Original Article

Dietary Practices and Physical Activity Performed by Adolescent in Selected Districts of India

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Abstract

Objectives: The present study assesses the dietary practices and physical activity performed by adolescent in selected districts of India. Also, an attempt was made to correlate key indicators of dietary practices and physical activity with Body Mass Index (BMI).

Methodology: The study was carried out between July and December 2011 covering adolescent studying in 8 to 10 standard using WHO recommended STEPS method in 5 districts of Uttrakhand, Maharashtra, Kerala, Madhya Pradesh and Andhra Pradesh of India. In each district, 6 schools (4 rural, 2 urban; 5 Government, 1 Private) were selected through stratified random sampling method.

Results: Study revealed that only 8.8% boys and 9.2% girls had good scores both for healthy diet and physical activity. On the other hand 25.2% boys and 24.7% girls had poor scores in both the parameters. Overall nearly 84% adolescents were within normal range of BMI. It was observed that 8.8% boys and 9.2% girls had good index for diet and physical activity. On the other hand 25.2% boys and 24.7% girls had poor index for diet as well as physical activity.

Conclusions: Unhealthy diet are consumed quite often, hence steps need to be taken to modify lifestyle that include educating children by teachers, making available healthy and traditional food and high taxation on unhealthy foods, subsidy on fruits and vegetables. Physical activity periods should be re-emphasized and taken seriously by students and teachers.

Key words: Non-communicable diseases, Dietary practices, physical activity, school children.

Introduction:

The seeds of Non-Communicable Diseases (NCDs) are sown early in childhood. It is a well proven fact that diabetes, hypertension and cardiovascular diseases are more common in obese individuals. There are estimated 61.3 million people living with diabetes in India; this places India second to China[1]. It is a high time to introduce preventive and promotional measures early in life to reduce incidence of NCDs.

While etiology of NCDs is multi-factorial, there is enough evidence that attributes obesity, unhealthy diet, physical inactivity as risk factors, besides smoking and alcohol consumption. Number of studies indicates that smoking and alcohol consumption can be controlled through restriction of production and access, price control and legal provisions, while other lifestyle factors like diet and physical activity are mainly governed by family and individual choices and therefore difficult to control. A study[2] observed that about a third of the students (34.4% of boys and 29.4% of girls) ate fast food more than three times a week and only 39.4% of the children consumed fruits daily. Only one in five (18.3% of boys and 22.2% of girls) students responded that they are physically active for 60 minutes per day at least three days in a week. Another study conducted in Chandigarh[3] found that 0.5% children were in pre-obese category and 0.3% were obese. While 13.6% of the subjects felt that there were no benefits of eating fruits and vegetables, large majority (81.3%) of them consumed fast food (*Samosa*, patties, noodles, etc.) in the past 7 days. It was noted that 70.7% boys and 71.6% girls did not attend the physical education class at school. A similar study in Kerala[4] shows that a majority (84.8%) of the students had a very low awareness regarding lifestyle risk factors of NCDs.

The forgoing studies have proven that risk of lifestyle diseases increases with unhealthy diet, lack of physical activity and obesity[1]. Though considerable number of studies has been undertaken on smoking and alcohol consumption, but very few studies have focused on dietary factors and physical activity particularly among adolescent and their attribution to NCDs. Hence, the

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present study assesses the dietary practices and physical activity performed by adolescent in selected districts of India. Also, an attempt was made to correlate key indicators of dietary practices and physical activity with Body Mass Index (BMI).

Materials and Methods:

The study was carried out between July and December 2011 using WHO recommended STEPS method[5] in five districts namely Nainital (Uttrakhand), Wardha (Maharashtra), Thrissur (Kerala), Ratlam (Madhya Pradesh) and Nellore (Andhra Pradesh) of India. In each district, 6 schools (4 rural, 2 urban; 5 Government, 1 Private) were selected through stratified random sampling method.

Keeping in view the anticipated prevalence of 5 percent (based on CBSE-School survey, 2007; prevalence of tobacco use 5%), a confidence interval of 90 percent, relative precision of 15 percent, with a design effect of 2 and the non-response rate of 10 percent, a total sample size of 1000 children per district was calculated. In each identified school, 100-200 children were expected to be enrolled for the surveillance.

Data were collected in pre-tested standardized tool adopted from WHO tool for adult Risk Factor surveillance for NCD. To carry out this study, official permission was obtained in advance from the Principal/ Head of the institution/school. A meeting of teachers and students was organized in each school, in order to explain the objectives and aims of study. Verbal consent of parents was taken who were explained about the purpose of the study ensuring them about the confidentiality of information.

While the surveillance covered all risk factors, this article details the patterns relating to diet, physical activity and obesity. In this comprehensive part of NCD risk factor surveillance, an attempt was made to assess whether following seven indicators relating to dietary practices and physical activity had any relationship with BMI:

1. Number of times per day an adolescent usually eats fruits during the past 30 days.
2. Number of times per day an adolescent usually eats vegetables during the past 30 days.
3. Number of times per day an adolescent usually drinks carbonated soft drinks during the past 30 days.
4. Number of days an adolescent eats at a fast food restaurant or at those places serving quick meals during the past 7 days.
5. Number of days an adolescent is physically active for a total of at least 60 minutes per day during in past 7 days.
6. Number of days an adolescent is physically active for a total of at least 60 minutes per day during a usual week.
7. Number of days an adolescent does stretching or strengthening exercises, such as toe touches, knee bends, or push-ups during the past 7 days.
8. Time an adolescent spends on sitting activities (e.g.: watching television, playing computer games, talking with friends, listening to music or other sitting activities) during a usual day.

Responses to each of the above key indicators relating to diet and physical activity were categorized as "Undesirable", "Acceptable" and "Desirable" and given positive or negative score. Criteria and score for each indicator are illustrated below and depicted in Table 1.

1. Eating Fruits: Intake of fruits two or more times has been considered as desirable and given a score of +15. Intake once a day is acceptable and given nearly half of the score (+7). If fruits are not consumed, then a score of zero is given as it is undesirable.
2. Eating Vegetables: Intake of vegetables was scored on same pattern as for fruits except that their intake once or twice a day was considered acceptable. Eating salad in addition to cooked vegetables was desirable and thus three or more intakes are recommended.
3. Carbonated soft drinks: Habit of regular consumption of these drinks is undesirable and thus consumption two or more times a day was given -10 score and once a day given half of negative score (-5). If a person does not consume these drinks regularly, then he/she was awarded +10 score.
4. Fast foods: Scoring for fast foods was applied on the same pattern as carbonated soft drinks except the fact that their consumption was measured in terms of days per week. Regular consumption (3 or more days a week) was considered undesirable and given score of -10 and consumption once or twice a week given -5 score and those who never consumed were given positive score of +10.
5. Physically active days: Ideally, a person should be physically active all the days of a week.

We have given a score of +20 to such individuals. If the person remains active for 3 to 6 days, it was considered acceptable and given positive score of +10. Any schedule less than the above was considered undesirable and given a zero score.

6. Exercises: Scoring for exercises followed the same pattern as physically active days. Considering that a person may remain preoccupied on 1-2 days, exercised performed 5 days or more in a week were considered desirable (+20) and if performed for 2 to 4 days, it was considered acceptable (+10) and anything less does not get any credit (zero).

7. Idle Time: Lifestyle changes brought above by TV, computer etc. beyond a level is not good for health. We felt that one hour in a day is desirable as physical activity is minimal at that time. Such low idle time was given positive score (+10). If idle time exceeded but was within 2 hours, a negative score of -5 was given and above two hours was considered undesirable and score of -10 was given.

Through the above scoring pattern, equal weight has been given to diet and physical activity. Maximum score that adolescents can get is 50 for desirable dietary habits and 50 for desirable levels of physical activity; with a maximum score of 100. Based on diet score, physical activity score and total score, all the adolescents were graded into three categories i.e. Good, Moderate and High (Table-2).

Table 1: Scoring key for dietary practices and physical activity by Adolescents

Theme	Undesirable	Score	Acceptable	Score	Desirable	Score
Eating Fruits per day during last 30 days	None	0	Once a day	7	Two or more times a day	15
Eating Vegetables per day during last 30 days	None	0	Once or twice a day	7	More than twice a day	15
Carbonated soft drinks per day during last 30 days	More than twice a day	-10	Once a day	-5	None or occasional	10
Days last week when taken fast foods	Three or more days	-10	One to two days	-5	None	10
Physically active days usual week	Up to two days	0	3 to 6 days	10	All days	20
Days last week when exercises done	None or once a week	0	2 to 4 days	10	5 days or more	20
Hours per day when idle (TV, Music etc.)	More than two hours	-10	One to two hours	-5	Up to one hour	10

Table-2: Diet, Physical Activity and Combined Scores and Grades

Scores	Grade		
	Good (G)	Moderate (M)	Poor (P)
Total Diet Score (Max 50)	=>25	15-24	<15
Total Physical Activity Score (Max 50)	=>25	15-24	<15
Total Score (Max 100)	=>50	30-49	<30

Body Mass Index (BMI) was calculated using the formula weight (in kilogram) divided by heights (in meter square) to identify children who are overweight or obese. Based on the norms developed by Indian Academy of Pediatrics (IAP)[6], boys and girls were classified as underweight (weight below the 5th percentile for children of each age), normal, overweight (weight above the 85th percentile, up to 95th percentile) and obese (weight above 95th percentile),

In order to fulfill the proposed objectives, frequency and cross tabulation analysis was carried out. Chi-square (÷2) test was used to check the association between the variables. The ÷2 test takes the mathematical form as follows:

$$\chi 2 = \sum_{i=1}^{i=n} \frac{(Oi - Ei)^2}{Ei}$$

Where *Oi* is the observed frequency in each category, *Ei* is the expected frequency in the corresponding category.

The Statistical Package for Social Sciences (SPSS) is used for the quantitative data analysis.

Informed Consent:

Informed consent was obtained from each respondent included in the study in which participants were made fully informed of the procedure. The participation of each respondent was fully voluntary. In the case of respondent age 15-17 years, consent was taken from a parent or guardian present in the household at the time of the survey.

Results:

A total of 4339 adolescents across 5 districts studying in 8, 9 and 10 standard were covered during the study. Majority of adolescents (86.1%) were in 13 to 15 years age group, comprising of 2587 boys (59.6%) and 1752 girls (40.4%). There were more boys in all districts except Thrissur (Kerala).

a. Dietary Practices and Physical activity:

It was observed that one in 5 (22.3%) adolescents did not consume fruits at all. Only 30% adolescents consumed two or more times a day and the rest just once a day. Majority adolescents (69.1%) took vegetables once or twice a day which is acceptable, additional 27.7% had 3 or more servings of vegetables a day. It was revealed that more than half (56.7%) of students consumed carbonated soft drinks at least twice a day which is not desirable. Nearly one in three (31.6%) adolescents had taken fast foods on three or more days in the preceding week. (Table-3)

Further, it has been found that 42-43% adolescents were physically active for at least 60 minutes only on maximum two days in a week as per their response for the preceding week or a usual week, respectively. But only 16.9% students performed stretching or strengthening physical exercises regularly (that is, 5 or more times per week). Majority of the children (61.1%) either did not perform at all or only once a week, which is not desirable for adolescents. On the other hand, one in three (31.3%) adolescents spent more than 3 hours on idle activities like watching television, listening to music, etc. an additional 45.3% adolescents engaged themselves in idle activities for one to two hours (Table-3).

Table 3: Distribution of Adolescent by Dietary Habits and Physical Activity

Question	Current Lifestyle Response (n=4339)					
	Undesirable		Acceptable		Desirable	
	No.	%	No.	%	No.	%
Number of times per day an adolescent usually eats fruits during the past 30 days.	956	22.3	2041	47.6	1293	30.1
Number of times per day an adolescent usually eats vegetables during the past 30 days.	138	3.2	2968	69.1	1190	27.7
Number of times per day an adolescent usually drinks carbonated soft drinks during the past 30 days.	2392	56.7	1212	28.7	614	14.6
Number of days an adolescent eats at a fast food restaurant or at those places serving quick meals during the past 7 days.	1359	31.6	2154	50.1	787	18.3
Number of days an adolescent is physically active for a total of at least 60 minutes per day during in past 7 days.	1792	41.7	799	18.6	1704	39.7
Number of days an adolescent is physically active for a total of at least 60 minutes per day during a usual week.	1829	43.2	873	20.6	1532	36.2
Number of days an adolescent does stretching or strengthening exercises, such as toe touches, knee bends, or push-ups during the past 7 days.	2619	61.1	943	22.0	724	16.9
Time an adolescent spends on sitting activities (e.g.: watching television, playing computer games, talking with friends, listening to music or other sitting activities) during a usual day.	1342	31.3	1947	45.3	1005	23.4

Missing cases excluded from the analysis

b. Diet and Physical Activity Index:

Result revealed that more than 50% of both boys and girls had total score less than 30 and thus were graded as 'poor' in diet and physical activity index. On the other hand nearly 18% of boys and girls had scored more than 50 and thus had 'good' diet and physical activity index. There was no statistically significant difference between boys and girls (Table-4). Furthermore, adolescent were graded as "Good", "Moderate" or "Poor" based on dietary scores and physical activity scores. Study indicates that only 8.8% boys and 9.2% girls had good scores both for healthy diet and physical activity. On the other hand 25.2% boys and 24.7% girls had poor scores in both the parameters. Other school children were in different strata of the spectrum as evident in Table-4. District and sex-wise distribution of school children according to total score for diet and physical activity are given in Table-4.

Table 4: District and Sex-wise Distribution of school children according to total score for Diet and Physical Activity

Total Score (Grade)	Nainital		Wardha		Thrissur		Ratlam		Nellore		Total	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girl
>= 50 (Good)	69	28	98	77	112	159	142	16	61	32	482	31
30-49 (Moderate)	107	52	118	172	153	168	296	46	104	115	778	55
< 30 (Poor)	150	77	232	327	198	196	509	64	234	205	1323	86
Total	326	157	448	576	463	523	947	126	399	352	2583	17:

*Chi-square= 1.56; Df=2; p=0.46 (not significant)

c. Correlation between dietary practices and physical activity with Body Mass Index:

It was observed that 75.1% to 87.7% boys in the age group of 12 to 16 years were found to be within normal BMI range. Similarly, girls in the same age group with normal BMI ranged between 74.2% and 88.2%. Overall nearly 84% adolescents were within normal range of BMI. Further, it was observed that 11.7% of boys and 13.6% of girls were underweight for their age. Proportion of boys who were underweight increased from 3.2% in boys aged 12 years to 20.9% in boys aged 16 years. Underweight boys in the age group of 13 to 15 years were between these two extremes. Similar observations were found among girls where the range was from 4.1% (age 12 years) to 22.6% (age 16 years). Thus was an increase in the proportion of underweight boys and girls with advancing age. Overall 4.1% boys and 1.8% girls were overweight or obese (Table-5). As both physical activity and healthy dietary practices are important determinants of good lifestyle we had graded boys and girls separately into various categories.

An attempt was made to observe the distribution of boys and girls based on dietary intakes and physical activity. For this purpose, diet and physical activity were graded as good, moderate and poor based on scores of dietary practices and physical activity separately. Those who secured more than 25 were scored as good, between 15 to 24 as moderate and less than 15 as poor out of a total of 50. It was observed that 8.8% boys and 9.2% girls had good index for diet and physical activity. On the other hand 25.2% boys and 24.7% girls had poor index for diet as well as physical activity. The rest were in intermittent categories. (Table 6)

Table 6: Correlation between Dietary practices and Physical Activity Grades

Diet Grade	Physical Activity Grade											
	Boys				Girls				All Adolescents			
	G	M	P	All	G	M	P	All	G	M	P	All
G	227 (8.8)	168 (6.5)	379 (14.7)	774 (30.0)	159 (9.2)	142 (8.2)	357 (20.6)	658 (37.9)	386 (27.0)	310 (21.6)	736 (51.4)	1432 (33.2)
M	144 (5.6)	140 (5.4)	268 (10.4)	552 (21.4)	69 (4.0)	84 (4.8)	245 (14.1)	398 (23.0)	213 (22.4)	224 (23.6)	513 (54.0)	950 (22.0)
P	306 (11.8)	300 (11.6)	651 (25.2)	1257 (48.7)	112 (6.5)	138 (8.0)	428 (24.7)	678 (39.1)	418 (21.6)	438 (22.6)	1079 (55.8)	1935 (44.8)
All	677	608	1298	2583	340	364	1030	1734	1017	972	2328	4317

*G= Good, M=Moderate, P=Poor; For Boys: Chi-square=7.65, Df=4, p=0.10 (Not significant); For Girls: Chi-square=16.38, Df=4, p<0.002(Significant); For All: Chi-square=14.56, Df=4, p=0.0057(Significant)

Discussion:

Transition in eating habits and lack of physical activity has been documented in number of studies in India. The present study conducted in 5 typical districts with a mixed population of school children from rural and urban areas is a reflection of changing lifestyles across the country. Every third student reported to have taken fast foods on three or more days in the preceding week. The observation is in conformity to similar studies[2,3] where 34.4% of boys and 29.4% of girls ate fast food more than three times a week. Similarly carbonated drinks were consumed by majority of school children very frequently. Fruits were consumed less often indicating the need for nutrition education about healthy and unhealthy foods, where teachers can play an important role. Opportunity in parent-teacher meetings can also be used to orient them about healthy dietary practices.

The present study observed that only one in six adolescents actively performed physical exercises regularly (5 days or more a week). Schools have limited physical space for sports and physical activity period is on the wane. There is need to educate adolescents to perform physical exercise regularly and engage in outdoor sports for healthy life. Using the currently available IAP standards of BMI for boys and girls of different ages, we found only 1.4% of boys and 1.8% of girls being overweight or obese. These estimates are much lower as observed in other studies[2]. The present study also found more than 11% boys and more than 13% girls to be underweight. A clear picture of increase in proportion of underweight school children was observed from age 12 to 16 years, indicating that dietary intakes are inadequate to cope up with physical growth during adolescence. Finally, an attempt was made in this study to come up with a simple tool that could be used regularly by health workers, school teachers and students themselves to assess their eating habits and physical activity and grading themselves based on the scores obtained by them. Teachers and parents can use this tool for following up children with poor scores and encouraging them to adopt healthy practices.

It is clear from the study that unhealthy diet like fast foods and carbonated drinks are consumed quite often and healthy foods like fruits, less often. Steps that could be taken to modify lifestyle should include educating children by teachers, making available healthy and traditional food in school canteens and neighborhood and increasing taxation on unhealthy foods to discourage their consumption and increasing subsidy on fruits and vegetables to make them more affordable. Physical activity periods should be re-emphasized and taken seriously by students and teachers.

One of the reasons for increased consumption of unhealthy foods is rigorous marketing undertaken by manufactures. There should be control on such advertisements with clear messages about contents and implications. Mass awareness programs to counter such advertisements and encourage healthy foods should be launched on a continuous basis to change the lifestyle patterns of children. Parents' role is very crucial in ensuring that children adopt a balanced and healthy lifestyle.

References:

1. International Federation of Diabetes.Diabetes Atlas, 5th Edition, November 2011.
2. Life-Style Disorders – Indian Scenario. CDAC, India Development Gateway. www.indg.in. (accessed on July 2, 2011).
3. Singh AK, Maheshwari A, Sharma N, Anand K. Lifestyle Associated Risk Factors in Adolescents. Indian J Paediatrics, 2006; 73: 55-60.
4. Galhotra A, Abrol A, Agarwal N, Goel N, Gupta S. Life Style Related Risk Factors For Cardiovascular Diseases In Indian Adolescents. The Internet J Health, 2009; 9 (2)
5. Divakaran B, Muttapillymyalil J, Sreedharan J, Shalini K. Lifestyle riskfactors of noncommunicable diseases: Awareness among school children. Indian J Cancer, 2010; 47: 9-13.
6. WHO. Chronic Diseases and Health Promotion. STEPwise approach to surveillance (STEPS).
7. Khadilkar VV, Khadilkar AV, Choudhury P, Agarwal KN, Ugra D, Shah NK. IAP Growth Monitoring Guidelines for Children from Birth to 18 Years. Indian Pediatrics, 2007; 44: 187-197.
8. Goyal RK, Shah VN, Saboo BD, Phatak SR, Shah NN, Gohel MC, Raval PB, Patel SS. Prevalence of overweight and obesity in Indian adolescent school going children: its relationship with socioeconomic status and associated lifestyle factors. J Assoc Physicians India. 2010; 58: 151-8.
9. Ramachandran A, Snehalatha C, Vinitha R, Thayyil M, Kumar CK, Sheeba L, Joseph S, Vijay V. Prevalence of overweight in urban Indian adolescent school children. Diabetes Res Clin Pract. 2002; 57(3): 185-90.