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Original Research Article

Assessing Dietary Pattern and Physical Activity among Adolescents: An Observational Study

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Abstract

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

Methods: The current investigation was undertaken, and cross-sectional data were gathered. The data were collected from teenagers aged 12 to 16 who were recruited from three secondary schools in Bihar. Personnel at the schools that agreed to participate chose a smaller group of their classes to take part. All pupils belonging to the nominated courses (n = 415) were qualified and provided with written information on the project. Prior to the study, parental consent was obtained, and teenage participants gave their approval before completing written questionnaires in class.

Results: A total of 393 students granted consent and successfully completed the questionnaire, resulting in a response rate of 95.85%. Out of them, 150 participants (38.16%) produced accelerometer data that could be used. There were no significant variations in age, socioeconomic status, ethnicity, or fruit and vegetable consumption between the group of 150 adolescents being compared and the group of 150 adolescents who did not produce useable accelerometer data. Nevertheless, a substantially greater percentage of individuals with valid accelerometer data were female, as opposed to male (53% versus 37%), and had breakfast on a greater number of days per week (4.7 days against 3.5 days). Hence, our data is likely to underestimate the proportion of those who do not fulfill the breakfast requirements. The ultimate sample makeup consisted of 150 adolescents, comprising 70 males, 80 females, 68 younger adolescents, and 50 older adolescents. The average age of younger adolescents was 14.3 years, whereas the average age of older adolescents was 14.6 years.

Conclusion: A significant number of teenagers do not fulfill various food and physical activity guidelines, indicating that physical activity and nutritional habits are interconnected. Further study should explore optimal strategies for achieving simultaneous modification of several health behaviors in teenage males and females.

Keywords: Adolescence, Life Style, Non-Communicable Disease, Physical Activity.

Introduction

The term "adolescence" originates from the Latin word "adolescere," which signifies "to grow to maturity." Adolescence is an intermediate phase of life that lies between childhood and maturity. Adolescence is a period characterized by significant physical and psychological growth and development, marking the transition from childhood to adulthood. [1] Adolescents in India make up 21.4% of the population, which is equivalent to one-fifth of the entire population. [2] Establishing nutritious dietary patterns is crucial due to the accelerated physiological maturation throughout adolescence, which is linked to heightened nutritional requirements. Multiple studies conducted on the dietary habits of teenagers and young adults in industrialized countries have revealed that their meals frequently consist of excessive amounts of fats and processed carbohydrates. [3] Children who consume a diet that is rich in sugar, saturated fat, salt, and calories are at risk of developing obesity, hypertension, dyslipidemia, and impaired glucose tolerance at an early age. [4]

The evolving lifestyles and convenient accessibility to unhealthy food in close proximity to schools, even within school canteens, have resulted in

youngsters developing a preference for and becoming dependent on junk food. There is strong evidence indicating that the dietary habits and lifestyle choices made during youth increase the risk of developing nutrition-related noncomm unicable diseases (NCDs) in adulthood. [5] Physical activity is the term used to describe any movement of the body that involves the use of skeletal muscles and results in energy expenditure above the resting state. Regular participation in physical exercise is widely recognized as having significant health advantages. [6,7]

Malnutrition and sedentary lifestyle are well-established determinants of chronic illness. Physical exercise and nutritious diets, which consist of regular breakfast eating and sufficient intake of fruits and vegetables, provide significant health benefits for young individuals in both the short and long term. Physical exercise in young individuals can have positive effects on risk factors associated with cardiovascular disease (CVD), obesity, and bone health. These effects may have long-term implications for adult health. [8] The eating of fruits and vegetables by children has been linked to a reduced occurrence of respiratory symptoms [9] and seems to provide protection against cancer later in life. [10] Furthermore, empirical studies employing cross-sectional and longitudinal designs have consistently demonstrated that adolescents who habitually have breakfast exhibit a lower propensity for obesity compared to their counterparts who abstain from breakfast. [11,12] Although breakfast offers several health advantages, young individuals are more prone to omitting this meal compared to others. According to the Health Behaviour in School-aged Children (HBSC) research, less than 40% of young individuals consume fruit on a regular basis, whereas around 33% consume vegetables everyday. [13,14]

The present study aims to precisely examine the objectively measured physical activity and food habits among teenagers in Bihar.

Materials & Methods

The current investigation was undertaken and cross-sectional data were gathered. The data were collected from teenagers aged 12 to 16 who were recruited from three secondary schools in Bihar. Personnel at the schools that agreed to take part chose a specific group of their classes to participate. All pupils belonging to the nominated courses (n = 415) were qualified and provided with written information on the project. Prior to the study, parental consent was obtained, and teenage participants gave their approval before completing written questionnaires in class. Participants filled out questionnaires during Physical Education or Personal, Social and Health Education (PHSE) courses, with professional researchers and class teachers overseeing the process.

Actions taken to achieve a specific goal or objective.

The school supplied demographic data, such as the individual's date of birth and ethnicity. The questionnaires gathered data on the demographic attributes of teenagers, such as their gender and home postcodes. Socioeconomic status (SES) was assessed by utilizing the Index of Multiple Deprivation (IMD), which is a comprehensive measure of combined social and material disadvantage. The IMD is derived from several data sources, including income, employment, health, education, and housing. The participant's socioeconomic status (SES) is approximated at the area level based on their home's postcode.

Adolescent eating habits

The evaluation of food consumption among adolescents was conducted through the utilization of a 30-item food frequency questionnaire (FFQ), which was developed based on the previously validated Youth/Adolescent Food Frequency questionnaire (YAQ). A group of 15 adolescents were surveyed on their frequency of consuming ten distinct fruits and twelve distinct vegetables throughout the previous month. The overall frequency of fruit and vegetable eating per day was calculated by summing the responses to questions on the frequency of consuming certain fruits and vegetables. In this study, each item was added together to determine the daily frequency of consuming 'fruits and vegetables' (FV). Based on the current guidelines for fruit and vegetable intake (5 parts of FV/day), the total daily frequency of consuming fruits and vegetables was divided into two categories: less than 5 times per day or 5 times or more per day. [15]

The assessment of breakfast intake was a single-item questionnaire that asked teenagers about the frequency of their breakfast consumption over the prior seven days. Although there are currently no official guidelines for how often one should eat breakfast, research indicates that young individuals who have breakfast most days of the week experience health advantages, such as a lower Body Mass Index, in comparison to those who choose to skip breakfast. [16,17] A new government program in Bihar advocates for parents to actively promote regular breakfast consumption among their children. Based on the provided evidence, the frequency of breakfast eating per week was divided into two categories: less than 5 days per week or 5 or more days per week.

Exercise

The assessment of physical activity was conducted using Actigraph GT1M accelerometers (ActiGraph, Fort Walton Beach, FL) with a measurement interval (epoch) of 5 seconds. Participants were directed to wear the accelerometer on their right hip for a duration of one week. Exceptions encompassed periods dedicated to sleep, personal hygiene, and engagement in water-related pursuits. The duration of moderate-to-vigorous physical activity (MVPA) was calculated exclusively for teenagers who wore the accelerometer for at least three days, namely those days where the accelerometer recorded counts ranging from 10,000 to 20 million. Nineteen In order to determine the duration of moderate intensity physical activity (3.0–5.9 metabolic equivalent of rest [METs]) and vigorous intensity physical activity (6.0+ METs) per day, specific movement count criteria were used based on age. The time spent in moderate-to-vigorous physical activity (MVPA) each day was calculated by adding together these values for the days that were considered genuine. The prevalence of adolescents satisfying the physical activity guidelines for young individuals was determined based on whether they engaged in an average of at least 60 minutes per day of moderate to vigorous physical activity (MVPA). Time spent in moderate-to-vigorous physical activity (MVPA) was categorized into two groups: less than 60 minutes per day or 60 minutes or more per day.

Quantitative Analyses

The analyses were performed using SPSS statistical software version 16.0. The sample's sociodemographic, physical activity, and nutritional variables were summarized using descriptive statistics. The adolescents were classified as younger or older based on a dichotomy at the mean age of 14.4 years. The Mann-Whitney tests were conducted to investigate the disparities in average minutes per day spent in moderate-to-vigorous physical activity (MVPA), daily fruit and vegetable consumption, and weekly breakfast consumption across gender and age groups. The study examined the percentage of teenagers who engage in at least 60 minutes of moderate to vigorous physical activity (MVPA) per day, the percentage of adolescents who consume fruits and vegetables at least 5 times per day, and the percentage of adolescents who have breakfast at least 5 days per week. The comparison was done based on gender and age-group using Pearson's chi-square ($\chi 2$) tests to determine statistical significance. Each participant's overall risk behavior score was determined by counting the total number of unfulfilled health recommendations, which ranged from zero to three. The study employed Pearson's chi-square tests to investigate the variations in the frequency of risk behaviors based on gender and age groups. To analyze the clustering patterns of various risk behaviors among teenagers, we computed the proportion of adolescents in each combination of risk behaviors. We then used Pearson's chi-square tests to investigate any variations in clustering patterns based on gender and age-group.

Results

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 = 150)	Boys (n = 70)	Girls (n = 80)	Younger adolescents (n = 68)	Older adolescents (n = 50)
MVPA minutes/day					
25th percentile	18.6	23.7	22.5	38.2	24.6
50th percentile	33.6	38.2	38.4	48.2	38.3
75th percentile	69.0	54.4	49.2	65.2	49.6
Frequency of FV consumption/day					
25th percentile	2.8	1.7	3.6	2.6	3.7
50th percentile	4.4	3.8	4.3	3.9	4.9
75th percentile	7.3	6.7	5.7	6.2	8.2

A grand total of 393 students graciously provided their consent and diligently completed the questionnaire, resulting in an impressive response rate of 95.85%. From the group, 150 individuals (38.16%) provided accelerometer data that was suitable for analysis. There were no notable differences in age, socioeconomic status, ethnicity, or fruit and vegetable intake between the group of 150 adolescents and the group of 150 individuals who did not provide meaningful accelerometer data. However, there was a higher proportion of individuals with reliable accelerometer data who were female compared to male (53% versus 37%), and they reported consuming breakfast more frequently per week (4.7 days versus 3.5 days). Thus, our data offers a cautious estimate of the frequency of non-compliance with the breakfast requirements. The final sample included 150 adolescents, with 70 males and 80 females. Among them, 68 were younger adolescents and 50 were

older adolescents. Younger adolescents had an average age of 14.3 years, while older adolescents had an average age of 14.6 years.

Table 2: Gender and age distribution of meeting health recommendations

	Total (n = 150)	Boys (n = 70)	Girls (n = 80)	Younger adolescents (n = 68)	Older adolescents (n = 50)
Meet >60 minutes MVPAper day, n (%)					
No	115(76.66)	49 (70)	66 (82.5)	42 (69.4)	44 (88)
Yes	35 (23.34)	21 (30)	14 (17.5)	26 (30.6)	6 (12)
Meet >5 portions fruits/ vegetables, n (%)					
No	80 (53.34)	37 (52.85)	43 (53.75)	44(64.3)	22 (44)
Yes	70 (46.66)	33 (47.15)	37 (46.25)	24 (35.7)	28 (56)
Meet >5 days a week eating breakfast, n (%)					
No	36 (24)	12 (17.14)	24 (30)	16 (23.5)	12 (24)
Yes	114 (76)	58 (82.85)	56 (70)	52 (76.5)	38 (76)
Number of risk behaviours, n (%)					
0	10 (6.6)	7 (10)	3 (3.75)	5 (7.1)	3 (6)
1	60 (40)	32 (45.71)	28 (35)	25 (36.7)	22 (44)
2	64 (42.66)	26 (37.14)	38 (47.5)	33 (48.0)	19 (38)
3	16 (10.66)	5 (7.14)	11 (13.75)	5 (8.2)	6 (12)

Incidence of adhering to health guidelines

Boys were found to have a much higher rate of consuming breakfast on more than 5 days per week compared to girls ($p < 0.01$). Individuals in the younger age group had a higher percentage of meeting the physical activity guidelines and a lower percentage of meeting the guidelines for fruit and vegetable consumption, compared to those in the older age group ($p < 0.01$). Only 6% of the teenage sample followed the recommendations for all three health behaviors, while nearly 10% engaged in three health risk behaviors. Girls showed a higher occurrence of three health risk behaviors in comparison to males, with statistical significance ($p < 0.01$).

Table 3: Descriptive cluster pattern of multiple risk behaviours

Number of risk behaviours	Percent of sample	Boys (n = 70)	Girls (n = 80)	Younger adolescents (n = 68)	Older adolescents (n = 50)
3: All three risk behaviours	9.8	5.8	13.7	8.2	11.6
2: MVPA < 60 minutes/day and < 5 fruit/vegetables per day	34.0	32.0	34.8	36.4	28.4
2: MVPA < 60 minutes/day and < 5 days a week eating breakfast	6.4	1.2	11.4	5.1	7.8
2: < 5 fruit/vegetables per day and < 5 days a week eating breakfast	5.7	5.7	5.6	8.2	2.8
1: MVPA < 60 minutes/day	28.0	34.5	24.6	19.4	42.1
1: < 5 fruit/vegetables per day	7.4	9.3	5.6	11.2	2.8
1: < 5 days a week eating breakfast	2.8	2.3	3.4	4.1	1.4
0: No risk behaviours	6.4	10.4	2.3	7.1	5.2

The most common group among teenagers displaying two risk behaviors included those who did not meet the recommended levels of physical activity and fruit and vegetable consumption. Females showed a higher prevalence of the cluster pattern, which involved not meeting the recommended levels of physical activity and skipping breakfast, compared to males. The p-value is less than 0.01. Boys and older adolescents exhibited a higher prevalence of the most common risk factor, namely not meeting the recommended level of physical activity, in comparison to females and younger adolescents ($p < 0.01$). Individuals in the younger age group had a higher percentage of youth who did not meet the recommended levels of fruit and vegetable consumption, in comparison to those in the older age group ($p < 0.01$).

Discussion

This study examined the frequency and grouping tendencies of three health behaviors (physical activity, fruit and vegetable eating, breakfast consumption) among a group of teenagers from Bihar. Approximately 54% of teenagers exhibited various nutrition and physical activity risk behaviors, whereas only 6% successfully adhered to the guidelines for all three health behaviors. Malnutrition and sedentary lifestyle are well-

established variables that increase the chance of developing chronic illnesses. Physical exercise and nutritious diets, which consist of regular breakfast eating and sufficient intake of fruits and vegetables, provide significant health benefits for young individuals in both the short and long term. Physical exercise in young individuals can have positive effects on risk factors associated with cardiovascular disease (CVD), obesity, and bone health. These effects may have long-term implications for health in adulthood. [20]

A total of 393 students granted consent and successfully completed the questionnaire, resulting in a response rate of 95.85%. Out of them, 150 participants (38.16%) produced accelerometer data that could be used. There were no significant variations in age, socioeconomic status, ethnicity, or fruit and vegetable consumption between the group of 150 adolescents being compared and the group of 150 adolescents who did not produce useable accelerometer data. Nevertheless, there was a statistically significant difference ($p < 0.01$) in the proportion of girls and boys having useable accelerometer data, with a higher percentage of females (53%) compared to boys (37%). Additionally, girls reported consuming breakfast on a greater number of days per week (4.7 days) compared to boys (3.5 days). Hence, our data is likely to underestimate the proportion of those who do not fulfill the breakfast requirements. The ultimate sample consisted of 150 adolescents, comprising 70 males, 80 females, 68 younger adolescents, and 50 older adolescents. The average age of younger adolescents was 14.3 years, whereas the average age of older adolescents was 14.6 years. Boys exhibited a greater prevalence of consuming breakfast on more than 5 days per week, in comparison to girls ($p < 0.01$). Youth in the younger age group had a greater percentage of individuals who met the physical activity guidelines and a lower percentage who met the guidelines for fruit and vegetable consumption, compared to those in the older age group ($p < 0.01$). Merely 6% of the teenage sample adhered to the recommendations for all three health behaviors, whereas almost 10% engaged in three health risk behaviors. Girls exhibited a greater prevalence of three health risk behaviors compared to males, with statistical significance ($p < 0.01$).

Boys had higher levels of moderate-to-vigorous physical activity (MVPA) in comparison to girls. Similarly, younger adolescents had higher levels of MVPA compared to older adolescents. These findings corroborate other research [21,22] that emphasizes gender disparities and age-related decreases in physical activity among adolescents, utilizing objective measures of physical activity. Recent studies utilizing accelerometry have also demonstrated that disparities in age and gender become apparent even comparing youngsters as young as six and eleven years old. [23,24] These findings indicate that the years spent in elementary school are crucial for the emergence of differences in physical activity patterns. [25] Initiating initiatives to encourage physical activity should start during these crucial years, since children who engage in regular physical exercise are more inclined to maintain an active lifestyle throughout adulthood. [26] Adolescent girls had a lower frequency of breakfast consumption per week in comparison to boys, in line with prior studies. [27] Although there is data indicating that teenagers who do not have breakfast are more prone to being overweight compared to those who consistently have breakfast, missing breakfast may be a deliberate strategy for weight management among females. Additionally, in certain individuals, it may be linked to dieting or disordered eating. [28,29]

Older adolescents exhibited higher daily fruit and vegetable intake and were more inclined to fulfill the recommended guidelines for fruit and vegetable consumption as comparison to younger adolescents. Conversely, a comprehensive analysis has demonstrated a detrimental correlation between age and the intake of fruits and vegetables. [30] The divergent results may indicate variations in the methods used to evaluate the intake of fruits and vegetables. Multiple studies have discovered that meal frequency surveys tend to result in an overestimation of fruit and vegetable consumption. [31,32] Girls exhibited a higher likelihood of displaying the two behavior risk cluster that involved engaging in physical exercise and consuming breakfast. One potential reason for this clustering phenomenon is that teenagers who regularly miss breakfast consume less energy throughout the day, whereas higher energy consumption is linked to increased physical activity. [33] Girls who omit breakfast as a component of their diet or weight management strategy may have reduced energy levels for engaging in physical activities. There is a need to make efforts to encourage teenage females, specifically, to engage in physical exercise and have breakfast regularly. Consistent with other studies, females exhibited a greater number of risk variables associated with physical activity and nutritional behaviors in comparison to boys. [34] These findings offer further evidence to support the implementation of gender-specific treatments that promote physical activity and nutritional behaviors. Despite the frequent targeting of multiple behaviors in health promotion programs, there is less knowledge on the most effective techniques for encouraging multiple behavior change in teenagers. [34] Multiple reviews of behavior treatments in young people have shown that some behaviors change, but not all. Significant benefits are more likely to be observed in nutritional outcomes rather

than physical activity results. There is

limited evidence of a relationship between nutrition and physical activity behaviors in teenagers across time. [35,36] Among teenagers exhibiting two risk behaviors, the most common cluster consisted of those who did not achieve the recommended levels of physical activity and fruit and vegetable consumption. Girls had a greater prevalence of the cluster pattern characterized by failure to reach the recommended levels of physical activity and breakfast eating, as compared to males. The value of p is less than 0.01. Boys and older adolescents exhibited a greater prevalence of not achieving the requirements for physical activity, compared to females and younger adolescents, respectively ($p < 0.01$). Youth in the younger age group had a greater percentage of not achieving the recommended fruit and vegetable consumption compared to those in the older age group ($p < 0.01$).

Conclusion

A significant number of teenagers do not satisfy certain food and physical activity guidelines, confirming prior findings that physical activity and nutritional habits are interconnected. When evaluating the effectiveness of interventions that promote multidimensional health behavior change, it is important to examine the variations in food and physical activity behaviors across teenage males and girls, as well as between older and younger adolescents.

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