Research Article

# Association of dietary practice with body mass index among late adolescent and their health risk habits

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## ABSTRACT

**Background:** Nutritional intake has great impact during the adolescent period due to their physical and mental growth and development. **Objective:** This study was designed to see the association of dietary practice with body mass index (BMI) among adolescent and their health risk habits. **Materials and Methods:** A total of 212 adolescents from three government schools of Butwal sub-metropolitan city were randomly selected to participate in this cross-sectional study. A semi-structured, self-administered questionnaire was provided to collect information. Height and weight were measured. SPSS software version 21 was used for data analysis; Chi-square test was applied to see association and $P \leq 0.05$ was taken as statistically significant. **Results:** The mean age of the respondent was 17 ± 1.19 years. Nearly 60% of them were female. Their BMI was ranging from 12.84 to 40.58 kg/m$^2$ with average 20.77 ± 3.52 kg/m$^2$. About 33% of the adolescents were malnourished, among them, 23.6% were underweight. Nearly one-fourth of the respondent had consumed alcohol which was 7% in case of drugs. Among the girls, non-smokers were 90.6% while it was 70.6% for boys. Health risk habits were significantly common among boys. **Conclusion:** Proportion of overweight among adolescent is increasing while underweight is still a significant problem. Health risk habits are also being common which is an alarming situation in public health.

**KEY WORDS:** Adolescent; Body Mass Index; Nutrition; Practice

## INTRODUCTION

According to the World Health Organization (WHO), one in six of the world's population is adolescents aged 10–19.[1] Nutritional intake has great impact on adolescent period due to their physical and mental growth and development.

Adolescents are becoming more independent and making many food decisions on their own, leading to eat more meals away from home than younger children.[1]

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Many boys and girls in developing countries enter adolescence undernourished while at the other end of the spectrum, the number of adolescents who are overweight or obese is increasing in low, middle, and high-income countries.

Drug use among 15–19 years old is also an important global concern. The vast majority of people using tobacco today began doing so when they were adolescents. Globally, at least 1 in 10 adolescents aged 13–15 years uses tobacco, although there are areas where this figure is much higher.[2]

## MATERIALS AND METHODS

This descriptive cross-sectional study was carried out in April 2018. Students who were 15–19 years were taken as the study population because this age group is the highest risk group to develop health risk habits. Information was collected from

three government schools of Butwal sub-metropolitan city which were Kalika Manavgyan Secondary School, Nabin Audhyogic Kadar Bahadur Rita Secondary School, and Shree Naharpur Secondary School.

Simple random sampling technique was used to select the three schools; similarly, 212 students were selected randomly from their class roll number from Grade 10, 11, and 12. Information related to sociodemography, knowledge on nutrition and practice of healthy eating, health risk behavior, and anthropometric data were recorded in semi-structured self-administrated questionnaire. Weighing machine and measuring tape were used to measure the weight and height of the respondent and the WHO guideline was followed to calculate their body mass index (BMI) and classify them in different group. The content validity of the tool was done through consultation with research advisor, subject teachers, and experts. Reliability of the instrument was maintained by pre-testing the instruments among 10% of the sample size at Butwal secondary school. Ethical clearance was obtained from the institutional ethical review committee. Proposal was approved and prior permission was taken from concerned authorities and informed consent was taken from respondents. Adolescents aged between 10 and 14 years and who were not willing to participate were excluded from the study.

### Statistics

Sample size was calculated using formula $n = Z^2.p.q/d^2$; where, confidence interval (CI) was 95% and level of error was 5%. Data were processed through using computer software SPSS version 20 and Microsoft Excel 2013. Data were analyzed and interpreted using descriptive statistics such as frequency, percentage, and mean, standard deviation. Chi-square test was applied to analyze qualitative data while $P \leq 0.05$ was taken as statistically significant.

## RESULTS

A total of 212 respondents age ranging from 15 to 19 years were included in this study. Among them, 60% were girls while almost half of them were Brahmin/Chhetri. Majority of the respondents were Hindu and proportion of normal BMI was more among them 130 (68.4%); however, almost one-third of them were malnourished. The association of religion and BMI was statistically significant ($P = 0.01$) [Table 1].

Mean age of the respondents was 17.12 ± 1.19 years ranging from 15 to 19. Height of the respondents was measured from 1.11 m to 1.94 m with average 1.55 ± 0.12 m and weight of them varied from 35 kg to 75 kg (mean 49.97, SD=7.69). Their BMI was calculated as minimum as 12.84 and maximum was 40.58 kg/m$^2$ ± 3.52. Normal BMI was reducing while age was increasing even though there was no significant relationship in between age and BMI.

Average height (1.51 m) and weight (47.59 kg) of girls' were lesser than boys' average height (1.62 m) and weight (53.52); however, the average age and BMI were greater among girls.

Table 2 shows the family background of the respondents. About 16% of respondents had illiterate mother while only 4% had graduate mothers. The occupation of mother was

**Table 1:** Sociodemographic information and BMI

| Variables | Category of BMI | | | | | |
|---|---|---|---|---|---|---|
| | Underweight (%) | Normal (%) | Overweight (%) | Obese (%) | Total (%) | *P* value |
| Age of the respondent | | | | | | |
| 15 | 4 (20) | 15 (75) | 1 (5) | 0 | 20 (9.4) | *P*=0.22 |
| 16 | 12 (23.1) | 38 (73.1) | 2 (3.8) | 0 | 52 (24.5) | |
| 17 | 11 (22.4) | 34 (69.4) | 4 (8.2) | 0 | 49 (23.1) | |
| 18 | 15 (23.1) | 40 (61.5) | 9 (13.8) | 1 (1.5) | 65 (30.7) | |
| 19 | 8 (30.8) | 15 (57.7) | 1 (3.8) | 2 (7.7) | 26 (12.3) | |
| Sex of the respondent | | | | | | |
| Boys | 19 (22.4) | 59 (69.4) | 6 (7.1) | 1 (1.2) | 85 (40.10) | *P*=0.93 |
| Girls | 31 (24.4) | 83 (65.4) | 11 (8.7) | 2 (1.6) | 127 (59.90) | |
| Caste of the respondent | | | | | | |
| Brahmin/Chhetri | 27 (26.2) | 62 (60.2) | 12 (11.7) | 2 (1.9) | 103 (48.60) | *P*=0.29 |
| Janajati | 17 (22.1) | 57 (74.0) | 2 (2.6) | 1 (1.3 | 77 (36.30 | |
| Dalit | 6 (18.8) | 23 (71.9) | 3 (9.4) | 0 | 32 (15.10) | |
| Religion of respondent | | | | | | |
| Hindu | 43 (22.6) | 130 (68.4) | 15 (7.9) | 2 (1.1) | 190 (89.6) | *P*=0.01 |
| Buddhist | 3 (50.0) | 3 (50.0) | 0 | 0 | 6 (2.8) | |
| Christian | 3 (25.0) | 7 (58.3) | 2 (16.7) | 0 | 12 (5.7) | |
| Muslim | 1 (25.0) | 2 (50.0) | 0 | 1 (25.0) | 4 (1.9) | |

BMI: Body mass index

significantly associated ($P$ = 0.04) with the BMI of their children. Businesswomen had more underweight children while mother who was in service had more overweight children. Proportion of children from those families who had <10,000 monthly income was less in normal BMI group while almost half of the respondents had monthly income ranging from 20,000 to 40,000 with greater proportion (67%) of healthy children.

**Table 2:** Family background and BMI

| Variables | Category of BMI | | | | | |
|---|---|---|---|---|---|---|
| | Underweight (%) | Normal (%) | Overweight (%) | Obese (%) | Total (%) | *P* value |
| Education of mother | | | | | | |
| Illiterate | 3 (8.8) | 28 (82.4) | 3 (8.8) | 0 | 34 (16.0) | *P*=0.10 |
| Primary | 18 (27.7) | 42 (64.6) | 4 (6.2) | 1 (1.5) | 65 (30.7) | |
| Secondary | 24 (30.0) | 49 (61.3) | 6 (7.5) | 1 (1.3) | 80 (37.7) | |
| Higher secondary | 3 (13.0) | 19 (79.2) | 2 (8.7) | 0 | 24 (11.3) | |
| Bachelor and above | 2 (22.2) | 4 (44.4) | 2 (22.2) | 1 (11.1) | 9 (4.2) | |
| Occupation of mother | | | | | | |
| Housewife | 36 (24.2) | 103 (69.1) | 8 (5.4) | 2 (1.3) | 149 (70.3) | *P*=0.04 |
| Business | 11 (27.5) | 25 (62.5) | 4 (10.0) | 0 | 40 (18.9) | |
| Service | 0 | 5 (62.5) | 2 (25.0) | 1 (12.5) | 8 (3.8) | |
| Labor | 3 (20.0) | 9 (60.0) | 3 (20.0) | 0 | 15 (7.1) | |
| Monthly family income | | | | | | |
| <10,000 | 7 (21.90) | 20 (62.50) | 5 (15.60) | 0 | 32 (15.10) | *P*=0.17 |
| 10,000–20,000 | 12 (31.60) | 25 (65.80) | 1 (2.60) | 0 | 38 (17.90) | |
| 20,000–30,000 | 11 (23.90) | 31 (67.40) | 3 (6.50) | 1 (2.20) | 46 (21.70) | |
| 30,000–40,000 | 10 (18.90) | 36 (67.90) | 7 (13.20) | 0 | 53 (25) | |
| 40,000–50,000 | 6 (25.00) | 16 (66.70) | 0 | 2 (8.30) | 24 (11.30) | |
| >50,000 | 4 (21.10) | 14 (73.70) | 1 (5.30) | 0 | 19 (9) | |
| Total | 50 (23.6) | 142 (67.0) | 17 (8.0) | 3 (1.4) | 212 (100) | |

BMI: Body mass index

**Table 3:** Nutritional practice and BMI

| Variables | Category of BMI | | | | | |
|---|---|---|---|---|---|---|
| | Underweight (%) | Normal (%) | Overweight (%) | Obese (%) | Total (%) | *P* value |
| Major meals per day | | | | | | |
| Once | 1 (50.00 | 1 (50.00) | 0 | 0 | 2 (0.90) | *P*=0.173 |
| Twice | 25 (29.10 | 59 (68.60) | 2 (2.30) | 0 | 86 (40.80) | |
| 3 times | 15 (17.20) | 58 (66.70) | 12 (13.80) | 2 (2.30) | 87 (41.2) | |
| 4 times or more | 9 (25.00) | 24 (66.67) | 3 (8.30) | 1 (2.80) | 36 (17.1) | |
| Place of eating afternoon snacks/khaja | | | | | | |
| Home | 20 (28.60) | 45 (64.30) | 4 (5.70) | 1 (1.40) | 70 (33.00) | *P*=0.73 |
| School canteen | 13 (20.60) | 46 (73.00) | 4 (6.30) | 0 | 63 (29.70) | |
| Restaurant | 8 (26.70) | 18 (60.00) | 3 (10.00) | 1 (3.30) | 30 (14.20) | |
| Thela/street | 9 (18.40) | 33 (67.30) | 6 (12.20) | 1 (2.00) | 49 (23.10) | |
| Types of food commonly eating as afternoon snacks/khaja | | | | | | |
| Noodles AND biscuits | 11 (18.30) | 48 (80.00) | 1 (1.70) | 0 | 60 (28.30) | *P*=0.15 |
| Panipuri and chatpate | 11 (17.50) | 44 (69.80) | 7 (11.10) | 1 (1.60) | 63 (29.70) | |
| Momo and chaumin | 15 (29.40) | 30 (58.80) | 5 (9.80) | 1 (2.00) | 5 (24.10) | |
| Tea and bread | 13 (34.20) | 20 (52.60) | 4 (10.50) | 1 (2.60) | 38 (17.90) | |
| Activities to maintain body weight | | | | | | |
| Dieting | 6 (25.0) | 15 (62.5) | 3 (12.5) | 0 | 24 (11.3) | *P*=0.19 |
| Exercise | 19 (24.1) | 50 (63.3) | 10 (12.7) | 0 | 79 (37.3) | |
| Nothing | 25 (22.9) | 77 (70.6) | 4 (3.7) | 3 (2.8) | 109 (51.4) | |

BMI: Body mass index

Table 3 shows the relation of nutritional practice and BMI. Most of the respondents (97.60%) had their lunch at their home while only one-third (33.00%) had their afternoon snacks (khaja) at home instead they prefer to eat outside including 49 (23.10%) who consumed street food. Students who ate at school canteen had comparatively greater proportion of 46 (73.00%) of normal BMI. Street food such as panipuri and chatpate which does not consider as healthy food was consumed by 63 (29.70%) respondents. More than one-third (35.80%) of the respondents had chapatti in dinner instead of rice. In case of activities to maintain body weight, majority of them (51.4%) were not doing anything while 37.3% (79) were doing exercise.

Only 47.2% of respondents had the habit of regular breakfast and two-third of the respondents were non-vegetarian while 7.50% (16) ate eggs even though they were vegetarian. Regarding the habit of fruit consumption, only 13.70% (29) of the respondents did not consume fruits even once during the week before the study while 23.60% (50) consumed fruits daily. Most of them consumed fast food and cold drinks. Fruits and cold drink consumption habit were statistically significant. In case of checking fast food before purchasing**,** 45.28% never check labeling of fast food while 37.7% check sometimes only [Table 4].

Regarding the health risk behavior, 16.5% (37) of the respondents had smoke and 5.7% were habitual smoker, among them, 11.8% were boys and 1.6% were girls. Among the girls, non-smoker was 90.6% (115) while it was 70.6% (60) for boys. Similarly, 77.9% (165) of respondents were never drink alcohol which was 84.3% among girls and only 68.2% among boys. Those who drank alcohol sometimes only were 14.6% while 7.5% consumed alcohol frequently. Moreover, 6.6% (14) of the respondents even tried drugs at least once which were 1.6% (2) among girls and 14.1% (12) among boys. Health risk behavior was more common among boys in comparison to girls with significant association. p value of smoking, alcoholism, and drugs consumption habit among girls and boys was 0.000, 0.012, and 0.000, respectively.

Regarding BMI, 23.6% (50) of the respondents were underweight and 8.0% (17) of them were overweight while 1.4% (3) of them were having obesity. Only about one-third (142) of them were having normal BMI. Underweight girls were 24.4% (31) while boys were 22.4% (19); on the other hand, overweight was 8.7% (11) and 7.1% (6) among girls and boys, respectively. Obesity was 1.6% (2) among girls while only 1.2% (1) boys were obese. Proportion of malnutrition was more common among girls in comparison to boys; however, it was not significant statistically ($P = 0.944$).

**Table 4:** Eating habit and BMI

| Variables | Category of BMI | | | | | *P* value |
|---|---|---|---|---|---|---|
| | Underweight (%) | Normal (%) | Overweight (%) | Obese (%) | Total (%) | |
| Habit regarding non-vegetarian food | | | | | | |
| Vegetarian | 11 (19.60) | 38 (67.90) | 6 (10.70) | 1 (1.80) | 56 (26.40) | *P*=0.75 |
| Eggetarian | 3 (18.80) | 13 (81.20) | 0 | 0 | 16 (7.50) | |
| Non-vegetarian | 36 (25.70) | 91 (65.00) | 11 (7.90) | 2 (1.40) | 140 (66.00) | |
| Habit of fast food consumption* | | | | | | |
| Daily | 16 (23.20) | 47 (68.10) | 4 (5.80) | 2 (2.90) | 69 (32.50) | *P*=0.35 |
| 2–3 times a week | 19 (24.70) | 51 (66.20) | 7 (9.10) | 0 | 77 (36.30) | |
| Once a week | 8 (17.80) | 31 (68.90) | 6 (13.30) | 0 | 45 (21.20) | |
| Occasionally | 7 (33.30) | 13 (61.90) | 0 | 1 (4.80) | 21 (9.90) | |
| Never | 2 (50.00) | 1 (25.00) | 1 (25.00) | 0 | 4 (1.90) | |
| Habit of cold drinks** consumption | | | | | | |
| Daily | 7 (41.2) | 10 (58.8) | 0 | 0 | 17 (8.0) | *P*=0.002 |
| 2–3 times a week | 23 (29.9) | 46 (59.7) | 7 (9.1) | 1 (1.3) | 77 (36.3) | |
| Once a week | 7 (10.6) | 50 (75.8) | 7 (10.6) | 2 (3.0) | 66 (31.1) | |
| Occasionally | 13 (25.0) | 36 (69.2) | 3 (5.8) | 0 | 52 (24.5) | |
| Never | 1 (20.0) | 2 (40.0) | 1 (20.0) | 1 (20.0) | 5 (2.4) | |
| Fruit consumption during the past 7 days | | | | | | |
| Not even once | 2 (6.90) | 23 (79.30) | 2 (6.90) | 2 (6.90) | 29 (13.70) | *P*=0.02 |
| Once | 6 (14.60) | 30 (73.20) | 4 (9.80) | 1 (2.40) | 41 (19.30) | |
| 2–3 times | 24 (26.10) | 62 (67.40) | 6 (6.50) | 0 | 92 (43.40) | |
| Daily | 18 (36.00) | 27 (54.00) | 5 (10.00) | 0 | 50 (23.60) | |
| Total | 50 (23.6) | 142 (67.0) | 17 (8.0) | 3 (1.4) | 212 (100) | |

*Fast food – Lays, Kurkure, chatpate, panipuri, and noodles, **Cold drinks – Coca-Cola, Fanta, Sprite, and Pepsi. BMI: Body mass index

## DISCUSSION

In the present study of 212 respondents including 40.10% (85) of boys and 59.90% (127) of girls had age range from 15 years to 19 years with mean age of 17 ± 1.19 years, height varied from 1.11 m to 1.94 m (mean 1.55 ± 0.12 m) and weight 35 kg to 75 kg (mean 49.97 ± 7.69). Their BMI was calculated as minimum as 12.84 and maximum was 40.58 with average 20.77 ± 3.52 kg/m$^2$. The average BMI of boys was 20.44 ± 2.87 kg/m$^2$ while girls had 20.99 ± 3.89 kg/m.$^2$ Normal BMI was inverse to the age of respondents; however, there was no significant relationship in between age and BMI ($P$ = 0.22). BMI, 23.6% (50) of the respondents were underweight and 8.0% (17) of them were overweight while 1.4% (3) of them were having obesity. Underweight girls were 24.4% (31) while boys were 22.4% (19); on the other hand, overweight was 8.7% (11) and 7.1% (6) among girls and boys, respectively. Obesity was 1.6% (2) among girls while only 1.2% (1) of boys were obese. Health risk habits were more prevalent among boys in comparison to girls.

A study conducted by Lopez *et al*.[3] showed that average age was 14 ± 1 years, weight (kg) 58.87 ± 12.08, and height (cm) 160.85 ± 7.74. BMI was higher for the girls group (23.22 ± 4.16 kg/m$^{2\ vs.}$ 22.19 ± 4.11 kg/m$^2$; $P < 0.001$), and the BMI mean value altogether was 22.71 ± 4.16 kg/m$^2$. Even though the age of the respondents was lower than the present study's respondents, the weight was higher which leads to higher BMI among Chilean students which may be due to different eating habits, culture, and lifestyle of the respondents. The findings of this study are similar to the findings of Nepal Census 2011,[4] where majority of the respondents were Brahmin/Chhetri, followed by Janajati and Dalit. In case of religious distribution, Hindu was the main religion (81.3%), 9% were Buddhist, and 1.4% were Christian.[5] According to the Adolescent Nutrition Survey,[6] highest proportion of undernourished adolescents was observed among Muslim 81% (95 % CI: 63.2–91.1), followed by Hindu 66% (95% CI: 55.7–74.4), Christian 65% (95% CI: 48.2–78.3), and Buddhist 55% (95% CI: 40.2–68.7).

Regarding the categories of BMI in this study, 23.6% of them were underweight and 8.0% of them were overweight while 1.4% of them had obesity. Underweight girls were 24.4% while boys were 22.4%; on the other hand, overweight was 8.7% and 7.1% among girls and boys, respectively. Obesity was 1.6% among girls while 1.2% of boys were obese. Proportion of malnutrition was more common among girls in comparison to boys; however, it was not significant statistically ($P$ = 0.944). According to the Adolescent Nutrition Survey,[6] overall 65% (95 % CI: 54.9–73.7) of adolescents were underweight. Furthermore, 42% (95% CI: 31.6–53.7) of late adolescents were underweight at the time of study. Only 1.8% were overweight among late adolescents. Not like nutrition survey, the overweight and obesity were more among the adolescent of this study which might showing the growing proportion of overnutrition in urban area of Terai region than in all area of Nepal.

A study by Benazeera and Umarani[7] found that equal numbers (34%) of adolescents belong to normal and underweight, 21.33% were obese, and 10.67% were overweight. Similarly, next study conducted in Saudi Arabia showed that underweight 28.6%, normal weight 53.3%, overweight 12.4%, and morbid obesity 5.7%.[8] Next study by Pramila Poudel showed more proportion of underweight (50.5%) than respondents with normal BMI (47.3%) and only 2.3% were overweight.[9] The study by AyselÖzdemir found obese and overweight rates as 3.3% and 12.6%, respectively.[10] The mean BMI in the adolescents at ages of 15–18 revealed 21.9 ± 4.7 kg/m$^2$ and 22.2 ± 3.7 kg/m$^2$ for girls and boys, respectively.[11] Various studies reported adolescent obesity rates of 4.1–8.2% and being overweight rates of 8.8–14.3%.[12] Waweru and Marete found that the prevalence of overweight and obesity among the study participants was 20% and 1%, respectively, while that of underweight was 14%.[13] The study done in Bangalore city had different findings with the present study, where 69.2% were underweight, 3.4% were overweight, and only 27.4% were well nourished. It may be due to their different food habit, lifestyle, and culture.[6,14]

The present study revealed that nearly four-fifth of the respondents ate panipuri, chatpate, noodles, biscuits, momo, chaumin, etc., for snacking which similar to the Barooadh's adolescents' nutrition study[15] where most of the adolescents agreed that they ate foods such as maggi noodles, samosas, burgers, chops, puffs pastries, chaats, chips, bhujia, popcorns, ice cream, and so on for snacks which shows similar habit of similar age group in different setting. According to the Adolescent Survey,[6] 94.2% of adolescent use fast food which was similar to the present study which found almost all respondents (98%) consume fast food. Regarding the health risk habit such as smoking and alcoholism,17.5% (37) of them had smoked either regularly or sometimes and 22.2% (47) of them had similar response regarding alcohol use. There were more alcohol users than smokers which may be due to cultural acceptance of the alcohol. The findings of the Adolescent Survey[6] among late adolescent (15–19 years) were different from the present study which showed the prevalence of smoking and alcoholism 5.7% and 6.8%, respectively. From this finding, it is understandable that health risk habit was more common among adolescents of urban area.

This study will serve as guidelines for health planners, health policymakers, community health workers to formulate plans, and strategies to improve the nutritional habits and to prevent health risk habits of adolescents. The findings of the study will help the health worker and school administration as well as parents to guide adolescent to adopt healthy eating habit while avoiding risky behavior. Along with the study was not able to include those adolescents who were out of the

school since this study was school-based study. This study was conducted in a city of western Nepal so the scenario of rural adolescent may be different that's why it may not be appropriate to generalize the findings in the national context until conduction of larger study.

## CONCLUSION

Consuming cold drinks and fast food were common among late adolescent students in urban area. Due to unhealthy eating habit, they are not able to maintain normal BMI. Together with that, they are adopting health risk habits which are problematic and need immediate attention for healthy future generation.

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