Study on assessment of BMI and its correlation with various lifestyle-associated factors in mid-adolescent schoolchildren

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ABSTRACT

Background: The problem of the double burden of malnutrition is being faced by India, in which one end consists of childhood and adolescent obesity and other end includes undernutrition. **Objective:** The present study aimed to assess the body mass index (BMI) and its correlation with various lifestyle-associated factors in mid-adolescent schoolchildren. **Materials and Methods:** The study was carried out among 605 students of classes 9th–12th of a school in Central India and in the age group of 15–17 years. The students were surveyed through an age appropriate modified Global School-Based Student Health Survey self-administered questionnaire. The height and weight were measured using standardized equipment and procedure. **Results:** Out of 605 schoolchildren, there were 243 (40%) males and 362 (60%) females. There was statistically significant association of BMI with hygiene habits ($P = 0.001$), dietary habits ($P = 0.017$), protective factors ($P = 0.001$), physical violence ($P = 0.035$), and dietary factor, i.e., use of vegetable in diet and use of fast food ($P = 0.05$). However, various other factors such as mental health, social media, and substance abuse were not found to be statistically significant. **Conclusion:** We found that there is a significant association present between BMI and few of the lifestyle-associated factors. Further studies of similar kind are required with the inclusion of children from different socioeconomic background particularly from affluent classes to find out more precise link between BMI and various lifestyle factors.

Key words: *Adolescent, Body mass index, Dietary, Lifestyle factors*

Adolescence is a period of developmental transition between childhood and adulthood. Typically, we view adolescence beginning at puberty and ending at 18 or 21 years. Physical growth (particularly in males) and cognitive development can extend into the early twenties. Thus, age provides only a rough marker of adolescence, and scholars have found it difficult to agree on a precise definition of adolescence [1,2]. The problem of the double burden of disease is being faced by India, which consists of childhood and adolescent obesity at one side and infectious diseases, malnutrition, and underweight on the other side.

It is important to identify factors that are correlated to excess weight. Body mass index (BMI) is an important tool which is helpful to assess obesity. Studies have found that BMI is associated with multiple factors such as the family's socioeconomic status, number of siblings, sedentary lifestyle, screen time, electronic equipment in the bedroom, total sedentary time, and physical activity [3,4]. The present study was conducted to assess the BMI and its correlation with various lifestyle-associated factors in mid-adolescent schoolchildren.

MATERIALS AND METHODS

This was a school-based cross-sectional study done in Central India from March 2017 to 2018 in the age group of 15–17 years in the urban schools. All children <15 and >17 years or children with any previous significant history of chronic medical illness were excluded from the study. The study was approved by the Institutional Ethical Committee. Consent was taken from the parents. The height and weight of each participant were recorded and BMI was calculated using the formula: BMI= Weight in kg/Height in meters [2].

The data were collected by a pre-designed questionnaire which was derived from Global School-Based Student Health Survey (GSHS) [5]. GSHS was developed by the World Health Organization in collaboration with United Nations'; United Nations Children's Fund, United Nations Educational, Scientific and Cultural Organization, and United Nations Programme on HIV/AIDS and with technical assistance from Centre for Disease Control. The goal of the GSHS is to obtain systematic information from students to support school health and youth health programs and policies globally. The important parameters included in the questionnaire are alcohol use, dietary behavior, hygiene, mental health, drug use, physical activity, protective factors, sexual behavior that contributes to HIV infection, other sexually transmitted infections, and unintended pregnancy, tobacco use, and violence and unintentional injury.

The study involved non-probability sampling. Statistical analysis was done using the Statistical Package for the Social

Sciences (SPSS Version 20). Chi-square, Student's *t*-test, and ANOVA test were used. $P < 0.05$ was considered statistically significant.

RESULTS

A total of 605 students were included in the study. Table 1 shows the demographic distribution of study subjects according to age and gender.

Table 2 shows mean BMI according to the use of vegetables in diet. Out of 605 children, 75.20% were eating vegetables more than 1 time/day and their mean BMI was slightly higher. There was statistically significant difference found in BMI according to the use of vegetables in diet ($P = 0.017$).

As shown in Table 2, 80.33% of children were always washing their hands after toilet with a higher mean BMI. The difference was statistically significant difference ($P = 0.001$). Around 38.51% were eating fast food from outside more than 1 time/day with higher mean BMI. The protective factors were homework check by the parents or guardians. Mean BMI was also related to physical fight in the past 12 months. Most of the children (54.21%) were involved in fight 2 or more times. The differences were found to be statistically significant.

Table 1: Demographic distribution of the study subjects according to age and gender

Age	Male, n (%)	Female, n (%)	Total, n (%)
15 years	89 (14.7)	137 (22.6)	226 (37.3)
16 years	77 (12.7)	113 (18.7)	190 (31.4)
17 years	77 (12.7)	112 (18.7)	189 (31.4)
Total	243 (40.0)	362 (60.0)	605 (100.0)

DISCUSSION

In the present study, we estimated BMI by measuring weight and height of an individual. Similar to weight and height, many researchers have attempted to identify a suitable anthropometric method to assess BMI which is reliable, simple, and logistically feasible in field conditions [6]. Here, 309 (51%) children were of normal weight, 12 (2%) were overweight, and rest 284 (46%) children were underweight. The study cohort was of low socioeconomic population which had led to a distribution of 98% of children within underweight and normal weight category. Overweight children contributed only 2%.

Out of 605 children, 75.20% were eating vegetables more than 1 time/day and their mean BMI was slightly higher. There was statistically significant difference found in BMI according to the use of vegetables in diet ($P = 0.017$). These results were in accordance with the study done by Pearson *et al*. [7]. Around 80.33% of children were always washing their hands after toilet with a higher mean BMI. The difference was statistically significant difference ($P = 0.001$). These results were in accordance with the results obtained by Hossain *et al*. [8].

In the present study, mean BMI was slightly higher (18.8 ± 2.5 SD) in those children who ate fast food more than 1 time/day in the past 30 days as compared to those who did

Table 2: Mean BMI according to various lifestyle factors

Factors	Number (%)	BMI			ANOVA "F" value	p-value
		Mean	SD	Range		
Use of vegetables in diet						
1. I did not eat vegetables	30 (4.9)	18.18	2.15	14.2–22.8	4.086	0.017
2. <1 time/day	120 (19.8)	19.16	2.90	13.6–28.5		
3. More than 1 time/day	455 (75.20)	18.43	2.57	12.1–28.3		
Hand wash after toilet						
1. Rare	29 (4.79)	20.16	3.66	14.0–27.9	6.988	0.001
2. Most of the times	90 (14.87)	18.07	2.52	12.1–25.0		
3. Always	486 (80.33)	18.55	2.55	13.6–28.5		
Use of fast food						
1. I did not eat fast food	120 (19.83)	18.25	2.52	12.5–26.3	2.897	0.05
2. <1 time/day	252 (41.65)	18.26	2.71	12.1–28.5		
3. More than 1 time/day	233 (38.51)	18.80	2.58	14.5–28.3		
Homework check by parents						
1. Never	90 (14.87%)	18.97	2.81	14.0–27.0	7.007	0.001
2. Sometimes	135 (22.31%)	17.84	2.37	12.1–24.1		
3. Most of the times	380 (62.80%)	18.72	2.64	13.6–28.5		
Physical fight in the past 12 months						
1. None	171 (28.26%)	18.14	3.03	12.1–28.5	3.369	0.035
2. Once	106 (17.52%)	18.54	2.30	14.5–27.0		
3. Twice or more	328 (54.21%)	18.78	2.49	14.5–28.3		
Total	605	18.56	2.63	12.1–28.5		

BMI: Body mass index

not eat (18.2 ± 2.5 SD). Statistically significant association was found in BMI according to the use of fast food ($P = 0.05$). These were in accordance with the results obtained by earlier authors [9,10]. We found that mean BMI was 18.9 ± 2.8 among those children whose homework was never checked by their parents than those whose homework was checked sometimes (17.8 ± 2.3) and the results were statistically significant. These results were in accordance with the results obtained by Jago *et al*. [11].

Another important factor was drug addiction or substance abuse in adolescent. One example is cigarette use, in which the mean BMI was 18.59 ± 2.8 in those who started smoking in 16 or 17 years of age than those who started in 15 years (BMI was 17.5 ± 1.7). However, no statistically significant difference was found in BMI according to the age of starting of cigarette ($P = 0.490$), as seen earlier by Larsen *et al*. [12].

Out of 605 children, most (60.33%) were doing physical activity at least once/day and rest (9.95%) children were doing physical activity more than twice/day. The mean BMI was slightly higher among those children, who were doing physical activity more than 2 times/day. There was statistically no significant difference found in BMI according to physically activity for a total of at least 60 min/day ($P = 0.244$) and these results were similar to those observed earlier [13]. In our study, 50.41% of children were using television/computer game for 1–2 h/day and 29.75% of children were using these for more than 2 h/day in the past 30 days; however, this difference was not significant ($P = 0.426$), as seen in the earlier studies [14,15].

In our study, we found statistically significant association of BMI with many lifestyles associated factors such as washing hands daily, fast food users, and use of vegetables in diet, homework checking by parents, and physical fight. We did not find significant statistically association of BMI with mental health, substance abuse, physical activity, watching television, and internet use. The study had a few limitations. The study was only conducted for the urban schoolchildren and the findings cannot be generalized. As only government schoolchildren were included in the study, where mostly children from low socioeconomic status study so the impact of social media on BMI could not be established.

CONCLUSION

We found statistically significant association of BMI with many lifestyle-associated factors such as washing hands daily, fast food users, use of vegetables in diet, homework checking by parents, and physical fight. Further studies of similar kind are required with the inclusion of children from different socioeconomic background, particularly from affluent classes to find out more precise link between BMI and various lifestyle factors.

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