

ORIGINAL RESEARCH ARTICLE

Cardiovascular risk in an adolescent population of Timbío, Colombia

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ABSTRACT

Introduction: Cardiovascular diseases are among the leading causes of death worldwide and the scientific evidence suggests that they have an origin at early ages, so reducing from adolescence the risks that contribute to their appearance is indispensable. **Objective:** To determine cardiovascular risk in the adolescent population of an educational institution in Timbío, Cauca, 2015–2016. **Methodology:** Quantitative, descriptive, observational and cross-sectional study. **Sample:** 100 students (47 females, 53 males), aged 10 to 19 years. Sociodemographic, anthropometric, biological, biochemical (glycemia), personal and family history, lifestyles and oral contraceptive use variables were evaluated. **Results:** A higher prevalence of cardiovascular risk was found in the adolescent age group (15–18 years) with 84.6%; the female gender presented a greater possibility of having cardiovascular risk (OR: 2.8, 95% CI 1.17–6.87); 7% reported regular tobacco use and 12% were passive smokers. The presence of unhealthy eating habits generated a higher cardiovascular risk (OR: 5.57, 95% CI 1.95–15.90). 67% ($n = 67$) have cardiovascular risk. **Conclusions:** Female gender, adolescent group (15–18 years), consumption of alcoholic beverages and unhealthy eating habits are associated with a higher possibility of having cardiovascular risk. Cardiovascular risk was found in a large percentage of the study population.

Keywords: risk factors; cardiovascular disease; lifestyle; child; adolescent

1. Introduction

Cardiovascular diseases (CVD) are a group of disorders of the heart and blood vessels^[1], which according to the World Health Organization (WHO) are responsible for 17 million deaths worldwide, and it is estimated that by 2020, deaths from these diseases will increase by 15% to 20%^[2,3]. In Colombia, in the last 30 years, cardiovascular diseases (CVD) have occupied the first five places in the list of the main causes of mortality in the population^[4].

The loss of productivity due to cardiovascular pathologies is substantial, given the number of people affected by these diseases who die prematurely as a result of them^[5,6]. The loss of productivity due to cardiovascular diseases is substantial, given the number of people affected by these diseases who die prematurely from them, shorten productive life years and deteriorate the quality of life of those who suffer from them, requiring lifelong medication, complex surgeries and prolonged hospitalization. Type 2 diabetes, for example, is considered a high-cost pandemic, both socially and economically, which due to its chronicity affects the quality of life^[7], worsening poverty conditions, affecting the economic development and welfare of

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any nation; not only does it have a high burden for individuals, families and communities, but it also hinders socioeconomic growth, especially for individuals and lower income countries^[8]. However, there is important scientific evidence that guides the strategies for prevention, detection and control of these diseases, through cost-effective responses^[9] that avoid the collapse of health systems, since the resources allocated to the treatment of these diseases can be invested in specific protection and early detection programs^[10], which allow reducing health costs, but mainly increase the current life expectancy of communities and improve the quality of life of those who suffer from them or are at risk, reducing the possibility of undergoing treatments and interventions to cure or control these diseases^[11].

According to the World Health Organization, the main cardiovascular risk factors that can be prevented in a timely manner are: arterial hypertension (HT), dyslipidemia, smoking, sedentary lifestyle, obesity, unhealthy diet and diabetes mellitus^[12]. These factors, when intervened at an early age, make it possible to successfully prevent and treat these diseases and reduce their incidence in adulthood^[13,14]. This makes it imperative the motivation of health agents and governments for the early detection of these risk factors in young population, because it is the best way to implement intervention strategies, timely and accurate, having a knowledge of these factors. In view of the above, this study aims to contribute to respond to the need to investigate cardiovascular risk factors in adolescents in an educational institution in the region and, according to the findings, to make recommendations to the institution regarding the promotion of healthy habits and prevention of chronic noncommunicable diseases, from an early age, as input for the creation of educational strategies that actively involve parents, mitigating to some extent the future impact of chronic noncommunicable diseases in our environment.

2. Methodology

A quantitative, descriptive, observational, cross-sectional, cross-sectional study was carried out at the educational institution concentración Escuela Guillermo Valencia with prior authorization from the rector. The total population belonging to the institution consisted of 467 students, a calculated sample of 100 high school students from 10 to 19 years of age of both sexes. The sampling was stratified probabilistic with proportional allocation, subdivided into groups according to the school grade to which the students belonged; the selection of the final study units was carried out by simple random sampling. The selected participants accepted their incorporation into the study and voluntarily gave parental informed consent and the informed consent of the student if he/she was of legal age. Exclusion criteria: adolescents with diagnosed diseases, such as diabetes mellitus, congenital heart disease with high hypertension, hyper- and hypothyroidism, pregnancy, and without filled-in informed consent.

The data were collected by means of a directed survey technique, using an instrument which was taken with prior authorization from the authors of the study: "Evaluation of cardiovascular risk in adolescents in the second and third years of secondary education in educational establishments in the city of Punta Arenas in 2005", to which some modifications were made to simplify the language for understanding by the younger participants and in the specification of the stratum to which each one belonged; a pilot test was subsequently conducted in the institution, which allowed errors in the questionnaire and in the procedures for its application to be corrected. The data questioned in the instrument included personal identification and sociodemographic data, anthropometric, physiological and biochemical variables, and questions aimed at evaluating the presence of cardiovascular risk factors.

The instrument was applied in the subject population by the researchers, capillary glycemia fasting was taken with a true result glucometer. This was done taking into account the parameters established for the taking of these variables. The data were analyzed using the statistical program Stata Version 12, with measures of

central tendency, correlation measures with chi-square and association measures such as OR.

The results are expressed in percentages and are presented in three groups: univariate and bivariate results, for which the general variables were cross-referenced with the dependent variable: cardiovascular risk. To determine cardiovascular risk, the population was classified as: no risk and at risk, according to the number of risk factors present; for the present study, 2 or more risk factors were present and the statistical significance p : (<0.05) was established in relation to cardiovascular risk, and the third group refers to the association of cardiovascular risk with the statistically significant variables.

3. Results

Of the total number of participants ($n = 100$) in relation to the sociodemographic variables, the median age was 14, mean 13.9 with a SD of 2, minimum age of 10 years and maximum age of 18 years. There is a higher frequency of male gender with 53% ($n = 53$) and of socioeconomic strata 1 and 2 with 99% ($n = 99$). In terms of origin, the majority belonged to the rural area 59% ($n = 59$).

Body mass index (BMI) values showed that most students had a normal nutritional status 94% ($n = 94$). Malnutrition, overweight and obesity had a prevalence of 2% ($n = 2$) each.

In the physiological variables, 95% ($n = 95$) of the respondents had blood pressure within normal parameters for age and 93% ($n = 93$) had a normal heart rate. Similarly, 99% ($n = 99$) of the population had normal glycemia values by capillary measurement.

Regarding the family history of the respondents, 71% ($n = 71$) had no CVD in parents and grandparents and 93% ($n = 93$) had no personal history.

In the lifestyles of the total sample, in relation to tobacco consumption, 7% ($n = 7$) declared to be smokers of which 85.7% ($n = 6$) are between 15–18 years old. Some 12% ($n = 12$) of the adolescents are passive smokers. It was also found that 26% ($n = 26$) of the adolescents ingested alcoholic beverages, of which 84.6% (22) were between the ages of 15–18 years.

Of the participants, 79% ($n = 79$) practiced some type of extracurricular physical activity. Eighty percent ($n = 80$) of the respondents had poor eating habits (consumption of saturated fats and junk food), 31% ($n = 31$) ate fruits every day and 20% ($n = 20$) vegetables; only 16% ($n = 16$) did not consume fats.

Of the 47% ($n = 47$) corresponding to the female population, 14% (7) were taking oral contraceptives (Table 1).

Table 1. General characteristics of the study population.

Variable	n	(%)
Sociodemographic variables		
Age		
Pre-teens (9–11)		13.0
Early adolescents (12–14)		48.0
Adolescaite (15–18) Gaiero		39.0
Fememno		47.0
Male Stratum		53.0
1		75.0
		24.0
Source	1	1.0
Rural		59.0

Urbana		41.0
Anthropometric variables		
Nutritional diagnosis		
Moderate Malnutrition		2.0
Normal		94.0
Overweight		2.0
Obesity		2.0
Physiological variables		
Arterial Pressure		
Normal (SBP and DBP <P90)		95.0
Normal-High (SBP and/or DBP >P90 but <P95)	5	5.0
Heart Rate		
Normal (6 to 12 years) 70-120 Ipm (13 to 18 years) 60-120 Ipm		93.0
Altered		7.0
biochemical variables		
Glycemia		
Normal (70–110 mg/dl))	99	99.0
Altered	1	1.0
Background		
Personal history (Diabetes, hypertension, stroke)		
No	92	92.0
Yes		8.0
Medical history (Diabetes, hypertension, stroke)		
No		71.0
Yes		29.0
Lifestyles		
Tobacco use		
Non-smoker		93.0
Occasional smoking		7.0
Passive funators		
No		88.0
Yes		12.0
Consumption of alcoholic beverages		
No		74.0
Yes		26.0
Engages in physical activity		
Yes		79.0
No		21.0
Healthy eating		
Yes		20.0
No		80.0
Use of oral contraceptives		
No		85.1
Yes		14.9
Cardiovascular risk		
No bias		33.0
With nesgo		67.0

Regarding age and cardiovascular risk, the highest prevalence was found in adolescents (15–18 years) with 84.6%, followed by preadolescents (9–11 years) with 61.5%, with significant differences ($p = 0.010$). Regarding gender, a higher cardiovascular risk was found in women with 78.7% ($p = 0.019$) and a higher cardiovascular risk in alcohol consumers (96.2%), with a statistical significance, $p = 0.000$.

In relation to the practice of physical activity and cardiovascular risk, a higher prevalence was observed in those who did not practice any, with 85.7% ($p = 0.040$). Regarding nutritional habits and cardiovascular risk, those with an unhealthy diet (75%) were at greater risk ($p = 0.001$). Other variables measured in the present study did not show statistical significance with respect to cardiovascular risk, such as: tobacco use, nutritional diagnosis and contraceptive use (**Table 2**).

Table 2. Statistical significance in relation to cardiovascular risk.

Variable	No Risk		With Risk		Total		$p (<0.05)$
	n	%	n	%	n	%	
Age (Stages of Adolescence)							
Pre-adolescent (9–11 years old)	5	38.5	5	61.5			0.010
Adolescent early (12–14 years)		45.8		54.2		100.0	
Adolescent (15–18 years)		15.4		84.6		100.0	0.019
Gender							
Female		21.3		78.7	100.0		
Male		43.4		56.6		100.0	
Nutritional diagnosis							
Normal		31.9		68.1		100.0	0.361
Abnormal						100.0	
Personal background							
No							0.038
Yes	0	0.0		100.0		100.0	
Family history							
No		45.5		53.5		100.0	0.000
Yes	0	0.0		100.0		100.0	
Tobacco use							
Non-smoker		35.5		64.5		100.0	0.054
Occasional smoking	0	0.0		100.0		100.0	
Passive smokers							
No		37.5		62.5		100.0	0.010
Yes	0	0.0		100.0		100.0	

Early adolescents (12–14 years) have a lower possibility of cardiovascular risk, OR 0.31 CI 95% [0.31–0.76], which constitutes a protective factor against risk. Adolescents (15–18 years) have 4 times higher cardiovascular risk than those in the other stages of adolescence, OR: 4.36 CI 95% [1.59–11.94]. The female gender has 2.8 times higher chance of cardiovascular risk compared to the male gender, OR 2.8 95% CI [1.17–6.87]. Consuming alcoholic beverages increases 19.04 times the possibility of cardiovascular risk than not consuming them, OR 19.04 CI 95% [2.45–148.11].

Although physical inactivity increases cardiovascular risk, OR 3.7 95% CI [0.99–13.53], the CI passes through the null value, which is statistically not significant, but clinically relevant.

Not having good eating habits increases 5.57 times more the possibility of cardiovascular risk, OR 5.57 CI 95% [1.95–15.90] (**Table 3**).

Table 3. Association of cardiovascular risk with statistically significant variables.

Variable	OR.	95% CI
Demographic variables		
Age		
Pre-teens	1.0	
Teenagers	0.31	0.13–0.76
early		
Teenagers	4.36	1.59–11.94
Genre		
Female	2.8	1.17–fi.87
Male	0.35	0.14–0.85
Habits of life		
Consumption of alcoholic beverages	19.04	2.45–48.11

4. Discussions

The study found that the female population is more likely to be at cardiovascular risk, which is consistent with Claver García’s statement that cardiovascular disease has always been considered a male disease, but recent data from the United States show that the absolute number of women who die from CVD is already higher than the number of deaths from this cause in men^[15–18].

Martínez Gómez et al.^[14] in their study also showed that women had higher levels of general adiposity than men, while men had higher levels of abdominal obesity.

With respect to age, the current study found a higher cardiovascular risk in adolescents (15–18 years) with 84%, which is consistent with that proposed by Lavielle et al. and is similar to the results of Sáez et al.^[19]. Adolescents are a risk group due to the significant increase in physical inactivity and sedentary behaviors, as a result of the indiscriminate use of new technologies, particularly television and the Internet, among others.

With regard to blood pressure (BP) values in this study, only 5% had high normal BP, in agreement with Alayón et al.^[20], where 2.7% of all adolescents had an elevated value.

According to the nutritional diagnosis in this study it was observed that only 2% of the population studied had obesity, which is in agreement with the results of Gamboa, Mulassi et al.^[21]. As for fasting glycemia, only 1% were found to have altered figures, results similar to those found by Cuneo et al.^[22].

In the study, it is striking that the prevalence of sedentary behaviors is low (21%), which may be due to the fact that most of the study participants belong to rural areas (59%), compared to the study by Lavielle et al. where a prevalence of physical inactivity of 66.3% was found, but their study population was urban. To add as the last mentioned study points out, a large proportion of young people in developed and developing countries (urban population) watch more than four hours of TV per day, twice the maximum recommended time, which is reflected in the decrease or lack of physical activity in this population.

Regarding physical activity and gender, it was found that of the 79 % of the total number of adolescents who practice physical activity, 61 % correspond to the male gender, the results are similar to what was found in the previously mentioned study, where it was evidenced that the lack of physical activity was associated

with gender; in this study a higher proportion of women reported being inactive with respect to men (75.3% vs. 54.6 % respectively, $p = 0.000$).

With regard to family medical history, 71% of the subject population reported having no family history related to cardiovascular pathologies, unlike the results of Lanas et al. who found that 24.9% of the children interviewed reported no history of this type^[23].

With respect to the consumption of alcoholic beverages, it was found that 26% of the population studied consumed them; of this percentage, 61.5% belonged to the female gender, different from what was found by Donlucas et al.^[24] and the results obtained by MinSalud.^[25], where the greatest predominance of consumption was in the male gender.

Six percent of the population belonging to the adolescent group smokes occasionally, while the study by Obregón et al. found that 20% of the population consumed tobacco regularly^[26]. This early exposure increases the risk of developing cardiovascular disease by approximately 60% in adulthood^[27].

In the study, 20% of the population had good eating habits; this result does not agree with that found by Gorrita Pérez et al., where only 5.4% had a healthy diet. However, regarding the consumption of junk food, it was found that 28% do not consume it, which differs from the study by Donlucas et al^[24]. These results coincide with the information obtained in the National Nutrition Situation Survey (ENSIN) 2010, which shows an unhealthy diet in the Colombian population with a high consumption of processed foods, flour, sausages and low consumption of fruits and vegetables.

These findings suggest that it is important to reinforce a culture of healthy habits in our population, characterized by a healthy diet and increased physical activity, which are two of the main alternatives for the prevention of chronic noncommunicable diseases. Rodríguez Domínguez, et al. also refer in their study that once the risk factors have been identified at an early age, it is necessary to carry out immediate intervention studies related to lifestyles to prevent cardiovascular disease and type 2 diabetes mellitus in adulthood .

5. Conclusions

The study found that two thirds of the subject population are at cardiovascular risk due to the presence of modifiable risk factors, first of all poor eating habits related to the consumption of “junk food” and saturated fats, followed by lack of regular physical activity.

Adolescents (15–18 years) have a higher cardiovascular risk compared to preadolescents and early adolescents, taking into account that physical inactivity and sedentary behaviors increase significantly at older ages, as a result of the indiscriminate use of new technologies.

Statistical significance was obtained between the variables: age, gender, alcoholic beverage consumption, physical activity, healthy diet and cardiovascular risk.

The female gender is associated with a higher cardiovascular risk than the male population. Likewise, the consumption of alcoholic beverages, physical inactivity and unhealthy eating habits are risk factors for cardiovascular disease ($OR > 1$).

Finally, it is essential to actively involve parents, and therefore, at the meeting where the results of the study were shared with parents, a recommendation was made to guardians about the importance of promoting good eating habits, since they are the most important actors in the integral formation of their children.

6. Recommendations

Since the population studied is small, we suggest that research be conducted on a larger population, including more adolescents from the same institution and/or from other public and private educational institutions.

Further research to evaluate young populations and identify risk factors in these groups will generate more effective interventions, mainly from our profession, to prevent the development of cardiovascular diseases. It is also proposed to measure other variables such as cholesterol level, stress level, etc.

The results of the research showed that cardiovascular risk exists in a large percentage of the adolescent population, so it is necessary to implement strategies that include the practice of regular physical activity in students, the promotion of a healthy diet both in schools and at home, to contribute to the reduction of cardiovascular diseases in adulthood, since the adoption of unhealthy habits begins in childhood and has negative repercussions later in life.

Conflict of interest

The authors declare no conflict of interest.

References

1. Sánchez Contreras M, Moreno Gómez GA, Marín Grisales EM, García Ortiz LH. Cardiovascular Risk Factors in Young Populations. *Rev Public Health*. 2009; 11(1): 110–122.
2. Briceño G, Fernández M, Céspedes J. Elevated prevalence of cardiovascular risk factors in a pediatric population. *Rev Biomedica*. 2015; 35: 219–226.
3. MINSALUD: Ministry of Health and Social Protection. Diseases cardiovascular diseases. Ministry of Health and Social Protection; 2012.
4. PAHO: Pan American Health Organization. The economic dimensions of noncommunicable diseases in Latin America and the Caribbean. Pan American Health Organization; 2016.
5. Robles Valdés C. Cardiovascular risk and metabolic syndrome in children and adolescents. *Rev Acta Pediatr Mex*. 2011; 32(1): 1–4.
6. López Cortés LF, Cifuentes Ortiz M, Sánchez Ruiz A. Health-related quality of life in patients with type 2 diabetes mellitus in a medium complexity hospital in Cali. *Science and Health, University Santiago de Cali*. 2014; 2(8): 43–48.
7. National Institute of Health. Cardiovascular diseases: a public health problem and a global challenge. *Rev Biomedica*. 2011; 31(4): 69–75.
8. Zea Robles AC, Leon Ariza HH, Botero Rosas DA, et al. Cardiovascular risk factors and their relationship with body composition in university students. *Rev Public Health*. 2014; 16(4): 505–515.
9. Campos Cavada I. Modifiable risk factors for cardiovascular disease in children. *Rev An Venez Nutr*. 2010; 23(2): 100–107.
10. Juonala M, Magnussen CG, Berenson GS, et al. Childhood Adiposity, Adult Adiposity, and Cardiovascular Risk Factors. *New Engl J Med*. 2012; 67(3): 156–158.
11. García Gulfo MA, García Zea JA. Prevalence of risk factors cardiovascular in young people at a university institution. *Rev Public Health*. 2012; 14(5): 822–830.
12. Claver García L. Cardiovascular Risk in Women. Universidad Pública de Navarra; 2014.
13. Alfonso F, Bermejo J, Segovia J. Cardiovascular disease in the woman: why now? *Rev Esp Cardiol*. 2006; 59(3): 259–263.
14. Martínez Gómez D, Eisenmann J, Gómez Martínez S, et al. Sedentary lifestyle, adiposity and cardiovascular risk factors in adolescents. AFINOS study. *Rev Esp Cardiol*. 2010; 63(3): 277–285.
15. Lavielle Sotomayor P, Pineda Aquino V, Jáuregui Jiménez O, Castillo Trejo M. Physical activity and sedentary lifestyle: sociodemographic, family determinants and their impact on adolescent health. *Rev Public Health*. 2014; 16(2): 161–172.
16. Tercedor P, Matillas M, Chillón P, et al. Increased tobacco use and decreased level of physical activity practice in Spanish adolescents: the AVENA Study. *Nutr Hosp*. 2007; 22(1): 89–94.
17. Gorrita Pérez R, Ruiz King Y, Hernández Martínez Y, Sánchez Lastre M. Risk factors for cardiovascular and cerebrovascular diseases in adolescents. *Rev Cub Pediatr*. 2015; 87(2): 140–155.

18. Gamboa Delgado EM, López Barbosa N, Quintero Lesmes DC. Prevalence of overweight and obesity in adolescents in the municipality of Floridablanca, Colombia. *Rev Med UNAB*. 2007; 10(2): 1–8.
19. Sáez Y, Bernui I. Prevalence of cardiovascular risk factors in adolescents from educational institutions. *Ann Fac Med*. 2009; 70(4): 259–265.
20. Alayón A, Castro Orozco R, Gaviria Esquivia L, et al. Cardiovascular risk factors in schoolchildren aged 7-14 years in Cartagena, Colombia, 2009. *Rev Public Health*. 2011; 13(2): 196–206.
21. Mulassi A, Hadid C, Borracci R. Eating habits, physical activity, smoking and alcohol consumption in school-aged adolescents in the province and conurbation of Buenos Aires. *Arch Argent Pediatr*. 2010; 108(1): 45–54.
22. Cuneo F, Contini MC, Zino GD. Cardiovascular risk factors and their associations in adolescents from the city of Santo Tomé. *Rev FABICIB*. 2015; 31(142): 34–41.
23. Lanas F, Serón, P. Role of smoking in global cardiovascular risk. *Rev Med Clin Condes*. 2012; 23(6): 699–705.
24. Donlucas G, Medrano JA, Acosta Favela ME, et al. Main cardiovascular risk factors in schoolchildren. *CULCyT*. 2014; 54(1): 72–80.
25. MinSalud: Ministry of Health and Social Protection. National Nutrition Situation Survey (ENSIN). Ministry of Health and Social Protection; 2010.
26. Obregón MC, Celis LG, De Jesús Ayala J, et al. Factors promoting nutritional culture in adolescents and young adults of the Universidad de la Sabana. *Rev Cient Salud Uninorte*. 2013; 29(3): 374–383.
27. Rodríguez Domínguez L, Díaz Sánchez ME, Ruiz Álvarez V, et al. Cardiovascular risk factors and their relationship with arterial hypertension in adolescents. *Rev Cub Med*. 2014; 53(1): 25–36.