Original Research Article

FACTORS ASSOCIATED WITH OBESITY AMONG ADOLESCENTS

Abstract

Background: Obesity is a medical condition characterized by an abnormal fat accumulation which is detrimental to health. The role of infectious disease is diminishing and that of non-communicable disease are increasing rapidly in developing countries like Nepal. Adolescents are vulnerable in terms of nutrition and the obese adolescent turns into an obese adult which leads to reduction of productivity of nation.

Objectives: To determine the prevalence and knowledge of overweight/obesity among adolescents and evaluate the associated factors in Bharatpur Metropolitan Municipality of Chitwan district.

Methodology: A descriptive cross-sectional study was conducted where two secondary schools of Bharatpur Metropolitan Municipality were randomly selected by lottery method. All the students of grade 9 and 10 of those two schools were included in the study (Sample size: 304). The question was self-administered and; Body Mass index (BMI) status and Central obesity was calculated. Data was analyzed by using IBM SPSS version 26.

Major Findings: In total, 187 (61.5%) of the respondents had knowledge about obesity, 251 (82.6%) had junk foods eating habits, 28 (9.2%) did not involve in any physical exercise and 50.3% of the respondents spent their leisure time playing/watching gadgets. The prevalence rate of overweight and obesity was 10.2% and 4.9% respectively. The study confirms 3 (1.9%) of boys and 12 (8.1%) of girls were central obese. Further, the mean BMI score was 18.57 kg/m^2 (Mean ± SD: 18.57±2.56) and mean waist circumference for boys and girls was 72.25 cm and 69.59 cm respectively. The study shows significant association (p value<0.05) between father's occupation and mother's education with types of snacks provided. Furthermore, respondent's sex, meal frequency and gadgets at home show statistically significant association (p value<0.05) with nutritional status of respondents.

Conclusion: The study suggests that preventive approaches should be followed from the very beginning to avoid the obesity and health problem. The food preferences of respondents,

foods they consumed, lack of physical exercise, preference of junk foods, parental history of obesity, use of gadgets and online games would lead to serious health effects in the future.
Keywords: *Obesity, Overweight, Adolescents, BMI, Nutritional status*

1. Introduction

Obesity is a medical condition characterized by an abnormal fat accumulation which is detrimental to health. According to World Health organization, obesity is defined as being at or above the 95th percentile of body mass index for age and sex and Overweight as being between the 85th and 95th percentiles of body mass index for age and sex. WHO defines Body mass index (BMI) as being weight in kilogram per height in square meter recommended for use in children and adolescent (WHO, 2021).

Worldwide obesity has nearly tripled since 1975. The prevalence of overweight and obesity among children and adolescents aged 5-19 has risen dramatically from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among both boys and girls: in 2016 18% of girls and 19% of boys were overweight. Over 340 million children and adolescents aged 5-19 years were overweight or obese in 2016 (WHO, 2021). The issue has grown to epidemic proportions, with over 4 million people dying each year as a result of being overweight or obese in 2017 according to the global burden of disease. Most of the world's population lives in countries where overweight and obesity kills more people than underweight (WHO, 2021).

The proportion of women who were overweight or obese increased from 9% in 2006 to 13% in 2011 and 22% in 2016 (NDHS, 2016). Obesity and central obesity are associated with an increased risk of multiple chronic diseases, including diabetes, cardiovascular disease (CVD), hypercholesterolemia, asthma and cancer (Regmi & Purushothama, 2018; Nonboonyawat et al., 2019). Previous studies using Nepal Demography and Health Survey (NDHS) 2016 showed variation in underweight and overweight and/or obesity by individual level factors, i.e., women compared to men, urban residents compared to rural residents, and wealthy individuals were more likely to be overweight and/or obese (Muhammed, 2019). Although individual characteristics play an important role in manifesting health outcomes, including weight status, recent evidence suggest that health is also determined by population

level characteristics such as residence, neighborhood's walk ability, availability of food and so on(Chaulagain,2021).

Adolescents in Nepal cover 23.62 percent of the total population i.e. nearly a quarter of the population (MOHP, 2011). Adolescence is a critical phase for the development of obesity because of various biological, psychological, social and environmental changes (Kamath & Sangamesh, 2016). Adolescence overweight and obesity may persist into adulthood (Lazzeri et al., 2014; Piryani et al., 2016). Overweight and obese adolescents also suffer short-term health consequences and may increase the risk of developing NCDs at a younger age and consequently a premature death (Raj & Kumar, 2010) In addition; their participation in school and other daily activities is also limited depending on the status of obesity (Piryani et al., 2016).

2. Objectives of the study

2.1 General Objective

The general objective of the study is to study the knowledge about health problems of obesity, determine the prevalence of obesity rate, factors related with obesity and nutritional status among school going adolescents of Bharatpur Metropolitan Municipality of Chitwan District.

2.2 Specific objectives

i. To find out the level of knowledge about health problems regarding obesity among adolescents
ii. To find out the prevalence rate of overweight and obesity among school going adolescents
iii. To explore the factors related with obesity among school going adolescents
iv. To assess the association between factors associated with obesity in terms of nutritional status

3. Materials and method

Study design, sample size and population

A descriptive cross-sectional study was conducted among adolescents of grade 9 and 10 of two schools of Bharatpur Metropolitan Municipality of Chitwan district which is the district headquarter and fourth largest city of Nepal. Bharatpur is a commercial and service centre of central south Nepal and major destination for higher education, health care and transportation in the region. The two schools (one government and one private) were selected by lottery method among all schools of Bharatpur and census method was done to collect information among those selected schools. The total sample was 304.

Sampling method

Bharatpur Metropolitan Municipality was selected purposively. There were a total of 226 schools in Bharatpur metropolitan municipality and among them 125 were governmental and 101 were private schools. Further, there were 60 primary schools, 46 lower secondary schools, 81 secondary schools and 39 higher secondary schools. Then, the 81 secondary schools were listed and among them, two schools were randomly chosen through a lottery method. All the students of grade 9 and 10 of those two schools were included in the study.

Data Collection Tools and Techniques

Information was collected using self-administered questionnaire. Questionnaire consists of different sections and they are: socio-demographic, health related, dietary habits, behavioral, lifestyle and nutritional status. Height, weight and waist circumference of the respondents were measured by the researcher.

For measuring height, respondent was made to stand bare feet on a floor against a wall and with feet parallel and joined together and with heels and buttock touching the wall. It was made sure that head was erect. The height was marked on the wall with the help of a ruler and marker and it was measured with the measuring tape. For measuring the weight, bathroom weighing machine was used. Before using, it was made sure that it is at zero error**.**

For measuring waist circumference, the respondents were made to stand straight. The midpoint of the top of the hip bone and bottom of the rib cage was found. The measuring

tape was used and the waist circumference was measured horizontally. The tape should be snug and not very tight. The Body Mass Index and Central obesity was calculated.

Statistical Analysis

Data entry and analysis was done through IBM SPSS Statistics Version 21. Obesity was measured by Body Mass Index (BMI) which is defined as the weight in kilograms divided by the square of the height in meter (kg/m^2). BMI level was calculated by percentile ranking for adolescents by plotting the BMI of each adolescent on BMI-for-age growth chart of World Health Organization (for either girls or boys). The value is mentioned below:

Underweight: Less than 5th percentile

Normal / Healthy weight: 5th percentile to less than 85th percentile

Overweight: 85th to less than 95th percentile

Obese: Equal to or greater than 95th percentile

Central obesity was calculated depending upon the waist circumference i.e. circumference ≥94 cm in male and ≥80 cm in female.

The age of the participants was calculated using date of birth reported by adolescents and date of data collection. Descriptive and inferential analysis was done through SPSS. The p-value below 0.05 was considered as statistically significant.

Ethical Considerations

The ethical approval was obtained from Central Department of Home Science, Bagbazar, Kathmandu. The study was conducted with prior permission from the school authorities. Before data collection, the research purpose and process of the study was clearly explained. Verbal informed consent was taken from participants before administering questionnaires. The study participants were assured for confidentiality of the information at all levels of the study by avoiding personal identifiers. The respondent may leave whenever they want. After the data collection, the researcher explained the school adolescents about overweight and obesity, their causes, consequences, and preventive measures.

4. Results and Discussion

4.1 Socio-demographic characteristics of the respondents

Table1: Socio-demographic characteristics of the respondents

n=304

Variables		Frequency	Percentage (%)
Age	Early adolescents	6	2
	Mid adolescents	184	60.5
	Late adolescents	114	37.5
	Mean age: 15 years		
Sex	Boys	156	51.3
	Girls	148	48.7
Family type	Nuclear	225	74
	Joint	79	26
Family income/month	≤20000	11	3.6
	>20000	246	80.9
	Don't know	47	15.5
Father's education status	Illiterate	23	7.6
	Formal education	19	6.3
	Primary	64	21.1
	Secondary	80	26.3
	Bachelors and above	106	34.9
Mother's education status	Illiterate	10	3.3
	Formal education	79	26
	Primary	59	19.4
	Secondary	77	25.3
	Bachelors and above	66	21.7
	Don't know	13	4.3
Mother's occupation	Agriculture	16	5.3
	Business	42	13.8
	Services	7	2.3
	Labour	1	0.3
	Foreign employment	3	1
	Housewife	235	77.3

	Agriculture	30	9.9
	Business	61	20.1
	Services	39	12.8
	Labour	47	15.5
	Foreign employment	49	16.1
Father's occupation	Others	78	25.7
	Government	162	53.3
Type of school	Private	142	46.7

The table 1 shows the socio demographic characteristics of the respondents. A total of 304 students were enrolled in the study and the mean age of the respondents was 15 years. The mean age of adolescents in this study was similar to the study conducted on Kaski which shows (15.08) years (Pandey & Sapkota, 2018). The study shows that 156 (51.3%) were boys and 148 (48.7%) girls participated in the study. Further, the study shows that 162 (53.3%) were from Government schools and 142 (46.7%) were from private schools.

Furthermore, 225 (74%) students lived in nuclear family while only 79 (26%) lived in joint family which is similar to the study conducted in Gokarneshwor municipality i.e 75.63% nuclear and 24.37% joint family (Chaulagain, 2021).

4.2 Food consumption pattern of the respondents

Table 2: Food consumption pattern of the respondents

n=304

Food Groups	**Frequency of intake**			
	Everyday	**Twice a week**	**Sometimes**	**Never**
Cereals	304(100%)	-	-	-
Roots and tubers	166(54.6)	70(23%)	41(13.5%)	9(3%)
Vegetables	303(99.7%)	-	-	1(0.3%)
Fruits	154(50.7%)	62(20.4%)	88(28.9%)	-
Meat	24(7.9%)	125(41.1%)	138(45.4%)	17(5.6%)
Eggs	35(11.5%)	98(32.2%)	164(53.9%)	7(2.3%)
Fish/sea food	6(2%)	71(23.4%)	167(54.9%)	60(19.7%)
Legumes, nuts and seeds	78(25.7%)	123(40.5%)	103(33.9%)	-
Milk and milk products	153(50.3%)	84(27.6%)	50(16.4%)	3(1%)
Oils and fats	304(100%)			
Condiments	212(69.7%)	61(20.1%)	30(9.9%)	1(0.3%)
Soft drinks	21(69.7%)	61(20.1%)	30(9.9%)	1(0.3%)
Junk foods	102(33.6%)	37(12.2%)	112(36.8%)	53(17.4%)

Table 2 of the study shows the food consumption pattern of the respondents. It shows that all of the respondents (304) consume cereals every day, 7 (2.3%) were vegetarians, 212 (69.7%) consume soft drinks daily and 102 (33.6%) consume junk foods every day. Karki et. al., (2019) mentioned 83.1% of the respondents use soft drinks and Chaulagain (2021) shows 10.93% of the respondents as vegetarian.

4.3. Exercise Behavior of the respondents

Table 3: Exercise Behavior of the respondents

n=304

Variables		Frequency (N)	(%)
Physical exercise	Yes	276	90.8
	No	28	9.2
Types of physical exercise *	Walk	108	35.5
	Run	84	27.6
	Cycling	125	41.1
	Yoga	56	18.4
	Indoor physical exercise	69	22.7
	Taekwondo	1	0.3
Hours spent/day	<1 hour	182	59.9
	1-2 hour	96	31.6
	2-3 hour	1	0.3

*multiple response

Table 3 represents the exercise behavior of the respondents which shows 276 (90.8%) of the respondents did physical exercise and among them 182 (59.9%) of the respondents performed physical exercise for less than 1 hour, 96 (31.6%) for 1-2 hours and 1 (0.3%) for 2-3 hours a day. The study conducted by Jain & Adhikari (2014) shows 12.4% of the respondents were not involved in any moderate physical activity which is higher compared to this study with 31.12 % of the respondents who performed moderate physical activity for greater than 1 hour which is similar to this study.

4.4 Knowledge on health problems of obesity

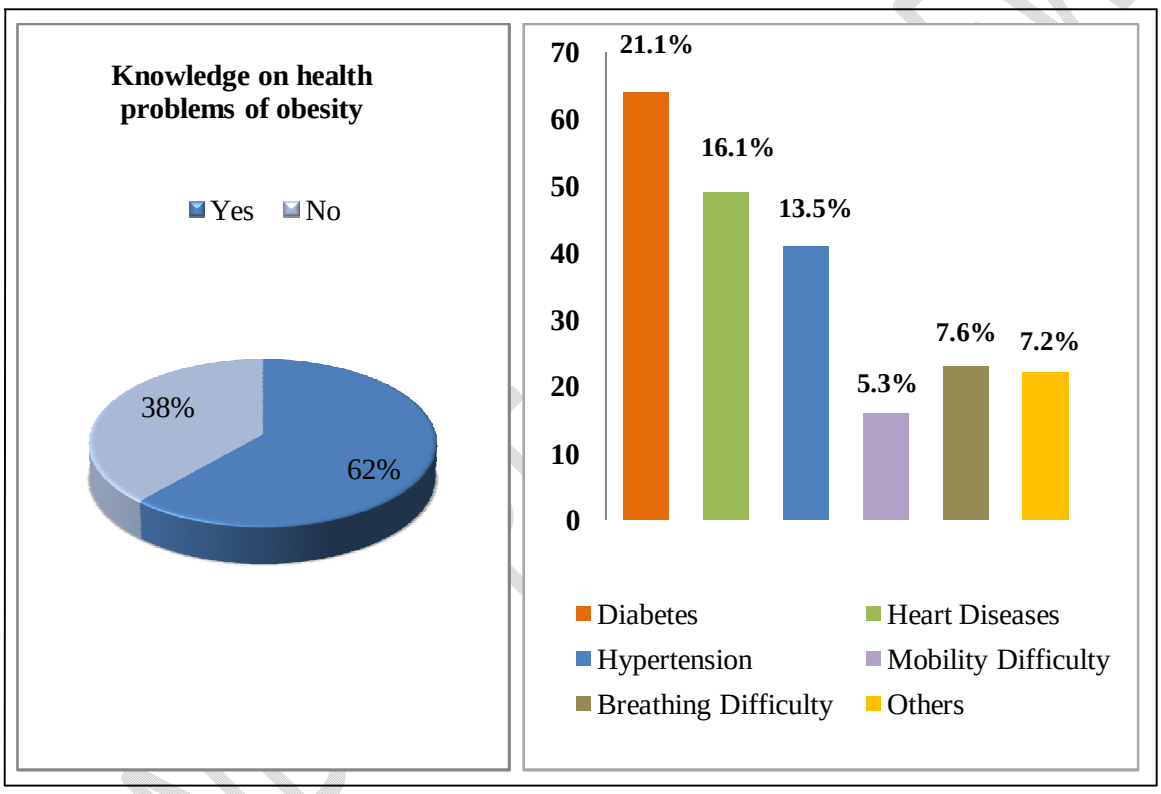

Figure 1: Knowledge on health problems of obesity

The figure 1 shows the knowledge on health problems related to obesity of the respondents which shows 62% of them had knowledge whereas 38% did not have any knowledge about health problems of obesity. Majority of the respondents (21.1%) mentioned diabetes as the health problem of obesity.

4.5 BMI status of the respondents

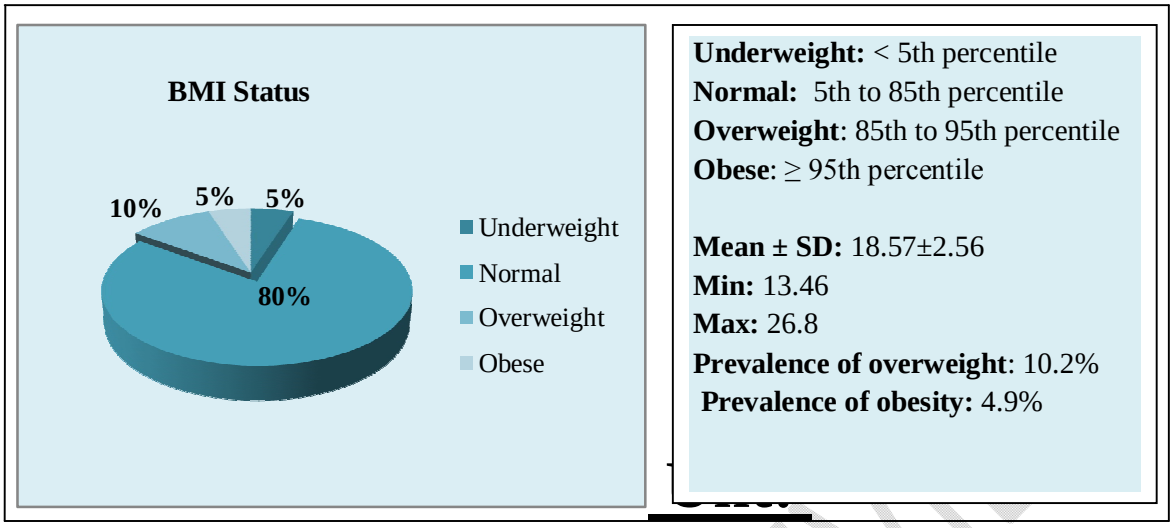

Figure 2: BMI status of respondents

The figure 2 shows the BMI status of the respondents with prevalence of overweight of 10.2% and obesity (4.9%). The mean BMI was 18.57 kg/m^2. It was measured according to the WHO BMI calculation for age 5 to 19 years. The findings of the study conducted in Tulsipur municipality shows that prevalence of overweight and obesity was 4.25% and 2.25% which is low compared to this study (Regmi & Purushothama, 2018) but is similar to the study condcuted by Piryani et.al. (2016) i.e. 12.2%. Further, the prevalence was less in the study conducted by Sah et al. (2016) in Biratnagar i.e Overweight (2.9%) and Obese (1.8%). In an observational study conducted in adolescents between the ages 11 to 19 years in Bangalore, India , the prevalence of obesity was 5.9% (Kamath & Sangamesh, 2016). The findings on the Prevalence of Obesity of this study is more than the findings of study on risk factors of non-communicable diseases conducted in Ratnanagar Municipality of Chitwan District which is 5.8% (Jain & Adhikari, 2014) and the findings of study conducted in Islamabad, Pakistan i.e. 8.5% (Durrani et al., 2016). Also, the findings of prevalence of overweight was lesser to some extent then study conducted by STEP survey of Nepal which is 17.7%(Step Survey, 2013), study conducted in rural china which is 24.8% (He and et. al. 2016), study conducted in Shenyang china which is 14.6% (Zhai et.al., 2017) and study conducted among 7-17 years old children and adolescents in Lithuania is 12.6% (Smetanina et al., 2015). The dissimilarity in findings may be because of variation in level of socio-economic development and lifestyle differences in various part of world.

4.6 Central obesity among respondents

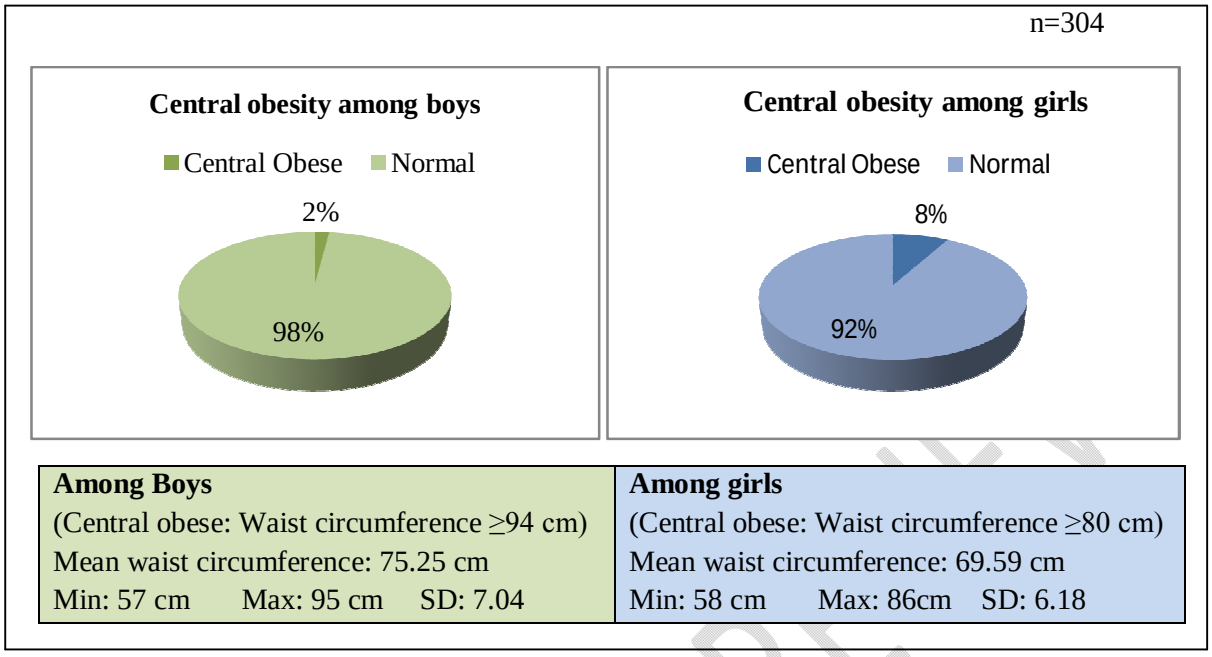

Figure 3: Central obesity of respondents

Figure 3 represents the central obesity of the respondent which shows that 3 (1.9%) of boys were central obese and 12 (8.1%) of girls were central obese. It shows that girls were more than four time central obese than boys. While measuring the waist circumference of the respondent, they are central obese if waist circumference is greater or equals to 94 cm in boys and greater or equals to 80 cm in female. In the study conducted by Castro et al. (2016) in Brazil shows the prevalence of abdominal obesity was 10.6% for the total sample (10.5% male, 10.8% female). The reasons for higher obesity among girls may be because of their fewer involvements in sports and other games. And difference in findings among above study may be because of difference in study site.

4.7 Association between parents' education and occupation with types of food provided

Table 4: Association between parents' education and occupation with food types

n=304

Education/ Occupation status		Food items (Snacks)			χ^2	P value
		Home made	Healthy canteen foods	Junk foods		
Education-Father	Illiterate	1	2	20	8.64	0.56
	Formal education	0	1	10		
	Primary	3	0	34		
	Secondary	9	5	65		
	Bachelors and above	11	10	70		
	Don't know	2	1	8		
Education-Mother	Illiterate	1	3	6	23.9	**0.008***
	Formal education	3	1	53		
	Primary	2	1	37		
	Secondary	12	5	59		
	Bachelors and above	5	8	44		
	Don't know	3	1	8		
Occupation-Father	Agriculture	2	2	26	26.9	**0.008***
	Business	3	6	44		
	Services	2	5	17		
	Labour	1	0	27		
	Foreign employment	8	1	40		
	Others	7	1	43		
	Don't know	3	4	10		
Occupation-Mother	Agriculture	1	3	12	17.2	0.14
	Business	1	2	31		
	Services	0	2	4		
	Labour	0	0	1		
	Foreign employment	0	0	3		
	Others	20	9	142		
	Don't know	4	3	14		

* Significant association i.e. p value<0.05

Table 4 shows that the food items provided to the adolescents is statistically significant with the educational status of mother. The mothers usually serve food items to the children and their educational status directly depends upon the types of food items they provided to their children. Most of the educated mothers provide healthy foods to their children. Further, it shows the significant association between occupation of father and food items the respondents' are provided as snacks. It shows most of the children whose father had a business consumed junk foods as snacks. This study contrasts to the study conducted in urban Nepal which shows the greater likelihood of being overweight or obese of children whose mothers in a professional field (aOR = 1.34, 95% CI: 1.02–4.05) (Karki et al., 2019) and study conducted in Dang Nepal by Regmi and Purushothama (2018) which shows significant association between BMI and occupation of mother (p=0.019). In addition, the study conducted in Lithuania showed statistical significant with obesity and education of parents (Smetanina et al. ,2015) and the study conducted in 20 Italian region also showed significant association with obesity (Lazzeri et al., 2014).

4.8 Association between gadgets use and nutritional status

Table 1: Association between gadgets use and nutritional status

n=304

Variables		Nutritional status				χ^2	P value
		Under weight	Normal weight	Over weight	Obese		
Gadgets at home	Yes	15	228	25	14	8.37	0.03*
	No	0	15	6	1		
Time spent on gadgets	less than 1 hour	4	92	7	6	7.89	0.54
	1-2 hours	6	102	13	8		
	2-3 hours	2	13	2	0		
	>3 hours	3	21	3	0		

* Significant association i.e. p value<0.05

The findings of this study (Table 5) shows significant association (p value: 0.03) with gadgets at home of the respondents and nutritional status however no association was found with duration of gazettes use by the respondents. This findings contrast with the findings of the study conducted among urban school students of Lalitpur sub-metropolitan city that

showed watching television for more than 2 h per day had association with obesity (Piryani et. al, 2016). In addition, the study conducted by Regmi and Purushothama (2018) in Tulsipur municipality, Dang shows that higher screening time for TV/Computer had association with obesity (p= <0.05).

4.9 Association between obesity and type of school

Table 2: Association between obesity and type of school

n=304

School type	Obesity		χ^2	P value
	Present	Absent		
Government	3	159	7	0.03*
Private	11	131		

* Significant association i.e. p value<0.05

The table 6 shows significant association between obesity and type of school (p value=0.03) which shows students studying in private schools are more obese compared to the government schools. A study by Sah et al.(2016) shows students studying in private schools and family income > Rs.10,000 were strongly associated with overweight and obesity and the study conducted in Tulsipur municipality, Dang also shows significant association i.e. p<0.05 between obesity and school type (Regmi & Purushothama ,2018).

5. Conclusion and Recommendation

There is a substantial burden of adolescent overweight and obesity in Nepal. The study provides evidence of the high prevalence of overweight among adolescents in the metropolitan municipality of Nepal which were at more risk of getting obesity. The occupation of parents and educational status is directly associated with the types of food provided to the adolescents which is directly related with the obesity. The gadgets at home and the type of schools show positive association with nutritional status in the study. The food preference of the respondents, the food groups they consumed, lack of physical exercise, preference of junk foods and juices, parental history of obesity, addiction to the gadgets and online games would lead to serious health effects in the future as well as in their academic performances.

The recommended measures from the study are as follows:

- Timely identification and prevention of overweight/obesity is required for prevention of development of other co morbidities.
- Healthy foods should be provided in home and school canteen strictly prohibiting junk foods.
- Students should be encouraged to do physical activities like walk, yoga, exercise, outdoor games etc.
- Program regarding weight management should be conducted for both teachers and students.
- Policies and programmes not only from the Ministry of Health and Population but also from the Ministry of Education and Ministry of Youth and Sports are needed to address this fast growing problem appropriately and in a timely manner.
- An enabling environment is of paramount importance to increase awareness about the risk factors for obesity in adolescence to decrease the prevalence of obesity associated NCDs in the upcoming generations of Nepal.

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