Pattern of physical activity and its association with overweight and obesity among rural school going adolescents in Rohtak district, Haryana

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Abstract

Introduction: Physical activity is one of the major lifestyle-related health determinants. Regular physical activity of moderate intensity—such as walking, cycling, or participation in sports—has significant benefits for health. In today’s world, the physical activity, one of the major health-protecting behaviors seems to decline among the adolescents.

Aim and Objectives: To study the pattern of physical activity and its association with overweight and obesity among rural school-going adolescents.

Material and Methods: A cross-sectional study was conducted in Lakhanmajra block (rural block) of Rohtak district over a period of one year from July 2016 to June 2017. A total of 750 students from six co-educational government senior secondary schools were included in the study. Data were collected using pre-designed, pre-tested, semi-structured interview schedule and analysed using SPSS version 20.0.

Results: Prevalence of overweight and obesity was 6.7% and 1.1% respectively. 10.3% of the study subjects who were not in the habit of doing any exercises in the morning after getting up were found to be obese/overweight. 13.2% of the study subjects who did not have the habit of playing daily were obese/overweight. 22% of the study subjects who used to spend 2-3 hours in a day in idle activities like watching TV or chatting with friends and playing mobile games were obese/overweight. About one fourth (25.6%) of the study subjects who were in the habit of sleeping in the afternoon or evening were obese/overweight. Habit of playing daily, its duration and sleeping in the afternoon/evening were significantly associated with overweight/obesity.

Conclusion: Physical inactivity leads to obesity which in turn gives rise to cardio-vascular diseases and diabetes. Thus, it is the need of the hour to address this problem and devise programs and strategies to prevent overweight and obesity among adolescents. The children should be encouraged for doing physical activity not only for weight control but also for general well-being.

Keywords: Physical activity, adolescents, rural, overweight, obesity.

Introduction

Physical activity is one of the major lifestyle-related health determinants. WHO defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure— including activities undertaken while working.
playing, carrying out household chores, travelling, and engaging in recreational pursuits.\textsuperscript{1}

Regular physical activity of moderate intensity – such as walking, cycling, or doing sports – has significant benefits for health. It improves muscular and cardiorespiratory fitness, improves bone and functional health and reduces the risk of hypertension, coronary heart disease, stroke, diabetes, various types of cancer (including breast cancer and colon cancer), and depression.\textsuperscript{1}

WHO recommends that children and adolescents aged 5-17 years should do at least sixty minutes of moderate to vigorous-intensity physical activity daily.

Physical inactivity has been identified as the fourth leading risk factor for global mortality causing an estimated 3.2 million deaths globally. More than 80% of the world's adolescents do not perform the recommended physical activity. Insufficient physical activity is a key risk factor for non-communicable diseases (NCDs) such as cardiovascular diseases, cancers and diabetes.\textsuperscript{1}

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended.\textsuperscript{3}

Physical inactivity is the main cause of this energy imbalance leading to overweight and obesity. Overweight and obesity are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancers.

In today’s world, the physical activity which is one of the major health-protecting behaviour is seen to decline among the adolescents. Hence, the present study was conducted to study the pattern of physical activity and its association with overweight and obesity among rural school going adolescents in district Rohtak of Haryana.

Material and Methods
A cross sectional study was conducted in the community development block Lakhan Majra (district Rohtak), which is a rural field practice area attached to the Department of Community Medicine, Pt. B. D. Sharma PGIMS, Rohtak over a period of one year from July 2016 to June 2017. The school going adolescents in the age group 13-19 years studying in classes 8th to 12th in six co-educational government senior secondary schools of Lakhan Majra block formed the study population.

Sample Size
According to the study conducted by Kowsalya et al\textsuperscript{4} in Salem district of Tamil Nadu, the prevalence of overweight/obese among school going adolescents was 12.11%. Considering the prevalence as 12.11%, with 95% confidence interval and allowable error of 20%,

\[
\text{Sample size} = \frac{(Z_{1-a/2})^2 \times p \times q}{d^2}
\]

Sample size came out to be 696. By assuming a non-response rate of 5 %, a sample of 750 eligible subjects was included in the study.

Sampling technique
The list of all students currently studying from classes 8\textsuperscript{th} to 12\textsuperscript{th} was sought from the Principals of the respective schools. From each school, 125 students were selected. It was proportionate to the strength of eligible students in each class. Simple random sampling technique was used for selection of students from each class through random number generator software.

Inclusion Criteria
1. Students in the age group 13-19 years studying in classes 8\textsuperscript{th} – 12\textsuperscript{th}.

Exclusion Criteria
1. Students who were not willing to participate in the study.
2. Students who were not present in the respective schools on the days of visit.

Study Instruments
A pre-designed, pre-tested, semi-structured interview schedule was used to elicit the
information on socio-demographic profile, time spent on physical activity, hours of sleep and time spent on idle activities like watching TV, sitting and chatting with friends. Anthropometric measurements such as height, weight were recorded and body mass index (BMI) for each student was calculated.

Methodology
The selected schools were visited in advance and prior permission was sought from the concerned Principals of the respective schools for conducting the study. The students were briefed about the nature and purpose of study and consent forms were distributed to them to get them signed from their parents/guardians. Only those students, who themselves along with their parents consented for the study, were interviewed. The students were interviewed one by one separately and their responses were noted. Confidentiality of the obtained information was maintained.

Study subjects were categorised into underweight, normal, overweight and obese using WHO reference 2007 standards for BMI for boys and girls aged 5-19 years.  

Data Analysis
Data collected were compiled, coded appropriately and entered in the MS Excel spread sheet and analysed using statistical package for social sciences (SPSS) software version 20.0. The data were represented as frequency and proportions. Appropriate tests of significance were applied wherever necessary.

Results
A total of 750 adolescents aged 13-19 years studying in 8th -12th classes were included in the study. The majority (60.7%) of the study subjects were in the age group 15 -17 years followed by 13-14 years (31.1%) and 18-19 years (8.2%). The mean age of the study subjects was 15.38 ± 1.493 years.

Majority (24.4%) of the study subjects belonged to 10th class followed by 9th (20.9%), 11th (20%), 12th (18.3%) and 8th (16.4%) classes. 61.7% of the study subjects belonged to Nuclear families followed by Joint families (20.5%) and Three generation families (17.8%) respectively. More than half (54.7%) of the study subjects had upto 5 members in the family followed by 44.7% with 6 – 10 family members and only very few (0.6%) had more than 10 family members. 38.3% of the study subjects had monthly family income between 10,000 to 15,000 rupees followed by 30.7% with income less than 10,000 rupees and 19.8%, 11.2% belonging to income range more than 15,000 to 20,000 rupees and more than 20,000 rupees respectively.

Table 1: Distribution of study subjects according to physical activity (n=750)

| Characteristic                        | Frequency | Percentage |
|---------------------------------------|-----------|------------|
| Regular morning exercise              | Yes       | 243        | 32.4      |
|                                       | No        | 507        | 67.6      |
| Type of exercise (n=243)              | Stretching| 100        | 41.15     |
|                                       | Yoga      | 100        | 41.15     |
|                                       | Jogging/Walking | 43    | 17.70     |
| Distance of school from home          | Less than 2 Km | 346  | 72.8     |
|                                       | 2 - 4 Km | 182        | 24.3      |
|                                       | More than 4 Km | 22   | 2.9       |
| Mode of transport                     | On foot   | 588        | 78.4      |
|                                       | Bicycle   | 160        | 21.3      |
|                                       | Others    | 2          | 0.3       |
| Time taken for commuting to school and back home | Less than 20 mins | 494 | 65.9 |
|                                       | 20-40 mins| 225        | 30.0      |
|                                       | More than 40 mins | 31 | 4.1      |
| Habit of playing daily                | Yes       | 454        | 60.5      |
|                                       | No        | 296        | 39.5      |
| Games played (n=454)                  | Cricket   | 179        | 39.43     |
|                                       | Kabaddi   | 116        | 25.56     |
|                                       | Football  | 89         | 19.60     |
|                                       | Others    | 70         | 15.41     |
| Duration of Playing                   | Less than 1 hour | 216  | 28.8 |
|                                       | 1-2 hours | 224        | 29.9      |
|                                       | More than 2 hours | 14  | 1.8      |
| Total time spent in a day in idle activities like watching TV, playing mobile games and talking to friends | Less than 2 hours | 535 | 71.3 |
|                                       | 2-3 hours | 200        | 26.7      |
|                                       | More than 3 hours | 15  | 2        |

Table 1 shows the distribution of study subjects according to various types of physical activities performed. About one third (32.4%) of the study subjects had the habit of doing exercise in the morning after getting up. Among the exercise, yoga (41.15%) and simple stretching exercises (41.15%) were commonly done in the morning.
72.8% of the study subjects had their school situated at a distance of less than 2 Km from their homes followed by 24.3% situated between 2-4 Km and only a few (2.9%) had their school situated at distance more than 4Km. More than three fourth (78.4%) of the study subjects walked to their school from home and 21.3% used a bicycle to commute to school. 65.9% of the study subjects took less than 20 minutes, 30% took 20-40 minutes and only 4.1% took more than 40 minutes for commuting between home to school and back.

Majority (60.5%) of the study subjects had the habit of playing daily. Cricket (39.43%) and Kabbadi (25.56%) were the most commonly played games by the study subjects.

29.9% of the study subjects played for 1-2 hours per day and 28.8% played for less than one hour per day. Only 1.8% study subjects played for more than two hours per day. Majority (71.3%) of the study subjects spent less than two hours in a usual day watching TV/playing mobile games or sitting and chatting with friends. 26.7% spent 2-3 hours and only 2% spent more than 3 hours for these idle activities.

Table 4 shows that 6.7% and 1.1% of the study subjects were overweight and obese respectively.

Table 2: Distribution of study subjects according to sleep pattern (n=750)

| Habit of sleeping in afternoon/evening | Frequency | Percentage |
|----------------------------------------|-----------|------------|
| Yes                                    | 176       | 23.5       |
| No                                     | 574       | 76.5       |

| Hours of sleep per day | Frequency | Percentage |
|------------------------|-----------|------------|
| Less than 6 hours      | 11        | 1.5        |
| 6-8 hours              | 559       | 74.5       |
| 8 - 10 hours           | 173       | 23.1       |
| More than10 hours      | 7         | 0.9        |

Almost one fourth (23.5%) of the total study subjects had the habit of sleeping in the afternoon or evening. Around three fourth of the subjects (74.5%) had sleep for 6-8 hours per day followed by 23.1% who slept for 8-10 hours per day and 1.5% & 0.9% with sleep duration of less than 6 hours and more than 10 hours per day respectively. (Table 2)

Table 3: Distribution of study subjects according to WHO BMI cut off values

| Category          | Frequency | Percentage |
|-------------------|-----------|------------|
| Underweight       | 67        | 8.9        |
| Normal            | 625       | 83.3       |
| Overweight        | 50        | 6.7        |
| Obese             | 8         | 1.1        |
| Total             | 750       | 100        |

Table 3 shows that 6.7% and 1.1% of the study subjects were overweight and obese respectively.

Table 4: Association of obesity/overweight with physical activity

| Obese/Overweight | Frequency | Percentage |
|-------------------|-----------|------------|
| Yes               | 52        | 10.3       |
| No                | 455       | 89.7       |
| z^2 value         | 13.96087  | 1          |
| df                | 1         | 0.000      |

| Mode of transport to go to school | Frequency | Percentage |
|----------------------------------|-----------|------------|
| On foot                          | 43        | 7.3        |
| Bicycle                          | 15        | 9.4        |
| Others                           | 0         | 0          |
| Habit of playing daily           | 39        | 13.2       |
| Yes                              | 257       | 86.8       |
| No                               | 435       | 95.8       |
| z^2 value                        | 20.298    | 1          |
| df                               | 1         | 0.000      |

| Duration of playing | Frequency | Percentage |
|---------------------|-----------|------------|
| NA                  | 39        | 13.2       |
| <1 hour             | 204       | 94.4       |
| 1-2 hours           | 219       | 97.8       |
| >2 hours            | 12        | 85.7       |
| z^2 value           | 24.06585  | 3          |
| df                  | 0.000     |            |

| Total time spent in a day watching TV, playing mobile games, talking to friends | Frequency | Percentage |
|-----------------------------------------------------------------------------|-----------|------------|
| < 2 hrs                        | 13        | 2.4        |
| 2-3 hrs                        | 44        | 22         |
| >3 hours                       | 14        | 6.7        |
| z^2 value                      | 78.16392  | 2          |
| df                             | 0.001     |            |

significant (*), those without chi square values are Fisher exact values. Table 4 shows the association of obesity/overweight with physical activity of study subjects. Approximately one-tenth (10.3%) of the study subjects who were not in the habit of doing any exercise in the morning were found to be obese/overweight, whereas, only very few (2.5%) were obese/overweight among those who were in the habit of doing exercise in the morning. This finding was statistically significant.

Regarding the mode of transport to school, 9.4% of the study subjects who used bicycle to commute to school were obese/overweight in comparison to those who walked to school (7.3%).
However, this finding was statistically not significant.

13.2% of the study subjects who were not playing daily were obese/overweight as compared to those who were in the habit of playing daily (4.2%). When the duration of playing was considered, the number of obese/overweight study subjects decreased with increase in duration of playing. This finding was statistically significant.

Table 5: Association of obesity/overweight with sleep pattern

| Sleeping in afternoon/evening | Obese/Overweight | \( \chi^2 \) value | df | p value |
|-------------------------------|------------------|----------------------|----|---------|
| No                            | Freq | %       | Freq | %       | chi2 | df | p value |
| No                            | 13   | 2.3     | 561  | 97.7    | 102.5155 | 1  | 0.000   |
| Yes                           | 45   | 25.6    | 131  | 74.4    |       |    |         |
| Hours of sleep per day        |      |         |      |         |       |    |         |
| < 6                           | 0    | 0.0     | 11   | 100     | 3     | 0.001|
| 6-8                           | 26   | 4.7     | 533  | 95.3    |       |    |         |
| 8 - 10                        | 31   | 17.9    | 142  | 82.1    |       |    |         |
| > 10                          | 1    | 14.3    | 6    | 85.7    |       |    |         |

Table 5 shows the association of obesity/overweight with sleep pattern of study subjects. About one fourth (25.6%) of the study subjects who were in the habit of sleeping in the afternoon or evening were obese/overweight, whereas, only 2.3% of those who did not have this habit were obese/overweight. The prevalence of obesity/overweight was also higher (17.9%) among study subjects who had sleep for 8-10 hours as against 14.3% for those having sleep for more than 10 hours in a day. This finding was statistically significant.

**Discussion**

The present study included 750 school going adolescents aged 13-19 years studying in classes 8th-12th in Govt. Sr. Sec Schools of Lakhan Majra block of Rohtak district. Out of the total study subjects, majority (60.7%) were in the age group 15-17 years. Males (72.5%) outnumbered the females (27.5%). 24.4% of the study subjects belonged to class 10th followed by 20.9% belonging to 9th class. 61.7% of the study subjects belonged to nuclear family. More than half (54.7%) of the study subjects had 5 and less than 5 family members. 38.3% of the study subjects had monthly family income between 10,000 to 15,000 rupees followed by 30.7% with monthly income less than 10,000 rupees.

Prevalence of overweight and obesity

In the present study, prevalence of overweight and obesity was found to be 6.7% and 1.1% respectively (Table 3) among rural school going adolescents of Rohtak district, Haryana. Similar prevalence of overweight (6.6%) and obesity (1.1%) was observed in the study conducted by Tiwari et al in Allahabad in which WHO BMI cut off values were used to categorize the study subjects as overweight and obese. Higher prevalence of overweight and obesity were reported in studies conducted by Choudhary et al in Patna (6.3% obese and 10.3% overweight), Prajapati et al in Vidarbha (11.8% obese and 15.8% overweight). This may be because studies were conducted in different areas and included different age groups.

A study conducted by Mithra et al in Udupi district of Karnataka reported prevalence of overweight and obesity to be 2.4% and 1.4%. This was much lower in comparison to the present study. The reason may be attributed to larger sample size (2963 students) and inclusion of students belonging to age group 10 – 18 years.
Overweight/obesity and physical activity
According to WHO, global recommendations on physical activity for health 2 the cumulative moderate to vigorous physical activity done by children and adolescents aged 5-17 years should be at least 60 minutes daily. Only 31.7% children studied had the recommended level of physical activity. This finding was comparable to the report of India Global School Based Health Survey (GSHS)11 2007 conducted by CBSE, where 30.2% of the students were physically active for at least 60 minutes per day on all days in the last week.
Higher (13.2%) proportion of the study subjects who did not have the habit of playing daily were overweight/obese in comparison to those who were in the habit of playing daily (4.2%). When the duration of playing was considered, the number of overweight/obese students decreased with increase in the duration. This finding was statistically significant.
Similar findings were reported in the studies conducted by Tiwari et al7, Kumar et al12 and Choudhary et al8 where the prevalence of overweight/obesity was higher in students who did not do any physical activity/played outdoor games as compared to those who played daily. These findings can be explained by the fact that lack of physical activity causes energy imbalance and leads to overweight/obesity.
22% of the students who spent two to three hours per day in idle activities like watching TV, playing mobile games and chatting with friends were found to be overweight/obese in the present study. This finding was statistically significant. Similar findings were reported by Kumar et al12, Choudhary et al8, Prajapati et al9 and Watharkar et al13 in their studies, where the prevalence of overweight/obesity among students who watched TV/played mobile games for more than two hours was higher as compared to those who watched TV/played mobile games for less than two hours. Parents preferred their children to sit and watch TV at home where they could keep an eye on them rather than allowing them to play outside unattended. This again led to energy imbalance and finally overweight/obesity.
Overweight/obesity and sleeping pattern
About one fourth (25.6%) of the participants who were in the habit of sleeping in the afternoon/evening were overweight/obese compared with those who did not have this habit (2.3%). This was consistent with the findings of the study conducted by Watharkar et al13, in which 31.1% of the study subjects who had the habit of sleeping in the afternoon were overweight/obese as compared to those who did not sleep in the afternoon (8.6%).
The present study also found higher (17.9% & 14.3%) prevalence of overweight/obesity among study subjects who slept for 8-10 hours per day and more than 10 hours per day as compared to those who had normal sleep duration (6-8 hours per day - 4.7%). Sleeping burns less calories as compared to physical activity thus causes energy imbalance and overweight/obesity.

Conclusion
The prevalence of overweight and obesity among adolescents is on an increasing trend in rural areas. Habit of playing daily, its duration, and the habit of sleeping in the afternoon/evening were significantly associated with the overweight/obesity. As stated earlier, physical inactivity leads to obesity which in turn gives rise to cardiovascular diseases and diabetes. Thus, it is the need of the hour to address this problem and devise programs and strategies to prevent overweight and obesity among adolescents.

Recommendations
The children should be encouraged to be physically active not only for weight control but also for general well-being. A moderate to vigorous physical activity for a period of at least one hour per day will be a more practical thing for all school going children. The schools should have adequate space and facilities for students to spend their free time actively. The sports and physical training activities should be inbuilt in school
curriculum. The physical activity should become their way of life. The school should look after all aspects of health of the children which includes physical, mental and social well-being. The group physical activities take care of all these things.

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