Research Article

Modifiable risk factors of noncommunicable diseases in urban adolescents of Girdhar Nagar, Ahmedabad: A cross-sectional study

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ABSTRACT

Background: Noncommunicable diseases (NCDs) have become a major health burden globally. The four main NCDs (heart disease, stroke, diabetes, and cancers and chronic respiratory diseases) share four modifiable risk factors: Tobacco use, harmful alcohol use, physical inactivity, and unhealthy diet. To minimize the burden of NCD epidemic, main risk behaviors common among young people must be curbed. Measurement of NCD risk factors is necessary to plan out the interventions and would also serve as a stepping stone in achieving primordial prevention of NCDs. **Objective:** The objective of the study was to measure the modifiable risk factors of NCDs among school-going adolescents of urban Ahmedabad. **Materials and Methods:** This cross-sectional study was conducted from November 2016 to January 2017 among two schools of Girdhar Nagar ward, Ahmedabad. 581 adolescents of a private and a government-run school, studying in class 8th–10th, of ages 12–16 were interviewed using GSBHS tool after taking informed consent. Appropriate anthropometric and blood pressure (BP) measurements were taken. Statistical analysis: Epi info ver. 7.0 and MS Excel 2007 used for analysis. Chi-square test, *t*-test, and multiple regression were applied. $P < 5\%$ was considered significant. **Results:** 52% (303) of the subject studied were boys and 48% (278) were girls. Among all, 66% (384) were physically inactive, 88% (511) were not consuming ≥5 servings of fruits and vegetables/day, 65% (376) and 78% (452) regularly consumed soft-drinks and fast food, respectively. 1.5% (9) of the subjects smoked and 3%(15) consumed smokeless form of tobacco. No student admitted consuming alcohol. 11% (65) were overweight and 13% (73) were obese. Raised systolic BP (>140 mmHg) was found in 3% (18) and raised diastolic BP (>90 mmHg) was found in 0.5% (3) of study subjects. **Conclusion:** One or more risk factors were found to be prevalent in all subjects. The presence of one or more modifiable risk factors in every adolescent point toward the dire need of school-based interventions for the prevention of NCDs in future adults.

KEY WORDS: Adolescents; Modifiable Risk-factors; Noncommunicable Diseases; Physical Inactivity

INTRODUCTION

The world changes every second of every day which brings about the changes in lifestyle. The way we live has been tremendously changed by the modern lifestyle, which has, in turn, affected our health and fitness. Chronic noncommunicable diseases (NCDs) are a major contributor to the burden of disease in developed countries, and are now rapidly increasing in developing countries.[1] NCDs have turned into the epidemic of recent times. NCDs have become the leading cause of mortality worldwide and a serious public health threat to developing countries.[2] In 2012, NCDs caused 68% of global deaths, nearing deaths of around 38 million people. This figure is projected to rise to 52 million by 2030 if no appropriate actions are taken.[3] Among all NCDs, heart disease, diabetes, stroke, cancers, and chronic respiratory diseases, account for

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60% of death worldwide and thus are a major global health burden. To add to the burden, 80% of these deaths occur in low-income countries, which create a daunting negative economic impact in these resource-poor countries.[4]

The four main NCDs that are responsible for the majority of NCD deaths have four risk factors in common: tobacco use, physical inactivity, and harmful use of alcohol and unhealthy diet. These risk factors, interestingly, are all modifiable behaviors which are typically established or initiated during adolescence or young adulthood defined as ages 10–24 years. This forms the basis of the occurrence of NCDs later in life.[5] Health behaviors in childhood are dominated by parental instruction and shared family values. During adolescence young people begin to explore alternatives or adult health behaviors including smoking, drinking alcohol, drug misuse, violence, and sexual intimacy.[6]

Adolescents represent over one-fifth of the total population in India. They are a vast current and future resource for their countries. Adolescents carry the highest risk of morbidity and mortality from lifestyle associated with diseases.[7] NCDs such as obesity, diabetes mellitus, and hypertension, and coronary artery diseases in adults have been related to the prevalence of risk factors in childhood.[8]

The rising prevalence of NCDs among adolescents is turning into a major public health problem.[9,10] Many risk factors for the occurrence of NCDs among adults are associated with behaviors, such as poor dietary habits and physical inactivity, learned during childhood, and adolescence.[11]

Adolescence is a crucial phase where habits can be made as well as changed. Thus, it also becomes an apt stage to intervene. Importance of healthy lifestyle can be realized, and its conscious adoption becomes the necessary steps toward healthy living and well-being.[12]

Chronic conditions if once established have a long course and are associated with an array of complications. Therefore, it is of utmost importance to intervene early. Curbing the rates of four main risk behaviors, which are common among young people today, can minimize the burden of the growing NCD epidemic.

The present study was formulated with the aim of measuring modifiable risk factors of NCD among school-going adolescents of the urban area of Ahmedabad. Measurement of the magnitude of risk factors of NCD is necessary to plan out the interventions needed and would also serve as an initial step in the direction of achieving primordial prevention of NCD in the population.

MATERIALS AND METHODS

The present study was conducted among two schools of Girdhar Nagar ward of Ahmedabad, namely a private and a government institution. The study was carried out from November 2016 to January 2017. 581 adolescents of ages 12–16 years, studying in classes 8th–10th, were surveyed with the help of age-appropriate Global School-based Student Health Survey structured questionnaire on risk factors of NCDs which was modified accordingly. Assessment of dietary practices was done by putting questions on dietary preference, intake of fast-foods, fruit and vegetable consumption and extra table salt addition. Assessment of physical activity was done by asking for daily physical activity (running, brisk walking, biking, and dancing) for at least 30 min/day during the past 7 days and during a typical week. Engaging in a sports activity at school or after school and details regarding time spent in front of the screen, i.e., T.V and video game were also asked. Smoking or alcohol intake even for a single episode was asked for, and if the answer was positive, the monthly and half-yearly frequency was asked. History of passive and parental smoking was also asked. The family history of hypertension and obesity in parents or grandparents was asked. Among other details, anthropometric measurements and blood pressure (BP) were noted. Height was measured to the nearest millimeter using a SECA wall mounted measuring scale without footwear. The weight was measured using an electronic weighing scale. The BP was measured using OMRON electronic BP measuring devices which were standardized daily against a mercury sphygmomanometer. Three readings were taken and the mean of the readings was taken as the final observation.

The statistical analysis was done using Epi-info ver. 7.0 and MS Excel 2007. Chi-square test, *t*-test, and multiple regression analysis were applied. *P* value was considered significant when < 5%.

The permission to conduct the study was granted by the school authority as well as the institution affiliated to the authors.

RESULTS

Of the 581 study subjects, 303 (52%) were males and 278 (48%) were females in the age group of 12–16 years. The mean values of biological parameters among boys and girls are as shown in Table 1.

On assessing dietary patterns, it was found that 504 (86.7%) admitted consuming fast-food items such as pizza, burger, samosa, patties, chat, and soft-drinks for at least 4 days in a week. Only 70 (12.5%) adolescents consumed five or more servings of fruits and vegetables on a daily basis. 88 (15.1%) of the adolescents were consuming extra salt daily.

About two-thirds (66.1%) of adolescents were not engaging themselves in any type of physical activity for 30 min/day

for at least 3 days in a week. Only 36 (6.2%) of adolescents said that they were doing stretching exercises for >3 days in a week. Around 352 (60.6%) of the adolescents were spending >2 h as screen-time (i.e., watching TV and playing video games).

On the assessment of lifestyle habits, 9 (1.5%) admitted smoking while 15 (2.6%) admitted chewing tobacco. None of the adolescents admitted consuming alcohol at any point of time in their life, in our study.

Nearly 208 (35.8%) of the adolescents had a family history (including parents, one or both) of obesity. 136 (23.4%) had the family history (including parents or any of the grandparents) of diabetes mellitus while 186 (32.0%) had a family history of hypertension.

Nearly 66 (11.4%) of the adolescents were overweight while 57 (9.8%) were obese (>85th percentile for age as overweight and >95th percentile for age as obese) according to the American Obesity Association.

On assessing BP, systolic hypertension (systolic BP [SBP] >140 mmHg) was found in 18 (3.1%) and diastolic hypertension (diastolic BP [DBP] >90 mmHg) was found in 3 (0.6%) of the adolescents.

The mean body mass index (BMI) for boys was 19.2 kg/m^2 while for girls were 20 kg/m^2. Among adolescent boys, the mean SBP was 115.5 mmHg and the mean DBP was 72.5 mmHg. The mean SBP for girls was 113.1 mmHg and mean DBP was 69.1 mmHg [Table 2].

In our study, the risk factors associated, as found on bivariate and multivariate analysis [Tables 3 and 6], with the rise in SBP were male sex, higher intake of fast-food and soft drinks, physical inactivity, and extra salt intake. Fewer intakes of fruits and vegetables and tobacco consumption were not the determining factors of SBP.

DBP was associated with SBP, showing that the rise in SBP would cause a rise in DBP. Rise in DBP was also determined by physical inactivity and extra salt intake but was not determined by fast-food and soft drinks consumption, less intake of fruits and vegetables and tobacco consumption.

Rise in BMI was determined by higher intake of fast-food and soft drinks and physical inactivity. BMI was negatively associated with fewer intakes of fruits and vegetables possibly due to an increase in overall diet intake of the study subjects, i.e. those who consumed fast-food also consumed fruits and vegetables. Extra salt intake and tobacco consumption did not determine BMI in our study. Female students had higher BMI on an average than male students in this age group.

DISCUSSION

The present study, cross-sectional in design, was aimed at determining the risk factors of NCD in students from urban schools of Ahmedabad. One or more risk factor was present in almost all of the study subjects in our study; whereby dietary risk factor was prevalent in the majority (87.9%).

The WHO recommends total intake of at least five servings of fruits and vegetables to prevent the risk of NCDs in the long run. In our study, not even one-fifth of the children was consuming recommended servings of fruits and vegetables. This finding is lower than the findings of a study conducted in New Delhi[13] but is higher than the findings of the WHO ICMR study conducted in Ballabgarh by Anand *et al*.[13] where regular consumption of five servings of fruits and vegetables was found to be in <1% of the screened population. In the study population, consumption of fast-food and soft drink was also very high. More than four-fifths of the children were consuming fast food and soft drinks for >3 days in a week which was higher than the finding of Singh *et al*.[8] Low consumption of fruits and vegetables was not influencing that

Table 1: Mean BMI and blood pressure values among boys and girls

Variables	Boys (*n*=303)	Girls (*n*=278)	*P* value
BMI	19.2±3.2	20±2.1	<0.05
SBP	115.5±13.5	113.1±12.4	<0.05
DBP	72.53±7.9	69.1±7.8	<0.05

BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 2: Summary of risk factors of noncommunicable diseases

Risk factors	Number (%)
Diet-related risk factors	
Total servings of fruits and vegetables <5	511 (87.5)
Consuming fast food and soft drinks	504 (86.7)
Consuming extra salt on a daily basis	88 (15.1)
Lifestyle habit-related to risk factors	
Consuming tobacco (including smoking in any form)	21 (3.61)
Consumed/consuming alcohol	00 (00)
Physical activity-related to risk factors	
Physically inactive for 4 days or more	384 (66.1)
Not doing stretching exercises	545 (93.8)
Screen time of 2 h or more	352 (60.6)
Biological risk factors	
BMI >85 percentile (overweight)	66 (11.4)
BMI >95 percentile (obese)	57 (9.8)
SBP >140 mmHg	18 (3.1)
DBP >90 mmHg	3 (0.6)

BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3: Determinant risk factors of BMI and blood pressure (SBP and DBP)

Risk factors	BMI	SBP	DBP
Less intake of fruits and vegetables			
Yes	19.4±3.1*	114.6±13.2	70.8±8.0
No	20.3±2.9	112.3±11.6	71.4±7.6
Higher intake of fast food and soft drinks			
Yes	19.6±3.1*	114.8±13.5*	70.9±8.1
No	18.1±3.1	111.4±9.2	70.5±7.5
Physical inactivity			
Yes	19.9±3.2*	115.3±13.5*	71.6±8.4*
No	18.8±2.9	112.4±12.1	69.4±6.9
Extra salt intake			
Yes	19.1±2.6	127.8±14.3*	76.3±7.4*
No	19.6±3.2	111.9±11.3	69.4±6.9
Tobacco consumption			
Yes	17.7±1.2	108.3±15.2	69.0±4.5
No	19.6±3.1	114.4±13.0	70.9±8.1

*Statistically significant at $P<0.05$. BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 4: Risk factors associated with SBP on regression analysis

Model	Standardized coefficient	t value	Significance	R^2
Higher intake of fast food and soft drinks	0.175	4.70	0.000	0.234
Physical inactivity	0.066	−1.774	0.077	
Higher salt intake	0.420	11.467	0.000	
Sex	0.070	1.861	0.063	

SBP: Systolic blood pressure

Table 5: Risk factors associated with DBP on regression analysis

Model	Standardized coefficient	t value	Significance	R^2
Physical inactivity	0.149	−3.824	0.000	0.146
Higher salt intake	0.270	6.992	0.000	
Sex	0.233	5.976	0.000	

DBP: Diastolic blood pressure

Table 6: Risk factors associated with BMI on the regression analysis

Model	Standardized coefficient	t value	Significance	R^2
Less intake of fruits and vegetables	−0.11	−2.91	0.004	0.144
Higher intake of fast food and soft drinks	0.312	7.90	0.000	
Physical inactivity	0.707	−2.710	0.007	
Sex (ref-female)	−0.162	−4.086	0.000	

BMI: Body mass index

the physical risk factors of NCDs, i.e., BMI and BP, rather low consumption of fruits and vegetables were associated with lower BMI ($P < 0.01$). A possible explanation to this can be that children who ate less overall, consumed lesser or no fruits and vegetables. Furthermore, socioeconomic condition from where the child comes from would also influence the intake of fruits and vegetables in the diet. Fruits and vegetables are costlier than other cheaper fast foods which are filling as well as tastier which influences their daily consumption in the community. This finding calls for conducting research in the community to determine the factors associated with low consumption of fruits and vegetables and higher consumption of soft drinks and fast food and implementation of appropriate actions. In our study, 3% of the adolescents had raised BP. The findings are in line with other studies conducted in India;[15,16] although Singh *et al*. found a higher prevalence of hypertension in New Delhi.[8] Extra salt intake, an established causative risk factor in raised BP was found in one-fifth of the study population. In our study, extra salt consumption determined raised systolic as well as DBP ($P < 0.01$). The finding was similar to the study conducted

in New Delhi by Singh *et al*.[8] and the study conducted in Mumbai by Tadvi *et al*.[14] About two-thirds of adolescents were not engaging themselves in recommended levels of physical activity. In a study conducted in rural parts of Kugur, Karnataka; only 30% of the adolescents were not engaging themselves in any sort of physical inactivity;[17] while the findings of our study were almost similar to the study conducted in urban areas of Delhi.[8] This may point toward higher prevalence of physical inactivity in urban areas as compared to the rural parts which may be attributed to daily lifestyle and geography of the urban area. In our study, physical inactivity was associated with an increase in BMI, systolic, and DBP ($P < 0.01$). Singh *et al*. found no such association in their study.[8] Looking onto the lifestyle habit associated risk factors, in our study, 5% of adolescents admitted smoking, 2.6% admitted chewing tobacco while none of them had consumed alcohol. In the study conducted by Singh *et al*., 5% of adolescents admitted smoking while 51% had consumed alcohol at some point of time in their life.[8] A possible explanation to this may lie in the restricted availability of alcohol due to the ban on liquor sale in Gujarat state. A positive correlation of DBP with a family history of hypertension ($P < 0.01$) and obesity ($P < 0.01$) was found in our study. Singh *et al*. found similar findings in their study.[8] Apart from this, SBP ($P < 0.01$) and DBP ($P < 0.01$) were associated with a rise in BMI in our study. According to the findings of the study conducted by Mohan *et al*., the BMI of hypertensive adolescents in both rural and urban areas was significantly higher than the respective normotensive population in Ludhiana.[17]

The study population was selected from one private school and another municipal corporation school with the ambition of encompassing students of all socioeconomic classes. However, the findings of this study cannot be generalized to all the schools of urban Ahmedabad, as random sampling was not rendered. Although the findings of this study cannot be generalized, this study definitely forms a base in estimating the prevalence of modifiable risk factors of NCD in urban adolescents of Ahmedabad and is a pointer in the direction of its rising trend.

CONCLUSION

The present study concludes that the modifiable risk factors of NCD are highly prevalent in the adolescents of urban areas of Ahmedabad. This finding can probably be attributed to current lifestyle patterns of being more homebound, spending the majority of time on the internet and electronic devices, easily accessible, and cheap fast foods and drastically reduced time spent on physical activity, particularly in urban areas.

REFERENCES

1. Puoane T, Tsolekile L, Sanders D, Parker W. Chronic non-communicable diseases: Primary health care: Programme areas. S Afr Health Rev 2008;2008:73-87.
2. Islam SM, Purnat TD, Phuong NT, Mwingira U, Schacht K, Fröschl G. Non-communicable diseases (NCDs) in developing countries: A symposium report. Global Health 2014;10:81.
3. World Health Organization. Management of Substance Abuse Unit. Global Status Report on Alcohol and Health; 2014. Canada: World Health Organization; 2014.
4. Mathers C. The Global Burden of Disease: 2004 Update. Europe: World Health Organization; 2008.
5. Curbing N. Noncommunicable Diseases in Africa: Youth are Key to Curbing the Epidemic and Achieving Sustainable Development. Washington: Population Reference Bureau: 2015.
6. Viner R, Macfarlane A. Health promotion. Br Med J 2005;330:527-9.
7. Promoting Healthy Life Style Behaviors for Adolescent; 2009. Available from: http://www.childtrends.org/Files/Child_Trends2003_03_12_PD_PDConfHKG. [Last accessed on 2017 Jan 27].
8. Singh AK, Maheshwari A, Sharma N, Anand K. Lifestyle associated risk factors in adolescents. Ind J Pediatr 2006;73:901-6.
9. Michaud PA, Suris JC, Viner R. The Adolescent with a Chronic Condition: Epidemiology, Developmental Issues and Health Care Provision. Geneva: World Health Organization; 2007.
10. Proimos J, Klein JD. Noncommunicable diseases in children and adolescents. Pediatrics 2012;130:379-81.
11. Nolan LA. Noncommunicable Diseases and Youth: A Critical Window of Opportunity for Latin America and the Caribbean; 2013. Available from: http://www.prb.org/pdf13/noncommunicable-diseases-latin-americayouth-policybrief.pdf. [Last accessed on 2017 Jan 27].
12. Lerner RM, Lerner JV, von Eye A, Bowers EP, Lewin-Bizan S. Individual and contextual bases of thriving in adolescence: A view of the issues. J Adolesc 2011;34:1107-14.
13. Anand K, Kapoor SK. Report on Development of Sentinel Health Monitoring Centers in India-Ballabgarh Center. New Delhi: WHO, ICMR, CRHSP, AIIMS: 2004.
14. Tadvi AY, Bandi JR. Study of prevalence of hypertension in young adult population of age group 20 to 40 years in an urban slum of Mumbai, Maharashtra, India. Int J Community Med Public Health 2016;3:3325-31.
15. Charan J, Buch N, Goyal JP, Kumar N, Parmar I, Shah VB. Prevalence of hypertension in school going children of Surat city, Western India. J Cardiovasc Dis Res 2011;2:28-32.
16. Bukelo MF, Kiran D, Goud BR, Bukelo MJ, Kiran PR, Kulkarni V, *et al*. Risk factors for non-communicable diseases among rural adolescents: A school based cross-sectional study. Asian J Pharm Clin Res 2015;8:284-7.
17. Mohan B, Kumar N, Aslam N, Rangbulla A, Kumbkarni S, Sood NK, *et al*. Prevalence of sustained hypertension and obesity in urban and rural school going children in Ludhiana. Ind Heart J 2004;56:310-4.

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