Assessing the Impact of Dietary Habits on Physical Status among Adolescents of Uttar Pradesh, India

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Abstract

Objective: Adolescence is a vulnerable period of life as health related behaviours that drive the major chronic degenerative diseases start or are reinforced during this time. Dietary habits of adolescents play a significant role in determining both their present and future health. The present study is an attempt to assess the impact of dietary habits on physical status among adolescents of Uttar Pradesh, India.

Materials and Methods: A cross sectional study using a self administered questionnaire was carried out among 300 adolescents aged 10-19 years from prominent districts of Uttar Pradesh (Lucknow, Prayagaraj, Gorakhpur, Ghaziabad, Varanasi). The socio-demographic profile, anthropometric measurements (height & weight) and dietary habits using simplified dietary gap assessment tool recommeneded by ICMR/NIN were recorded. The physical status of the adolescents was categorized as per WHO-BMI. Based on their BMI, underweight, normal and overweight adolescents were identified. Chi-square test using SPSS 22 software was employed to assess the association between dietary habits and BMI status.

Results: Overall, the adolescents reported poor dietary intakes; over one quarter (38%) reported not consumption of three main meals and (81.3%) reported skipping their regular meals. Nearly one third of the adolescents do not consume any servings of fruits daily. The results revealed that consuming junk food and buying eatables from street shops were considerably high in all the adolescents. More adolescents falling into the overweight/obese category were found to have poor eating habits, such as missing meals, consuming junk food, or buying eatables from street shops. Male adolescents were found to consume fruit and green leafy vegetables more often than female individuals. In general, boys consumed more nutrient-rich diets than girls.

Conclusion: The adolescents reported poor food consumption patterns, and the poor dietary choices significantly impact the physical status of adolescents. The study findings highlight the need to develop strategies for promoting good nutrition and creating awareness to encourage healthy eating in adolescence.

Keywords: BMI, Adolescents, Dietary habits, Physical status, Overweight/obese.

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INTRODUCTION

The nutrition transition has brought about rapid changes in the structure of the Indian diet. The replacement of traditional home cooked meals with ready-to-eat, processed foods has contributed to an increased risk of chronic diseases in Indians. These changing food preferences have contributed to the

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increased risk of chronic degenerative diseases, thus affecting the quality of life and health of about 1.2 billion Indians (NIN, 2010).

The WHO defines the individuals in the age group between 10 to 19 years as adolescents. Adolescence (10–19 years) is a vulnerable period of life as health related behaviours that drive the major chronic degenerative diseases start or are reinforced during this time (WHO, 2016). Adolescents experience a number of physical, emotional, cognitive and social changes which bring anticipation and anxiety (Sawyer *et al.* 2018). These changes also contribute towards faulty dietary habits emphasizing the role of parents in promoting healthy eating behaviour among adolescents (Rathi *et al.* 2017).

Due to the rapid urbanisation, there is a change in dietary pattern which contributes to chronic diseases and obesity in the urban areas (Shetty, 2002). Adolescents have high rates of consumption of energy dense, nutrient poor foods and inadequate consumption of fruits and vegetables In addition, adolescents also exhibit unhealthy eating habits such as meal skipping and snacking on fast foods (Deka *et al.* 2015). These food behaviours may set in train unhealthy eating trends for adult life (Wennberg, 2015) and contribute to a number of health problems including overweight and obesity, metabolic syndrome, diabetes and a number of cancers (NIN, 2010). Dietary habits of adolescents play a significant role in determining both their present and future health (Keldar et al., 1994). Improvement of the food habits of adolescents is therefore one avenue to reduce the prevalence of these health problems.

To date, little is known about the food intakes of Indian adolescents. Neither the National Family Health Survey nor the National Sample Survey Office has examined the dietary habits of urban Indian adolescents. This lack of evidence about the food consumption patterns of Indian adolescents is a significant barrier to the development of effective nutrition promotion and disease prevention measures. Therefore, the present study was undertaken to examine the food consumption patterns of a sample of Indian adolescent boys and girls residing in Uttar Pradesh, India.

MATERIALS AND METHODS

A cross sectional study using a self administered questionnaire was carried out among 300 adolescents aged 10-19 years from prominent districts of Uttar Pradesh (Lucknow, Prayagaraj, Gorakhpur, Ghaziabad, Varanasi). Data were collected from Nov 2022 to Mar 2023.

Inclusion criteria: A total of 300 adolescents between 10-19 years of age whose parents gave informed consent were included in the study.

Exclusion criteria: An Adolescent with long-term medication or suffering from chronic disease was excluded from the study.

Data collection: The targeted respondents were approached with a structured self administered questionnaire. The complete information about the study was shared with the respondents. A pre-designed, pretested questionnaire in english and hindi (local language) was used. All the questions included in the socio demographic profile and simplified dietary gap assessement tool based on the dietary recommendation by the Indian Council of Medical Research (ICMR) and the National Institute of Nutrition (NIN) were discussed with each respondent and adequate time was provided to fill the questionnaire. The respondent's age was verified from their identity cards and aadhaar cards.

The heights of the adolescents were measured using a portable stadiometer. Each participant was required to stand with their head held comfortably upright while not wearing any shoes. The subjects' weights were recorded using a calibrated weighing scale. On the weighing scale, participants were instructed to stand with their feet apart, without shoes, and with their heads straight.

Criteria for Adolescent Stage: The WHO classifies adolescence into early, middle, and late phases, which correspond to age groups of 10–14, 15–17, and 18–19 years, respectively.

Criteria for the Assessment of Underweight/thin, Normal & Overweight/obese.

The WHO-BMI for age and gender specific standards for adolescents was used. The normal BMI range was based on the age and gender specific standards. The criteria used to evaluate the underweight/thin, normal, and overweight/obese were: below 18.5 (underweight), (18.5-24.9) Normal, and 25 & above (overweight).

STATISTICAL ANALYSES

Statistical analyses were carried out by utilising SPSS version 22. The descriptive analysis was done to determine the frequency of dietary consumption Pattern. The association between dietary intake and BMI levels was examined using cross tabulation and the chi-square test.

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RESULTS

Table 1: Profile of Respondents

Variables	Category	Frequency n=300	Percentage
Gender	Male	178	59.3
	Female	122	40.7
Age	10-14 years (early adolescent)	168	56
	15-19 years (mid & late adolescent)	132	44
Religion	Hindu	224	74.7
	Non Hindu	76	25.3
Type of Family	Nuclear	274	91.3
	Joint	26	8.7
Socio Economic Class	Upper (more than 50000)	159	53
(Income INR)	Middle (between 25000 - 50000)	120	40
	Lower (below 25000)	21	7
Father's Education	Illiterate	-	-
	Upto 12th	32	10.7
	Graduation and above	268	89.3
Mother's Education	Illiterate	48	16
	Upto 12th	104	34.7
	Graduation and above	148	49.3
Total		300	100

Source: Survey data

Table 1 depicts that the total number of respondents in the study was 300 out of which 178 (59.3%) were males and 122 (40.7%) were females. The majority of the study subjects 168 (56%) were from the age group of 10-14 years and whereas 132 (44%) were from the age group of 15-19 years. 224 (74.7%) respondents were Hindu, as compared to 76 (25.3%) who were non-Hindu. The majority of the respondents were Hindu 56 (74.7%) and whereas 19 (25.3%) were non- Hindu. The majority of respondents 274 (91.3%) live in nuclear families, while only 26 (8.7%) live in joint families.

Table 2 revealed that 96 (32%) respondents had normal BMI as per the criteria used while 60 (20%) respondents were underweight/thin and 144 (48%) respondents were in overweight/obese category. The physical status of male respondents revealed 24.7% were underweight and 37.1% were overweight. Among female respondents, 13.1% were underweight and 78% were overweight/obese. This difference between male and female was statistically significant.

Table 2: Physical Status of Respondents

Variables	Category	BMI (Underweight/ thin) n=60	BMI (Normal) n=96	BMI (Overweight/ obese) n=144	Chi- square (X^2)	p-Value
Gender	Male (n =178)	44 24.70%	68 38.20%	66 37.10%	21.012	*0* *0.05>0.000**
	Female (n = 122)	16 13.10%	28 23.00%	78 63.90%		
Age	10-14 years (n=168)	38 22.60%	64 38.10%	66 39.30%	11.783	0.003 0.05>0.003*
	15-19 years (n=132)	22 16.70%	32 24.20%	78 59.10%		

*Note: * p< 0.05 significant*

A 22.6% of respondents belonged to early adolescent age were underweight and 39.3% were overweight while 16.7% of respondents from late adolescent age were thin and 59.1% were overweight. This difference between age group was also statistically significant.

Table 3 depicts the distribution and pattern of eating food habits among adolescents. Adolescents

Table 3: Pattern of Food Habits of Respondents

S.No.	Pattern of food habits	n=300 (%)
1	Do you have 3 main meals of cereals?	186 (62.0%)
2	Do you have mid-morning and evening snack daily?	93 (31%)
3	Do you take at least one of these items along with your meals [pulses/non vegetarian food (fish, chicken, mutton, egg)] daily?	205 (68.3%)
4	Do you take a cup of milk/coffee/tea/flavoured milk or curd daily?	168 (56.0%)
5	Do you take green leafy vegetables daily?	126 (42.0%)
6	Do you take other vegetables along with your meals daily?	198 (66%)
7	Do you take a fruit daily?	199 (66.3%)
	General faulty dietary habits	
8	Do you skip any meal?	244 (81.3%)
9	Do you eat junk food?	278 (92.7%)
10	Do you buy eatables from the street shops?	262 (87.3%)

*Note: * p< 0.05 significant*

had relatively low habit of taking daily mid-morning and evening snacks (31%) and very high habits of skipping meals (81.3%), consuming junk food (92.7%) and buying eatables from street shops (87.3%).

Table 4: Association of Food Habits with Adolescent Stage

Pattern of food habits	10-14 yrs (n=168)	15-19 yrs (n=132)	Chi-square (X^2)	p-Value
Do you have 3 main meals of cereals?	118 -70.20%	68 -51.50%	10.998	0.001 0.05>0.001*
Do you have mid-morning and evening snack daily?	51 -30.40%	42 -31.80%	0.073	0.785 0.05<0.785
Do you take at least one of these items along with your meals [pulses/non vegetarian food (fish, chicken, mutton, egg)] daily?	96 -57.10%	109 -82.60%	22.096	0 0.05>0.000*
Do you take a cup of milk/coffee/tea/flavoured milk or curd daily?	105 -62.50%	63 -47.80%	6.547	0.011 0.05>0.011*
Do you take green leafy vegetables daily?	84 -50.00%	42 -31.80%	10.031	0.002 0.05>0.002*
Do you take other vegetables along with your meals daily?	126 -50.00%	72 -54.50%	13.782	0 0.05>0.000*
Do you take a fruit daily?	92 -55.50%	107 -81.10%	22.892	0 0.05>0.000*

table cont...

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General faulty dietary habits				
Do you skip any meal?	135	109	0.239	0.624
	-80.40%	-82.60%		*0.05<0.624*
Do you eat junk food?	155	123	0.092	0.761
	-92.30%	-93.20%		*0.05<0.761*
Do you buy eatables from the street shops?	143	119	1.692	0.193
	-85.10%	-90.20%		*0.05<0.193*

*Note: * p< 0.05 significant*

Table 4 demonstrates that Chi-square was applied to determine whether there was any significant difference in the dietary habits between age group. Except for consuming mid-morning & evening snack daily, skipping meals, eating junk foods and buying of eatables from the street shops which were found to be insignificant, rest other food habits were found to be significant between the age group 10-14 years (early adolescents) and 15-19 years (mid and late adolescents).

According to Table 5, Chi-square was applied to determine whether there were any gender specific dietary differences that were statistically significant. While the faulty dietary habits of skipping meals,

Table 5: Association of Food Habits with Gender

Pattern of food habits	Male (n=178)	Female (n=122)	Chi- square (X²)	p-Value
Do you have 3 main meals of cereals?	122	64	7.944	0.005
	-68.50%	-52.50%		*0.05>0.005**
Do you have mid-morning and evening snack daily?	46	47	5.442	0.019
	-25.80%	-38.50%		*0.05>0.019**
Do you take at least one of these items along with your meals [pulses/ non vegetarian food (fish, chicken, mutton, egg)] daily?	116	89	2.025	0.154
	-65.20%	-65.60%		*0.05<0.154*
Do you take a cup of milk/coffee/tea/flavoured milk or curd daily?	96	72	0.759	0.383
	-53.90%	-59.00%		*0.05<0.383*
Do you take green leafy vegetables daily?	92	34	16.855	0
	-51.70%	-27.90%		*0.05>0.000**
Do you take other vegetables along with your meals daily?	134	64	16.801	0
	-75.30%	-52.50%		*0.05>0.000**
Do you take a fruit daily?	107	92	7.585	0.005
	-60.10%	-75.40%		*0.05>0.005**
General faulty dietary habits				
Do you skip any meal?	143	101	0.286	0.592
	-80.30%	-82.80%		*0.05<0.592*
Do you eat junk food?	162	116	1.765	0.184
	-91.00%	-95.10%		0.05<0.061
Do you buy eatables from the street shops?	156	106	0.037	0.846
	-87.60%	-86.90%		0.05<0.846

*Note: * p< 0.05 significant*

consuming junk food, and buying eatables from street shops were found to be insignificant, the other food habits of eating fruit and green leafy vegetables, as well as morning and evening snacks, were found to be significant for both male and female adolescents.

Table 6 reveals that Chi-square was applied to measure the association between the pattern

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Table 6: Association of Food Habits with BMI Status

Pattern of food habits	BMI (underweight/thin) n=60	BMI (normal) n=96	BMI (overweight/obese) n=144	Chi-square (X²)	p-Value
Do you have 3 main meals of cereals?	28 -46.70%	70 -72.90%	88 -61.10%	10.892	0.004 *0.05>0.004**
Do you have mid-morning and evening snack daily?	11 -18.30%	36 -37.50%	46 -31.90%	6.456	0.193 *0.05<0.039**
Do you take at least one of these items along with your meals [daily pulses/ dal/non vegetarian food (fish, chicken, mutton, egg)] daily?	29 -48.30%	70 -72.90%	106 -73.60%	13.876	0 *0.05>0.000**
Do you take a cup of milk/coffee/tea/ flavoured milk or curd daily?	22 -36.60%	71 -73.90%	75 -52.10%	22.563	0 *0.05>0.000**
Do you take green leafy vegetables daily?	19 -31.60%	55 -57.30%	52 -36.10%	13.895	0 *0.05>0.000**
Do you take other vegetables along with your meals daily?	36 -60.00%	69 -71.90%	93 -64.60%	2.567	0.276 *0.05<0.276*
Do you take a fruit daily?	29 -48.30%	82 -85.40%	88 -61.10%	26.118	0 *0.05>0.000**
General faulty dietary habits					
Do you skip any meal?	49 -73.30%	73 -20.80%	122 -55.60%	2.864	0.238 *0.05<0.238*
Do you eat junk food?	53 -92.90%	87 -90.60%	138 -95.80%	4.371	0.112 0.05<0.112
Do you buy eatables from the street shops?	47 -78.30%	81 -84.40%	134 -93.10%	9.415	0.009 *0.05>0.009**

of food habits and the BMI status of adolescents. Faulty dietary habits of skipping meals and eating junk foods which were found to be insignificant whereas majority of other food habit patterns were significantly associated with the BMI levels among adolescents. It was also observed that faulty dietary habits of skipping meals, eating junk foods & buying eatables from the street shop were associated with higher prevalence of overweight/obese adolescents. Additionally, adolescents who fell into the underweight/thin category had a strong association with the habit of non consumption of healthy 3 main cereals, healthy mid morning and evening snacks, green leafy vegetables and fruit in daily diet.

DISCUSSION

As per the present study, 44 (24.7%) boys and 16 (13.5%) girls were thin. These under nutrition findings are in line with the findings of survey conducted by the national family health survey 2015-16 where the prevalence of thinness in boys were more common as compared to girls.

It was discovered that the prevalence of overweight and obesity was significantly higher among girls than boys. The findings of the study conducted among school children from Delhi (Marwaha *et al.* 2006) are consistent with the fact that girls have the highest prevalence of obesity.

In the present findings, 186 (62%) adolescents consumed three main meals a day. It is observed that girls had substantially lower propensity to have three main meals in a day as compared to boys. The behaviour behind not taking the main meals among adolescent girls is their ambition to be thin and the unhappy feeling about their weight (Chacko & Ganesan, 2018) the other possible reasons can be lack of interest in the diet, time or appetite (Schur, 2000).

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It is observed in the present study that 244 (81.3%) adolescents had a propensity to skip meals and become prone to poor eating habits. Nearly 73% from the thin category and 56% from the overweight/obese category tends to skip one of their daily meals. This tendency among adolescents pushes them towards the double burden of malnutrition where the prevalence of underweight and prevalence of overweight/obesity among the adolescent population is increasing rapidly in India (Datta *et al.* 2019). According to Rodrigues *et al.* (2017) skipping meals is frequently linked to poor diet quality and a large intake of low nutritious foods. It was also recommended that regular meal habits among adolescents can help them to enhance the quality and pattern of diet intake.

It has been found that only 93 (31%) adolescents had the habit of consuming midmorning and evening snack daily. Reicks *et al.* (2015) found that mid morning and mid-evening healthy snacks bridged the nutritional gap. Benton & Jarvis (2007), also noted that adverse effects of low quantity and quality breakfast were reversed by mid morning snack intake.

As per the Comprehension National nutrition survey conducted by the Ministry of Health and Family Welfare of India in 2016-18 on 11,00,000 preschooler, school-age children and adolescents suggested that more than 80% of the study population consumed pulses in their weekly diet chart though the intake of meat/fish/egg consumption was less frequent. In the current study, we also discovered that 205 (68.3%) of the study participants included non-vegetarian and pulses in their daily diets. Additionally, the majority of the study's adolescents consumed pulses or non-vegetarian foods on a daily basis, regardless of their gender, adolescent stage, or BMI levels.

In the current study, 168 (56%) adolescents had a daily routine of consuming milk and milk products. The boys were substantially more likely than the girls to regularly consume milk and other dairy products. The habit of consuming milk or milk products differs noticeably between the adolescent age groups of 10–14 years (105) and 15–19 years (63) of age. The study results are also aligned with Rathi et al. (2017) where approximately 60 % of the respondents reported consuming milk or milk-related items. *Milk* and *milk* products are *rich in* protein and *calcium*. These 2 nutrients *have* been linked to *growth* status *in* adolescence.

In the present study, 126 (42%) consumed green leafy vegetables and 199 (66.3%) adolescents consumed fruits in their dietary pattern. Fruit and vegetable intake is an important part of a healthy diet and is associated with numerous positive health outcomes. These outcomes include reduced risk for chronic diseases and benefits to weight management.

According to Table 6, only 31.6% of adolescents under the thin BMI category included green leafy vegetables and 48.3% included fruits in their daily diet. The quantitative analysis of micronutrients was not carried out in our study. However, inadequate consumption provides indirect evidence of adolescent micronutrient deficiency. Meenakshi (2016) further asserted that the Indian population suffers from nutritional deficiencies due to a low intake of fruits and vegetables. The hidden hunger of micronutrient deficiencies among adolescents causes a kind of triple burden of malnutrition.

The present study found no discernible gender differences in junk food consumption. Compared to mid and late adolescents, early adolescents had a more regular practice of eating fast food and purchasing snacks from street shops. The dietary influences of parents on mid and late adolescents may be responsible for this change in behaviour (Reicks, 2015).

The percentage of overweight/obese adolescents was only 144 (48%) in the present study and out of them 138 (95.8%) adolescents were consuming junk foods and 134 (93.1%) bought eatables from street shops. Likewise, it is also evident from another study done in Maharashtra, that BMI was higher in the subjects who consumed junk food item more frequently (chincholikar & Sohani, 2016). Additionally, it is in line with the findings of Mohammadbeigi et al. (2018), who found that eating fast food is closely linked to weight increase and obesity. According to survey results of 1,999 secondary school students, 81.2% of those who consumed sweetened carbonated beverages were overweight or obese (Zalewska, 2007)

Limitations and Future Research Directions

The study was conducted among adolescents of Uttar Pradesh therefore the findings cannot be generalized to other geographical areas. The data on dietary habits was based on recall memory of the adolescents, so there may be recall bias. The quantitative measurements of the recommended portions of food groups were not recorded. Further studies can be designed to detect the clinical manifestation of micronutrient deficiency and socioeconomic status and its correlation with the consumption pattern of food items.

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CONCLUSION

Consumption of junk foods and buying eatables from street shops were remarkably high in all the adolescents. Regardless of adequate knowledge on harmful consequences of junk foods, adolescents are consuming junk foods due to its easy availability and ready to use packaging. Female adolescents had a larger dietary gap than their male counterparts. The current study has found that adolescents' consumption of milk and milk products, green leafy vegetables, and fruits is considerably low. Low consumption of milk/milk products, green leafy vegetables and fruits among adolescents may lead to micronutrient deficiency.

Adolescents' dietary patterns suggest that the frequency of intake of fast foods is more than desired that needs to be curtailed. There is an urgent need to spread awareness among adolescents about adverse effects of junk food. Awareness about the consequences of faulty dietary habits must start during childhood and nutritional interventional programs should be designed based on the gap in the diet of adolescents. In schools, the awareness about healthy eating habits among adolescents should be encouraged to reduce the gap of nutrition in the daily diet. This kind of approach can be inculcated to increase the consumption of milk, green vegetables and fruits to minimise the micronutrient deficiency among the adolescents. There is a need for nutrition counselling to bridge the gap between knowledge and practice. Adolescents knew what is regular and good food but their practice showed that they did not follow the dietary pattern that they considered good because of the social factors on one side and less perceived importance of the regular and quality food on the other.

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