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PATTERN OF PHYSICAL ACTIVITY AND ITS ASSOCIATION WITH ANTHROPOMETRIC RISK FACTORS FOR NON-COMMUNICABLE DISEASES (NCDS) AMONG RURAL SCHOOL GOING ADOLESCENTS IN ROHTAK DISTRICT OF HARYANA

Community Medicine

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ABSTRACT

Introduction: In recent times, the non-communicable diseases (NCDs) have attained a magnitude of epidemic proportion, with increasing number of adolescents being reported as obese. The risk factors for NCDs such as obesity, sedentary lifestyle, unhealthy dietary habits etc., are inculcated during the adolescence and continue to exist into adult life. Thus, lessening the associated risk factors is an important way to reduce the NCDs.
Aim and objectives: To study the pattern of physical activity and its association with anthropometric risk factors for NCDs among school-going adolescents in a rural block of Haryana.
Material and Methods: A cross-sectional study was conducted in Lakhanmajra 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: 61.74% adolescents were involved in different physical activities like jogging/walking, cycling and playing for one hour or more. 11.2% of the study subjects had anthropometric risk for developing NCDs based on waist circumference and waist hip ratio criteria.
Conclusion: The anthropometric risk factors for NCDs among adolescents are on an increasing trend in rural areas. Thus, it is the need of the hour to address this problem and devise programs and strategies to prevent development of NCDs in children and adolescents.

KEYWORDS

Physical activity, Anthropometric risk factors, Rural, Adolescents

Introduction

World Health Organization (WHO) defines an adolescent as any person between ages 10 and 19 years.[1] The world is home to 1.2 billion adolescents and more than half of them live in Asia. These young people constitute 16% of the world's population.[2]

Healthy development of adolescents is dependent on several complex factors; their socio-economic circumstances, the environment in which they live and grow, the quality of relationships with their families, communities and peer groups and the opportunities for education and employment. Thus this is a period of challenges and opportunities.[3]

Adolescents and Non-communicable diseases (NCDs)

In recent times, the non-communicable diseases (NCDs) have attained a magnitude of epidemic proportion, with increasing number of adolescents being reported as obese. Childhood obesity is associated with higher chances of premature deaths and disabilities in adulthood. It is also evident that nearly 75% of the obese adolescents remain obese as adults, increasing the risk of NCDs.[5-7]

Increased BMI highlights the fact that, obesity is a central factor common to the problem of Hypertension, Diabetes and Coronary Heart Diseases.[8] The risk factors for NCDs such as obesity, sedentary lifestyle, unhealthy dietary habits etc., are inculcated during the adolescence and these lifestyle changes continue to exist into adult life. The lack of physical activity, unhealthy diet can jeopardize not only their current health but often their health for years to come. Thus, lessening the associated risk factors is an important way to reduce the NCDs.

Low-cost solutions exist to reduce the common modifiable risk factors. These interventions have to be done in the adolescent stage of life as seeds of NCDs are sown in childhood and early adolescent span of life. Promoting healthy practices during adolescence and taking steps to protect young people from health risks are critical for the prevention of health problems in adulthood.

Importance of anthropometry

Anthropometry is the single most universally applicable, inexpensive and non-invasive method available to assess the size, proportion and composition of the human body. It reflects both health and nutritional status.[9]

Anthropometry is especially important during adolescence because it allows the monitoring and evaluation of the hormone-mediated changes in the growth and maturation during this period. Moreover, because growth may be sensitive to nutritional deficit and surfeit, adolescent anthropometry provides indicators of nutritional status and health risk, and may be diagnostic of obesity.[9]

Body fat distribution is an important independent correlate of cardiovascular risk factors than percentage of body fat in children and adolescents.[10] Abdominal obesity is important in the development of insulin resistance and in the metabolic syndrome (hyper insulinaemia, dyslipidaemia, glucose intolerance and hypertension) that link obesity with coronary heart disease (CHD).[11]

The waist circumference (WC) is a good index of abdominal obesity and is the best indicator of changes in the intra-abdominal fat during weight loss.[12] Waist circumference independently contributes to the prediction of non-abdominal (total fat minus abdominal fat), abdominal subcutaneous and visceral fat in both sexes. It has the ability to act as a surrogate for abdominal fat.[13]

Waist to hip ratio (WHR) is a well-recognised measure of regional fat distribution in the body and is often used as a marker for intra-abdominal fat accumulation. In adults, there are gender differences in accumulation of intra-abdominal fat, which appears to be independent of the total amount of body fat.[14] Males often show a central or android pattern of fat distribution, whereas, in females body fat tends to accumulate in the thighs and buttocks resulting in a peripheral or gynoid pattern of adiposity. In men and women, an increased WHR (>1.0 for males and > 0.8 for females) is associated with greater risk of chronic diseases such as hypertension, stroke and ischemic heart disease independent of total body fat.[15]

With this background, the present study was conducted to study the pattern of physical activity and its association with anthropometric risk factors for NCDs among school-going adolescents in a rural block of Haryana.

Material and Methods

A cross sectional study was conducted over a period of one year from July 2016 to June 2017 in 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. 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 the block formed the study population.

Sample Size:

According to the study conducted by Kowsalya et al[16] 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 class 8th to 12th was sought from the Principals of the respective schools. From each school, 125 students were selected which was proportionate to the strength of eligible students in each class. Simple random sampling technique was used for inclusion of eligible students from each class.

Inclusion Criterion:
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 the visit.

Study Instruments:
A pre-designed, pre-tested, semi-structured interview schedule was used to interview the study participants to elicit the information on their 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 waist circumference and hip circumference were recorded and waist to hip ratio (WHR) 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 assented themselves along with consent of their parents were interviewed. The students were interviewed one by one separately and their responses were noted. Confidentiality of the obtained information was maintained.

Waist circumference and Hip circumference
Waist circumference and hip circumference for each study subject was measured by standard technique.

Cut off for Waist circumference (90th percentile) for boys and girls aged 13 – 16 years.[17]

Age	Boys	Girls
13	53.3	54.6
14	55.8	58.4
15	58.4	64.7
16	81.2	64.7

Cut off for waist circumference for boys and girls aged 17 – 19 years.[18]

Age	Boys	Girls
17	84	72
18	90	80
19	90	80

Study subjects who had waist circumference more than cut off were considered to be at risk for NCDs.

Waist to Hip ratio
From the waist and hip circumferences, the Waist to hip ratio was calculated using the formula

Waist circumference (in cm) / Hip circumference (in cm)
According to WHO, Waist Hip ratio of more than 0.85 for women and 0.90 for men is a predictor for cardiovascular risk.[19] The same was used as cut off in our study to consider the subjects to be at risk of NCDs.

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 $\pm$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	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 exercises, 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 4 Km. 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 risk of developing NCDs based on criteria of waist circumference & Waist to hip ratio (n=750)

		Frequency	Proportion
Anthropometric risk	**Yes**	84	11.2
	No	666	88.8

Table 3 shows that 11.2% of the total study subjects were found to have anthropometric risk of developing NCDs on analysis of waist circumference (WC) and Waist hip ratio (WHR).

Table 4: Association of anthropometric risk with physical activity

		Anthropometric Risk				χ^2 value	df	p value
		Yes		No				
		Freq	%	Freq	%			
Regular morning exercise	**Yes**	13	5.3	230	94.7	12.37	1	0.000*
	No	71	14	436	86			
Mode of transportation for school	**On foot**	62	10.5	526	89.5		2	0.064
	Bicycle	22	13.8	138	86.3			
	Others	0	0	2	100			
Habit of playing daily	**Yes**	33	7.3	421	92.7	17.876	1	0.000*
	No	51	17.2	245	82.8			
Duration of playing	**Not applicable**	51	17.2	245	82.8		3	0.000*
	Less than 1 hour	18	8.3	198	91.7			
	1-2 hours	13	5.8	211	94.2			
	More than 2 hours	2	14.3	12	85.7			
Total time spent in a day watching TV, playing mobile games and talking to friends	**Less than 2 hours**	32	6	503	94		2	0.000*
	2 – 3 hours	51	25.5	149	74.5			
	More than 3 hours	1	6.7	14	93.3			

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

Table 4, shows the association of anthropometric risk with physical activity of the study subjects. 14% of the study subjects who were not in the habit of doing any exercise in the morning after getting up were found to have anthropometric risk, whereas, only 5.3% had risk among those doing exercise in the morning. This finding was statistically significant.

Regarding the mode of transport to school, 13.8% of the study subjects who used bicycle to commute to school had anthropometric risk in comparison with those who came to school on foot (10.5%). This finding was not statistically significant.

17.2% of the study subjects who were not in the habit of playing daily had the anthropometric risk, whereas, this risk was 7.3% among those who were in the habit of playing daily. When the duration of playing was considered, there was a decrease in the number of study subjects having anthropometric risk with increase in duration of playing. This finding was statistically significant.

Anthropometric risk was 25.5% among study subjects who used to spend 2-3 hours in a day in idle activities like watching TV, chatting with friends or playing mobile games. The risk was 6.7% and 6% respectively among study subjects who spent more than 3 hours and less than 2 hours in idle activities. This finding was statistically significant.

Table 5: Association of anthropometric risk with sleep pattern

		Anthropometric Risk				χ^2 value	df	p value
		Yes		No				
		Freq	%	Freq	%			
Sleeping in afternoon/ evening	**No**	30	5.2	544	94.8	87.759	1	0.000*
	Yes	54	30.7	122	69.3			
Hours of sleep per day	**Less than 6 hours**	0	0	11	100			0.000*
	6-8 hours	48	8.6	511	91.4			
	8 - 10 hours	35	20.2	138	79.8			
	More than 10 hours	1	14.3	6	85.7			

significant (*), those without Chi square values are Fischer exact values

Table 5 shows the association of anthropometric risk with sleep pattern of study subjects. 30.7% of the study subjects who were in the habit of sleeping in the afternoon or evening had anthropometric risk of developing NCDs, whereas, this risk was only 5.2% among those who did not have this habit. The prevalence of anthropometric risk was also higher among study subjects who had sleep for 8-10 hours (20.2%) and more than 10 hours (14.3%) in a day. The findings were 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 up to five 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.

According to WHO, global recommendations on physical activity for health [20] the cumulative moderate to vigorous physical activity done by children and adolescents aged 5- 17 years should be at least 60 minutes daily. In the present study, 61.74% adolescents were involved in different physical activities like jogging/walking, cycling and playing for one hour or more. The remaining 38.26% adolescents were not involved in such physical activity and were having a sort of sedentary lifestyle. These children are to be educated about good life style habits, role of physical activity and involvement in sports.

The American Academy of Sleep Medicine (AASM) recommends that 8-10 hours of sleep in 24 hours period is essential to maintain optimum health in adolescents[21]. In the present study, 23.1% of the study subjects had the recommended level of 8-10 hours sleep per day and the rest of the study subjects either had less duration of sleep (less than 8 hours – 76%) or more than this recommended duration of sleep (more than 10

hours -0.9%). This has to be addressed and the children should be taught regarding the benefits of adequate sleep. They can be involved in Yoga, other relaxation activities and physical activities so they can have better sleep. They should also be advised to have proper duration of sleep along with carrying out their household activities. They can be advised about proper work schedule and sleep.

As per available literature, the nation-wide cut off values for waist circumference and waist hip ratio for this group of adolescents is not available. Based on the studies conducted by Kawatra et al[17] and Misra et al[18] for defining cut off values for waist circumference among children, the participants of the present study were categorised as having anthropometric risk for NCDs. The present study found that 11.2% of the study subjects had anthropometric risk for developing NCDs based on waist circumference and waist hip ratio criteria. The study conducted by Rani et al[22] in Haryana showed higher (25.5%) proportion of adolescents to be at risk of developing abdomen obesity based on waist hip ratio criteria. The variation in prevalence could be due the less sample size (200) as the study was done in one rural school only.

The present study showed that the habit of doing exercise in morning, playing daily, duration of playing, duration of time spent in idle activities and the habit of sleeping in the afternoon/evening were significantly associated with anthropometric risk for NCDs.

Conclusion

The anthropometric risk factors for NCDs among adolescents are on an increasing trend in rural areas. Habit of playing daily, duration of playing and the habit of sleeping in the afternoon/evening are significantly associated with anthropometric risk factor for NCDs. Thus, it is the need of the hour to address this problem of increasing risk factors for NCDs and to devise programs and strategies to prevent development of NCDs in children and adolescents because today's children are future citizens of the nation.

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