

## ASSOCIATED RISK FACTORS FOR OVERWEIGHT OR OBESITY AMONG YOUNG ADULTS: A COMMUNITY BASED CASE CONTROL STUDY

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### ABSTRACT

**Introduction:** Obesity is rapidly establishing itself as a public health problem. It leads to changes in disease structure which is evidenced by increasing non communicable disease related morbidities and mortality which can be observed in Nepalese young adults also. The objective of the study was to determine the factors associated with overweight or obesity among young adults of Dharan, Nepal.

**Methods:** A community based case control study was conducted among 200 respondents (100 cases and 100 controls) on the basis of body mass index (BMI) in age group 21-39 years. Respondents having BMI 18.5 to 22.9 kg/m<sup>2</sup> were categorized as control and BMI  $\geq 23$  kg/m<sup>2</sup> were categorized as case as per Asian criteria after gender matching. Odds ratio, bivariate and multivariate logistic regression analysis was done to examine association of different possible factors with overweight or obesity. **Results:** The average BMI and standard deviation (SD) among cases and controls were (27.32  $\pm$  2.84) and (21.11  $\pm$  1.28) respectively. Twelve possible risk factors were significantly associated with overweight or obesity in bivariate analysis. Final regression model suggests that age, occupation, frequency of snacks consumption, frequency of vegetable consumption and leisure time with no physical activity were the significant predictors of overweight or obesity after adjusting the effect of all possible risk factors. **Conclusions:** This study identifies some modifiable risk factors in context of Nepal. Awareness program including importance of physical activity on health should be organized to reduce the problem of overweight or obesity in the community.

**KEYWORDS:** Body mass index; case control study; overweight; obesity; risk factors.

### INTRODUCTION

The greatest challenge of 21<sup>st</sup> century in public health sector is controlling the widespread increased prevalence of overweight and obesity.<sup>[1]</sup> It is a chronic non communicable disease characterized by deposition of fat<sup>[2]</sup> which is associated with several chronic conditions.<sup>[3]</sup>

High incidence of obesity in adults was reported from developed countries like USA.<sup>[4]</sup> Obesity is now considered as an epidemic of the 21<sup>st</sup> century.<sup>[5]</sup> In 2014, more than 1.9 billion adults aged 18 years and older were overweight and over 600 million adults were obese around the globe.<sup>[6]</sup>

In Nepal also due to socio-demographic changes, changing lifestyle and people's inclination towards high

sugar and fatty diet leading towards double disease burden and multiple health problems in young adults. Therefore, the present study was carried out to determine the associated risk factors for overweight or obesity.

### MATERIALS AND METHODS

A community based case control study was conducted among 200 young adult respondents in Dharan-17 after obtaining ethical clearance from Institutional Review Committee (IRC/1042/017) of BPKIHS from December 2016 to August 2018. The possible associated variables like age, marital status, education, occupation, dietary habit, physical activity, immigration status from rural to urban, use of alcohol, watching television/using gadgets >2h/day, smoking, economic status, sleep/ rest, contraceptives used, etc were included in the study.

The sample size was calculated based on physical activities<sup>[7]</sup> at home per day among cases and control. Considering 87% of physical activities among normal weight sample and 73% among overweight or obesity sample, the sample size was calculated as 100 in each group after adding 10% non-response. A total of 200 samples were selected from the community using purposive sampling technique.

Anthropometric measurement and self developed semi structured interview schedule was used for data collection. Pretesting was done among 10% of total sample. Test of reliability on the basis of height, weight, BMI, waist circumference, hip circumference, waist hip ratio (WHR) were examined with Cronbach's alpha which shows a good reliability and has been expressed in terms of intra class correlation coefficient which was 0.744 (95% CI= 0.684 to 0.795).

Door to door survey was done for selection of case and control. Height, weight, waist circumference and hip circumference of respondents were measured by standardized technique and instruments. On the basis of BMI, respondents were classified as case and control. Respondent aged between 21-39 years and having BMI  $\geq 23\text{kg/m}^2$  were included in case group where as respondent aged between 21-39 years and having BMI

18.5 to 22.9  $\text{kg/m}^2$  were included in control group according to Asian criteria.<sup>[8]</sup> Both overweight and obesity were considered as single category. For each case same sex matched control from same study area were selected during data collection. Data other than anthropometric measurement was collected through face to face interview.

## STATISTICAL METHODS

The collected data were checked for its completeness and coding list was prepared. The data were entered into the Microsoft Excel 2007. Entered data were checked, verified and then transferred into SPSS 16 Version for further analysis. Bivariate regression analysis was done to find out the potential risk factors associated with overweight or obesity. Those variables which showed significant association ( $p < 0.05$ ) in bivariate analysis were subjected to multivariate logistic regression to find out the adjusted odds ratio.

## RESULTS

In the anthropometric characteristics, Mean  $\pm$  SD of BMI in case and control was (27.32 $\pm$ 2.84) and (21.107 $\pm$ 1.28) respectively. Mean  $\pm$  SD of WHR in case and control was (0.94 $\pm$ 0.06) and (0.81 $\pm$ 0.04) respectively (**Not shown in table**).

**Table 1: Association of socio demographic characteristics of respondents with overweight or obesity among adults in Dharan 17.**

Variables	Case (n=100)	Control (n=100)	OR	95% CI	P value
<b>Age Group</b>					
$\leq 25$	20	35	1	Ref.	
26-30	24	32	1.31	0.61-2.81	0.485
31-35	26	26	1.75	0.81-3.79	0.156
$> 35$	30	7	<b>7.5</b>	2.79-20.17	<b>&lt;0.001</b>
<b>Marital Status</b>					
Single	17	34	1	Ref.	
Married	83	66	<b>2.52</b>	1.29-4.89	<b>0.007</b>
<b>Educational Status</b>					
Higher education	7	15	1	Ref.	
Secondary	52	54	<b>2.06</b>	0.779-5.469	0.145
Primary level	31	21	<b>3.06</b>	1.064-8.804	<b>0.038</b>
No formal education	10	10	<b>2.36</b>	0.682-8.147	0.175
<b>Occupation</b>					
Agriculture and others	14	28	1	Ref.	
Job	11	21	1.05	0.39-2.77	0.925
Homemaker	38	30	<b>2.53</b>	1.14-5.64	<b>0.023</b>
Business	37	21	<b>3.52</b>	1.53-8.13	<b>0.003</b>

Significantly higher risk was associated among  $> 35$  years (OR-7.5,  $p < 0.001$ ) in reference to  $\leq 25$  years of age group. Similarly married respondents were 2.52 times at risk of being overweight or obese ( $p = 0.007$ ). Those who were educated up to primary level were 3.06 times more prone to be overweight or obese than those who had higher level education ( $p = 0.032$ ). Pearson Chi-square

shows significant association between occupation like business workers (OR-3.52,  $p = 0.032$ ), homemaker (OR-2.53,  $p = 0.023$ ) with overweight or obesity (**Table 1**).

**Table 2: Association of dietary pattern, alcohol intake and smoking with overweight or obesity among adults in Dharan 17**

Variables	Case (n=100)	Control (n=100)	OR	95% CI	P value
<b>Frequency of snacks per day</b>					
Never	15	29	1	Ref.	
Once	47	50	1.82	0.87-3.81	0.113
twice or more	38	21	<b>3.49</b>	1.54-7.94	<b>0.003</b>
<b>Frequency of vegetable consumption</b>					
Regular	65	48	1	Ref.	
3-5 times in a week	17	31	0.41	0.20-0.82	<b>0.011</b>
1-3 times in a week	18	21	0.63	0.30-1.32	0.221
<b>Frequency of fruits intake</b>					
Never	7	11	1	Ref.	
once in a week	25	32	1.23	0.42-3.62	0.71
1-3 times in a week	38	40	1.49	0.52-4.25	0.453
3-5 times in a week	7	8	1.39	0.34-5.51	0.653
Regularly	23	9	<b>4.02</b>	1.18-13.62	<b>0.026</b>

Respondents who took snacks twice or more in a day were 3.49 times at risk of being overweight or obese (P value=0.003). There is significant association between

taking vegetables 3-5 times in a week only and risk of being overweight or obese (p=0.011). Regular fruits consumption was found more likely to be associated with overweight or obesity (OR=4.02, P = 0.026) (Table 2).

**Table 3: Association of physical activity, exercise with overweight or obesity among adults in Dharan 17.**

Variables	Case (n=100)	Control (n=100)	OR	95% CI	P. value
<b>Indoor Activities</b>					
Regularly	71	62	1	Ref.	
Frequently	5	13	0.34	0.11-0.99	<b>0.049</b>
Occasionally	10	16	0.55	0.23-1.29	0.168
Seldom	14	9	<b>1.36</b>	0.55-3.36	0.507
<b>Exercise</b>					
Regularly	21	9	1	Ref.	
1-5 times in a week	9	7	0.55	0.16-1.94	0.354
3-5 times in a month	6	11	0.23	0.06-0.83	<b>0.024</b>
Never	64	73	0.38	0.16-0.88	<b>0.024</b>

Those respondents who perform indoor activities frequently were significantly associated with risk of

overweight or obesity. There was significant association between doing exercise 3-5 times in a month (p=0.024) and risk of overweight or obesity (Table 3)

**Table 4: Association of leisure time and sleeping pattern with overweight or obesity among adults in Dharan 17.**

Variables	Case (n=100)	Control (n=100)	OR	95% CI	P. value
<b>Leisure Time with no physical activity</b>					
<4 hours	42	61	1	Ref.	
4-8 hours	28	29	1.4	0.73-2.69	0.309
> 8 hours	30	10	<b>4.36</b>	1.93-9.86	<b>&lt;0.001</b>
<b>Hours spending in gadgets</b>					
Less than one hour	28	31	1	Ref.	
1-2 hours	18	24	0.83	0.37-1.84	0.647
2-4 hours	11	26	0.47	0.19-1.12	0.088
More than four hours	43	19	<b>2.51</b>	1.19-5.27	<b>0.015</b>
<b>Daytime Sleep</b>					
Never	56	52	1	Ref.	
1-3 times/month	5	14	0.33	0.11-0.99	<b>0.047</b>
3-5 times/month	25	24	0.97	0.49-1.90	0.923
3-5 times/week	6	5	<b>1.11</b>	0.32-3.87	0.865
Regularly	8	5	<b>1.49</b>	0.46-4.83	0.511

Those respondents who spent >8 hours leisure time without any physical activity were 4.36 times more likely to be overweight or obesity which was statistically significant ( $p < 0.001$ ). There was significant relationship

between sleeping at day time; 1-3 times in a month and those who regularly sleep at day time were 1.49 times at risk of being overweight or obese (**Table 4**).

**Table 5: Multivariate logistic regression showing adjusted potential risk factors with overweight or obesity among adults in Dharan 17.**

Variables	Beta Value	Standard Error	Wald	DF	P. Value	OR (adj.)	95% CI
<b>Age group</b>							
<25						Ref.	
26-30	0.515	0.55	0.877	1	0.349	1.673	0.57-4.92
31-35	0.351	0.58	0.367	1	0.545	1.421	0.46-4.43
>35	2.005	0.669	8.975	1	<b>0.003</b>	<b>7.428</b>	2-27.58
<b>Marital Status</b>							
Married	1.171	0.58	4.073	1	<b>0.044</b>	<b>3.226</b>	1.03-10.06
Single						Ref.	
<b>Occupation</b>							
Agriculture and others						Ref.	
Job	-0.033	0.704	0.002	1	0.962	0.967	0.24-3.85
Homemaker	0.46	0.645	0.509	1	0.475	1.585	0.45-5.61
Business	1.466	0.677	4.687	1	<b>0.03</b>	<b>4.331</b>	1.15-16.33
<b>Frequency of snacks intake per day</b>							
Never						Ref.	
Once	0.652	0.502	1.687	1	0.194	1.919	0.72-5.13
twice or more	1.618	0.568	8.111	1	<b>0.004</b>	<b>5.043</b>	1.66-15.36
<b>Leisure time with no physical activity</b>							
< 4 hours						Ref.	
4-8 hours	0.97	0.438	4.902	1	<b>0.027</b>	<b>2.638</b>	1.12-6.23
> 8 hours	2.512	0.601	17.488	1	<b>0</b>	<b>12.328</b>	3.79-40.01

After adjusting significant effects of variables in Multivariate Logistic Regression; age, marital status, occupation, frequency of snacks intake per day and leisure time with no physical activity were found to be significant factors for overweight or obesity (**Table 5**).

## DISCUSSION

This study shows strong association between age and risk of overweight or obesity which is similar with cross sectional study done in Ghana,<sup>[9]</sup> which shows strong association between age and risk of overweight or obesity.

In a cross sectional study,<sup>[9]</sup> the finding of Multiple Logistic Regression shows strong association between marital status and risk of being overweight or obesity which supports this current study that there was significant association in bivariate analysis. Married respondents were 3.22 times risk of being overweight or obese than single even in the multivariate analysis result. Finding of the same study shows no association between educational status and risk of overweight or obesity but this study finds significant association between primary educational attainment and risk of overweight or obesity. At the same time another case control study<sup>[10]</sup> shows no significant association between educational attainment and risk of overweight or obesity.

Similarly another study<sup>[11]</sup> done with the aim to see relationship between occupation and weight gain and life style factors among employees shows strong association ( $P < 0.0001$ ) between respondents job and risk of overweight or obesity. This finding is contrast with the current study result that there was no significant association between job holders and risk of overweight or obesity.

The current study also shows that there is an increasing risk (OR 3.49, 95% CI 1.54-7.94) of becoming overweight or obesity who intake snacks two or more times per day. It contradicts with a study result done in University of Hail, Saudi Arabia<sup>[12]</sup> that there is no significant relationship between frequencies of snacking with overweight or obesity. Snacks such as fast food high in fat and salt may be related to obesity.

A cross sectional study<sup>[13]</sup> conducted in Saudi Arabia shows no significant association ( $P=0.051$ ) between frequency of vegetable intake and risk of overweight or obesity. This finding contradicts the current study that shows significant association ( $P=0.011$ ) between frequency of vegetable intake and risk of overweight or obesity. It also revealed that the less you consume vegetables; the more risk for overweight or obesity.

This study reveals that there was significant association ( $P = 0.04$ ) between doing physical activities frequently

and overweight or obesity. It also signifies that those respondents who seldom do physical activities are 1.36 times at risk of being overweight or obese in comparison to those who perform physical activities regularly. This study is supported by the cross sectional study<sup>[9]</sup> done in Ghana that shows significant association ( $P = 0.03$ ) between physical activity and risk of overweight or obesity. It also reveals that there is increased risk of overweight or obesity among inactive individuals than those who are active. Physical activities and exercise<sup>[14]</sup> have the ability to regulate food intake. Increasing physical activities most certainly can create energy deficit through increased energy expenditure. So, physical activities and exercise hold potential solution for the ongoing obesity epidemic.

The case control study<sup>[15]</sup> done in eight cities of China to see risk factors of overweight or obesity shows no significant association ( $P = 0.73$ ) between exercise with risk of overweight or obesity. But this current study finds significant association ( $P = 0.024$ ) between exercise and obesity and those who never perform exercise were 2.62 times at risk of overweight or obesity than those who perform exercise regularly.

Similarly case control study<sup>[16]</sup> conducted among young adult Singaporean males shows that those who performed exercise less than one hour per day were at 2.97 times risk of overweight or obesity than those who perform exercise more than one hour per day. This current study doesn't show significant association among those who perform exercise less than 1 hour per day or more than 1 hour per day.

Current study reveals that the more you spend time in gadgets, the more it has risk of overweight or obesity. This finding is supported by the cross sectional study<sup>[17]</sup> conducted in Meerut which shows significant association between spending more hours watching TV increases the risk for overweight or obesity. Commercials and mass media have significant effect on our eating habits. The amount of time spent in front of the television<sup>[18]</sup> and the content watched can be a reason for developing obesity. Using gadgets does not only contribute to physical inactivity but also encourages us to eat more which leads to increased energy intake through snacking and eating meal.

Present study shows that those respondents who get >8 hours leisure time with no physical activity ( $p < 0.001$ ), are significantly associated with overweight or obesity. This finding is contradicted with cross sectional study<sup>[19]</sup> done in working adults of China which depicts that there is no significant association ( $P = 0.28$ ) between sitting leisure time with no physical activity and risk of overweight or obesity. Men with leisure sitting time < 2.5 hour /day had a significantly lower risk of abdominal overweight or obesity than those sitting  $\geq 4$  hours/ day. The person who gets more leisure time will spend less time in physical activities. Spending leisure time by

sleeping, using gadgets and staying still decreases energy expenditure. Also the individual can eat more amount of food frequently which may lead them to overweight or obesity.

## CONCLUSIONS

The present study identifies the factors associated with overweight or obesity among adults of Dharan metropolitan which were; age, marital status, education level, occupation, frequency of eating snacks per day, frequency of vegetable consumption, frequency of fruits intake, frequency of sweet intake, indoor activities, hours spending in gadgets, leisure time with no physical activity, exercise, daytime sleep are independently associated with overweight or obesity.

Except age, all factors are modifiable risk factors. So, community based awareness program could help to reduce overweight or obesity among adults. Interventions such as sports, fit clubs, promoting physical activity should be implemented in community level by the government.

**Conflict of Interest:** None.

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