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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 determinant. 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 behaviour 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 determinant. 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.[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.[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.[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.[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[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%,

The sample size was thus calculated by using the formula:

$$n = \frac{(Z_{1-a/2})^2 \times p \times q}{d^2}$$

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 8th to 12th 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 8th – 12th.

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.[5,6]

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 8^{th} -12^{th} 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 $\pm$ 1.493 years.

Majority (24.4%) of the study subjects belonged to 10^{th} class followed by 9^{th} (20.9%), 11^{th} (20%), 12^{th} (18.3%) and 8^{th} (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 upto5 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	546	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
	Kabbadi	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 2: Distribution of study subjects according to sleep pattern (n=750)

		Frequency	Percentage
Habit of sleeping in afternoon/evening	**Yes**	176	23.5
	No	574	76.5
Hours of sleep per day	**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						
		Yes		No				
		Freq	%	Freq	%	χ^2 value	df	p value
Regular morning exercise	**No**	52	10.3	455	89.7	13.96087	1	0.000*
	Yes	6	2.5	237	97.5			
Mode of transport to go to school	**On foot**	43	7.3	545	92.7			0.093
	Bicycle	15	9.4	145	90.6			
	Others	0	0	2	100			
Habit of playing daily	**No**	39	13.2	257	86.8	20.298	1	0.000*
	Yes	19	4.2	435	95.8			
Duration of playing	**NA**	39	13.2	257	86.8	24.06585	3	0.000*
	<1 hour	12	5.6	204	94.4			
	1-2 hours	5	2.2	219	97.8			
	> 2 hours	2	14.3	12	85.7			
Total time spent in a day watching TV, playing mobile games, talking to friends	**< 2 hrs**	13	2.4	522	97.6	78.16392	2	0.001*
	2-3 hrs	44	22	156	78			
	>3 hours	1	6.7	14	93.3			

significant (*), those without chi square values are Fischer 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.

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 or playing mobile games were obese/overweight. 6.7% and 2.4% of the study subjects who spent more than 3 hours and less than 2 hours in idle activities were obese/overweight. This finding was statistically significant.

Table 5: Association of obesity/overweight with sleep pattern

		Obese/Overweight				χ^2 value	df	p value
		Yes		No				
		Freq	%	Freq	%			
Sleeping in afternoon/evening	**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	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			

significant (*). Those without chi square values are Fischer exact values

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 8^{th}-12^{th} 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 10^{th} followed by 20.9% belonging to 9^{th} 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[7] 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[8] in Patna (6.3% obese and 10.3% overweight), Prajapati et al[9] 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[10] 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 al[7], Kumar et al[12] and Choudhary et al[8] 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 al[12], Choudhary et al[8], Prajapati et al[9] and Watharkar et al[13] 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 al[13], 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 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.

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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