

Noncommunicable Diseases among School-going Adolescents: A Case Study on Prevalence of Risk Factors from Sabarkantha District of Gujarat, India

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Abstract

Background: The increasing burden of noncommunicable diseases (NCDs) and large proportion of adolescent population in India; crafts the dynamics of NCD risk factors. Most of the NCD risk factors are behaviorally acquired which are due to change in lifestyle during adolescent age groups. **Objective:** This study aims to determine the prevalence of risk factors among school-going adolescents in one of district of Gujarat state, India. **Subjects and Methods:** This is a cross-sectional study conducted among sampled schools of Sabarkantha district of Gujarat, India, during September–December 2016. A total of 484 school-going adolescents were screened for body weight, height, blood pressure, and some information of sociodemographic, lifestyle habits, and family history were collected through a structured questionnaire in vernacular language. Data were managed with SPSS version 20. **Results:** This study documents that not having fruits and not doing physical activities daily are the major risk factors of NCDs among school-going adolescents of Sabarkantha district, Gujarat. In addition to this, also it has been documented that there are differential standards for body mass index (BMI) available for adolescents and have been used extensively in various studies. This study provides an insight to these three major BMI standards and their differences in measurement for the school-going adolescents. **Conclusions:** This study recommends promoting healthier practices for prevention of NCD lifestyle risk factors among school-going adolescents and it also recommends standardizing the BMI measurements for adolescents for India.

Keywords: Adolescents, India, noncommunicable diseases, risk factors

INTRODUCTION

Of 56.4 million global deaths in 2015, 39.5 million, or 70%, were due to noncommunicable diseases (NCDs).^[1] The leading risk factors responsible for NCDs are behavioral factors such as tobacco use, physical inactivity, and metabolic factors such as overweight/obesity, high blood pressure (BP), high cholesterol level, and high blood glucose level.^[2] Most of the risk factors are behaviorally acquired and are due to change in lifestyle during adolescent age group. According to the World Health Organization (WHO), adolescent is a person between 10 and 19 years of age period of life with rapid growth and development of body, mind, and social relationship with behavior changes such as sexual maturity and self-independence with more exposure to risk behavior such as unsafe sex, risky driving, and substance abuse. At this age, these risk factors are well tolerated and are barely perceived as harmful.

An analysis of the distribution of health behaviors among adolescents from >100 countries found that approximately 80% of them performed daily physical activities (for at least 60 min), 32% used the computer for >2 h per day, 6% smoked cigarettes daily, 7.6% consumed beer weekly, and 25% had an unhealthy diet.^[3] Each of these risk factors for NCDs has a different impact on health. Adolescents with low levels of physical activity have a higher risk of hypertension.^[4] Sedentary adolescents have a higher risk of obesity.^[5] Physical inactivity and sedentary behavior are different constructs and

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represent different causes and consequences that affect health. Another risk factor for NCDs that have a negative impact on the health of adolescents is unhealthy diet, either through the low consumption of fruits and vegetables or the high intake of foods rich in sugars that cause diabetes mellitus type II.^[6] In addition, excessive alcohol use causes changes in the central nervous system that may be a cause of depression among adolescents.

Lifestyle-associated risk factors among adolescent are rampantly increasing throughout the world.^[7,8] In framing of cost-effective strategies for prevention and treatment, identification of the risk factors and their quantification is of great importance. India with >243 million adolescents and being the capital of NCDs; this study aims to determine the prevalence of risk factors among school-going adolescents in one of the district of Gujarat state, India.

SUBJECTS AND METHODS

This is a cross-sectional study conducted during September–December 2016 in Sabarkantha district of Gujarat, India.

The reported prevalence of different NCD among adolescents in India was retrieved from a systematic review published in 2014.^[9] The overall prevalence of NCDs was 10%–20%, half of adolescents were underweight, 15%–20% adolescents were using tobacco, 3%–15% adolescents were consuming alcohol, and 5%–10% adolescents were hypertensive. At the same time, few studies showed that 3%–5% of adolescents were suffering from type 1 and type 2 diabetes mellitus, and 5%–7% suffered from asthma.

At 95% confidence level (CI) and 15% average prevalence with design effect of 2, and response rate of 80%, the sample size of 484 adolescents was calculated. Considering average class size of 30, 14 schools were randomly selected from the list of schools obtained from the district education office. All the primary schools were selected from rural area as secondary/higher secondary schools were situated in urban area. All selected schools were government or government-aided schools.

The stepwise approach of the WHO on NCD risk factors was adapted to collect the data.

Questionnaire: Information on sociodemographic variables, family history, and behavioral risk factors such as tobacco use, alcohol use, physical activity level, and dietary habits were obtained using a STEPS survey format of the WHO, which was translated in vernacular language and administered by trained researchers.

Measurements: Height, weight, and BP of each adolescent were measured in the study. After removing belts and shoes, all children were weighed using a standardized spring balance scale nearest to 500 g and a maximum capacity of 125 kg. The machine was regularly checked using test weights. Each

child was made to stand still and upright with weight evenly distributed between 2 feet. Zero was readjusted after each reading on the scale. A standard measure tape was used to make calibrations on a wall nearest to 1 cm. All adolescents were made to stand against wall after removing shoes and their heels touching wall. Height was measured using flat scale while adolescent was looking straight. Based on the weight and height, the body mass index (BMI) was calculated as per the formula $BMI = \text{Weight (kg)}/\text{Height (m}^2\text{)}$. Adolescents were classified based on their BMI using, The WHO BMI classification for Asian adults (Indians^[10]), WHO reference for adolescents^[11] and Indian Academy of Pediatrics (IAP) standards.^[12]

Team of four supervisors and eight volunteered trained by a doctor for measuring BP using digital sphygmomanometer screened adolescents for hypertension. BP was determined in the right arm in sitting position after a sufficient rest, by standardized method using standard digital sphygmomanometers with a set of different sized cuffs. The cuff bladder was wide enough to cover at least two-third of the arm and long enough to encircle arm completely. Height percentile of each adolescent was determined using IAP growth charts. IAP reference for BP using height percentile was used to define hypertension. The BP level <90th percentile was considered normal. Prehypertension was defined as systolic or diastolic BP or both between 90th and 95th percentile for height for age and sex. The BP level >95th percentile is hypertension. Stage 1 hypertension is the designation for BP levels that range from the 95th percentile to 5 mmHg above the 99th percentile. Stage 2 hypertension is the designation for BP levels that are 5 mmHg above the 99th percentile. Students found to have hypertension or prehypertension on the first visit were contacted to undergo a second set of BP measurement after 10 min. Adolescents diagnosed having hypertension were referred to nearest government hospital for further evaluation and management.

This study was ethically cleared from Institutional Ethics Committee of Indian Institute of Public Health, Gandhinagar, India. Written consent was obtained from each adolescent before data collection and measurements. List of adolescents, who were suffering from or having high risk of NCDs, was shared with school management for further referral and appropriate prevention, however, kept confidential to the other stakeholders.

Data were entered and analyzed through SPSS version 20. Descriptive statistics and univariate analysis was conducted to understand the difference between the genders and expressed in the form of *P* value at the level of 95% of CI.

RESULTS

Among 484 studied sample, 56% were boys and 44% were girls while 58% of them were from 10 to 14 years of age and 42% were of 15–19 years of age. Mean age of the boys was 13.9 ± 1.9 years while the mean age of girls was 14.3 ± 1.9 years. Overall, the mean age of the population was

14.1 ± 1.9 years. Majority of the study population belonged to other backward caste category followed by scheduled caste.

Lifestyle-related factors

For this study, we defined Junk food, salty food, fast food, and food with high-fat content as per their local availability and use by the community. Various diet-related healthy behaviors, as reported by adolescents, are described in Table 1.

No diet survey was conducted and results are presented as reported by adolescents. Only 11.6% of the study population consumed fruits daily. About 60% of them consume one or two fruits per serving. The difference between boys and girls for consumption of fruits daily was statistically significant. More than 70% of the study population consumed vegetables daily in their diet. Almost 80% of them consumed one or two katori of vegetables per serving.

Almost 69% of boys and 59% of girls consumed milk daily. The difference was statistically significant. Over 60% of boys and girls took one glass of milk per day. Occasional eating was defined as eating that food once in 2 weeks or once in a month or never. More than 40% of the study population consumed junk foods occasionally. Similarly, >60% consumed carbonated drinks occasionally. Only 27% and 14% adolescents consumed high-salt and high-fat diet occasionally. Finally, about 77% of adolescents reported that advantages of eating vegetables and fruits explained to them in the school.

Physical activity-related factors

More than 88% adolescent reported that advantages of

physical activities explained to them in the school. Moreover, 87% of boys and 60% of girls reported doing some or other physical activity daily as shown in Table 2. This difference was statistically significant ($P = 0.000$). Types of physical activities among boys and girls are shown in Table 2. Most common physical activity among boys and girls was cycling and walking, respectively. Average duration of cycling among boys is 30 min and 26 min per day among girls. Average duration of physical activities like various sports was 40 min among boys and 55 min among girls.

Addiction-related factors

About 2.2% (6) boys and 1 girl reported to having addiction of chewing tobacco. No adolescent reported having smoking or alcohol addiction. However, 83% of them reported exposure to passive smoking in the last 1 week out of which 21% reported exposure to passive smoking every day in the last 1 week.

About 60% boys and 35% girls reported that someone in the family (mainly father) was addicted to tobacco and/or alcohol. 13.3% boys and 1.9% girls reported addiction among peers mainly of chewing tobacco. Almost all adolescent (97%) reported that they would not taste tobacco or alcohol under the pressure from friends.

More than 80% of adolescents reported that ill effects of tobacco were explained to them in the school. 80% of adolescent knew that tobacco could cause disease while 51% knew that alcohol addiction could cause disease. However, correct knowledge about which diseases caused by tobacco and alcohol was very low.

Table 1: Diet related behavioral factors among study population

Healthy behaviors	Gender		Total	P
	Boys	Girls		
Eating fruits daily	7.4	16.8	11.6	0.001
Eating vegetables daily	74.1	69.2	71.9	0.2
Taking milk daily	68.5	59.3	64.5	0.03
Occasional consumption of junk food (once in 15 days, a month, sometimes, and never)	40.7	41.6	41.1	
Occasional consumption of empty calories (carbonated drinks) (once in 15 days, a month, sometimes, and never)	65.5	61.7	62.8	0.4
Occasional consumption of food with high-salt content (once in 15 days, a month, sometimes, and never)	27.4	11.4	26.7	0.6
Occasional consumption of food with high-fat content (once in fifteen days, a month, sometimes, and never)	13.7	14	13.8	

Table 2: Physical activities among the study population

Type of physical activity	Percentage of boys	Percentage of boys doing that exercise daily	Average duration per spell of physical activity in minutes by boys Mean ± SD	Percentage of girls	Percentage of girls doing that exercise daily	Average duration per spell of exercise in minutes by girls Mean ± SD
Cycling	91.3	73.3	30.3±17.7	72.9	54.3	26.4±14
Walking	86.8	74.8	29.6±18.6	70.8	55.8	27.2±18.7
Cricket	71.1	29.7	38.6±21.1	44.8	40.9	16±13.8
Running	65.7	64.8	24.9±15.9	40.1	33.8	35.3±14
Kabbadi	49.6	17.5	37.1±17.5	7.3	0	33.9±15
Volley/foot ball	38.4	48.8	37.8±15.9	4.7	0	33.6±20.1
Swimming	11.2	14.8	42±19.2	1.0	0	15±7.1

SD: Standard deviation

Table 3: Differential body mass index scores of the study population as per three different body mass index standards

WHO BMI (Asian adults)	Total, n (%)	Boys, n (%)	Girls, n (%)	WHO BMI	Total, n (%)	Boys, n (%)	Girls, n (%)	IAP BMI	Total, n (%)	Boys, n (%)	Girls, n (%)
Severe underweight (score range)	248 (51.2)	155 (57.4)	93 (43.5)	Severe thinness	95 (19.6)	29 (13.6)	66 (24.4)	Severe thinness	91 (18.8)	49 (18.1)	42 (19.6)
Moderate underweight	64 (13.2)	31 (11.5)	33 (15.4)	Thinness	105 (21.7)	60 (22.2)	45 (21)	Thinness	111 (22.9)	68 (25.2)	43 (20.1)
Mild underweight	87 (18)	38 (14.1)	49 (22.9)	Normal	258 (53.3)	130 (48.1)	128 (59.8)	Normal	256 (52.9)	139 (51.5)	117 (54.7)
Normal	72 (14.9)	35 (13)	37 (17.3)	Over weight	18 (3.7)	10 (3.7)	8 (3.7)	Over weight	22 (4.5)	10 (3.7)	12 (5.6)
Overweight	6 (1.2)	4 (1.5)	2 (0.9)	Obese	8 (1.7)	4 (1.5)	4 (1.9)	Obese	4 (0.8)	4 (1.5)	0
Obese	7 (1.4)	7 (2.6)	0								

BMI: Body mass index, WHO: World Health Organization, IAP: Indian Academy of Pediatrics

Body mass index

BMI of the adolescents was classified using the WHO-BMI standards for Asians adults, WHO adolescent reference for BMI, and IAP BMI standards as shown in Table 3.

As per the WHO-BMI standards for Asian adults (Indians); majority of adolescents were undernourished. Only 1.2% adolescents were overweight while 1.4% were obese according to the WHO adult standards for Asians. These standards are used to define obesity or undernutrition in Rashtriya Kishor Swasthya Karyakram.

As per the WHO-BMI standards for adolescent; majority of adolescents as per this reference were normal. While 3.7% were overweight and 1.7% adolescents were obese. However, the WHO recommends country-specific standards for BMI. In India, IAP has published standards for various growth parameters of children and adolescents including BMI.

As per the IAP-BMI standards, majority of adolescents had normal BMI. Only 0.8% adolescents were obese and 4.5% were overweight. More than quarters of adolescents knew that obesity can cause any disease.

Blood pressure

As suggested in STEPS methodology of the WHO, we also measured BP of all the study participants. IAP has also published standards for interpreting the levels of BP among adolescents. The mean SBP for boys 110 and for girls 111 and overall is 110.3 mmHg; whereas, mean DBP for boys 69.7 and for girls 69.9 and overall is 69.7 mmHg.

DISCUSSION

This study estimated the most prevalent risk factors for NCDs among adolescents are as not eating fruits daily ($P = 0.001$), not doing exercise daily ($P = 0.000$), and having high BP ($P = 0.005$).

A review of few selected studies during 2001–2012 showed a prevalence of overweight among children aged 10–19 year to be 9.9–19.9%; high in both boys (3%–15.1%) and girls (5.3%–13.3%) indicating early onset of obesity^[13-15] affecting more of urban school adolescents (3.4%–6.5%)^[16-19] as compared to 0.6% among the rural adolescents^[15] with significant gender

variations. In another STEPS survey from Northern India reported the higher obesity among the girls;^[20] however, in this study, overweight found to be more among boys.

Another lifestyle-related factor is dietary pattern. In previous studies among adolescents, it has been reported that inadequate amount of fruits and vegetables intake and high consumption of fast food in their dietary habits,^[21,22] which is also similarly reported by this study.

Lack of physical activity among adolescent found to be a major risk factor for NCDs, however, the range of physically inactive is huge from 10% to 90% reported in various studies^[23-25] with gender variations. In this study also, lack of exercise, especially the duration of activity found to be an important factor.

CONCLUSIONS

There are two major risk factors documented in this study, that is, not having daily fruits in the diet and not doing physical activity daily among school-going adolescents. Although this study identified higher BMI as one of the major contributing risk factor, it could not able to justify the same. Because high BMI as per one standard does not mean as high for other standards, therefore the availability of three different BMI standards resulted into a challenge for classifying these adolescents. This study provides an insight to these three major BMI standards and their differences in measurement for the school-going adolescents. On the one hand, this study recommends promoting healthier practices for prevention of NCD lifestyle risk factors among school-going adolescents, and on the other hand, it recommends standardizing the BMI measurements for adolescents for India.

Limitations

This study conducted on school-going adolescents only so cannot be generalized for all adolescents of the block or district of Gujarat, India.

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Conflicts of interest

There are no conflicts of interest.

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