Factors Associated with Cardiovascular Risk in High School Students of a Public School in the City of Santiago de Cali, Colombia

Factores asociados a riesgo cardiovascular en estudiantes de bachillerato de un colegio público de la ciudad de Santiago de Cali, Colombia

Fatores associados a risco cardiovascular em estudantes de educação secundária de uma escola pública da cidade de Santiago de Cali, Colômbia

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Abstract

Introduction: Cardiovascular diseases are the leading cause of death worldwide, and they have become a problem of interest of public health, both for developed and developing countries. In this regard, the decrease in time devoted to physical activity and the increase of sedentary activities stand out, thus making physical inactivity one of the many risk factors for Cardiovascular diseases. The objective was to determine the factors associated with cardiovascular risk in students of an educational institution in the city of Cali, Colombia. *Materials and Methods:* It is an observational and analytical epidemiological study

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with a sample of 227 randomly selected students, with 95 % reliability. To determine the level of physical activity in schoolchildren, researchers applied the international IPAQ physical activity questionnaire, and took anthropometric measures such as weight, height, and waist and hip circumference. *Results:* 96 % of the participants presented low cardiovascular risk. Likewise, the variables that showed a statistically significant association with cardiovascular risk were alcohol consumption and body mass index, which predict 81 % of the possibility of being at risk. *Conclusions:* The low cardiovascular risk and the high level of physical activity prevailed in the evaluated schoolchildren, significant differences regarding gender were observed, finding that men have higher values in weight, height, and waist/hip ratio compared to females. Finally, it was established that the factors associated with cardiovascular risk are body mass index and alcohol consumption.

Keywords: Physical activity; obesity; overweight.

Resumen

Introducción: las enfermedades cardiovasculares son la principal causa de muerte en todo el mundo, lo que las convierte en un problema de interés en salud pública, tanto para países desarrollados, como en vías de desarrollo. La disminución del tiempo dedicado a la actividad física y el aumento de las actividades sedentarias son parte de los muchos factores de riesgo para las enfermedades cardiovasculares. El objetivo fue determinar los factores asociados al riesgo cardiovascular en los estudiantes de una institución educativa de la ciudad de Cali, Colombia. *Materiales y métodos:* estudio epidemiológico observacional y analítico, con una muestra de 227 estudiantes seleccionados de forma aleatoria, con una confiabilidad del 95 %. Para determinar el nivel de actividad física en los escolares, se aplicó el cuestionario internacional de actividad física IPAQ; igualmente, se tomaron medidas antropométricas como peso, talla, perímetro de cintura y cadera. *Resultados:* el 96 % de los participantes presentaron riesgo cardiovascular bajo. Así mismo, las variables que mostraron una asociación estadísticamente significativa con el riesgo cardiovascular fueron el consumo de alcohol y el índice de masa corporal, los cuales predicen en un 81 % la posibilidad de tener riesgo. *Conclusiones:* prevaleció el bajo riesgo cardiovascular y el alto nivel de actividad física en los escolares evaluados, con diferencias significativas respecto al sexo. Los hombres presentan valores más altos en peso, talla y relación cintura/cadera en comparación con las mujeres. Se estableció que los factores asociados con el riesgo cardiovascular son el índice de masa corporal y el consumo de alcohol.

Palabras clave: obesidad; sobrepeso; actividad física (DeCS).

Resumo

Introdução: as doenças cardiovasculares são a principal causa de morte no mundo, convertendo-se em um problema de interesse em saúde pública, tanto para países desenvolvidos quanto em vias de desenvolvimento. Neste sentido, ressalta-se a diminuição de tempo dedicado à atividade física e o aumento das atividades sedentárias, convertendo a inatividade física em um dos muitos fatores de risco para as doenças cardiovasculares. O objetivo consistiu em determinar os fatores associados a risco cardiovascular nos estudantes de uma instituição educativa da cidade de Cali, Colômbia. *Materiais e métodos:* estudo epidemiológico observacional e analítico com uma amostra de 227 estudantes selecionados de maneira aleatória com uma confiabilidade do 95 %. Para determinar o nível de atividade física nos escolares, aplicou-se o questionário internacional de atividade física IPAQ; igualmente tomaram-se medidas antropométricas como peso, estatura, perímetro de cintura e quadril. *Resultados:* o 96 % dos participantes apresentaram risco cardiovascular baixo. Igualmente, as variáveis que mostraram associação estatisticamente significativa com o risco cardiovascular foram o consumo de álcool e o índice de massa corporal, os quais predizem em um 81 % a possibilidade de ter risco. *Conclusões:* prevaleceu o baixo risco cardiovascular e o alto nível de atividade física nos escolares avaliados, observando diferenças significativas com respeito ao sexo, encontrando que os homens apresentam valores maiores em peso, estatura e relação cintura/quadril em comparação com as mulheres,

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estabelecendo finalmente que os fatores associados com o risco cardiovascular são índice de massa corporal e o consumo de álcool.

Palavras-chave: obesidade; sobrepeso; atividade física (DeCS).

Introduction

Cardiovascular diseases, are the main cause of death worldwide, thus being a problem of interest in public health, in developed as well as in developing countries. In Colombia these diseases are the main cause of death, both in men and in women older than 45 years (1).

These diseases have been associated with the presence of various risk factors such as sedentarism, obesity, tobacco use, alcoholism, unhealthy diet, which usually appear early in childhood due to the technological advances in transportation, communications and entertainment and leisure, promoting an increase in hypokinetic activities (2).

The decrease of the time spent in physical activity and the increase of sedentary activities like watching TV, playing video games and using internet are evident (3, 4); these do not only produce problems related to health, it also, considered from the perspective of education, connected with physical inactivity, affects motor abilities and qualities (5).

According to the report of the Pan American Health Organization –PAHO– and the World Health Organization –WHO–, 15.2 % of alcohol users and 6.8 of tobacco users are young people. In this regard, it has been established that men start smoking at the age of 17.3 years and women at the age of 18.2 years.

As to arterial hypertension, prevalence in the population older than 15 years of age is 12.6 %, equally, it is estimated that 7 % of population older than 30 years suffer from non-insulin dependent diabetes mellitus, and of these, between 30 % and 40 % are not aware they are sick (6).

Scientific evidence suggests that CD have their origins in early ages of life and that the risk of suffering from them is determined by the synergic effect, resulting from the exposure to different cardiovascular risk factors over time. For this reason, the appearance of CD in adults is connected to unhealthy habits acquired already in childhood (2). Literature shows that previous history of practicing exercise is an important factor of initiating and/or maintaining physical and sport activity. Added to this, it has been observed how the level of physical activity in individuals at early ages is reflected in their motor processes in adult ages (4, 7-12).

In response to this situation, the present study was carried out with the aim of establishing which factors are associated with cardiovascular risk in the students of a high-school educational institution in the city of Cali, Colombia.

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Materials and Methods

This is a descriptive, transversal and analytical epidemiological study. The established population were students aged between 15 and 19 years of age. The sample development was determined by a multistage process: in the first stage the sample size was calculated by means of Epidat software version 4.2, considering the proportion of the practice of physical activity, reported by Morales and Flórez, a confidence level of 95 %, an error rate of 5 %, and a design effect of 1, thus establishing a sample size of 227 students (13). Then, the sample was stratified by school year, according to the number of students suggested in the stratification previously conducted.

Selection criteria were: students enrolled in the educational institution where the sample was selected; age between 15 and 19 years; and, finally, acceptance and signature of the informed consents and approvals. As to the exclusion criteria, following were selected: students who present cognitive disorders; students with metabolic disorders, pregnant students, and students with cardiopulmonary diseases.

An informed consent for adults stating the objectives, purposes and information regarding the instruments of information gathering was made available for participants. Additionally, for minors an informed approval with which their parents or guardians endorse their participation in the study was also given.

The assessed variables were considered according to the reviewed background information. The studied socio-demographic variables were age, gender, schooling level, level of physical activity (IPAC questionnaire), as well as alcohol and tobacco use. The anthropometric variables measured in the study were weight, valued by means of a TANITA scale; waistline measured with the help of a SECA 214 portable height measuring rod; and the waist circumference assessed with a flexible tape measure. In order to measure cardiovascular risk, waist and hip circumferences were assessed obtaining, through the division of both values, the results of low, high or very high risk according to the parameters established by the WHO (14).

Finally, a univariate descriptive analysis was conducted, thus determining the frequency and proportion of the qualitative variables, as well as the measures of central tendency and dispersion for the quantitative variables. The bivariate analysis was developed based on the associations found between the study variables and the cardiovascular risk thus determining the statistical significance of these associations on the basis of non-parametrical statistical tests (chi-square); besides identifying the intensity of the associations through Odds Ratio (OR).

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Results

According to the data described, a male predominance of 70.2 % was found; the school grade with the highest number of students was the tenth grade with 54.4 % (n=124), as to tobacco and alcohol there is a predominance of non-use with 96.5 % (n=154) and 67.5 %, respectively (table 1).

Table 1. Distribution of the sociodemographic variables and the habits of alcohol and tobacco use

	Frequency	%	95 % CI
Gender			
Female	67	29.4	[23.75 – 35.55]
Male	**160**	70.2	[64.24 – 76.11]
Schooling Level			
Eighth Grade	8	3.5	[1.1 – 5.89]
Ninth Grade	64	28.1	[22.24 – 33.9]
Tenth Grade	**124**	54.4	[47.92 – 60.85]
Eleventh Grade	31	13.6	[9.14 – 18.65]
Tobacco Use			
Yes	7	3.1	[0.8 – 5.3]
No	**220**	96.5	[94.1 – 98.88]
Alcohol Use			
Yes	73	32	[25.96 – 38.07]
No	**154**	67.5	[61.47 – 73.62]

95 % IC: 95 % Confidence Index

Regarding the anthropometric measures (table 2), findings show for the variable body mass index a higher frequency of normal weight, with 62.2 % (n=142); for waist circumference a normal frequency, with 90.7 % (n=206); a low cardiovascular risk, with 96 % (218), was found; and the level of physical activity shows a high level, with 51.5 % (n=117).

Table 2. Distribution of the anthropometric measures, level of physical activity and cardiovascular risk

	Frequency	%	95 % CI
BMI			
Low Weight	25	11	[6.94 – 15.09]
Normal Weight	**142**	62.6	[56.26 – 68.85]
Overweight	42	18.5	[13.45 – 23.55]
Obesity	18	7.9	[4.4 – 11.44]
Waist Circumference			
Normal	**206**	90.7	[86.98 – 94.54]

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	Frequency	%	95 % CI
High Risk	15	6.6	[3.37 – 9.83]
Very High Risk	6	2.6	[0.55 – 4.73]
Cardiovascular Risk			
Low	**218**	96	[93.5 – 98.57]
High	9	4	[1.42 – 6.5]
Level of Physical Activity			
Low	55	24.2	[18.6 – 29.8]
Moderate	55	24.2	[18.66 – 29.8]
High	**117**	51,.5	[45.04 – 58.04]

BMI: Body Mass Index. 95 % CI: 95 % Confidence Index.

Table 3 shows that the mean age for females reached 16.22, and for males 15.98 years old. Regarding the variables weight and height, a higher mean was established in males, with 65.97 kilograms and 1.7 meters, respectively; it applies equally to the waist circumference with a mean of 76.56 centimeters. However, the variable BMI, in females showed a higher mean with 23.4 Kg/cm^2.

Table 3. Distribution of the sociodemographic variables and anthropometric measures by gender

	Mean	95 % CI	SD	Max-Min
Female				
Age	16.22	[15.95 – 16.50]	1.11	19 – 15
Weight	59.18	[55.93 – 62.43]	13.33	101 - 39
Height	1.58	[1.57 -1.60]	0.056	1.71 – 1.46
BMI	23.4	[22.27 – 24.55]	4.6	35.3 – 16.1
Waist Circumference	72.36	[70.18 – 74.54]	8.94	97 – 58
Hip Circumference	98.46	[96.11 – 100.80]	9.5	126 – 81
Waist/Hip Ratio	0.73	[0.72 – 0.74]	0.04	0.84 – 0.64
Male				
Age	15.98	[15.82 – 16.13]	0.97	19 – 15
Weight	65.97	[63.82 – 68.12]	13.76	122 - 38
Height	1.70	[1.69 – 1.71]	0.06	1.83 – 1.43
BMI	22.72	[22.07 – 23.38]	4.18	39.3 – 16.1
Waist Circumference	76.56	[75,.11 – 78.01]	9.28	105 – 57
Hip Circumference	96.85	[94.85 – 98.67]	12.20	172 – 61
Waist/Hip Ratio	0.79	[0.78 – 0.80]	0.06	1.26 – 0.49
Total				
Age	16.05	[15.91 – 16.18]	1.023	19 – 15
Weight	63.11	[62.14 – 65.79]	13.96	122 – 38
Height	1.66	[1.65 – 1.67]	0.08	1.83 – 1.43

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|	Mean	95 % CI	SD	Max-Min
BMI	22.93	[22.64 – 23.49]	4.3	39.3 – 16.14
Waist Circumference	75.32	[74.09 – 76.54]	9.36	105 – 57
Hip Circumference	97.76	[95.76 – 98.76]	11.50	172 – 61
Waist/Hip Ratio	0.77	[0.76 – 0.78]	0.069	1.26 – 0.49

BMI: Body Mass Index. 95 % CI: 95 % Confidence Index. SD: Standard Deviation. Max: Maximum. Min: Minimum

Table 4 shows the statistical association between the use of alcohol and cardiovascular risk, OR indicates that the possibility students using alcohol have of suffering from a cardiovascular disease is 1.062 times higher compared to those not using alcohol drinks. Similarly, a statistical association is established between BMI and cardiovascular risk, proving that students with a high BMI are 1.062 more likely to contract a cardiovascular disease.

Table 4. Association of the sociodemographic variables, anthropometric measures with cardiovascular risk

	Cardiovascular Risk		X^2		OR [95 % CI]
	Alto (n - %)	Bajo (n - %)	Valor	P	
Gender					
Male	(5 – 2.20)	(155 – 68.28)	1.004	0.316	1.968 [0.512 – 7.570]
Female	(4 – 1.76)	(63 – 27.75)			
Age					
15 to 17 years old	(7 – 3.1)	(198 – 87.2)	1.681	0.195	2.829 [0.550 – 14.543]
18 to 19 years old	(2 – 0.9)	(20 – 8.8)			
Tobacco Use					
Yes	(0 – 0)	(7 – 3.1)	0.298	0.585	0.968 [0.945 – 0.992]
No	(9 – 4)	(211 – 93)			
Alcohol Use					
Yes	(0 – 0)	(73 – 32.2)	4.442	**0.035**	**1.062** [1.021 – 1.105]
No	(9 – 4)	(145 – 63.9)			
Physical Activity					
Active	(5 -2.2)	(167 -73.6)	2.086	0.149	2.620 [0.678 – 10.122]
Inactive	(4 – 1.8)	(51 – 22.5)			
BMI					
Low Weight-Nor-moweight	(3 – 1.3)	(164 – 72.2)	7.802	**0.005**	**6.074** [1.469 – 25.119]
Overweight-Obesity	(9 – 2.6)	(54 – 23.8)			

Significance level: p<0.05. BMI: Body Mass Index. X^2: Chi-square. OR: Odds Ratio. CI: Confidence Intervals

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Figure 1. ROC curve (Receiver Operating Characteristic)
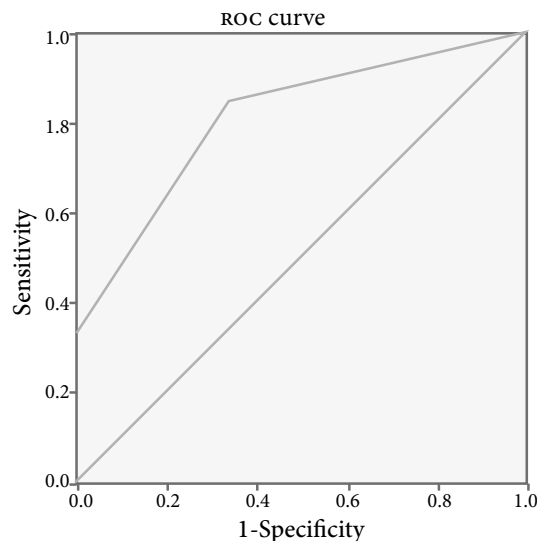
The ROC represents graphically the relation between sensitivity and the specificity inverse, in this regard and once the variables that influence cardiovascular risk in students were determined, a ROC curve analysis was conducted in order to establish the probability of cardiovascular risk in this population, thus finding that the area beneath the curve reaches 0.816, that is to say, a student who has the habit of using alcohol and whose BMI indicates overweight or obesity has a probability of 81 % of having cardiovascular risk.

Discussion

This research has as objective to determine the factors related to cardiovascular risk in school students of an educational institution in Cali, Colombia, with a sample of 227 students, where males (70.2 %, n=160) predominated over females (29.4 %, n=67), thus differing from the study of Ferreira et al. in 2013 that showed a higher frequency in females (57 %) in contrast to males (43 %) (15).

Predominance of the negative answer related to tobacco use (96.5 %, n=220) stands out, staying in line with the 2016 study of Cúneo et al., in which "non-use" was found in 80 % of the interviewees (16).

For its part, the 2009 study of Sáez and Bernui established that 46 % of the evaluated population present a high prevalence of being passive smokers who reported being exposed to tobacco smoke at home and/or in other places, a fact that increases in 25 % the risk of cardiorespiratory diseases (17, 18).

Alcohol use showed a low prevalence (32 %, n=73), a fact that does not correspond to López et al., who identified an alcohol use of 88 % of students, since their motivations are

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consistent with a behavior of imitation and are encouraged by their friends (19). According to Jackson et al., alcohol use grows during teenage and youth, a condition that raises in the surroundings of educational institutions, and decreases as the young adult reaches the age of thirty years (20, 21).

Regarding the BMI, a higher prevalence of normal weight (62.6 %, n=142) was found, similar to what González et al. have established, where the prevalence of normal weight was 61.6 % (22). These findings could be a consequence of a low sedentary behavior, due to the socioeconomic and cultural characteristics of the students attending this particular school.

In this respect, a positive ratio between BMI and waist circumference is evidenced, suggesting that the presence of obesity is due to a greater subcutaneous fat accumulation or, in some cases, visceral fat; for this reason, this ratio is a predictor of cardiovascular risk (23-25).

A normal condition of weight prevails in the study, taking into account that this variable reflects a behavior of a high level of physical activity (51.5 %, n=117). Such behavior allows maintaining a balance between energy intake and energy expenditure, making possible that the interviewees maintain a normal abdominal girth (90.7 %, n=206), allowing, in turn, a low cardiovascular risk (96 %, n=218).

The obtained results concerning overweight (18.5 %, n=42) and obesity (7.9 %, n=18) are supported by Lavielle et al. who found 7.6 % overweight and 20.1 % obesity, as well as Ferrer et al. who found an overweight prevalence of 13.8 % and an obesity prevalence of 6.8 % (26, 27).

Though these data show a low prevalence, there is evidence of the presence of a condition that can raise over time considering the current professional development that increases duties leading individuals to hypokinetic working conditions.

The level of physical activity of our study is derived from the answers to the IPAQ questionnaire in which interviewees report frequent participation in sport activities. They also report that for their daily activities they move between their homes and the educational institution walking, cycling or using skateboards or skates. These results are similar to what Yang et al. have established, with a prevalence of 71.5 % of high or vigorous physical activity, with study participants practicing physical exercise for at least 60 minutes daily (28). However, Lavielle et al. identified a prevalence of low physical activity of 66.3 % (26).

Based on the background knowledge, promoting physical activity responds to having the support of places that provide the motivation of practicing even physical exercise like parks and facilities that stimulate this practice; and the lack of these locative characteristics conduct to other type of activities that, according to sociocultural conditions, result in violence, forcing the neighborhood to opt for practicing sedentary activities (22, 26). The study of Torres et al. reported a high level of physical activity of 79 % in individuals living in rural areas, where people are characteristically involved in farming activities, among others, besides traveling long distances between their homes and the educational institutions (29).

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A statistical association between alcohol use and cardiovascular risk (p=0.035) is evident, a finding that corresponds to Telumbre and Sánchez who reported that alcohol use affects brain functions, as well as the functions of the organs and body systems, a fact that in turn is associated with incidence of health problems such as cardiovascular, endocrine and metabolic diseases, among others, a behavior to which attention must be paid specially in young people (30). They also report that 72.1 % of adolescents have used alcohol once in their lives, and, according to the results of the implemented Alcohol Use Disorders Identification Test, audit, it was evidenced that 24.8 % of the interviewees presented a detrimental alcohol use, and 38 % presented a harmful alcohol use (26).

O'Keefe et al. affirm that the effects of alcohol in health depend on the consumed amount and on the consume patterns (31). On the other hand, excessive alcohol intake increases the risk of motor vehicle accidents, strokes, cardiomyopathies, severe myocardium infarct, suicide, fetal alcoholism syndrome, among others (24, 32, 33).

bmi has been accepted to be the main indicator of overweight and obesity. A statistically significant relation between bmi and cardiovascular risk p=0.005 was identified, corresponding to the study of Álvarez et al., who established a significance level between a bmi alteration and the cardiovascular risk factors, with a prevalence of overweight (31 %) and obesity (10.9 %), indicating that both variables presented in an adolescent population turn into predisposing factors for the appearance of cardiovascular diseases (34). Moreover, Lima et al. identified a strong association between overweight and quality of life (p=0.01), thus proving that bmi alterations in terms of excess fat become a determining factor of poor quality of life perceived by adolescents (35).

Monitoring and controlling different cardiovascular risk factors provide the best prevention strategy aiming at reducing the incidence of cardiovascular pathologies in the future, particularly when these are identified at an early age; here is where the educational institutions can develop education and control programs on these variables, thus promoting alternatives that help reducing habits that contribute to the appearance of such factors. In this sense, all health professionals play a very relevant role since they contribute with different promotion and risk factor prevention strategies that, together with interdisciplinary work, could strengthen the various interventions for their identification and/or control.

Therefore, it is necessary and urgent to provide more opportunities of physical activity for adolescents; the practice of physical activity needs also to be highly valued, thus raising awareness among the families, the teachers and all social agents on the fact that promoting physical exercise and sports, especially non-competitive sports, is the best way to shape a healthier future for the younger.

This needs to be further improved by generating new processes and educational strategies, besides frequently monitoring the behavior of physical activity of school students of the

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city, thus stimulating the formulation of government policies for the allocation of resources aiming at promoting healthy habits.

In this sense, and with the help of these findings, institutions can create control programs together with health professionals who contribute with the inclusion of the health sector and effective investment strategies.

Authors' Contribution

Brayan Esneider Patiño Palma performed the debugging, tabulation and statistical analysis of data. Additionally he wrote the first draft of the study. Pedro Antonio Calero Saa conducted the study design and the ulterior data analysis. Juan David Ceballos Santacruz, Christian Daniel Ramírez Giraldo and Carmelina Zorrilla López devised the project, performed the data collection process and systematization. All authors reviewed the manuscript and approved the final version forwarded to the editor.

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Conflicts of Interests

None declared

References

1. Muñoz O, Rodríguez N, Ruiz Á, Rondón M. Validación de los modelos de predicción de Framingham y PROCAM como estimadores del riesgo cardiovascular en una población colombiana. Rev Colomb Cardiol. 2014;21(4):202–12. Doi: 10.1016/j.rccar.2014.02.001

2. Abraham W, Blanco G, Coloma G, Cristaldi A, Gutiérrez N, Sureda L, et al. Estudio de los factores de riesgo cardiovascular en adolescentes. ERICA study of cardiovascular risk factors in adolescents. Rev Fed Arg Cardiol. 2013;42(1):29–34.

3. Organización Mundial de la Salud. Comisión sobre Determinantes Sociales de la salud. OMS; 2008. p. 3–5. Organización mundial de la salud. Subsanar las desigualdades en una

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generación. Informe de la Comisión de Determinantes Sociales en Salud. oms; 2008. p. 1-232

4. Department of Health. Health Inequalities: Progress and Next Steps; 2008. p. 1–5.

5. Public Health Agency of Canada, World Health Organization. Health Equity through Intersectoral Action: An Analysis of 18 Country Case Studies.

6. Organización Panamericana de la Salud (ops). Salud en las Américas 2007 Volumen I-Regional. No 622. 2007;(622):482.

7. Alcaldía Mayor de Bogotá. Evaluación de las cualidades físicas en los escolares del Distrito Capital: Aspectos teóricos y metodológicos. Bogotá: Universidad Pedagógica Nacional; 2003.

8. 19th World Conference on Health Promotion and Health Education. Crossing Sectors: Dialogue on Intersectoral Action. Dialogue Report; 2007.

9. Organización Mundial de la Salud. Subsanar las desigualdades en una generación. Subsanar las desigualdades en una generación; 2009.

10. Sobal J, Stunkard AJ. Socioeconomic status and obesity: A review of the literature. Psychol Bull. 1989;105(2):260–75.

11. Gomez R. La enseñanza de la educación física en el nivel inicial y el primer ciclo de egb. Buenos Aires: Stadium, ed.; 2002.

12. Skinner J, Bounds W, Carruth B, Morris M, Ziegler P. Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2–8 y. Int J Obes. 2004;28(4):476–82.

13. Morales R, Flórez M. Agencia de autocuidado y factores de riesgo cardiovascular en adolescentes. Av. enferm., 2016;34 (2): 125-36, DOI: 10.15446/av.enferm.v34n2.41964

14. World Health Organization. Obesity: Preventing and Managing the Global Epidemic - who Technical Report Series. who Tech Rep Ser. 2000;1–252.

15. Ferreira D, Díaz M, Bonilla C. Factores de riesgo cardiovascular modificables en adolescentes escolarizados de Ibagué 2013. Rev Fac Nac Salud Pública. 2017;35(2):264–73. Doi: 10.17533/udea.rfnsp.v35n2a10.

16. Cuneo F, Contini M, Zino G. Factores de riesgo cardiovascular y sus asociaciones en adolescentes de la ciudad de Santo Tomé. fabicib. 2016;19:35–54. Doi: 10.14409/fabicib.v19i0.5414

17. Sáez Y, Bernui I. Prevalencia de factores de riesgo cardiovascular en adolescentes de instituciones educativas. An Fac Med. 2009;70(4):259–65.

18. Falkner B, Daniels SR. Summary of the fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Hypertension. 2004;(44): 387–8. Doi: 10.1161/01.HYP.0000143545.54637.af

19. López L, González L, Pacheco L. Prevalencia del consumo de bebidas alcohólicas en estudiantes de colegios Ae Asunción. An Fac Ciencias Médicas. 2005; 28;38(3):82–7.

20. Jackson K, Sher K, Cooper M, Wood P. Adolescent alcohol and tobacco use: Onset, persistence and trajectories of use across two samples. Addiction. 2002;97(5):517–31.

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21. Rohde P, Lewinsohn PM, Seeley JR. Psychiatric comorbidity with problematic alcohol use in high school students. J Am Acad Child Adolesc Psychiatry. 1996;35(1):101–9.

22. González R, Llapur R, Díaz M, Illa M, Yee E, Pérez D. Estilos de vida, hipertensión arterial y obesidad en adolescentes. Rev Cubana Pediatr. 2015;87(3):273–84.

23. Janssen I, Katzmarzyk P, Ross R. Waist circumference and not body mass index explains obesity-related health risk. Am J Clin Nutr. 2004;79(3):379–84.

24. Ardern C, Katzmarzyk P, Janssen I, Ross R. discrimination of health risk by combined body mass index and waist circumference. Obes Res. 2003;11(1):135–42.

25. Berenson G. Obesity —A Critical Issue in Preventive Cardiology: The Bogalusa Heart Study. Prev Cardiol. 2005;8(4):234–43.

26. Lavielle P, Pineda V, Jáuregui O, Castillo M. Physical activity and sedentary lifestyle: Family and socio-demographic determinants and their impact on adolescents' health. Rev Salud Pública. 2014;16(2):161–72. Doi: 10.15446/rsap.v16n2.33329

27. Ferrer M, Rodríguez C, González M, Díaz M, Núñez M. Obesidad, hipertensión y tabaquismo: señales ateroscleróticas tempranas en adolescentes de la secundaria básica Guido Fuentes. Rev Cuba Investig Biomed. 2009;28(2).

28. Yang C, Hsu Y. A Review of Accelerometry-Based Wearable Motion Detectors for Physical Activity Monitoring. Vol. 10, Sensors. Multidisciplinary Digital Publishing Institute (MDPI). 2010;(10):7772–88.

29. Torres C, Illera D, Acevedo D, Cadena M, Meneses L, Ordóñez P, et al. Riesgo cardiovascular en una población adolescente de Timbío, Colombia. Rev Univ Ind Santander Salud. 2018;50(1):59–66. Doi: 10.18273/revsal.v50n1-2018006

30. Telumbre J, Sánchez B. Alcohol consumption among adolescents from state of Guerrero, México. Health and Addictions . 2015 31;15(1):79–86. Doi: 10.13140/RG.2.1.3852.7525

31. O'Keefe J, Bybee K, Lavie C. Alcohol and Cardiovascular Health. The Razor-Sharp Double-Edged Sword. Jour Am Coll of Cardiology. 2007;(50):1009–14.

32. Naimi TS, Brewer RD, Mokdad A, Denny C, Serdula MK, Marks JS. Binge Drinking among US Adults. J Am Med Assoc. 2003;289(1):70–5.

33. Gunzerath L, Faden V, Zakhari S, Warren K. National institute on alcohol abuse and alcoholism report on moderate drinking. Alcoholism: Clinical and experimental research. 2004;(28): 829–47.

34. Álvarez F, Díaz J, Riaño I, Pérez D, Venta R, Málaga S. Factores de riesgo cardiovascular clásicos y emergentes en escolares asturianos. An Pediatr. 2011;74(6):388–95.

35. Lima M, Martínez J, Guerra M, Vargas A, Lima- J. Factores relacionados con la calidad de vida en la adolescencia. Gac Sanit. 2018;32(1):68–71. Doi: 10.1016/j.gaceta.2016.06.016

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