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ASSOCIATION OF SOCIO-DEMOGRAPHIC FACTORS WITH ANTHROPOMETRIC RISK FACTORS FOR NON-COMMUNICABLE DISEASES (NCDS) AMONG RURAL SCHOOL GOING ADOLESCENTS IN ROHTAK DISTRICT OF HARYANA

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ABSTRACT

Background: Seeds of NCDs are sown in the childhood and early adolescent life. In recent times, the non-communicable diseases (NCDs) have attained an epidemic proportion, with increasing number of adolescents being reported as obese. Hence, it is vital to assess the magnitude of these risk factors in adolescents in order to achieve the goal of primordial prevention.

Aim and Objectives: To study the prevalence of anthropometric risk factors for NCDs and associated socio-demographic factors among rural school going adolescents in Rohtak district of Haryana.

Material and Methods: The present study was conducted in Lakhanmajra block of Rohtak district over a period of one year from July 2016 to June 2017. 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. Collected data were analysed using SPSS version 20.0.

Results: 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). Parents' education status, type of family and monthly family income were significantly associated with anthropometric risk for NCDs.

Conclusion: The prevalence of anthropometric risk factors for NCDs is on an increasing trend among rural adolescents. Thus it is the need of the hour to address this problem and to devise programs and strategies to prevent the development of NCDs among children and adolescents.

KEYWORDS : Anthropometric risk factors, Adolescents, Rural, Socio-demographic factors

Background

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioural factors. The main types of NCDs are cardiovascular diseases (like coronary heart disease and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes.[1]

Non-communicable diseases (NCDs) are surpassing infectious diseases and malnutrition as the leading causes of disability and early death. They, indirectly affect country's economic growth through loss of income and investments as they are the major causes of deaths among people in their productive years. NCDs also add on to the financial burden on a country due to the increasing cost of treatment. Increase in ageing population, changed lifestyle, speedy urbanization, financial expansion of a country and advancement in technology have brought in epidemiological transition.[2]

Burden of NCDs and their risk factors in India

India is experiencing a rapid health transition with a rising burden of NCDs causing significant morbidity and mortality, both in urban and rural population, with considerable loss in potentially productive years.[3] NCDs contribute to around 5.87 million deaths that account for 60 % of all deaths in India. India shares more than two-third of the total deaths due to NCDs in the South-East Asia Region (SEAR) of WHO. Cardiovascular diseases (coronary heart disease, stroke and hypertension) contribute to 45% of all NCD deaths followed by chronic respiratory diseases (22 %), cancers (12 %) and diabetes (3%).[4]

Adolescents and Non-communicable diseases (NCDs)

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

Importance of Anthropometry

Anthropometry is especially important during adolescence because it allows the monitoring and evaluation of hormone-mediated changes in growth 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.[8]

Abdominal obesity is important in the development of insulin resistance and in the metabolic syndrome (hyperinsulinaemia, dyslipidaemia, glucose intolerance and hypertension) that link obesity with coronary heart disease (CHD).[9]

Body mass index (BMI) is a measure of overall obesity, whereas, waist circumference (WC) and waist hip ratio (WHR) are reliable proxy indicators of abdominal fat. Waist circumference and waist hip ratio are all shown to be important for estimating cardio vascular disease (CVD) risk due to their positive association with various CVD risk factors.[10]

Rationale

Seeds of NCDs are sown in the childhood and early adolescent life. Increased body weight in children and adolescents is associated with increased systolic and diastolic blood pressure which can multiply the risk for cardiovascular diseases in adulthood. Hence, it is vital to assess the magnitude of these risk factors in adolescents in order to achieve the goal of primordial prevention. Since school is an effective setting for health education and large number of adolescents can be contacted easily, so, the study was conducted among school going adolescents.

With this background, the present study was conducted to study the prevalence of anthropometric risk factors for NCDs and associated

socio-demographic factors among rural school going adolescents in Rohtak district 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[11] 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:

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

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. 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 values for Waist circumference (90th percentile) for boys and girls aged 13 – 16 years.[12]

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 values for waist circumference for boys and girls aged 17 – 19 years.[13]

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

Study subjects who had waist circumference more than cut off value 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.[14] The same was used as cut off in present 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.]

Table 1: Distribution of study subjects according to their socio-demographic characteristics (n=750)

Characteristic		Frequency	Percentage
Religion	Hindu	539	98.54
	Muslim	11	1.46
Caste	General	532	70.9
	OBC	61	8.1
	SC	157	21
Type of Family	Nuclear family	463	61.7
	Joint family	154	20.5
	Three generation family	133	17.8
No. of family members	5 and less than 5 members	410	54.7
	6 - 10 members	335	44.7
	>10 members	5	0.6

Table 1 shows the distribution of the study subjects according to their socio-demographic characteristics. Most of the study subjects were Hindus (98.54%) and only 1.46% were Muslims. More than two-third (70.9%) belonged to General castes followed by Scheduled castes (21%) and Other backward castes (8.9%). 61.7% of the study subjects belonged to Nuclear family followed by Joint family (20.5%) and Three generation family (17.8%). 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.

Table 2: Distribution of study subjects according to parents' education status (n=750)

Education status		Frequency	Percentage
Father	Illiterate	56	7.5
	Primary	183	24.4
	Middle school	95	12.7

	High school	333	44.4
	Higher Secondary School	67	8.9
	Graduation and Above	16	2.1
Mother	**Illiterate**	260	34.7
	Primary	195	26.0
	Middle school	117	15.6
	High school	129	17.2
	Higher Secondary School	40	5.3
	Graduation and Above	9	1.2

According to parents' education status, 44.4% of the study subjects had their fathers educated up to high school followed by primary education (24.4%). Mothers of 34.7% of the study subjects were illiterate while 26% mothers were educated upto primary class. None of the students had both of their parents illiterate (Table 2).

38.3% of the study subjects had monthly family income between Rs 10,000 to 15,000 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 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 socio-demographic factors

		Anthropometric Risk				χ2 value	df	p value
		Yes		No				
		Freq	%	Freq	%			
Age categories (years)	**13-14**	34	14.6	199	85.4	6.854	2	0.032*
	15-17	48	10.5	407	89.5			
	18-19	2	3.2	60	96.8			
Sex	**Male**	73	13.4	471	86.6	9.807	1	0.002*
	Female	11	5.3	195	94.7			
Religion	**Hindu**	84	11.4	655	88.6		1	0.268
	Muslim	0	0	0	0			
Caste	**General**	61	11.5	471	88.5	3.038	2	0.219
	OBC	10	16.4	51	83.6			
	SC	13	8.3	144	91.7			
Type of Family	**Nuclear**	31	6.7	432	93.3	24.712	2	0.001*
	Joint	28	18.2	126	81.8			
	Three generation	25	18.8	108	81.2			
No of family members	**Up to 5**	29	7.1	381	92.9		2	0.000*
	6 - 10	55	16.4	280	83.6			
	More than 10	0	0	5	100			

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

Table 4 shows the association of anthropometric risk with socio-demographic factors. 14.6%, 10.5% and 3.2% of the study subjects belonging to the age group 13-14 years, 15-17 years and 18-19 years respectively were at the risk of developing NCDs based on waist circumference and WHR criteria. The prevalence decreased with increase in age. The findings were statistically significant. The prevalence of anthropometric risk was high among males (13.4%) in comparison with females (5.3%) and it was found to be statistically significant.

11.4% of the Hindus and none of the Muslims among the study subjects had the anthropometric risk of developing NCDs. Regarding caste, 16.4% belonging to OBC, 11.5% belonging to general caste and 8.3% belonging to SC were at risk. The findings were not statistically significant.

18.8% and 18.2% of the study subjects belonging to three generation family and joint family had anthropometric risk, whereas, only 6.7% of those belonging to the nuclear family had the risk. Regarding the number of family members, 16.4% of the study subjects who had 6-10 family members had anthropometric risk followed by 7.1% of those who had up to 5 members. The findings were statistically significant.

Table 5: Association of anthropometric risk with parents' education status

Education status		Anthropometric Risk				χ2 value	df	p value
		Yes		No				
		Freq	%	Freq	%			
Father	**Illiterate**	4	7.1	52	92.9		5	0.000*
	Primary	14	7.7	169	92.3			
	Middle	7	7.4	88	92.6			
	High school	41	12.3	292	87.7			
	Higher Secondary	13	19.4	54	80.6			
	Graduation and Above	5	31.3	11	68.8			
Mother	**Illiterate**	23	8.8	237	91.2		5	0.000*
	Primary	13	6.7	182	93.3			
	Middle	14	12	103	88			
	High school	21	16.3	108	83.7			
	Higher Secondary	10	25	30	75			
	Graduation and Above	3	33.3	6	66.7			

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

As for parents' education status was concerned, 31.3% and 19.4% of the study subjects who had their fathers educated up to graduation and higher secondary were having anthropometric risk. Regarding mothers education status, one third (33.3%) of the study subjects whose mothers were educated up to graduation had anthropometric risk followed by one fourth (25%) of those whose mothers were educated up to higher secondary level. The prevalence of anthropometric risk increased with increase in parents' education status. The findings were statistically significant (Table 5).

Table 6: Association of anthropometric risk with monthly family income

		Anthropometric Risk				χ2 value	df	p value
		Yes		No				
		Freq	%	Freq	%			
Monthly family income (Rs.)	**Less than 10,000**	9	3.9	221	96.1	60.628	3	0.000*
	10,000 - 15,000	20	7	267	93			
	15,000 - 20,000	29	19.5	120	80.5			
	More than 20,000	26	31	58	69			

significant (*)

Regarding monthly family income, 31% of the study subjects having family income more than 20,000 rupees per month had

anthropometric risk followed by those in the income range 15,000 to 20,000 rupees (19.5%) and 10,000 to 15,000 rupees (7%) per month. The prevalence of anthropometric risk increased with increase in monthly family income. The findings were statistically significant (Table 6).

Discussion

The present study included 750 school going adolescents aged 13-19 years studying in classes 8th-12th in Government Senior Secondary Schools of Lakhan Majra block, 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. 98.54% of the study subjects were Hindus. More than two-third (70.9%) belonged to general caste. 61.7% of the study subjects belonged to nuclear families. More than half (54.7%) of the study subjects had upto 5 members in their family. 44.4% of the study subjects had their fathers educated up to high school and 34.7% of the students had their mothers illiterate. 38.3% of the study subjects had monthly family income between 10.000 to 15,000 rupees.

Prevalence of anthropometric risk factors

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[12] and Misra et al[13] for defining cut off values for waist circumference among children and the WHO cut off value for waist hip ratio[14], 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[15] in Haryana showed higher (25.5%) proportion of adolescents to be at risk of developing abdominal obesity based on waist hip ratio criteria. The variation in prevalence between the present study and the study by Rani et al could be due the less sample size (200) that too from one school only in the study of Rani et al.

Socio-demographic factors and Anthropometric risk factors for NCDs

It was found in the present study that the anthropometric risk was higher among the study subjects in age group 13-14 years. The risk decreased with increase in age. The findings were statistically significant. This higher prevalence of anthropometric risk in early adolescent age group may be associated with the increase in adipose tissue and overall weight gain during the pubertal growth spurt.

In the present study, 18.8% and 18.2% of the study subjects belonging to three generation family and joint family had anthropometric risk. 16.4% of the study subjects who had 6-10 family members had anthropometric risk. Since most of the families with 6-10 members were joint families, the family income was also high due to more number of earning members. Moreover, in the joint families as the resources are pooled so the individual member gets more and that may be the reason for higher prevalence of anthropometric risk.

The prevalence of anthropometric risk increased with increase in parents' education status. 31.3% and 19.4% of the study subjects respectively whose fathers were graduates and higher secondary pass had the anthropometric risk. 33.3% and 25% of the study subjects respectively whose mothers were graduates and higher secondary pass had anthropometric risk. This can be explained by the notion that when both the parents are well educated so, both the parents may be working and are having better earning. With higher income there will be better accessibility to energy dense foods. Their children may also get pocket money for spending in school. With this money they may also purchase junk foods which may be the cause of higher prevalence of anthropometric risk factor among these children.

31% of the study subjects who had family income more than 20,000 rupees per month had anthropometric risk. One possible explanation for the higher family income and anthropometric risk for NCDs relationship in developing countries like India is the influence of income on the lifestyles of people such as food consumption patterns. Rich people have better access to energy dense foods than people with relatively low income.

Conclusion

The prevalence of anthropometric risk factors for NCDs among adolescents is on an increasing trend in rural areas. Parents' education status, type of family and monthly family income were significantly associated with anthropometric risk for NCDs among adolescents. It is the need of the hour to address this problem of rising prevalence of anthropometric risk factors and devise appropriate community and school based health programmes to create awareness through health education and conduct screening camps to identify the risk factors to prevent the development of non-communicable diseases among children and adolescents who are the future of our nation.

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