



ASSOCIATION OF FAULTY FOOD HABITS WITH ANTHROPOMETRIC RISK FACTORS FOR NON-COMMUNICABLE DISEASES AMONG RURAL SCHOOL GOING ADOLESCENTS IN ROHTAK DISTRICT OF HARYANA

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ABSTRACT **Introduction:** Adolescence is a time of newly discovered independence and freedom of choice. Dietary habits and food preferences which affect energy consumption and nutrient intake are generally developed over a period of time and particularly during adolescence. Unhealthy dietary habits are one among the common risk factors for NCDs, which is inculcated during adolescence and continue to exist in adult life.

Aim and objectives: to study the association of faulty food habits with anthropometric risk factors for non-communicable diseases among rural school going adolescents in Rohtak district of Haryana.

Material and Methods: A cross-sectional study was conducted in Lakhnamajra 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: 11.2% of the study subjects had anthropometric risk for developing NCDs based on waist circumference and waist hip ratio criteria. The frequency of fruits intake, habit of eating deep fried foods, snacks, bakery foods and consuming carbonated drinks were significantly associated with anthropometric risk for NCDs.

Conclusion: The anthropometric risk factors for non-communicable diseases among school going adolescents are on a rising trend in the rural areas. The consumption of fried and processed foods contributes to this problem. Hence there is an urgent need to reduce the intake of these food items among children and adolescents in order to decrease the incidence of obesity and other risk factors for NCDs.

KEYWORDS :Anthropometric risk, Faulty food habits, Adolescents, Rural

Introduction

Adolescence is a time of newly discovered independence and freedom of choice. This puts adolescents in a group susceptible to external influences, particularly from the media, school and their peers.¹

World Health Organization (WHO) defines an adolescent as any person between ages 10 and 19 years.² 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.³

Food habits in Adolescents

Adolescence is the period when a child's body changes into that of an adult. Among other things, an adolescent has increased nutrient needs. Dietary habits and food preferences which affect energy consumption and nutrient intake are generally developed over a period of time and particularly during adolescence. Two major factors affect food choices during adolescence. The first is a greater quest for independence; as in earlier periods of life, there is total supervision by parents. One of the ways of exhibiting independence is through eating, or not eating a particular food. This, coupled with a lack of knowledge and experience necessary to make adequate evaluation of dietary practices, may lead to the adoption of unhealthy diets. The second factor is greater purchasing power to obtain meals, snacks and beverages. Rather than relying solely on family foods, sources of food may include food outlets, vending machines and school canteens.¹

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.^{4,5}

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 and 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.

Rationale

There is transition in nutrition from conventional home made healthy foods to fast foods and aerated/carbonated soft drinks due to their popularity through advertisements. The availability of these items has penetrated even into remote areas. The plight is such that children from even remote areas are familiar with these junk foods rather than healthy foods available in their homes. Because of small family size, the parents also try to provide their children such junk foods out of love, affection or adamant behaviour of their wards. This is considered as a sign of modern living reflecting high societal culture. This unhealthy eating habit in the period of adolescence contributes to the development of NCDs in later stages of life.

With this background, the present study was conducted with the aim to study the association of faulty food habits with anthropometric risk factors for non-communicable diseases 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 Lakhnamajra (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 al⁷ 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 and on individual characteristics like intake of fruits, junk foods and consumption of carbonated drinks. Anthropometric measurements like waist circumference and hip circumference were recorded and waist hip ratio 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.⁸

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.⁹

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

Study subjects who had waist circumference more than cut off values 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

$$\text{Waist circumference (in cm) / Hip circumference (in cm)}$$

According to WHO, Waist Hip ratio of more than 0.85 for women and 0.90 for men is a predictor for cardiovascular risk.¹⁰ The same was used as cut off value 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 + 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 family followed by Joint family (20.5%) and Three generation family (17.8%) respectively. More than half (54.7%) of the study subjects had upto 5 family members 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 Rs 10,000 to 15,000 followed by 30.7% with income less than 10,000 rupees while 19.8% and 11.2% belonging to income range of more than 15,000 to 20,000 rupees and more than 20,000 rupees respectively.

Table 1: Distribution of study subjects according to fruits consumption (n=750)

Characteristic	Frequency		Percentage	
	Yes	No	Yes	No
Eating fruits	750		100	
Frequency of consumption	Once in a week	567	75.6	
	Twice in a week	94	12.5	
	Thrice in a week	26	3.5	
	Once/Twice in a month	48	6.4	
	Daily	15	2	

All the study subjects were consuming fruits (Table 1). Among them, three fourth (75.6%) consumed fruits once in a week. 12.5%, 6.4% and 3.5% consumed fruits twice a week, once or twice in a month and thrice a week respectively. Only 2% had the habit of eating fruits daily which is only one serving per day.

Table 2: Distribution of study participants according to intake of food items (n=750)

Characteristic	Frequency		Percentage	
	Yes	No	Yes	No
Habit of eating deep fried foods	No	541	72.1	
	Yes	209	27.9	
Frequency of consumption of deep fried foods	Once a week	151	20.13	
	Twice a week	35	4.7	
	Thrice a week	1	0.13	
	Once/Twice in a month	22	2.93	
Habit of eating snacks	No	497	66.3	
	Yes	253	33.7	
Frequency of consumption of snacks	Once a week	166	22.1	
	Twice a week	70	9.3	
	Thrice a week	11	1.5	
	Once/Twice in a month	6	0.8	
Habit of eating bakery foods	No	557	74.3	
	Yes	193	25.7	
Frequency of consumption of bakery foods	Once a week	144	19.2	
	Twice a week	33	4.4	
	Thrice a week	0	0	
	Once/Twice in a month	16	2.1	
Habit of eating fast foods	No	567	75.6	
	Yes	183	24.4	
Frequency of consumption of fast foods	Once a week	161	21.5	
	Twice a week	15	2	
	Thrice a week	1	0.1	
	Once/Twice in a month	6	0.8	

Habit of consuming carbonated drinks	No	452	60.3
	Yes	298	39.7
Frequency of consumption of carbonated drinks	Once a week	226	30.1
	Twice a week	32	4.3
	Thrice a week	6	0.8
	Once/Twice in a month	34	4.5

Table 2 shows the distribution of study subjects according to intake of food items. More than one fourth (27.9%) of the study subjects had the habit of eating deep fried foods. 20.1% had the habit of eating deep fried foods once in a week. 4.7%, 2.93% and 0.13% had the habit of eating deep fried foods twice a week, once or twice a month and thrice a week respectively. None of the study subjects had the habit of eating deep fried foods daily.

Regarding the habit of eating snacks, about one third (33.7%) of the study subjects had the habit of eating snacks. 22.1% had the habit of eating snacks once in a week followed by 9.3%, 1.5% and 0.8% eating snacks twice a week, thrice a week and once/twice in a month respectively. None of the study subjects had the habit of eating snacks daily.

Almost one fourth (25.7%) of the study subjects were in the habit of eating bakery foods. 19.2% consumed bakery foods once in a week followed by 4.4% eating twice a week and 2.1% once or twice a month. None of the study subjects had the habit of eating bakery foods daily.

Regarding fast foods consumption, 24.4% of the study subjects were in the habit of eating fast foods. 21.5% had the habit of eating fast foods once in a week followed by 2% eating twice a week and 0.8%, 0.1% eating once/twice a month and thrice a week respectively. None had the habit of eating fast foods daily.

About two fifth (39.7%) of the study subjects had the habit of taking carbonated drinks. 30.1% had the habit of consuming carbonated

drinks once a week followed by 4.5% once/twice a month and 4.3%, 0.8% twice a week and thrice a week 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	
	Yes	No		
Anthropometric risk	84	666	11.2	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 consumption of fruits

	Anthropometric Risk				χ^2 value	df	p value
	Yes		No				
	Freq	%	Freq	%			
Frequency of fruit consumption	Once a week	51	9	516	91	4	0.000*
	Twice a week	11	11.7	83	88.3		
	Thrice a week	2	7.7	24	92.3		
	Once/Twice in a month	20	41.7	28	58.3		
	Daily	0	0	15	100		

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

The study subjects who had the habit of eating fruits daily did not have anthropometric risk of developing NCDs. Risk of developing NCDs was 41.7% among those who consumed fruits only once/twice a month. The anthropometric risk was 11.7%, 9% and 7.7% respectively among those who consumed fruits twice a week, once a week and thrice a week. The findings were statistically significant.

Table 5: Association of anthropometric risk with food items intake

	Anthropometric Risk				χ^2 value	df	p value	
	Yes		No					
	Freq	%	Freq	%				
Habit of eating deep fried foods	No	47	8.7	494	91.3	12.321	1	0.000*
	Yes	37	17.7	172	82.3			
Frequency of consumption of deep fried foods	Once a week	19	12.6	132	87.4	55.357	1	0.001*
	Twice a week	5	14.3	30	85.7			
	Thrice a week	1	100	0	0			
	Once/Twice in a month	12	54.5	10	45.5			
Habit of eating snacks	No	25	5.1	470	94.9	92.862	1	0.000*
	Yes	59	23.1	196	76.9			
Frequency of consumption of snacks	Once a week	28	16.9	138	83.1	30.554	1	0.001*
	Twice a week	24	34.3	46	65.7			
	Thrice a week	6	54.5	5	45.5			
	Once/Twice in a month	1	16.7	5	83.3			
Habit of eating bakery foods	No	26	4.7	531	95.3	30.554	1	0.000*
	Yes	58	30.1	135	69.9			
Frequency of consumption of bakery foods	Once a week	32	22.2	112	77.8	30.554	1	0.001*
	Twice a week	11	33.3	22	66.7			
	Thrice a week	0	0	0	0			
	Once/Twice in a month	15	93.7	1	6.3			
Habit of eating fast foods	No	43	7.6	524	92.4	30.554	1	0.000*
	Yes	41	22.4	142	77.6			
Frequency of consumption of fast foods	Once a week	37	23	124	77	30.554	1	0.001*
	Twice a week	2	13.3	13	86.7			
	Thrice a week	0	0	1	100			
	Once/Twice in a month	2	33.3	4	66.7			

Habit of taking carbonated drinks	No	29	6.4	423	93.6	26.179	1	0.000*
	Yes	55	18.5	243	81.5			
Frequency of consumption of carbonated drinks								0.001*
	Once a week	24	10.6	202	89.4			
	Twice a week	6	18.8	26	81.3			
	Thrice a week	0	0	6	100			
	Once/ Twice in a month	25	73.5	9	26.5			

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

Table 5 shows the association of anthropometric risk with different food items. The study subjects who were in the habit of eating deep fried foods, snacks, bakery foods, fast foods and consuming carbonated drinks had higher prevalence of anthropometric risk of developing NCDs in comparison to those who were not in the habit of eating these items.

The anthropometric risk was 17.7% among students who were in the habit of eating deep fried foods, whereas, it was 8.7% for those who did not consume such foods. All the study subjects who had the habit of eating deep fried foods thrice in a week had anthropometric risk. The prevalence was higher (54.5%) among those who consumed deep fried foods once/twice in a month followed by those consuming such foods twice a week (14.3%) and once a week (12.6%) respectively.

23.1% of the study subjects who had the habit of eating snacks were at risk, whereas, the risk was only 5.1% for those who didn't have this habit. The prevalence was high (54.5%) among those who had snacks thrice in a week and twice in a week (34.3%). Almost equal (16.9% & 16.3%) prevalence of anthropometric risk was seen among those who had snacks once a week and once/twice in a month.

Regarding eating bakery foods, 30.1% of the subjects having the habit of eating bakery foods had anthropometric risk in comparison to only 4.7% for those not having this habit. 93.7% of the participants who consumed bakery foods once/twice a month had anthropometric risk followed by those who consumed such foods twice (33.3%) or once a week (22.2%).

22.4% of the participants having the habit of eating fast foods had anthropometric risk, whereas, only 7.6% of those who were not having this habit had the risk. One third of the study subjects who consumed fast foods once/twice in a month were at risk followed by 23% and 13.3% respectively for those who consumed fast foods once and twice a week.

Regarding carbonated drinks, it was found that 18.5% of the study subjects having the habit of taking such drinks were at risk in comparison to only 6.4% for those not having the habit. About three fourth (73.5%) of the study subjects who were in the habit of taking carbonated drinks once/twice in a month had anthropometric risk of developing NCDs. 18.8% and 10.6% of those consuming such drinks twice and once a week also had the risk. All the above 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 Lakhna Majra block in 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 upto 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.

WHO recommends that including fruits and vegetables (minimum of 400g per day) as part of the daily diet may reduce the risk of some NCDs including cardiovascular diseases and certain types of cancers.¹¹ In the present study, all the study subjects were consuming fruits but only 2% study subjects had the habit of eating fruits daily which is only one serving per day. The rest of them were in the habit of consuming fruits irregularly. These children have to be taught about the locally available fruits, their nutritive value and the benefits of consuming them.

In the present study, it was observed that 27.9%, 33.7%, 25.7% and 24.4% of the study subjects were in the habit of eating deep fried foods, snacks, bakery foods and fast foods. 39.7% students were consuming carbonated drinks. Although none of these children were consuming these foods daily, but most of them had the habit of consuming these foods once or twice in a week. Fried and processed foods contain high amounts of trans fats, saturated fats in addition to oxysterol. Oxysterol is found to be a lethal compound to heart health as reported by scientists from China in the National meeting of the American chemical society in August 2009.¹² The school children have to be discouraged from consuming these kind of foods and educated about the healthy foods available at their homes.

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 al⁸ and Misra et al⁹ 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 al¹³ 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 could be due the less sample size (200) as the study was done in one rural school only.

The present study showed that frequency of fruits intake, habit of eating deep fried foods, snacks, bakery foods and consuming carbonated drinks were significantly associated with anthropometric risk for NCDs.

Conclusion

The anthropometric risk factors for non-communicable diseases among school going adolescents are on a rising trend in the rural areas. The consumption of fried and processed foods contributes to this problem. Hence there is an urgent need to reduce the intake of these food items among children and adolescents in order to decrease the incidence of obesity and other risk factors for NCDs.

Recommendations

Children should be taught about the traditional healthy food items available in their homes and be discouraged for eating energy dense foods (e.g., pre-packaged snacks, bakery foods and carbonated drinks). The school canteen should not provide fast/ junk foods and cold drinks. Wherever possible the parents should be asked to send home made foods for their wards for the school lunch. The hawkers outside the school should also be checked frequently for not selling unhealthy food items to the school children. Accessibility of money to school children should not be unlimited.

Conflicts of Interest: There is no conflict of interest.

References

1. Ministry of Health. Food and Nutrition Guidelines for Healthy Adolescents – A Background Paper. Wellington, New Zealand: Ministry of Health, Government of New Zealand, 1998.
2. Mihalyi CS. Adolescence [Internet]. Chicago: Encyclopaedia Britannica;1998 [updated 2017 Jul 07; cited 2018 Feb 12]. Available from: <https://www.britannica.com/science/adolescence>
3. United Nations Children's Fund (UNICEF). Adolescents – Demographics [Internet]. New York: United Nations Children's Fund;2016 [cited 2018 Feb 12]. Available from: <https://data.unicef.org/topic/adolescents/adolescent-demographics/>
4. Nicklas TA, Baranowski T, Cullen KW, Berenson G. Eating patterns, dietary quality and obesity. *J Am Coll Nutr* 2001;20(6):599-608.
5. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* 1997;337(13):869-73.
6. Visscher TLS, Seidell JC. The public health impact of obesity. *Annu Rev Public Health* 2001;22:355-75.
7. Kowsalya T, Parimalavalli R. Prevalence of overweight/obesity among adolescents in urban and rural areas of Salem, India. *J Obes Metab Res [Internet]*. 2014 [cited 2018 Jan 30];1(3):152-5. Available from: http://www.jomjournal.org/temp/JObesMetabRes13152-1043109_025351.pdf

8. Kawatra A, Trygg N, Parhar G, Mohta A. Waist circumference and waist height ratio percentiles for assessing childhood obesity: Cross-sectional survey in rural Indian child population. *Indian Journal of Basic and Applied Medical Research*. 2013;3(1):246-56.
9. Misra A, Vikram NK, Gupta R, Pandey RM, Wasir JS, Gupta VP. Waist circumference cutoff points and action levels for Asian Indians for identification of abdominal obesity. *International Journal of Obesity*. 2006;30:106-11.
10. World Health Organization. Waist circumference and Waist- Hip ratio: Report of a WHO expert consultation, Geneva, December 8-11 2008. Geneva: World Health Organization; 2011.
11. World Health Organization. Global Strategy on Diet, Physical Activity and Health [Internet]. Geneva: World Health Organization; 2016 [cited 2018 Feb 13]. Available from: <http://www.who.int/dietphysicalactivity/childhood/en/>
12. Hovenkamp E, Demonty I, Monsink RP, Trautwein EA. Biological effects of, oxidized phytosterols review of the current knowledge, *Prog Lipid Res*. 2008, 47:37-49.
13. Rani N, Rani V. Assessment of Nutritional Status of School Going Adolescents in Fatehabad District of Haryana. *Indian J Nutri*. 2016;3(2):146.