Screening Of Risk Factors For Cardiovascular Diseases Among School Going Adolescents: A Cross-Sectional Study

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Abstracts: Background**:** The main preventable risk factors for cardiovascular diseases such as poor dietary habits, sedentary lifestyle, tobacco and alcohol consumption and stress have their beginning in the adolescent age group. Present study was carried out to screen some risk factors for cardiovascular diseases among school going adolescents in an urban area. Methodology: A cross sectional survey was done among 871 adolescents aged 10 to 18 years during September 2014 to March 2015. Demographic information, dietary history and history of physical activity were collected. Anthropometric parameters and blood pressure were measured using standard technique. Percentage and 95% CI were used to summarize the results. Results: Among 871 adolescents 462 (53.05%) were male. Mean age ± SD was 13.86 ± 2.21 years. Majority of the adolescents 782 (89.78%) consumed inadequate amount of fruits and vegetables. The proportion of adolescents who consumed junk food more than three times a week was 24.34% (212). There were 413 (47.42%) study subjects who consumed added salt while having their meals. Thirty-seven (4.25%) consumed carbonated drinks more than 3 times a week. More than half 478 (54.88%) were not physically active. Most of them i.e. 734 (84.27%) spent three hours or more per day on sedentary activities. Proportion of overweight and obesity was 5.97%(52) and 2.87% (25). Proportion of pre-hypertension was 10.10% (88) and hypertension was 8.27% (72). Conclusion: High proportion of risk factors for cardiovascular disease is found among the school going adolescents in the urban area. [Deshpande S NJIRM 2016; 7(3):1-6]

Key Words: Screening, Risk factors for cardiovascular diseases, Adolescents.

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Introduction: Cardiovascular diseases are number one cause of death with 17 million deaths worldwide each year.[1] According to the World Health Organisation Non-communicable Disease Country Profiles (2011), non-communicable diseases are estimated to account for 53 percent of all deaths in India across all age groups.[2] The main preventable risk factors for cardiovascular diseases such as poor dietary habits, sedentary lifestyles, tobacco and alcohol consumption and stress have their beginning in this age group[3]. There are three critical aspects of adolescence that have an impact on chronic diseases i.e. the development of risk factors during this period; the tracking of risk factors throughout life; and in terms of prevention and the development of healthy or unhealthy habits that tend to stay throughout life[4].

India is home to 243 million adolescents in the age group of 10–19 years, accounting for 21.2 percent of the country's population. Adolescents experience intense physical, psychological, emotional and economic changes as they make the transition from childhood to adulthood.[5] Adolescence provides an opportune time for positive behaviour modification, to mitigate the emergence of risk factors for cardiovascular diseases and to initiate the promotion of a healthy lifestyle and this is more effective than trying to change unhealthy behaviours during adulthood. Schools play a critical role in promoting the health of young people, and helping them to establish lifelong healthy behaviour patterns. Considering the rising prevalence of behavioural and metabolic risk factors among young age group, present study was carried out to screen some risk factors for cardiovascular diseases among school going adolescents in an urban area.

Material and Methods: Present descriptive cross-sectional study was carried at Secondary and Higher Secondary School in Nagpur amongst adolescents aged 10 to 18 years during September 2014 to March 2015. Approval from institutional ethics committee was sought. The school was purposively selected for feasibility reasons. Permission from school Principal was sought after appraising her about nature and purpose of the study.

Assuming the prevalence of Hypertension amongst adolescents to be 10% (Rao S et al[6] 2007), α=5%, β=20%, by using formula $N = Z_{(1-\alpha)}^2\ p\ (1-p)/\ d^2$ sample size was calculated to be 864. There were in all 2627 students in the school from standard 5th to 12th. There were six divisions in each standard with around 55 to 60 students in each division. Two divisions were

randomly selected from each standard by lottery method. All the students present at the first visit in the selected division were included in the study. Thus, the final sample size for study was 871.

Demographic information, dietary history and history of physical activity were collected using pre-designed proforma based on Global School-based Student Health Survey.[7] History of past one week was taken for assessment of dietary habits and physical activity.

Height was measured to nearest 0.1cm using Seca Stadiometer. Weight was measured with 100gm accuracy using electronic weighing machine and Blood pressure was measured by using mercury sphygmomanometer. Body Mass Index Percentile Charts (WHO Charts for boys and girls) were used to classify the nutritional status of the adolescents.[8] Percentiles for systolic and diastolic blood pressure were obtained by using Fourth task force report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents.[9]

Following definitions were used in the study.
Inadequate consumption of fruits and vegetables: Consuming less than five total servings (400 grams) of fruits and vegetables per day.[4,10]

Insufficient physical activity in adolescents defined as less than 60 minutes of moderate to vigorous intensity activity daily.[4,10]

Overweight: 85th to 95th Percentile of BMI.[11]

Obese: >95th Percentile of BMI.[11]

Hypertension: Average systolic blood pressure and/or diastolic blood pressure that is greater than or equal to the 95th percentile for sex, age, and height on three or more occasions. [9]

Pre-hypertension: Average systolic blood pressure or diastolic blood pressure levels that are greater than or equal to the 90th percentile, but less than the 95th percentile.[9]
As with adults, adolescents with blood pressure levels greater than or equal to 120/80 mmHg should be considered pre-hypertensive.[9]

Data was entered in excel sheet and Percentage, mean, standard deviation, range, 95% Confidence Interval (CI) were calculated.

Results: Among 871 adolescents 462 (53.05%) were male. Mean age ± SD of study participants was 13.86 ± 2.21 years. Majority of them were Hindu by religion (80.71%). Most of them (84.96%) belonged to upper middle and lower middle class (II & III) by socio-economic status. [Table 1]

Table 1: Socio demographic profile of the adolescents (n = 871)

Variables		Number	Percentage
Gender	Male	462	53.05
	Female	409	46.95
Age group (years)	10-12	315	36.16
	13-15	346	39.73
	16-18	210	24.11
Religion	Hindu	703	80.71
	Buddhist	168	19.29
Socioeconomic status*	Upper	38	4.36
	Upper Middle	383	43.97
	Lower middle	357	40.99
	Upper Lower	93	10.68
	Lower	00	00.00

*Modified Kuppuswamy's Classification (Corrected as per current CPI)

Behavioral and metabolic risk factors were screened among them. Among behavioral risk factors, dietary habits and physical activity were studied. Obesity and hypertension were studied among metabolic risk factors.

Majority of the study subjects i.e 782 (89.78%) consumed inadequate amount of fruits and vegetables in past one week. Two servings of fruits and three servings of vegetables were considered as total five servings of fruits and vegetable consumption. The proportion of study subjects who consumed junk food for more than three times a week was 24.34% (212). There were 413 (47.42%) study subjects who consumed added salt while having their meals in past one week. Among all, 37 (4.25%) consumed carbonated drinks more than 3 times a week.

More than half of the study subjects i.e. 478 (54.88%) were not physically active for minimum one hour on all

days in last one week. Most of the study subjects, 734 (84.27%) spent more than or equal to three hours a day on sedentary activities like watching TV, playing sitting games and on computers etc. in the week preceding to the survey. [Table 2]

Table 2: Proportion of behavioral risk factors among adolescents

Risk factors	Study subjects	
	No (%)	95% CI
Inadequate consumption of fruits and vegetables	782 (89.78)	87.77, 91.79
Junk food consumption (> 3 times a week)	212 (24.34)	21.50, 27.18
Carbonated drinks consumption (> 3 times a week)	37 (4.25)	2.91, 5.59
Added salt consumption	413 (47.42)	44.11, 50.73
Insufficient physical activity	478 (54.88)	51.57, 58.18
Time spent on Sedentary activities (> 3 Hours/day)	734 (84.27)	81.85, 86.69

Proportion of overweight adolescents was 5.97% (52) while and 2.87% (25) were obese. Proportion of pre-hypertension was 10.10% (88) and hypertension was 8.27% (72). Overall 18.37% (160) study subjects had elevated blood pressure. [Table 3]

Table 3: Proportion of metabolic risk factors amongst adolescents

Risk factors	Study subjects (n=871)	
	No (%)	95% CI
Overweight	52 (5.97)	4.40, 7.54
Obese	25 (2.87)	1.76, 3.98
Pre-hypertension	88 (10.10)	8.10, 12.10
Hypertension	72 (8.27)	6.44, 10.10

Discussion & Conclusion: Present cross-sectional study was carried out in secondary and higher secondary school to screen some risk factors for cardiovascular diseases among school going adolescents in an urban area. The school was selected purposively for feasibility reasons. It was a Grant-in-aid school. Therefore, most of the students (84.96%) belonged to upper middle and lower middle class (II & III) by socio-economic status. Though Adolescent age group as defined by WHO is 10 to 19 years, none of the student in the school was aged 19 years, thus study was conducted among adolescents aged 10 to 18 years.

In the present study markedly low consumption of fruits and vegetable was found. Consumption of daily five servings of fruit and vegetable was 10.22%. The finding is consistent with findings of Prajapati J et al[12] (9.1%). Epidemiologic data support the association between high intake of vegetables and fruits and low risk of chronic disease. There are several biologically plausible reasons why consumption of vegetables and fruit might slow or prevent the onset of chronic diseases. Vegetables and fruit are rich sources of a variety of nutrients including vitamins, trace minerals, and dietary fibre, and many other classes of biologically active compounds. These phytochemicals can have complementary and overlapping mechanisms of action, including modulation of detoxification enzymes, stimulation of the immune system, reduction of platelet aggregation, modulation of cholesterol synthesis and hormone metabolism, reduction of blood pressure, and intakes of dietary fibre and minerals, such as potassium and magnesium, are aspects of a high-vegetable, high-fruit diet believed to reduce blood pressure.[13]

In the present study, the proportion of adolescents who consumed junk food more than thrice a week was 24.24%. It was lower than the findings of Singh AK et al[14] (31.56%) but higher than the findings of Prajapati J et al[12] (5%). Junk food, fast food and trash food are all definitions of a quick, unhealthy, hunger satisfying food, which are easy to make and easy to consume. They are low in nutritional value with a high caloric value. Junk food contains high level of refined sugar, white flour, polyunsaturated fats, salts and numerous food additives but lacking in protein, vitamin and fibers. Harmful effects of junk food may be long term or short terms; fat contents have high cholesterol level. High calorie content with sugar can lead to obesity. Cholesterol and salt can increase blood pressure, stroke and heart diseases. Excessive salt can worsen the hypertension.[15]

In the present study 47.42% of the study subjects added extra salt while having their meals. Actual salt consumption could not be studied. But, use of added

salt was considered as proxy for high salt consumption. Added salt consumption was higher than in the study done by Singh AK et al[14] (24%) and Prajapati J et al[12] (9.25%). The current recommendation for adequate daily sodium intake is only 1.5 g/day for older (> 8 years) children.[8]

More than half of the study subjects i.e. 478 (54.88%) were not physically active for all days in the week in the present study. It was higher than the findings of Singh AK et al[14] (21.17%), Prajapati J et al[12] (4.26%) and GSHS[7] (30.2%). However Singh AK et al[14] studied the proportion of students who were physically active for at least three days in the week. Physical activity reduces risk for cardiovascular diseases and diabetes. The beneficial effects of physical activity are mediated by mechanisms beyond controlling excess body weight. Physical activity improves the level of high density lipoprotein cholesterol, improves control of blood glucose in overweight people, even without significant weight loss and reduces blood pressure.[8]

Percentage of study subjects who spent three or more hours per day on sedentary activities like watching television, playing computer games, talking with friends etc. was 84.27%. It was very high as compared to findings of Global School Based Student Health Survey[7] (23.2%). However GSHS was conducted among students from standard 8th to 10th (13 to 15 years) and current study was carried out among 10 to 18 years. It was observed in our study that more time is spent on sedentary activities by older adolescents. Every hour of sedentary activity increases the chance of obesity and is also contributory to failure of many weight reduction attempts in adolescents and children.[16] Physical inactivity is been found independently to predict coronary artery disease and stroke in later life.[4]

Present study found the proportion of overweight and obesity as 5.97% and 2.87% respectively. The finding is consistent with findings of some Indian studies like Raj M et al[16] (6.5%, 1.89%), Sharma A et al[17] (6.2%, 1%), and Global School based student health survey[7] (10.8%, 2.1%). Higher prevalence of overweight and obesity was found in studies done aboraod Moura AA et al[18] (9.3%, 4.5%), Abolfotouh MA et al[19](6.3%, 4%), Dyson PA et al[20] (China - 13.4%, 3.2%, Mexico 28.7%, 8.4%) and Oduwole AA et al[21] (13.8%, 9.4%).

The proportion of pre-hypertension (10.10%) was higher than the hypertension (8.27%) in the present study. Overall, 18.37% adolescents had elevated blood pressure; many of the studies support this finding.[17,19,22,23,24,25,26]

The situation of cardiovascular risk factors in children is concerning. Risk factor modifications earlier in childhood may control the burgeoning epidemic of adult CVD in south Asia.[27]

Proportion of risk factors for cardiovascular disease is found to be high among the school going adolescents in the urban area.

Study has few limitations like, some of the behavioural risk factors like tobacco and alcohol consumption were not studied. Low proportion of carbonated drinks consumption may be due the fact that, maximum data collection was done during winter months.

References:

1. Revised draft: Global action plan for the prevention and control of noncommunicable diseases: 2013-2020. [Internet]. Geneva: World Health Organization;2008 [cited 2014 Oct 21]; Available from: http://www.who.int/nmh/events/2013/revised_draft_ncd_action_plan.pdf.
2. Noncommunicable Diseases Country Profiles. [Internet]. Geneva: World Health Organization;2011 [cited 2014 Oct 21]; Available from: http://www.who.int/nmh/publications/ncd_profiles_report.pdf.
3. Strategy Handbook. Rashtriya Kishor Swasthya Karyakram. [Internet]. New Delhi: Government of India Ministry of Health and Family Welfare;2014 [cited 2014 July 15]; Available from: https://www.dropbox.com/s/0oj4p422y7st4ku/RKSK%20Strategy%20Handbook.pdf.
4. WHO Technical Report Series no. 916. Diet, nutrition and the prevention of chronic diseases. [Internet]. Geneva: World Health Organisation; 2002 [cited 2013 April 12]; Available from: http://www.who.int/dietphysicalactivity/publications/trs916/en/.
5. Progress for Children. A report card on adolescents. [Internet]. New York :UNICEF. Division of Communication; 2012 [cited 2016 May 2]; Available from:

http://www.unicef.org/media/files/PFC2012_A_report_card_on_adolescents.pdf.
6. Rao S, Kanade A, Kelkar R. Blood pressure among overweight adolescents from urban school children in Pune, India. European Journal of Clinical Nutrition 2007;61:633–41.
7. Global School-based Student Health Survey (CBSC).India Factsheet. [Internet]. Geneva: World Health Organisation;2007 [cited 2014 August 12]; Available from: http://www.who.int/chp/gshs/2007_India_CBSE_fact_sheet.pdf.
8. BMI-for-age (5-19 years) Growth Charts [Internet]. Geneva: World Health Organisation;2007 [cited 2012 December 24]. Available from: http://www.who.int/growthref/who2007_bmi_for_age/en/.
9. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth Report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Pediatrics 2004;114:555-75.
10. Draft comprehensive global monitoring framework and targets for the prevention and control of noncommunicable diseases. Sixty-sixth world health assembly a66/8. Provisional agenda item 13.1. [Internet]. Geneva: World Health Organization;2013 [cited 2014 January 14]; Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_8-en.pdf.
11. Nutritional status categories as per BMI: NHANES III. [Internet]. Atlanta: CDC;2007 [updated 2015 May 15; cited 2016 May 29] Available from: http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html
12. Prajapati J, Oza J, Prajapati P, Bhagyalaxmi A, Rawal V. Prevalence of Behavioural Risk Factors Of Cardiovascular Diseases Among School Going Adolescents Of Ahmedabad, Gujarat. HPPI 2009;32(4):198-203.
13. Lampe JW. Health effects of vegetables and fruit: assessing mechanisms of action in human experimental studies. Am J Clin Nutr 1999;70(suppl):475S–90S.
14. Singh AK, Maheshwari A, Sharma N, Anand K. Lifestyle Associated Risk Factors in Adolescents. Indian J Pediatr 2006;73(10):901-6.
15. Zahid N. Increasing trend of Junk food use in Saudi Arabia and health implications (Editorial). International Journal of Health Sciences, Qassim University 2012;6(1):1433H.
16. Raj M, Kumar RK. Obesity in children & adolescents. Indian J Med Res 2010; 132:598-607.
17. Sharma A, Grover N, Kaushik S, Bhardwaj R, Sankhyan N. Prevalence of Hypertension Among School children in Shimla. Indian Pediatrics 2010;47:873-6.
18. Moura AA, Silva MAM, Ferraz MT, Rivera IR. Prevalence of high blood pressure in children and adolescents from the city of Maceió, Brazil. J Pediatr (Rio J) 2004;80(1):35-40.
19. Abolfotouh MA, Sallam SA, Mohammed MS, Loutfy AA, Hasab AA. Prevalence of Elevated Blood Pressure and Association with Obesity in Egyptian School Adolescents. International Journal of Hypertension 2011;952537.doi:10.4061/2011/952537
20. Dyson PA, Anthony D, Fenton B, Matthews DR, Stevens DE. High rates of child hypertension associated with obesity: a community survey in China, India and Mexico. Paediatrics and International Child Health 2013. doi: 10.1179/2046905513Y.0000000079
21. Oduwole AA, Ladapo TA, Fajolu IB, Ekure EN, Adeniyi OF. Obesity and elevated blood pressure among adolescents in Lagos, Nigeria: a cross-sectional study. BMC Public Health 2012;12:616. Available from: http://www.biomedcentral.com/1471-2458/12/616.
22. Verma V, Singh SK. Prevalence of hypertension in Gujarati school going children and adolescents in Anand district. National Journal of Community Medicine 2012;3(3):452-7.
23. Baradol RV, Ranagol A, Patil SV. Hypertension as an emerging health problem amongst school children and adolescents. International Journal of Medical Research & Health Sciences 2013;2(4):941-8.
24. Deshpande AV. Study of prevalence of Hypertension in adolescent in Central India. International Journal of Basic Medicine and Clinical Research 2014;1(3): 66-71.
25. Ostrowska-Nawarycz L, Nawarycz T. Prevalence of excessive body weight and high blood pressure in children and adolescents in the city of Łódź. Kardiologia Polska 2007;65(9):1079-87.
26. Ujunwa FA, Ikefuna AN, Nwokocha ARC, Chinawa JM. Hypertension and prehypertension among adolescents in secondary schools in Enugu, South

East Nigeria. Italian Journal of Pediatrics 2013;39:70. doi:10.1186/1824-7288-39-7.

27. Prasad DS, Kabir Z, Dash AK, Das BC. Childhood cardiovascular risk factors in South Asians: A cause of concern for adult cardiovascular disease epidemic. Ann Pediatr Cardiol 2011;4(2):166-71.

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