

Original article

Prevalence and interrelations of cardiovascular risk factors in urban and rural Mexican adolescents

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Abstract:

Purpose: To examine the prevalence of coronary risk factors in Mexican adolescents, and their relations to school type, gender, and residence in urban and rural areas.

Methods: A cross-sectional survey was conducted in 3121 junior high school students, aged 12 to 16 years, attending urban schools (eight public, $n = 1850$, two private, $n = 480$) and three rural public ($n = 791$) schools. Weight, height, waist circumference, blood pressure, and fasting glucose and lipid-lipoprotein levels were measured. Tobacco smoking and physical activity were also ascertained. The prevalence rates of cardiovascular risk factors were determined by gender and school type.

Results: Obesity, overweight, high blood pressure, cigarette smoking, and physical inactivity were higher for urban than rural adolescents. The prevalence of the low HDL-C level was exceedingly high in adolescents of three school types ($> 30\%$) but particularly in male rural students (48.9%). Compared with rural students, high LDL-cholesterol was twice as high in private schoolchildren. The prevalence of impaired fasting glucose was .35% in the whole population and much higher in obese males (1.6%) and obese females (2.4%).

Conclusions: Our findings highlight an epidemic of coronary risk factors mainly in adolescents living in the urban area, suggesting the importance of environmental factors. © 2006 Society for Adolescent Medicine. All rights reserved.

Keywords:

Obesity; High blood pressure; Dyslipidemia; Urban-rural; Mexican adolescents

Although clinical coronary heart disease (CHD) usually does not occur until the fourth or fifth decades of life, several studies have shown that atherosclerosis is already present in youth [1]. Autopsy studies in young people [2] have demonstrated a significant association between atherosclerotic lesions and premortem cardiovascular risk factors

that included hypercholesterolemia, high blood pressure, obesity, and cigarette smoking. Furthermore, autopsy data from Bogalusa Heart Study [3] showed that severity of coronary and aortic atherosclerosis is even higher in young subjects with three or more antemortem risk factors. Tobacco smoking, physical inactivity, and unhealthy dietary habits have been shown to be acquired in childhood and adolescence [4]. The tracking of obesity, hypertension and hypercholesterolemia from childhood into adult life is also well known [5].

Because the presence of cardiovascular risk factors in any given population is influenced by ethnicity [6], eco-

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nomic [7], and psychosocial [8] factors, and the urban or rural environment in which they live [9], wide differences in prevalence of CHD risk factors among adolescents have been found in epidemiological studies conducted in different nations. Therefore, extrapolating results from one population to another with different characteristics would be unacceptable and useless for establishing preventing strategies.

In Mexico, CHD has steadily increased over the past four decades, and is currently the leading cause of death in our society [10]. Several studies have demonstrated that the prevalence of coronary risk factors is high in Mexican adults [11,12]. However, as in other Latin American countries, information on coronary risk factors in our adolescent population is very limited. The prevalence rates of hypercholesterolemia [13], high blood pressure [14], tobacco [15], and obesity [16] in Mexican adolescents have been reported separately and no study has investigated all these and other coronary risk factors and their interrelations in the same population.

Level of income, level of education, and European genetic admixture are lower, whereas infant mortality rates and illiteracy are higher in rural than in urban Mexican people [17,18]. Diet is also different between urban and rural populations [19]. Therefore, the purpose of the present study was to determine the prevalence of CHD risk factors among urban and rural Mexican adolescents.

Methods

Characteristics of the population

A cross-sectional survey was conducted from March 1996 to June 1998. Mexico City is divided into 16 political districts. The population included the 12- to 16-year-old residents in the district of Coyoacán, Mexico City, and in the rural municipality of El Oro, State of Mexico. The district of Coyoacán was selected because the distribution of urban public and private junior high schools and the population size registered in the schools are similar to those of Mexico City [17]. The rural municipality of El Oro is located 100 miles northwest of Mexico City; 45% of the population is native and predominating ethnic groups are *Mazahuas* and *Otomíes*, whose livelihood is based mainly on agriculture [18]. Multiple stage sampling was used; eight urban public and two urban private high schools (Mexico City), and three rural public high schools (El Oro) were randomly selected from a list of high schools provided by the Public Education Ministry. A proportional distribution of the sample was produced based on the number of students registered in urban public, urban private, and rural public schools. All students attending the selected schools were invited to participate in the study. The overall participation rate was 47.3% (40.1%, 48.2%, and 81.6% for urban public, urban private and rural public schools, respectively).

To identify potential differences between students who accepted and those who refused to participate in the survey (mainly because of fear of venous puncture), a randomly selected sub-sample of 126 nonparticipating individuals answered the questionnaire and had anthropometry and blood pressure measurements taken. Age was the only variable that showed statistical significance between participants and nonparticipants (13.43 ± 1.9 vs. 13.65 ± 1.5 , $p = .044$), indicating that both populations were similar. The sample included 3121 adolescents (1405 males and 1716 females), 1850, 480, and 791 for urban public, urban private and, rural public schools, respectively. Socioeconomic status was based on the highest level of education obtained by either parent [20] and also on the type of school adolescents attended. In México, the type of school is an indirect indicator of the socioeconomic status. Most students in urban private schools come from a middle-high socioeconomic group, whereas urban public students are from a low socioeconomic group, and rural public students usually belong to the lowest income group. School authorities, the parents and/or guardian, and students received detailed information concerning the study purpose and the measurement procedures. The study included only students who agreed to participate and whose parents signed the informed consent. Adolescents with an organic pathology or under chronic medical treatment were excluded. The protocol was approved by the Research Coordination of the Department of Public Health at the Medical School of the National Autonomous University of Mexico and the authorities of the Public Education Ministry.

Sources, methods and techniques for data collection

Before beginning the survey, the study team conducted two pilot tests in 60 students in urban public and urban private high schools to standardize the staff in questionnaire application, measurement of anthropometric variables, blood pressure, and the technique to collect blood samples. Results of these tests were not included in the study. The same examination procedures were used in two communities.

Questionnaire application, anthropometry, and blood pressure determination were performed between 8:00 and 11:00 AM from Monday to Thursday. An average of 30 subjects per day was studied. Adolescents answered questions about cigarette smoking and alcohol consumption individually and to encourage truthful answers, students were reassured that nobody (parents and/or teachers) would receive the information about smoking or alcohol habits. A participant was defined as a smoker when he/she smoked at least one cigarette per week. Subjects who drank alcoholic beverages (liquor, beer, or wine) at least once a month were considered to be alcohol users. Adolescents who did not participate in any sport or physical activity in their leisure time were considered to have a sedentary life style [21].

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