International Journal of Public Health Asia Pacific

Open Access: e-Journal
ISSN: 2822-0587(Online)

Prevalence of Overweight and Obesity among Adolescents: A cross-sectional study in urban area of Kathmandu, Nepal

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ABSTRACT

Background: Overweight and obesity constitute a mounting global public health concern in middle to lower socioeconomic countries like Nepal. The contemporary shifts in nutrition patterns and swift urbanization have introduced overweight and obesity as an additional challenge to the persistently prevalent issue of under nutrition among adolescents. Many low- and middle-income countries are facing a dual burden of disease, struggling to address both under nutrition and over nutrition.

Objectives: The objective of this study was to assess the prevalence and factors associated with overweight and obesity among late adolescents.

Methods: A cross-sectional study was conducted on two public and two private schools of Tarkeshwor municipality of Kathmandu, Nepal. A random sample of 366 school going students aged 16-19 years and grade 11 and 12 were selected in the Tarkeshwor municipality of Kathmandu, Nepal. Cluster sampling technique was used to reach the respondents. STEPS survey questionnaire, National sleep foundation questionnaire, 24-hour dietary recall were used as data collection tools.

Results: The prevalence of overweight and obesity was 16.7% and 10.7% respectively. Factors associated with overweight and obesity included being female (AOR: 1.99,95% CI: 1.21-3.26), junk food intake per week (AOR: 2.73, 95% C.I: 1.34-5.58), and absence of play yard at home (AOR: 2.36, 95% C.I: 1.59-4.09). However, vegetable intake per week (AOR: 0.42, 95% C.I: 0.13-0.80) has been found to be associated with significant reduction of overweight and obesity.

Conclusion: Female in gender**,** junk food and absence of play yard at home were found to be contributing to the overweight and obesity in Nepal. Raising awareness about the negative effects of junk food, promoting healthy diets, implementing policies are key to prevention.

Key words: Malnutrition, Nepal, Obesity, Overweight

1. Introduction

Obesity and overweight among adolescent has been major public health problem in affluent countries, the problem has risen in low and middle income countries like Nepal [1]. This may be due to rapid rate of urbanization in Nepal. According to WHO, the prevalence of overweight and obesity had nearly tripled between 1975 and 2016 and had reached over 340 million children and adolescents aged 5-19 were overweight or obese in 2016. Among them, 18% of girls and 19% of boys were overweight and 6% of girls and 8% of boys were obese [2]. Among South Asian countries, Bangladesh had the highest incidence of overweight among adolescents at 26%, followed by Pakistan at 17%, and India at 19%. In terms of obesity, Bangladesh also led with 14%, followed by Pakistan at 7.5%, and India at 5.3% [3–5]. The 2022 Nepal Demographic and Health Survey report states that urban areas have higher rates of overweight/obesity among women aged 20-49 (38%) compared to rural areas (26%). Among adolescent women aged 15-19, 6% are overweight or obese, while among women aged 20-49, the rate rises to 35% [6].

Still majority of the government funds for improving nutrition has been utilizing for halting under nutrition only, but rising over nutritional problem has been less addressed [7]. To our knowledge few studies in Nepal have compared obesity rates across different demographic strata. Nepal is experiencing a nutrition transition. According to Nepal Demographic and Health survey 2001 to 2016 it was stated that underweight prevalence decreased from (26.7% to 17.2%) and prevalence of overweight/obesity increased from (6.5% to 22.1%) among women of reproductive age group (15 to 49 years) [8].

In Nepal there are few studies related to obesity, and very few important interventions are planned and implemented to combat it at the national, regional and local level. Several studies conducted in Nepal have reported only prevalence of over nutrition, others have assessed socio demographic risk factors associated with over nutrition, only few studies have assessed physical activity, school environment which also have been considering as important risk factor of over nutrition.

2. Methods

2.1 Study area and period

This study was conducted in Tarkeshwor municipality of Kathmandu Metropolitan city, which is highly urban city with dense population. Tarkeshwor being one of the urban areas of Bagmati province, it has advanced infrastructure among urban areas of Nepal,

consists high migration rate of adolescents in schools from nearby district Rasuwa and Nuwakot.

2.2 Study Design

A cross sectional analytical study was conducted to identify the prevalence and factors associated with overweight and obesity among adolescent (16-19 years).

2.3 Sample size and Sampling Technique

Students who were currently on late adolescent age (16 to 19 years) and studying in grade 11 and 12 were the sampling unit. Four schools (two public and two private) of Tarkeshwor Municipality were selected. Cluster sampling technique was used. Schools were selected as a cluster and all students studying at grade 11 and 12 were taken as a sample. The Cochrane formula was used to calculated the sample size, $n = Z^2pq/d^2$. The study done by Piryani S et. al [1] done in Lalitpur found the prevalence of overweight and obesity (p) = 0.122 with 0.05 allowable error. The sample size was 165. Adding design effect and adding 10% non-response rate, the final sample size for the study was 366. After getting research permission from Tarkeshwor municipality, the list of all wards (11 wards) was obtained from municipality office and selection of two wards (ward 10 &11) was done through random sampling. The list of all public (21) and private (67) schools were obtained from where, two public and two private schools were selected randomly. Students of grade 11 and 12 were included. Sampling frame of 16 to 19 age groups of selected schools were obtained from administrative section of respective schools. Sample was made through proportionate allocation from each school.

2.4 Data collection and statistical analysis

The study duration was six months from July 1st to 30th December 2019. Data were collected using a self- administered, pretested and structured questionnaire. To measure overweight and obesity stadiometer and seca scale were used. The accuracy of the weighing scale and stadiometer were checked before and in between of every student. Each student BMI was calculated through height and weight measurement. To identify physical activity, STEPS survey semi structured questionnaire was used. To identify sleeping pattern National sleep foundation questionnaire was used. Similarly, to identify dietary behavior, 24 hours recall self- administered questionnaire were used. Raw data was checked manually for accuracy and completeness. Student currently studying at class eleven and twelve were included in the study. Students present at the time of data collection period and those students who were interested to participate in

the study were included. Data entry and analysis was done through SPSS V.16. Data coding and verification was done. Descriptive statistics was used to find out the frequency, mean, median, percentage, quartile deviation and standard deviation for all variables. Univariate logistic regression was done to find out the association between independent and dependent variables. Multiple logistic regression was applied.

2.5 Variables

Using Asian BMI, cut offs for school age children overweight was defined as 23-27.5(kg/m²) and obese ≥27.5 (kg/m²). For grade of education grade11 and 12 students were included. To analyze sleeping pattern National sleep foundation standard protocol were used. Sleep categories were defined as less sleep (<7hours), adequate sleep (7-9 hours) and more sleep (>9 hours).

2.6 Ethical Consideration

Approval was taken from Institutional review committee of Manmohan Memorial Institute of Health Sciences. (MMIHS-IRC) (Registration Number 444, Approval reference number 127/02). Permission for the study was taken from the selected schools. The objectives of study had been explained to the respondents. Both verbal and written informed consent was taken and respondent was assured that the information will be confidential and used only for research purpose. Respondents were allowed to fully participate with their own wishes and withdrawal at any time. Respondent's choice of not participating in the study was respected.

3. Results

The prevalence of overweight and obesity was found 16.7% and 10.7% respectively as illustrated in Table 1.

Table 1: Prevalence of overweight and obesity (n=366)

Characteristics	Number (n)	Percentage (%)
BMI		
<18.5 (Underweight)	72	19.7
18.5-22.9 (Normal)	194	53.0
23-27.4 (Overweight)	61	16.6
>27.5 (Obesity)	39	10.7
Two categories of BMI		
Normal	266	72.7
Combined overweight/obesity	100	27.3

3.1 Demographic and Bivariate Analysis

Table 2 shows the association of overweight and obesity with individual risk factors. It shows that variables such as gender, grade, vegetable intake per week, junk food intake three or more times per week, three or more

times soft drink intake per week was highly significantly associated with overweight and obesity whereas individual level risk factor such as age, religion, ethnicity, sweets and chocolate consumption, meat consumption, junk food consumption, soft drink consumption, fruits intake per week, vegetable serving per day, red meat intake, sleep duration, TV watch duration in 24 hours was not significantly associated with overweight and obesity.

Table 2: Association of overweight and obesity with individual risk factors (n=366)

Characteristics	Frequency n (%)	Prevalence		OR	95% CI	P-value
		Normal n (%)	Overweight & Obesity n (%)			
Age						0.701
16-17	258(70.5)	189 (51.6)	69(18.9)	1		
18 – 19	108(29.5)	77 (21)	31(8.5)	1.103	0.66-1.81	
Gender						0.012*
Male	171(46.7)	135 (36.9)	36(9.8)	1		
Female	195(53.3)	131 (35.8)	64(17.5)	1.832	1.14-2.94	
Grade						0.051*
11	307(83.9)	217 (59.3)	90(24.6)	1		
12	59(16.1)	49 (13.4)	10(2.7)	0.492	0.23-1.01	
Preferences						0.090
Vegetarian	47(12.8)	39(10.7)	8(2.2)	1		
Non vegetarian	319(87.2)	227(62)	92(25.1)	1.976	0.88-4.39	
Meat consumption per week(n=319)						0.085
At least once a day	57(15.6)	47(14.7)	10(3.1)	1		
Once a week	119(32.5)	77(24.1)	42(13.2)	1.615	1.12-6.25	
Twice a week	57(15.6)	39(12.2)	18(5.6)	2.169	0.82-5.87	
Three or more times a Week	86(23.5)	64(20.1)	22(6.9)	2.563	0.65-4.18	
Vegetable intake per week						0.011*
<3	49(13.4)	43(11.7)	6(1.6)	1		
>=3	317(86.6)	223(60.9)	94(25.7)	0.422	0.13-0.80	
Vegetable serving per day						1.000
1-2 serving	364(99.5)	264(72.1)	100(27.3)	1		
3-4 serving	2(0.5)	2(0.5)	0(0)	0.725	0.68-0.77	
Fruits intake per week						0.508
<4times/week	254(69.4)	182(49.7)	72(19.7)	1		
>=4times/week	112(30.6)	84(23)	28(7.7)	0.843	0.50-1.39	
Junk food intake per week						<0.001***
At least once a day	130(35.5)	104(28.4)	26(7.1)	1		
Once a week	79(21.6)	62(16.9)	17(4.6)	1.096	0.51-2.29	
Twice a week	45(12.3)	21(5.7)	24(6.6)	1.670	0.88-3.15	
Three or more times a week	112(30.6)	79(21.6)	33(9)	4.571	2.07-10.06	
Sweets intake per week						0.161
At least once a day	100(27.3)	78(21.3)	22(6)	1		
Once a week	122(33.3)	92(25.1)	30(8.2)	1.156	0.59-2.28	
Twice a week	45(12.3)	28(7.7)	17(4.6)	2.152	0.92-4.94	
Three or more times a week	99(27.0)	68(18.6)	31(8.5)	1.616	0.81-3.22	
Soft drink intake per week						0.006**
At least once a day	85(23.2)	71(19.4)	14(3.8)	1		

Characteristics	Frequency n (%)	Prevalence Normal n (%)	Overweight & Obesity n (%)	OR	95% CI	P-value
Once a week	164(44.8)	122(33.3)	42(11.5)	1.745	0.86-3.70	
Twice a week	43(11.7)	29(7.9)	14(3.8)	2.448	0.94-6.29	
Three or more times a week	74(20.2)	44(12)	30(8.2)	3.457	1.56-7.82	
Sleep duration in 24 Hour						0.749
Less sleep	242(66.1)	173(47.3)	69(18.9)	1		
Adequate sleep	102(27.9)	76(20.8)	26(7.1)	1.163	0.48-1.48	
More sleep	22(6.0)	17(4.6)	5(1.4)	1.356	0.20-2.19	
TV watch duration in 24 hours						
<2hr/day	248(67.8)	181(49.5)	67(18.3)	1		0.849
>=2	118(32.2)	85(23.2)	33(9)	1.049	0.64-1.71	

*Level of significance p- value <0.05

Table 3: Association of overweight and obesity with family level risk factors (n=366)

Variable	Frequency n (%)	Prevalence Normal n (%)	Overweight and obesity n (%)	OR	95% CI	P-value
Type of Family						0.326
Nuclear family	245(66.9)	182(49.7)	63(17.2)	1	0.78-2.05	
Joint family	121(33.1)	84(23)	37(10.1)	1.272		
Father Occupation						0.231
Service	204(55.7)	150(41)	54(14.8)	1		
Agriculture	80(21.9)	62(16.9)	18(4.9)	0.751	0.42-1.32	
Business	82(22.4)	54(14.8)	28(7.7)	0.573	0.28-1.15	
Mother Occupation						0.245
House maker	246(67.2)	172(47)	74(20.2)	1		
Agriculture	51(13.9)	40(10.9)	11(3)	0.639	0.28-1.35	
Business	19(5.2)	13(3.6)	6(1.6)	1.072	0.32-3.17	
Service	50(13.7)	41(11.2)	9(2.5)	0.510	0.20-1.13	
Father Education						0.682
Less than primary Education	108(29.5)	81(22.1)	27(7.4)	1		
Primary	48(13.1)	37(10.1)	11(3)	0.891	0.35-2.10	
Secondary	183(50)	130(35.5)	53(14.5)	0.667	0.69-2.19	
Higher Secondary Above	27(7.4)	18(4.9)	9(2.5)	0.595	0.52-4.01	

*Level of significance p- value <0.05

Table 4: Association of overweight and obesity with school level associated factors (n=366)

Variable	Frequency n (%)	Normal n (%)	Prevalence Overweight & Obesity n (%)	OR	95% CI	P value
Mother's education						0.389
Less than primary Education	194(53)	146(39.9)	48(13.1)	1		
Primary	39(10.7)	30(8.2)	9(2.5)	0.912	0.35-2.14	
Secondary	117(32)	80(21.9)	37(10.1)	0.771	0.81-2.40	
Higher secondary Above	16(4.4)	10(2.7)	6(1.6)	0.548	0.51-5.86	
Play yard at home						0.001*

Yes	141(38.5)	86(23.5)	55(15)	1		
No	225(61.5)	180(49.2)	45(12.3)	2.558	0.24-0.62	

*Level of significance p- value <0.05

Table 5: - Association of overweight and obesity with physical activity (n=366)

Variable	Frequency n (%)	Prevalence Normal n (%)	Overweight and obesity n (%)	OR	95% CI	P-value
Heavy work						0.354
Yes	13(3.6)	8(2.2)	5(1.4)	1		
No	353(96.4)	258(70.5)	95(26)	1.697	0.18- 1.84	
Light work						0.022*
Yes	281(76.8)	196(53.6)	85(23.2)	1		
No	85(23.2)	70(19.1)	15(4.1)	2.024	0.26-0.91	
Heavy sport						0.320
Yes	59(16.1)	46(12.6)	13(3.6)	1		
No	307(83.9)	220(60.1)	87(23.8)	1.399	0.72-2.71	
Light sport						0.383
Yes	119(32.5)	83(22.7)	36(9.8)	1		
No	247(6	183(50)	64(17.5)	1.240	0.49-1.30	

*Level of significance p- value <0.05

Table 6: Association of overweight and obesity with school level associated factor (n=366)

Characteristics	Frequency n (%)	Prevalence Normal n (%)	Overweight and obesity n (%)	OR	95% CI	P-value
Physical education session per week						0.226
Once a week	24(6.6)	20(5.5)	4(1.1)	1		
Never	342(93.4)	246(67.2)	96(26.2)	1.951	0.65-0.85	

*Level of significance p- value <0.05

Table 7: Association of overweight and obesity with community level associated factor (n=366)

Characteristics	Frequency n (%)	Prevalence Normal n (%)	Overweight and Obesity n (%)	OR	95% CI	P value
Mode of transportation						0.497
Vehicle	116(31.7)	87(23.8)	29(7.9)	**1**		
Foot	250(68.3)	179(48.9)	71(19.4)	0.397	0.72-1.96	
Play yard at community						0.465
Yes	227(62.0)	168(45.9)	59(16.1)	**1**		
No	139(38.0)	98(26.8)	41(11.2)	1.191	0.74-1.90	

***Level of significance p- value <0.05**

3.3 Multiple logistic regression analysis

Multiple logistic regression analysis shows that variables such as female (AOR:1.99, 95%CI:1.21-3.26), grade 12 (AOR: 0.20, 95% C.I: 0.98-4.18), vegetable intake per week (AOR: 0.42, 95% C.I: 0.13-0.80), junk food

intake per week (AOR: 2.73, 95% C.I: 1.34-5.58), soft drink intake per week **(**AOR: 0.70, 95% C.I: 0.32-1.55) and play yard at home (AOR: 2.36, 95% C.I: 1.59-4.09) was highly significantly associated with overweight and obesity is illustrated in Table 8.

Table 8: Multiple logistic regression model for independent variables regarding obesity (n=366)

Variables	AOR	95% CI	P-Value
Gender			**<0.001***
Male	1		
Female	1.990	1.21-3.26	
Grade			
11	1		**<0.001***
12	0.204	0.98-4.18	
Vegetable intake per week			
<3	1		**<0.001***
>=3	0.422	0.13-0.80	
Junk food intake per week			**<0.001***
At least once a day	1		
Once a week	0.598	0.33-1.08	0.076
Twice a week	0.656	0.33-1.28	0.200
Three or more times a week	2.736	1.34-5.58	0.013*
Soft drink intake per week			**<0.001***
At least once a day	1		
Once a week	0.289	0.13-0.60	0.051
Twice a week	0.505	0.28-0.90	0.070
Three or more times a week	0.708	0.32-1.55	0.291
Play yard at home			**0.001***
Yes	1		
No	2.366	1.59-4.09	

* Level of significance p- value <0.05

4. Discussion

This study shows the prevalence of overweight and obesity was 16.7% and 10.7% respectively which is more than the study conducted in Morocco which showed the prevalence of overweight and obesity as 7.69% and 3.4% [9] and study done by Khatri E. et al which found overweight as 9.31 [10] and higher than the study conducted on Nepal from Lalitpur district aged 16 to 19 years, the obesity of adolescents reflects (12.2%) [1] and the study conducted in Pokhara district of Nepal with age group 15 to 19 years showed prevalence of overweight and obesity is (3.3% and 0.5%) respectively [11]. However, this finding is slightly higher than other study done among urban areas in Nepal which might be due to larger sample in this study, adolescents from higher socioeconomic group [12] and variation in adopting a sedentary lifestyle [10]. The Tarkeshwor municipality, located in close proximity to the highly urbanized and industrialized Kathmandu Valley, experiences a notable shift towards the consumption of junk food, modern dietary patterns and sedentary lifestyles.

In this study female is 1.99 times more likely to be obese in reference to male. This finding is consistent with the STEP survey done in Nepal. Obesity prevalence was found to be higher in women (2.4% and 4.8%) in survey done by STEPS studies (2007-2008) to 2012-2013 than men (1.1% and 3.1%). This may be due to girls tend to stay at home for longer duration and their movements in comparison to boys are prohibited because of cultural influence [11]. In this study adolescent who watch TV more than 2 hour a day has 1.04 times more likely to develop overweight and obese than those who spent less than 2 hour a day which is similar to study conducted in Lalitpur, Nepal which also showed that students who spent more than 2 hour a day watching television were found to be nearly nine times more likely to be overweight than those who spent less than 2 hour a day watching television [1]. The surge in adolescent overweight could be attributed to television viewing by uptick in snacking while engrossed in television content, disruption in regular sleep patterns attributed to prolonged television viewing, decline physical activity and the escalating trend towards adopting unhealthy dietary patterns spurred by the pervasive influence of junk and fast-food advertisements [1].

The result of the study reveals that adolescent who consumed soft drink has high significant association (P=0.001) between development of overweight and obesity. This finding is similar with studies carried out in Morocco between 2014 and 2015, revealed frequent consumption of soda and soft drinks (three or more times a week) were correlated with increased risk for overweight and obesity [9]. The present study shows that adolescent who consume junk food three or more times a week are 2.7 times more likely to be obese in reference to adolescent who consume junk food at least once a day. This may be due to junk food contains concentrated energy content, a high glycemic index, elevated levels of saturated and trans fats and these food choices generally exhibit lower levels of dietary fiber, essential micronutrients and vital antioxidants [12]. This finding is compatible with studies carried out in Lalitpur, Nepal where Consumption of fast food and sugary drinks were found among (99%) and (95%) of the respondents respectively [1]. In this study adolescent whose mother occupation has business are 1.07 times more like to get overweight and obese than whose mother is house maker. This may be due to students from privileged socioeconomic background possess the capacity to effortlessly procure energy dense, yet nutritionally sparse, fast-food selections. Similarly this finding is

compatible to study done in southern Hawassa Ethiopia, increased monthly income were found to be risk factors of overweight and obesity [12].

In this study students who did not play heavy sport and light sport had more than 1.3 times higher risk to develop overweight and obese. Similarly, students who had not performed heavy work and light work were 1.7- and 2-times risk to get overweight and obese respectively. It is similar to finding from Nepal study on 2017, two thirds (65.2%) among overweight/obese participants had poor level of physical activity [13]. Also, it is compatible with finding of study done in Pokhara which revealed that overall prevalence of low physical activity among the adolescents was (22.3%) and considered public health problem among the 15 to 19 age group [11].

The study was only limited in exploring prevalence and associated factors with overweight among adolescent of Tarkeshwor Municipality of Kathmandu district, therefore the findings of this study could not be generalized and recall bias can occur during data collection.

5. Conclusion

The study showed the prevalence of overweight and obesity among the adolescents. The study provides evidence of the high prevalence of overweight among adolescents living in urban area of Nepal. Orientation to multi-sector stakeholders should be done to focus on adolescence overweight/obesity in countries like Nepal where all nutritional interventions are targeted to reduce under-nutrition only. The findings of this study can provide baseline data for the prevention and control of overweight and obesity among adolescent school students. Further studies need to be done to assess the major contributing factors associated with overweight and obesity in this group of students.

Acknowledgement

Author acknowledges to Nepal Rastriya Secondary school, Gramin Aadarsha Multiple Campus, Shree Mansingh Dharma Secondary school, Angel's Heart Higher Secondary schools for permission for data collection and students who participated in the study.

COMPETING INTEREST

The authors declared no competing interests.

FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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