the problem which is an important step towards planning effective intervention strategies. Therefore this study was conducted to determine prevalence of overweight and obesity and associated factors among school adolescents in Jimma town.

1.3. Significance of the study

The health and well-being of adolescents have a major impact on the overall social and economic health of nation as today's adolescents are tomorrow's workforce, parents and leaders. But for many years, their health has been neglected because they were considered to be the less vulnerable group. However, evidences were suggesting the raise in overweight and obesity among these magnificent hope of the nation. Adolescent obesity has a strong tendency to track in to adult hood and become a foundation for substantial increase in the risk of premature development of chronic disease and certain cancers which will have far reaching impact on the overall welfare and disease burden of a nation. Yet, available evidences are suggesting that one of the most effective ways to prevent severe consequence of obesity in later life is prevention and management of obesity at early stages of life and identification of setting specific factors. Moreover having clear picture of the level and predictors of obesity at early stages of life where prevention of obesity is sensibly achievable and sustainable is very crucial and mandatory momentum, especially in developing countries with limited resource and advanced health care like Ethiopia. Surprisingly, to the best of my knowledge, there are limited studies nationally and there is no even a single study report from Oromiya region. Though, the paucity of available information was also hindering development of intervention strategies, still in Ethiopia most nutrition efforts have concentrated on under-nutrition and national surveys hardly report on over nutrition.

Therefore, this study was conducted to determine magnitude and predictors of obesity and overweight among Jimma town school adolescents and it is envisioned that data from this study will have great contribution for health policy makers, educators and other stakeholders in designing early preventive action. Information gathered from this study will also elicit support and promote cooperation among the different stakeholders. Finally it is anticipated that data from this finding will serve as a baseline data for further investigation.

CHAPTER -TWO

2. LITERATURE REVIEW

2.1. Magnitude of the problem

Globally obesity is rapidly becoming one of the most important medical and public health problems of our times with the worrisome raise in the magnitude of overweight and obesity among young population, and recently about 10% of children aged 5-17 years globally were overweight, among which 2-3.5% was obese(14).

The study conducted in eastern turkey among school children aged 6-18 years using the IOTF growth reference detected that prevalence of overweight and obesity were 11.2% and 2.2% respectively. The sex specific prevalence of overweight and obesity was 10.9% and 2.1 % in boys, and 11.4% and 2.3% in girls, respectively(20).

In China, over the past 20 years, nationally representative studies of youth ages 8 to 18 have revealed intense rise in obesity: In 1985, only 2% of boys and 1% of girls were overweight or obese, by 2005, about 14% of boys and 9% of girls were reported to overweight or obese(21). In India the largest study conducted among 8 to 18 years age children found that prevalence overweight/obese were 14 %(22). Similarly, the study conducted among public primary school children in Basra city in 2011 found that the overall prevalence of overweight and obesity was 24.1% of which 13.6% were overweight and 10.5% were obese(23).

A cross sectional study conducted among 1260 8 to 16 years of age children and adolescents in the City of Al-Ain, UAE in 2008 revealed that prevalence of overweight and obesity were 12% boys; 12.7% girls and 14% boys ; 13.6% girls respectively(24). Different study conducted in 2009 on overweight/obesity and socioeconomic status in (6-16) children in Yemen, revealed that prevalence of overweight was 12.7% whereas obesity was 8.0% (25).

In Africa the same trend is also appreciated, despite a high prevalence of under nutrition; overweight and obesity is rising at an alarming rate. Study conducted in 2013 among public and private primary school children in Nairobi, Kenya reported that the 19.0% of the participants were either overweight or obese(7, 26).

Cross sectional study conducted on primary school children in Tanzania showed that 9.8% and 5.2%, of adolescents were overweight and obese respectively. Prevalence of overweight and obesity was significantly higher among girls, 13.1% and 6.3% than their peer boys 6.3% and 3.8% respectively. Overall, the combined prevalence of overweight and obesity was 15.0%(27) and similarly study from south Africa in 2012 reported that the prevalence of overweight was 5.5% for boys and 4.4% for girls(28).

A cross sectional study conducted in Addis Ababa among high school adolescents in Arada sub city in 2013 reported that prevalence of overweight and obesity were 8.6% and 0.8% respectively and the combined prevalence of overweight/ obesity was (9.4%)(11) and similarly the study conducted in Hawasa and Gondar town reported the combined prevalence of obesity and overweight was 15.8 % and 6% correspondingly (12)(35).

2.2. Factors associated with obesity and overweight

2.2.1. Socio-economic factor

Study conducted in France showed higher prevalence of overweight/obesity(8.6%) to be among adolescents from families with higher affluence (29) and another study among Norwegian adolescents detected that adolescents with parents in the highest education category had a 46% reduced odds of being overweight compared to adolescents with parents in the lowest education category. Adolescents with parents with medium education had 42% lower odds of being overweight than adolescents with parents with the lowest education category(30).

The study conducted in the Nablus city among school-age children reported a steady rise in prevalence of overweight and obesity with the increase in parental education. The study also showed a significant association between children's obesity and mother's level of education(31)and Similarly the study conducted on 6-17 years aged children in southern India found that private school and Girls participants had greater odds of being overweight/obese than their counter peers(32).

A cross sectional studies conducted in several Eastern Mediterranean region countries like Qatar, Lebanon and Kuwaiti among children and adolescents showed that the prevalence of overweight and obesity were high among girls than male adolescents of the same age. Conversely, the finding from Beirut showed that boys had greater odds of obesity than girls of the same age (33-37).

The study conducted in Basra City in 2011 among school children reported that prevalence of overweight and obesity was consistently increased with the increase in child's age. The study also found that the prevalence of overweight/obesity was directly related to socioeconomic status of participant's families. In addition, the prevalence of overweight/obesity was higher among children whose fathers were involved in professional job followed by children whose father were self-employed and also highest among children of working mothers(23). The study conducted among school children in Al-Hassa, Kingdom of Saudi Arabia and Yemen reported that learning in private schools and high family affluence was associated with significantly higher odds of overweight and obesity among childrens and adolescents. Fathers' and mothers' educational status (being above grade eight) was also a risk factor for overweight and obesity(25, 38), in contrary study conducted among Lebanese children and adolescents revealed that higher maternal education was associated with significantly higher odds of overweight, while higher paternal education was associated with lower odds of obesity. Maternal employment was shown to be associated with significantly higher odds of obesity(39).

One study in Burkina Faso revealed that students from private school were in 2.7 folds more likely to become overweight as compared to students from government school(40) and different study in Ghana reported 17.4% prevalence of overweight/obese and also stated no significant association was found when the occupational status of the children's parent/guardian was compared with BMI-for-age status(41).

The results of a Kenyan study also found that overweight/obesity was significantly greater in private (29.0%) than in public (11.5%) schools more ever the prevalence of overweight/obesity among boys in private schools (27.1%) was three times higher than among boys in public schools (9.0%). Yet, there were no significant differences

in overweight status between boys and girls within the schools(26). Conversely, study conducted among school age children in Tanzania found that the overall prevalence of adolescent obesity was 5.2%. Obesity was higher among girls compared to boys(42).

In Ethiopia, study conducted in Gondar in 2012 revealed that overweight was significantly associated with school type, sex and grade level and study in Hawasa town revealed that adolescent girls were more at risk of becoming overweight and obese than males and Adolescents from higher socio economic index category were also more at risk for overweight as compared to adolescents whose family socio economic index were in the lowest category(12, 13).The study conducted in 2013 in Addis Ababa showed that learning in private school was positively and significantly associated with overweight/obesity. The likelihood of overweight/obesity among adolescents who were in 15-17 age groups was lower as compared to 17-19 age groups. Adolescents from higher and middle income families had higher odds of overweight and/or obesity compared to those from lower income families(11, 43).

2.2.2. Dietary factors

The study conducted among primary school children in Al-Hassa, Kingdom of Saudi Arabia on overweight and obesity and their Association with dietary habits, and sociodemographic characteristics reported frequent consumption of food out of home are positively associated with the development of obesity and overweight while consuming breakfast at home was inversely associated with the development of overweight(38)

Study conducted among Lebanese children and adolescents revealed that daily breakfast consumption, higher intakes of milk & dairies was associated with significantly lower odds of overweight and obesity. High consumption of fast foods and sugar sweetened beverages were associated with significantly higher odds of overweight and obesity in this age group and study conducted among children and adolescents aged between 8 to 16 years in UAE also showed a significant association between overweight/obese and breakfast consumption (24, 39).

Study conducted on Snacking and its effect on nutritional status of adolescents in two national high schools in Nairobi Kenya in 2014 and study conducted in Tamale,

Northern Ghana showed that snacking has no effect on adolescents' nutritional status(41, 44). The study conducted in Hawasa town among high school students showed that Adolescent who eat fruit twice per month or less are 4.67 times more likely to be overweight than adolescents who eat fruit for more than two times per day. The odds of being overweight were 91% lower in adolescents who eat meat twice per month or less compared with adolescents who eat meat once or more than once per day. In contrary the study revealed that there is no association between snacking, meal frequency, skipping breakfast, eating outside and overweight/obesity(13).

2.2.3. Physical activity

The study conducted by European Youth Heart Study on adolescents Physical activity, overweight and central adiposity in Swedish children and adolescents reported that adolescents, who had a low level of vigorous physical activity, were more likely to be overweight including obesity than those with a high level of vigorous physical activity. Similarly, those subjects who had a low or middle level of total physical activity were more likely to be overweight than those who had a high level of total physical activity. A longer screen time were also associated with higher odds of having a high BMI(overweight/obesity) and also another cross sectional study conducted among 11-15 years adolescents in France reported that there is a significant positive association overweight/obesity and sedentarity(29, 45). In opposition, the study conducted among 1260 children and adolescents in UAE in showed that there were no associations between BMI and exercise(24).

According to the study conducted in Gondar and Hawasa town among high school students physical activity was statistically associated with overweight and obesity(12, 13). The study in Hawasa town also reported that there was statistically significant association between times spent watching TV or using computer and overweight and those adolescents who used to watched TV or used computer three or more hours per day were 3.04 times more likely to be overweight than those who watched TV or used computer for less than three hours per day(13). Another study conducted in selected government and private secondary schools of Addis Ababa in 2012 stated that sedentary activity over two hours and using car as a means of transport increased odds of overweight/obesity by two fold(46).

The gaps identified from previous literatures are:

- Most of the literatures were conducted using US-CDC growth reference which provides inaccurate estimation of magnitude of the problem which is an important step towards planning effective intervention strategies.
- Most of the previous were conducted using invalidated questionnaire for assessing dietary intake and physical activity.
- There is no single study done in Oromiya region
- The result of previous literatures have certain controversies related to association of socioeconomic status and overweight/obesity

In summary in different parts of the world direct obesity is a common cause of death and disability. As different literatures reported that adolescence period is the common period that children's are more likely to be obese. There are different factors that affect development of obesity among this young population: sex, age, parental education, overall health status, economic status, parental occupation, dietary habit, using alcohol and cigarette and physically activity are some of them. However in Ethiopia there is there is limited evidence regarding the adolescent obesity. Therefore this study was conducted to determine prevalence of overweight and obesity and associated factors among school adolescents in jimma town.

2.3. Conceptual frame work

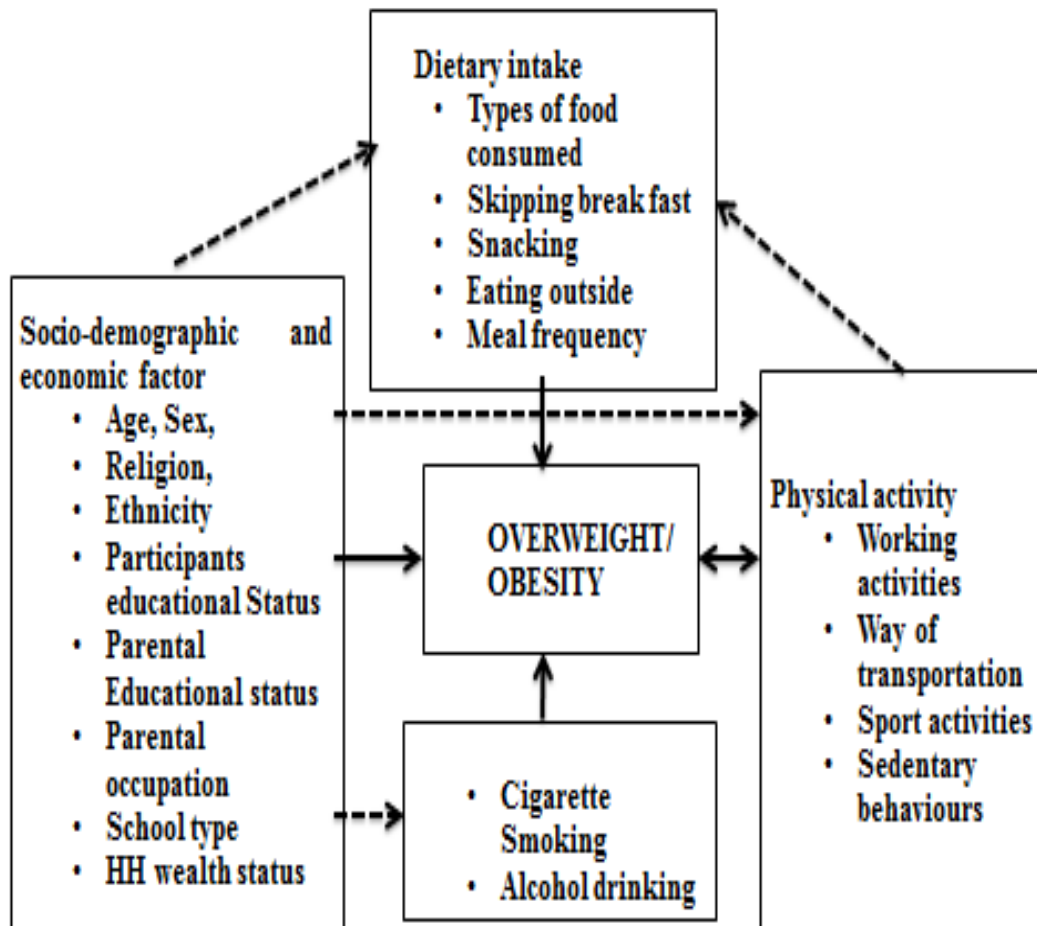


Figure 1: Conceptual framework for predictors of overweight and obesity among school adolescents.

Source: developed by author after reviewing different literatures.

CHAPTER THREE: OBJECTIVES

3.1. General Objective

- To determine prevalence of overweight and obesity and associated factors among school adolescents in jimma town, Jimma, Ethiopia, 2014/15.

3.2. Specific Objectives.

- To determine prevalence of overweight among Jimma town school adolescents.
- To determine prevalence of obesity among Jimma town school adolescents.
- To identify factors associated with overweight among Jimma town school adolescents.
- To identify factors associated with obesity among school adolescents in Jimma town

CHAPTER –FOUR

4. METHODS

4.1. Study area and period

The study was conducted in Jimma town, a capital of Jimma zone, Oromiya. Jimma town is located at 346 km to the south west of Addis Ababa. The town has an area of 44.86sq.km with an altitude of 1760m above sea level. Jimma town is the fifth largest city in Ethiopia with an estimated population of about 195,228. According to the 20014/15 Jimma town education office statistics, the town has 16 governmental and 12 private schools. There are 20886 adolescents (9901 male and 10985 female) in both category of school. The study was conducted from March 8st to 1st April /2015.

4.2 Study design

School based cross sectional study design was employed

4.3. Population

4.3.1. Source population

The source population were all school adolescents in Jimma town.

4.3.2. Study Population

The study population were adolescents in the randomly selected school.

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

- 10-19
- Grade four and above
- Being inhabitants of Jimma town for at least six months.

4.4.2. Exclusion criteria

- Pregnant girls
- Adolescents with body deformity
- Sick and unable to communicate

4.5. Sample size Determination and Sampling procedure

4.5.1. Sample size Determination

The sample size was calculated using the single proportion formula:

$$n = \frac{z^2 p (1-p)}{d^2}$$

d= Acceptable margin of error = 5%

z= Standard variant (1.96) which correspond to 95% confidence level

P= (20.2%) prevalence of overweight among private school adolescents in Hawasa town)(13).

$$n = \frac{(1.96)^2 0.202(1 - 0.202)}{(0.05)^2} = 247$$

Considering a design effect of 2 and 10% non-respondent rate the final sample size was 546 school adolescents.

4.5.2. Sampling procedure

Multistage stage stratified random sampling technique was employed to select the study subjects. The schools were stratified in to two governmental and private schools according to their ownerships. At the first stage 8 schools (5 from government school (four primary schools and one secondary school and 3 from private (two primary schools and one secondary school) was selected using lottery method. Secondly, one section per grade was selected by using a lottery method from each selected schools. Then the sampled population was proportionally allocated for male and females. Finally 366(government) and 180(private) participants were selected by using computer generated simple random sampling from each selected sections.

4.5.2. Schematic presentation of sampling procedure

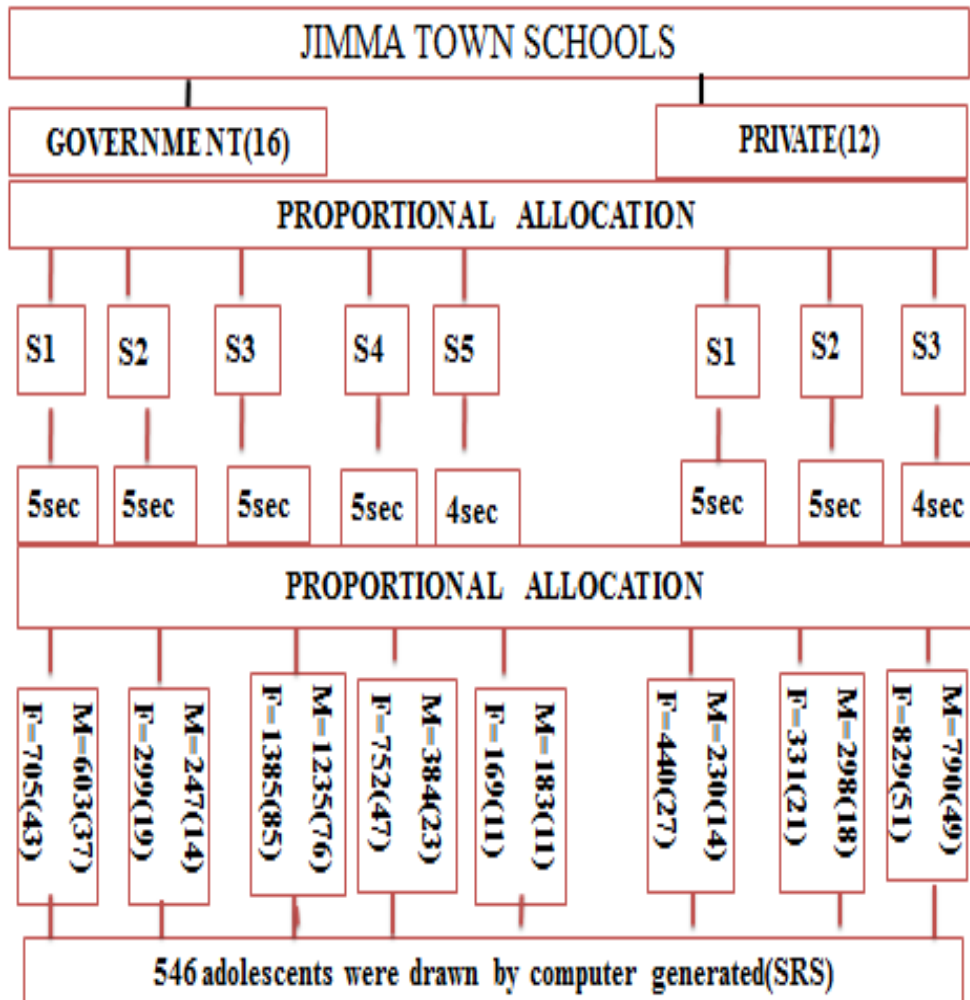


Figure 2: the schematic presentation of the sampling procedure.

4.6. Study variables

4.6.1. Dependant variables

- Overweight
- Obesity

4.6.2. Independent variable

- **Socio demographic and economic status**
 - Age
 - Sex
 - Religion
 - Ethnicity
 - School grade level
 - Parental educational status
 - Parental occupation
 - House hold wealth status
- **Dietary intake**
 - Types of food consumed
 - Skipping break fast
 - Snacking
 - Eating outside
 - Meal frequency
- **Health risky behaviours**
 - Cigarette Smoking
 - Alcohol drinking
- **Physical activity**
 - Working activities
 - Mode of transportation
 - Sport/recreational activities
 - Sedentary behaviours

4.7. Data collection tools and Procedures

The data were collected through interviewer administered structured questionnaire and anthropometric measurements. All the participants were interviewed for their

socio demographic information, dietary intakes, health risky behaviours, physical activity. Anthropometric measurements were taken at end of the interview. Data collectors were trained five Human nutrition postgraduate students.

Assessment of dietary intake

Qualitative food frequency questionnaire modified from WHO-STEP wise approach was used to gather information on the frequency of consumption of different food groups from each participant. This technique was considered to obtain qualitative descriptive data on typical consumption of food and group of food over extended periods of time. Finally data were used to categorize participant for detailed characteristics food and dietary diversity(47).

Assessment of the physical activity level

Global physical activity questionnaire (GPAQ) developed by WHO for physical activity surveillance was used to assess the physical activity pattern among school adolescents in three domains including activity at work, travel to and from places and recreational activities and sedentary behaviour through face-to-face interview of the respondent in the study area. The activity level of the study participants were evaluated according to the standard WHO total physical activity calculation guide and the level of total physical activity was categorized as physically active and inactive(48).

Anthropometric measurements

Height and weight of each student was taken using standardized and calibrated equipment. Weight was measured using UNICEF seca digital weighing scale (Germany) with light clothing & no shoes and recorded to nearest 0.1 kg. Height was measured using a portable Stadiometer (Seca, Germany) and recorded to the nearest 0.1cm. During height measurement shoes, bulky clothing, pins and braids from the hair that could affect the measurement were removed. Height was measured with the head of participants at the Frankfurt plane, knees straight and the heels buttocks and the shoulders blades touching the vertical surface of the stadiometer(49).

4.7. Data quality control

Data qualities were ensured during tool development, data collection, cleaning, entry and analysis. One day extensive training was also given for the data collectors and the

tool was pretested on 27(5%) of the total sample in Jiren primary school. Principal investigator conducted on the spot checking and reviewed all the completed questionnaires to ensure completeness and consistency of collected information. Anthropometric measurements were taken in triplicates for each participant. Weighing scales were checked against zero reading after weighing every participant & calibrated with known weight object regularly.

4.8. Data processing, Analysis and presentation

The data entry were done using Epi-Data version 3.1. The data were checked for missing values and outliers and analysed using Statistical Package for the Social Sciences Software (SPSS) version 20 and WHO Anthro-Plus (version 1.0.4.0). A one-sample Kolmogorov-Smirnov test was used to assess normality of the data and all of them are normally distributed. Descriptive statistics were used to examine the frequency distributions of certain study variables. Principal component analysis was used to assess house hold wealth status and four components were developed using items having Eigenvalues greater than one. Finally house hold wealth status was ranked as low, medium and high. Overweight and obesity were determined using the WHO age and gender specific growth reference for children 5 - 19 year(49). To allow for comparisons with other studies overweight and obesity were also re-analysed using both CDC 2000 and IOTF criteria. Overweight and obesity were merged in analysis due to the limited number of participants who were classified as obese. General chi square test for independence was used to determine the association between overweight/obesity and certain nominal variables (sex, school type, religion, ethnicity, participant educational status, parental occupation, eating out side) and fisher exact test were used to investigate the association between overweight /obesity and marital status, smoking cigarette and alcohol drinking. Chi square test for trend was used to measure of association between overweight/obesity and ordinal scale independent variables (participants and parental educational status, HH wealth quintiles, dietary intake and physical activity). First bivariate analysis was conducted to identify those variables with p-values ≤ 0.2 and 15 candidate variables were isolated. Before inclusion of candidate variables in the final model multi collinearity was checked using the cut-off point of Variance inflation (VIF) <10 and all of the candidate variables have VIF of less than two which is less than the settled cut off

points, Then multivariable logistic regression was carried out to isolate independent predictors of obesity and overweight. The goodness of fit of the final logistic model was tested by using Hosmer and Lemeshow's test at p-value of > 0.05 and Omnibus test at p-value < 0.05 . Both COR & AOR with 95% confidence interval were reported.

4.9. Operational definition

Underweight: BMI-for –age Z scores $\leq -2SD$

Normal weight: BMI-for –age Z scores $-2SD < BAZ \leq +1SD$

Overweight: BAZ ($+1SD < BAZ \leq +2SD$)(49)

Obese: BAZ $> +2SD$ (49)

Overweight/obesity: BAZ $> 1SD$ (49)

High DDS-Consuming 5 & more food groups(50).

Low DDS-Consuming 4 and less food groups(50).

Snacking –Eating between breakfast and lunch and between lunch and supper meal

Moderate exercise: Low-impact aerobic exercise classes, brisk walking or hiking, recreational team sports (volleyball, soccer, etc.)(48).

Vigorous exercise: activity that causes large increases in breathing or heart rate like carrying or lifting heavy loads, digging or construction work, Running or jogging, high-intensity aerobic classes, competitive full-field sports (soccer) or basketball(48)

Physically active: If the total physical activity MET minute/wk. is at least 600(48).

Physically in-active: If the total physical activity MET minute/wk. is < 600 (48).

4.10. Ethical Consideration

Ethical clearance was obtained from research ethics committee of Jimma University. Support letter was written from Department of Population and Family health to Jimma town education bureau. The necessary permission was also obtained from the school

directors. Selected participants were given passive written consent form to take home to their parents one day before data collection and verbal assent was obtained from the participants. Selected students with refusal either from parents or themselves were excluded. Data was kept confidential and anonymous. Participants were also informed that they are not forced to answer the entire question and they can withdraw at any time if they face any inconveniency.

4.11. Dissemination plan

This finding will be disseminated to Jimma University College of health sciences, Jimma town health and education bureau, and selected schools. The findings will be also disseminated to different stakeholders that have a contribution to improve adolescents' health. Finally effort will be made to present the result in various workshops and for publication on peer reviewed scientific journals.

CHAPTER-FIVE

5. RESULT

5.1. Socio-demographic and economic characteristics of the study population

Out of 546 sampled adolescents, 93.4% gave complete response. Greater than half (58.6%) of the participant were between 15-19 age groups. The mean age of respondents was 15.37 ± 1.88 years and 303 (59.4%) of the samples were females. Concerning marital status, almost all 503 (98.6%) of the study participants, were single. Greater than two third (67.6%) of the respondents were from government school and 40% were from primary schools. The prominent religions of participants were Muslim (44.1%) and orthodox (40%). Almost half (46.9%) were Oromo. Seventy (13.7%) and 80(15.7%) of the respondents reported that their mother and father were not attended formal education respectively. The prominent occupations of participants fathers' were government employee (34.9%) followed by merchant (30%). Greater than one third (38.6%) of mothers were house wife. More than half (54.4%) of students were from households with lower wealth status (**Tabl-1**).

Table 1: Socio-demographic characteristics of adolescents in Jimma town, Feb/2015

Variables (n=510)		Frequency	Percentage
Age	10-14	211	41.4%
	15-19	299	58.6%
Sex	Female	303	59.4%
	Male	207	40.6%
Marital status	Single	503	98.6%
	In a relation	7	1.4%
School type	Private	165	32.4%
	Government	345	67.6%
Religion	Protestant	81	15.9%
	Orthodox	204	40.0%
	Muslim	225	44.1%
Ethnicity	Amhara	124	24.3%
	Oromo	239	46.9%
	Gurage	54	10.6%
	Tigre	29	5.7%
	Dawuro	40	7.8%
	Others	24	4.7%
Participants` education	Primary	204	40.0%
	Secondary	306	60.0%
Mother education	No formal education	70	13.7%
	Primary education	152	29.8%
	Secondary education	214	42.0%
	Tertiary education	74	14.5%
Father education	No formal education	80	15.7%
	Primary education	105	20.6%
	Secondary education	157	30.8%
	Tertiary education	168	32.9%
Occupation of father	Merchant	153	30.0%
	Gov` t employee	178	34.9%
	Ngo	62	12.2%
	Daily laborer	83	16.3%
	Others	34	6.7%
Occupation of mother	Merchant	145	28.4%
	Gov` t employee	139	27.3%
	Farmer	0	0.0%
	House wife	197	38.6%
	Others	29	5.7%
House hold wealth status	Low	278	54.5%
	Medium	95	18.6%
	High	137	26.9%)

£= Kefa, Silte & Yam and \$= drivers, retired and died

5.2. Dietary habit characteristics of school adolescents in Jimma town

The mean individual dietary score (IDDS) were 6.97 ± 1.15 . Four hundred ninety-nine (88%) had high IDDS. Almost all (99.6%) students had consumed cereal based foods with different frequency per week. Two hundred thirty (64.7%) consumed fruits and 73.9% had vegetables 3 or more days. Nearly half (49.8%) and 202(39.6%) of students did not consume any forms of dairy products and animal source foods respectively. The majority (78%) consumes legumes at least once per week and the majority (96.1%) consumes oil and fats 5-7 days per week. Four hundred sixty five (91.2%) students had 3 to 4 meals per day. Two hundred eighty one (55.1%) of the respondents reported they have eaten a snack in a day. Regarding the type of food used for snacking 229(44.9%) reported using firfir. Nearly half (53.9%) of the students did not eat fast foods in typical week. One-fourth (25.9%), of the adolescents were not eat their breakfast regularly. The majority (80.2%) of the subjects did not eat their meal outside of home (**Table: 2**).

Table 2: Dietary intake characteristics of school adolescents in Jimma town, Jimma, Ethiopia, February/2015

Variables (n=510)		Frequency	Percentage
DDS category	Low	61	12.0%
	High	449	88.0%
Cereal	None	2	0.4%
	1-2	43	8.4%
	3-4	33	6.5%
	5-7	432	84.7%
Vegetables	None	30	5.9%
	1-2x/wk.	103	20.2%
	3-4x/wk.	194	38.0%
	5-7x/wk.	183	35.9%
Fruit	None	180	35.3%
	1-2x/wk.	26	5.1%
	3-4x/wk.	127	24.9%
	5-7x/wk.	177	34.7%
Dairy product	None	254	49.8%
	1-2x/wk.	141	27.6%
	3-4x/wk.	56	11.0%
	5-7x/wk.	59	11.6%
Animal source	None	202	39.6%
	1-2x/wk.	164	32.2%
	3-4x/wk.	74	14.5%
	5-7x/wk.	70	13.7%
Legumes and nuts	None	6	1.2%
	1-2x/wk.	81	15.9%
	3-4x/wk.	189	37.1%
	5-7x/wk.	234	45.9%
Sweet food	None	112	22.0%
	1-2x/wk.	268	52.5%
	3-4x/wk.	92	18.0%
	5-7x/wk.	38	7.5%
Oil and fats	3-4	20	3.9%
	5-7	490	96.1%
Fast food	None	275	53.9%
	1-2x/wk.	188	36.9%
	3-4x/wk.	17	3.3%
	5-7x/wk.	30	5.9%
Skipping break fast	None	378	74.1%
	1-2x/wk.	89	17.5%
	3-4x/wk.	23	4.5%
	5-7x/wk.	20	3.9%
Eating out side	No	409	80.2%
	Yes	101	19.8%

5.3. Health risky behaviors

The majority (92.5%) of the participants never drank alcohol. Five hundred one (98.2%) had never smoke cigarette.

5.4. Physical activity

More than half (54.1%) of the respondents were engaged household certain working activities beside their education. Majority (81.6%) were walking on foot at least for 30 minutes per day. Most students, 427 (83.7%), got to and from school on foot and 83 (16.3%) travelled by car. The majority (62.7%) of adolescents were involved in moderate to vigorous sport activities. The mean sedentary time was 3.78 ± 1.6 hrs.

Table 3: Physical activity characteristics of adolescents in Jimma town, Jimma, Ethiopia, February/2015

Variables (n=510)		Frequency	Percentage
Working beside education	No	241	47.3%
	Yes	269	52.7%
Vigorous intensity activities	None	438	85.9%
	1-2	32	6.3%
	3-4	8	1.6%
	5-7	32	6.3%
Moderate intensity activities	None	260	51.0%
	1-2	34	6.7%
	3-4	83	16.3%
	5-7	133	26.1%
Walking/using bicycle	None	94	18.6%
	1-2	47	9.3%
	3-4	34	6.7%
	5-7	331	65.4%
Vigorous intensity sport activities	None	249	48.8%
	1-2	88	17.3%
	3-4	91	17.8%
	5-7	82	16.1%
Moderate intensity sport activities	None	330	64.7%
	1-2	86	16.9%
	3-4	53	10.4%
	5-7	41	8.0%
Physical activities	High	208	40.8%
	Medium	204	40.0%
	Low	98	19.2%
Sedentary behavior	<3hr	253	49.6%
	≥ 3 hr	257	50.4%
Mode of transportation	On foot	83	16.3%
	Vehicles	427	83.7%

5.6. Nutritional status of the study participants

The mean BAZ of the respondents were -0.19 with standard deviation of ± 1.19 . The mean and standard deviation of BMI of the study participants were 20.05 and ± 3.23 respectively (Table:4).

Table 4: The anthropometric measurements of school adolescents in Jimma town, February/2015

(n=510)	Sex		Type of school		AGE		Total
	Female	Male	Private	Gov`t	10-14	15-19	
Weight(Kg)	52.8	50.9	55.7	50.2	45.8	56.4	52kg
Height(cm)	159.5	162.3	162.1	159.9	156.4	163.6	160.6cm
BAZ(Z)	.01	-0.49	0.09	-0.33	-0.43	-0.02	-0.19
BMI(kg/m ²)	20.69	19.13	21.14	19.54	18.58	21.10	20.05kg/m ²

The prevalence of overweight and obesity among the study participants were 60(11.8%) and 8(1.6%) respectively. The overall combined prevalence of obesity and overweight (BAZ >+1) was 13.4%. Fifty seven (11.1%) of the participants were underweight and 385(75.5%) were normal. The prevalence of overweight and obesity for age group 10-14 was 8.1% and 0.5% respectively, whereas for age group 15-19 was 14.3% and 2.3% respectively. The gender specific distribution of BMI status showed that the prevalence of overweight was 11(5.3%) for males and 49(16.2%) for females, whereas obesity was 4(1.9%) for males and 4(1.3 %) for females. Prevalence of overweight for private school is 22.2% which is about three fold higher than the government school(6.7%) and the prevalence of obesity in private school was 6(3.6%) and 2(0.6%) in government school.

To allow comparison with findings reported from selected countries in the region and worldwide, data were re-analysed according to IOTF and CDC criteria. Based on the IOTF criteria, current prevalence rates of overweight and obesity amongst school adolescents in Jimma town was (7.1%) and (1%) respectively whereas the prevalence of overweight and obesity was [9.2%] and [3.1%] according to the CDC 2000 definition.

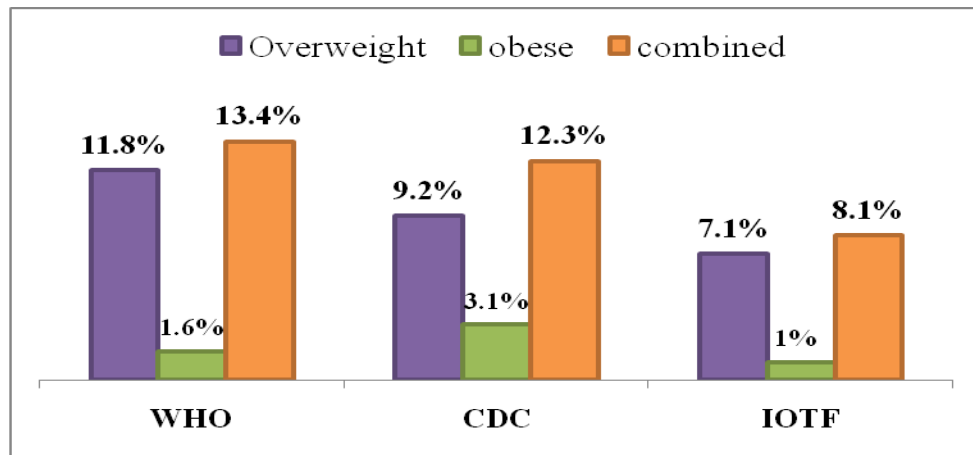


Figure 3: Prevalence of overweight/obesity using various diagnostic criteria among adolescents in Jimma town southwest, Ethiopia, February/2015

5.6. Factors associated with overweight/obesity

Findings of this study showed that age, sex, school type, father educational level, household wealth status, fruit, vegetable and animal source food consumption, physical activity and sedentary behaviour are significant predictors of overweight and obesity among school adolescent. For an additional year in age of the adolescents the odds of being overweight or obese is lower by 28.9% (AOR = 0.711 [95% CI: 0.53-0.95]). Girls are three and half times more likely to be overweight/ obese as compared to boys (AOR = 3.57 [95% CI: 1.28-9.9]). Adolescent who are attending private school are greater than seven times more likely to become overweight/obese than the government school adolescents (AOR=7.53[95%CI: 2.51-22.3]). Adolescents whose father did not attend formal education (AOR=5.57[95%CI: 1.53-20.26]) and primary education school (AOR=3.7 [95%CI: 1.008-13.76]) are more likely to become obese compared to whose father attended college and above. Adolescents from high wealth quintile HHs are 3 times more likely to be overweight/ obese than their counter part from low wealth quintile HHs (AOR = 3 [95% CI: 1.094-8.26]). Adolescents who did not consume vegetables are nine times a more likely to be overweight/obese as compared to those who consume 5-7x/wk (AOR=9.23[1.68-50.8]), Adolescents who consume vegetables 1-2x/wk. are five times more likely to be overweight/obese as compared to those who consume 5-7x/wk (AOR=8[1.93-33.9]). Adolescents who did not consume fruit are five times more likely to be overweight/obese than those who consumes fruit 5-7x/wk (AOR =5.08[1.57-16.38]). Adolescent who did not consume

animal source foods had 96.2% (AOR = 0.038[0.006-0.24]) and those who consume 1-2 times/week had 80.4% (AOR = 0.196[0.049-0.78]) lower odds of being obese/overweight than their peers who consume animal source foods 5-7 times/week. Physically inactive adolescents are almost four times more likely to be obese/overweight than active adolescents (AOR=3.7[1.06-13.02]). Adolescents involved in sedentary behaviour for ≥ 3 hr in day are 3.64 times higher odds of being obese/overweight than their counter peers (AOR=3.64[1.39-9.5]) (**Table: 5**).

Table 5: Multivariable logistic regression analysis of factors associated with overweight/obesity among Jimma town adolescents in February/2015

Variables (n=510)		Yes	No	COR	AOR (95% C.I.)
Sex	Female	53(17.5)	250(82.5)	2.7	3.57(1.28-9.91)**
	Male	15(7.2)	192(92.8)	1	1
School type	Private	43(26.1)	122(73.9)	4.51	7.53(2.51-22.3)*
	Government	25(7.2)	320(92.8)	1	1
Father education	No formal edu	19(23.8%)	61(76.25)	2.76	5.57(1.53-20.26)*
	Primary	15(14.35)	90(85.7%)	1.48	3.7(1.008-13.76)*
	Secondary	17(10.8%)	140(89.2%)	1.079	0.73(0.19-2.82)
	Tertiary	17(10.1%)	151(89.9%)	1	1
Wealth status	Low	24(8.6%)	254(91.4%)	1	1
	Medium	15(15.8%)	80(84.2%)	1.98	2.25(0.73-6.93)
	High	68(13.3%)	108(78.8%)	2.84	3(1.094-8.26)*
Vegetables consumption	None	12(40.0)	18(60.0%)	12.88	9.23(1.68-50.8)*
	1-2x/wk.	21(20.4)	82(79.6%)	4.95	8(1.93-33.9)*
	3-4x/wk.	26(13.4)	168(86.6%)	2.99	3.13(0.99-9.98)
	5-7x/wk.	9(4.9)	174(95.1)	1	1
Fruit consumption	None	23(12.8)	157(87.2)	2.01	5.08(1.57-16.38)*
	1-2x/wk.	10(38.5)	16(61.5)	8.59	4.17(0.56-30.85)
	3-4x/wk.	23(18.1)	104(81.9)	3.04	2.87(0.77-10.65)
	5-7x/wk.	12(6.8)	165(93.2)	1	1
Animal source consumption	None	13(6.4)	189(93.6)	0.185	.038(.006-0.24)**
	1-2x/wk.	21(12.8)	143(87.2)	0.39	.196(0.049-0.78)*
	3-4x/wk.	15(20.3)	59(79.7)	0.68	.37(0.087-1.66)
	5-7x/wk.	19(27.1)	51(72.9)	1	1
Physical activity	Inactive	40(56.3%)	31(43.7%)	18.94	3.7(1.06-13.02)*
	Active	28(6.4%)	411(93.6%)	1	1
Sedentary behavior	<3hr	14(5.5%)	239(94.5%)	1	1
	≥3hr	54(21%)	203(79.0%)	0.22	3.64(1.39-9.5)*
Age in year				1.076	0.711(0.53-0.95)*

*=p<0.05, **=p≤0.001 and 1=reference group.

NB. Hosmer and Lemeshow's goodness-of-fit test has chi-square of 9.586 with p-value of 0.29, omnibus test of p-value of 0.000.

CHAPTER SIX

6. DISCUSSION

The finding of this study showed that overall prevalence of overweight/obesity according to WHO 2007 definition is 13.4% which is comparable with the finding from Kenya(26) where 13.2% of adolescents were obese/overweight while being lower than those reported from Basra(23), Yemen(51), Ghana(41) and Hawasa town(13). Based on the IOTF criteria, the current prevalence of overweight and obesity amongst school adolescents in Jimma town is 7.1% and 1% respectively which is lower than those observed in Turkey 13.4% and South Africa 9.9% (20, 28). This difference might be due to availability of high sedentary recreation facilities in the compared settings and the difference in socioeconomic backgrounds. Based on the CDC 2000 definition, the prevalence of overweight and obesity amongst school adolescents in Jimma town is 9.2% and 3.1% which appears considerably higher than estimates reported from Gondar[5.5% and 0.5%] and Addis Ababa[8.6% & 0.8%](11, 12). This incongruence could be accredited to the time gap, those studies were conducted more than two years ago and it has been fast socioeconomic transition period in Ethiopia. The other possible explanations for the overall difference lie around methodological issues of measurement and classification of obesity. The documented high prevalence of overweight/obesity in this stage of life has onerous impact on psychosocial wellbeing of adolescents related to negative body image, low self-esteem, and depression especially in girls. Moreover it is a definite indicator of growing concern of chronic non-communicable disease which will have far-reaching impacts on the country economic growth and quality of life both in terms of huge lost productivity and increased disease burden and health care cost.

The study showed a significant association between adolescent overweight/obesity and school type with high prevalence of overweight/obesity ($BAZ > 1$) in private school(26%) which is greater than three times higher than the prevalence in government schools (7.3%). This result is in line with reports from France(29), India(32), KSA(52), Yemen(51), Burkina Faso(40), Kenya(26) and earlier studies in Ethiopia(11, 13). This resemblance might be due to the circumstance that adolescents in this segment usually come from families with higher economic status which will

likely expose them to highly processed energy dense foods and motorized way of life compared to those from government school.

In this study, overweight and obesity was significantly associated adolescents age where older adolescents had low proportion of overweight and obesity. This is inconsistent with studies from Saudi Arabia(38), Turkey(20) and Iran(53). This difference could be accredited to the innate genetic differences, environmental factors and overall health status that were not addressed by this particular study.

This study showed that girls are more at risk of being overweight and obese than males. This finding is comparable to the report from Nigeria(54), Bahrain(36) and an earlier study in Ethiopia(11, 13). This influence of gender on obesity can be attributed to hormonal changes at puberty resulting in fat accumulation and family's negative attitudes toward girl's participation in outdoor activities due to certain cultural and religious restriction. It is however in contrast to study in Lebanon(34) in which higher prevalence of overweight and obesity were for boy. This disparity might be due certain strict cultural influences put on girls in Ethiopia to stay long time at home which result in physical inactivity and even in this particular study girls had significantly lesser participations in outdoor activities($p < 0.001$) and greater screen time compared to males. Finally, high prevalence of overweight and obesity documented among female adolescents is unquestionable indicator of the forthcoming vicious cycle of intergenerational obesity since they are future mothers.

Although the association between family affluence and overweight/obesity have been debated this study found statistical association with adolescents from high household quintiles having higher chance of overweight/obesity than adolescents from lower household quintiles. This result is similar to study report from Hawasa town(13). This consistency might be explained by the tradition where being wealth has been associated to the rise in motorized way of life and consumption of unhealthy foods which are high in saturated, glycaemic index and energy density in our country.

This study showed significant negative association between father education and overweight which is consistent with reports from Yemen(51) and Saudi Arabia(38). This similarity may partly explained by the hypothesis that high educational level will leads to more healthy food choice and increased physical activities.

This study presented negative statistical association between fruit and vegetable consumption and overweight. This result coincide with study from Hawasa town(13). Also in agreement with the study in Hawasa town(13) the intake of animal source food was found to be associated with higher odds of overweight/obesity. Nevertheless, this is incongruous with the study from Gondar(12) where no association was reported and this difference might be explained the issue that overweight adolescents have consciously limit their intake or under-reported their consumption of animal source food.

There is no statistically significant association between fast food and overweight/obesity which is similar to previous studies in Gondar(12). However, the result of Lebanese study(39) reported positive association between fast food consumption and overweight/obesity. This difference might be due to the a lower trends in fast food consumption in this setting so that there might be minimal difference in between groups who consume fast food or not compared to Lebanese adolescents in which fast food only offers 17.27% of the total daily energy intake. The study also found that there is no statistically significant association between snacking and the odds of being overweight or obese which is similar with studies in Kenya(44) and Ghana (41). This study documented significant association between physical activity and overweight/obesity which is similar to the result of study conducted in Gondar(12) and Hawasa(13). But in contrast to the study in UAE(24), this difference will be attributed to lack of objective definition for physical activity and methodological difference in measurement of physical activity. This study also found significant positive associations between sedentary behaviour of ≥ 3 hr/day and overweight/obesity which are in agreement with the study conducted in Addis Ababa(46).

Even though this study addressed very important issues it should be highlighted with the following limitations. Other factors like genetic factor, parental BMI and health condition of participants were not addressed. There might be social desirability and recall bias and possibility to wrongly level individual as obese while their body is built with muscle. Another limitation of concern is that since the dietary intake and physical activity were self-reported there might be over or under reporting. Finally this study lacks qualitative data.

CHAPTER SEVEN

7. CONCLUSIONS

The present study showed that the prevalence of overweight and obesity among Jimma town adolescents is considerably high. The present study also showed that girls and private school adolescents have the highest prevalence of overweight and obesity which can be comparable with the proportion of overweight/obesity in some high and middle income countries.

Even if factors of overweight and obesity are complex and are not limited these, present study isolated certain socioeconomic, dietary, and lifestyle factors that are linked with greater risk of overweight and obesity among this population. Accordingly being female, younger age, learning in private school, lack/lower level of father's education, high house hold wealth status, limited fruit and vegetable consumption, frequent consumption of animal source foods, being physically inactive and sedentary behaviour were significantly associated with overweight and obesity.

CHAPTER EIGHT

8. RECOMMENDATION

Based on the findings of study the following recommendations were forwarded:

For federal ministry of health

- A Multi-sectorial collaborative intervention has to be designed.
- Formulate alternative policies targeted towards early prevention of obesity and strengthening the existing programs
- School based preventive program which can actively participate adolescents, families, and the school should be set.
- Nutritional information and physical intervention strategies should in particular target private school and female students

Ministry of education

- Ministry of education has to incorporate nutrition education in to the school curricula and physical education class has to be strengthen and given attention.

Media

- Promotion of public awareness on healthy life styles such as increased physical activities, lesser sedentary behavior, frequent consumption of fruit and vegetables, should be given for the adolescents, family and community.

Jimma town health and education office

- Should collaboratively work on activities to sensitize family and adolescents towards increased healthy diet and lifestyles

School

- Establish stricter standards for school physical education
- The school should modify the environment to enhance physical activities in school and set a rule on delivery of healthy foods.

Parents

- Should set aside time for healthy meals, physical activity and limit television viewing for their children's

Adolescents:

- Increase fruit and vegetable consumption and reduced consumption of foods high in fat

- Decrease television viewing and other screen-based activities
- Increase competitive and non-competitive sport participation
- Increase active transport to schools.

Researchers

- More extensive research should be done with large sample size using the most precise technologies such as Air displacement plethysmography including factors that were not addressed such as genetic factor, nutritional knowledge and overall health condition.

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ANNEEX

Annex 1. Passive Written consent form for child parent

How are you, I am----- . I am working in the research team of Jimma University College of public health & medical sciences department of human nutrition. I would like to ask your willingness for your child participation in our study. We will take measurement of your child height and weight. We will also ask your child eating habit and physical activity. This will help us to improve the prevention and control method of adolescent hood overweight and obesity based on your child information. You and your child name will not be written in this form and will never be used in connection with any information you tell us. All information given by your child will be kept strictly confidential. Your child's participation is voluntary and she/he is not obligate to answer any question which he does not wish to answer. Could I have your permission to continue?

1. If yes, continue.
2. If no, stop

Annex II. Verbal assent form for students

How are you, I am----- . I am working in the research team Jimma University College of public health & medical sciences department of human nutrition. I would like to ask you a few questions about your personal characteristics; you're eating habit, your physical exercise, your willingness for weight and height measurements. This will help us to improve the prevention and control activities of adolescent hood overweight and obesity on the information you provide us. Your name will not be written in this form and will never be used in connection with any information you tell us. All information given by you will be kept strictly confidential. Your participation is voluntary and you are not obligate to answer any question which you do not wish to answer. If you fill discomfort with the interview, please fill free to drop it any time you want. This interview will take about 10-15 minutes. Could I have your permission to continue?

1. If yes, continue the interview.
2. If no, skip to the next participant.

Data collectors code [-----]

Date of interview/-----/-----/-----

Code	Part 1: Socio-demographic and socio-economic information.	
S1	Sex.	1. Male. 2. Female
S2	Age (date of birth)	_____ in year/ Date of birth/-----/-----/-----
S3	Religions	1. Orthodox. 2. Muslim. 3. Catholic. 4. Protestant. 5. Other (specify)_____
S4	Marital status	1. Single 2. Married 3. Divorced 4. Widowed
S5	Ethnicity.	1. Amhara. 2. Oromo. 3. Gurage. 4. Tigre. 5. Other (specify)_____
S6	Your school grade level?	
S7	Type of school	1. Government. 2. Private.
S8	Level of education your mother has completed?	1. No formal education. 2. Primary education 3. Secondary education. 4. College/above.
S9	Level of education your father has completed?	1. No formal education. 2. Primary education 3. Secondary education. 4. College/above.
S10	Occupation of your father?	1. Merchant 2. Government employer. 3. Farmer. 4. Daily laborer 5. NGO employer. 6. Other (specify).....
S11	Occupation of your mother?	1. Merchant 2. Government employer 3. Daily laborer 4. House wife 5. NGO employer 6. Other (specify).....

Questionnaire

Part II- House hold wealth			
Does the hold has any of the following assets		Yes	No
H1	Radio/ tape player		
H2	Television		
H3	DVD player		
H4	Video games		
H5	Internet access attached mobile phone		
H6	Refrigerator		
H7	iPod		
H8	Sofa		
H9	Computer		
H10	Pedal bicycle		
H11	Motor bicycle		
H12	Bajaj		
H13	Car		

Part III: Dietary intake.		
Code	Question	Responses
D1	In a typical week on how many days do you eat cereal based foods?	Number of days [____] Don't Know 77
D2	In a typical week on how many days do you eat vegetables?	Number of days [____] Don't Know 77
D3	In a typical week on how many days do you eat fruits?	Number of days [____] Don't Know 77
D4	In a typical week on how many days do you consume milk and milk products?	Number of days [____] Don't Know 77
D5	In a typical week on how many days do you eat animal source proteins?	Number of days [____] Don't Know 77
D6	In a typical week on how many days do you eat plant source proteins?	Number of days [____] Don't Know 77
D7	In a typical week on how many days do you eat	Number of days [____]

	sweet foods?	Don't Know 77
D8	In a typical week on how many days do you eat oil and fats?	Number of days [_____] Don't Know 77
D9	How many meal do you have a day other than snacks?	Number of meals [_____] Don't Know 77
D10	In a typical week do you have a snack?	1. Yes 2. No (go to D13)
D11	If your answer is yes what do you have for snack?	1. Cake 2. Biscuit 3. Firfir 4. Chocolate 5. Others specify-----
D12	How many times a day do you have snack?	_____
D13	In a typical week on how many days do you eat fast foods?	Number of days _____ Don't Know 77
D14	In a typical week do you skip breakfast?	1. Yes 2. No (if no go toD16)
D15	If yes how many times you skip your breakfast in typical week?	Number of meals [_____] Don't Know 77
D16	In a typical week do you eat meal outside of the home?	1. Yes 2.No (if no go to C1)
D17	On average, how many meals per week do you eat that were not prepared at a home?	Number of days [_____] Don't Know 77

Part IV: Health risky behaviors		
C1	Have you ever consumed an alcoholic drink such as whisky, beer, wine, tej, tela or areqe?	1.Yes 2.No
C2	Have you consumed an alcoholic drink such as whisky, beer, wine, tej, tela or areqe in the last one month?	1. Yes 2. No
C3	Have you ever smoked cigarette?	1.Yes 2.No
C4	Have you smoked in the last one month?	1.Yes 2.No(go to W1)

Part V: Physical activity

Activity at work		
Code	Question	Responses
W1.	Do you engaged in Work besides your education?	1. Yes 2.No(go toP7)
P1.	Does your work involve vigorous –intensity activity like carrying or lifting heavy loads, digging or fetching wood that cause large increases in breathing or heart rate for at least 10 minutes continuously?	1. Yes 2. No (go to p4)
P2	In a typical week on how many days do you do vigorous –intensity activities as part of your work?	No of days -----
P3.	How much time do you spend doing vigorous –intensity activities at work on a typical day?	Hours: minutes -----
P4.	Does your work involve moderate intensity activity like carrying light loads] that causes small increases in breathing or heart rate for at least 10 minutes continuously?	1. Yes 2. No if no go to P7
P5.	In a typical week on how many days do you do moderate –intensity activities as part of your work?	No of days -----
P6.	How much time do you spend doing moderate –intensity activities at work on a typical day?	Hours: minutes -----
Travel to and from places(For example to work, for shopping, to market, to place of worship)		
P7.	Do you walk or use a bicycle for at least 10 minutes continuously to get to and from places?	1. Yes 2. No(go to p10)
P8.	In a typical week on how many days do you walk or use a bicycle for at least 10 minutes continuously	No of days -----
P9.	How much time do you spend walking or bicycling for travel in a typical day?	Hours: minutes -----
Now I would like to ask you about sports, fitness and recreational activities		
P10.	Do you do any vigorous-intensity sports like [running ,football, weight lifting, rope jumping an etc.] that cause large increases in breasting or heart rate for at least 10 minutes continuously?	1. Yes 2. No (go to P13}
P11.	In a typical week on how many days do you do vigorous –intensity sports, fitness or recreational activities?	No of days -----

P12.	How much time do you spend doing vigorous –intensity sports, fitness or recreational activities in a typical days?	Hours: minutes -----
P13.	Do you do any moderate-intensity sports as brisk walking, [cycling, swimming, volleyball] that cause small increases in breathing or heart rate for at least 10 minutes continuously?	1. Yes 2. No (go to P 16)
P14.	In a typical week on how many days do you do moderate –intensity sports, fitness or recreational activities?	No of days -----
P15.	How much time do you spend doing moderate –intensity sports, fitness or recreational activities in a typical days?	Hours: minutes -----
Sedentary behavior (time spent at work sitting, reading, watching television, using a computer, resting etc. Do not include time spent sleeping.		
P16	How much time do you usually spend sitting or reclining on a typical day?	Hours: minutes -----
P17	Mode of transportation from and to school	1. On foot/bicycle 2. vehicles

Part VI: Physical Measurements		M1	M2	M3
M1	Height _____ in cm			
M2	Weight _____ In Kg			