

# Risk Factors for Cardiovascular Disease in School Children - a Pilot Study

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## Abstract

**Objective:** To assess the frequencies of risk factors for cardiovascular disease in school children. The information may help in designing interventions aimed at modifying unhealthy lifestyle in children, which may reduce the later incidence of cardiovascular disease in adults.

**Methods:** A cross-sectional study was conducted on 206 students (ages 14-18 years), enrolled in higher secondary school. Students were interviewed about their lifestyles, family history of cardiovascular disease and its risk factors. Moreover, they were assessed for height, weight and blood pressure.

**Results:** Twenty nine percent of the children were physically inactive, 31% were taking unhealthy diet daily, 21% were overweight (BMI  $\geq 25$ ) and 6% were smokers. History of paternal smoking was reported by 36% of the children, and among them 76% of fathers smoked in the presence of their children. Family history of cardiac disease, hypertension and diabetes were positive in 4%, 23% and 16% of the children respectively. Overall, 58% of the children had at least one modifiable risk factor.

**Conclusion:** Majority of the children had modifiable risk factors for cardiovascular disease. Prevention efforts are required early in life, using strategies for behavioral modification and health promotion. (JPMA 53:396;2003)

## Introduction

The burden of non-communicable diseases (NCDs) is emerging as a major public health challenge for developing countries. NCDs are largely attributed to unhealthy life style such as unhealthy dietary habits, physical inactivity, overweight/obesity and smoking. NCDs are projected to account for 73% of global mortality by the year 2020.<sup>1</sup> World Health Organization (WHO) estimates that NCDs accounted for at least 40% of all deaths in developing countries.<sup>2</sup>

The most common and problematic non-communicable conditions are heart disease<sup>3</sup>, hypertension and diabetes.<sup>4</sup> Globally, cardiovascular diseases (CVD) are the first cause of mortality.<sup>2</sup> In Middle Eastern Crescent Region which includes Pakistan, in 1990, cardiovascular disease was responsible for nearly 11% of disability adjusted life years (DALYs), second only to infectious and parasitic diseases.<sup>5</sup> In Pakistan, CVD results in more than 100,000 deaths per year, i.e., 12% of all-cause mortality.<sup>6</sup> Evidence of increased risk of CVD with the presence of specific risk factors has been documented in a large number of hallmark epidemiological studies, such as the Framingham Heart Study<sup>7</sup>, the Multiple Risk Factor Intervention Trial<sup>8</sup> and others.<sup>9</sup> There is significantly higher prevalence of cardiovascular disease risk factors in Pakistani adults, where 29% of men are smokers, 18% suffer from hypertension and 13% have elevated cholesterol levels.<sup>10</sup> Moreover, in Pakistan over 10% of people in the age group 25 years and above have type 2 diabetes and an equal number are suffering from impaired glucose tolerance.<sup>11,12</sup> It is also estimated that by the year 2025, the number of persons with diabetes in Pakistan will rise to 14.5 million as compared to 4.3 million in the year 1995, representing a 3.37 fold increase in case-load.<sup>13</sup>

Atherosclerosis, the underlying cause of cardiovascular disease, begins in early childhood, and clinically manifests in adulthood. There is sufficient evidence that the risk factors, which were predicted in childhood, track to adolescence and adulthood.<sup>14,15</sup> It is also well established that a large number of cardiovascular disease risk factors can best

obesity, which itself is a potent modifiable risk factor for cardiovascular disease, hypertension, diabetes and dyslipidemia.

The impact of cardiovascular disease on the lives of people is devastating. Cardiovascular disease has severe economic consequences that result from premature deaths, long-term disability, and cost for the patient.<sup>17</sup> Additionally, cardiovascular disease has also a substantial burden in terms of costs on country's health system. In USA, cardiovascular disease cost US\$151.3 million in a year, which includes medical treatment and lost of productivity from disability.<sup>2</sup> In Pakistan, where over one-third of the people living in poverty<sup>18</sup>, can not afford the increasing burden of such costly disease. Thus it is important to identify unhealthy lifestyles and behaviors early to promote healthy changes during childhood and adolescence period. More importantly because of evidence that behaviors once established in childhood are difficult to change in adulthood.

There is no published data, which provides an information about the extent of cardiovascular disease risk factors in Pakistani children, which constitute more than 43% of the total country's population.<sup>19</sup> The objective of this study was to assess the frequencies of various risk factors for cardiovascular disease in school children, thus to design and implement interventions to modify unhealthy lifestyles.

## Subjects and Methods

A cross-sectional survey was conducted on 206 school children who were between the ages of 14 to 18 years and studying in higher secondary school (class 9th and 10th), in a private sector school in Hyderabad, the second largest city of Sindh province, Pakistan.

Students were informed regarding the aims and rationale of the study and were assured about the confidentiality of the information. All the data collected and measurements done by a trained Research Assistant (Medical graduate) in the month of April 2001, by administering a structured questionnaire to those students who agreed to participate in the study. The questionnaire comprised of variables of various risk factors for cardiovascular disease

consumption of "fast foods" and "empty calorie foods" (high in energy, often from fat, but provide few nutrients) like French fries, snack foods, cakes, cookies and soft drinks at least 'once a day'. The children were categorized into three groups according to the level of self-reported information on their physical activity in their leisure time. They were: 1) children who were inactive i.e., read books, watched television and used computers; 2) children with some physical activities such as walking and out door household activities and 3) children with strenuous physical activities such as participating in sports (cricket, football), cycling or/and doing heavy physical work regularly. Children who were inactive were considered to be at risk. The children who smoked at least one cigarette per week were considered to be smokers.

For the purpose of our study, we considered only those conditions as cardiovascular diseases which comes in the category of Coronary Heart Diseases i.e., all types of Angina (Angina Pectoris and Unstable Angina) and Myocardial Infarction.

Height was measured to the nearest 0.1 centimeter, and weight was measured to the nearest 0.1 kilogram, wearing minimum clothing and without shoes. Body mass index (BMI) was calculated as weight in kilograms divided by height in meter squares. Those who had BMI  $\geq 25$  were labeled as overweight.

For blood pressure (BP) measurement the student was seated in a quiet and restful room for at least 10 minutes. BP was measured twice from the right arm placed in semiflexation at the height of the heart with an interval  $\geq 5$  minutes in between the two measurements using a mercury sphygmomanometer with an appropriate size cuff (Investigator had BP cuffs of two different sizes i.e., 9.5 cm and 13.5 cm so that it covered approximately 75% of the upper arm of the participant). Average of these two blood pressure measurements was used in the analyses. Korotkoff phase I values were recorded as systolic BP and Korotkoff phase V values were recorded for diastolic BP. The value over the 95th percentile for age according to the National Institute of Health Second Task Force Report on Blood Pressure were evaluated as hypertension.<sup>20</sup>

Epi-Info 6 statistical package was used for data entry and validation. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 11. Frequencies for various characteristics were calculated in percentages.

## Results

Out of total 240 students enrolled in four sections of class 9th and 10th, 206 agreed to participate in the study. Overall, the response rate was about 87%. The frequencies of various risk factors for cardiovascular disease in order of

occurrence were unhealthy dietary habits (64%), physical inactivity (60%), BMI  $\geq 25$  (21%) and smoking (6%) as shown in Table. None of the children had hypertension.

History of paternal smoking was reported by 74 (36%) of the children, and among them 56 (76%) fathers smoked in the presence of their children as shown in Figure 1.

When the modifiable risk factors were considered, excluding family history of cardiac disease, hypertension and diabetes mellitus, 97 (47%) children had one risk factor and 23 (11%) had two or more risk factors positive as shown in Figure 2.

## Discussion

No information is available on the nature and extent of cardiovascular disease risk factors in the Pakistani children, which constitute of almost half of total population of the country. This study examined some of the well-recognized risk factors for the development of CVD in higher secondary school children in Hyderabad, Sindh. These include: physical inactivity, unhealthy dietary habits, overweight, smoking habits (children and their fathers), positive family history of cardiac disease, hypertension and diabetes.

There are substantially high health benefits associated with physically active life-style in children, which includes weight control, lower blood pressure, improved psychological well-being, and a predisposition to increased physical activity in adulthood. Moreover, increased physical activity has been associated with an increased life expectancy and decreased risk of cardiovascular disease.<sup>21</sup> In our study, 29% of school children had inactive lifestyle. In an Italian study, physical inactivity was reported in 20.4% of boys between 12-15 years of age.<sup>22</sup> Along with more developing interest of children to watch television and play with video and computer games; lack of safe out door playgrounds in many areas of large cities in our country may be the reason for lack of or recreational sports involving physical activity in our children.

Unhealthy eating patterns in childhood can adversely affect health and contribute to non-communicable chronic disease in later life. This study reveals that 31% of school children had unhealthy dietary habits and ate junk foods, high fat content foods and 'empty calorie' foods every day. These results are quite consistent with a survey of school children in Ontario and Charlottetown, where over one third of the students ate candy, chocolate bars, snack foods and soft drinks every day.<sup>23</sup>

Childhood obesity has reached epidemic proportions, worldwide.<sup>24,25</sup> The tracking (persistence) of obesity has been well documented from childhood to adulthood.<sup>14</sup> It is reported that about 50% of obese adolescents become obese adults.<sup>26</sup> This trend is of particular concern because

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There is a consistent evidence about smoking as an independent modifiable risk factor for cardiovascular and other atherosclerotic disease.<sup>9,28</sup> Most smokers first acquire this habit in the preteen or teenage years<sup>21</sup> and thus prevalence of smoking among school age children is rising.<sup>23</sup> The

prevalence of smoking in our study children was lower than documented by others researchers.<sup>29</sup> It is possible that many students did not admit that they smoke, probably due to the fear for disclosure of information, as smoking is a socially unacceptable habit. This may have led to an underestimate of actual behavior. It is alarming that history of paternal smoking was reported by 36% of children, and among them 76% of the fathers smoked in the presence of their children. It is well established that children, whose parents smoke, will more likely be smokers in their adult life<sup>21</sup> and risk for development of heart disease substantially increases with exposure to ETS.<sup>30</sup> Two recent meta-analyses<sup>31,32</sup> have reported increased risk of coronary heart disease among non-smokers exposed to ETS in their homes.

Hypertension is a major precursor for the development of cardiovascular disease and other atherosclerotic lesions.<sup>7,21</sup> Rabbia et al<sup>22</sup> reported up to 3% prevalence of hypertension among boys of 12-15 years of age. None of the children had hypertension in this study. This denotes that the prevalence of hypertension may be low in these children and/or it may be because of small sample size.

Family history of cardiac disease, hypertension and diabetes mellitus is a strong predictor for the development of these diseases in future life. A positive family history [parents, siblings, grandparents, first cousins, or blood related uncles and aunts] of cardiac disease, hypertension and diabetes were reported by 4%, 23% and 16% of children respectively in this study. There is a possibility of underestimation in these figures because children may not be aware of their family's health problems. In addition, non-awareness about these diseases in the individual family members is also quite likely. In Pakistan, up to 85% of hypertensives and 64% of diabetics are un-aware of their disease.<sup>10</sup>

Identification of a child with multiple risk factors for cardiovascular disease is important. Epidemiological and clinical studies have established that multiple risk factors increase the probability of cardiovascular events, since risk factors tend to reinforce each other in their influence on morbidity and mortality compared to a single risk factor. Gerald et al<sup>33</sup>, found a significant effect of multiple risk factors on the extent of atherosclerosis where subjects with 0, 1, 2, and 3 or 4 risk factors had 0.6%, 0.7%, 2.4% and 7.2% collagenous fibrous plaques respectively in the aorta. In this study overall, 58% of the children had at least one modifiable risk factor (47% of the children had one risk factor and 11% of the children had two or more risk factors), which is alarming.

Some of the limitations in this study need to be addressed. The study was conducted on a pilot basis with a small sample in a conveniently selected school of Hyderabad City, in a limited age group of children and on

Some of the limitations in this study need to be addressed. The study was conducted on a pilot basis with a small sample in a conveniently selected school of Hyderabad City, in a limited age group of children and on boys only; thus the results cannot be generalized to all the school going and other children. Due to financial constrains, specific laboratory tests like lipid profile and blood sugar level were not done. As both these deranged profiles have a potent effect on the development of cardiovascular disease<sup>21</sup> and measurement of these factors could have strengthened our assessment as there is a rapidly emerging epidemic of type 2 diabetes mellitus in children and youth.<sup>25,34</sup>

## Conclusion

This study indicates that a large proportion of school children had modifiable risk factors for cardiovascular disease such as physical inactivity, unhealthy dietary habits, overweight, smoking and exposure to paternal smoking.

In this regard, more comprehensive research is required, involving population-based samples and incorporating other childhood age groups and social class, regarding the burden of risk factors for the development of cardiovascular disease to compile evidence for a cost-effective intervention in accordance to our local scenario. More funding should be allocated to conduct such type of surveys on larger scale with exploration of lipid profiles and blood sugar levels as in the long run, it will be cost-effective approach to invest on these emerging risk factors for epidemic of non-communicable chronic diseases. Long term follow-up and intervention studies are also required, using strategies for primordial, primary and secondary prevention. Interventions related to modifiable risk factors, such as encouragement of physical exercise and sports, healthy and prudent diet, weight control, and the prevention of smoking, if undertaken early in life, may control the development of atherosclerosis and thus beating the epidemic of cardiovascular disease in later life. At the same time, it is important to educate and encourage parents to personally adopt and practice a healthy life style at home, especially with regard to diet, physical activity, and avoidance of tobacco use. In this way, parents become positive role models for their children and improve their own cardiovascular health.

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