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Original Research Article

An Observational Study Assessing the Association between Physical Activity & and Dietary Habits among Adolescents

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Abstract

Aim: The current study aimed to focus specifically on objectively assessed physical activity & and dietary habits among adolescents.

Methods: The present study was conducted in the Department of Community Medicine at DMCH, Darbhanga, Bihar, India for one year and cross-sectional data were collected. Data were obtained from adolescents (12–16 years) recruited from three secondary schools in Bihar. Staff at participating schools selected a subset of their classes for participation. All students from nominated classes (n = 200) were eligible and received written information on the project. Consent was sought from parents prior to the study and adolescent participants provided assent before completing written surveys during class.

Results: A higher proportion of boys, compared to girls, ate breakfast on more than 5 days/week ($p < 0.01$). A higher proportion of younger adolescents, com- pared to older adolescents, met the physical activity recommendations and did not meet the recommendations for fruit and vegetable consumption ($p < 0.01$). For adolescents with two risk behaviours, the most prevalent cluster was formed by not meeting the physical activity and fruit and vegetables recommendations. A higher proportion of girls, compared to boys, had the cluster pattern of not meeting the recommendations for physical activity and breakfast consumption. ($p < 0.01$). A higher proportion of boys, compared to girls, and older adolescents, compared to younger adolescents, had the most prevalent single risk factor of not meeting the recommendations for physical activity ($p < 0.01$). A higher proportion of younger adolescents, com- pared to older adolescents, had the single risk factor of not meeting the recommendations for fruit and vegetable consumption ($p < 0.01$).

Conclusion: Many adolescents fail to meet multiple diet and physical activity recommendations, highlighting that physical activity and dietary behaviours do not occur in isolation. Future research should investigate how best to achieve multiple health behaviour change in adolescent boys and girls.

Keywords: adolescence, life style, non-communicable disease, physical activity

Introduction

Adolescents are defined as people belonging to the age group of 10 to 19 years. A recent Lancet commission on adolescent health and well-being divided this time into two categories: early adolescence (10–14 years) and late adolescence (15–19 years). [1] It is estimated that men and women gain 50% of adult weight and 15% of adult height during adolescence. Hence, it is imperative to understand that adequate nutrition is important for attaining full growth potential, and any insults or poor nutrition during adolescence may have transgenerational consequences. [2] Adolescence represents a window of opportunity to recuperate the growth insults that ensued early in life. [3] There is a growing interest at the public health and policy levels in understanding the complex adolescent health and nutrition needs [4] Adolescents are the important reserves for human resources in India. Their health has been neglected in the past because they were thought to be less vulnerable to disease than others. [5] Usually they are themselves are shy and avoid medical intervention. [6] However, this is a time when habits are formed that persist into adulthood. Good habits, such as exercise, healthy diet and healthy personal hygiene are likely to bring benefits, like improved performance in school. [6,7]

According to a recent study by Jouhar R et al., [8] poor dietary habits, sedentary lifestyles and

improper hygiene can have a deleterious effect on their BMI. Indian adolescents are usually poorly informed about the important factors leading to nutritional health problems, and the lack of timely guidance may cause many preventable complications in their adulthood. [9] BMI is the most frequently used method to determine the nutritional status in children and adolescents. School-going population in developing countries like India are susceptible to under nutrition due to several socioeconomic, demographic, and nutritional factors. [10] The prevalence of under nutrition and micronutrient deficiencies is not equitable and differs across geographies, ethnicities, gender, religion, and other socio-demographic attributes. [11] Under nutrition is caused by inadequate dietary intake, infectious diseases, and indirectly related to poor oral hygiene and water, sanitation and hygiene (WASH) facilities.

Similarly, adolescents with a vegetarian diet have been found to have high probabilities of micronutrient deficiencies. [11] This spotlights the influence of various socio-demographic attributes in the nutrition of adolescents, and hence they need to be understood while comprehending the nutrition profile of the population. Overweight and obesity is also a type of malnutrition with serious health consequences such as noncommunicable diseases like diabetes and cardiovascular diseases at a younger age. Healthy eating and physical exercise habits at this age are foundations for good health in adulthood. [12] Since malnutrition is a major challenge among this age group, it is always better to initiate any process early in life especially to change the behaviour of the person. Adolescence is a suitable age to inculcate healthy dietary practice, habit of physical exercise, and proper hygienic methods. Our aim was to determine their nutritional status with BMI, and find any existing association with physical health, dietary behaviour and personal hygiene practiced by them.

Materials & Methods

The present study was conducted in the Department of Community Medicine at DMCH, Darbhanga, Bihar, India for one year and cross-sectional data were collected. Data were obtained from adolescents (12–16 years) recruited from three secondary schools in Bihar. Staff at participating schools selected a subset of their classes for participation. All students from nominated classes (n = 200) were eligible and received written information on the project. Consent was sought from parents prior to the study and adolescent participants provided assent before completing written surveys during class. Participants completed questionnaires during Physical Education or Personal, Social and Health Education (PHSE) lessons, under the supervision of trained researchers and class teachers.

Measures

Demographic information, including date of birth and ethnicity, was provided by the school. Questionnaires collected information on demographic characteristics of adolescents including gender and home postcodes. Socioeconomic status (SES) was determined using the Index of Multiple Deprivation (IMD), a measure of compound social and material deprivation, calculated from a variety of data including income, employment, health, education, and housing. It is based on the postcode of the participant's home, and thus represents an area level approximation of SES.

Adolescent Dietary Behaviour

Adolescent food intake was assessed using a 30-item food frequency questionnaire (FFQ), based on the previously validated Youth/Adolescent Food Frequency questionnaire (YAQ). [13] Adolescents were asked how often they ate ten different fruits and twelve different vegetables in the past month. Responses to questions on the frequency of consumption of specific fruits and vegetables were summed to compute total frequency of fruit and vegetable consumption/day, respectively. For the purpose of this study each item was summed to calculate the frequency of consumption of 'fruits and vegetables' (FV) per day. Guided by the current recommendations for fruit and vegetable consumption (5 portions of FV/day), the total daily frequency of FV consumption was dichotomised into <5 times/day or ≥ 5 times/day.

Breakfast consumption was assessed with a single item asking adolescents how often they ate breakfast in the past seven days. While there are no current national recommendations for frequency of breakfast consumption, evidence suggests that young people who eat breakfast on most days of the week see health benefits (e.g. lower Body Mass Index) compared to those who skip breakfast. [14,15] A recent government initiative in the Bihar recommends that parents encourage their children to eat breakfast regularly. Given such evidence, frequency of breakfast consumption/week was dichotomized into <5 days/week or ≥ 5 days/week.

Physical activity

Physical activity was assessed by Actigraph GT1M accelerometers (ActiGraph, Fort Walton Beach, FL) using a 5 second measurement interval (epoch). Participants were instructed to wear the accelerometer over their right hip for one-week. Exceptions included time spent sleeping, showering and during water-based activities. Duration of

MVPA was computed only for adolescents who wore the accelerometer for a minimum of three days [16], defined as days on which accelerometer counts were between 10,000 and 20 million. [17] To estimate the time spent per day in moderate intensity physical activity (3.0–5.9 metabolic equivalent of rest [METs]) and vigorous intensity physical activity (6.0+ METs), age specific movement count thresholds were applied. Time-per-day in MVPA was derived by summing these values across valid days. The proportion of adolescents meeting the physical activity recommendations for young people was calculated according to whether they performed an average of ≥ 60 mins/day of MVPA. Time spent in MVPA was dichotomised as <60 mins/day or ≥ 60 mins/day

Statistical Analyses

All analyses were conducted using SPSS statistical software version 16.0. Descriptive statistics were used to summarise sociodemographic, physical activity and dietary characteristics of the sample. Adolescents were categorised as younger or older adolescents by dichotomising at the mean (14.4 years). Mann-Whitney tests were performed to examine gender and age-group differences in mean minutes/day spent in MVPA, fruit and vegetable consumption per day, and breakfast consumption per week. The proportion of adolescents achieving ≥ 60 mins/day of MVPA, and the proportion of adolescents consuming fruit and vegetables ≥ 5 times/day, and breakfast ≥ 5 times/ week were compared by gender and age-group using Pearson's chi-square ($\chi 2$) tests of significance. A total risk behaviour score was calculated for each participant based on the total number of unmet health recommendations (range from zero to three). Pearson's chisquare tests were used to examine gender and age-group differences in the number of risk behaviours. The proportion of adolescents in each multiple risk behaviour combination was determined to examine behaviour clustering patterns, and Pearson's chi-square tests were used to examine gender and age-group differences in the clustering patterns.

Results

Sample characteristics

The final sample composition was 110 adolescents, with 54 boys, 56 girls, 60 younger adolescents and 50 older adolescents. The mean age of younger adolescents was 14.3 years and of older adolescents was 14.6 years.

Table 1: Distribution fruit and vegetables consumption per day, breakfast consumption per week and minutes per day spent inmoderate-to-vigorous intensity physical activity (MVPA)

	Total (n = 110)	Boys (n = 54)	Girls (n = 56)	Younger adolescents (n = 60)	Older adolescents (n = 50)
MVPA minutes/day					
25th percentile	18.4	23.5	22.6	38.2	24.6
50th percentile	31.4	37.3	38.2	47.3	39.1
75th percentile	69.0	55.4	49.2	66.4	48.2
Frequency of FV consumption/day					
25th percentile	2.6	1.8	3.6	2.7	3.9
50th percentile	4.4	3.9	4.4	3.8	4.8
75th percentile	7.3	6.7	5.6	6.2	8.2

Prevalence of meeting health recommendations

A higher proportion of boys, compared to girls, ate breakfast on more than 5 days/week ($p < 0.01$). A higher proportion of younger adolescents, compared to older adolescents, met the physical activity recommendations and did not meet the recommendations for fruit and vegetable consumption ($p < 0.01$).

Table 2: Gender and age distribution of meeting health recommendations

	Total (n = 110)	Boys (n = 54)	Girls (n = 56)	Younger adolescents (n = 60)	Older adolescents (n = 50)
Meet >60 minutes MVPA per day, n (%)					
No	95 (86.36)	40 (72.4)	44 (78.57)	40 (67)	42 (84)
Yes	15 (22.74)	14 (25.94)	12 (14.28)	20 (33)	8 (16)
Meet >5 portions fruits/ vegetables, n (%) No	70 (63.63)	30 (55.55)	34 (60.71)	32(64)	18 (45)
Yes	40 (45.47)	24 (44.44)	22 (39.28)	28 (36)	32 (55)

Meet >5 days a week eating breakfast, n (%) No	15 (22.74)	8 (14.81)	16 (28.57)	22 (24)	15 (25)
Yes	95 (86.36)	46 (85.18)	40 (71.42)	38 (76)	35 (75)
Number of risk behaviours,n (%)					
0	5(4.54)	5 (9.25)	3 (3.57)	4 (8)	2 (5)
1	45 (40.90)	25(4629)	20(35.71)	18 (36)	18 (45)
2	50(445.45)	20(37.03)	28 (50)	34 (48)	16 (40)
3	10 (9.09)	4 (7.40)	5 (8.92)	4 (8)	4 (10)

A higher proportion of girls, com- pared to boys, had three health risk behaviours ($p < 0.01$).

Table 3: Descriptive cluster pattern of multiple risk behaviours

Number of risk behaviours	Percent of sample	Boys (n = 61)	Girls (n = 62)	Younger adolescents (n = 68)	Older adolescents (n = 55)
3: All three risk behaviours	9.7	5.7	13.5**	8.2	11.5
2: MVPA < 60 minutes/day and < 5 fruit/vegetables per day	33.0	31.0	34.8	36.7	28.2
2: MVPA < 60 minutes/day and < 5 days a week eating breakfast	6.2	1.1	11.2**	5.1	7.7
2: < 5 fruit/vegetables per day and < 5 days a week eating breakfast	5.7	5.7	5.6	8.2	2.6
1: MVPA < 60 minutes/day	29.0	34.5	23.6**	19.4	41.0**
1: < 5 fruit/vegetables per day	7.4	9.2	5.6	11.2	2.6**
1: < 5 days a week eating breakfast	2.8	2.3	3.4	4.1	1.3
0: No risk behaviours	6.2	10.3	2.2**	7.1	5.1

For adolescents with two risk behaviours, the most prevalent cluster was formed by not meeting the physical activity and fruit and vegetables recommendations. A higher proportion of girls, compared to boys, had the cluster pattern of not meeting the recommendations for physical activity and breakfast consumption. ($p < 0.01$). A higher proportion of boys, compared to girls, and older adolescents, compared to younger adolescents, had the most prevalent single risk factor of not meeting the recommendations for physical activity ($p < 0.01$). A higher proportion of younger adolescents, com- pared to older adolescents, had the single risk factor of not meeting the recommendations for fruit and vegetable consumption ($p < 0.01$).

Discussion

This study described the prevalence and clustering patterns of three health behaviours (physical activity, fruit and vegetable consumption, breakfast consumption) in a sample of adolescents from the Bihar. Almost 54% of adolescents had multiple diet and physical activity risk behaviours, and only 6% achieved the recommendations for all three of the health behaviours. Poor diet and physical inactivity are established risk factors for chronic disease. In young people, physical activity and healthy diets including regular breakfast consumption and adequate levels of fruit and vegetables, have important short- and long-term health protective effects. For example, physical activity in young people may benefit cardiovascular disease (CVD) risk factors, adiposity and bone health, which could influence health in adulthood. [18]

Higher levels of MVPA were found among boys, compared to girls, and in younger adolescents, compared to older adolescents. Such findings support previous research [19,20] highlighting gender differences and age-related declines in physical activity, using objective measures of physical activity among adolescents. Recent research using accelerometry has also shown that age and gender differences are evident when comparing children as young as six and eleven years of age. [21,22] This suggests that the primary school years may be critical for the development of disparities in physical activity behaviours. [23] Efforts to promote physical activity should begin in these critical years given that active children are more likely to become active adults. [24] Consistent with previous research, adolescent girls ate breakfast on fewer days per week compared to boys. [25] Despite the evidence that adolescents who skip breakfast are more likely to be overweight than those who regularly eat breakfast, skipping breakfast may be a chosen method of weight control for girls, and in some individuals may be associated with dieting, or disordered eating. [26]

A higher proportion of boys, compared to girls, ate breakfast on more than 5 days/week ($p < 0.01$). A higher proportion of younger adolescents, com-

pared to older adolescents, met the physical activity recommendations and did not meet the recommendations for fruit and vegetable consumption ($p < 0.01$). Older adolescents ate more fruit and vegetables per day, and were more likely to meet the recommendations for fruit and vegetable consumption, compared to younger adolescents. In contrast, review level evidence has shown a negative association between age and fruit and vegetable consumption. [27] Contrasting findings may reflect a difference in the methodologies employed to assess fruit and vegetable consumption. Several studies have identified overestimation of fruit and vegetable intake when using food frequency questionnaires. [28.29] Girls were more likely to have the two behaviour risk cluster that paired physical activity and breakfast consumption. A possible explanation for such clustering is that adolescents who frequently skip breakfast have lower daily energy intakes, with higher daily energy intake being associated with more time spent being physically active. [30] Girls who skip breakfast as part of a diet or method of weight control, may have less energy to be physically active. Efforts to promote both physical activity and regular breakfast consumption to adolescent girls, in particular, are needed. Consistent with previous research, girls had a higher number of risk factors related to physical activity and dietary behaviours compared to boys. [31] Such findings provide additional evidence for support of gender specific interventions promoting physical activity and dietary behaviours. Although health promotion programmes frequently target multiple behaviours, little is known about the best approaches to stimulating multiple behaviour change in adolescents. [32] Reviews of multiple behaviour interventions with young people have revealed changes in some but not all behaviours, with significant effects more likely for dietary as opposed to physical activity outcomes. [33] There is little evidence of covariation among diet and physical activity behaviours in adolescents over time. [34]

For adolescents with two risk behaviours, the most prevalent cluster was formed by not meeting the physical activity and fruit and vegetables recommendations. A higher proportion of girls, compared to boys, had the cluster pattern of not meeting the recommendations for physical activity and breakfast consumption. ($p < 0.01$). A higher proportion of boys, compared to girls, and older adolescents, compared to younger adolescents, had the most prevalent single risk factor of not meeting the recommendations for physical activity ($p < 0.01$). A higher proportion of younger adolescents, com- pared to older adolescents, had the single risk factor of not meeting the recommendations for fruit and vegetable consumption ($p < 0.01$).

Conclusion

Many adolescents fail to meet multiple diet and physical activity recommendations, supporting previous evidence that physical activity and dietary behaviours do not occur in isolation. Differences in dietary and physical activity behaviours between adolescent boys and girls, as well as between older and younger adolescents, should be taken into consideration when assessing the efficacy of strategies promoting multiple health behaviour change.

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