



# The Burden of Overweight and its Risk Factors in Urban Nepalese School Adolescents: A Cross-Sectional Study

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## Abstract

**Introduction:** Adolescent's overweight is rising in both developing and developed countries. Overweight and obese adolescents are more likely to become obese adults which stimulate the risk of non-communicable diseases such as diabetes, cardiovascular diseases and so on. Adolescence is the critical period for development of unhealthy lifestyles and food choices which increases the risk of NCDs. The loss of productivity, premature deaths and disability has been associated with NCDs at younger ages. This study focuses on identifying the prevalence and associated risk factors with adolescents' overweight.

**Methods:** A school based cross-sectional study was conducted between August-October 2020 in Gokarneshwor municipality of Nepal. A random sample of 558 students aged 10-19 years from nine schools was included in the study. A self-administered questionnaire was filled out by the study participants. Anthropometric indices were measured and categorized using BMI for age Z-score. Descriptive statistics were carried out. Variables were considered for multivariable logistic regression if a Wald test p-value was  $\leq 0.25$  during bivariate logistic regression. The odds ratio with a 95% CI was calculated and a p-value of  $\leq 0.05$  was considered to declare the statistical significance of variables after fitting into the multivariable logistic regression.

**Results:** The prevalence of overweight among school adolescents was 17.9% (95% CI 14.7 to 21.1). The female adolescents were more likely to get overweight as compared to male adolescents (AOR 1.53, 95% CI 0.97 to 2.39). Similarly, the adolescents staying with more than four family members were less likely to get overweight as compared to their counterparts (AOR 0.57, 95% CI 0.35 to 0.95). There was no statistical significant association between adolescent overweight and age group, family type, school type, mothers' occupation or fruits consumption.

**Conclusion:** The study findings highlighted the accelerated increase in the prevalence of overweight among school adolescents in Nepal. Therefore, appropriate nutritional intervention focusing on tackling overweight should be formulated and implemented so that the prevalence of overweight-associated non-communicable diseases can be minimized.

**Keywords:** Overweight; Risk Factors; Adolescents; Nepal

## Introduction

The burden of overweight and obesity among adolescents had been a major public health problem in the world. Previously it was the problem of developed world,

however, prevalence of overweight and obesity has increased in recent years at developing countries like Nepal. Although overweight and obesity has become pandemic even in developing countries, it has been a most neglected issue [1]. Globally, overweight has nearly tripled since 1975 with more

than 340 million children and adolescents aged 5–19 years being overweight in 2016 [2]. The overweight and obesity is estimated that around 30% of all children will be obese or overweight by 2030 [3]. The recent report shows that maximum numbers of overweight children are in developing countries with higher rate of increment than as compared to developed world<sup>3</sup>. The overweight and obesity has been elevated in most countries in an alarming rate despite of the economies of the countries [4]. The rise in overweight and obesity can be attributable to change in lifestyle related factors such as physical activity and dramatic change in dietary intake pattern of adolescents [5]. Overweight and obesity stimulates non-communicable diseases (NCDs) such as high blood pressure, high cholesterol, elevated blood glucose and cardio-vascular diseases [6]. The World Health Organization Global Status Report (GSR) reported that NCDs were responsible for 38 million (68%) of the world's 56 million deaths in 2012 of which one quarter deaths in low and middle income countries [7].

Adolescents comprise of around 16% of the world's total population [8]. In Nepal, these population comprise of around one fourth (24%) of the total population [9]. The period of adolescence (10–19 years) is a time of considerable physiological, physical, and behavioral changes [10,11]. It is a crucial stage of life span in which adolescents tends to adopt unhealthier lifestyles and food behavior which may have deleterious effects on their health. Studies suggest that overweight adolescents are likely to be overweight adults [12,13]. It is estimated that adolescent overweight will increase future adult obesity by 5–15% by 2035 [14]. The recent increase in adolescent obesity will direct to huge cost in future ranging from productivity loss to premature deaths and disability among adolescents [15].

Overweight and obesity among adolescents have been neglected mostly in low- and middle-income countries assuming that these age groups are herds of healthy population. Further, it is noted that there are limited studies and consequently grossly inadequate information regarding overweight among adolescents. Thus, this study aimed to discover the prevalence and associated factors of overweight among adolescents which will bridge the knowledge and information gap in this area with potentiality to design policy and program appropriately.

## Methods

### Study Design, Sample Size and Population

This is a school based cross-sectional study, which was conducted in the Gokarneshwor municipality, in the northeast of Kathmandu, between August 2019 and October 2019. The total number of adolescent students studying in both private

and community schools in Gokarneshwor municipality was 18557 students (2019). A multistage random sampling technique was adopted to select the study participants. The list of private and community schools was obtained from the education, sports, and youth section of the municipality. Among the total 90 schools, 7 private (out of 75) and 2 community (out of 15) schools were selected randomly using probability proportionate to size (PPS) sampling method. In the next stage, equal numbers of participants were enrolled from all nine schools. Participants were selected using the systematic random sampling method. A total of 558 school adolescents were included in the study with their self-administered responses and anthropometric measurement. The inclusion criterion was school adolescents who can stand for measure of health and weight.

### Data Collection Procedure

The study permission was obtained from the municipal education, sports, and youth section. Then the researcher visited the chosen schools to inform them about the research. Data were collected using a self-administered, pretested and structured questionnaire. The measurement of weight and height were obtained as per WHO guidelines using a SECA digital weighing scale and Shorr-board, respectively. The accuracy of the weighing scale and Shorr-board were checked using the standard weight and height at the beginning of every data collection session and after measurement of every ten students. The questionnaire was designed to gather personal, socio-demographic, nutritional and life-style information about study participants.

### Statistical Analysis

Data entry was done in Epi-Info version 7 and for anthropometric calculation, WHO Anthroplus software V.1.0.4 was used. Body mass index (BMI) for age Z-score were calculated for identifying the overweight individuals. Adolescents whose BMI for age Z-score was above +1SD from the median of the WHO reference population were classified as overweight [16]. The age of the participants was calculated using date of birth reported by adolescents and date of data collection. STATA MP 13 software was used for the statistical analysis. Bivariate and multivariate binary logistic regression analyses were conducted to determine the association between dependent (overweight) and independent (risk factors) variables. In the beginning, for bivariate analysis, a variable at a time was entered; unadjusted OR and 95% CI were computed for all independent variables. The Wald test p-value from the bivariate analysis was checked and p-value less than 0.25 were taken to the final model [17]. Multicollinearity was checked before taking the variable to final model. It was done among the variables observing the variance inflation factor (VIF) and variables having VIF less

than 2 were then included in the final model. Multivariate analyses with all independent variables were entered at the same time to adjust the effect of confounding and adjusted OR and 95% CI were computed. Statistical significance was considered with the p-value ( $p > 0.05$ ).

### Ethical Consideration

The ethical approval for the study was obtained from Institutional Review Committee, Patan Academy of Health Sciences, Nepal. The study was conducted with prior permission from the municipal authorities and school administration. Informed consent and/or assent were obtained from the study participants prior to the data collection. The study objectives and benefits were shared with the school adolescents. The study participants were

assured for confidentiality of the information at all levels of the study by avoiding personal identifiers. After the data collection, the researcher explained the school adolescents about the nutritional problems, their causes, consequences, and preventive measures.

### Results

The prevalence of overweight among school adolescents was 17.9% (95% CI 14.7 to 21.1). Table 1 represents the general characteristics of the school adolescents. The mean  $\pm$  SD of the age was  $13.5 \pm 2.1$  years and 51.2% were females. The mean weight and height of the adolescents were found to be  $45.29 \pm 10.78$  kg (95% CI 44.3- 46.1) and  $151.09 \pm 10.07$ cm (95% CI 150.2-151.9) respectively.

Characteristics	Frequency	Percentage
Sex		
Male	272	48.75
Female	286	51.25
Age group		
10-13 (early adolescents)	289	51.79
14-16 (middle adolescents)	221	39.71
17-19 (late adolescents)	48	8.6
School type		
Community (Government)	124	22.22
Private	434	77.78
Birth Order		
1 <sup>st</sup>	257	46.06
2 <sup>nd</sup>	168	30.11
3 <sup>rd</sup>	80	14.34
4 <sup>th</sup>	32	5.73
5 <sup>th</sup> and above	21	3.76
Family type		
Nuclear	422	75.63
Joint/Extended	136	24.37
Veg/Non-veg		
Vegetarian	61	10.93
Non-Vegetarian	497	89.07
Meals Consumption		
$\leq 3$ times/day	255	45.7
$> 3$ times/day	303	54.3
Fruits Consumption in last week		
Yes	389	69.71
No	169	30.29

N=558

**Table 1:** General characteristics of school adolescents.

The bivariate analysis Table 2 showed that three variables were independently associated with the overweight. The sex of the participants, family size and mothers' education were statistically significantly associated with overweight. However, school type, mothers' occupation, playing games or watching TV, family type, age groups, meal consumption and fruits consumption were not statistically significant. The variables with Wald test p-value <0.25 were considered in the final model. The multivariate logistic regression analyses Table 2 were fitted between sex, family type, family size,

occupation and hours spent in playing games in mobile or watching TV. The mothers' education variable was dropped due to multicollinearity. The female adolescents were more likely to get overweight as compared to male adolescents (AOR 1.53, 95% CI 0.97 to 2.39) holding constant for other variables. Similarly, the adolescents staying with more than four family members were less likely to get overweight as compared to their counterparts (AOR 0.57, 95% CI 0.35 to 0.95) controlling for other variables.

Characteristics	Overweight		Unadjusted OR	P-value	Adjusted OR	P-value
	Yes	No				
Sex			Wald test	0.05		
Male	40 (14.71%)	232 (85.29%)	1		1	
Female	60 (20.98%)	226 (79.02%)	1.53 (0.99 to 2.39)	0.05*	1.53 (0.97 to 2.39)	0.05*
Family type			Wald test	0.25		
Nuclear	80 (18.96%)	342 (81.04%)	1		1	
Joint/Extended	20 (14.71%)	116 (85.29%)	0.73 (0.43 to 1.25)	0.25	1.02 (0.54 to 1.83)	0.99
Family size			Wald test	0.02		
≤4 members	56 (22.05%)	198 (77.95%)	1		1	
>4 members	44 (14.47%)	260 (85.53%)	0.59 (0.38 to 0.92)	0.02*	0.57 (0.35 to 0.95)	0.03*
Mothers Occupation			Wald test	0.23		
Household work	52 (20.00%)	208 (80.00%)	1		1	
Outside Home	48 (16.11%)	250 (82.89%)	0.76 (0.49 to 1.18)	0.23	0.74 (0.48 to 1.15)	0.19
Watching TV or playing games on computer			Wald test	0.15		
>2 h/day	84 (19.09%)	356 (80.91%)	1		1	
≤2 h/day	16 (13.56%)	102 (86.44%)	0.66 (0.37 to 1.18)	0.16	0.72 (0.40 to 1.29)	0.27
Mothers' Education			Wald test	0.007		
No education	42 (19.00%)	179 (81.00%)	0.26 (0.09 to 0.72)	0.01**		
Primary	14 (10.61%)	118 (89.39%)	0.13 (0.04 to 0.40)	0.00**		
Secondary	30 (20.27%)	118 (79.73%)	0.28 (0.10 to 0.80)	0.01**		
Higher Secondary	6 (15.00%)	34 (85.00%)	0.19 (0.05 to 0.72)	0.01**		
University	8 (47.06%)	9 (52.94%)	1			
Age group			Wald test	0.42		
10-13 years	50 (17.30%)	239 (82.70%)	1			
14-16 years	44 (19.91%)	177 (80.09%)	1.18 (0.75 to 1.86)	0.45		
17-19 years	6 (12.50%)	42 (87.50%)	0.68 (0.27 to 1.69)	0.41		
School Type			Wald test	0.38		
Government (Community)	19 (15.32%)	105 (84.68%)	1			
Private	81 (18.66%)	353 (81.34%)	1.26 (0.73 to 2.18)			
Meals Consumption			Wald test	0.55		

≤3 times/day	43 (16.86%)	212 (83.14%)	1		
>3 times/day	57 (18.81%)	246 (81.19%)	1.14 (0.73 to 1.76)	0.55	
Fruits Consumption			Wald test	0.81	
<3 times/week	82 (18.10%)	371 (81.90%)	1		
≥3 times/week	18 (17.14%)	87 (82.86%)	0.93 (0.53 to 1.64)	0.81	

\*p<0.05; \*\*p<0.01

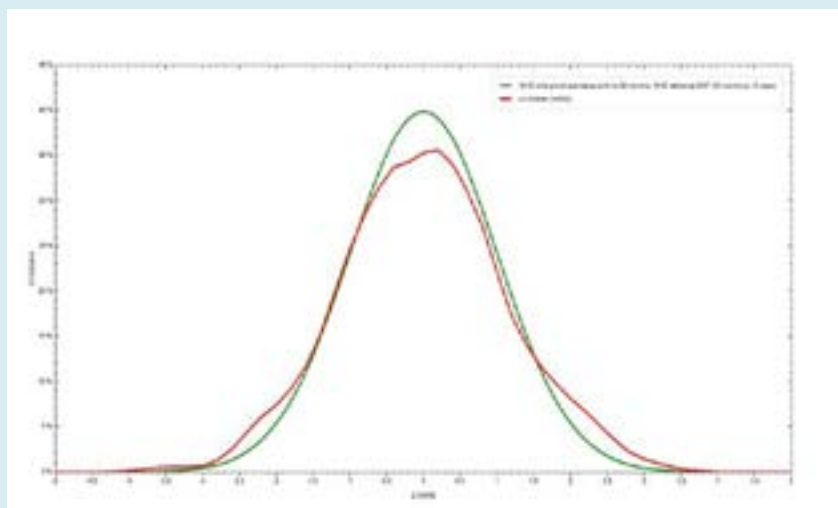
**Table 2:** Factors associated with overweight among school adolescents in Nepal.

## Discussion

The mean BMI-for-age Z- scores of the study populations was found to be 0.017SD. The prevalence of overweight was 17.9% which is higher than the similar study conducted in Nepal which reported 12.2% overweight among 16-19 years adolescents [18]. Similarly, the prevalence of overweight in this study is greater than the findings from study done in Kaski district which reported 8.1% prevalence of overweight among school adolescents [19]. The study from Pakistan,

India and China showed lower prevalence of overweight among adolescents than this study [20-24].

Figure 1 shows the comparison of the BMI for age index curves of the study population when compared with reference curves proposed by the World Health Organization. School adolescents in the present study showed, in general, lower values for BMI for age index, when compared to the analyzed reference points.



**Figure 1:** Comparison of the growth curve of school adolescents with the World Health Organization (WHO) curve, according to BMI for age index.

In this study, the female adolescents were found to be more overweight as compared to the male adolescents. This might be because of physical inactivity among adolescent girls compared to the boys. Boys tend to get engaged with sports and extracurricular activities than boys. However, a study conducted in Nepal showed adolescent boys were three times more likely to get overweight than their counterparts [18]. Adolescents staying with more than four family members were less likely to get overweight as compared to those who stay with less than four family members.

The present study showed that there is no significant association between overweight and school type and

mothers' occupation. However, the study conducted in Nepal showed that school type and mothers' occupation were significantly associated with overweight among adolescents [18,19].

## Study Limitation

The study was conducted using a cross-sectional study design, so this study had a limited extrapolative value. This study was carried out among school adolescents in a semi-urban area so this study cannot be generalized to schools of rural settings. There might be over or under reporting and recall bias since the self-reporting technique was used for

data collection.

## Conclusion

There is a substantial burden of adolescent overweight in Nepal. This study shows the higher prevalence of overweight among school adolescents in a municipality of Nepal. Action needs to be taken to curb the problem of overweight among school adolescents. Comprehensive urban-based campaigns for its prevention and control should be launched at earliest to tackle this problem.

## Declaration

**Competing Interests:** No.

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